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# International Journal of Scientific Study

[www.ijss-sn.com](http://www.ijss-sn.com)

February 2015 • Volume 2 • Issue 11

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### Publishing Details

**Publisher Name:** Smile Nation - Lets Smile Together

**Registered Office:** International Journal of Scientific Study, 9/2, Satyalok Building, Gadital, Hadapsar, Pune, Maharashtra, India – 411028.

**Designed by:** Tulyasys Technologies ([www.tulyasys.com](http://www.tulyasys.com))

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# Determining the Indications and Role of Screening/Diagnostic Mammography in Breast Cancer in Women below 40 Years and Contribution of Ultrasound as an Adjunct to Mammography: A Retrospective Study

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## Abstract

**Introduction:** Many studies have assessed mammography in women over age 40 years, but little is known about its usefulness in younger women. Although screening mammograms are not generally recommended under age 40, about 29% of women between 30 and 40 reports having had one.

**Aim:** The purpose of this study was to retrospectively determine the indications and role of screening/diagnostic mammography in women below 40 years in breast cancer detection and contribution of ultrasound as an adjunct to mammography.

**Materials and Methods:** This 1-year retrospective study involved all female patients below the age of 40. All charts of these patients were reviewed for information like age of the patient, Specialty of referring physician, indication for mammography, mode of diagnosis - mammography or ultrasound or both, cyto/histopathology and any supplement information.

**Results:** A total of 234 women were referred for mammography. Of which the 96 (approximate 41%) of the patients were below the 40 years (17-40 years) with a mean age of 33.4 years. Indications of mammography were: (a) Presence of pain in breast with fear of cancer but without a palpable mass, (b) palpable mass, (c) an abnormality of skin or nipple, (d) follow-up mammography because of a previously detected lesion defined as probably benign, (g) non-hemorrhagic nipple discharge. Only 21/96 (22%) women had palpable mass, 14/21 (67%) lesions were occult on mammography and were seen on ultrasound only, while 7/21 (33%) lesions were seen on mammography and ultrasound both. Sensitivity of 7.2% was observed of mammography to detect lesions in young patients, while of ultrasound was 98%.

**Conclusion:** Mammography is less sensitive to sonography in dense breasts; therefore one can use sonography for younger age group and mammography for a later age group. Combining with sonography will result in higher sensitivity for detecting benign lesions and breast cancer.

**Key words:** Breast cancer, Indication, Mammography, Younger women.

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**Month of Submission :** 12-2014  
**Month of Peer Review :** 01-2015  
**Month of Acceptance :** 01-2015  
**Month of Publishing :** 02-2015

## INTRODUCTION

Many studies have assessed mammography in women over age 40 years, but little is known about its usefulness in younger women. Although screening mammograms are not generally recommended under age 40. Breast cancer is diagnosed either clinically following self-breast examination

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or physical examination by healthcare personals or following screening mammography.<sup>1</sup> Mammography has capability of detecting non-palpable lesions, thus identifying very early breast cancer lesions and carcinoma *in situ* and hence is used as a screening toll.<sup>2</sup> Performance of screening mammography is known to vary by age. Younger women are more likely to experience some of the downsides of screening such as false positive or negative test results due to varied degree of density of breast parenchyma.<sup>2,3</sup> The use of ultrasound with mammography increases in diagnostic accuracy.<sup>4,5</sup>

The U.S. Preventive Task Force in new breast cancer screening guidelines dated November 17, 2009 now recommends against routine mammography screening for women before age 50 years and suggests that screening end at age 74 years. It recommends that routine screening of average risk women begin at age 50. The American Cancer Society recommends that screening begins at age 40. However, the advocacy groups like the National Breast Cancer Coalition, Breast Cancer Action, and the National Women's Health Network welcomed the new guidelines.

Regardless of the type of the breast problem, the goal of imaging studies is to rule out cancer and to address the patient's symptoms. Purpose of this study was to retrospectively determine the indications and the role of mammography still used as a screening/diagnostic tool by physicians/surgeons for detection of cancer in women under 40 and how mammography performs in the diagnosis and contribution of ultrasound as an adjunct.

## MATERIALS AND METHODS

The study involved all female patients below the age of 40 who reported to the 1000 bed multispecialty SRMSIMS Hospital at Bhojipura, Bareilly, Uttar Pradesh, India between November 2013 and November 2014 for screening/diagnostic mammography.

All charts of these patients were reviewed for information like age of the patient, specialty of referring physician, indication for mammography, family history, mode of diagnosis - mammography or ultrasound or both, and any supplement information.

In the patient's record, the parenchymal density of the glandular tissue was noted. It was considered to be dense, heterogeneously dense, scattered fibro glandular tissue sufficiently spread out and intermingle with a variable amount of fat and breast with predominantly fatty component.

Mammography was performed on mammomat 1000 Siemens machine with computed radiography system. Standard cranio-caudal and medio-lateral oblique views were routinely obtained. Ultrasound was performed in all cases immediately after mammography by same radiologist reporting the mammography.

In suspected cases of malignancy/abscess on ultrasound or mammography or on both a cyto/histopathology was performed.

## RESULTS

Over the 1-year, a total of 234 patients were referred to the Radiodiagnosis Department of SRMSIMS, Bareilly for mammography. The 96 (approximately 41%) of the patients referred for mammography were below the 40 years (17-40 years) and 135 (59%) of patients were above 40 years (41-84 years). The youngest patient was 17-year old (Table 1). Average age of the patients below 40 in our study was 33.4 years.

About 36.5% (35/96) were self-referred, 24% (23/96) by general surgeons, 12.5% (12/96) patients were referred by corporate sectors for health checkup, 11.5% (11/96) by gynecologist, 8.3% (08/96) by oncologists and 7.2% (07/96) by medical specialist. The highest percentage of patients was self-referred (Table 2).

Indications of mammography by referring physician were: (a) Presence of pain in breast without a palpable mass with fear of cancer, (b) palpable mass, (c) health checkup, (d) follow-up mammography because of a previously detected lesion defined as probably benign, (e) non-hemorrhagic nipple discharge (Table 3).

Approximately 41% of the patients had dense pattern on mammography, 32% had heterogeneous dense pattern, 19% scattered fibroglandular density, and 08% had predominantly fat replaced pattern (Table 4).

Largest indication (61%, 59/96) of mammography referral was pain in breast without a palpable mass with fear of cancer, and all patients in this group were above age of 20 (35% in age group 20-30 and 65% age group 30-40).

**Table 1: Division of patients according to age groups**

Age group (in years)	Number of patients
15-20	02
21-30	33
31-40	61
Total	96

**Table 2: Division of patients according to age groups (all specialties)**

Age group	Self	Surgery	Health checkup	Gynaecology	Oncologists	Medicine	Total
15-20 years	Nil	2	Nil	Nil	Nil	Nil	02
21-30 years	12	03	03	04	03	03	33
31-40 years	23	18	09	07	05	04	61
Total	35	23	12	11	08	07	96

**Table 3: Division of patients according to indications for mammography**

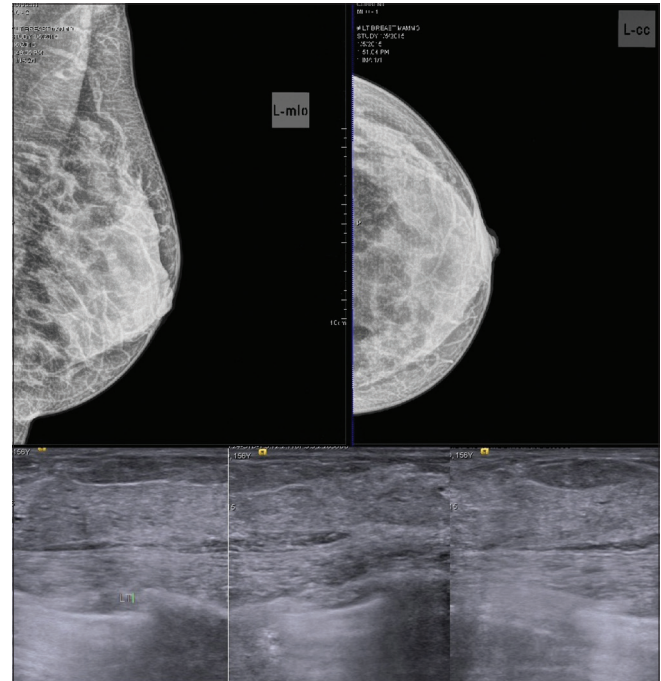
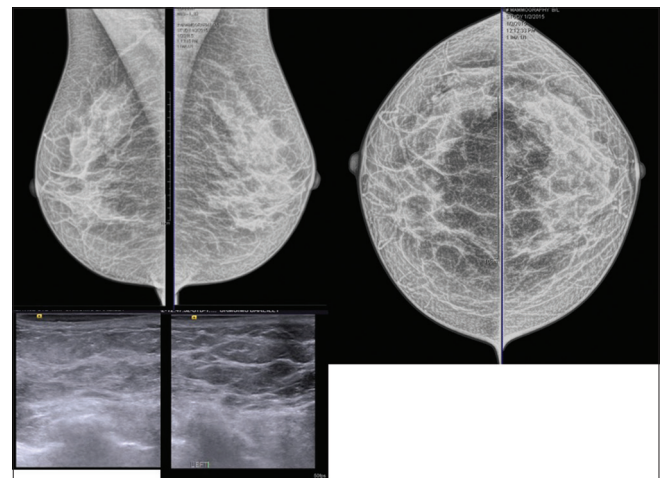
Symptoms	Total number of patients	Age group (years)		
		15-20	21-30	31-40
Presence of pain in breast without a palpable mass with fear of cancer	59	Nil	21	38
Palpable mass	20	2	08	10
Abnormality of skin/nipple with palpable mass	01	Nil	Nil	01
Follow-up mammography because of a previously detected lesion defined as probably benign	01	Nil	Nil	01
Health checkup	12	Nil	03	09
Acute problem	02	Nil	Nil	02
Non-hemorrhagic nipple discharge	01	Nil	Nil	01
Total	96	2	32	62

**Table 4: Distribution of mammographic findings of tissue densities**

Frequency	Frequency	Percent
Dense	39	41
Heterogeneous dense	31	32
Scattered fibro glandular density	18	19
Predominantly fatty	08	08
Total	96	100

This category included all pattern of breast parenchyma density on mammography with predominantly dense or heterogeneously dense breast parenchyma pattern on mammography (Figures 1 and 2) that were difficult to comment or rule out the mass. These mammograms were considered negative if no mass was palpable and adjunct ultrasound examination revealed no cyst or mass lesion. Ultrasound examination with high frequency probe revealed no abnormality in 50/59 patients (84.7%), while 09/59 (15.3%) on ultrasound showed small well defined thin walled anechoic subcentimeter/centimeter size cysts favoring the diagnosis of fibroadenosis and these patients were in age group of 31-40 years. Cysts with such description were considered benign and these patients were advised yearly follow-up by ultrasonography.

Mammography evaluation of palpable abnormalities in 22% (21/96) patients showed that 1/3<sup>rd</sup> (33%) had smooth or lobulated homogeneously opaque sols with sharply defined margins which were labeled as fibroadenomas on ultrasound

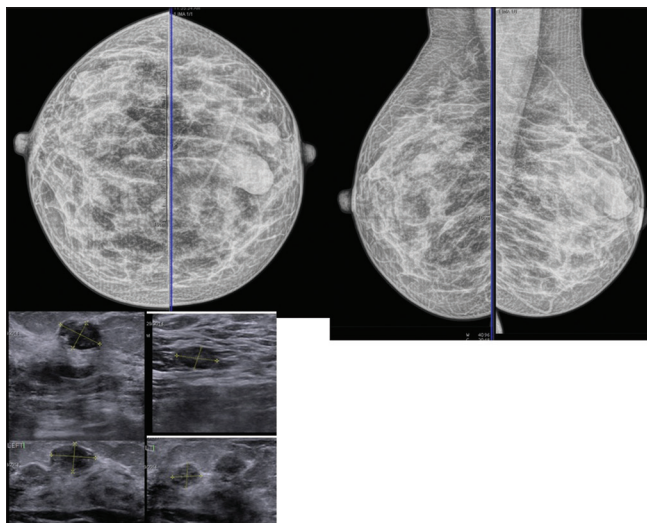

**Figure 1: Normal dense breast parenchyma and ultrasound images**

**Figure 2: Normal scattered fibroglandular breast pattern and ultrasound images**

(Figure 3), except one suspicious malignant lesion which showed as a radiopaque mass with nipple deformation on mammography and was also labeled as malignant on ultrasound with axillary lymph nodes and sols in liver (Figure 4). In some patients, more than two fibroadenomas

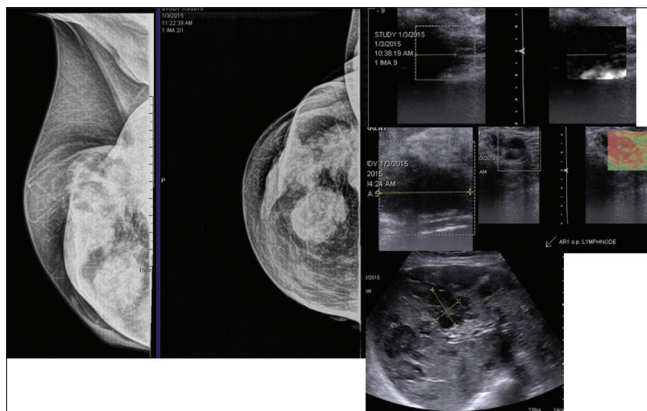


were present involving single or both breast (Figure 5). Largest fibroadenomas was of length 4.5 cm and width 3.4 cm in 17 years patient. Rest of the lesions were in the range of 1.5-2.5 cm. These had a horizontal orientation with length more than breadth and were assumed to be fibroadenomas and were classified as probably benign (Table 5). Rest of the 2/3 palpable lesions remained occult on mammography (Figure 6). In these patients, USG indicated fibroadenomas/cysts in 09/21 (43%) patients and 3/21 (14%) showed irregularly marinated infiltrating masses measuring approximately 2.5-3 cm in size with large axillary lymphadenopathy >1.5 cm and were classified as malignant and were confirmed on fine needle aspiration cytology.

While in 2/21 (10%) no lesion was detected on ultrasound. The possible explanation for non-detecting lesion on USG was, these young women were feeling a normal fibrogladular



**Figure 3: Mammography two well-defined radioopacities in left breast. Sonography showed sols in both breast, likely to be benign, presumed fibroadenomas**



**Figure 4: Mammography with sols and nipple deformation. Sonography showed masses with ill-defined margins, axillary lymph nodes and sols in liver.**

breast element between thumb and fingers as lump (Table 6). However, these were advised for ultrasound follow-up. About 71% (15/21) palpable breast masses were benign, and 19% (4/21) were malignant and in 10% (2/21) mammography was unremarkable and lesions not detected on ultrasound.

All the malignant lesions were present in women aged 30, 35 and 40 years (Figure 7).

All 13% (12/96) patients with health checkup showed dense/heterogeneously dense breast parenchyma pattern and these were further examined with ultrasound. No lesion was found on ultrasound examination and only then these mammograms were considered to be negative for any lesion. Screening mammography alone in ours study was inconclusive for malignancy.

Two patients out of 96 (2%) of age 32 and 39 years presented with acute/subacute breast swelling. On mammography, breast parenchyma showed non-specific increased opacity but ultrasound revealed large irregularly marginated lesion with necrotic area. USG guided aspiration revealed the pus suggestive of abscess (Figure 8).

One patient with non-hemorrhagic nipple discharge, mammography was unremarkable, but ultrasound showed two well-defined subcentimeter size thin walled hypoechoic cysts and were classified as benign. Nipple discharge was negative for malignant cell. Patient was advised follow-up by ultrasound after 1 year.

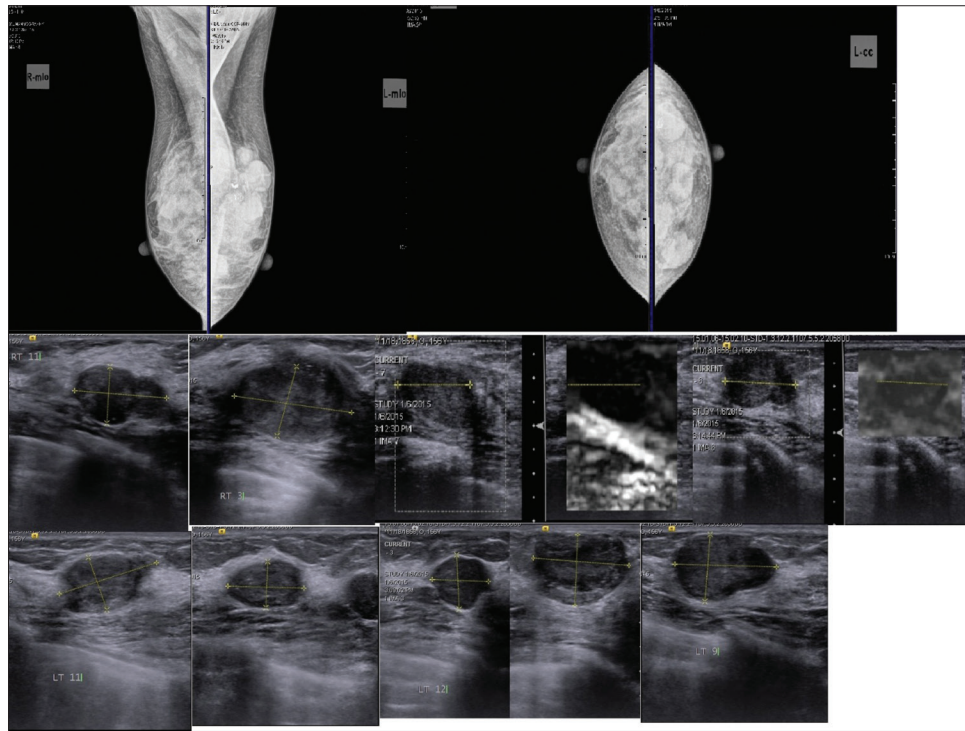
A patient was on follow-up for probably benign lesion (fibroadenomas), the status of the lesion was same on mammography and ultrasound and she was advised to do follow-up on ultrasound.

**Table 5: Mammographic findings of palpable breast abnormalities**

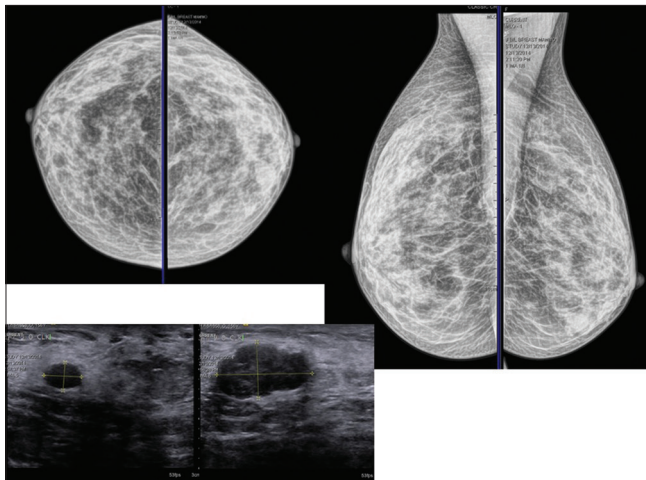
Mammographic finding	Frequency	Percent
Occult	14	66
Cyst or fibro adenoma	06	29
Radio opaque density suspicious malignancy	01	05
Total	21	100

**Table 6: Sonographic findings of palpable breast abnormalities**

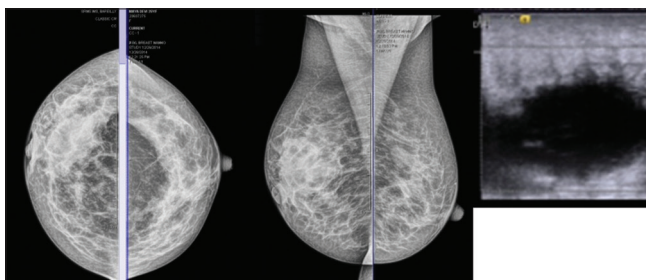
Sonographic finding	Frequency	Percent
Fibro-adenoma	13	62
Cyst	2	9.5
Malignant lesion/III defined mass	4	19
Occult/normal breast	2	9.5
Total	21	100



**Figure 5: Mammography with multiple opacities in both breast sonography showed more number of sols in both breast, likely to be benign, presumed fibroadenomas**



**Figure 6: Mammography occult sols, sonography showed sols in both breast parenchyma, likely to be benign, presumed fibroadenomas**



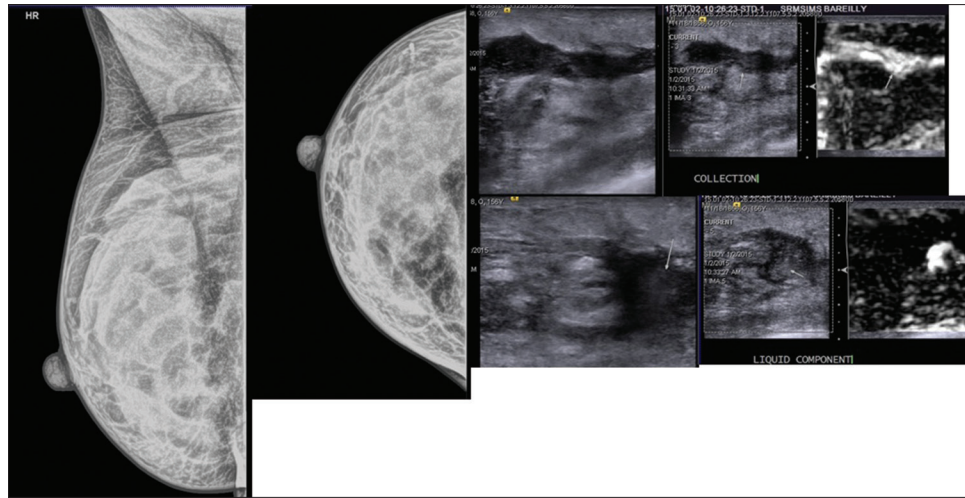
**Figure 7: Mammography showed asymmetric dense parenchyma, sonography showed definite mass with infiltration. Fine-needle aspiration cytology malignant**

## DISCUSSION

Many studies have assessed mammography in women over age 40 years. Although screening mammograms are not generally recommended under age 40, about 29% of women between 30 and 40 report having had one.<sup>6,7</sup> In our study of over the 1 year a total of 96/234 patients (approximately 41%) referred for screening/diagnostic mammography, were below the 40 years. Their age group distribution in ours study was 15-20 years 02%, 21-30 years 34% and 31-40 years 64%. These patients were referred by all major specialties including self-referral. Majority of self-referred patients were for pain in breast with fear of cancer. This reflects the awareness of breast cancer in physicians/women but lack of knowledge for poor sensivity of the mammography for breast cancer or other benign conditions in young breast as well as little awareness for sensivity of USG for detecting breast lesions. In ours study even patients of age group 15-20 years. with palpable fibroadenomas was referred for mammography and not sonography.

In ours study no cancer was detected in women under 25 years. The age group of breast cancer in ours study was 30-40 years. For diagnostic mammography for palpable masses the breast cancer detection on mammography in ours study 5% while rest (14%) of the breast cancer cases were occult on mammography and in them clinical and ultrasound examination was suspicious for malignancy. The





**Figure 8: Mammography was non-specific, sonography showed large ill-defined heterogeneous area with necrotic component. Aspiration revealed pus**

sensitivity, specificity and positive and negative predictive values of mammography depend on several factors - composition of study population, age distribution, number of symptomatic patients and tumor stage.<sup>8,9</sup> In our study age group, mammography sensitivity is lower due to the fact that younger women have dense breast more often, in which it is harder to find smaller tumors in the back ground of fibro glandular tissue.

In non-malignant palpable lesions, 28.3% (6/21) were visible on both mammography and sonography, but ultrasound was also very helpful in identifying these benign lesions as cystic or solid.<sup>10,11</sup> In some patients number of fibroadenomas noted on USG were much more than the mammography substantive the fact that some were occult on mammogram and were seen on ultrasound only. Rest of the palpable benign lesions were occult on mammogram and were detected by adjuvant sonography. Palpable breast masses are common in younger women and are usually benign.<sup>12</sup>

In ours study, patients with a breast lump were referred for identification of the nature of breast disease on mammography only, however without adjuvant USG the false negative rate would have been quite large. Combined mammographic and sonographic assessment was shown to be very helpful in identifying benign as well as malignant lesions causing palpable abnormalities of the breast.<sup>13,14</sup>

In ours study 81% palpable breast lump in younger women were benign while 19% were malignant. Meyer and Kopans in their study reported that 70-80% biopsies of palpable abnormalities were benign.

To determine the accuracy and outcomes of mammograms in younger women, Bonnie Yankaskas from the University of North Carolina at Chapel Hill, and *et al.*, pooled data from

six mammography registries around the country. Their study included 117,738 women who had their first mammogram between the ages of 18 and 39. They analyzed data for both screening mammograms and diagnostic mammograms, which were performed because a woman had a warning sign or symptom, such as a lump. No cancers were detected in women under 25 in their study. In women aged 35-39, the researchers found that screening mammograms had poor accuracy (sensitivity, specificity, and positive predictive value) and high rates of recall for additional tests. The cancer detection rate in this group was 1.6 cancers per 1000 women. For diagnostic mammograms, accuracy was better, and the detection rate was 14.3 cancers per 1000 women aged 35-39. In ours screening mammography study for health check-up due to the known differences in breast density at younger ages we could assess the difficulty of screening utilities of the test itself, such as a lower sensitivity and the value of adjuvant ultrasound examination which was helpful to avoid false positive or false negative mammogram.<sup>15</sup> Mammography should not be included for health check-up of younger asymptomatic women.

In self-referred women for mammography with fear of cancer, negative findings on combined mammography and sonographic imaging have very high specificity and are reassuring to patient and to minimize unnecessary interventions in those cases in which imaging findings are unequivocally benign.

For acute infective/inflammatory problems, ultrasound is a better modality, and the mammogram was non-contributory.

Mammography is less sensitive than sonography in dense breasts and sonography is superior to mammography



in detecting and differentiating between solid and cystic lesions.<sup>16</sup> In our study sensitivity of 7.2% was observed of mammography in young patients up to 40 years of age, while of ultrasound was 98%. Therefore, one can use sonography for younger age group and mammography at a later age group, combining these modalities will result in a higher sensitivity for detecting breast diseases including cancer.

## CONCLUSION

Younger women have very low breast cancer rates. Ultrasound to be used as first modality in younger age group with palpable masses. Screening mammography should not be included for health check-up of younger asymptomatic women and to be reserved for older age group. Mammography without adjuvant ultrasound in younger age group will have a poor performance. The referring physician and surgeons needs to be aware of these facts.

## REFERENCES

1. U.S. Cancer Statistics Working Group. United States Cancer Statistics 2004 Incidence and Mortality (Preliminary Data). Atlanta (GA): Department of Health and Human Services, Centers for Disease Control and Prevention, and National Cancer Institute; 2007.
2. Ghebrehwet M, Paulos E, Andeberhan T. The role of combined ultrasonography and mammography in the diagnosis of breast cancer in Eritrean women with palpable abnormalities of the breast. *J Eritrean Med Assoc* 2007;2:1-7.
3. WHO. The World Health Report 2003, Shaping the Future. Available from: [http://www.who.int/whr/2003/en/whr03\\_en.pdf](http://www.who.int/whr/2003/en/whr03_en.pdf).
4. Jernal A, Murray T, Samuels A, Ghafoor A, Ward E, Thun MJ. Global cancer statistics. *CA Cancer J Clin* 2003;53:5-26.
5. Shetty MK, Shah YP, Sharman RS. Prospective evaluation of the value of combined mammographic and sonographic assessment in patients with palpable abnormalities of the breast. *J Ultrasound Med* 2003;22:263-8.
6. Moy L, Slanetz PJ, Moore R, Satija S, Yeh ED, McCarthy KA, et al. Specificity of mammography and US in the evaluation of a palpable abnormality: Retrospective review. *Radiology* 2002;225:176-81.
7. Dennis MA, Parker SH, Klaus AJ, Stavros AT, Kaske TI, Clark SB. Breast biopsy avoidance: The value of normal mammograms and normal sonograms in the setting of a palpable lump. *Radiology* 2001;219:186-91.
8. Malur S, Wurdinger S, Moritz A, Michels W, Schneider A. Comparison of written reports of mammography, sonography and magnetic resonance mammography for preoperative evaluation of breast lesions, with special emphasis on magnetic resonance mammography. *Breast Cancer Res* 2001;3:55-60.
9. Ekeh AP, Alleyne RS, Duncan AO. Role of mammography in diagnosis of breast cancer in an inner-city hospital. *J Natl Med Assoc* 2000;92:372-4.
10. Zonderland HM, Coerkamp EG, Hermans J, van de Vijver MJ, van Voorthuisen AE. Diagnosis of breast cancer: Contribution of US as an adjunct to mammography. *Radiology* 1999;213:413-22.
11. Moss HA, Britton PD, Flower CD, Freeman AH, Lomas DJ, Warren RM. How reliable is modern breast imaging in differentiating benign from malignant breast lesions in the symptomatic population? *Clin Radiol* 1999;54:676-82.
12. Barton MB, Elmore JG, Fletcher SW. Breast symptoms among women enrolled in a health maintenance organization: Frequency, evaluation, and outcome. *Ann Intern Med* 1999;130:651-7.
13. Kolb TM, Lichy J, Newhouse JH. Occult cancer in women with dense breasts: Detection with screening US – Diagnostic yield and tumor characteristics. *Radiology* 1998;207:191-9.
14. Stavros AT, Thickman D, Rapp CL, Dennis MA, Parker SH, Sisney GA. Solid breast nodules: Use of sonography to distinguish between benign and malignant lesions. *Radiology* 1995;196:123-34.
15. Jackson VP. The current role of ultrasonography in breast imaging. *Radiol Clin North Am* 1995;33:1161-70.
16. Venta LA, Dudiak CM, Salomon CG, Flisak ME. Sonographic evaluation of the breast. *Radiographics* 1994;14:29-50.

**How to cite this article:** Madhok R, Rastogi SK, Aggarwal A, Kapoor A, Rastogi S. Determining the Indications and Role of Screening/Diagnostic Mammography in Breast Cancer in Women below 40 Years and Contribution of Ultrasound as an Adjunct to Mammography: A Retrospective Study. *Int J Sci Stud* 2015;2(11):1-7.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Prevention of Post-operative Nausea and Vomiting with a Sub-hypnotic Dose of Propofol Combined with Dexamethasone in Patients Undergoing Laparoscopic Cholecystectomy Surgeries: A Prospective Randomized Controlled Study

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## Abstract

**Introduction:** Post-operative nausea and vomiting (PONV) is a common complication after laparoscopic cholecystectomy (LC) surgeries. Several agents and techniques have been employed to reduce the incidence of PONV. Propofol was suggested as another alternative for drug combinations with dexamethasone to prevent PONV.

**Objective:** This study was aimed to compare the administration of a subhypnotic dose of propofol with dexamethasone 4 mg, 8 mg dexamethasone alone and placebo in the prevention of PONV after surgery.

**Materials and Methods:** This clinical research was performed at Government general hospital, attached to Rangaraya Medical College, Kakinada. The study included 120 adult patients scheduled for LC surgeries. These patients were randomly assigned into three groups each comprising of 40 patients. The patients in Group A received propofol in a dose of 0.5 mg/kg plus 4 mg of dexamethasone (2 ml), Group B patients were administered with 8 mg of dexamethasone alone (2 ml), whereas Group C patients were given 0.9% saline solution (2 ml). Within the framework of the study, we evaluated the number of patients suffering from nausea and vomiting at 0-4, 4-12, and 12-24 h post-operatively, and the necessity to use additional anti-emetics.

**Results:** The comparison of data showed that up to 4 h, the incidence of vomiting was 25% in Group A, 22.5% in Group B and 67.5% in Group C. The incidence rates in Group A and Group B were significantly lower than that in Group C ( $P < 0.05$ ), while the rate of antiemetic drug usage was higher in Group C than in Group A and Group B ( $P < 0.05$ ). The nausea vomiting scale scores were also significantly higher in Group C than in Group A and Group B ( $P < 0.05$ ). There were no significant differences between the values at 4-12 and 12-24 h.

**Conclusion:** The administration of a sub-hypnotic dose of propofol plus 4 mg of dexamethasone at the end of surgery was found to be at least as effective as 8 mg of dexamethasone in preventing the PONV.

**Key words:** Dexamethasone, Laparoscopic cholecystectomy, Post-operative nausea and vomiting, Propofol

## Access this article online



www.ijss-sn.com

Month of Submission : 12-2014  
Month of Peer Review : 01-2015  
Month of Acceptance : 01-2015  
Month of Publishing : 02-2015

## INTRODUCTION

Laparoscopic cholecystectomy (LC) is one of the most common elective surgical procedures performed now a days. Due to advances in anesthetic and surgical management, up to 84% of elective LC patients can be discharged on the day of surgery. Duration of convalescence after non-

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complicated LC may depend on several factors of which pain, fatigue, nausea and vomiting and socio-cultural factors are the most important ones. Nausea and vomiting occur mainly on the day of operation and only rarely contribute to prolonged convalescence. Despite advances in anesthetic drugs and techniques, post-operative nausea and vomiting (PONV) remain the second most common post-operative complaint after surgery. Despite the increasing attention to post-operative pain control, the PONV is still considered as a minor complication.<sup>1</sup> The determination of the true incidence of PONV is difficult due to the lack of a single stimulus of onset and multiple etiologies (medical, surgical and those related to patient and anesthesia). In the absence of antiemetic treatment, the estimate puts the incidence of PONV at 25-30% for all surgical interventions and patient populations. Of these, 0.18% of cases are resistant to PONV.<sup>2</sup> Pharmacological approaches based on anti-cholinergics, anti-histamines, phenothiazines, butyrophenones, benzamides, corti-costeroides, and serotonin receptor antagonists have been investigated in the prevention and treatment of PONV, with various results.<sup>3,4</sup> Propofol was first reported to be an effective antiemetic drug at low doses in patients undergoing cancer chemotherapy.<sup>5</sup> Song *et al.* have shown that intravenous (IV) administration of 0.5 mg/kg propofol, a low dose, at the end of surgery was effective in preventing nausea and vomiting after LC.<sup>6</sup> Dexamethasone is among the most potent corticosteroids available with a biologic half-life of 36-72 h. Dexamethasone is effective, alone or in combination with other antiemetic agents, in reducing nausea and vomiting after laparoscopic procedures. Compared with placebo, 8 mg of dexamethasone given IV 90 min before LC has been demonstrated to reduce PONV significantly.<sup>7</sup> For high risk PONV patients, a multimodal approach is recommended,<sup>8</sup> because most anti-emetics work independently of each other and of the patient's risk factor.<sup>9</sup> It is widely believed that propofol based anesthetic regimen reduces PONV more compared with volatile anesthetics.<sup>10</sup> Furthermore, even a small dose of propofol was reported to possess direct antiemetic effects,<sup>6,11,12</sup> and an adjuvant sub-hypnotic dose,<sup>13,14</sup> or infusion<sup>15</sup> of propofol to dexamethasone reduced emetic events in surgical or chemotherapy patients.<sup>W</sup>

For surgical patients, a small dose of propofol combined with dexamethasone was effective in preventing PONV during immediate post-operative periods without delaying anesthetic recovery and would be valuable to neurosurgical patients.

Therefore, we compared the post-operative anti-emetic effect between dexamethasone alone and dexamethasone with a small dose of propofol in patients who underwent LC surgeries.

### Aim of the Study

The objective of this prospective, randomized and controlled study was to compare the efficacy of sub-

hypnotic dose of propofol (0.5 mg/kg) combined with dexamethasone (4 mg) versus dexamethasone (8 mg) alone versus placebo in controlling the PONV in adult patients undergoing LC surgeries.

## MATERIALS AND METHODS

This study was conducted in the Laparoscopic OT, Government General Hospital attached to Rangaraya Medical College, Kakinada between January 2014 and September 2014. After obtaining Institutional Ethical Committee's approval and informed consent from the patient's, 120 adult patients belonging to American Society of Anesthesiology (ASA) Grades I and II, of both sexes, aged between 20 and 50 years were taken up for the study.

They were randomly divided into three groups Group A, Group B and Group C each comprising of 40 patients. The patients were assigned to one of three study groups using a computer generated random number table.

### Exclusion Criteria

- Patients with hypertension, chronic obstructive pulmonary disease, bleeding disorders, severe hepatic and renal diseases
- Patients belonging to ASA III, IV
- Allergic to any of the study drugs
- Patients were excluded after enrollment if the surgical procedure was changed from a laparoscopic to an open approach.

All these patients were kept on fasting for 4-8 h before surgery. During premedication, anti-emetics were not given. Patients in all the groups were given standard general anesthesia with injection glycopyrrolate 0.2 mg IV, injection fentanyl 1 µg/kg IV. All the patients were pre-oxygenated with 100% oxygen for 5 min. Patients were induced with IV thiopental sodium 5 mg/kg. Intubated after giving succinylcholine 1.5 mg/kg IV with appropriate sized cuffed polyvinyl chloride endotracheal tube. Neuro muscular blockade was maintained with the loading dose followed by increments of injection atracurium, oxygen and nitrous oxide mixture 40%: 60% and sevoflurane 1-1.5%.

Controlled ventilation was adjusted to maintain ET<sub>CO<sub>2</sub></sub> of 35-40 mm Hg. Standard anesthetic with electrocardiographic monitoring, invasive blood pressure, and pulse oximetry, capnography was done continuously. Intra-operatively, injection fentanyl (0.5-1 µg/kg) IV increments and 1% sevoflurane increased to 1.5%, when there was a considerable rise in heart rate and blood pressure. Throughout the operation, IV fluids were given routinely. After surgery, residual neuromuscular blockade was antagonized with injection glycopyrrolate 10 µg/kg

IV and injection neostigmine 50-70 µg/kg IV and shifted to the recovery room after complete recovery from neuromuscular blockade. Monitored for 2 h in the recovery room and shifted to the ward.

At the end of the surgery, before extubation

- Group A patients were given propofol 0.5 mg/kg + dexamethasone 4 mg IV (2 ml)
- Group B received dexamethasone 8 mg IV (2 ml)
- Group C received placebo (normal saline) (2 ml).

All the syringes with propofol, dexamethasone, or placebo were prepared by the same investigator. Administration of anesthesia and drugs used in the study, and intraoperative data collection were made by other investigators blinded to the study group.

Vomiting was defined as forced gastric and esophageal movement with either the expulsion of gastric contents or not. When vomiting occurred more than twice in 30 min or patients were intolerant to vomiting, injection ondansetron 4 mg was administered IV as a rescue antiemetic. Vomiting was evaluated with nausea vomiting scale (NVS) (Table 1).<sup>2,16</sup>

Sedation was assessed after surgery and for the following 6 post-operative hours by a modified Ramsay sedation scale (Table 2).<sup>16</sup>

All these patients were shifted to post-operative recovery room and monitored after extubation for evaluation of potential post-operative complications.

Post-operatively, the pain score was recorded by using visual analogue pain scale (VAS) between 0 = no pain, 10 = most severe pain. Injection ketorlac 1 mg/kg was given IV when the VAS score was more than 4.

**Table 1: NVS**

NVS	Severity
0	No complaints
1	Mild nausea
2	Moderate nausea
3	Frequent vomiting (4 times)
4	Severe vomiting (continuous)

NVS: Nausea vomiting scale

**Table 2: Modified ramsay sedation scale**

Sedation score	Parameter
1	Anxious, agitated, restless
2	Cooperative, oriented, tranquil
3	Responds to commands only
4	Brisk response to light glabellar tap or loud noise
5	Sluggish response to light glabellar tap or loud noise
6	No response

The standard parameters monitored include occurrence of post-operative vomiting, pain score, sedation score and the number of patients who were given injection ondansetron.

## Statistical Analysis

Statistical analysis was performed with Sigma stat V 3.0. Demographic data, ASA status, were compared using Chi-square test and Fischer' exact test. The occurrence of vomiting and pain severity was evaluated by means of one-way ANOVA test and the differences were measured using Mann-Whitney test. *P* value <0.05 was considered significant, <0.01 was considered very significant.

## RESULTS

In comparison of demographic data between the three groups, there were no statistically significant differences between the three groups among age, weight, ASA group, gender and duration of surgery (*P* > 0.05) (Table 3).

- In our study, patients were observed for 24 h post-operatively, for nausea and vomiting and times of additional antiemetic administration were recorded (Table 4).
- The degree of PONV was scored using the NVS at 0-4, 4-12, and 12-24 h. Additional antiemetic injection

**Table 3: The demographic data were comparable between the three groups**

Parameters	Group A (n=40)	Group B (n=40)	Group C (n=40)	<i>P</i> value
Age (years)	35.74±1.63	36.16±2.52	34.91±1.53	<i>P</i> >0.05
Weight (kg)	61.8±4.40	62.36±1.30	62.06±1.68	<i>P</i> >0.05
ASA (I/II)	25/15	24/16	21/19	<i>P</i> >0.05
Gender (M:F)	19/21	17/23	15/25	<i>P</i> >0.05
Duration of surgery (min)	103.56±37.3	116.5±35.3	105.65±35.7	<i>P</i> >0.05
Sedation score	2	2	2	<i>P</i> >0.05

ASA: American Society of Anesthesiology

**Table 4: Number of patients experiencing nausea and vomiting**

	Group A (n=40)	Group B (n=40)	Group C (n=40)	<i>P</i> value
Nausea				
0-4 h	10	9	27	<i>P</i> <0.05
4-12 h	10	11	14	<i>P</i> >0.05
12-24 h	3	2	14	<i>P</i> >0.05
Vomiting				
0-4 h	11	10	25	<i>P</i> <0.05
4-12 h	9	8	15	<i>P</i> >0.05
12-24 h	3	2	5	<i>P</i> >0.05
Need for additional anti-emetics	8	10	23	<i>P</i> <0.05
NVS (median value)	0	0	2	<i>P</i> <0.05

NVS: Nausea vomiting scale



metaclopramide 0.15 mg/kg was administered IV when the NVS score was  $\geq 3$ .

The incidence of nausea at 0-4 h, in Group A 25%, Group B 22.5%, Group C was 67.5% and is statistically significant ( $P < 0.0001$ ) while there was no statistically significant differences at 4-12 h and 12-24 h (Table 4).

As per as the incidence of vomiting is concerned during 0-4 h, Group A 27.5%, Group B 25%, and Group C is 62.5% ( $P < 0.0001$ ) while there were no statistically significant differences at 4-12 h and 12-24 h among the groups (Table 4).

The incidence of vomiting in Group A ( $P = 0.004$ ), Group B ( $P = 0.001$ ) when compared to Group C and were statistically significant.

Regarding the need for additional antiemetic was Group A 20%, Group B 25%, whereas Group C was 57.5% and the difference is statistically significant (0.05) during 0-4 h, whereas is not significant in 4-12 h and 12-24 h ( $P > 0.05$ ).

The evaluation PONV with NVS showed that the median in Group A (0) Group B (0-1.69) and in Group C is 2 (1.29-3), which was significantly lower.

Sedation scores did not differ much between the three groups ( $P > 0.005$ ).

## DISCUSSION

PONV occurs as a complication after anesthesia, and if not prevented, may lead to post-operative complications like electrolyte imbalance causing hyponatremic hypochloremic metabolic alkalosis, dehydration, wound dehiscence, collections under skin flaps associated with abdominal, vascular or plastic surgeries.<sup>2,16,17</sup>

Different drugs such as anti-cholinergics, anti-histamines, phenothiazines, corticosteroids, and serotonin receptor antagonists have been tried for the treatment of PONV with various outcomes.<sup>2,16,17</sup>

Propofol was suggested as another alternative for drug combinations with dexamethasone to prevent post-operative vomiting.<sup>13-15</sup>

The enrolled patients belong to a very high risk category of post-operative vomiting (POV) because of many well known risk surgical factors like type of surgery, laparoscopic surgery, intra-abdominal installation of carbon dioxide gas, anesthetic factors like positive pressure ventilation, opioids, anti-cholinergics used in premedication, full stomach, using sevoflurane and ketorolac as rescue analgesic in anesthetic

maintenance. Nitrous oxide may cause PONV if used as sole anesthetic agent.<sup>3</sup> We tried to neutralize the patient dependent factors, anesthesia dependent factors and surgery dependent factors by homogenizing the study groups in terms of age, body weight, ASA group, gender, duration of operation and anesthesia.

In our study, we recorded and compared the severity of nausea, vomiting using NVS during 24 h post-operative period and the need for additional anti-emetics during 0-4 h, 4-12 h, and 12-24 h of the post-operative period. The results were expressed in percentages.

From the statistical analysis, we have observed that number of patients who suffered from nausea and vomiting in the early post-operative period (0-4 h) were significantly lower in the A and B groups when compared with Group C. Even the need for additional antiemetic was also very low in Group A and B patients when compared with C Group. From this study, it is also observed that drugs used in Group A and B were almost equally effective in preventing PONV in the 1<sup>st</sup> 4 h post-operatively. There was no significant difference in all the three groups in 4-12 h and 12-24 h period. Our results of PONV control during the 1<sup>st</sup> h of post-operative period show that immediate post-operative bolus of propofol in a dose of 0.5 mg/kg plus 4 mg dexamethasone or 8 mg of dexamethasone were more effective than control group ( $P < 0.05$ ).

When compared to other induction agents, propofol was found to cause less PONV.<sup>18,19</sup> The exact antiemetic mechanism of propofol was not clearly known. This may be due to its sedative effect, modulation of subcortical pathway,<sup>20,21</sup> or due to its weak serotonin antagonistic effect.<sup>22</sup>

The efficacy of sub-hypnotic dose of propofol as antiemetic is still controversial as some studies shown that it is not effective in preventing PONV.<sup>23,24</sup> Contrary to these findings, some studies support the antiemetic effect of a single dose of propofol.

Erdem *et al.*<sup>15</sup> showed that in children undergoing tonsillectomy, the addition of a sub-hypnotic dose of propofol infusion at a rate of 20  $\mu$ /kg/min intra-operatively to dexamethasone in a dose of 0.15 mg/kg was more effective in reducing POV than dexamethasone alone.

Song *et al.*<sup>6</sup> have determined that low doses of propofol (0.5 mg/kg) infused at the end of operations in patients who have undergone LC under general anesthesia reduce the incidence of PONV. Fujii and Nakayama have determined that low doses of propofol plus dexamethasone at the end of operations in patients who have undergone laparoscopic cholecystectomy under general anesthesia reduce the incidence of PONV.



Fujii *et al.*<sup>25</sup> showed that a small dose of propofol (0.5 mg/kg) combined with 8 g of dexamethasone was more effective than propofol alone for the prevention of PONV in adult Japanese patients having general anesthesia for extractions of third molars.

Numazaki *et al.*<sup>22</sup> have reported that the minimum dose of propofol for effective prevention of PONV equals to 0.5 mg/kg given IV at the end of the operation, while the effect of a dose of 0.25 mg/kg does not differ from that of placebo. The authors have also concluded that propofol at doses of 0.5 mg/kg and 0.75 mg/kg has similar effects while at doses under 1 mg/kg, it yields less sedation, dysphoria, and extrapyramidal signs. Consequently, the latter dose is not recommended. Based on this information, we preferred to administer propofol in a bolus dose of 0.5 mg/kg.

Our study observed that adjuvant use of propofol 0.5 mg/kg would increase the antiemetic effect of dexamethasone in patients who underwent laparoscopic cholecystectomy surgery under intraoperative use of sevoflurane and received ketorolac as a rescue analgesic.

## CONCLUSION

Therefore, this clinical trial has demonstrated that administration of sub-hypnotic dose of propofol (0.5 mg/kg) with dexamethasone 4 mg at the end of surgery was found to be as effective as 8 mg of dexamethasone alone in preventing PONV in the early post-operative period in adult patients undergoing LC surgeries.

## REFERENCES

- Acalovschi I. Postoperative nausea and vomiting. *Curr Anaesth Crit Care* 2002;13:37-43, 332-6.
- Kovac AL. Prevention and treatment of postoperative nausea and vomiting. *Drugs* 2000;59:213-43.
- Gan TJ, Meyer T, Apfel CC, Chung F, Davis PJ, Eubanks S, *et al.* Consensus guidelines for managing postoperative nausea and vomiting. *Anesth Analg* 2003;97:62-71.
- Watcha MF, White PF. Postoperative nausea and vomiting: Its etio-doses for reducing nausea and vomiting following thyroidectomy. *Can logy, treatment, and prevention. Anesthesiology* 1992;77:162-84.
- Borgeat A, Wilder-Smith OH, Wilder-Smith CH, Forni M, Suter PM. Propofol improves patient comfort during cisplatin chemotherapy. A pilot study. *Oncology* 1993;50:456-9.
- Song D, Whitten CW, White PF, Yu SY, Zarate E. Antiemetic activity of propofol after sevoflurane and desflurane anesthesia for outpatient laparoscopic cholecystectomy. *Anesthesiology* 1998;89:838-43.
- Bisgaard T, Klarskov B, Kehlet H, Rosenberg J. Preoperative dexamethasone improves surgical outcome after laparoscopic cholecystectomy: A randomized double-blind placebo-controlled trial. *Ann Surg* 2003;238:651-60.
- Apfel CC, Kranke P, Piper S, Rüscher D, Kerger H, Steinfath M, *et al.* Nausea and vomiting in the postoperative phase. Expert- and evidence-based recommendations for prophylaxis and therapy. *Anaesthesiol* 2007;56:1170-80.
- Apfel CC, Korttila K, Abdalla M, Kerger H, Turan A, Vedder I, *et al.* A factorial trial of six interventions for the prevention of postoperative nausea and vomiting. *N Engl J Med* 2004;350:2441-51.
- Shinn HK, Lee MH, Moon SY, Hwang SI, Lee CS, Lim HK, *et al.* Post-operative nausea and vomiting after gynecologic laparoscopic surgery: Comparison between propofol and sevoflurane. *Korean J Anesthesiol* 2011;60:36-40.
- Borgeat A, Wilder-Smith OH, Saiah M, Rifat K. Subhypnotic doses of propofol possess direct antiemetic properties. *Anesth Analg* 1992;74:539-41.
- Gan TJ, El-Molem H, Ray J, Glass PS. Patient-controlled antiemesis: A randomized, double-blind comparison of two doses of propofol versus placebo. *Anesthesiology* 1999;90:1564-70.
- Borgeat A, Wilder-Smith O, Forni M, Suter PM. Adjuvant propofol enables better control of nausea and emesis secondary to chemotherapy for breast cancer. *Can J Anaesth* 1994;41:1117-9.
- Arslan M, Demir ME. Prevention of postoperative nausea and vomiting with a small dose of propofol combined with dexamethasone 4 mg or dexamethasone 8 mg in patients undergoing middle ear surgery: A prospective, randomized, double-blind study. *Bratisl Lek Listy* 2011;112:332-6.
- Erdem AF, Yoruk O, Alici HA, Cesur M, Atalay C, Altas E, *et al.* Subhypnotic propofol infusion plus dexamethasone is more effective than dexamethasone alone for the prevention of vomiting in children after tonsillectomy. *Paediatr Anaesth* 2008;18:878-83.
- Isik B, Cekmen N, Arslan M, Ozsoylar O, Kordan AZ, Akcabay M. Comparison of the antiemetic effects of ondansetron and dexamethasone on middle ear surgery. *Saudi Med J* 2006;27:646-51.
- American Society of Health System Pharmacists. ASHS therapeutic guidelines on the management of nausea and vomiting in adult and paediatric patients receiving chemotherapy or radiation therapy or undergoing surgery. *Am J Health Syst Pharm* 1999;56:729-64.
- Gunawardene RD, White DC. Propofol and emesis. *Anaesthesia* 1988;43 Suppl:65-7.
- Price ML, Walmsley A, Swaine C, Ponte J. Comparison of a total intravenous anaesthetic technique using a propofol infusion, with an inhalational technique using enflurane for day case surgery. *Anaesthesia* 1988;43 Suppl:84-7.
- Tramèr MR. Strategies for postoperative nausea and vomiting. *Best Pract Res Clin Anaesthesiol* 2004;18:693-701.
- Scuderi PE, D'Angelo R, Harris L, Mims GR 3<sup>rd</sup>, Weeks DB, James RL. Small-dose propofol by continuous infusion does not prevent postoperative vomiting in females undergoing outpatient laparoscopy. *Anesth Analg* 1997;84:71-5.
- Numazaki M, Fujii Y. Antiemetic efficacy of propofol at small doses for reducing nausea and vomiting following thyroidectomy. *Can J Anaesth* 2005;52:333-4.
- Campbell NN, Thomas AD. Does propofol have an anti-emetic effect? A prospective study of the anti-emetic effect of propofol following laparoscopy. *Anaesth Intensive Care* 1991;19:385-7.
- Tarhan O, Canbay O, Celebi N, Uzun S, Sahin A, Coskun F, *et al.* Subhypnotic doses of midazolam prevent nausea and vomiting during spinal anesthesia for cesarean section. *Minerva Anesthesiol* 2007;73:629-33.
- Fujii Y, Nakayama M, Nakano M. Propofol alone and combined with dexamethasone for the prevention of postoperative nausea and vomiting in adult Japanese patients having third molars extracted. *Br J Oral Maxillofac Surg* 2008;46:207-10.

**How to cite this article:** Ramaiah YA, Babu BVM, Lakshmi BS, Mouli C. Prevention of Post-operative Nausea and Vomiting with a Sub-hypnotic Dose of Propofol Combined with Dexamethasone in Patients Undergoing Laparoscopic Cholecystectomy Surgeries: A Prospective Randomized Controlled Study. *Int J Sci Stud* 2015;2(11):8-12.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Assessment of the Role of Preparatory Information on Children's Anxiety Levels before and after a Dental Procedure

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## Abstract

**Introduction:** Anxious children are the major concern in dental practice because anxiety and fear often function as barriers to needed dental treatment. Psychological preparation prior to dental treatment reduces anxiety levels during dental treatment.

**Aim:** The aim was to assess the role of preparatory information on children's anxiety levels before and after dental treatment procedures.

**Methods:** A total of 60 children were selected for the study, 30 in the study group and 30 in the control group. In each group 10 underwent restorative treatment, 10 endodontic treatment and 10 extractions. Study group: Each child from this group was explained about the dental procedure. The procedure was then carried on the child. Control group: Children in this group were not explained about the procedure and directly the procedure was carried out on them. Anxiety levels in both the groups were rated twice using a facial image scale recorded on a proforma before and after the procedure.

**Result:** Although the anxiety levels in the study group were found to be less, the difference was not statistically significant.

**Conclusion:** Based on the results of the study, it cannot be recommended to give any kind of preparatory information before a dental procedure. However, it is always better for children to know what to expect from a visit to the dentist.

**Key words:** Dental anxiety, Facial image scale, Preparatory information

## INTRODUCTION

In children, the existence of dental fear and anxiety are very well known. However, studies regarding the prevalence of fear and anxiety vary greatly in their results. Although anticipatory anxiety and fear are interchangeably used, the terms have different meanings. The term "anticipatory anxiety" is used to denote the response to an unknown stimulus, whereas "fear" is taken as the response to a known stimulus. The difference in the prevalence in these parameters is because of the different definitions and tools used to measure them.

In a study in Europe, it was found that 35% of 5 year old children and 21% of 12 year old children were anxious about visiting the dentist.<sup>1</sup> In another study, Skaret *et al.* reported that 15-19% of children showed high dental anxiety in Norway.<sup>2</sup> In America, however, 23% children showed dental fear.<sup>3</sup> Buchanan and Niven,<sup>4</sup> found that 7% of their sample dentally anxious and in a review by Klingberg and Broberg<sup>5</sup> Dental fear was found to be prevalent in 9% of the population.

Anticipatory anxiety leads to the development of avoidances behaviour towards dental treatment.<sup>6</sup> Fear makes the child frightened and uncooperative.<sup>7</sup> No specific cause of dental fear has been stated, and it is believed to be multifaceted.<sup>8</sup> Any past experience of unpleasant dental treatment may play a very important role in development of fear.<sup>9</sup>

Many basic behavior guidance techniques have been employed for managing dental fear and anxiety. Children can be given a sense of control over proceedings by making

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Month of Submission : 12-2014  
Month of Peer Review : 01-2015  
Month of Acceptance : 01-2015  
Month of Publishing : 02-2015

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them hold a mouth mirror or a toy. The dentist's first meeting can be a casual one and a little "social" time with the fearful child before treatment can be of a lot of help.<sup>10</sup> American Academy of Pediatric Dentistry has given a list of behavior guidance techniques, which include distraction, physical restraint, etc.<sup>11</sup> However, when basic behavior guidance techniques fail, advanced techniques have to be employed, for example, nitrous oxide/oxygen inhalation sedation.<sup>12</sup>

Bandura's social learning theory<sup>13</sup> can be employed to shape a child's behavior and manage fearful children in a less invasive manner. Possibly fearful children are exposed to positive images or information about dentistry. In this way, they learn that dentistry is good, and certainly nothing to be afraid of.

Psychological preparation prior to dental treatment is said to reduce anxiety levels during pediatric dental treatment. Furthermore, it is well-known that the three most common dental procedures in children are restorations, extractions and endodontic therapy. Psychological preparation could be in the form of preparatory information about the dental treatment the child is scheduled for.

Therefore, the aim of this study was to assess the role of preparatory information on children's anxiety levels before and after dental treatment procedure and to compare anxiety levels in children undergoing three different dental procedures (restorative, endodontic and extractions).

## METHODS

A total of 60 healthy patients were selected for the study from children visiting the Department of Pedodontics and Preventive Dentistry at V S Dental College and Hospital, Bengaluru, India through simple random sampling. Institutional ethical clearance was obtained for the study. Signed written informed consent was taken from the parents or the caretakers of all the children. The study sample was selected based on the following criteria:

### Inclusion Criteria

- Healthy children who attended the clinic, aged between 8 years and 12 years, with no previous dental experience
- Children requiring a restorative, endodontic or extraction procedure.

### Exclusion Criteria

- Children who were visually or mentally disabled
- Children whose parents or caregivers refused to give consent for the study.

Out of the 60 children selected for the study, 30 were in the study group, and 30 children were in the control

group. In each group 10 underwent restorative treatment, 10 endodontic treatment and 10 extractions. In the study group, each child was explained about the dental procedure before the planned procedure. The procedure was then carried out on the child. In the control group, children were not explained about the procedure, and directly the procedure was carried out on them.

Anxiety levels in both the groups was rated twice and recorded on a proforma using the facial image scale given by Buchanan and Niven.<sup>4</sup> It is a sequential diagrammatic scale consisting of five images ranging from very happy-very unhappy. Score of 1 is for very happy and 5 for very unhappy (Figure 1). The proforma was shown to the patient, and he or she then indicated on the scale, which "face" best reflected their feelings at that particular time. First time the anxiety levels were recorded prior to the commencement of the procedure. Second time it was recorded after the completion of the procedure. The anxiety levels in children undergoing different dental procedures (restorative, endodontic and extractions) were also compared. The intergroup anxiety scores were compared using Mann-Whitney *u*-test. The results were then stored and analyzed using SPSS software version 17.

## RESULTS

The mean anxiety levels of the study and control groups were recorded before and after the dental procedure. It was found that before the procedure the anxiety scores were 2.50 and 2.87 for the study group and the control group respectively (Table 1). However, after the dental procedure the anxiety score were 2.90 and 3.30 in the study and control groups. Although the anxiety scores were less for the study group when compared to the control group, both before and after the procedure, the difference was not found to be statistically significant ( $P = 0.165$ ). Furthermore, it was found that the mean anxiety scores increased after the completion of dental procedure for both the groups.

The comparison of anxiety scores between the groups based on the treatment they underwent was also done. The mean anxiety scores in the extraction group were 3.10 and 3.65 before and after the treatment respectively.

**Table 1: Comparison of anxiety between study and control groups**

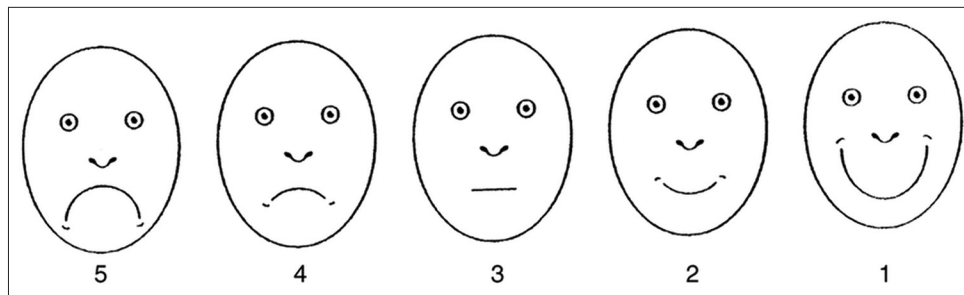
Anxiety Group	Mean	Standard deviation	SE of mean	Mean difference	Z	P value
Before Study	2.50	1.20	0.22	-0.367	-1.388	0.165
Control	2.87	1.11	0.20			
After Study	2.90	1.30	0.24	-0.400	-1.335	0.182
Control	3.30	1.32	0.24			

SE: Standard error

**Table 2: Comparison of anxiety between groups based on the treatment done**

Time interval	Group	Mean	Standard deviation	SE of mean	95% CI for mean		Min	Max	P value	Significant difference between	
					Lower bound	Upper bound					
Before	Extraction	3.10	1.21	0.27	2.53	3.67	1	5	0.108	3 versus 5 ( <i>P</i> <0.01)	
	Pulpectomy	2.65	1.23	0.27	2.08	3.22	1	5			
	Restorations	2.30	0.92	0.21	1.87	2.73	1	4			
After	Extraction	3.65	1.23	0.27	3.08	4.22	1	5	0.021*		3 versus 5 ( <i>P</i> <0.01)
	Pulpectomy	3.10	1.33	0.30	2.48	3.72	1	5			
	Restorations	2.55	1.19	0.27	1.99	3.11	1	5			

\*Significant difference, SE: Standard error, CI: Confidence interval

**Figure 1: Facial image scale**

In the pulpectomy group, the scores were 2.65 and 3.10 before and after the procedure. For the restoration group, the anxiety scores were 2.30 and 2.55 before and after treatment respectively. It is clearly seen that anxiety levels in extraction group was highest followed by pulpectomy and restoration groups (Table 2).

## DISCUSSION

The results of the present study revealed that the preparatory information about the dental treatment had no effect on anxiety levels in children. These results support the findings of Folayan and Idehen<sup>14</sup> and Olumide *et al.*<sup>15</sup> who also found that dental information did not reduce anxiety in children. However, Fox and Newton<sup>16</sup> found a reduction in anxiety, but they used positive images of dentistry, rather than just information about dentistry. Folayan and Idehen<sup>14</sup> on the other hand, had carried out their study on children who had been exposed to dental information in the past. In the present study, however, the children were exposed to dental information as an integral part of the study and did not have any past dental experience.

The present study had certain limitations. Factors that could have affected anxiety levels were not taken into consideration, like previous medical visits. Also, many children could not detect a unit difference in facial image scale. All the previous studies too had similar limitations. According to Cohen *et al.*<sup>6</sup> anxious children avoid visiting a dentist. This was seen in our study too where we found a mean anxiety score of 2.68 in the children before they

underwent the treatment. This score clearly showed that the children were not very anxious before the treatment. Therefore, future studies should attempt to select participants who exhibit higher levels of dental anxiety.

Different behavior guidance approaches can be employed for enhancing cooperation, based on the level of anxiety a child presents with.<sup>17</sup> For children reporting with low levels of dental anxiety, techniques such as distraction, modeling, voice control and environmental changes are thought to be useful. According to Newton *et al.*<sup>17</sup> preparatory information is best for children with moderate levels of anxiety. In our study, however, children presented with low levels of anxiety before the treatment. This possibly explains why giving preparatory information did not alter their anxiety levels significantly.

The results of the present study also revealed that the mean anxiety scores increased after the treatment indicating that the children were more frightened after the procedures were completed. This was due to their unpleasant experience with a rubber dam, drill, and injections, etc. which they had not come across previously. The anxiety levels were found to be highest in extraction group followed by pulpectomy and restoration groups.

## CONCLUSION

Though the study did not show any statistical difference in anxiety levels between the study and control groups, the anxiety levels did seem to drop in the study group when

compared to the control group. We cannot, therefore, recommend giving any type of preparatory information before the dental procedure. However, it is always better for the children to know what to expect when they are sitting on the dental chair. Further studies on a sample of more anxious children would give true results about the effect of preparatory information on their anxiety levels.

## REFERENCES

1. Bolin AK. Children's dental health in Europe. An epidemiological investigation of 5 - and 12-year-old children from eight EU countries. *Swed Dent J Suppl* 1997;122:1-88.
2. Skaret E, Raadal M, Berg E, Kvale G. Dental anxiety among 18-yr-olds in Norway. Prevalence and related factors. *Eur J Oral Sci* 1998;106:835-43.
3. Milgrom P, Mancl L, King B, Weinstein P. Origins of childhood dental fear. *Behav Res Ther* 1995;33:313-9.
4. Buchanan H, Niven N. Validation of a facial image scale to assess child dental anxiety. *Int J Paediatr Dent* 2002;12:47-52.
5. Klingberg G, Broberg AG. Dental fear/anxiety and dental behaviour management problems in children and adolescents: A review of prevalence and concomitant psychological factors. *Int J Paediatr Dent* 2007;17:391-406.
6. Cohen LA, Harris SL, Bonito AJ, Manski RJ, Macek MD, Edwards RR, *et al.* Coping with toothache pain: A qualitative study of low-income persons and minorities. *J Public Health Dent* 2007;67:28-35.
7. Newton JT, Mistry K, Patel A, Patel P, Perkins M, Saeed K, *et al.* Stress in dental specialists: A comparison of six clinical dental specialties. *Prim Dent Care* 2002;9:100-4.
8. Klingberg G. Dental anxiety and behaviour management problems in paediatric dentistry – A review of background factors and diagnostics. *Eur Arch Paediatr Dent* 2008;9 Suppl 1:11-5.
9. Mineka S, Oehlberg K. The relevance of recent developments in classical conditioning to understanding the etiology and maintenance of anxiety disorders. *Acta Psychol (Amst)* 2008;127:567-80.
10. Wright FA, McMurray NE, Giebartowski J. Strategies used by dentists in Victoria, Australia, to manage children with anxiety or behavior problems. *ASDC J Dent Child* 1991;58:223-8.
11. American Academy of Pediatric Dentistry. Guidelines 2001-02. Chicago, IL: AAPD; 2002.
12. Goumans C, Veerkamp JS, Aartman IH. Dental anxiety and behavioural problems: What is their influence on the treatment plan? *Eur J Paediatr Dent* 2004;5:15-8.
13. Bandura A. *Social Learning Theory*. Morristown, NJ: General Learning Press; 1971.
14. Folayan MO, Idehen EE. Effect of information on dental anxiety and behaviour ratings in children. *Eur J Paediatr Dent* 2004;5:147-50.
15. Olumide F, Newton JT, Dunne S, Gilbert DB. Anticipatory anxiety in children visiting the dentist: Lack of effect of preparatory information. *Int J Paediatr Dent* 2009;19:338-42.
16. Fox C, Newton JT. A controlled trial of the impact of exposure to positive images of dentistry on anticipatory dental fear in children. *Community Dent Oral Epidemiol* 2006;34:455-9.
17. Newton T, Asimakopoulou K, Daly B, Scambler S, Scott S. The management of dental anxiety: time for a sense of proportion? *Br Dent J* 2012;213:271-4.

**How to cite this article:** Babu NSV, Jha S. Assessment of the Role of Preparatory Information on Children's Anxiety Levels before and after a Dental Procedure. *Int J Sci Stud* 2015;2(11):13-16.

**Source of Support:** Nil, **Conflict of Interest:** None declared.



# Functional Outcome of Minimally Invasive Percutaneous Plate Osteosynthesis Using Locking Compression Plates in Distal Femur Fractures

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## Abstract

**Introduction:** The conventional fracture management of the distal femur (DF) fractures was largely replaced by biological fixation or indirect reduction techniques. Several minimally invasive procedures like minimally invasive percutaneous plate osteosynthesis (MIPPO) are introduced and are composed of closed reduction of fracture and percutaneous insertion of the plate.

**Aims and Objectives:** To assess the functional outcome of MIPPO using locking compression plate (LCP) in DF fractures and also to evaluate its complications.

**Materials and Methods:** A prospective study conducted in the Department of Orthopaedics, A.J. Institute of Medical Sciences, Mangalore from 2012 to 2014. 30 patients (age range: 20-70 years) with DF fractures were managed by MIPPO using LCP. The fractures were classified according to AO/OTA classification. These patients were regularly followed up clinically and radiologically.

**Results and Observations:** Among 30 patients, road traffic accident was present in 17 patients and remaining 12 patients had domestic fall. The average time interval injury and surgery was 3 days, with all patients operated within a week. The mean operating time was 103 min. The average time to union was 17 weeks (range, 12-24 weeks). No delayed/non-union noted. 3% serous discharge, 3% superficial infection, 3% implant failure, 4% each of limb shortening and varus/valgus malalignment seen. At follow-up, the mean flexion was 120° (range, 90-140°). Functional outcome was assessed using Schatzker *et al.* scoring system. Score was excellent in 8 patients (27%), good in 14 (47%), fair in 7 (23%) and failure in 1 (3%).

**Conclusion:** MIPPO of LCPs used for DF fractures yields intact fracture biology and offers favorable biological fixation with few complications. Functional outcome of these patients are significantly improved, thus reducing morbidity.

**Key words:** Accidents, Minimally invasive, Osteosynthesis

## INTRODUCTION

The treatment of the distal femur (DF) fractures has evolved over last few decades. In the past, the conservative approach was substituted with conventional fracture management, which was based on original principles namely the direct fracture exposure, precise reduction and rigid internal fixation in an attempt to achieve an anatomic

fracture union. This conventional fracture management technique often needed a significant surgical exposure with soft tissue stripping and devascularization, altering the biologic environment at and around the fracture site. The adverse effects of wide iatrogenic soft tissue trauma include delayed/non-union, mal union, the need for bone graft and infection.<sup>1,2</sup>

With due concern of minimizing the additional biologic damage caused by the surgical trauma, various newer surgical methods were developed. Biological fixation through indirect fracture reduction techniques solved most of the consequences of conventional methods. These indirect reduction techniques consist of applying traction on the soft tissues to achieve fracture reduction. Biological fixation techniques have been developed as a method of

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Month of Submission : 12-2014  
Month of Peer Review : 01-2015  
Month of Acceptance : 01-2015  
Month of Publishing : 02-2015

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fracture fixation that depends on relatively mechanical stability with minimal soft tissue trauma and intact fracture biology. Thus, local morbidity is decreased, and fracture healing was promoted.<sup>1,3-7</sup>

Together with biological fixation, several minimally invasive techniques have been implemented recently. Minimally invasive percutaneous plate osteosynthesis (MIPPO) and methods using less invasive stabilization system stand out among them and consist of two main factors, the closed reduction of the fracture and the percutaneous insertion of plate.<sup>1,2</sup>

The goal of this study was to assess the functional outcome of MIPPO technique using locking compression plate (LCP) for DF fractures and also to evaluate its effectiveness and complications.

## MATERIALS AND METHODS

A clinical, prospective study conducted in the Department of Orthopaedics, A.J. Institute of Medical Sciences, Mangalore over a period between July 2012 and April 2014. 30 adult patients of either sex with fracture DF were included. Osteoporotic fractures involving DF were also included. Compound fractures, pathological fractures other than osteoporotic fractures and certain fracture Types B1, B2, B3 of AO/OTA classification were excluded. Institutional ethics committee approval was obtained. Informed written consent was taken from all patients.

Primary immobilization of the involved limb was done using Thomas splint or above knee plaster of Paris slab. Fractures were classified with the help of radiographs according to the AO/OTA classification. Pre-operative evaluation was done on radiographs to ascertain the size of the plate, accurate size of locking, cortical and cancellous screws after subtraction of the magnification factor. The limb, to be operated was prepared the night before the day of surgery. 1 g of third-generation cephalosporin was injected 10 min before surgery after giving test dose initially.

The approach of MIPPO in DF was a shorter version of open lateral approach under appropriate anesthesia and patient positioning, the distal skin incision starts from the joint line on the lateral aspect (Figure 1a and b). Fractures were anatomically reduced and provisionally stabilized with K-wires. All reduction was achieved by indirect methods using reduction clamps, traction and small bolsters/bumps (Figure 1d).<sup>8</sup> Under image intensifier guidance, alignment and rotation were restored. After reduction, appropriately sized plates (with 6-12 holes) were inserted over the lateral aspect of the DF in a distal to proximal direction

(Figure 1c). Once the plate is properly centered on the shaft locking screws were inserted.<sup>9</sup>

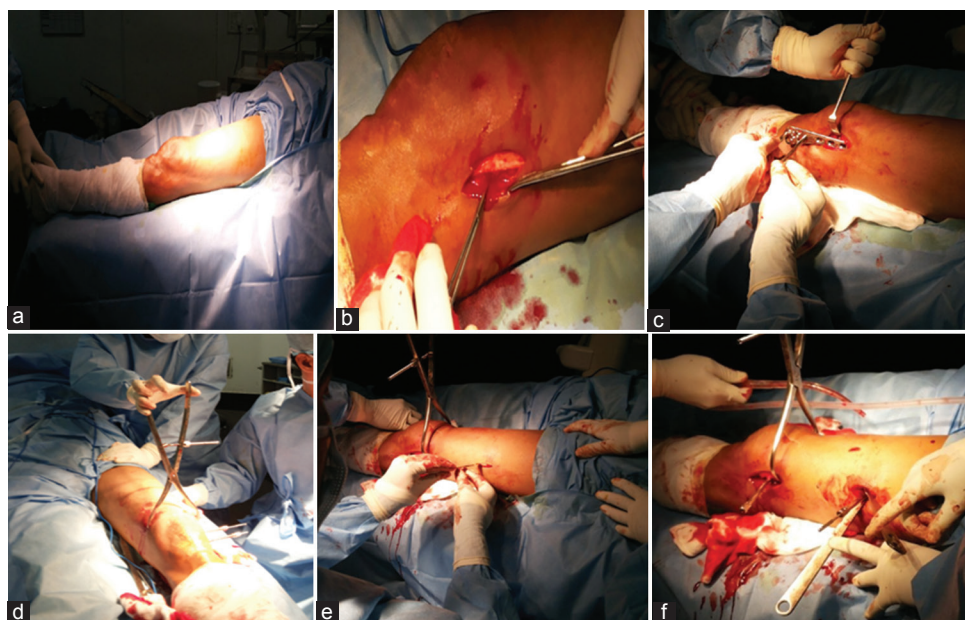
Initially, using locking sleeves distal holes were drilled and depth was measured by depth gauge and then appropriate distal locking screws were inserted. Once distal locking was done, the plate was fixed to the shaft of femur proximal to the fracture site with percutaneously placed screws, which may be either locking screw or regular cortical screws (Figure 1e and f). This depends on the type of fracture pattern and quality of bone. Once the fracture fixation was secured satisfactorily thorough wash was given to the surgical site varico drain kept wound closed with 2-0 vicryl for the subcutaneous layer and 2-0 ethilon used for skin closure. Compression bandage applied with gamge and bandage rolls.

Post-operatively the limb was kept in Bohler-Braun splint to prevent contracture of the quadriceps. Splints were removed and mobilization of the limb started on the 3<sup>rd</sup> or 4<sup>th</sup> day post-operatively. Mobilization with non-weight bearing was started from the first post-operative week till 6-8 weeks depending on the fracture pattern and then partial weight bearing after confirmation of beginning of the healing process till fracture union. Patients were followed up regularly initially on a weekly basis at 6 weeks and 12 weeks followed by monthly basis at 6 months. On follow-up, all patients were assessed using Schatzker *et al.* scoring system for functional outcome.<sup>10</sup>

## RESULTS AND OBSERVATIONS

There were 22 males, 8 females and were in the age group of 20-70 years, of mean age 47 years. Road traffic accident as the mechanism of injury was observed more commonly in younger males and domestic fall in elderly females ( $P = 0.001$ , statistically significant). There were 18 Type A fractures and 12 Type C fractures. Type A (60%) fractures are more common than Type C (40%) (Figure 2). Among thirty patients, four had associated injuries. One patient had a head injury. One patient had both bone fracture. Mandibular fracture and 2<sup>nd</sup> and 3<sup>rd</sup> metacarpal fracture were present in two others. The associated injuries were treated accordingly.

The mean time interval between injury and surgery was 3 days within in a range of immediate surgery to 7 days. The mean duration of surgery in our study was 103 min with a range of 75-130 min. Partial weight bearing was usually achieved at 8 weeks in our study. Later full weight bearing was started around 16 weeks according to signs of union on follow-up.



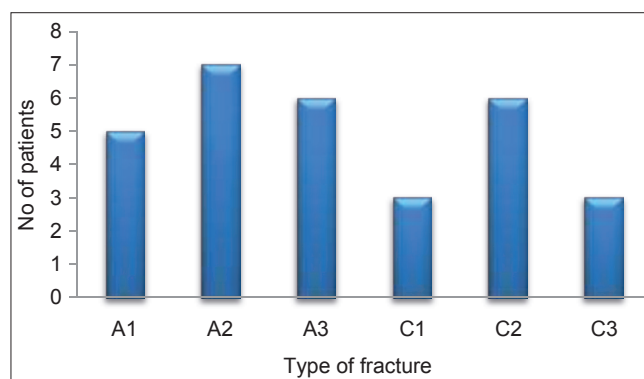
**Figure 1: (a) Positioning, painting, draping, (b) distal incision for plate entry, (c) entry of plate using sleeves, (d) indirect reduction of fracture using clamps, (e) skin incision for proximal sleeves, (f) drilling proximal and distal holes of locking compression plate**

The average time to union was 17 weeks. In our study, the mean flexion was  $120^\circ$  (range  $90^\circ$ - $140^\circ$ ). It was attributed to the stable and sturdy construct of DF-LCP. The extensor lag ranged from  $0^\circ$  to  $10^\circ$  with an average of  $3^\circ$ . Out of 30 patients, four had limb length discrepancy. One patient had shortening of  $<1$  cm while other three patients had shortening of 1 cm. Four patients had varus/valgus malalignment. One patient had  $10^\circ$  valgus mal alignment. Three patients had  $10^\circ$  varus malalignment. Single patient had serous discharge. Another patient had implant failure – the screw cutout. One patient had a superficial infection (Figure 3).

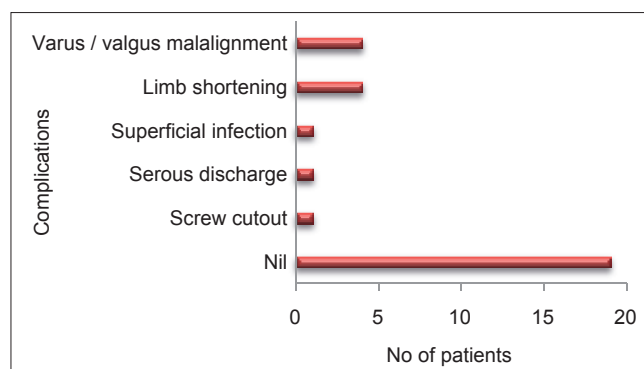
Functional outcome was assessed using Schatzker *et al.* scoring system. Excellent in 8 patients (27%), good in 14 patients (47%) (Figure 4), fair in 7 patients (23%), failure in 1 patient (3%) (Table 1). Most of the patients in our study had excellent to a fair outcome. One patient had failure outcome with range of motion  $10^\circ$ - $90^\circ$ .

**Table 1: Functional outcome and fracture type**

Type of fracture	Functional outcome				Total
	Failure	Fair	Good	Excellent	
A1	0	0	2	3	5
A2	0	0	6	1	7
A3	1	2	2	1	6
C1	0	1	1	1	3
C2	0	2	2	2	6
C3	0	2	1	0	3
Total	1	7	14	8	30



**Figure 2: Types of fractures (number of patients,  $n = 30$ )**



**Figure 3: Complications (number of patients,  $n = 30$ )**

## DISCUSSION

The surgical treatment of DF fractures has evolved emphasizing on preservation of osseous vascularity using





**Figure 4:** 60 year, female, AO/OTA Type A2; Schatzker *et al.* score - Good, (a) Pre-operative X-ray – anterior/posterior (AP)/lateral views, (b) immediate post-operative - AP/lateral views, (c) at 6 weeks follow-up, (d) at 6 months follow-up, (e) healed surgical scar and functional outcome

indirect reduction techniques. Indirect fracture reduction was achieved by exerting traction on the soft tissues. These techniques have gradually replaced open reduction methods. The newer method of sub muscular plate applications offer the advantages of lower infection rate and need for bone graft.

The LCP acts on the internal fixation principle.<sup>7</sup> In this the locked screws to the plate does not pull the fracture towards the implant, hence no further displacement of the fracture.<sup>3</sup> The LCP is well-suited for MIPPO, as periosteal blood supply and bone perfusion were preserved. It also required less soft-tissue dissection, hence enhances fracture healing.<sup>5,6,11</sup> In this system, there is indirect bone healing by callus formation because stability is maintained at the angular stable screw-plate interface.<sup>5</sup>

In our study, the average time interval between injury and surgery was 3 days within in a range of immediate surgery to 7 days. One patient was taken up for immediate surgery, as this patient had associated popliteal artery injury, which required immediate repair. Almost every patient in our study

was operated within a week after injury, this would have also contributed to better union with no case of delayed/non-union. Yeap and Deepak<sup>10</sup> reported average number of days from injury to surgery as 9.9 days with a range of 4-19 days.

The mean duration of surgery in our study was 103 min with a range of 75-130 min. Four patients had surgical time more than 120 min. Amongst these four patients, associated procedures like open reduction internal fixation with DCP for both bone forearm fracture and K wiring for metacarpal fracture were done. Two other patients had type C3 fracture, which needed slightly more time for reduction and fixation. Nayak *et al.*<sup>9</sup> in his study reported a mean operating time of 70 min (range 60-100 min).

Post-operatively all patients were started with quadriceps strengthening exercises, calf exercises, knee and ankle mobilization exercises. Partial weight bearing was achieved at 8 weeks in our study. Later full weight bearing was started at 16 weeks according to signs of union on follow-up. Kolb *et al.*<sup>12</sup> mobilized their patients non-weight bearing as early as 2-3<sup>rd</sup> post-operative day. Thus, physiotherapy and rehabilitation have an important role in restoring maximal functional outcome.

The mean time to union was 17 weeks with a range of 12-24 weeks and a standard deviation of 2.8 in our study. Time to union increased with increase in age of the patient. Time to union of Type C fractures and Type A fractures were almost the same. The union rate in our study (17 weeks) was in range with other authors, Yeap and Deepak<sup>10</sup> (18 weeks), Luechoowong<sup>13</sup> (17 weeks) and Nayak *et al.*<sup>9</sup> (3.7 months).

None of our patients had delayed or non-union. This observation would have been attributed to certain facts observed in our study, like Type A fractures being more commoner; the time interval between injury and surgery being not more than a week and nil deep infection. Sanders *et al.*<sup>14</sup> reported 100% union rate in patients with severely comminuted fractures.

In our study, the mean flexion was 120° (range 90-140°) (Figure 4). It was attributed to the stable and sturdy construct and the early range of motion achieved with DF-LCP. Even though, intra-articular extension of fractures may be expected to limit the joint movement, the average knee flexion in Type A and Type C fractures were almost around 120°. Eight of our patients had extension lag of 5°. Another six patients had extensor lag of 6-10°. Yeap and Deepak<sup>10</sup> reported an average extension was 1° (range 0-5°), and average flexion 107.7° (range 40-140°).

There were 18 Type A fractures, of which 17 (94%) showed excellent to a fair outcome. One patient with Type A3

fracture had failure outcome. This patient had 90° knee flexion with extension lag of 10°. All of the 12 Type C fractures had excellent to a fair outcome. The mean range of movement (knee flexion) was 120° with a range of 90-140°. Out of 30 patients, three had minimal pain at 6 months follow-up. Rest of the patients had absent pain. DF-LCP used in our study allowed early mobilization was conferring to its sturdy and stable construct provided by them. Range of motion was better in patients operated with locking plates. Yeap and Deepak<sup>10</sup> using Schatzker scoring system reported one failure, two fair, four good and four excellent results.

## CONCLUSION

MIPPO of LCPs used for DF fractures yields intact fracture biology and offers favorable biological fixation with few complications. Functional outcome of these patients are significantly improved, thus reducing morbidity. Surgical expertise and precise pre-operative planning are essential for wider and safer practical usage.

## REFERENCES

1. Valles JF, Rodríguez FR, Gómez JM. Distal femur fractures. Comparative analysis of two different surgical treatments. *Acta Ortop Mex* 2010;24:324-30.
2. Weight M, Collinge C. Early results of the less invasive stabilization system for mechanically unstable fractures of the distal femur (AO/OTA types A2, A3, C2, and C3). *J Orthop Trauma* 2004;18:503-8.
3. Schütz M, Südkamp NP. Revolution in plate osteosynthesis: New internal fixator systems. *J Orthop Sci* 2003;8:252-8.
4. Egol KA, Kubiak EN, Fulkerson E, Kummer FJ, Koval KJ. Biomechanics of locked plates and screws. *J Orthop Trauma* 2004;18:488-93.
5. Wagner M, Frenk A, Frigg R. New concepts for bone fracture treatment and the Locking Compression Plate. *Surg Technol Int* 2004;12:271-7.
6. Perren SM. Evolution of the internal fixation of long bone fractures. The scientific basis of biological internal fixation: Choosing a new balance between stability and biology. *J Bone Joint Surg Br* 2002;84:1093-110.
7. Frigg R. Locking compression plate (LCP). An osteosynthesis plate based on the dynamic compression plate and the point contact fixator (PC-Fix). *Injury* 2001;32 Suppl 2:63-6.
8. Leunig M, Hertel R, Siebenrock KA, Ballmer FT, Mast JW, Ganz R. The evolution of indirect reduction techniques for the treatment of fractures. *Clin Orthop Relat Res* 2000;7-14.
9. Nayak RM, Koichade MR, Umre AN, Ingle MV. Minimally invasive plate osteosynthesis using a locking compression plate for distal femoral fractures. *J Orthop Surg* 2011;19:185-90.
10. Yeap EJ, Deepak AS. Distal femoral locking compression plate fixation in distal femoral fractures. *Malays Orthop J* 2007;1:12-7.
11. Sommer Ch, Gautier E. Relevance and advantages of new angular stable screw-plate systems for diaphyseal fractures locking compression plate versus intramedullary nail. *Ther Umsch* 2003;60:751-6.
12. Kolb W, Guhlmann H, Windisch C, Marx F, Kolb K, Koller H. Fixation of distal femoral fractures with the less invasive stabilization system: A minimally invasive treatment with locked fixed-angle screws. *J Trauma* 2008;65:1425-34.
13. Luechoowong M, Buddhachinaraj. The locking compression plate (LCP) for distal femoral fractures. *Med J* 2008;25(Suppl 1).
14. Sanders R, Swiontkowski M, Rosen H, Helfet D. Double-plating of comminuted, unstable fractures of the distal part of the femur. *J Bone Joint Surg Am* 1991;73:341-6.

**How to cite this article:** Kumar SR, Shetty S, Sreejesh S, Mohapatra A, Deka RP. Functional Outcome of Minimally Invasive Percutaneous Plate Osteosynthesis Using Locking Compression Plates in Distal Femur Fractures. *Int J Sci Stud* 2015;2(11):17-21.

**Source of Support:** Nil, **Conflict of Interest:** None declared.



# Free Non-vascular Fibular Graft in Non-union of Long Bones: A Clinical Study

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## Abstract

**Introduction:** Non-union of long bones due to bone loss or infection is very common. Treatment of this non-union is done by bone grafting. The grafts are usually removed from the iliac crest, proximal tibia or fibula. Non-vascularized cortical fibular grafts have been used for non-union of long bones since long time. It provides structural strength and resistance to infection along with infrequent donor site morbidity, associated with removal of fibular graft, has popularized its use.

**Materials and Methods:** A prospective study was conducted from June 2012 to June 2014 on a total of 20 cases with ununited long bone fractures, post-traumatic, and post-infective bone defects. Mean age was 42.3 years. M:F - 2.3:1. We evaluated all patients at regular follow-up for clinical and radiological union.

**Result:** Overall union was achieved in 85% of cases. Refracture occurred in 1 (5%) cases in lower limb. Superficial infection occurred in 2 cases which was treated successfully with antibiotic therapy. Graft resorption occurred in 2 (10%) cases. Use of free non-vascularized bone graft in selected patients with suitable recipient bed is a simple and cost-effective procedure with excellent results.

**Discussion:** Non-union of long bones is a difficult clinical situation, challenging in terms of management. Different treatment options that can be considered are use of vascularized bone graft, bone segment transport using Ilizarov principle (in case of bone defect), use of bone substitutes or use of conventional free non-vascularized bone grafts. Among free non-vascularized bone grafts, fibula offers an easily accessible site. It is easy to harvest, being a superficial bone with very low donor site morbidity if peroneal nerve and vessels are protected.

**Conclusion:** Non-vascularized fibular grafting along with adequate internal or external fixation, is a good option for management of non-union of long bones.

**Keywords:** Fibular graft, Non-union, Non-vascularized

## INTRODUCTION

Most of the non-unions of fractures are atrophic and usually heal following conventional treatment (open reduction and internal fixation/external fixation with bone grafting).<sup>1,2</sup> Management of non-union is challenging, especially in patients with wound infection following multiple failed surgeries and in the presence of scarred,

adherent soft tissues, and inadequate bone stock. With the advent of locked compression plates, stabilization can be achieved in osteoporotic bones. Nonetheless, in severely osteoporotic bones, internal fixation may fail even with locked compression plates.<sup>3</sup> For patients with non-union who also have multiple risk factors for failure of internal fixation, the use of a fibular graft as an intramedullary strut is an alternative.<sup>4,6</sup> We reviewed outcomes of 20 patients who underwent revision surgery for infected non-union, using a fibular graft as an intramedullary structure.

## MATERIALS AND METHODS

Twenty patients aged 24-64 years (mean, 42.3 years) with non-union who underwent fixation using different

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Month of Submission : 12-2014  
Month of Peer Review : 01-2015  
Month of Acceptance : 01-2015  
Month of Publishing : 02-2015

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modalities of fixation and a non-vascularized fibular graft as an intramedullary strut between 2012 and 2014 were reviewed, details are given in Table 1. The mean number of previous surgeries was 2.7 (range = 2-4). Three of the patients had active draining sinuses 6 to 12 months earlier but not at the presentation. The remaining 4 patients had active draining sinuses. They first underwent implant removal and debridement. Patients were reviewed regularly after debridement. When their C-reactive protein level had come to normal, and the wounds had healed well, the definitive surgery was performed. The mean duration between the debridement and the definitive surgery was 5 (range = 3-10) months. The skin was incised depending on previous incisions and soft-tissue scarring. Intervening fibrous tissue was excised. The medullary canal was re-established in both fragments by serial reaming of the proximal and distal fragments. Bone-holding forceps were used to hold the fragments especially near the fracture site so as to prevent splintering of osteoporotic bone. The length of the fibular graft needed was measured by adding the depth of the last reamer inserted into both fragments. An ipsilateral non-vascularized fibular graft was harvested by a standard technique. The diameter of the fibular graft was usually larger than that of the last reamer. An oscillating saw was used to reshape and reduce the diameter of the fibular graft to 2 mm less than the last reamer size and multiple drill holes were made to enhance strut graft incorporation. The center of the graft was marked. The fibular graft was then inserted into the proximal fragment, with the distal 4-5 cm exposed. The distal fragment was reduced onto the fibular graft protruding from the proximal fragment. Care was taken to avoid fracturing the fibular graft or distal fragment. Once, the distal fragment was

reduced. The fibular graft was then pushed into the distal fragment until the central mark was at the fracture site. Autogenous iliac crest bone grafts were placed around the non-union area in few cases. The wound was then closed. Post-operative drains were retained for 48 h. Patients were followed up every month after suture removal until bone union.

## RESULTS

In our study, of 20 patients, 13 were male (65%) and 7 were female (35%). Average age was 42.3 years. Overall 85% cases, there was good fracture union. The mean time duration for complete fracture union was 20.5 (range = 14-30) weeks. The mean follow-up period was 12 (range = 13-24) months. The mean length of the fibula harvested was 11 (range = 12-15) cm. There was no donor-site morbidity. In 2 patients (10%) with active infection led to graft reabsorption where repeat surgery was required. At the time of definitive surgery, tissue cultures were positive in some cases but there was no macroscopic evidence of infection. Two of them had wound washouts, and their non-unions went on to heal successfully. The one patient underwent implant removal after union for continuous discharge from a small sinus after which the residual infection resolved completely (Figures 1 and 2).

## DISCUSSION

Treatment modalities for non-unions include compression plating, intramedullary nailing, and external fixation with or without cancellous bone grafting.<sup>7,8</sup> In compression

**Table 1: Details of patients**

Case serial no.	Age/sex	Bone involved	Implant used	Time to union (weeks)	Complications	Management
Case 1	42/M	Femur	DCS plate	24	Superficial infection	Antibiotic
Case 2	49/M	Tibia/fibula	Jess+AO fixator	24	Non-union at proximal end	Bone grafting
Case 3	35/F	Humerus	DCP plate	14	None	
Case 5	31/F	Humerus	DCP plating	20	None	
Case 6	47/M	Humerus	DCP plate	24	None	
Case 7	50/M	Tibia	Distal tibia plate	22	None	
Case 8	64/M	Humerus	DCP plate	24	None	
Case 9	24/F	Femur	DCP plate	24	None	
Case 10	47/M	Tibia	Proximal tibia plate	18	None	
Case 11	27/M	Tibia	Proximal tibia plate	32	None	
Case 12	53/M	Femur	Broad DCP plate	26	None	
Case 13	48/M	Humerus	DCP plate	30	Non-union at proximal end	Bone grafting
Case 14	38/F	Tibia	Distal tibia plate	22	Refracture	PTB cast for 6 weeks
Case 15	24/F	Humerus	DCP plate	Non-union	Resorption of graft	Resurgery
Case 16	33/M	Humerus	DCP plate	30	None	
Case 17	38/M	Tibia/fibula	DCP plate	20	Superficial infection	Antibiotic
Case 18	49/F	Femur	DCP plate	12	None	
Case 19	52/M	Humerus	DCP plate	Non-union	Resorption of fibular graft	Resurgery
Case 20	57/M	Tibia	DCP plating	24	None	

DCP: Dynamic compression plate, PTB: Patella tendon bearing, DCS: Dynamic condylar screw



**Figure 1:** (a) Non-union after first surgery 5 years back, (b) infective non-union after second surgery 3 years, (c) implant removal and debridement done 7 months, (d) immediate post-operative X-ray, (e) follow-up after 3 months, (f) follow-up after 6 months, (g) no limb length discrepancy, (h) 100° flexion at knee joint after 6 months



**Figure 2:** (a) Compound comminuted fracture upper end of tibia/fibula, (b) debridement and AO + jess fixator, (c) debridement + vacuum-assisted closure application after jess fixator removals, (d) fibular grafting + jess fixator + AO fixator after 3 months follow-up, (e) fibular grafting + jess fixator + AO fixator after 6 months follow-up

plate fixation, the screw purchase depends on the quality of the bone.<sup>9</sup> Screw purchase may be inadequate owing to osteoporosis or previous surgery.<sup>10</sup> Although locked compression plates provide improved pull-out strength and fixation, implant failure can still occur. The intramedullary fibular graft provides a good purchase for screws and adequate fixation. Rigid stabilization is necessary for non-unions. In this series, 17 out of 20 patients (85%) achieved bony union after fixation using the fibular graft and locked compression plates for non-unions. Similar results were achieved by al-Zahrani *et al.*<sup>11</sup> In selected patients, adequate stability can be obtained with non-locked plates and fibular

grafts. In a biomechanical study of fixation using a locked compression plate with fibular strut grafting is also used for a gap non-union.<sup>12</sup> The fibular graft can increase the pull-out strength even for locked compression plates. Non-vascularized fibular strut grafts have more resistance to infection than cancellous graft. If the infection remains, re-debridement and local antibiotic delivery should be performed. In our study, post-operative immobilization with plaster could be avoided owing to adequate stabilization after fibular strut grafting. In patients with multiple surgeries, the joints are already stiff. Any further immobilization leads to more stiffness and suboptimal outcome.

## CONCLUSION

Thus, we would like to conclude that Non-vascularized fibular grafting along with adequate internal or external fixation is a good option for management of non-union of long bones. Least morbidity at donor site (fibula). Strut graft gives good mechanical strength and support to stabilize fracture fragments. Mobilization can be started early to avoid stiffness of nearby joints.

## REFERENCES

1. Epps CH Jr, Grant RE. Fractures of the shaft of the humerus. Rockwood and Green's Fractures in Adults. 3<sup>rd</sup> ed., Vol. 1. Philadelphia, PA: Lippincott Williams & Wilkins; 1991. p. 843-69.
2. Jupiter JB. Complex non-union of the humeral diaphysis. Treatment with a medial approach, an anterior plate, and a vascularized fibular graft. J Bone Joint Surg Am 1990;72:701-7.
3. Micic ID, Kim KC, Shin DJ, Shin SJ, Kim PT, Park IH, *et al.* Analysis of early failure of the locking compression plate in osteoporotic proximal humerus fractures. J Orthop Sci 2009;14:596-601.
4. Daniel AJ, Sundararaj GD. Treatment of complex nonunion of the humeral shaft. J Orthop Surg (Hong Kong) 1996;4:79-82.
5. Vidyadhara S, Vamsi K, Rao SK, Gnanadoss JJ, Pandian S. Use of intramedullary fibular strut graft: a novel adjunct to plating in the treatment of osteoporotic humeral shaft nonunion. Int Orthop 2009;33:1009-14.
6. Badman BL, Mighell M, Kalandiak SP, Prasarn M. Proximal humeral nonunions treated with fixed-angle locked plating and an intramedullary strut allograft. J Orthop Trauma 2009;23:173-9.
7. Dhar SA, Kawoosa AA, Butt MF, Ali MF, Mir MR, Halwai MA. Acute invaginating docking for infected non-unions of the humerus. J Orthop Surg (Hong Kong). 2008;16:290-4.
8. Brinker MR, O'Connor DP, Crouch CC, Mehlhoff TL, Bennett JB. Ilizarov treatment of infected nonunions of the distal humerus after failure of internal fixation: an outcomes study. J Orthop Trauma 2007;21:178-84.
9. Schatzker J, Sanderson R, Murnaghan JP. The holding power of orthopedic screws *in vivo*. Clin Orthop Relat Res 1975;115-26.
10. Martinez AA, Cuenca J, Herrera A. Two-plate fixation for humeral shaft non-unions. J Orthop Surg (Hong Kong) 2009;17:135-8.
11. al-Zahrani S, Harding MG, Kremli M, Khan FA, Ikram A, Takroni T. Free fibular graft still has a place in the treatment of bone defects. Injury 1993;24:551-4.
12. Lonner JH, Desai P, Dicesare PE, Steiner G, Zuckerman JD. The reliability of analysis of intraoperative frozen sections for identifying active infection during revision hip or knee arthroplasty. J Bone Joint Surg Am 1996;78:1553-8.

**How to cite this article:** Khan A, Gupta U, Kaushik SK, Pathania VP. Free Non-vascular Fibular Graft in Non-union of Long Bones: A Clinical Study. Int J Sci Stud 2015;2(11):22-25.

**Source of Support:** Nil, **Conflict of Interest:** None declared.



# Oral Health Knowledge, Attitude, and Behavior in Relation to Use of Manual Toothbrush among Dental Students in Bangalore, India: A Questionnaire Study

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## Abstract

**Aims and Objectives:** Oral hygiene is the key to prevention and successful treatment of inflammatory periodontal disease. Microbial plaque plays a dominant role in the initiation of periodontal disease. Most preventive measures are directed toward the elimination of plaque and minimization of its effects, and one of the most accepted, proven and easiest method is toothbrushing. However, there are factors that influence the effectiveness of this procedure, such as the dexterity of the individual, frequency, duration and toothbrush design. The aim was to investigate the toothbrush-related knowledge, attitudes, behavior and perception among dental students of 1<sup>st</sup> year BDS, 2<sup>nd</sup> year BDS, 3<sup>rd</sup> year BDS, 4<sup>th</sup> year BDS, and interns.

**Design:** A quantitative research method was used and data were collected through questionnaire comprising of 20 questions from 1<sup>st</sup> year BDS, 2<sup>nd</sup> year BDS, 3<sup>rd</sup> year BDS, 4<sup>th</sup> BDS, and interns of Rajarajeswari Dental College and Hospital, Bengaluru, and the results were statistically evaluated.

**Result:** The common theme that emerged at the final stage of the analysis process was tooth brushing twice a day for about 2 min with horizontal and (or) vertical brushing method, despite the lack of knowledge about how to use toothbrush and toothpaste effectively and its positive effects on oral health.

**Conclusion:** The early establishment of good oral hygiene habits and the regular use of toothbrush and toothpaste are important in achieving good oral health. There seems to be a great need to continuously promote and teach dental students and interns about the benefits of good oral hygiene habits so that they can promote and implement them among the general population.

**Key words:** Attitude, Behaviour, Knowledge, Oral hygiene, Plaque, Toothbrush

## INTRODUCTION

Oral hygiene is the practice of keeping the mouth clean and healthy by brushing and flossing to prevent tooth decay and gum disease. According to the World Oral Health Report (2003) oral disease is the fourth most expensive

disease to treat in most industrialized countries and it is estimated that these countries spend 5-10% of their national public health resources on dental care.<sup>1</sup>

The WHO reported in 2007<sup>2</sup> that the burden of oral disease is especially high and impaired oral health has a negative effect on the quality of life. Microbial biofilms and plaque are considered to be the primary etiological factors in the initiation of gingival inflammation, which in turn leads to gingival and periodontal diseases. The rigorous self-performed plaque control over a long period of time reduces the amount and alters the composition of microbial plaque. This in turn results in achieving a functionally healthy gingiva and periodontium.<sup>3</sup>

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**Month of Submission :** 12-2014  
**Month of Peer Review :** 01-2015  
**Month of Acceptance :** 01-2015  
**Month of Publishing :** 02-2015

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Knowledge about oral health influences attitudes and behavior. Knowledge can be acquired through experience or education and through complex cognitive processes, such as perception, communication, association and reasoning. It can refer to a theoretical or practical understanding of a subject which can include facts, information, descriptions or skills. Studies have shown that oral health education and promotion can increase an individual's knowledge about oral health and change attitudes towards it, thus improving behavior. However, maintaining changes in behavior over a longer time period seems to be difficult.<sup>4</sup>

Attitude can be described as being an expression of favor or disfavor toward a person, place, subject, thing or event. Within health psychology, attitudes refer to a person's cognition (beliefs), affective/emotional (feelings) or behavioral (intended action) relation to an object.<sup>5</sup>

Attitudes can be changed through communication. Most of the attitudes we hold are learned from experiences, and it is expected that they change as we learn from new experiences. Attitudes are among the most important determinants of intentions and behavior and many social psychologists have used attitudes to predict and explain social behavior.<sup>6</sup>

Behaviors are observable events and often directed at some target. Behaviors are composed of four elements: Action, target, context and time. Behavioral changes are an individual's actions and reactions and can be common or unusual, acceptable or unacceptable and deliberate/conscious or subconscious/instinctive. Human social behavior follows from the information or beliefs people possess about a specific behavior.<sup>6</sup> Factors such as motivation, performance and negative feelings, like fear of failure, will affect behavioral reactions. People's behavior is strongly influenced by their confidence in their ability to perform the behavior.

Several factors influence people's oral health behavior, such as socioeconomic status, educational level and knowledge about, and attitudes towards oral health.<sup>7</sup> Regular toothbrushing is associated with high education<sup>8</sup> and Tseveenjav *et al.*<sup>9</sup> found that less favorable oral health related behavior was more common among adults with low education and the unemployed.

Adolescents oral health behavior is influenced by knowledge, attitudes and beliefs.<sup>10</sup> While the frequency of toothbrushing seems to be influenced by life style and social norms.<sup>11</sup> In early adolescence, frequent toothbrushing is related to not using tobacco and alcohol, as well as to having a regular bed time. When parents teach their children regular toothbrushing, they also transmit ideals of goal-

directed behavior. By the age of 16, toothbrushing habits have become quite firmly settled and low toothbrushing frequency reflects a lifestyle in which education is not an important value.

This quantitative research study focuses on dental students' knowledge, attitude, and perception on toothbrush, toothbrush wear, toothbrush renewal periods and recommendations and to investigate the relationship between dental students views on toothbrush renewal intervals and dental students own renewal habits.

The objective of this method is to gain a deeper understanding of, and to describe and interpret the informant's own descriptions of their thoughts, feelings and actions, at various levels of depth and abstraction.

The aim was to investigate the toothbrush-related knowledge, attitudes and behavior among dental students of 1<sup>st</sup> year BDS, 2<sup>nd</sup> year BDS, 3<sup>rd</sup> year BDS, 4<sup>th</sup> year BDS, and interns.

## MATERIALS AND METHODS

- Study design: A cross sectional questionnaire based study
- Sampling: Convenient sampling
- Source: Department of Periodontology, Rajarajeswari Dental College and Hospital, Bengaluru
- Study duration: 45 days
- Sample size: 250 dental students population
- Study groups:
  - Group 1: 1<sup>st</sup> year BDS students
  - Group 2: 2<sup>nd</sup> year BDS students
  - Group 3: 3<sup>rd</sup> year BDS students
  - Group 4: 4<sup>th</sup> year BDS students
  - Group 5: Interns.

A structured questionnaire comprising of 20 multiple-choice questions was given to 250 under graduate students and interns of Rajarajeswari Dental College and Hospital, Bengaluru. The questionnaire comprised of the following questions: Knowledge of brushing time and frequency, attitudes, knowledge and perception of dental students on toothbrush, toothpaste, toothbrush wear, toothbrush design, toothbrush renewal period, toothbrush selection criteria, the brushing techniques they know and the technique they follow. All the dental student population completed the same questionnaire. The ethical clearance letter was obtained from the institution (Rajarajeswari Dental College and Hospital, Bengaluru). The results were statistically evaluated and expressed as percentages for categorical variables and mean and standard deviation (SD) for continuous variables.

### Statistical Analysis

Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on mean $\pm$ SD (Min-Max) and results on categorical measurements are presented in a number (%). Significance is assessed at 5% level of significance. Chi-square/Fisher exact test has been used to find the significance of study parameters on categorical scale between two or more groups.

### Statistical Software

The Statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1, MedCalc 9.0.1, Systat 12.0 and R environment ver.2.11.1 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

## RESULTS

A variable, “good oral hygiene behavior” was constructed based on the most important factors affecting toothbrush efficiency when brushing. The variable and the common theme that emerged at the final stage of the analysis process, underlying the core findings in the data and providing a deeper understanding of the studied phenomenon was tooth brushing twice a day for about 2 min with horizontal and (or) vertical brushing method, despite the lack of knowledge about how to use toothbrush and toothpaste effectively and its positive effects on oral health.

### Significant Figures

1. + Suggestive significance ( $P$  value:  $0.05 < P < 0.10$ )
2. \* Moderately significant ( $P$  value:  $0.01 < P \leq 0.05$ )
3. \*\* Strongly significant ( $P$  value:  $P \leq 0.01$ )

## DISCUSSION

The daily use of a toothbrush and other oral hygiene aids is the most dependable way of achieving oral health benefits for all patients. Plaque growth occurs within hours and must be completely removed at least every 48 h in periodontally healthy subjects to prevent inflammation.<sup>12</sup>

In our study, a quantitative research method, a questionnaire was used to gather data concerning knowledge, attitudes and behavior with regard to the use of the toothbrush. The strength of the study is the randomized selection of participants and the large number of respondents to the questionnaires. Other possible strengths are that participants came from different class groups of the dental school population representing different knowledge and different educational background.

Our study showed that more students only brushed their teeth once a day with the use of toothbrush and toothpaste when brushing (Table 1, Figures 1 and 2). This result is in accordance with other studies showing that tooth brushing is not performed twice a day.<sup>13</sup>

In our study, the participants were more convinced that toothbrushing was more important with the use of toothpaste and believed that the main reason for brushing was to reduce the number of bacteria. As oral hygiene routines are usually performed with the purpose of preventing both caries and periodontal diseases, the above statement is probably a logical conclusion.

In our study, majority of the students used only toothbrush and toothpaste to brush their teeth without the use of dental floss or any other interdental cleaning aids (Table 1 and Figure 3). Toothbrushing alone is not sufficient to control gingival and periodontal diseases because periodontal lesions are predominantly found in interdental locations.<sup>14</sup>

It has been demonstrated in healthy subjects that plaque formation begins on the interproximal surfaces where the

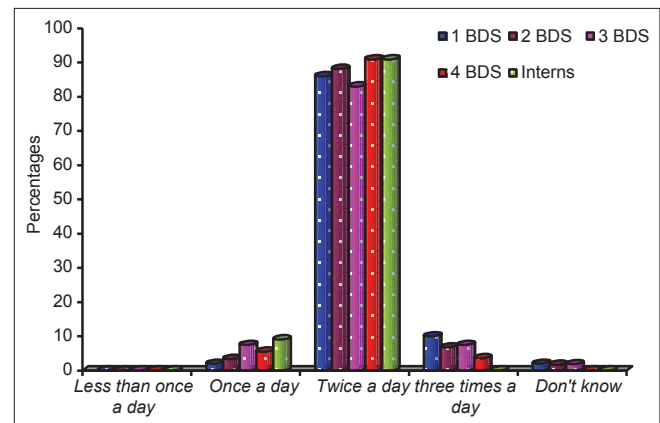


Figure 1: What is the recommended frequency of brushing?

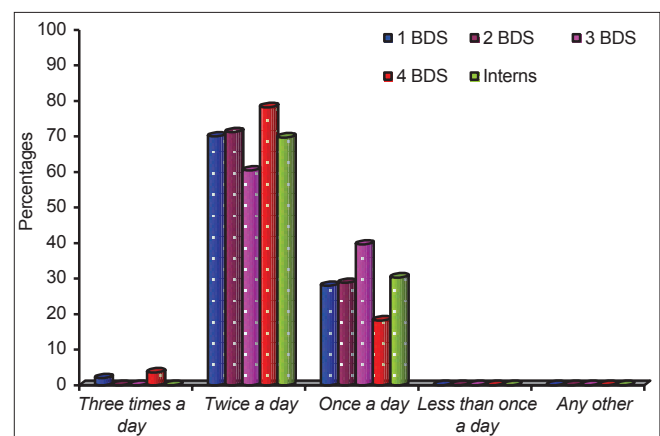


Figure 2: How often do you brush your teeth daily?

**Table 1: Questionnaire analysis**

	1 <sup>st</sup> year BDS n=50 (%)	2 <sup>nd</sup> year BDS n=59 (%)	3 <sup>rd</sup> year BDS n=53 (%)	4 <sup>th</sup> year BDS n=55 (%)	Interns n=33 (%)	P value
What is the recommended frequency of brushing?						
Less than once a day	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.643
Once a day	1 (2)	2 (3.4)	4 (7.5)	3 (5.5)	3 (9.1)	
Twice a day	43 (86)	52 (88.1)	44 (83)	50 (90.9)	30 (90.9)	
Three times a day	5 (10)	4 (6.8)	4 (7.5)	2 (3.6)	0 (0)	
Don't know	1 (2)	1 (1.7)	1 (1.9)	0 (0)	0 (0)	
How often do you brush your teeth daily?						
3 times a day	1 (2)	0 (0)	0 (0)	2 (3.6)	0 (0)	0.222
Twice a day	35 (70)	42 (71.2)	32 (60.4)	43 (78.2)	23 (69.7)	
Once a day	14 (28)	17 (28.8)	21 (39.6)	10 (18.2)	10 (30.3)	
Less than once a day	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	
Any other	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	
What is the method of cleaning your teeth?						
Brush+toothpaste+dental floss	18 (36)	17 (28.8)	7 (13.2)	11 (20)	16 (48.5)	0.002**
Dental floss only	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	
Brush+toothpaste only	32 (64)	42 (71.2)	46 (86.8)	44 (80)	14 (42.4)	
Any other	0 (0)	0 (0)	0 (0)	0 (0)	1 (3)	
How much is the ideal amount of toothpaste to be put on a toothbrush?						
Thin smear layer of toothpaste (0.125 g)	0 (0)	2 (3.4)	2 (3.8)	4 (7.3)	4 (12.1)	<0.001**
Small pea size amount of toothpaste (0.25 g)	22 (44)	13 (22)	18 (34)	34 (61.8)	27 (81.8)	
Half head amount of toothpaste (0.5 g)	15 (30)	30 (50.8)	23 (43.4)	10 (18.2)	2 (6.1)	
Full head amount of toothpaste (1 g)	8 (16)	4 (6.8)	7 (13.2)	3 (5.5)	0 (0)	
Don't know	5 (10)	4 (6.8)	3 (5.7)	4 (7.3)	0 (0)	
How much toothpaste do you normally put on your toothbrush?						
Full length of bristles	6 (12)	16 (27.1)	14 (26.4)	8 (14.5)	6 (18.2)	<0.001**
About the size of a pea	15 (30)	12 (20.3)	14 (26.4)	28 (50.9)	17 (51.5)	
About the size of a grain of rice	1 (2)	0 (0)	0 (0)	1 (1.8)	10 (30.3)	
Half length of bristles	28 (56)	31 (52.5)	25 (47.2)	15 (27.3)	0 (0)	
Any other	0 (0)	0 (0)	0 (0)	3 (5.5)	0 (0)	
How much is the ideal brushing time?						
About 30 s	0 (0)	2 (3.4)	0 (0)	2 (3.6)	0 (0)	<0.001**
About 1 min	4 (8)	4 (6.8)	6 (11.3)	5 (9.1)	1 (3)	
About 2 min	10 (20)	18 (30.5)	17 (32.1)	34 (61.8)	13 (39.4)	
About 3 min	10 (20)	14 (23.7)	6 (11.3)	7 (12.7)	10 (30.3)	
About 3-5 min	19 (38)	21 (35.6)	14 (26.4)	5 (9.1)	9 (27.3)	
More than 5 min	0 (0)	0 (0)	4 (7.5)	2 (3.6)	0 (0)	
Don't know	7 (14)	0 (0)	6 (11.3)	0 (0)	0 (0)	
How long do you normally take to brush your teeth?						
About 30 s	2 (4)	2 (3.4)	0 (0)	0 (0)	0 (0)	0.006**
About 1 min	7 (14)	9 (15.3)	6 (11.3)	10 (18.2)	1 (3)	
About 2 min	10 (20)	23 (39)	20 (37.7)	26 (47.3)	20 (60.6)	
About 3 min	18 (36)	7 (11.9)	14 (26.4)	9 (16.4)	7 (21.2)	
About 3-5 min	12 (24)	18 (30.5)	8 (15.1)	10 (18.2)	4 (12.1)	
More than 5 min	1 (2)	1 (1.7)	5 (9.4)	0 (0)	1 (3)	
Any other	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	
When do you normally brush your teeth?						
Only in the morning	12 (24)	16 (27.1)	19 (35.8)	12 (21.8)	10 (30.3)	0.762
Only in the evening	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	
In the morning and evening	36 (72)	42 (71.2)	33 (62.3)	41 (74.5)	23 (69.7)	
After every meal	1 (2)	1 (1.7)	1 (1.9)	2 (3.6)	0 (0)	
Don't know	1 (2)	0 (0)	0 (0)	0 (0)	0 (0)	
What type of toothbrush do you normally use?						
Ordinary plastic toothbrush	30 (60)	46 (78)	42 (79.2)	45 (81.8)	20 (60.6)	0.036*
Environmentally friendly toothbrush	9 (18)	7 (11.9)	3 (5.7)	5 (9.1)	11 (33.3)	
Natural toothbrush	4 (8)	2 (3.4)	6 (11.3)	1 (1.8)	1 (3)	
Chewable toothbrush	2 (4)	1 (1.7)	2 (3.8)	0 (0)	1 (3)	
Superbrush	3 (6)	2 (3.4)	0 (0)	4 (7.3)	0 (0)	
Standard electric toothbrush	2 (4)	0 (0)	0 (0)	0 (0)	0 (0)	
Expensive electric toothbrush	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	
Any other	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	

Contd...



**Table 1: Contd...**

	1 <sup>st</sup> year BDS n=50 (%)	2 <sup>nd</sup> year BDS n=59 (%)	3 <sup>rd</sup> year BDS n=53 (%)	4 <sup>th</sup> year BDS n=55 (%)	Interns n=33 (%)	P value
When choosing a toothbrush what parameters do you consider most important?						
Toothbrush handle						
Thick	16 (32)	15 (25.4)	21 (39.6)	13 (23.6)	7 (21.2)	0.032*
Thin	6 (12)	2 (3.4)	11 (20.8)	10 (18.2)	4 (12.1)	
Modest	25 (50)	38 (64.4)	21 (39.6)	32 (58.2)	21 (63.6)	
Any other	3 (6)	4 (6.8)	0 (0)	0 (0)	1 (3)	
Toothbrush handle design						
Straight handle	10 (20)	3 (5.1)	11 (20.8)	6 (10.9)	4 (12.1)	0.010**
Contra-angle handle	5 (10)	14 (23.7)	9 (17)	6 (10.9)	9 (27.3)	
Flexible handle	27 (54)	33 (55.9)	24 (45.3)	33 (60)	8 (24.2)	
Slip prevention grip handle	7 (14)	9 (15.3)	7 (13.2)	10 (18.2)	12 (36.4)	
Any other	1 (2)	0 (0)	2 (3.8)	0 (0)	0 (0)	
Toothbrush shank						
Straight	13 (26)	17 (28.8)	15 (28.3)	16 (29.1)	7 (21.2)	<0.001**
Angled	24 (48)	38 (64.4)	31 (58.5)	39 (70.9)	25 (75.8)	
Offset	0 (0)	0 (0)	0 (0)	0 (0)	1 (3)	
Agled offset	3 (6)	4 (6.8)	2 (3.8)	0 (0)	0 (0)	
Any other	10 (20)	0 (0)	5 (9.4)	0 (0)	0 (0)	
Toothbrush head						
Flat	19 (38)	27 (45.8)	25 (47.2)	27 (49.1)	20 (60.6)	0.050+
Uneven	5 (10)	7 (11.9)	6 (11.3)	5 (9.1)	3 (9.1)	
Dome	7 (14)	6 (10.2)	6 (11.3)	5 (9.1)	10 (30.3)	
Rippled	0 (0)	1 (1.7)	2 (3.8)	1 (1.8)	0 (0)	
Bilevel	1 (2)	5 (8.5)	1 (1.9)	7 (12.7)	0 (0)	
Multilevel	10 (20)	5 (8.5)	5 (9.4)	4 (7.3)	0 (0)	
Angled	6 (12)	6 (10.2)	4 (7.5)	3 (5.5)	0 (0)	
Any other	2 (4)	5 (8.5)	4 (7.5)	3 (5.5)	0 (0)	
Size of the brush head for an adult should be						
Hong Kong 10-cent coin (~15 mm)	2 (4)	3 (5.1)	6 (11.3)	4 (7.3)	2 (6.1)	<0.001**
Hong Kong 20-cent coin (~19 mm)	7 (14)	12 (20.3)	10 (18.9)	10 (18.2)	12 (36.4)	
Hong Kong 50-cent coin (~22 mm)	5 (10)	7 (11.9)	4 (7.5)	9 (16.4)	9 (27.3)	
Hong Kong 1-dollar coin (~25 mm)	0 (0)	2 (3.4)	2 (3.8)	0 (0)	1 (3)	
Don't know	36 (72)	35 (59.3)	31 (58.5)	32 (58.2)	9 (27.3)	
Toothbrush bristles						
Hard	1 (2)	2 (3.4)	2 (3.8)	1 (1.8)	1 (3)	0.379
Medium	19 (38)	33 (55.9)	24 (45.3)	25 (45.5)	12 (36.4)	
Soft	27 (54)	24 (40.7)	22 (41.5)	28 (50.9)	19 (57.6)	
Extra soft	2 (4)	0 (0)	5 (9.4)	1 (1.8)	1 (3)	
Any other	1 (2)	0 (0)	0 (0)	0 (0)	0 (0)	
Arrangement of bristles (bristle pattern)						
Block pattern	4 (8)	5 (8.5)	9 (17)	5 (9.1)	9 (27.3)	0.033*
Wavy or V-shape pattern	9 (18)	10 (16.9)	13 (24.5)	8 (14.5)	7 (21.2)	
Multilevel trim pattern	8 (16)	6 (10.2)	3 (5.7)	10 (18.2)	2 (6.1)	
Criss-cross pattern	18 (36)	28 (47.5)	13 (24.5)	21 (38.2)	11 (33.3)	
Polishing-cup bristles pattern	7 (14)	4 (6.8)	2 (3.8)	4 (7.3)	3 (9.1)	
Don't know	4 (8)	6 (10.2)	13 (24.5)	7 (12.7)	1 (3)	
The bristle diameter of hard, medium , and soft toothbrushes are:						
0.014 inch (0.4 mm) for hard brushes	4 (8)	1 (1.7)	5 (9.4)	0 (0)	2 (6.1)	<0.001**
0.012 inch (0.3 mm) for medium brushes	10 (20)	14 (23.7)	10 (18.9)	4 (7.3)	7 (21.2)	
0.007 inch (0.2 mm) for soft brushes	11 (22)	4 (6.8)	3 (5.7)	7 (12.7)	4 (12.1)	
All of the above are correct	11 (22)	13 (22)	18 (34)	36 (65.5)	17 (51.5)	
Two of the above are correct	14 (28)	3 (5.1)	6 (11.3)	6 (10.9)	1 (3)	
None of the above are correct	0 (0)	23 (39)	11 (20.8)	2 (3.6)	2 (6.1)	
The efficacy of a toothbrush in removing plaque is						
Only 25	6 (12)	4 (6.8)	6 (11.3)	4 (7.3)	0 (0)	<0.001**
Only 39	5 (10)	13 (22)	2 (3.8)	8 (14.5)	5 (15.2)	
Only 50	17 (34)	35 (59.3)	38 (71.7)	37 (67.3)	20 (60.6)	
Total 100	5 (10)	1 (1.7)	1 (1.9)	1 (1.8)	5 (15.2)	
Don't know	16 (32)	6 (10.2)	6 (11.3)	5 (9.1)	3 (9.1)	

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**Table 1: Contd...**

	1 <sup>st</sup> year BDS n=50 (%)	2 <sup>nd</sup> year BDS n=59 (%)	3 <sup>rd</sup> year BDS n=53 (%)	4 <sup>th</sup> year BDS n=55 (%)	Interns n=33 (%)	P value
The most effective and ideal brushing force for children and adults is						
100 g	1 (2)	7 (11.9)	2 (3.8)	8 (14.5)	8 (24.2)	<0.001**
200 g	6 (12)	14 (23.7)	8 (15.1)	12 (21.8)	9 (27.3)	
300 g	6 (12)	14 (23.7)	6 (11.3)	4 (7.3)	3 (9.1)	
400 g	2 (4)	1 (1.7)	1 (1.9)	0 (0)	3 (9.1)	
500 g	0 (0)	0 (0)	0 (0)	0 (0)	1 (3)	
Don't know	35 (70)	23 (39)	36 (67.9)	31 (56.4)	7 (21.2)	
Types of brushing techniques you are aware of:						
Horizontal or scrub technique	5 (10)	21 (35.6)	27 (50.9)	20 (36.4)	13 (39.4)	<0.001**
Vertical or leonard technique	15 (30)	13 (22)	17 (32.1)	10 (18.2)	12 (36.4)	
Vibratory or Stillman's technique	0 (0)	4 (6.8)	12 (22.6)	8 (14.5)	10 (30.3)	<0.001**
Roll or modified Stillman's technique	1 (2)	7 (11.9)	15 (28.3)	6 (10.9)	12 (36.4)	
Charters method	0 (0)	0 (0)	6 (11.3)	5 (9.1)	10 (30.3)	<0.001**
Bass method	0 (0)	2 (3.4)	18 (34)	17 (30.9)	11 (33.3)	
Modified Bass method	1 (2)	1 (1.7)	18 (34)	35 (63.6)	26 (78.8)	<0.001**
Circular or Fones method	3 (6)	15 (25.4)	15 (28.3)	10 (18.2)	11 (33.3)	
Physiologic or Smith's method	1 (2)	0 (0)	1 (1.9)	1 (1.8)	9 (27.3)	<0.001**
Rolling stroke/press-roll method	7 (14)	9 (15.3)	4 (7.5)	2 (3.6)	9 (27.3)	
Don't know	17 (34)	9 (15.3)	4 (7.5)	0 (0)	0 (0)	<0.001**
Type of brushing technique you follow						
Horizontal or scrub technique	9 (18)	23 (39)	18 (34)	15 (27.3)	1 (3)	0.002**
Vertical or leonard technique	21 (42)	10 (16.9)	5 (9.4)	3 (5.5)	3 (9.1)	
Vibratory or Stillman's technique	2 (4)	1 (1.7)	0 (0)	1 (1.8)	1 (3)	0.677
Roll or modified Stillman's technique	0 (0)	2 (3.4)	1 (1.9)	0 (0)	0 (0)	
Charters method	0 (0)	2 (3.4)	1 (1.9)	1 (1.8)	0 (0)	0.628
Bass method	0 (0)	2 (3.4)	3 (5.7)	8 (14.5)	3 (9.1)	
Modified Bass method	1 (2)	0 (0)	7 (13.2)	26 (47.3)	17 (51.5)	<0.001**
Circular or Fones method	3 (6)	14 (23.7)	16 (30.2)	1 (1.8)	8 (24.2)	
Physiologic or Smith's method	1 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0.404
Rolling stroke/press-roll method	6 (12)	5 (8.5)	0 (0)	0 (0)	0 (0)	
Any other	7 (14)	6 (10.2)	2 (3.8)	0 (0)	12 (36.4)	<0.001**
How often do you change your old toothbrush (how often do you buy a new toothbrush)?						
After every 15 days	1 (2)	1 (1.7)	1 (1.9)	1 (1.8)	0 (0)	<0.001**
After 1 month	12 (24)	11 (18.6)	9 (17)	11 (20)	4 (12.1)	
After 2 months	15 (30)	18 (30.5)	10 (18.9)	10 (18.2)	15 (45.5)	
After 3 months	15 (30)	20 (33.9)	19 (35.8)	28 (50.9)	12 (36.4)	
After 4-5 months	6 (12)	8 (13.6)	13 (24.5)	3 (5.5)	2 (6.1)	
Any other	1 (2)	1 (1.7)	1 (1.9)	2 (3.6)	0 (0)	
When do you feel that you should renew your toothbrush (signs of toothbrush wear)?						
Bristles causing trauma to the gingiva	2 (4)	9 (15.3)	3 (5.7)	4 (7.3)	3 (9.1)	0.098+
Bristles no longer removing plaque	8 (16)	9 (15.3)	12 (22.6)	14 (25.5)	3 (9.1)	
Bristles bent or splaying (spread out)	33 (66)	27 (45.8)	29 (54.7)	33 (60)	24 (72.7)	
Bristles being too soft	5 (10)	6 (10.2)	6 (11.3)	0 (0)	2 (6.1)	
Any other	2 (4)	8 (13.6)	3 (5.7)	4 (7.3)	1 (3)	
How likely are you to try different toothbrushes?						
Will stick only to what I use now	5 (10)	8 (13.6)	4 (7.5)	3 (5.5)	3 (9.1)	0.525
Will only try different type if I see something a lot better	24 (48)	27 (45.8)	23 (43.4)	25 (45.5)	23 (69.7)	
Will be happy to try most of different toothbrushes	17 (34)	19 (32.2)	22 (41.5)	21 (38.2)	6 (18.2)	
Don't know	4 (8)	5 (8.5)	4 (7.5)	6 (10.9)	1 (3)	
On what basis do you select (purchase) a toothbrush?						
Brand	14 (28)	9 (15.3)	12 (22.6)	14 (25.5)	9 (27.3)	0.159
Cleaning capabilities	21 (42)	31 (52.5)	14 (26.4)	18 (32.7)	9 (27.3)	
Design	1 (2)	8 (13.6)	5 (9.4)	8 (14.5)	3 (9.1)	
Quality	14 (28)	20 (33.9)	13 (24.5)	14 (25.5)	12 (36.4)	
Durability	0 (0)	4 (6.8)	0 (0)	1 (1.8)	0 (0)	
Low environmental impact	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	
Price	0 (0)	6 (10.2)	6 (11.3)	0 (0)	0 (0)	
Advertisement	0 (0)	3 (5.1)	2 (3.8)	0 (0)	0 (0)	
Other, please specify	0 (0)	0 (0)	1 (1.9)	0 (0)	0 (0)	

Contd...

**Table 1: Contd...**

	1 <sup>st</sup> year BDS n=50 (%)	2 <sup>nd</sup> year BDS n=59 (%)	3 <sup>rd</sup> year BDS n=53 (%)	4 <sup>th</sup> year BDS n=55 (%)	Interns n=33 (%)	P value
Does the cost influence in selection of your toothbrush						
Yes	15 (30)	10 (16.9)	20 (37.7)	21 (38.2)	9 (27.3)	
No	25 (50)	33 (55.9)	29 (54.7)	24 (43.6)	17 (51.5)	
Can't say	10 (20)	16 (27.1)	4 (7.5)	10 (18.2)	7 (21.2)	<0.001**

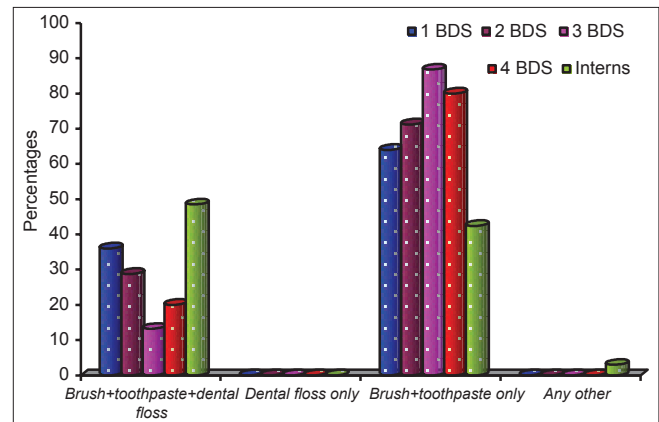
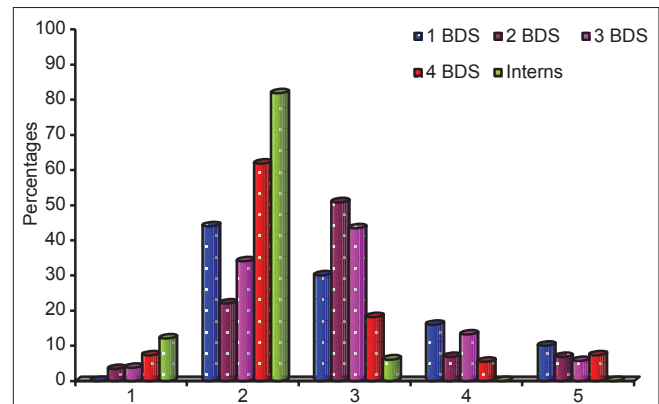
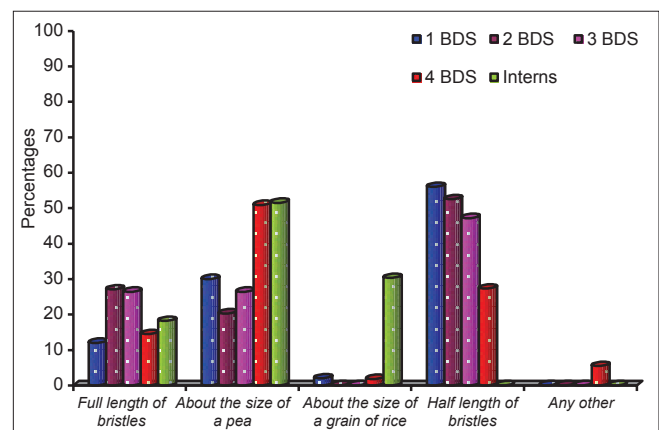
toothbrush does not reach. Masses of plaque first develop in the molar and premolar areas, followed by the proximal surfaces of the anterior teeth and the facial surfaces of the molars and premolars. Lingual surfaces accumulate the least amount of plaque. Patients consistently leave more plaque on the posterior teeth than the anterior teeth, with interproximal surfaces retaining the highest amounts of plaque, exactly the places where periodontal infections begin.<sup>12</sup>

In addition, periodontal patients often have complex defects in gingival architecture and long, exposed root surfaces to clean, compounding the difficulty of doing a good job. Plaque control efforts for periodontal patients must focus on improved brushing and cleaning interproximal areas, tasks that require mastering difficult and time consuming daily oral hygiene habits.

The amount of toothpaste used varied among the participants in the study, as majority describing using “a pea size amount of toothpaste” and others only “half the head amount” of toothbrush (Table 1 and Figure 4), but not everyone was aware of the amount of toothpaste to be used (Table 1 and Figure 5). The significance of the amount of toothpaste on the brush has been disputed.<sup>15</sup> However, studies support the view that a larger amount of toothpaste increases the F content in saliva and thus creating a longer caries preventive effect.<sup>16</sup> Zero *et al.* study showed that increasing the amount from 0.5 to 1.5 g more than doubled the F content in saliva after brushing.<sup>17</sup>

In our study, brushing time varied among respondents and not everyone was aware of brushing times, some stating they brushed for “30 s or maybe a minute” and others for “3-5 min” (Table 1 and Figure 6). Just half of the students reported brushing for 2 min or longer (Table 1 and Figure 7). This result is in line with a study by Saxer *et al.*<sup>18</sup> Zero *et al.*<sup>17</sup> has evaluated brushing time from 30 s to 3 min, and concluded that longer brushing times reduced the retention of toothpaste in the brush.

In our study, majority of the students stated that they brushed their teeth twice daily both in the morning and evening, whereas one third of the students brushed their teeth only once in the morning without knowing

**Figure 3: What is the method of cleaning your teeth?****Figure 4: How much is the ideal amount of toothpaste to be put on a toothbrush?****Figure 5: How much toothpaste do you normally put on your toothbrush?**

the rationale behind brushing twice daily (Table 1 and Figure 8).

Majority of the students in our study use an ordinary plastic toothbrush (Table 1 and Figure 9) with a modest (Table 1 and Figure 10) flexible handle (Table 1 and Figure 11), straight or an angled shank (Table 1 and Figure 12), and a flat head toothbrush (Table 1, Figures 13 and 14) with medium or soft bristles (Table 1 and Figure 15) arranged

in a crisscross pattern (Table 1 and Figure 16). When recommending a particular toothbrush, ease of use by the patient as well as the perception that the brush works well are important considerations. The effectiveness of and potential injury from different types of brushes depend to a great degree on how the brushes are used.<sup>19</sup> Data from *in vitro* studies of abrasion by different manual toothbrushes suggest that brush designs are permitting the bristles to carry more toothpaste while brushing contribute

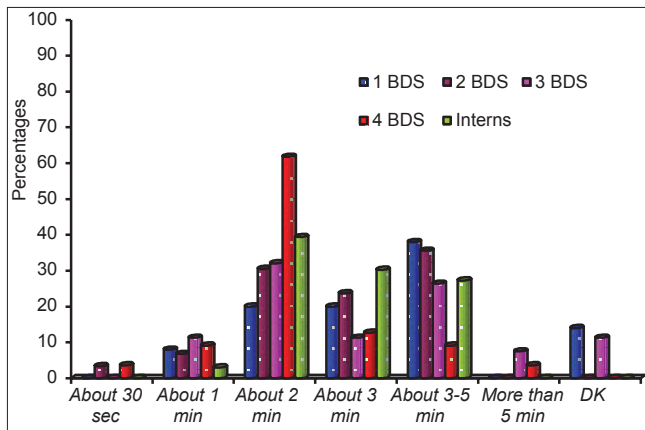


Figure 6: How much is the ideal brushing time?

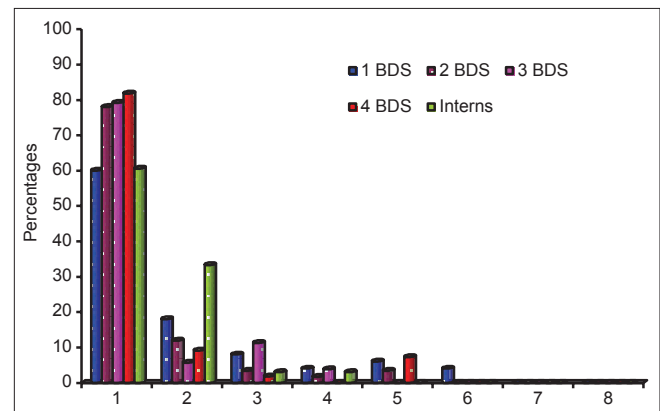


Figure 9: What type of toothbrush do you normally use?

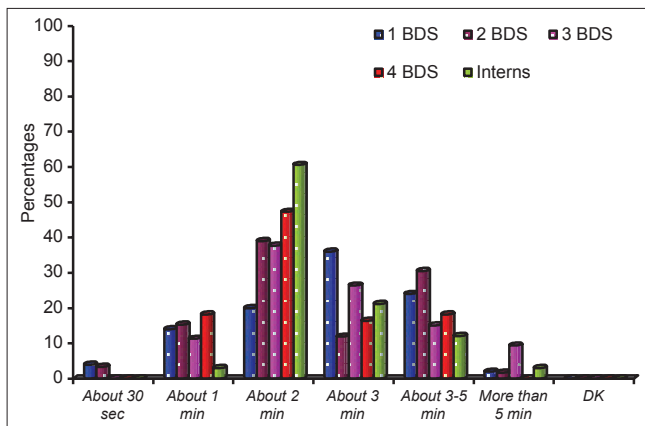


Figure 7: How long do you normally take to brush your teeth?

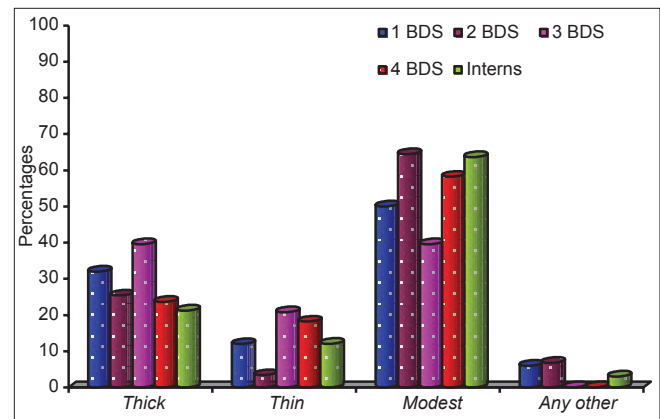


Figure 10: Toothbrush handle

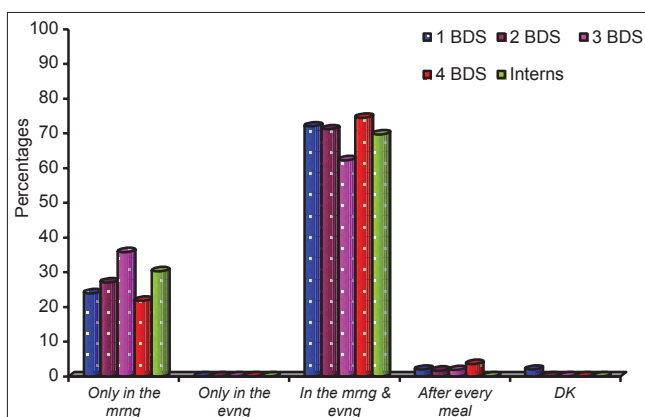


Figure 8: When do you normally brush your teeth?

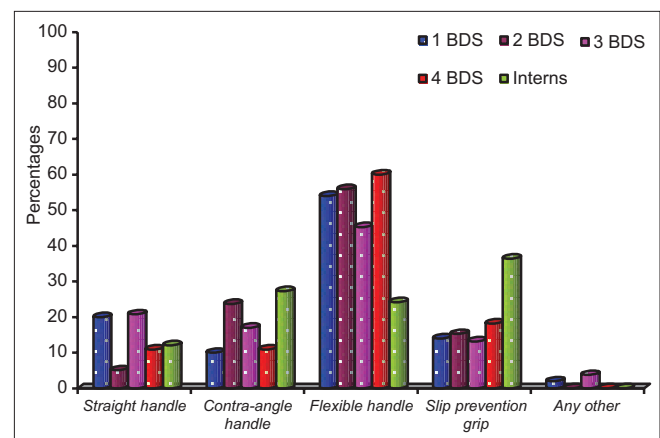


Figure 11: Toothbrush handle design



to abrasion more than brush bristles themselves.<sup>20</sup> However, all agree that use of hard toothbrushes, vigorous horizontal brushing, and use of extremely abrasive dentifrices may lead to cervical abrasions of teeth and recession of the gingiva.<sup>20</sup> Some novel toothbrush designs intended to make difficult-to-reach areas more accessible have been described.

One study even demonstrated a brush's improved plaque removal ability compared with a conventional brush, but

as with other toothbrush studies, absolute differences were slight.<sup>21</sup>

The notion of brushing all reachable surfaces of the teeth at 1 time is attractive, and these inventive brush designs may be useful for some patients to achieve better plaque control. There is no reason to discourage use of any particular device, especially if the patient likes it and uses it more or better than a conventional brush. There may well be a truly better design in the hands of an individual

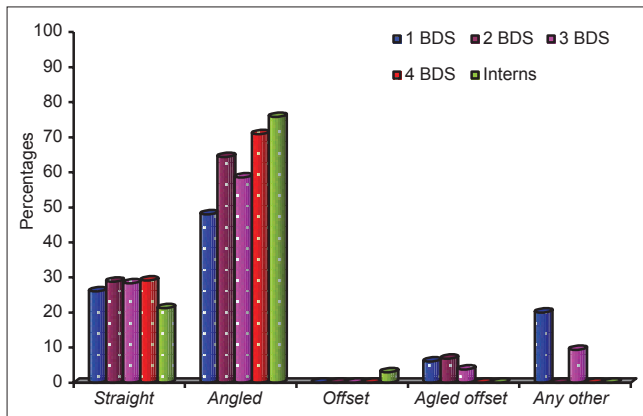


Figure 12: Toothbrush shank

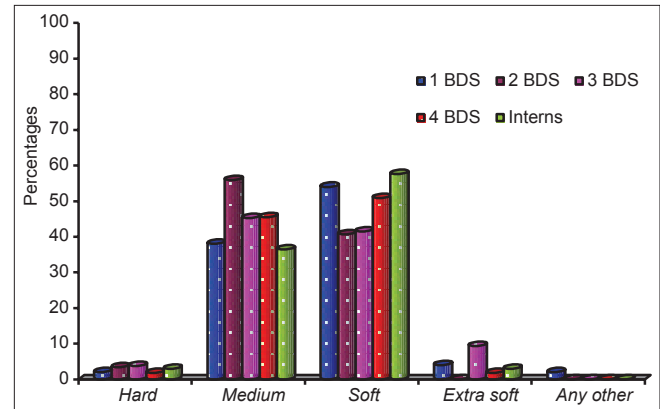


Figure 15: Toothbrush bristles

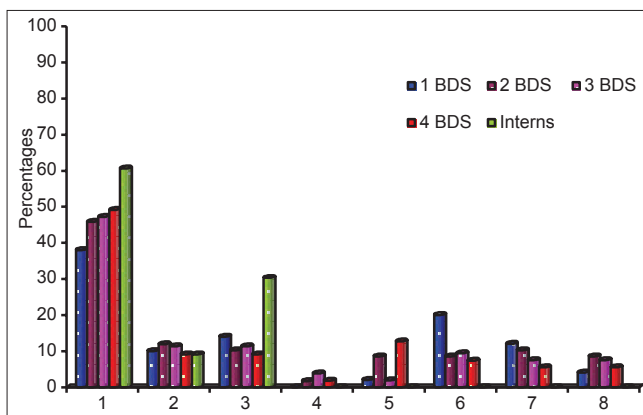


Figure 13: Toothbrush head

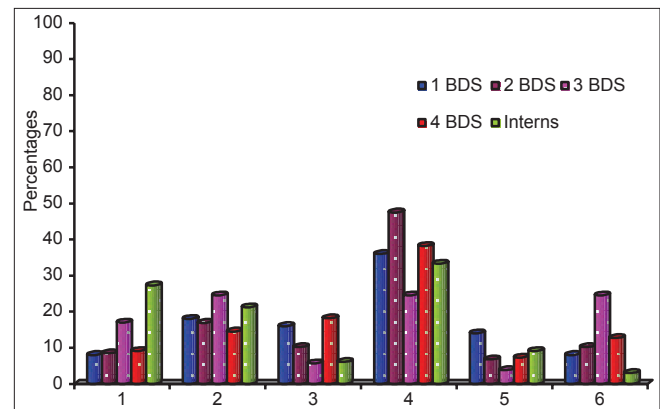


Figure 16: Arrangement of bristles (bristle pattern)

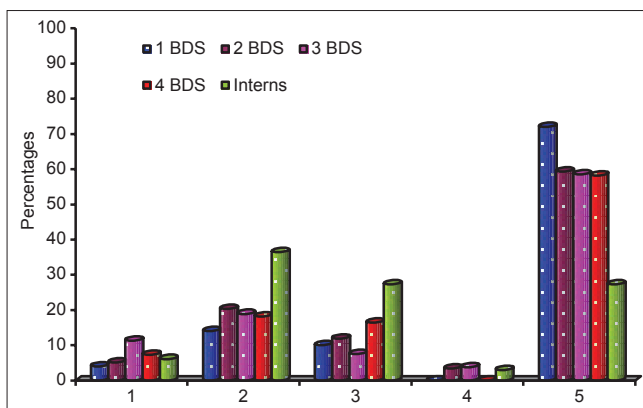


Figure 14: Size of the brush head for an adult should be

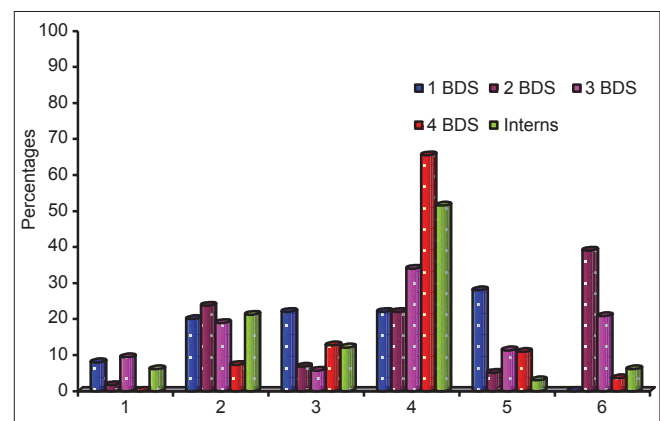


Figure 17: The bristle diameter of hard, medium, and soft toothbrushes are

patient that results in better plaque removal and improved gingival health.

Toothbrush bristles are grouped in tufts that are usually arranged in three or four rows. Rounded bristle ends cause fewer scratches on the gingiva than flat-cut bristles with sharp ends.<sup>22</sup> Two types of bristle material are used in toothbrushes: Natural bristles from hogs and artificial filaments made of nylon. Both types remove plaque, but nylon bristle brushes vastly predominate in the market.

Natural bristles fray, break, soften, and lose their elasticity quickly. Patients accustomed to the softness of an older natural bristle brush can easily traumatize the gingiva when using a new brush with comparable vigor.

Bristle hardness is proportional to the square of the diameter and inversely proportional to the square of bristle length.<sup>23</sup> Diameters of common bristles range from 0.007 inch (0.2 mm) for soft brushes to 0.012 inch (0.3 mm) for medium brushes and 0.014 inch (0.4 mm) for hard brushes<sup>24</sup> (Table 1) (Figures 17 and 18). Soft bristle brushes of the type described by Bass<sup>25</sup> have gained wide acceptance. Opinions regarding the merits of hard and soft bristles are based on studies that are not comparable, are often inconclusive, and contradict one another.<sup>26</sup> Softer bristles are more flexible, clean slightly below the gingival margin when used with a sulcular brushing technique, and reach farther onto the proximal surfaces.<sup>27</sup> Use of hard-bristled toothbrushes is associated with more gingival recession, and frequent brushers who use hard bristles have more recession than those who use soft bristles.<sup>28</sup> However, the manner in which a brush is used and the abrasiveness of the dentifrice affect the action and abrasion to a greater degree than the bristle hardness itself.<sup>29</sup> Bristle hardness does not significantly affect wear on enamel surfaces.<sup>30</sup>

The dental student population in this study does not know the optimum force used for brushing (Table 1 and Figure 19). However, the amount of force used to brush is not critical for effective plaque removal.<sup>31</sup> Vigorous brushing is not necessary and can lead to gingival recession; bacteremia, especially in patients with pronounced gingivitis; wedge shaped defects in the cervical area of root surfaces<sup>32</sup> and painful ulceration of the gingiva.<sup>33</sup>

Students in our study are not aware of all the different brushing techniques for various periodontal conditions and majority of the students brush their teeth either in the horizontal scrub or the vertical brushing techniques (Table 1) (Figures 20 and 21).

Students in our study changed their brushes once in 2-3 months when the bristles splay or spread out (Table 1 and Figures 22 and 23). Toothbrushes must also be replaced periodically, although the amount of visible bristle wear does not appear to affect plaque removal for up to 9 weeks.<sup>34</sup> Wear patterns differ widely among individuals, but with regular use, most brushes show signs of wear within a few months. If all the bristles are flattened in a few days, brushing is too vigorous; if the bristles still look

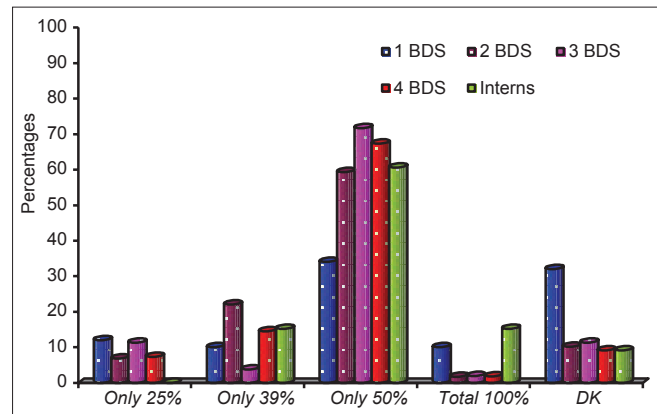


Figure 18: The efficacy of a toothbrush in removing plaque is

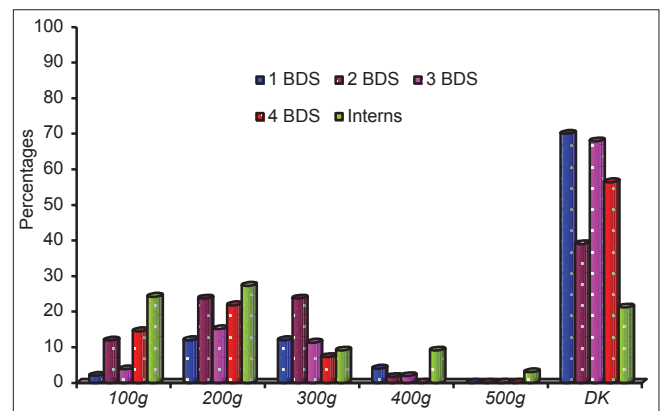


Figure 19: The most effective and ideal brushing force for children and adults is

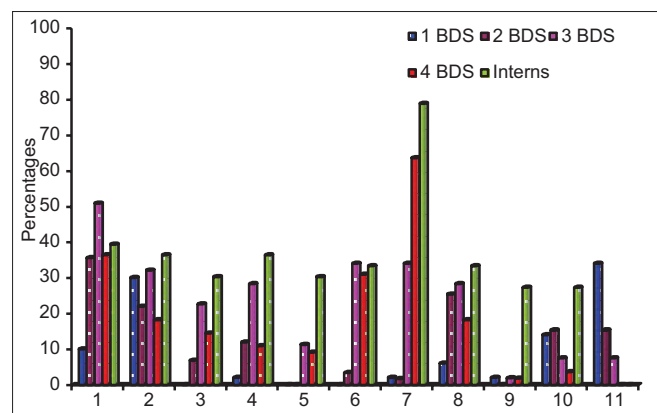


Figure 20: Types of brushing techniques you are aware of

new after 6 months, the brush probably has not been used every day.

To summarize, the great majority stated that they brushed their teeth twice daily with toothbrush and toothpaste without the use of dental floss. They used toothpaste half the length of toothbrush for about 2-3 min with an ordinary plastic toothbrush with a modest flexible handle,

angled shank, and a flat head, with criss-cross soft bristles in horizontal and vertical direction, even though majority of 4<sup>th</sup> year BDS and interns knew about other brushing techniques, and changed their toothbrush every 2-3 months when toothbrush bristles were bent or splayed out (spread out) (Table 1, Figure 24). The choice of selection of toothbrush was based on cleaning capabilities and quality and cost having no influence (Table 1, Figures 25

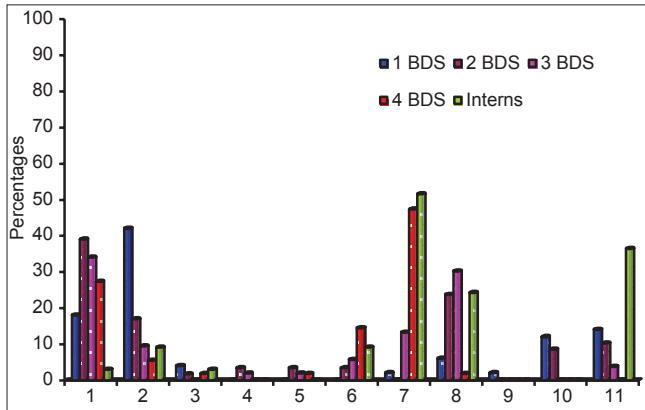


Figure 21: Type of brushing technique you follow

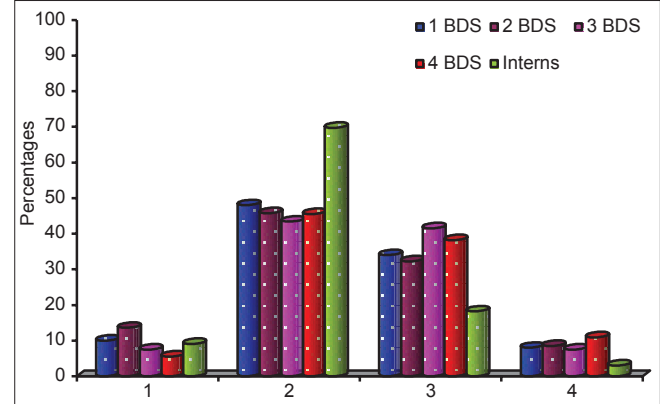


Figure 24: How likely are you to try different toothbrushes?

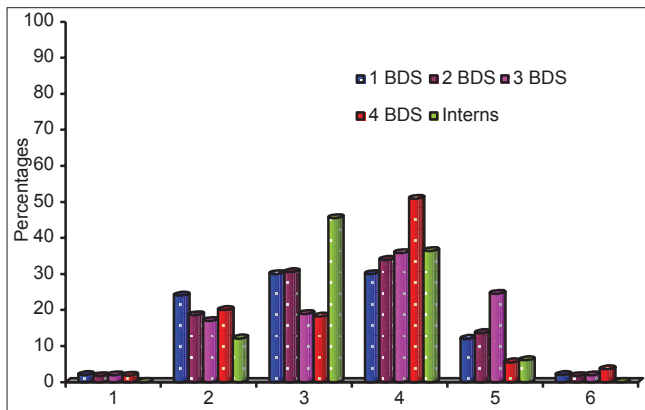


Figure 22: How often do you change your old toothbrush ( how often do you buy a new toothbrush)?

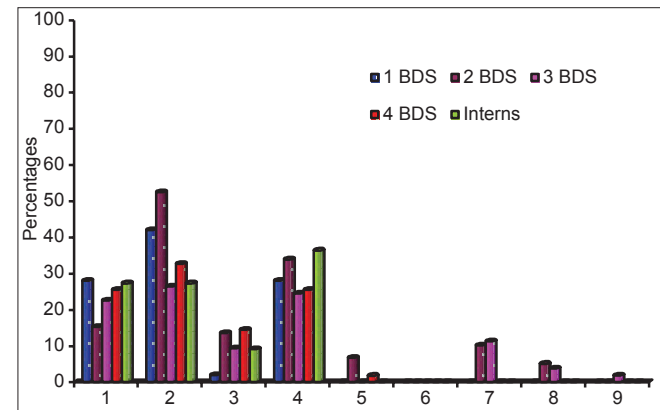


Figure 25: On what basis do you select (purchase) a toothbrush?

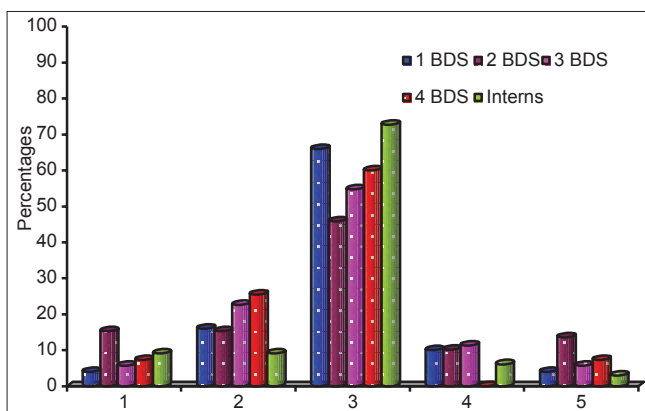


Figure 23: When do you feel that you should renew your toothbrush (signs of toothbrush wear)?

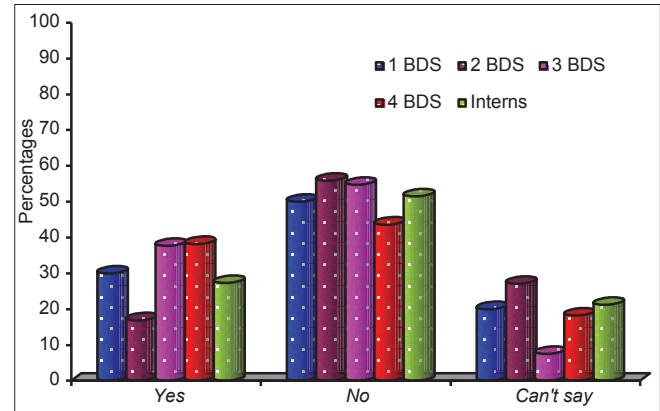


Figure 26: Does the cost influence in selection of your toothbrush

and 26). They showed positive attitude of trying other better toothbrush and techniques if they see something better than they follow.

Interns and 4<sup>th</sup> year BDS students expressed more focus on toothbrush brand and design than on effective technique, and they took for granted that they already had good knowledge and behavior of selecting appropriate toothbrush than the lower classes.

Increased knowledge alone did not influence the behavior and attitude on toothbrush and toothpaste of the elder class (4<sup>th</sup> year BDS) students and interns compared to lower class students (1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> year BDS).

Majority of the student population are not aware of the following:

- Recommended size of the toothbrush head
- The bristle diameter of hard, medium and soft tooth brush
- The most effective and ideal brushing force
- Ideal amount of toothpaste to be applied on the toothbrush
- Various brushing techniques
- Recommended time for toothbrush renewal.

## CONCLUSION

Plaque control is one of the key elements of the practice of dentistry. It permits each person to assume responsibility for his or her own oral health on a daily basis without which optimal health through periodontal treatment cannot be attained or preserved. Every person should be educated about plaque control and encouraged to perform a personalized program on a daily basis. Good plaque control facilitates the return to health for patients with gingival and periodontal diseases, prevents tooth decay, and preserves oral health for a lifetime. The early establishment of good oral hygiene habits and the regular use of toothbrush and toothpaste are important in achieving good oral health. There are several public policies that state that dental health care should work with oral health promotion. There seems to be a great need to continuously promote and teach dental students and interns about the benefits of good oral hygiene habits so that they can promote and implement them among the general population.

## REFERENCES

1. World Health Organization. The World Oral Health Report 2003: Continuous Improvement of Oral Health in the 21<sup>st</sup> Century – The Approach of the WHO Global Oral Health Programme. Geneva: WHO; 2003.
2. World Health Organization. Global Policy for Improvement of Oral Health – World Health Assembly. Geneva: WHO; 2007.
3. Newman MG, Takei H, Klokkevoeld PR, Carranza FA, Klokkevoeld PR, Takei HH, *et al.* Carranza's Clinical Periodontology. 10<sup>th</sup> ed. St. Louis: Saunders, Elsevier; 2006. p. 300-38.
4. Kay E, Locker D. A systematic review of the effectiveness of health promotion aimed at improving oral health. *Community Dent Health* 1998;15:132-44.
5. Morrison V, Bennet P. An Introduction to Health Psychology. Essex: Pearson Education Limited; 2012.
6. Fishbein M, Ajzen I. Predicting and Changing Behavior: The Reasoned Action Approach. New York: Psychology Press, Taylor and Francis Group; 2010.
7. Wendt LK, Hallonsten AL, Koch G, Birkhed D. Oral hygiene in relation to caries development and immigrant status in infants and toddlers. *Scand J Dent Res* 1994;102:269-73.
8. Koivusilta L, Honkala S, Honkala E, Rimpelä A. Toothbrushing as part of the adolescent lifestyle predicts education level. *J Dent Res* 2003;82:361-6.
9. Tseveenjav B, Suominen AL, Vehkalahti MM. Oral health-related behaviours among dentate adults in Finland: Findings from the Finnish Health 2000 Survey. *Eur J Oral Sci* 2012;120:54-60.
10. Poutanen R, Lahti S, Hausen H. Oral health-related knowledge, attitudes, and beliefs among 11 to 12-year-old Finnish schoolchildren with different oral health behaviors. *Acta Odontol Scand* 2005;63:10-6.
11. Macgregor ID, Balding J, Regis D. Toothbrushing schedule, motivation and 'lifestyle' behaviours in 7,770 young adolescents. *Community Dent Health* 1996;13:232-7.
12. Straub AM, Salvi GE, Lang NP. Supragingival plaque formation in the human dentition. In: Lang NP, Attstrom R, Loe H, editors. *Proceedings of the European Workshop on Mechanical Plaque Control*. Chicago: Quintessence; 1998.
13. Tseveenjav B, Suominen AL, Hausen H, Vehkalahti MM. The role of sugar, xylitol, toothbrushing frequency, and use of fluoride toothpaste in maintenance of adults' dental health: findings from the Finnish National Health 2000 Survey. *Eur J Oral Sci* 2011;119:40-7.
14. Kinane DF. The role of interdental cleaning in effective plaque control: need for interdental cleaning in primary and secondary prevention. In: *Proceedings of the European Workshop on Mechanical Plaque Control*. Chicago: Quintessence; 1998.
15. Ashley PF, Attrill DC, Ellwood RP, Worthington HV, Davies RM. Toothbrushing habits and caries experience. *Caries Res* 1999;33:401-2.
16. DenBesten P, Ko HS. Fluoride levels in whole saliva of preschool children after brushing with 0.25 g (pea-sized) as compared to 1.0 g (full-brush) of a fluoride dentifrice. *Pediatr Dent* 1996;18:277-80.
17. Zero DT, Creeth JE, Bosma ML, Butler A, Guibert RG, Karwal R, *et al.* The effect of brushing time and dentifrice quantity on fluoride delivery *in vivo* and enamel surface microhardness *in situ*. *Caries Res* 2010;44:90-100.
18. Saxer UP, Barbakow J, Yankell SL. New studies on estimated and actual toothbrushing times and dentifrice use. *J Clin Dent* 1998;9:49-51.
19. Cantor MT, Stahl SS. Interdental col tissue responses to the use of a water pressure cleansing device. *J Periodontol* 1969;40:292-5.
20. Dyer D, Addy M, Newcombe RG. Studies *in vitro* of abrasion by different manual toothbrush heads and a standard toothpaste. *J Clin Periodontol* 2000;27:99-103.
21. Chava VK. Clinical efficacy of curved bristle brush and straight bristle brush. *J Periodontol* 2000;71:785-9.
22. Danser MM, Timmerman MF, Ijzerman Y, Bulthuis H, van der Velden U, van der Weijden GA. Evaluation of the incidence of gingival abrasion as a result of toothbrushing. *J Clin Periodontol* 1998;25:701-6.
23. Harris NO. Dentifrices, mouth rinses and oral irrigators. In: Harris NO, Christen AG, editors. *Primary Preventive Dentistry*. Norwalk, Connecticut: Appleton and Lange; 1991. p. 141-7.
24. Hine MK. Toothbrush. *Int Dent J* 1956;6:15-25.
25. Bass CC. The optimum characteristics of toothbrushes for personal oral hygiene. *Dent Items Interest* 1948;70:697-718.
26. Hiniker JJ, Forscher BK. The effect of toothbrush type on gingival health. *J Periodontol* 1954;25:40-6.
27. Gilson CM, Charbeneau GT, Hill HC. A comparison of physical properties of several soft toothbrushes. *J Mich State Dent Assoc* 1969;51:347-61.
28. Khocht A, Simon G, Person P, Denepitiya JL. Gingival recession in relation to history of hard toothbrush use. *J Periodontol* 1993;64:900-5.
29. Abrasivity of current dentifrices. Report of the Council of Dental Therapeutics. *J Am Dent Assoc* 1970;81:1177-8.
30. Sangnes G. Traumatization of teeth and gingiva related to habitual tooth cleaning procedures. *J Clin Periodontol* 1976;3:94-103.



31. Van der Weijden GA, Timmerman MF, Danser MM, Van der Velden U. Relationship between the plaque removal efficacy of a manual toothbrush and brushing force. *J Clin Periodontol* 1998;25:413-6.
32. Sangnes G, Gjermo P. Prevalence of oral soft and hard tissue lesions related to mechanical toothcleansing procedures. *Community Dent Oral Epidemiol* 1976;4:77-83.
33. Pattison GL. Self-inflicted gingival injuries: Literature review and case report. *J Periodontol* 1983;54:299-304.
34. Daly CG, Chapple CC, Cameron AC. Effect of toothbrush wear on plaque control. *J Clin Periodontol* 1996;23:45-9.

**How to cite this article:** Kripal K, Sirajuddin S, Biswas S, Prabhu SS, Chungkham S, Chandrashekar BM, Gundapaneni V, Kumuda MN. Oral Health Knowledge, Attitude and Behaviour in Relation to Use of Manual Toothbrush among Dental Students in Bangalore, India: A Questionnaire Study. *Int J Sci Stud* 2015;2(11):26-38.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Angiotensin Converting Enzyme Levels in Normal Pregnancy

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## Abstract

**Objectives:** The renin angiotensin system is very well established hormone systems, which regulate the endothelial homeostasis. We propose this study in order to determine the angiotensin converting enzyme (ACE) (levels in serum as well as in placental tissue in normal pregnancy. This will be done by determining: (1) Serum ACE levels in non-pregnant controls, (2) serum ACE levels in maternal serum, in first, second and third trimester of pregnancy, (3) ACE levels in maternal placenta, (4) serum ACE levels in cord blood.

**Materials and Methods:** This study was conducted in Queen Mary's Hospital, King George's Medical University, Lucknow in collaboration with Department of Pharmacology, Central Drug Research Institute, Lucknow.

**Observations:** In the present study, all subjects both pregnant and non-pregnant (control) were allocated into various groups, which consisted of 20 subjects each in first, second and third trimester of pregnancy and 20 subjects from non-pregnant normal women. Among the three trimesters, highest mean angiotensin converting enzyme levels were found for the second trimester ( $10.98 \pm 2.36$ ). The ACE levels were higher in non-pregnant group ( $7.36 \pm 1.79$ ) as compared to the other two pregnant groups ( $4.59 \pm 1.09$  for first trimester and  $6.19 \pm 1.58$  for third trimester). The ACE levels in placental tissue were  $3.23 \pm 0.79$  units/mg tissue while those for cord blood were  $4.85 \pm 1.64$  units/ml.

**Conclusion:** ACE levels were found in study subgroup II (second trimester pregnancy) ( $10.985 \pm 10.575$  IU/ml) while lowest ACE levels were observed in study subgroup III a (placental tissue specimen) ( $3.23 \pm 0.79$  IU/mg) the differences in ACE levels among the groups were analyzed statistically using ANOVA and they were found to be statistically significant ( $P < 0.05$ ).

**Key words:** Angiotensin, Converting, Enzyme, Pregnancy

## INTRODUCTION

The renin angiotensin system is very well established hormone systems which regulates, the endothelial homeostasis. Renin angiotensin-aldosterone axis is intimately involved in renal control of salt and water balance.<sup>1-3</sup> Abnormality in this system has been implicated in the pathogenesis of cardiovascular, renal, obstetric conditions.

All components of this system are increased in normal pregnancy. Renin is produced by maternal kidney and uteroplacental unit while increased angiotensinogen is produced by maternal and fetal liver. Increased aldosterone may be the factor responsible for salt and water retention and consequent edema of pregnancy.<sup>4,5</sup> Despite these increased levels, the blood pressure (BP) in normal pregnancy is stabilized due to the refractoriness of the vessel wall to angiotensin II.

How pregnancy incites or aggravates, hypertension remains unsolved despite decades of intensive research, and hypertensive disorders remain among the most significant unsolved problem in obstetrics.

The importance of renin angiotensin aldosterone system (RAAS) in the pathogenesis of arterial hypertension has

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Month of Submission : 12-2014  
Month of Peer Review : 01-2015  
Month of Acceptance : 01-2015  
Month of Publishing : 02-2015

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directed attention to the possible role it plays in pregnancy induced hypertension (PIH).<sup>5-7</sup>

Hypertensive disorders due to pregnancy result in a decrease in these values approaching toward the normal non-pregnant range. With sodium retention, hypertension or both, rennin secretion by J.G apparatus decreases, thus angiotensin I, II and aldosterone level decreases. These changes i.e., angiotensin converting enzyme (ACE) levels in normal pregnancy in different trimester of pregnancy has been studied and can be used in future in prevention and treatment of PIH.

### Key Objectives

We propose this study in order to determine the ACE levels in serum as well as in placental tissue in normal pregnancy.

This will be done by determining:

- Serum ACE levels in non-pregnant controls
- Serum ACE levels in maternal serum, in first, second and third trimester of pregnancy
- ACE levels in maternal placenta
- Serum ACE levels in cord blood.

The objective thus obtained out of this study could be very well utilized in prevention and treatment of PIH.

## MATERIALS AND METHODS

The present study was conducted in Queen Mary's Hospital, King George's Medical University, Lucknow in collaboration with Department of Pharmacology, Central Drug Research Institute, Lucknow in order to determine the ACE levels in serum, cord blood and placental tissues in normal pregnancy and comparing serum ACE levels in non-pregnant women.

### Subjects for Study

Women attending the outpatient department, the antenatal clinic and the admitted patients in Queen Mary's Hospital, Lucknow were included in the study.

The subjects were divided into two groups:

- The control group
- The study group.

### Control group

Comprised of 20 normal healthy non-pregnant women selected randomly to match with the age and parity with the study subgroups I, II, and III.

### Study group

Comprised of 60 normal pregnant women with BP consistently <140/90 mm Hg (without any antihypertensive therapy and according to JNC V Classification of Hypertension), having no family history or past history suggestive of hypertension and other complications of pregnancy.

On the basis of the stage of pregnancy, the study group was further divided into following groups:

- Study Group I: 20 women in the first trimester of pregnancy
- Study Group II: 20 women in the second trimester of pregnancy
- Study Group III: 20 women in the third trimester of pregnancy. It was further subdivided into
  - Study Group III A: Maternal serum specimens of the above 20 women
  - Study Group III B: Placenta specimens of above 20 women
  - Study Group III C: Cord blood specimens of neonate of above 20 women.

### Exclusion Criteria

Patients with any of the following diseases were not included in the study:

- Essential hypertension
- Renovascular hypertension
- Hypertension secondary to the condition such as primary aldosteronism, pheochromocytoma, coarctation of the aorta
- PIH.

### Methodology

Family history, obstetric history, socioeconomic history, nutritional history and complaints of all subjects were noted.

### Clinical history

A comprehensive clinical history to rule out hypertension was taken.

A detailed physical examination was done and a careful assessment of BP as well as its evidence seen on target organs.

### BP assessment

- The patient was asked to sit for 15 min in a quiet room before starting measurements
- A standard cuff was used with a bladder that is 12-13 cm × 35 cm.

The arterial BP was measured by the auscultatory method.

Laboratory tests include the following

- Hematocrit
- Urine for protein, blood and glucose by
- Urine routine and microscopic examination
- Test for macroproteinuria by dipstick method
- Investigation to assess renal function - blood urea, serum creatinine
- Serum potassium
- Obstetrical ultrasound in the study group.

### Biochemical estimation

- The sample (10 ml blood) was collected in a sterilized, clean, dry disposable plastic syringe by a peripheral venepuncture. The sample was cold centrifuged (4°C temperature at 5000 rpm for 10 min) and serum was separated by Epindorf pipette using sterilized clean disposable polyethylene tips
- Cord blood (10 ml) was collected in a clean dry plastic vial. Sample was cold centrifuged (4°C temperature) at 5000 rpm for 10 min
- About 5 g of placental tissue was taken in a clean plastic bottle in normal saline.

### Preparation of Tissue Homogenate

A 10% (w/v) homogenate of this tissue was made by dissolving 5 mg of placental tissue in 1 ml of tris HCL buffer (pH7.4) in a polytron homogenizer. The homogenate was centrifuged at 4000 rpm for 15 min at 4°C. The supernatant was collected for various biochemical estimations.

### Estimation of ACE

ACE was estimated by modified method of Laberman<sup>8</sup> using hippuryl-histidyl-leucine (HHL) as substrate. In two tubes 50 ul of substrate HHL (HHL Sigma, Aldrick USA) was prepared. In so tubes, 250 ul of HCL was added. In S0 and S1 tubes 75 ul of sample (serum or tissue supernatant) was added. The tubes were kept for incubation in 37°C for 1 h. After incubation, 250 ul of 1N HCL was added into S1 to stop the reaction. After 5 min 15 ml ethyl acetate was added into each tube and vortexed for 15 s. Each tube was centrifuged in 3000 rpm for 5 min. 1 ml of supernatant was pipetted out and heated in the water bath at 120°C for 15 min. 3 ml of 1 M NaCl was added into each tube and vortexed for 15 s. After 30 min, the absorbance was taken in 228 nλ in spectrophotometer by quartz cuvette.

### Following Formula was Used

ACE (units/ml) = (Absorbance in S1 tube {228} / absorbance in S0 tube {228}) × 18.7 λ 228 is the wave length in spectrophotometer.

### Analysis of Data

Levels of ACE so recorded will be subjected to correlation and intergroup analysis by using mean, standard deviation, standard error of mean, Student's t-test, analysis of variance and coefficient of correlation.

## OBSERVATIONS

The ACE levels were assessed as per the methodology described in materials and method section of the present study. The following observations were made:

In the present study, out of 80 subjects included in the study, 43 (53.75%) were from low income group, 34

(42.5%) from middle income group and 3 (3.75%) from high income group. On comparing the groups statistically for any significant difference on the basis of age using Chi-square test, no significant difference could be obtained ( $P > 0.05$ ).

Thus, our groups were matched socioeconomically.

Most of the patients either primi or bi parous. The parity wise status among groups did not differ significantly ( $P > 0.05$ ).

Among the three trimesters, highest mean angiotensin converting enzyme levels were found for the second trimester ( $10.98 \pm 2.36$ ). The ACE levels were higher in non-pregnant group ( $7.36 \pm 1.79$ ) than the other two pregnant groups ( $4.59 \pm 1.09$  for first trimester and  $6.19 \pm 1.58$  for third trimester). The ACE levels in placental tissue were  $3.23 \pm 0.79$  units/mg tissue while those for cord blood were  $4.85 \pm 1.64$  units/ml (Table 1).

Table 2a shows a statistically significant difference in mean ACE levels of control (i.e. non-pregnant women) versus study subgroup III B (placental tissue), study subgroup I (first trimester pregnant women) versus study subgroup II (second trimester pregnant women), study subgroup II versus study subgroup III B, study subgroup II and study subgroup III C (third trimester pregnant women).

The correlation analysis between period of pregnancy and ACE levels did not reveal a significant correlation ( $r = 0.08$ ;  $P = 0.542$ ) (Table 2b).

The correlation analysis between mean BP and ACE levels did not reveal a significant correlation ( $r = 0.012$ ;  $P > 0.05$ ) (Table 3).

The correlation analysis between diastolic BP and ACE levels did not reveal a significant correlation ( $r = 0.012$ ;  $P > 0.05$ ) (Table 4).

## DISCUSSION

The main objective of the present study was “to determine the ACE levels in normal pregnancy” in Indian women, to evaluate and assess following critical objectives:

The serum ACE levels in different stages (three trimesters of pregnancy), in addition, ACE levels in placental tissue and cord blood was determined, and their comparison was made with non-pregnant controls.

Historical experiments by Tiegerstedt and Bergman (1898) followed by Goldblatts (1934), Page and Helper (1940) discovery of rennin as an important component of rennin angiotensin system has given enormous impact to this



**Table 1: Mean angiotensin converting enzyme levels in different groups**

	Levels in serum (units/ml)			Levels in tissue (units/mg)		Levels in blood (units/ml)
	Control group (nonpregnant)	Study Group I (first trimester)	Study Group II (second trimester)	Study Group III (third trimester)	Study Group III B (placenta sample)*	Study Group III C (cord blood)
Mean±SE	7.36±1.79	4.59±1.09	10.98±2.36	6.19±1.58	3.23±0.79	4.85±1.64
95% CI	3.60, 11.11	2.31, 6.87	6.03, 15.93	2.88, 9.50	1.57, 4.89	1.43, 8.28

\*0.5 mg placenta mixed in 1 ml of Tris buffer, CI: Confidence interval, SE: Standard error

**Table 2a: Intergroup comparison of ACE levels**

Comparison	Difference between groups	t	P
Control group versus study Group I	2.76±2.10	1.32	0.20
Control group versus study Group II	3.62±2.96	1.22	0.23
Control group versus study Group III A	1.17±2.39	0.46	0.63
Control group versus study Group III B	4.12±1.96	2.10	0.04
Control group versus study Group III C	2.50±2.43	1.03	0.31
Study Group I versus study Group II	6.39±2.60	2.45	0.02
Study Group I versus study Group III A	1.60±1.92	0.83	0.41
Study Group I versus study Group III B	1.36±1.35	1.01	0.32
Study Group I versus study Group III C	0.26±1.97	0.13	0.89
Study Group II versus study Group III A	4.79±2.84	1.68	0.10
Study Group II versus study Group III B	7.75±2.49	3.11	0.004
Study Group II versus study Group III C	6.13±2.88	2.13	0.04
Study Group III A versus study Group III B	2.96±1.77	1.67	0.10
Study Group III A versus study Group III C	1.33±2.27	0.59	0.56
Study Group III B versus study Group III C	1.62±1.82	0.89	0.38

ACE: Angiotensin converting enzyme

**Table 2b: Correlation between period of pregnancy and ACE levels**

Group	Mean ACE (units/ml) (mean AC)	r	P
Study subgroup I: First trimester	4.59±1.09	0.08	0.542
Study subgroup II: Second trimester	10.98±2.36		
Study subgroup III: Third trimester	6.19±1.58		

SE: Standard error, ACE: Angiotensin converting enzyme

paracrine and endocrine system which control the endothelial homeostasis. In the past decades discovery of angiotensin converting enzyme inhibitors (Captopril, Enalapril, Remipril, etc.) have revolutionized the treatment of cardiovascular disease, Puri (1996).<sup>9</sup> ACE inhibitors are contraindicated in pregnancy based on the scanty experimental data. We got interested for the past years to explore and evaluate this important system in normal and abnormal pregnancies in women from North India attending our indoor and outdoor services of KGMU, Lucknow. In present times when the bioinformatics based on structural and functional genomics and molecular biology have so much advanced, but still this important area of RAAS of reproductive biology remains untouched. Our endeavor is to know the status of RAAS, especially the angiotensin converting enzyme levels in normal pregnant women. Our findings are important to derive and

**Table 3: Correlation between mean arterial BP and ACE levels**

Group	Mean ACE levels (units/ml) (mean±SE)	r	P
Control group	7.36±1.79	-0.16	>0.05
Study Group I	4.59±1.09	-0.34	>0.05
Study Group II	10.98±2.36	0.07	>0.05
Study Group III	6.19±1.58	0.30	>0.05

BP: Blood pressure, SE: Standard error, ACE: Angiotensin converting enzyme

**Table 4: Correlation between diastolic BP and ACE levels**

Group	Mean ACE levels (units/ml) (mean±SE)	r	P
Control group	7.36±1.79	-0.016	>0.05
Study Group I	4.59±1.09	0.376	>0.05
Study Group II	10.98±2.36	-0.266	>0.05
Study Group III	6.19±1.58	0.135	>0.05

SE: Standard error, ACE: Angiotensin converting enzyme, BP: Blood pressure

determine the future treatment modalities for PIH in Indian subjects. It is expected that in the near future we will develop new paradigms in the area of RAAS to guide evidence-based therapy (Puri 1996).<sup>9</sup>

The role of RAAS in the pathogenesis of arterial hypertension had directed attention to the possible role it plays in PIH.

Helmer and Judson (1967) showed that plasma renin activity increased in normal pregnancy. Similarly, plasma aldosterone levels were elevated too Weir *et al.* (1971)<sup>10,11</sup> but in established toxemia, these levels are reduced when compared with levels of normal pregnancy (van de Wiele, 1960).

Lammintausta and Erkkola (1977)<sup>12</sup> showed that plasma renin activity and angiotensin I levels were significantly elevated throughout pregnancy and showed maximal mean values at the 10<sup>th</sup> week, gradually returning to the level of non-pregnant women 7 days after delivery. The daily urinary excretion of aldosterone was also increased throughout pregnancy, but the mean values showed an increasing trend until 34<sup>th</sup> week. They returned to non-pregnant levels 7 days after delivery.

Valdés *et al.* (1981)<sup>13</sup> reported that urinary kallirein (UK) excretion, plasma rennin activity (PRA), and 24 h urine volume, sodium and potassium excretion rates were determined sequentially in 16 normal pregnant women. Throughout gestation UK was significantly elevated as compared to values obtained in 13 control women ( $1466 \pm$  vs.  $375 \pm$  U/g creatinine). Highest level was observed in the period 2 of gestation, corresponding to 17-24 weeks. PRA was also significantly elevated during pregnancy ( $11.97 \pm 1.35$  vs.  $1.06 \pm 0.09$  ng/ml/h), with the highest level in period 2 of gestation. Mean 24 h urine volume, sodium and potassium excretion rates were significantly higher during pregnancy.

These results were similar to our finding where in second trimester of pregnancy higher levels of ACE were found. Higher levels of ACE might induce an increase in systemic BP. ACE induced increased activity of renin might have been suppressed or antagonized by higher levels of bradykinin, which is a hypotensive peptide. We have not evaluated the plasma bradykinin levels in this investigation but our findings of hyperactivity of ACE enzymes in second trimester of pregnancy in Indian women give enough evidence to address and evaluate the role of kallikrein system in different trimesters of normal pregnancy in Indian women.

Plasma rennin concentration (Brown *et al.*, 1963<sup>14-17</sup>; Helmer and Judson, 1967), plasma rennin substrate (Helmer and Judson, 1967; Pickens *et al.*, 1965)<sup>8</sup> and PRA (Helmer Judson, 1967; Genest *et al.*, 1965)<sup>18</sup> are increased in normal.

Measurement of plasma renin concentration (Brown *et al.*, 1966)<sup>14-17</sup> and plasma renin activity (Helmer and Judson, 1967) in established severe toxemia have revealed levels, which are lower than in normal pregnancy of comparable duration. This reduction might be consequence of the characteristic renal glomerular lesion with reduced renal blood flow and glomerular filtration rate (Chesley and Duffus, 1971)<sup>19</sup> and reduced sodium excretion (Assali, Holm and Parker, 1964) seen in toxemia.

Helmer and Judson (1967) showed that plasma renin activity increased in normal pregnancy; similarly plasma aldosterone levels were elevated too (Wier *et al.* 1971)<sup>10,11</sup> However, in established toxemia, these levels were reduced when compared with levels in normal pregnancy (Van de wiele, 1960).

Langer *et al.* (1998)<sup>20</sup> evaluated the activity of RAAS system in the circulation during different trimesters of normal pregnancy and in women with preeclampsia. Normal pregnant volunteers ( $n = 7$ ) were studied throughout pregnancy, and women with preeclampsia ( $n = 8$ ) were

studied in the third trimesters. They concluded that there is no significant difference in plasma ACE activity in preeclampsia as compared to normal pregnancy. In this study first and second trimesters pregnancy in preeclampsia were not evaluated therefore comparison with first and second trimesters of normal pregnancy could not be made. However, based on our findings it can be considered that the balance between depressor (bradykinin) and pressor (renin-angiotensin system) might be a trigger in the development of preeclampsia in the population also.

Kalenga, 1995<sup>21</sup> has reported that in preeclamptic pregnancies, the chorion membrane contained the highest concentration of ACE activity. In the placenta, as in fetal membranes, no significant difference was found in the levels of ACE between hypertensive patients and normal subjects.

Brar *et al.* (1987)<sup>22</sup> has reported that there is no significant difference between active renin, inactive renin and ratio of active to total rennin in subjects with PIH compared to control subjects.

Chesley (1978), Carr and Grant (1973)<sup>23</sup> Broughton-Pipkin (1988)<sup>24-26</sup> have shown that in comparison to normal pregnancy, the PRA is lower in women with PIH.

According to Wier *et al.* (1973)<sup>10,11</sup> plasma levels of aldosterone are increased in normal pregnancy. Hypertension disorder due to pregnancy result in a decrease towards normal non-pregnant range.

Hassan *et al.*<sup>27</sup> concluded that although plasma aldosterone levels were increased progressively in hypertensive women but they remained significantly lower than the ones of normotensive pregnant women.

Langer *et al.* (1998) has concluded that most parameters (apart from active rennin) remain low when compared to those in normal pregnancy and were comparable to post-partum data. Van de Wiele (1960) and Sims (1964) have opined that in established severe toxemia, plasma aldosterone secretion decreases.

Our group for the first time has reported ACE levels in different trimester of pregnancy, in placenta and cord blood of Indian women.

In the present study, 80 subjects were included. They were divided into study group ( $n = 60$ ) and control group ( $n = 20$ ) according to the criteria mentioned. Highest ACE levels were found in the study subgroup II (second trimester of pregnancy) ( $10.985 \pm 10.575$  IU/ml) while lower ACE levels were observed in study subgroup III

a (placental tissue specimen) ( $3.23 \pm 0.79$  IU/mg) the differences in ACE levels among the groups were analyzed statistically using ANOVA and they were found to be statistically significant ( $P < 0.05$ ).

The correlation analysis between the period of pregnancy and ACE levels did not reveal a significant correlation ( $r = 0.08$ ;  $P = 0.542$ ).

We have done this important and interesting observation with significant findings and it is expected that in future our department will take the lead and many more investigations related to hypertension and hypotensive peptide will be done so as to enhance our generic pool data to improve the treatment outcome in normal and abnormal pregnancy.

## CONCLUSION

We carried out our study in normotensive pregnant and non-pregnant Indian women. Our study was to determine ACE levels in serum obtained from women in different trimesters of pregnancy, in placental tissue and cord blood and comparing them with non-pregnant controls.

The above study we concluded that:

- Highest ACE levels were found in study subgroup II (second trimester pregnancy) ( $10.985 \pm 10.575$  IU/ml) while lowest ACE levels were observed in study subgroup III a (placental tissue specimen) ( $3.23 \pm 0.79$  IU/mg) the differences in ACE levels among the groups were analyzed statistically using ANOVA and they were found to be statistically significant ( $P < 0.05$ )
- The correlation analyses between the period of pregnancy and ACE levels did not reveal a statistically significant correlation ( $r = 0.008$ ;  $P = 0.542$ )
- There was no significant correlation between mean arterial BP, systolic and diastolic BP with the serum ACE levels.

## REFERENCES

1. Braundwald E. 5<sup>th</sup> JNC Classification. In: Atlas of Heart Disease. Vol. I. Philadelphia: Current Medicine; 1995. p. 13.1-13.16.
2. Alhenc-Gelas F, Tache A, Saint-Andre JP, Milliez J, Bureau C, Corvol P, *et al.* The renin-angiotensin system in pregnancy and parturition. *Adv Nephrol Necker Hosp* 1986;15:25-33.
3. Anderson S, Brenner BM. The critical role of nephron mass and of intraglomerular pressure for initiation and progression of experimental hypertension-renal disorders. In: Laragh JH, Brenner B, editors. *Hypertension: Pathophysiology, Diagnosis and Management*. New York: Raven Press Ltd; 1995.
4. August P, Lenz T, Ales KL, Druzin ML, Edersheim TG, Hutson JM, *et al.* Longitudinal study of the renin-angiotensin-aldosterone system in

- hypertensive pregnant women: Deviations related to the development of superimposed preeclampsia. *Am J Obstet Gynecol* 1990;163:1612-21.
5. August P, Mueller FB, Sealey JE, Edersheim TG. Role of renin-angiotensin system in blood pressure in pregnancy. *Lancet* 1995;345:896-7.
6. Baker PN, Broughton Pipkin F, Symonds EM. Platelet angiotensin II binding and plasma renin concentration, plasma renin substrate and plasma angiotensin II in human pregnancy. *Clin Sci (Lond)* 1990;79:403-8.
7. Bay WH, Ferris TF. Factors controlling plasma renin and aldosterone during pregnancy. *Hypertension* 1979;1:410-5.
8. Pickens PT, Bumpus FM, Lloyd AM, Smeby RR, Page IH. Measurement of renin activity in human plasma. *Circ Res* 1965;17:438-48.
9. Puri VN. Renin angiotensin aldosterone system. Design and development of better antihypertensive agent. *Med Update* 1996;943-6.
10. Weir RJ, Brown JJ, Fraser R, Kraszewski A, Lever AF, McIlwaine GM, *et al.* Plasma renin, renin substrate, angiotensin II, and aldosterone in hypertensive disease of pregnancy. *Lancet* 1973;1:291-4.
11. Wier RJ, Brown JJ, Fraser R, Lever AF, Logan RW, McIlwaine GM, *et al.* Relationship between plasma renin, renin-substrate, angiotensin II, aldosterone and electrolytes in normal pregnancy. *J Clin Endocrinol Metab* 1975;40:108-15.
12. Lammintausta R, Erkkola R. Renin-angiotensin – Aldosterone system and sodium in normal pregnancy: A longitudinal study. *Acta Obstet Gynecol Scand* 1977;56:221-5.
13. Valdés G, Espinoza P, Moore R, Croxatto HR. Urinary kallikrein and plasma renin activity in normal human pregnancy. *Hypertension* 1981;3:II-55-8.
14. Brown MA, Zammit VC, Mitar DA, Whitworth JA. Renin-aldosterone relationships in pregnancy-induced hypertension. *Am J Hypertens* 1992;5:366-71.
15. Brown MA, Nicholson E, Gallery ED. Sodium-renin-aldosterone relations in normal and hypertensive pregnancy. *Br J Obstet Gynaecol* 1988;95:1237-46.
16. Brown MA, Reiter L, Rodger A, Whitworth JA. Impaired renin stimulation in pre-eclampsia. *Clin Sci (Lond)* 1994;86:575-81.
17. Brown AJ, Casals-Stenzel J, Gofford S, Lever AF, Morton JJ. Comparison of fast and slow pressor effects of angiotensin II in the conscious rat. *Am J Physiol* 1981;241:H381-8.
18. Genest J, de Champlain J, Veyrat R, Boucher R, Tremblay GY, Strong CG, *et al.* Role of renin angiotensin system in various physiological and pathological states. *Hypertension* 1965;13:97-116.
19. Chesley LC. Renin-angiotensin system in pregnancy. *J Reprod Med* 1975;15:179.
20. Langer B, Grima M, Coquard C, Bader AM, Schlaeder G, Imbs JL. Plasma active renin, angiotensin I, and angiotensin II during pregnancy and in preeclampsia. *Obstet Gynecol* 1998;91:196-202.
21. Kalenga MK, Thomas K, de Gasparo M, De Hertogh R. Determination of renin, angiotensin converting enzyme and angiotensin II levels in human placenta, chorion and amnion from women with pregnancy induced hypertension. *Clin Endocrinol (Oxf)* 1996;44:429-33.
22. Brar HS, Kjos SL, Dougherty W, Do YS, Tam HB, Hsueh WA. Increased fetoplacental active renin production in pregnancy-induced hypertension. *Am J Obstet Gynecol* 1987;157:363-7.
23. Carr BR, Gant NF. The endocrinology of pregnancy-induced hypertension. *Clin Perinatol* 1983;10:737-61.
24. Broughton-Pipkin. Fetal renin angiotensin system in pregnancy induced hypertension. *Clin Sci Mod Med* 1977;52:449-56.
25. Pipkin FB. The renin angiotensin system in normal hypertensive pregnancies. *Hypertension in pregnancy*. In: Rubin PC, editor. *Handbook of Hypertension*. Vol. 10. New York, NY, U.S.A.: Elsevier; 1988. p. 118-51.
26. Broughton Pipkin F, Oats JJ, Symonds EM. Sequential changes in the human renin-angiotensin system following delivery. *Br J Obstet Gynaecol* 1978;85:821-7.
27. Hassan E, Creatsas G, Mastorakos G, Michalas S. Clinical implications of the ovarian/endometrial renin-angiotensin-aldosterone system. *Ann N Y Acad Sci* 2000;900:107-18.

**How to cite this article:** Srivastava M, Gupta HP, Bhatnagar P, Gupta M. Angiotensin Converting Enzyme Levels in Normal Pregnancy. *Int J Sci Stud* 2015;2(11):39-44.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Association of ABO Blood Groups with Malocclusion in Population of Jaipur, India: A Prospective Study

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## Abstract

**Background:** One of the most important human genetic characteristics is the relationship between the ABO blood group system and diseases and deformities.

**Aim:** The aim was to find out the relationship between blood groups and malocclusion by comparing blood groups of each individual with one's malocclusion.

**Materials and Methods:** A total of 300 subjects (age range 15-28 years) were recruited in the study for whom complete information about their malocclusion and blood group type was recorded as per the ABO system. The subjects were equally divided into two groups: Half of the subjects in malocclusion and the remaining half in normal occlusion group who served as control. In normal occlusion group, only those subjects were included, which on clinical evaluation, showed, bilateral Angles Class I molar relationship with acceptable overjet and overbite and well-aligned arches or minimal crowding while the individuals with malocclusion were classified into three groups according to Angles classification.

**Results:** Statistical analysis with Chi-square test showed that association of blood groups with malocclusion is statistically highly significant ( $P < 0.001$ ) indicating the prevalence of malocclusions is highest in blood group B, followed by A, O and AB with the least prevalence ( $B > A > O > AB$ ). Blood groups B and A had the increased incidence of association with malocclusion while blood groups O and AB had decreased incidence of association with malocclusion.

**Conclusions:** The evaluation of the relationship between blood and malocclusions revealed that blood groups have an association with malocclusions with prevalence of malocclusions being highest in blood group B, followed by A, O and AB in Jaipur population.

**Key words:** ABO blood groups, Association, Jaipur population, Malocclusion

## INTRODUCTION

The relative influence of genetic and environmental factors in the etiology of malocclusion has been a matter for discussion, debate and controversy in orthodontic literature.<sup>1</sup> Malocclusions have a multi-factorial origin and can hardly

be attributed to a single specific cause. Causes include general factors, such as genetic and hereditary components, nutritional deficiencies and abnormal pressure habits, or local factors, located directly in the dental arch such as supernumerary teeth, tooth decay and premature loss of primary teeth. Indeed, genetics plays a significant role in causing malocclusions. Epidemiological evaluations can reveal relationships between malocclusions and some genetic characteristics or accompanied diseases, which will help to recognize and treat them. One of the most important human genetic characteristics is the relationship between the ABO blood group system and some oral diseases such as malocclusions. With the discovery of ABO

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Month of Submission : 12-2014  
Month of Peer Review : 01-2015  
Month of Acceptance : 01-2015  
Month of Publishing : 02-2015

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blood groups and some enzyme polymorphs, it could be possible to determine the zygosity of twins, which are especially helpful in twin studies concerning the role of heritability of malocclusion.<sup>1,2</sup>

The ABO blood group system is the first and the most important system defined in 1901 by Karl Landsteiner<sup>3</sup> (who received a Nobel Prize in 1930 and together with Weiner; he discovered Rh system in 1940). There are two main antigens, A and B, in the ABO system, present on cell membranes or secreted into the plasma and other fluids of the body. The presence or absence of these antigens results in the four blood groups or blood types: A, B, AB, and O. These antigens are present on the 9<sup>th</sup> chromosome and are inherited co-dominantly.<sup>4</sup> Since the malocclusion and blood groups both are related to genetic components, it can be hypothesized that blood groups have an association with malocclusions. In India as well as Western countries, research has been done to find out the relationship between ABO blood group and various systemic diseases, and the results showed that some diseases like dental caries,<sup>5</sup> salivary gland tumors,<sup>6</sup> chicken pox,<sup>7</sup> malaria,<sup>8</sup> oral cancer,<sup>9</sup> hematological malignancies,<sup>10</sup> ischemic heart disease,<sup>11</sup> cholera<sup>12</sup> etc. were found to have significant association with blood groups.

On evaluating the literature, Weber and Pastern<sup>13</sup> first studied the association of ABO blood group with periodontal disease. Kaslick *et al.*<sup>14</sup> studied the association of aggressive periodontitis and ABO blood group, they found significantly less patients with blood group O and more patients with blood group B. Roberts,<sup>15</sup> discussed the relationship between ABO blood group and susceptibility to chronic disease as an example of genetic basis for family predisposition. Koregol *et al.*<sup>16</sup> in a study concluded that blood group A formed a significantly higher percentage in the gingivitis group, blood group O formed a higher percentage in the periodontitis group and blood group AB showed the least percentage of periodontal diseases.

In general, a few studies have been conducted to determine the relationship between ABO blood group and the incidence of oral and dental diseases. The reports of some researchers claimed that there was a relationship, whereas some others could not find any relationship, which may be attributed to the geographic diversity of the population. Due to the lack of information on the relationship of blood groups with malocclusion, this study was conducted to fill this lacuna and it is hoped that these findings will be beneficial for future research.

### Aims and Objectives

The aim and objective of this study is to find out whether there is a relationship between ABO blood groups and

dental malocclusion by comparing blood groups of each individual with one's malocclusion in population of Jaipur, India.

## MATERIALS AND METHODS

This study was conducted on 300 patients (age range 15-28 years) reporting to the Department of Orthodontics and Dentofacial Orthopedics of NIMS Dental College and Hospital, Jaipur and for whom complete information about their malocclusion and blood group type was recorded as per the ABO blood grouping system. Ethical committee clearance was obtained from the institution before starting the study. A separate sheet or proforma was used as a record for each individual including name of the patient, age, sex, blood group, and the malocclusion.

All individuals were assigned for evaluation by a single operator, and occlusal relationships were evaluated at centric occlusion, which was achieved by asking the subject to swallow and then to bite on his/her teeth together. The subjects were equally divided into two groups: Half of the subjects in malocclusion and the remaining half in normal occlusion group who served as control. The cheeks were fully retracted to obtain a direct lateral view of the dentition on each side and dental casts were also used (Figures 1 and 2).

### Inclusion Criteria

1. All permanent teeth present in each arch (except third molars), and in a sufficient state of eruption
2. No systemic disease or congenital syndrome.

### Exclusion Criteria

1. Dentition with missing molars or carious teeth or any deciduous/primary teeth



**Figure 1: Evaluation of occlusal relationships at centric occlusion**

2. Dentition with large coronal restoration that might have altered both coronal shape and size
3. End to end cuspal molar relationships or others (not full cusp relationships).

In normal occlusion group, only those subjects were included, which on clinical evaluation, showed, bilateral Angles Class I molar relationship with acceptable overjet and overbite and well-aligned arches or minimal crowding.

Then, in the malocclusion group those individuals were included who fulfilled the criteria according to Angles classification of malocclusion,<sup>17</sup> i.e.. Class I, Class II and Class III malocclusions. The criteria for inclusion were:

#### **Class I Malocclusion**

Bilateral Angles Class I molar relationship (mesio-buccal cusp of maxillary first permanent molar occluding in the buccal groove of mandibular first permanent molar) with one or more of these characteristics: Crowded incisors or labial canines, protruded maxillary incisors, anterior end to end occlusion or anterior cross bite, unilateral or bilateral posterior cross bite, mesial drift of molars, anterior or posterior open bite, deep anterior overbite.

#### **Class II Malocclusion**

Bilateral Angles Class II molar relationship (disto-buccal cusp of maxillary first permanent molar occluding in the buccal groove of mandibular first permanent molar) with proclined maxillary incisors and increased overjet (Angles Class II div 1 malocclusion) or with retroclined maxillary central incisors and proclined lateral incisors (Angles Class II div 2 malocclusion).

#### **Class III Malocclusion**

Bilateral Angles Class III molar relationship (mesio-buccal cusp of maxillary first permanent molar occluding in the inter-dental space between mandibular first and second permanent molars) with end to end incisor relationship or with normal incisor relationship with incisors in cross bite relationship.

#### **Principle for Blood Grouping or Blood Typing**

The surface of red cell membrane contains a variety of genetically determined antigens, called isoantigens or agglutinogens while the plasma contains antibodies (agglutinins). To determine the blood group of a person, his/her red cells are made to react with commercially available antisera containing known agglutinins. The slide is then examined by naked eye or under the microscope to detect the presence or absence of clumping and hemolysis (agglutination) of red cells, which occur as a result of antigen-antibody reaction.

#### **Apparatus and Materials**

A microscope, glass dropper with a long nozzle, sterile blood lancet or needle, sterile cotton or gauze swabs, alcohol, toothpicks, clean and dry microscope slides, 1% sodium citrate in normal saline were used. Anti-A serum (also called anti-A or alpha agglutinins), anti-B serum (anti-B or beta agglutinins) and anti-D or anti Rh serum were used. For a quick identification, the anti-A serum is tinted blue, anti-B, yellow and anti-D is colorless (Figure 3).

#### **Procedure**

Using a glass marking pencil, the slide was divided into three proportions. Lower left corner of the slide was marked anti-A, lower middle portion of the slide was marked anti-B and the lower right corner of the slide was marked anti-D. Another slide was marked S for only red cell suspension in saline. No antiserum will be added to this (Figure 4).

Then by another operator a finger-prick was done under aseptic conditions (Figure 5 and 6), and two drops of blood



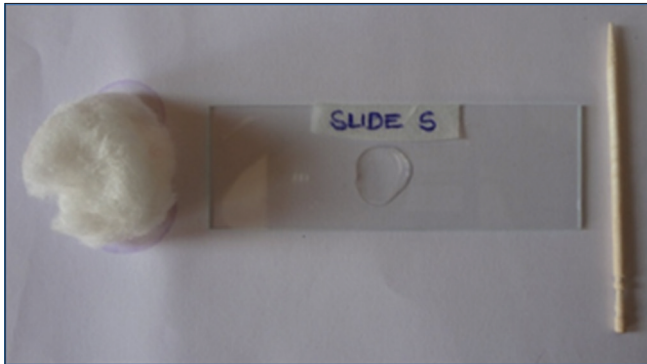
**Figure 2: Dental study casts used in the study**



**Figure 3: Anti-A serum, anti-B serum and anti-D or anti Rh serums**

were added to the saline on the slide (Figure 7) and mixed with toothpick and thus red cell suspension was prepared for each subject assigned in this study.

1-1 drop of antisera A, B and D was placed on the left, middle and right portions of the slide and 1-1 drop of normal saline was placed on control sides of all proportions



**Figure 4:** Slide marked with S - for only red cell suspension in saline



**Figure 5:** Finger-prick under aseptic conditions



**Figure 6:** Collecting the drops of blood

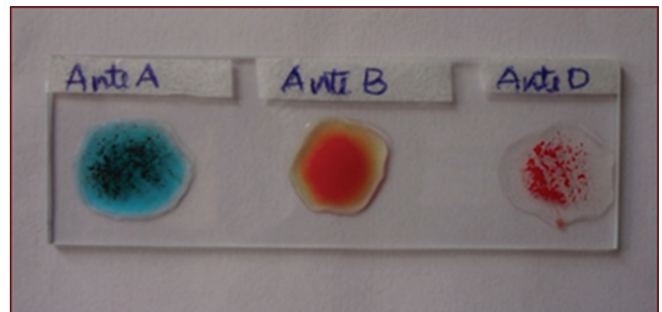
to confirm agglutination or no agglutination. Antisera and red cell suspension were mixed with the help of three separate toothpicks (for three antisera) and waited for 8-10 min (Figure 8). Then, all the three antisera - red cell mixtures on the slide were inspected, first with the naked eye to see whether agglutination (clumping or hemolysis) had taken place or not. It appeared as a coarse separation of red cells in isolated clumps (red precipitates of cells) and this agglutination was confirmed under low magnification microscope.

Thus, the presence or absence of agglutination indicated individual's blood group (blood type) as shown in Table 1.

Then, the data were collected and statistical analysis of the information obtained was performed using SPSS software (version 20) and the Chi-square test. The differences with  $P < 0.05$  were considered statistically significant.



**Figure 7:** Drops of blood added to the saline on the slide



**Figure 8:** Mixed red cell suspension were mixed for all the three antisera

**Table 1: Individual's blood group determination**

Antisera A	Antisera B	Antisera D	Blood group
+	-	+/-	A+/A-
-	+	+/-	B+/B-
+	+	+/-	AB+/AB-
-	-	+/-	O+/O-



## RESULTS

Among 300 participants, the distribution of all participants with malocclusion and normal occlusion with their respective blood groups is shown in Table 2.

Statistical analysis with Chi square test, showed that association of blood groups with malocclusion is statistically highly significant ( $P < 0.001$ ), indicating the prevalence of malocclusions is highest in blood group B, followed by A, O and AB with the least prevalence ( $B > A > O > AB$ ). Hence, among all blood groups, blood group B has the highest prevalence of malocclusion while blood group AB has the least prevalence of malocclusion. The data from Table 2 shows that blood groups B and A had the increased incidence of association with malocclusion while blood groups O and AB had decreased incidence of association with malocclusion.

## DISCUSSION

This study gives us the important information about malocclusion and blood groups. All the subjects were clinically assessed by a single operator to check the occlusal status or relationship to minimize inter-operator bias. Subjects with overall good general health were included to assess the blood groups, so as to have a proper evaluation and classification of blood groups. In a diverse and vast country like India, a large variation in prevalence of malocclusion exists. The distribution of ABO blood groups also varies regionally, ethnically and from one population to another. Malocclusion is a multifactorial disease and the etiology of the disease not been clearly established yet with genetic factors probably playing a role. The purpose of this study was to identify such a possibility and to correlate ABO blood group and malocclusion in population of Jaipur, India.

Blood groups are considered to be important for the purpose of blood transfusion, but some studies have illustrated the statistical relationship of blood groups and some specific diseases. During the last few years, several reports have suggested that ABO blood groups, specifically

non-O blood groups are associated with the risk of ischemic heart disease and of developing severe manifestations of atherosclerosis.<sup>11,18-20</sup> Compared to non-O group (A, AB, and B) individuals, O group individuals have a 14% reduced risk of squamous cell carcinoma and 4% reduced risk of basal cell carcinoma. It is also associated with a reduced risk of pancreatic cancer.<sup>21</sup> The B antigen links with increased risk of ovarian cancer. Gastric cancer has reported to be more common in blood group A and least in group O. According to Glass *et al.*,<sup>12</sup> those in the O blood group have an increased risk of infection with cholera, and those O-group individuals who are infected have more severe infections. The mechanisms behind this association with cholera are currently unclear in the literature. Reid and Bird<sup>22</sup> and Hadley<sup>23</sup> have shown the relationship between blood group and congenital cataract in the Asian race. Blood group an individuals have been reported to be more susceptible to gall stones, cholitis<sup>24</sup> and tumors of salivary glands,<sup>25</sup> pancreas and ovary.<sup>26</sup> Cardiovascular diseases are more prevalent in blood groups A, O and non-O.<sup>5,21,27,28</sup> Diabetes mellitus may be higher in subjects of blood groups A and O.<sup>29</sup> Along with these findings, the ABO groups have been suspected of having a role in causation of infertility and fetal loss, but reports were found to be conflicting.<sup>30</sup>

Thus it is clear that several studies have been carried out to investigate the relation between ABO blood group and incidence of disease in medicine, but limited research has been made to investigate the association between ABO blood groups and occurrence of oral diseases. Few reports claimed that there was a relation of blood groups an increased incidence of oral diseases, whereas some others could not confirm these findings, which may be attributed to geographical diversity in the population.<sup>14,31-34</sup> Vivek *et al.*<sup>35</sup> found that subjects with blood group O and Rh positive had a greater propensity for periodontitis. Gheisari *et al.*<sup>36</sup> in their study showed that among different blood groups; those with blood group B were found to have a greater likelihood of association with maxillofacial deformities and the probability of the association of such deformities was found to be the least with blood group A. Demir *et al.* found that different ABO blood groups may show significant differences in the rates of colonization of numbers of periodontal pathogens that are the main etiologic agents of periodontal diseases.<sup>37</sup> It has also been reported that blood group A seems to have an association with oral pathologies such as dermatophytosis.<sup>38</sup>

In our study, the evaluation of the association between blood and malocclusions revealed that blood groups have an association with malocclusions. Statistical analysis with shows that relationship of blood groups with malocclusion is statistically significant ( $P < 0.0001$ ), indicating the prevalence of malocclusions is highest in blood group B,

**Table 2: Distribution of malocclusion and normal occlusion with blood group types in the study population**

Blood group	Malocclusion (%)	Normal (%)
A	41 (27.33)	18 (12.00)
AB	12 (08.00)	45 (30.00)
B	69 (46.00)	14 (09.33)
O	28 (18.66)	73 (48.66)
Total	150 (100)	150 (100)

Chi-square=66.707 with 3 degrees of freedom;  $P=0.000$  statistically highly significant



followed by A, O and AB having the least prevalence. So, among all blood groups, blood group B has the highest prevalence of malocclusion while blood group AB has the least prevalence of malocclusion. No, previous studies have been reported in this regard. In further studies, by increasing the sample size, it can be established whether there is an association between blood groups and types of malocclusions.

As we discuss the reason behind the differences arisen due to blood groups in prevalences of pathologies, deformities or malocclusion, the ABO gene is autosomal and because of this, every person carries two copies of genes coding for their ABO blood group. The A and B blood groups are dominant over the O blood group, and their genes are codominant.<sup>4,39</sup> Furthermore, if a person inherited one A group gene and one B group gene, his or her red blood cells would possess both A and B antigens. The alleles were termed A (production of A antigen), B (production of B antigen), and O (no antigen production).<sup>40</sup> The antigens of the ABO system are an integral part of the red cell membrane, which are also found in plasma and other body fluids. The presence or absence of certain antigens has been associated with various diseases and deformities, with antigens also acting as receptors for infectious agents.<sup>41</sup> Immunohistochemical studies have demonstrated the presence of A or B antigens on spinous cells in the non-keratinized oral epithelium of blood group A and B persons where basal cells express precursor structures and the more differentiated spinous cells express the A or B antigens. Blood group O persons who do not have the A and B gene-coded glycosyltransferase express a fucosylated variant (Ley) of the precursor structure.<sup>42</sup>

Thus, it has always been hypothesised that the presence of a certain kind of pathology may be associated with a specific type of blood group. According to our findings, further differentiations and other reasons should also be considered. The statement of Bakare *et al.*<sup>43</sup> seems true that varieties of ABO may play an important role in immunology and in the prevention of diseases. For definitive establishment of their etiogenic role, multicenter collaborative studies, which include diverse population groups, are required to further explore this relation globally.

## CONCLUSION

The evaluation of the relationship between blood and malocclusions revealed that blood groups have association with malocclusions. Statistical analysis with Chi-square test revealed that the prevalence of malocclusions is highest in blood group B, followed by A, O and AB with the least prevalence. Hence, among all blood groups, blood group B

has the highest prevalence of malocclusion while blood group AB has the least prevalence of malocclusion.

Further differentiations and other reasons should also be considered, warranting a more comprehensive study. More precise research tools and methods are required to improve knowledge and understanding, which in turn is a prerequisite to the appreciation of the potential for genetic and/or environmental manipulation in orthodontic therapy.

## REFERENCES

1. Mossey PA. The heritability of malocclusion: Part 2. The influence of genetics in malocclusion. *Br J Orthod* 1999;26:195-203.
2. Nagan D. The genetic contribution to orthodontic root resorption. A retrospective twin study. Natural inheritance. Master Thesis. University of Sydney; 1889.
3. Landsteiner K. Über Agglutinationserscheinungen normalen menschlichen blutes. *Wien Klin Wochenschr* 1901;14:1132-4.
4. Lewis M, Kaita H, Giblett ER, Anderson JE. Genetic linkage analyses of chromosome 9 loci ABO and AK1. *Cytogenet Cell Genet* 1978;22:452-5.
5. Demir T, Tezel A, Orbak R, Eltas A, Kara C, Kavrut F. The Effect of ABO Blood Types on Periodontal Status. *Eur J Dent* 2007;1:139-43.
6. Pinkston JA, Cole P. ABO blood groups and salivary gland tumors (Alabama, United States). *Cancer Causes Control* 1996;7:572-4.
7. Chakravarti MR, Chakravarti R. ABO blood groups and chicken pox in an Indian population. *Acta Genet Med Gemellol (Roma)* 1977;26:297-8.
8. Singh N, Shukla MM, Uniyal VP, Sharma VP. ABO blood groups among malaria cases from district Mandla, Madhya Pradesh. *Indian J Malariol* 1995;32:59-63.
9. Vijay Raghavan MR, Bailoor DN, Jhansi Rani P. Incidence of ABO blood groups in oral cancer in South Kanara District. *J Indian Dent Assoc* 1986;58:305-8.
10. Janardhana V, Propert DN, Green RE. ABO blood groups in hematologic malignancies. *Cancer Genet Cytogenet* 1991;51:113-20.
11. Whincup PH, Cook DG, Phillips AN, Shaper AG. ABO blood group and ischaemic heart disease in British men. *BMJ* 1990;300:1679-82.
12. Glass RI, Holmgren J, Haley CE, Khan MR, Svennerholm AM, Stoll BJ, *et al.* Predisposition for cholera of individuals with O blood group. Possible evolutionary significance. *Am J Epidemiol* 1985;121:791-6.
13. Weber R, Pastern W. Über die Frage der konstitutionellen Bereitschaft zur sog Alveolar-pyorrhoe. *Dtsch Mschr Zahnerlk* 1927;45:704-709.
14. Kaslick RS, Chasens AI, Tuckman MA, Kaufman B. Investigation of periodontitis with periodontitis: Literature survey and findings based on ABO blood groups. *J Periodontol* 1971;42:420-7.
15. Roberts JA. Blood groups and susceptibility to disease: A review. *Br J Prev Soc Med* 1957;11:107-25.
16. Koregol AC, Raghavendra M, Nainegali S, Kalburgi N, Varma S. ABO blood groups and Rhesus factor: An exploring link to periodontal diseases. *Indian J Dent Res* 2010;21:364-368.
17. Angle EH. Classification of malocclusion. *Dent Cosm* 1899;41:248-64, 350-7.
18. Stakishaitis DV, Ivashkiavichene LI, Narvilene AM. Atherosclerosis of the coronary arteries and the blood group in the population of Lithuania. *Vrach Delo* 1991;55-7.
19. Akhund IA, Alvi IA, Ansari AK, Mughal MA, Akhund AA. A study of relationship of ABO blood groups with myocardial infarction and angina pectoris. *J Ayub Med Coll Abbottabad* 2001;13:25-6.
20. Nydegger UE, Willemin WA, Julmy F, Meyer BJ, Carrel TP. Association of ABO histo-blood group B allele with myocardial infarction. *Eur J Immunogenet* 2003;30:201-6.
21. Wolpin BM, Kraft P, Gross M, Helzlsouer K, Bueno-de-Mesquita HB, Steplowski E, *et al.* Pancreatic cancer risk and ABO blood group alleles: Results from the pancreatic cancer cohort consortium. *Cancer Res* 2010;70:1015-23.

22. Reid ME, Bird GW. Associations between human red cell blood group antigens and disease. *Transfus Med Rev* 1990;4:47-55.
23. Hadley TG, Issitt PD. Null red blood cell phenotypes: associated biological changes. *Transfus Med Rev* 1993;7:139-155.
24. Jesch U, Endler PC, Wulkersdorfer B, Spranger H. ABO blood group. Related investigations and their association with defined pathologies. *ScientificWorldJournal* 2007;7:1151-4.
25. Hamper K, Caselitz J, Seifert G, Seitz R, Poschmann A. The occurrence of blood group substances (A, B, H, Le-a, Le-b) in salivary glands and salivary gland tumors. An immunohistochemical investigation. *J Oral Pathol* 1986;15:334-8.
26. Henderson J, Seagroatt V, Goldacre M. Ovarian cancer and ABO blood groups. *J Epidemiol Community Health* 1993;47:287-9.
27. Skaik YA. ABO blood groups and myocardial infarction among Palestinians. *Ann Card Anaesth* 2009;12:173-4.
28. Biswas J, Islam MA, Rudra S, Haque MA, Bhuiyan ZR, Husain M, *et al.* Relationship between blood groups and coronary artery disease. *Mymensingh Med J* 2008;17:S22-7.
29. Okon UA, Antai AB, Osim EE, Ita SO. The relative incidence of diabetes mellitus in ABO/Rhesus blood groups in South-Eastern Nigeria. *Niger J Physiol Sci* 2008;23:1-3.
30. Matsunaga E, Itoh S. Blood groups and fertility in a Japanese population, with special reference to intra-uterine selection due to maternal-foetal incompatibility. *Ann Hum Genet* 1958;22:111-31.
31. Al Ghamdi AS. Association between ABO blood groups and severity of chronic periodontitis. *JKAU Med Sci* 2009;16:31-41.
32. Koregol AC, Raghavendra M, Nainegali S, Kalburgi N, Varma S. ABO blood groups and Rhesus factor: An exploring link to periodontal diseases. *Indian J Dent Res* 2010;21:364-8.
33. Pradhan AC, Chawla TN, Samuel KC, Pradhan S. The relationship between periodontal disease and blood groups and secretor status. *J Periodontol Res* 1971;6:294-300.
34. Blackwell CC, Weir DM, James VS, Cartwright KA, Stuart JM, Jones DM. The Stonehouse study: Secretor status and carriage of *Neisseria* species. *Epidemiol Infect* 1989;102:1-10.
35. Vivek S, Jain J, Simon SP, Battur H, Supreetha S, Haridas R. Association of ABO blood group and Rh factor with periodontal disease in a population of Virajpet, Karnataka: A cross-sectional study. *J Int Oral Health* 2013;5:30-4.
36. Gheisari R, Ghoreishian M, Movahedian B, Roozbeh A. The association between blood groups and maxillofacial deformities. *Indian J Plast Surg* 2008;41:138-40.
37. Demir T, Uslu H, Orbak R, Altöparlak U, Ayyıldız A. Effects of different blood groups on the reproduction of periodontal pocket bacteria. *Int Dent J* 2009;59:83-6.
38. Enweani I. Dermatophytosis and Blood Group Classification. Oral Presentation Medical Congress, Nigeria - First in Africa; 2005.
39. Greenwalt TJ. A short history of transfusion medicine. *Transfusion* 1997;37:550-63.
40. Telen MJ. Erythrocyte blood group antigens: Polymorphisms of functionally important molecules. *Semin Hematol* 1996;33:302-14.
41. Pai GP, Dayakar MM, Shaila M, Dayakar A. Correlation between "ABO" blood group phenotypes and periodontal disease: Prevalence in south Kanara district, Karnataka state, India. *J Indian Soc Periodontol* 2012;16:519-23.
42. Campi C, Escovich L, Valdés V, García Borrás S, Racca L, Racca A, *et al.* Secretor status and ABH antigens expression in patients with oral lesions. *Med Oral Patol Oral Cir Bucal* 2007;12:E431-4.
43. Bakare AA, Azeez MA, Agbolade JO. Gene frequencies of ABO and rhesus blood groups and haemoglobin variants in Ogbomoso, South-West Nigeria. *Afr J Biotechnol* 2006;5:224-9.

**How to cite this article:** Sharma R, Preethi PN, Nagarathna C, Navin HK. Association of ABO Blood Groups with Malocclusion in Population of Jaipur, India: A Prospective Study. *Int J Sci Stud* 2015;2(11):45-51.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Efficacy of Modified Vacuum Assisted Closure in Wound Healing

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## Abstract

**Background:** Vacuum assisted wound healing is a recent trend and proven method of fast and better healing of wounds. The basic concept is the removal of blood and serous collection from the wound site with negative pressure and promoting the healing process rapidly by altering the local microcellular environment.

**Aim:** The aim of this study is to evaluate efficacy of the modified method of vacuum dressing in wound healing in low resource settings.

**Objectives:** To find out the rate of wound contraction, infection clearance, duration of hospital stay in comparison to betadine dressings.

**Materials and Methods:** In our prospective non-randomized comparative study, a total of 100 patients were taken and divided into two groups with 50 each for conventional betadine dressing and modified vacuum assisted dressing. Vacuum dressing done with autoclaved sponge, opsite, glove, sterile plastic cover and creating a vacuum with 50 cc syringe, romovac, pedal suction, portable motorized suction apparatus. Comparison between the groups made in categories of wound cultures, wound area, wound scoring, duration of hospital stay, cost-effectiveness.

**Results:** Among 50 patients of vacuum dressing, 9 patients are excluded due to various reasons. There is 29.72% decrease in wound area in the experimental group than compared to 19.97% decrease in conventional dressing with  $P = 0.000$ . In wound scoring, 68.16% improvement is seen in the experimental group as compared with 57.10% in the control group with  $P = 0.002$ . There is 19.41% decreased duration of hospital stay in the experimental group. There is a significant decrease in wound infection clearance of 63.4% in the experimental group as compared to 34% in the control group with  $P = 0.005$ . The median cost for modified vacuum dressing was Rs. 311.1111 and compared to Rs. 610.5477 in the control group.

**Conclusion:** Modified vacuum assisted dressing in low resource settings proven effective than conventional betadine dressing.

**Key words:** Negative pressure wound therapy, Opsite, Surgical glove

## INTRODUCTION

Vacuum assisted closure (VAC), may also be known as negative pressure wound therapy or Microdeformational wound therapy, which has brought a revolution in wound care since past 15 years. This method was first described by Fleischmann *et al.* in 1993.<sup>1</sup> The basic concept of this

method is removal of blood and serous collection from the wound site by the application of negative pressure. This will be done by applying a piece of foam and a drain over the wound surface after debridement and is covered over by a semi permeable plastic adherent membrane securing it to skin margin and the drain is given connection to a vacuum creating unit. The plastic membrane forms like a barrier preventing the contamination from outside environment and the foam will help to distribute the negative pressure uniformly over the entire wound surface area preventing the chance of necrosis at a single place due to high pressure at a single place. The standardized average negative pressure applied is around -125 mm Hg. The interface material used in the VAC therapy stretches the cells at the base of the wound bed, promoting the response for divide and

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**Month of Submission :** 12-2014  
**Month of Peer Review :** 01-2015  
**Month of Acceptance :** 01-2015  
**Month of Publishing :** 02-2015

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proliferates. It also creates an environment of hypoxia over the surface leading to promotion of angiogenesis in addition to it keeps the wound warm, moist and prevents desiccation.

In the era of modern wound care negative pressure therapy for treatment of wounds has been routinely used and become integral part of the treatment plan. Its usage in acute, chronic, and complex wounds has been proven more effective and promotes for faster healing, early discharge with good quality of life with cost-effectiveness

The trademarked VAC therapy belonging to KCI VAC<sup>2</sup> needed a sophisticated equipment with specialized foam and drain and trained personnel for application and maintenance, which is possible at high cost settings.

There are many studies done to make negative pressure dressing more cost effective and can also be practiced in low resource settings, like Danu and Rosadi,<sup>3</sup> Singh *et al.*<sup>4</sup> who have proven their efficacy in using negative pressure therapy in low resource settings.

Main objectives of negative pressure therapy are:

1. To promote rapid healing
2. To decrease the frequency of change of dressings
3. To prepare faster granulation bed for the wound for change to other surgical intervention procedure
4. To promote contraction of the wound edges
5. To minimize the contamination of the wound
6. To decrease the hospital stay.

In this study, we practiced to do the negative pressure dressing by using easily available materials to a surgeon and making in cost effective manner than compared to standard method and achieving similar results in a low resource setting.

## MATERIALS AND METHODS

This prospective comparative study was undertaken at Kasturba Medical College Hospitals and Government Wenlock Hospital attached to Kasturba Medical College, Mangalore, India from October 2012 to September 2014. Ethical approval was obtained for this study from local ethical committee. A total of 100 patients in the study divided into experimental and control groups each of 50 patients in each group and all patients informed consent was taken. All patients are of above 18 years of age of both sexes. Modified method of vacuum dressing applied for the experimental group, and conventional betadine dressing applied for the control group. For vacuum dressing, the inclusion and exclusion criteria are as follows:

### Inclusion Criteria

1. Chronic pressure ulcers
2. Neuropathic ulcers
3. Dehisced wounds or wounds with exposed bone/tendons
4. Partial thickness burns.

### Exclusion Criteria

1. Wounds of very large surface area (area more than 30% body surface area, areas like groin, perineum, axilla)
2. Malignancy in wound
3. Cavity or sinus of unknown depth or origin
4. Untreated osteomyelitis within vicinity of the wound
5. Wound with unstable fractures or loose fragments of bone
6. Ulcers over the extremities with peripheral vascular disease
7. Wound with exposed blood vessels or organs
8. Acute burns.

### Materials Needed

1. Autoclaved sponge foam (double autoclaved at pressure of 20 PSI, 250°F for 30 min)<sup>4</sup>
2. Disposable syringes (10 cc, 20 cc, 50 cc), romovac, mucus suckers, pedal suction apparatus, portable electrical suction machine
3. Tegaderm/opsite/plastic cover/surgical glove of appropriate size
4. Suction catheter/Ryle's tube/infant feeding tube
5. Transparent adhesive tape/micropore
6. Cling drape
7. Graph paper
8. Plastic sheet
9. Marker pen.

### Method of Application

After thoroughly debriding the wound from necrotic slough after hemostasis wound surface area is measured by imprint of plastic sheet over graph paper and recorded in cm<sup>2</sup>. Sponge foam which is normally available at hardware stores of 8 mm thickness is taken and is autoclaved and is cut in to shape of the wound with slightly larger size than the wound. Wound swab is taken for culture sensitivity.

Over the wound surface if there is clean granulation tissue present then bactigrass or Vaseline gauge can be applied so that while removing of dressing the sponge surface will not be adherent to the wound surface and during its removal bleeding can be reduced. A suction catheter/Ryle's tube with adequate number of fenestrations made depending upon the wound size is placed in between the two sponge layers and the whole wound area is sealed with tegaderm/opsite/sterilized polyethylene cover<sup>5</sup>/sterile surgical glove.<sup>6</sup> The exit site of the suction catheter to the opsite T-tailing

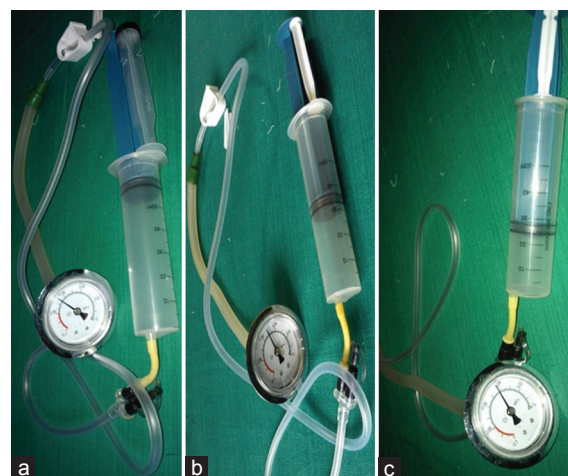


should be done to prevent the tubing exit site leakage.<sup>7</sup> The suction catheter on the other end is connected to vacuum creating device and is charged.

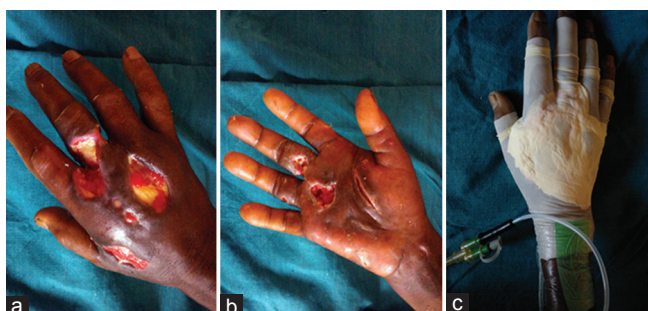
The syringe/romovac/mucus sucker/pedal suction machine is cleared of drainage and recharged with vacuum after each clearance at timely intervals.

The method of application of dressings and the negative pressures that can be created with portable suction, romovac, syringe and mucus sucker are shown in Figures 1-6.

The negative pressure applied will be from  $-75$  mm Hg to  $-200$  mm Hg depending upon the type of modality used to create the vacuum. The characteristic of exuded fluid and quantity is noted down. The wounds surroundings were inspected at time of change of dressing for any spreading cellulitis or maceration. Dressings are changed at intervals of 48-72 h depending upon the amount of exudates



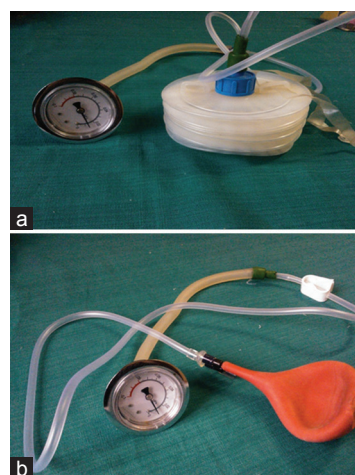
**Figure 3:** (a) Negative pressure created with 50 cc plastic syringe on maximum retraction is 0.06 Mpa = 450 mm Hg pressure, (b) negative pressure created at keeping at level of 30 cc retraction is 0.04 Mpa = 300 mm Hg pressure, (c) negative pressure created at keeping at level of 20 cc retraction is 0.03 Mpa = 225 mm Hg pressure



**Figure 1:** (a) Cellulitis of right hand dorsal aspect post debridement, (b) cellulitis of right hand palmar aspect post debridement, (c) application of vacuum assisted closure dressing using sterile surgical glove with finger tips cut to promote aeration and prevent maceration due to retaining of moisture



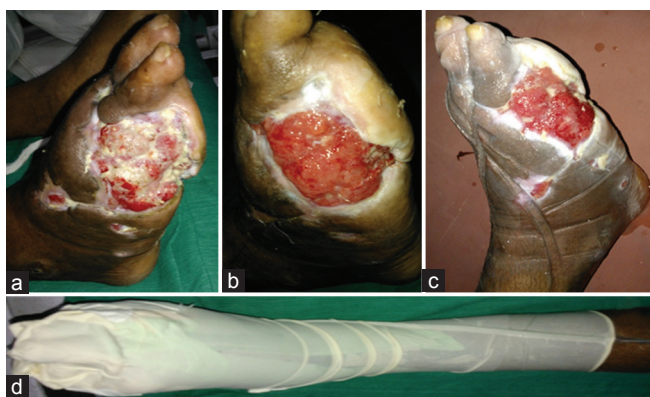
**Figure 2:** (a) Traumatic injury to left thumb of 4 days old, (b) after debridement and placement of K-wire and getting infant feeding tube from middle of wound with few serrations outside, (c) application of sponge around the finger and applying negative pressure with help of sterile surgical glove finger and syringe, (d) complete healing seen after seven dressings



**Figure 4:** (a) Negative pressure created with romovac suction on full compression is 0.02 Mpa = 150 mm Hg, (b) negative pressure created with mucus sucker is 0.01 Mpa = 75 mm Hg



**Figure 5:** (a) Left lower limb necrotizing fasciitis wound, (b) application of dressing with sterile plastic cover, sponge, and sterile gauge, (c) healing response after eight dressings



**Figure 6: (a) Right diabetic foot post debridement, (b) healing response after eight dressings, (c) maceration seen over the foot due to retaining of moisture, (d) application of dressing with sterile gynaecological glove**

drained, leakage from the sealed area due to fluid logging in and also upon the state of the wound and pictures of the wound and measurements are taken.

If maceration present then the next dressing will be applied after 12-24 h interval period to allow the skin to get back to the normal state. When surgical glove is used for dressing then, by creating small fenestrations in the distal end of the glove will allow the minimal air leak and decrease the maceration.

Wound swab and also the exudates obtained in the vacuum device are sent for culture at weekly intervals. The size of the wound is measured every time on change of dressing over the graph paper, and successive measurements will be recorded. The improvement in the wound is assessed by revised photographic wound assessment tool<sup>8</sup> and the scores are noted. The total cost analysis of the dressing for each patient is analyzed separately and recorded.

The vacuum dressing are done till the granulation tissue of the wound fills till to the skin surface and left to healing by secondary intention or as secondary method of wound closure as secondary suturing, split skin grafting, flap repair.

## RESULTS

In our study, among the experimental group nine patients were considered as failure (two patients underwent amputation, two patients developed leak in vacuum, one patient was not willing to continue, four patients not improved and changed to other modality of dressing) and these patients were excluded from study population of vacuum dressing, thereby experimental group  $n = 41$ , control group  $n = 50$ . The mean age distribution in the experimental group is  $45.39 \pm 9.95$  and in control group  $46.72 \pm 7.63$  and sex distribution in experimental

group 34 patients (82.9%) are males and 7 patients (17%) females, in control group 41 patients (82%) males and 9 patients (18%) females. The ulcers are located predominantly over lower limbs and other sites also like upper limb, clavicular region, abdomen, amputation stump, back, neck and scrotum.

The modality to create vacuum are by portable suction machine in 28 cases (68%), by using syringe in 10 cases (24%), pedal suction 2 cases (5%) and using romovac in 1 case (3%), by comparing with Fischer's exact test  $P = 0.0001$  proving highly significant. The materials used for vacuum dressing are with opsite in 21 cases (51%), surgical glove in 12 cases (29%) and plastic cover in 8 cases (20%). On comparison by mode of healing in both groups split skin grafting was done in 41 (82%) cases and 22 (53.7%) cases in control and experimental groups, respectively and healing by secondary intention in 9 (18%) and 17 (41.5%) cases in control and experimental groups respectively, scrotum reconstruction done in 1 (2.4%) case in experimental group, and secondary suturing in 1 (2.4%) case in experimental group with  $P = 0.008$  proving highly significant.

The efficacy of wound healing indicated by clearing the infection is measured by sequential wound swab cultures in both experimental and control group and the results are shown in Table 1.

In Culture 1 the predominant organisms being pseudomonas in 16 (40%) and 19 (38%) cases in experimental and control group and *Staphylococcus aureus* in 16 (40%) and 24 (48%) cases in experimental and control group and *Klebsiella* in 4 (10%) and 2 (4%) cases in experimental and control group. In Culture 3 *S. aureus* in 12 (80.0%) and 27 (81.8%) cases in experimental and control group and *Klebsiella* in 3 (20%) cases in experimental group and proteus in 3 (9%) cases and pseudomonas in 3 (9%) cases of control group.

The wound healing is also compared between the experimental and control groups in the parameters such as wound areas initial and final, number of debridements, number of dressings, number of days of hospital stay,

**Table 1: Sequential wound cultures swabs**

Wound culture	Absent (%)	Present (%)	P value
Culture 1			
Experimental group	2.4	97.6	0.451
Control group	0	100	
Culture 2			
Experimental group	29.3	70.7	0.075
Control group	14	86	
Culture 3			
Experimental group	63.4	36.6	0.005
Control group	34	66	



wound scoring assessment by photographic wound assessment tool, pain assessment by visual analog scale has been shown in Table 2.

In our study diabetic patients in experimental and control groups are 15 (36.6%) and 13 (26.0%). Due to vacuum dressing in the experimental group in 4 (9.8%) patients maceration of the skin was observed due to moisture retainment.

The cost-effectiveness of modified vacuum dressing compared with the conventional betadine dressing is measured by comparing to a 20 cm<sup>2</sup> area of wound and the median cost of modified vacuum dressing is much less compared to conventional betadine dressing as shown in Table 3.

## DISCUSSION

Wound healing is a complex interdependent and intricate process involving many cellular interactions, release of

biochemical mediators, changes in the microenvironment and extracellular matrix resulting in structural and functional restoration of the wound.<sup>9</sup> Locally acting growth factors influence healing in the events of angiogenesis, formation of extracellular matrix, migration of neutrophils, macrophages, fibroblasts, increasing collagen and protein production thereby enhancing the healing of wound.<sup>10,11</sup> Any disturbance in this mechanism will delay in healing and lead to chronic non healing wounds.

Application of sub atmospheric pressure decreases the bacterial colonization over the wound and increases the blood flow.<sup>12</sup> Increase in oxygenated blood flow to the damaged tissues increases the wound resistance to the infection.<sup>13</sup> Increased oxygenated blood flow to the wound healing promotes the oxidative bursts in neutrophils and there by promoting the killing of microbes and preventing infection.<sup>14</sup>

Negative pressure therapy decreases the interstitial edema and increases the capillary blood flow, promotes granulation tissue formation and produces a traction force whereby

**Table 2: Comparisons on wound area, number of debridements, number of dressings, number of days of hospital stay, wound scoring, pain scoring by VAS**

Group	N	Min	Max	Mean	Standard deviation	Median	Mann-Whitney test Z value	P value	% change
Wound area initial									
Experimental	41	10	458	136.6341	115.9021	128	2.760906	0.005764	-156.928
Control	50	17	106	53.18	20.22091	48			
Wound area final									
Experimental	41	3	437	96.02439	97.0514	78	1.180796	0.237684	-125.621
Control	50	13	90	42.56	17.34189	39.5			
Number of debridements									
Experimental	41	0	5	1.634146	1.444924	2	3.537858	0.000403	44.79235
Control	50	1	6	2.96	1.689825	3			
Number of dressings									
Experimental	41	4	25	10.70732	4.691716	10	7.214766	5.4E-13	59.19468
Control	50	10	47	26.24	9.707056	25			
Number of days of stay									
Experimental	41	15	83	32.17073	14.18433	28	2.491042	0.012737	19.41199
Control	50	15	71	39.92	15.69328	38			
Wound scoring initial									
Experimental	41	15	30	22.36585	4.699766	23	0.104052	0.917128	0.684486
Control	50	14	28	22.52	3.882141	23			
Wound scoring final									
Experimental	41	1	13	7.121951	3.001626	7	3.668592	0.000244	26.2738
Control	50	4	15	9.66	2.811129	9.5			
Pain score VAS									
Experimental	41	2	6	3.853659	0.882071	4	0.427268	0.669184	2.68539
Control	50	2	7	3.96	1.087217	4			

VAS: Visual analog scale

**Table 3: Comparison between costs per 20 cm<sup>2</sup> area of wound**

Group	N	Minimum	Maximum	Mean	Standard deviation	Median	Mann-Whitney test value	P
Experimental	41	41.13	3750	505.3146	701.45988	311.1111	4.072	0.000
Control	50	238.81	1058.82	646.4833	205.17792	610.5477		
Total	91	41.13	3750	582.8798	496.58367	529.4118		

decreases the wound surface area and increases the mitoticity in cells around the area.<sup>15</sup>

It has been proposed four primary mechanisms for healing by negative pressure therapy

1. Macrodeformation or wound shrinkage at the base
2. Microdeformation near the interface sponge
3. Removal of excess fluid
4. Optimizing the wound environment.<sup>16</sup>

### Macrodeformation

It refers to decrease in the wound surface due to shrinkage of sponge and action of centripetal forces over the wound surface. In studies made by Borgquist *et al.* in porcine models, exposing the sponge to negative pressure of 125 mm Hg will decrease the foam volume by 80% leading to decrease in wound surface area.<sup>17</sup> Due to the inherent tension which is present in the dermis near the wound and underlying attachments of different wounds over different sites contract to a different extent. The macrodeformation effects depend upon the variety of tissues, amount of negative pressure, volume of the interface material, and the surrounding tissues deformability.<sup>16</sup>

### Microdeformation

The negative pressure transmitted through interface material acting over the undulated surface of the wound produces changes occur in  $\mu$  to mm range scale. Depending on the common diameters of pores of interface material in range of 400-600  $\mu$ m, on application of the negative pressure there will be 5-20% tissue strain over the wound surface.<sup>18</sup> These mechanical forces are transmitted to every cell through the extracellular matrix and lead to cell deformation causing modifications in cell function for adaptation of stress.<sup>19,20</sup>

### Removal of Excess Fluid

The total body fluid is distributed in three compartments. They are: (1) Intracellular, (2) extracellular (3) intravascular. Translocation of fluid in between these compartments across the semi permeable membrane is governed by the differential between osmotic and hydrostatic pressures derived by Starling's equation. Extracellular compartment is the most variable compartment among the three. Excess fluid in this compartment leads to edema and deprivement leads to signs of dehydration. This compartment is drained by lymphatics; abnormality in this may lead to lymphedema.

Chronic wounds and edema are often concomitant more commonly in lower limbs. Excess of fluid will lead to delay in healing due to the compressive effect exerted over the tissues. While healing intrinsic tension will be developed within the individual cells through their cytoskeleton and extracellular matrix interactions, increased fluid pressure

will dampen the building up intrinsic tension and prevent proliferative response.<sup>16</sup>

Removal of this excess fluid will decrease the compression of microvasculature there by promoting the perfusion to the local area.<sup>21</sup> The semi permeable nature of the occlusive drape will allow a little leakage of air into the system, which helps in preventing the fluid lock and thereby allowing the evacuation of fluid continuously. Along with excess extracellular fluid toxins formed over the wound and microbes were also cleared by the negative pressure therapy.<sup>22</sup> Negative pressure therapy also allows for developing of lymphatics at the wound edges thereby improving the fluid drainage.<sup>23</sup> The semi occlusive drape is not permeable to microorganisms thereby significantly reducing the contamination and also helps in maintaining moist and warmth environment, which promotes the healing response.<sup>24,25</sup>

Conditions where negative pressure therapy is contraindicated are:

1. Untreated osteomyelitis
2. Unexplored and nonenteric fistulas
3. Necrotic tissue along with eschar
4. Exposed blood vessels
5. Wounds with malignancy
6. Exposed nerves
7. Exposed anastomotic sites
8. Exposed internal organs.<sup>26</sup>

FDA has proposed risk factors and other warrant conditions before consideration of a patient of negative pressure therapy. They are:

1. Treatment with platelet aggregation inhibitors or anticoagulants
2. High risk for bleeding
3. Infected blood vessels, wounds, osteomyelitis, exposed blood vessels, nerves, tendons, ligaments, anastomosis, spinal cord injuries, enteric fistulas, sharp edges at wound edges
4. Patient requirement for hyperbaric oxygen therapy, magnetic resonance imaging, defibrillation
5. Patient size and weight
6. Circumferential dressing application
7. Proximity of foam to the vagus nerve
8. Continuous or intermittent suction application.<sup>26,27</sup>

The negative pressure therapy will cause deformations in the cell cytoskeleton architecture leading to cellular proliferation, differentiation, and migration. This has been supported by studies in diabetic mouse model by application of short term intermittent negative pressure there is increased expression of Ki67 which is a marker for proliferation.<sup>28</sup>



Negative pressure therapy treated wounds in the proliferation phase there will be robust granulation tissue, proliferation of cells, angiogenesis and the maturation of collagen exhibit mast cell dependence in proliferation and remodeling phases.

Morykwas *et al.* studies showed a decrease in the bacterial load in wounds treated with negative pressure therapy,<sup>29</sup> Mouës *et al.* studies showed there is a decrease in non fermentive Gram-negative bacilli and *S. aureus* increased.<sup>30</sup> The effect of negative pressure therapy on bacterial culture from the wounds should be more studied particularly in responses of different strains that are elicited. Traditional VAC dressing's uses polyurethane ether foam, reduction of bacterial load can be achieved in the wound by silver coating added to the foam. Stinner *et al.* study in the goat model with silver dressings placed beneath the foam in complex wounds with high bacterial load demonstrated reduction in bacterial growth particularly *S. aureus* when compared to standard VAC dressings.<sup>31</sup> Instillation therapy adding of fluid to the wound through a tubing in form of normal saline or other antimicrobials like sodium hypochlorite solution, dilute betadine, doxycycline, phenytoin, lactoferrin are done but trials are needed to prove its efficacy.

Treatment by negative pressure therapy provides cosmetic as well as functional outcomes by promoting the local vascularity and decrease in scar height. Negative pressure therapy can be used for preparation of recipient sites for dermal scaffolds and skin grafts over exposed bones or tendons which provide complete vascularized wound bed before skin grafting.

For the treatment with negative pressure therapy, many factors to be considered in view of goal of therapy, type of dressing, suction pressure application. For different types of wounds, there is different amount pressure protocols and the duration of treatment changes. In acute wounds, it is beneficial to start within 48 h initially with continuous suction followed by intermittent suction therapy. For chronic wounds they benefit more by continuous negative pressure therapy. Short and intermittent negative pressure therapy<sup>32</sup> shows improved tissue response than compared to the continuous effect, but it may not be applicable for all types of cases. Intermittent negative pressure therapy may not be tolerated by some patients due to discomfort. The optimal pressure to be applied for improvement of the wound is not yet currently known, there are different studies with application from -75 mm Hg to -150 mm Hg pressure and achieved good healing responses. Frequent change of vacuum dressings may be required for wounds with increased risk of infection.

All wounds are not amenable to negative pressure therapy. Due to hypersensitivity for the adhesive drape and pain

caused due to the suction effect some patients may not tolerate the therapy. Pain can be reduced by modalities like decreasing the negative pressure, and if pain is from the surrounding skin then framing the wound with hydrocolloid dressing at the borders and adhesive drape can be placed over hydrocolloid so that the friction force is relieved over the skin. Tissue integrity must be checked during every change of dressing. If hematoma or bruises appears over the wound negative pressure should be decreased, if still persists then negative pressure therapy should be discontinued substituted by alternative type of dressing.

## CONCLUSION

Through our study it has been proven that modified vacuum assisted therapy is more beneficial when compared to the conventional moist betadine dressings, compared in parameters of granulation tissue formation, clearance of the infection over the wound, decreasing the duration of hospital stay, and cost effectiveness than compared to moist dressings.

## REFERENCES

1. Fleischmann W, Strecker W, Bombelli M, Kinzl L. Vacuum sealing as treatment of soft tissue damage in open fractures. *Unfallchirurg* 1993;96:488-92.
2. KCI VAC, 2014. Available from: <http://www.kci1.com/KCI1/educationtraining>. [Last accessed on 2014 Nov 11].
3. Danu M, Rosadi S. The simplest modified vacuum assisted closure to treat chronic wound: Serial case report. *J Plastik Rekonstruksi* 2012;1:117-22.
4. Singh M, Singh R, Singh S, Pandey V, Singh D. Vacuum assisted closure in wound management – Poor man's VAC. *Int J Plast Surg* 2008;6.
5. Kumar P. Exploiting potency of negative pressure in wound dressing using limited access dressing and suction-assisted dressing. *Indian J Plast Surg* 2012;45:302-15.
6. Hemmanur SR, Siddha LV. Role of the surgical glove in modified vacuum-assisted wound healing. *Arch Plast Surg* 2013;40:630-2.
7. Ram S, Vijayan SK, Kini A. T tail configuration of opsie on suction tubing outlet for modified vacuum assisted closure. *Int J Plast Surg* 2012;8.
8. Thompson N, Gordey L, Bowles H, Parslow N, Houghton P. Reliability and validity of the revised photographic wound assessment tool on digital images taken of various types of chronic wounds. *Adv Skin Wound Care* 2013;26:360-73.
9. Clarkeand RA, Henson PM, editors. *The Molecular and Cellular Biology of Wound Repair*. New York, NY, USA: Plenum Press; 1988.
10. Laiho M, Keski-Oja J. Growth factors in the regulation of pericellular proteolysis: A review. *Cancer Res* 1989 15;49:2533-53.
11. Whitby DJ, Ferguson MW. Immunohistological studies of the extracellular matrix and soluble growth factors in fetal and adult wound healing. In: Adzick NS, Longaker MT, editors. *Fetal Wound Healing*. New York, NY, USA: Elsevier Science; 1992. p. 161-77.
12. Argenta LC, Morykwas MJ. Vacuum-assisted closure: A new method for wound control and treatment: Clinical experience. *Ann Plast Surg* 1997;38:563-76.
13. Hunt TK. The physiology of wound healing. *Ann Emerg Med*;17:1265-73.
14. Ryan TJ. Microcirculation in psoriasis: Blood vessels, lymphatics and tissue fluid. *Pharmacol Ther* 1980;10:27-64.
15. Leininger BE, Rasmussen TE, Smith DL, Jenkins DH, Coppola C. Experience with wound VAC and delayed primary closure of contaminated soft tissue injuries in Iraq. *J Trauma* 2006;61:1207-11.

16. Orgill DP, Manders EK, Sumpio BE, Lee RC, Attinger CE, Gurtner GC, *et al.* The mechanisms of action of vacuum assisted closure: More to learn. *Surgery* 2009;146:40-51.
17. Borgquist O, Ingemansson R, Malmjö M. The influence of low and high pressure levels during negative-pressure wound therapy on wound contraction and fluid evacuation. *Plast Reconstr Surg* 2011;127:551-9.
18. Saxena V, Hwang CW, Huang S, Eichbaum Q, Ingber D, Orgill DP. Vacuum-assisted closure: Microdeformations of wounds and cell proliferation. *Plast Reconstr Surg* 2004;114:1086-96.
19. Ingber DE, Levin M. What lies at the interface of regenerative medicine and developmental biology? *Development* 2007;134:2541-7.
20. McLeod KJ, Lee RC, Ehrlich HP. Frequency dependence of electric field modulation of fibroblast protein synthesis. *Science* 1987;236:1465-9.
21. Adámková M, Tymonová J, Zámečníková I, Kadlcik M, Klovová H. First experience with the use of vacuum assisted closure in the treatment of skin defects at the burn center. *Acta Chir Plast* 2005;47:24-7.
22. Lancerotto L, Bayer LR, Orgill DP. Mechanisms of action of microdeformational wound therapy. *Semin Cell Dev Biol* 2012;23:987-92.
23. Labanaris AP, Polykandriotis E, Horch RE. The effect of vacuum-assisted closure on lymph vessels in chronic wounds. *J Plast Reconstr Aesthet Surg* 2009;62:1068-75.
24. Winter GD, Scales JT. Effect of air drying and dressings on the surface of a wound. *Nature* 1963;197:91-2.
25. Hinman CD, Maibach H. Effect of air exposure and occlusion on experimental human skin wounds. *Nature* 1963;200:377-8.
26. V.A.C. Therapy Indications and Contraindications. Available from: <http://www.kci1.com/KCI1/indicationsandcontraindications>. [Last accessed on 2014 Nov 12].
27. FDA Safety Communication: UPDATE on Serious Complications Associated with Negative Pressure Wound Therapy Systems, 2011. Available from: <http://www.fda.gov/MedicalDevices/Safety/AlertsandNotices/ucm244211.htm>. [Last accessed on 2014 Nov 12].
28. Scherer SS, Pietramaggiore G, Mathews JC, Orgill DP. Short periodic applications of the vacuum-assisted closure device cause an extended tissue response in the diabetic mouse model. *Plast Reconstr Surg* 2009;124:1458-65.
29. Morykwas MJ, Simpson J, Pungner K, Argenta A, Kremers L, Argenta J. Vacuum-assisted closure: State of basic research and physiologic foundation. *Plast Reconstr Surg* 2006;117:121S-6.
30. Mouës CM, Vos MC, van den Bemd GJ, Stijnen T, Hovius SE. Bacterial load in relation to vacuum-assisted closure wound therapy: A prospective randomized trial. *Wound Repair Regen* 2004;12:11-7.
31. Stinner DJ, Waterman SM, Masini BD, Wenke JC. Silver dressings augment the ability of negative pressure wound therapy to reduce bacteria in a contaminated open fracture model. *J Trauma* 2011;71:S147-50.
32. Mendez-Eastman S. Guidelines for using negative pressure wound therapy. *Adv Skin Wound Care* 2001;14:314-22.

**How to cite this article:** Siddha LV, Shetty SK, Varghese T. Efficacy of Modified Vacuum Assisted Closure in Wound Healing. *Int J Sci Stud* 2015;2(11):52-59.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Indirect Maxillary Sinus Lift for Single Tooth Implant: A Clinical Study

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## Abstract

**Purpose:** Tooth replacement with dental implant has been most challenging in maxillary posterior region due to pneumatization of maxillary sinus. Indirect maxillary sinus floor augmentation is one of the methods to overcome this problem so a clinical study was performed in institute and patients treated with indirect maxillary sinus lift and simultaneous implant placement.

**Aim:** The aim of this study is to evaluate clinically and radiographically the long-term success of one-stage indirect (crestal approach) sinus lift procedure using alloplastic bone graft material and bioabsorbable membrane in conjunction with two-stage implant placement in atrophic partially edentulous posterior maxilla.

**Materials and Methods:** One-stage indirect maxillary sinus lift in conjunction with two-stage implant placement was carried out in six patients at six sites. All the patients were partially edentulous with posterior maxillary alveolar ridge height of >5 mm and were in the age group of 20-50 years. Bioactive glass putty, bioabsorbable collagen membrane and 3.75 mm × 11.5 mm implants were used. Patients were evaluated clinically and radiographically for 18 months after placement of implants at intervals of 6 months to assess increase in residual ridge height, peri-implant condition (marginal bone loss, plaque and gingival index) and implant stability.

**Results:** Maxillary first molar was the most common site (71.42%) for sinus lift and implant placement. Caries was the most common cause (83.33%) for loss of tooth. Increase in residual ridge height ranged from 71.43% to 133.33% as measured by denta-scan. Implant survival rate was 100%. Marginal bone loss ranged from 0.6 to 1.2 mm. Implant stability was measured by periotest (2-6). Only one patient had perforation of the sinus membrane, but it was sealed satisfactorily by bioabsorbable membrane.

**Conclusion:** One-stage crestal approach sinus lift procedure with alloplastic bone graft material in combination with two-stage implant placement has a predictable outcome in patients with severe resorption of the posterior maxilla.

**Key words:** Alloplastic bone graft, Maxillary sinus floor augmentation, Single tooth dental implant

## INTRODUCTION

The most commonly used augmentation method for the sinus reconstruction was presented by Tatum in 1976 at Alabama implant conference and published by Boyne and James in 1980.<sup>1-3</sup> It intended to increase the vertical bone dimension in the posterior maxilla where access to the

maxillary sinus is obtained by drilling a bony window in the lateral sinus wall while ensuring that the sinus membrane remains intact.

Sinus elevation using the lateral window approach required extensive surgical manipulation and extended waiting period before uncovering for implant placement. To overcome this disadvantage and to augment the bone for implant placement in a simpler less invasive manner Summers (1994) proposed the osteotome technique or the indirect sinus lifting.<sup>4</sup> In contrast to more invasive lateral approach, this method is a conservative surgical entry, more localized augmentation of the sinus with less degree of post-operative morbidity, and an ability to load the implants in a shorter time period.

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**Month of Submission :** 12-2014  
**Month of Peer Review :** 01-2015  
**Month of Acceptance :** 01-2015  
**Month of Publishing :** 02-2015

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Summers<sup>4</sup> suggested that the bone added osteotome sinus floor elevation (BAOSFE) technique should be considered for patients with (remaining bone height) residual bone heights (RBH) of 5 mm or more. According to Romero-Millán *et al.*, indirect osteotome mediated sinus floor elevation (OMSFE) is indicated for a bone height of 6-8 mm. More bone height was gained when graft material was used.

## MATERIAL AND METHODS

The study consisted of sample of six patient and six implant sites, who visited the Department of Oral and Maxillofacial Surgery, Government Dental College and Hospital, Ahmedabad. The patients were selected randomly irrespective of the sex and socioeconomic status.

### Inclusion and Exclusion Criteria

#### Inclusion criteria

Age between 20 and 50 years, residual alveolar bone height above 5 mm at the edentulous posterior maxillary region, buccolingual and mesiodistal bone dimension should be >5 mm, quality of bone D3 and D4, a delay of at least 6 months between tooth extraction and an implant placement, absence of maxillary sinusitis, presence of normal healthy adjacent teeth or restored teeth.

#### Exclusion criteria

Uncontrolled systemic illness, presence of periapical pathology, heterotopic ossification radiotherapy in maxillofacial region, oral destructive habit, debilitating temporomandibular joint pathosis, inadequate mouth opening, which cannot allow placement of instruments necessary for implant insertion.

### Preoperative Evaluation of Implant Site

Pre-operatively, each patient was subjected to a detailed clinical and radiographic examination of the soft and hard tissue which provided necessary diagnostic information for proceeding with implant therapy.

It includes the following:

- The gingival health was assessed for color, consistency, texture, bleeding on probing and pocket depth
- Presence of sufficient inter-occlusal space
- The bone topography was evaluated with ridge mapping technique
- Pre-surgical measurement of the alveolar height to the sinus floor, bucco-lingual and mesio-distal width of edentulous space was measured using standard intra oral peri-apical (IOPA), orthopantomogram (OPG) and computed tomography (CT) scan/dentascans
- Pre-operative, intra-operative and post-operative photographs were taken for record maintenance and documentation.

### Implant, Bone Graft and Membrane Used

In our study, we have used self-threaded, tapering, double thread, acid etched and sand-blasted, selective integrated surfaced implants, sinus lift kit, alloplastic bone graft (bioactive glass putty), resorbable collagen membrane.

### Pre-operative Preparation of Patient

Tablet augmentin (625 mg tds) and non-steroidal anti-inflammatory drugs were administered 24 h before surgery to achieve adequate blood concentrations. Nasal decongestant in the form of tablet was started twice a day, a day before surgery, nasal decongestant drops (otrivin) was started as two drops twice a day, a day before surgery. All patients were told to rinse with 0.2% chlorhexidine gluconate mouthwash pre-operatively.

### Surgical Technique

- Posterior superior alveolar nerve, infraorbital nerve and greater palatine nerve blocks were given with sensorcaine, and local infiltration was done with 2% lignocaine HCL with 1:100,000 adrenaline concentration
- An incision 2-3 mm on the palatal side of the crest of the ridge with two releasing incisions given (Figure 1)
- A full-thickness mucoperiosteal flap was reflected and retracted (Figure 2)
- Surgical stent inserted over site. Using round bur marking of implant position done on the bone by handpiece 1:20 reduction gear at the low speed (800-1200 rpm) high torque (35 ncm) along with copious irrigation (external and internal) of normal saline to prevent thermal injury to the bone
- Pilot drill was used to prepare an implant bed 1-2 mm short of the sinus floor
- Consecutive drills till planned size implant diameter were used to prepare the implant site 2 mm away from the sinus floor boundary according to the dentascans
- The sinus floor was broken with osteotome (of the

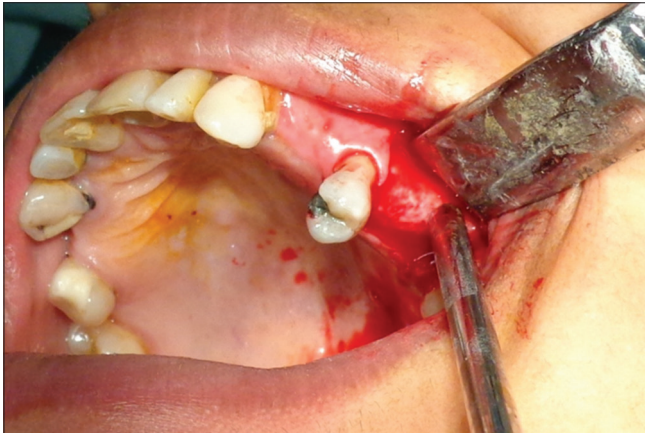


**Figure 1: Incision 2-3 mm on the palatal side of the crest of the ridge**

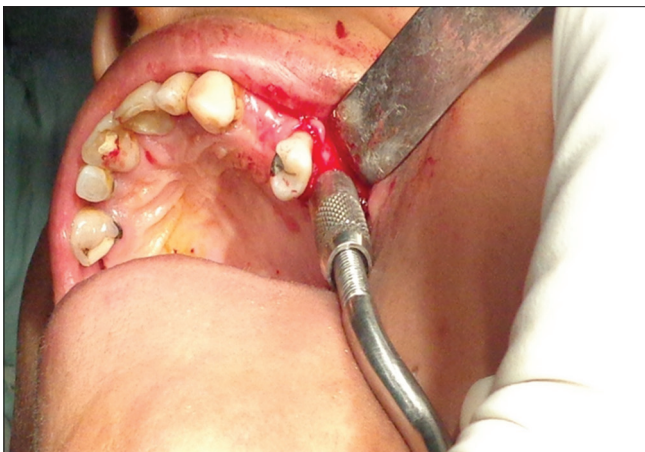


same diameter as the last drill used to prepare the osteotomy site) by tapping light strokes with a mallet (Figure 3)<sup>5</sup>

- Alloplastic bone graft granules are mixed with patient's blood and obtain a putty consistency, which is condensed at sinus floor below the membrane with osteotomes (Figure 4)



**Figure 2: Flap reflected and retracted exposing crestal bone**

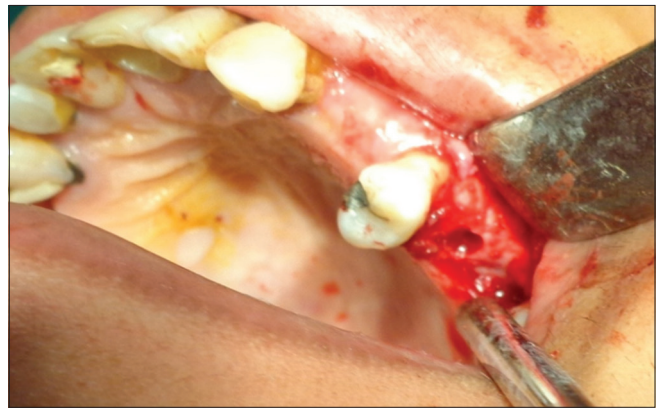


**Figure 3: Stopper of osteotome is adjusted according to implant length**



**Figure 4: Alloplastic bone graft placement at sinus floor**

- The mobilized bone at the sinus floor along with the membrane is raised with osteotome (of same diameter as the last drill used to prepare the osteotomy site was selected) and mallet to the final implant length (Figure 5)
- When the sinus membrane is intact, a bellows effect may be observed as the patient breathes. If a tear occurs in the membrane, place a small piece of resorbable collagen membrane (PerioCol - GTR) against the tear, where it should easily adhere. Check again for the bellows effect. If a larger perforation occurs in the membrane, laminar bone (membrane like sheets of demineralized freeze-dried bone) can be used to easily repair it
- A self-tapping implant was inserted in the prepared site
- A titanium cover screw supplied with the implant was inserted on the implant (to protect internal threads and close the dead space) with the use of implant screw driver (Figure 6)
- The mucoperiosteal flap was repositioned and sutured with the help of (3-0) black silk.



**Figure 5: Prepared final osteotomy**



**Figure 6: Implant in proper position**

## Two Stage – Surgical Exposure of the Implant

Surgical exposure of the implant and placement of the healing cap was done 6 months after placement of the implant. After 15 days of two-stage, an abutment was attached to the implant and prosthesis was fabricated (Figures 7 and 8). All the patients were kept on regular follow-up.

## RESULTS

The present study was conducted in the Department of Oral and Maxillofacial Surgery, Government Dental College and Hospital, Ahmedabad. It was conducted on 6 patients with 6 implant sites, to evaluate clinically and radio graphically; the self-threaded, tapered, double thread; EZ selective integrated surfaced implants placed using direct sinus lift technique (lateral approach) with alloplastic bone graft (a bio-active glass) as the graft material and resorbable collagen membrane as the barrier membrane followed by simultaneous placement of the implant. Follow-up



**Figure 7: Clinical view of abutment and healing of surrounding gingival tissue**



**Figure 8: Occlusal view of maxilla showing prosthesis at left first molar**

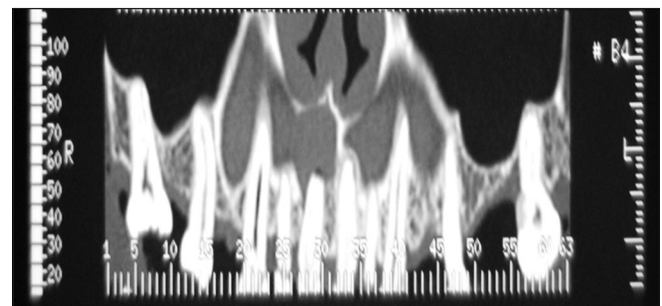
was done 6 month after sinus lift and simultaneous implant placement (time allowed for graft maturation and implant healing) and at the interval of 1 year and 2 years after final prosthesis. Standardized IOPA, digital OPG and CT scan/dentascanner were taken pre-operatively and at 6 months follow-up intervals.

In our study of six patients, height of the residual alveolar bone was in the range of 5-7 mm, on an average 6.0 mm (Table 1). Summers<sup>4</sup> suggested that the BAOSFE technique should be considered for patients with RBH of 5 mm or more. Some have suggested pre-operative RBH from 8 to 10 mm<sup>3</sup>; others have recommended 4 mm.<sup>3</sup> There is a lack of conclusive evidence relating pre-operative RBH to implant survival. However, Rosen *et al.*<sup>6</sup> Demonstrated implant success was reduced to 85.7% for implants placed in pre-operative RBH of 3-4 mm compared to 96% for implants put in pre-operative bone of >5 mm.

## DISCUSSION

Del Fabbro *et al.*<sup>7</sup> found implant survival after osteotome mediated sinus floor augmentation 92.7% for 331 implants placed in <5 mm ridge height and 96.9% for 2525 implants inserted in >5 mm ridge height. Hence, treatment plan selected was osteotome mediated maxillary sinus floor augmentation along with simultaneous implant placement.

Pjetursson *et al.*<sup>8</sup> evaluated the pattern of tissue remodeling after maxillary floor elevation using transalveolar osteotome technique with or without using grafting materials the mean RBH for implants placed with grafting material 6.4 mm mean bone gain of 4.1 mm. All these coincide with our study where average residual alveolar bone height was 6.0 mm pre-operatively (Figures 9 and 10) in the sample of 6 patients (Table 2) and after sinus floor augmentation, the residual alveolar bone height was in the range of 9.0-11.0 mm, on an average 10.2 mm (Table 2) suggest that the final bone gain was very significant in the range of 4-5 mm (Figures 11 and 12), on an average 4.25 mm



**Figure 9: Pre-operative panoramic computed tomography view - showing inadequate residual alveolar bone height 5.0 mm for an implant insertion at maxillary left first molar region**

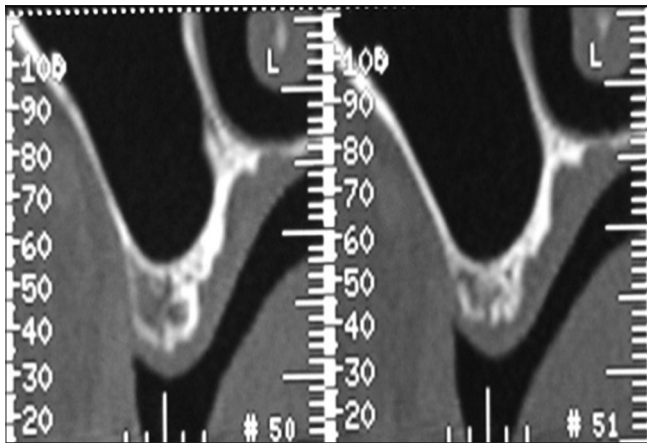
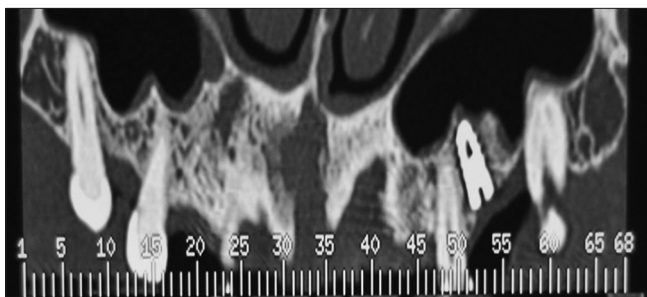
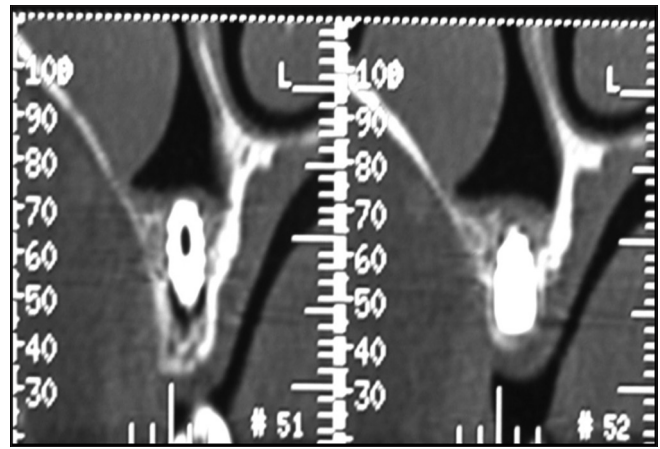


**Table 1: Maxillary alveolar ridge height, clinical evaluation after sinus lift and implant placement**

Site of sinus lift with implant placement	Pre-operative radiographic bone height	Follow-up after one-stage surgery					Bone height achieved after sinus floor augmentation	Radiographic evaluation	
		Local swelling/infection	Pain	Soft tissue dehiscence	Maxillary sinusitis	Post-operative radiographic bone height		Crestal/vertical bone loss	Peri-implant radio-lucency
Maxillary right first molar	6.0 mm	A	A	A	A	10.0 mm	4.0 mm	A	A
Maxillary left first molar	5.0 mm	A	P	A	P	9.0 mm	4.0 mm	A	A
Maxillary left second molar	7.0 mm	A	A	A	A	11.0 mm	4.0 mm	A	A
Maxillary right first molar	6.0 mm	A	A	A	A	11.0 mm	5.0 mm	11 mm (6 months)	A
Maxillary left first molar	6.5 mm	A	A	A	A	11.0 mm	4.5 mm	A	A
Maxillary right second molar	5.5 mm	A	A	A	A	9.5 mm	4.0 mm	A	A

**Table 2: Statistics evaluation of bone height-preoperative and postoperative**

Statistical analysis	Pre-operative bone height	Bone height 6 months after sinus lifting surgery	Bone gain following sinus lift surgery
Mean	6.0	10.25	4.25
Median	6.0	10.5	4
Mode	6.0	11	4
Standard deviation	0.70711	0.88034	0.41833

**Figure 10: Pre-operative dentascan cut showing residual alveolar bone height 5.0 mm where implant has to be placed****Figure 11: Post-operative panoramic computed tomography view at 6 months - showing raise in bone level above the initial sinus floor and implant covered with bone. Bone height 9.0 mm****Figure 12: Post-operative dentascan cut showing the bone height 9.0 mm 6 months after surgery**

after sinus floor augmentation over the period of 6 months following surgery. Hence, 71.51% bone gain was noted on an average after sinus floor augmentation with alloplastic bone graft.

Indirect OMSFE is indicated for a bone height of 6-8 mm and more bone height was gained when graft material was used stated by Romero-Millán *et al.* (2012).<sup>9</sup> Though the autografts are widely considered the “gold standard” for osseous reconstruction, there are some practical difficulties in clinical use such as secondary surgery, morbidity of the donor site, surgery under general anesthesia etc.

In this study, an alloplastic bone graft material was used for the sinus floor augmentation; graft is made of natural low crystalline hydroxy apatite with collagen. It is available in form of granules, has graft retentive properties, easy manipulation during surgery, no risk of immunogenic response and infection transmission and very low chances of graft infection because antibiotics readily penetrates into it due to its hydrophilic nature. Also there is formation of bony tissues noted in the bone graft.

Romero-Millán *et al.*<sup>9</sup> analyzed studies published on OMSFE between 1999 and 2010 on patients with a minimum of 1 year of follow-up and found that most frequent complication was perforation of the Schneiderian membrane; this was present in almost all of the articles with a range of 2.2:21.4%. Similarly, in 1 out of 6 patients (16.66%), Schneiderian membrane perforation occurred which was successfully repaired by sealing the perforation with resorbable collagen membrane (Periocol - GTR). Although the patient had experienced pain and mild attack of maxillary sinusitis after 2 months, the next follow-up visits were absolutely normal. It had not adversely affected the outcome during the follow-up and the post-operative healing was uneventful. The maxillary sinusitis was treated conservatively with the help of antibiotics, analgesics, and decongestants. In all the rest of patients (83.33%), there was the absence of local inflammation/infection, pain, a soft tissue dehiscence after surgery (Table 1).

In this study, osteotomes with stoppers are used which can be adjusted at required length which reduced the risk of invading the sinus cavity and made it possible to lift the membrane gently without perforating the membrane same method is described by Tilotta *et al.*<sup>10</sup>

The success criteria suggested by Schmitt and Zarb<sup>11</sup> for edentulous patients were utilized and applied to the six implant sites, which were examined during the last recall visit. Each implant was examined and found to be asymptomatic without any clinical evidence of mobility. Radiographically, all the implants showed absence of peri-implant radiolucency. Bleeding on probing was present at one implant site (16.66%) and probing depth was 3 mm mesially and distally at one implant site (16.66%) (Table 1).

Table 1 shows that soft tissue complications such as moderate inflammation, redness edema, and glazing, bleeding on probing (gingival index 2) were observed at one site (16.66), which easily resolved with good oral hygiene practice and without any compromise in osseointegration. Result was consistent with the study of Rebaudi *et al.*<sup>12</sup>

According to Table 1 neither prosthesis loosening nor prosthesis fracture was encountered in any patient. Patient's response to rehabilitation with single tooth restoration using indirect sinus lifting and simultaneous implant placement were good to very good, both from esthetic and functional aspects, which was similar to the findings of Ekfeldt and Carlsson.<sup>13</sup>

The major criterion for evaluating implant success is change in bone level around the implants. During follow-up period of 6 months of implant loading only

one implant site (16.66%) at maxillary right first molar had bone loss of 1 mm. This value coincide with the study of Friberg *et al.*<sup>14</sup> but long-term follow-up is needed to know the mean annual bone loss of 0.2 mm/year for success of implant (Table 1).

Sinus floor augmentation by indirect technique along with simultaneous implant placement can be an excellent method for restoring the partial edentulism, if performed by the experienced hand. Preventing complications requires an understanding of the biomechanical principles involved in surgical management of Schneiderian membrane during sinus lift, perfect attention to the many details involved in the diagnosis and treatment planning and encouraging the patient toward maintaining strict oral hygiene to increase the longevity of the implant.

## CONCLUSION

With RBH between 5 and 10 mm this technique allows for localized maxillary sinus elevation. It is a conservative surgical entry, more localized augmentation of the sinus with less degree of post-operative morbidity, and an ability to load the implants in a shorter time period than conventional Caldwell Luc approach to sinus augmentation. It should be noted that bone grafts are placed blindly in to the space below the sinus membrane. Hence, the main disadvantage of this technique is uncertainty of a possible perforation of the Schneiderian membrane and loss of graft in to the sinus. The drawback of the procedure can be substantially reduced when performed by an experienced surgeon using the presented surgical protocol. The risk of complications remains low.

It can be concluded that sinus floor augmentation by indirect technique improves both the residual alveolar ridge dimension and the osseointegration of implants.

## REFERENCES

1. Misch CE. Book of Contemporary Implant Dentistry. 2<sup>nd</sup> ed. St. Louis: Mosby; 1999.
2. Esposito M, Hirsch JM, Lekholm U, Thomsen P. Biological factors contributing to failures of osseointegrated oral implants. (II). Etiopathogenesis. Eur J Oral Sci 1998;106:721-64.
3. Boyne PJ, James RA. Grafting of the maxillary sinus floor with autogenous marrow and bone. J Oral Surg 1980;38:613-6.
4. Summers RB. The osteotome technique: Part 2 – The ridge expansion osteotomy (REO) procedure. Compendium 1994;15:422, 424, 426.
5. Sforza NM, Marzadori M, Zucchelli G. Simplified osteotome sinus augmentation technique with simultaneous implant placement: A clinical study. Int J Periodontics Restorative Dent 2008;28:291-9.
6. Rosen PS, Summers R, Mellado JR, Salkin LM, Shanaman RH, Marks MH, *et al.* The bone-added osteotome sinus floor elevation technique: Multicenter retrospective report of consecutively treated patients. Int J Oral Maxillofac Implants 1999;14:853-8.
7. Del Fabbro M, Corbella S, Weinstein T, Ceresoli V, Taschieri S. Implant



- survival rates after osteotome-mediated maxillary sinus augmentation: A systematic review. *Clin Implant Dent Relat Res* 2012;14 Suppl 1:e159-68.
8. Pjetursson BE, Rast C, Brägger U, Schmidlin K, Zwahlen M, Lang NP. Maxillary sinus floor elevation using the (transalveolar) osteotome technique with or without grafting material. Part I: Implant survival and patients' perception. *Clin Oral Implants Res* 2009;20:667-76.
  9. Romero-Millán J, Martorell-Calatayud L, Peñarrocha M, García-Mira B. Indirect osteotome maxillary sinus floor elevation: An update. *J Oral Implantol* 2012;38:799-804.
  10. Tilotta F, Lazaroo B, Gaudy JF. Gradual and safe technique for sinus floor elevation using trephines and osteotomes with stops: A cadaveric anatomic study. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2008;106:210-6.
  11. Schmitt A, Zarb GA. The longitudinal clinical effectiveness of osseointegrated dental implants for single-tooth replacement. *Int J Prosthodont* 1993;6:197-202.
  12. Rebaudi A, Koller B, Laib A, Trisi P. Microcomputed tomographic analysis of the peri-implant bone. *Int J Periodontics Restorative Dent* 2004;24:316-25.
  13. Ekfeldt A, Carlsson GE. The long-term efficacy of currently used dental implants: A review and proposed criteria of success. *Int J Oral Maxillofac Implant* 1994;9:179-83.
  14. Friberg B, Grondahl K, Lekholm U. A new self-tapping Brånemark implant: Clinical and radiographic evaluation. *Int J Oral Maxillofac Implants* 1992;7:80-5.

**How to cite this article:** Tandel RC, Parikh D, Parmar B. Indirect Maxillary Sinus Lift for Single Tooth Implant: A Clinical Study. *Int J Sci Stud* 2015;2(11):60-66.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Prevalence of Rhesus Negative Pregnant Population at a Tertiary Care Hospital

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## Abstract

**Introduction:** The D antigen after ABO blood group system is the second most crucial red cell antigen due to hemolytic disease of newborn. During the World wars, it was discovered that the frequency of ABO and rhesus (Rh) blood group systems was variable in persons native to different parts of the world. The present study was carried out to assess the prevalence of Rh negative pregnant population at Teerthanker Mahaveer Medical College and Research Centre.

**Materials and Methods:** This study has been conducted from January 2014 to December 2014. A total of 1661 blood samples were collected from pregnant women aged 15-45 years and tested for their Rh phenotype.

**Results:** Of 1661 subjects, 1638 were Rh (D) positive while 23 were Rh (D) negative. Majority of the subjects were in the 26-35 years age group (46%), followed by the 15-25 years age group (43.2%).

**Conclusion:** Despite the fact that the prevalence of Rh-negative phenotype is significantly lower among Africans compared with Caucasians, Rh isoimmunization remains a deterministic factor responsible for perinatal morbidity in most developing countries.

**Key words:** ABO blood group system, Rhesus blood group system, Rhesus isoimmunization

## INTRODUCTION

The ABO blood group system was the first human blood group system to be discovered by Landsteiner in 1900. The D antigen is the second crucial red cell antigen in transfusion practice due to hemolytic disease of newborn with two phenotypes depending on whether rhesus (Rh) antigen is present on the red cell or not. During the world wars, it was discovered for the first time that the frequency of ABO and Rh blood groups was variable in persons native to different parts of the world. Attempts have been made to classify the racial groups of mankind according to the incidence of known blood groups.<sup>1</sup> The resultant polymorphism remains important in population genetic studies, evaluating the probability of hemolytic disease.<sup>2,3</sup> At present, the Rh

blood group system consists of 50 defined blood group antigens, among which the five antigens D, C, c, E, and e are the most important. Unlike A and B blood group, red cell lacking the D antigen does not have anti-D in their serum. Anti-D discovered in 1966 was a breakthrough. Despite all these advances, the incidence of Rh alloimmunization remains constant, being higher in countries with limited availability of D-immunoglobulin. Apart from the importance of the Rh antigens in blood transfusion and hemolytic disease of the fetus and newborn (HDFN), Rh proteins are important in transporting ammonia across the red blood cell (RBC), membrane.<sup>4</sup> It follows that RBCs lacking Rh antigens will have an abnormal shape, increased osmotic fragility and shortened life span often resulting in hemolytic anemia that is mild in nature.<sup>5</sup> Therefore, the investigation of pregnant women for Rh antigens is important to facilitate the prevention of alloimmunization, reduce the risk of HDFN and transfusion reaction. The present study was done to assess the prevalence of Rh negative pregnant population and obstetric outcome in a tertiary care hospital.

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Month of Submission : 12-2014  
Month of Peer Review : 01-2015  
Month of Acceptance : 01-2015  
Month of Publishing : 02-2015

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## MATERIALS AND METHODS

This study was conducted at Teerthanker Mahaveer Medical College and Research Centre (TMMCRC) in the Department of Obstetrics and Gynaecology at Moradabad from January 2014 to December 2014 over a span of 1 year. This study was approved by the institutional review board and written informed consent was obtained from all the participants.

### Eligibility Criteria

Pregnant patients delivering in the hospital (irrespective of gestational age, parity) were included in the study.

### Exclusion Criteria

- Women who were not pregnant
- Pregnant women who have had a history of recent blood transfusion in the last 4 months.

ABO blood grouping with Rh typing was conducted in patients, and the prevalence of Rh negative pregnancy was calculated. The frequency of Rh antigens among pregnant women was determined using the standard serologic technique (tube method) using Lorne diagnostic anti-D reagents. The principle is based on the ability of Lorne diagnostic anti-D reagents to cause a direct agglutination of the test RBCs that carry the corresponding Rh D antigen. Agglutination indicated the presence of the group specific Rh D antigen to which the Rh antibody is specific. No agglutination indicates the absence of the corresponding Rh antigen.

## RESULTS

A total of 1661 blood samples were collected from pregnant women aged 15-45 years attending labor room at TMMCRC. Out of 1661 subjects tested for their Rh D phenotype 1638 were Rh (D) positive while 23 were Rh (D) negative. Table 1 shows the prevalence of Rh (D) among subjects. Pregnant subjects were stratified based on their age groups. Majority of the subjects were of 26-35 years age group (46%), followed by those among 15-25 years of age (43.2%) while the least were in the 36-45 years age group (10.8%). Table 2 shows the distribution of the subjects based on age groups. Table 3 shows the distribution based on blood group with Rh negative phenotype.

## DISCUSSION

India is a country with diversities based on race, religion and creed. Hence, diversity has been observed in the distribution of blood groups in the population. In India, the incidence of Rh negative is 5-10%, even though the incidence is <10%

**Table 1: Prevalence of Rh (D) among subjects**

Rh (D) antigen status	N (%)
Positive	1638 (98.61)
Negative	23 (1.38)
Total	1661

Rh: Rhesus

**Table 2: Distribution of subjects based on their age range**

Age group	N %
15-25	43.2
26-35	46
36-45	10.8

**Table 3: Distribution of subjects based on blood group with Rh negative phenotype**

Blood group type	N (%)
O	9 (39)
A	4 (17)
B	6 (26)
AB	4 (17)

Rh: Rhesus

handling an isoimmunized child is a challenge. Recently in the antenatal period, affected fetus can be monitored by specialized imaging i.e., Middle cerebral artery using color Doppler. Intrauterine transfusion, timely delivery and exchange transfusion help in managing an isoimmunized child. In this study, we observed the prevalence of Rh (D) positive and negative prevalence of 98.61% and 1.38% respectively among our cohort of pregnant women tested. Our finding is consistent with previous reports obtained among non-caucasians in Gusau in North Western Nigeria<sup>6</sup> (98.8% and 1.2%) and Egesie *et al.*<sup>7</sup> who observed Rh-D positive and negative prevalence of 98% and 2% respectively in the Niger Delta of Nigeria. Other documented Rh-D positive rates includes 96.6% by Pramanik and Pramanik<sup>8</sup> in Nepal, 93% by Bashwari *et al.*<sup>9</sup> in the Eastern region of Saudi Arabia, 97.7% in West Bengal India,<sup>10</sup> 95.94% in Guinea,<sup>11</sup> 84.35% in South Gujarat by Kahar and Patel,<sup>12</sup> in Maharashtra, India.<sup>13,14</sup> In the Orient, almost 100% of the population are Rh (D) positive.<sup>15</sup> Study from South India showed that blood Group O was most common (38.75%) followed by Group B (32.69%), Group A (18.85%) and AB (5.27%).<sup>16</sup> Similarly, studies in Karnataka, Jammu and Kashmir also showed O to be most common ABO group in their population.<sup>17,18</sup> In our study, the most common blood group with Rh negative phenotype was O (39%), A (17%), B (16%), AB (17%). Hence, Rh disease is rare among populations in Africa and the eastern half of Asia, and among the indigenous peoples of Oceania and the Americas, but more common in other genetic groups, most especially

western Europeans. There are several obstetric advantages associated with a low prevalence of D-negative status among pregnant women. The risk of Rh (D) alloimmunization will be of a much smaller magnitude than it is in most western countries where a significant proportion of the population lacks the major Rh(D) antigen. In such individuals, the chances of becoming sensitized to the D antigen following exposure either by transfusion of Rh(D) positive red cells or during pregnancy involving a Rh positive fetus is very high. Alloantibody D produced as a result of such immunization has serious clinical significance, including hemolytic disease in the newborn, fetomaternal hemorrhage, insufficient placental transfer, inborn ability to respond to Rh antigen stimulus. Manifestation of the affected baby depends on the severity of isoimmunization i.e., hydrops fetalis, icterus gravis neonatorum or congenital anemia of the newborn. Despite the fact that the prevalence of Rh-negative phenotype is significantly lower among Africans compared with Caucasians, Rh alloimmunization remains a determining factor responsible for perinatal morbidity in most developing countries due to lack of universal access and unaffordability of anti-D immunoglobulin.

## CONCLUSION

In India, the incidence of Rh negative is 5-10%, even though the incidence is <10% handling an isoimmunized child is a challenge. During the world wars, it was discovered for the first time that the frequency of ABO and Rh blood groups was variable in persons native to different parts of the world. To conclude, the prevalence of Rh negative phenotype was 1.38% and positive was 98.61% in pregnant patients at TMMCRC confirming the polymorphism and variation of Rh D phenotype.

## REFERENCES

1. Boyd WC. Genetics and the Races of Man. Boston: Little Brown; 1958. p. 335-42.

2. Armitage S, Warwick R, Fehily D, Navarrete C, Contreras M. Cord blood banking in London: The first 1000 collections. Bone Marrow Transplant 1999;24:139-45.
3. Solves P, Mirabet V, Larrea L, Moraga R, Planelles D, Saucedo E, *et al.* Comparison between two cord blood collection strategies. Acta Obstet Gynecol Scand 2003;82:439-42.
4. Dutta AB. Blood Banking and Transfusion. 1<sup>st</sup> ed. New Delhi: CBS Publishing; 2006. p. 53-72.
5. Daniels G. The molecular genetics of blood group polymorphism. Transpl Immunol 2005;14:143-53.
6. Erhabor O, Isaac IZ, Saidu A, Ahmed HM, Abdulrahman Y, Festus A, *et al.* The distribution of ABO and rhesus blood groups among residents of Gusau, Zamfara State, North Western Nigeria. Res Rev J Med Health Sci 2013;2:55-63.
7. Egesie UG, Egesie OJ, Usar I, Johnbull TO. Distribution of ABO, Rhesus blood and haemoglobin electrophoresis among the undergraduate students of Niger Delta State University, Nigeria. Niger J Physiol Sci 2008;23:5-8.
8. Pramanik T, Pramanik S. Distribution of ABO and Rh blood groups in Nepalese medical students: A report. East Mediterr Health J 2000;6:156-8.
9. Bashwari LA, Al-Mulhim AA, Ahmad MS, Ahmed MA. Frequency of ABO blood groups in the Eastern region of Saudi Arabia. Saudi Med J 2001;22:1008-12.
10. Mondal B, Maiti S, Biswas BK, Ghosh D, Paul S. Prevalence of hemoglobinopathy, ABO and rhesus blood groups in rural areas of West Bengal, India. J Res Med Sci 2012;17:772-6.
11. Loua A, Lamah MR, Haba NY, Camara M. Frequency of blood groups ABO and rhesus D in the Guinean population. Transfus Clin Biol 2007;14:435-9.
12. Kahar MA, Patel RD. Phenotype frequencies of blood group systems (Rh, Kell, Kidd, Duffy, MNS, P, Lewis, and Lutheran) in blood donors of south Gujarat, India. Asian J Transfus Sci 2014;8:51-5.
13. Giri PA, Yadav S, Parhar GS, Phalke DB Frequency of ABO and rhesus bloodgroups: A study from a rural tertiary care teaching hospital in India. Int J Biol Med Res 2011;2:988-90.
14. Warghat NE, Sharma NR, Baig MM, Sharma SH, Pachalore GS. ABO and Rh blood group distribution among Kunbis (Maratha) population of Amravati District Maharashtra. Asiat J Biotechnol Res 2011;2:479-83.
15. M'baya B, Mfune T, Mogombo E, Mphalalo A, Ndhlovu D, Knight RC. The prevalence of red-cell antigens and antibodies in Malawi. Transfus Med 2010;20:196-9.
16. Das PK, Nair SC, Harris VK, Rose D, Mammen JJ, Bose YN, *et al.* Distribution of ABO and Rh-D blood groups among blood donors in a tertiary care centre in South India. Trop Doct 2001;31:47-8.
17. Periyavan S, Sangeetha SK, Marimuthu P, Manjunath BK, Seema DM. Distribution of ABO and Rhesus-D blood groups in and around Bangalore. Asian J Transfus Sci 2010;4:41.
18. Khan MN, Khaliq I, Bakhsh A, Akhtar MS, Amin-ud-Din M. Distribution of ABO and Rh D blood groups in the population of Poonch District, Azad Jammu and Kashmir. East Mediterr Health J 2009;15:717-21.

**How to cite this article:** Agarwal S, Najam R, Chowdhary HH. Prevalence of Rhesus Negative Pregnant Population at a Tertiary Care Hospital. Int J Sci Stud 2015;2(11):67-69.

**Source of Support:** Nil, **Conflict of Interest:** None declared.



# Evaluation of Various Prognostic Factors in Diabetic Foot: A Clinical Study

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## Abstract

**Background:** Diabetes mellitus is a well-known metabolic disorder of varying severity, especially involving carbohydrate metabolism. It is present in 2-3% of the general population, which may be higher (4-5%) in populations above 40 years of age.

**Aims and Objectives:** (1) To study the clinical presentation of diabetic foot infection, (2) to study the various factors having causal relation with diabetic foot infection, (3) to study various modalities available for treatment of diabetic foot infection, (4) to correlate these factors and management strategies with prognosis of diabetic foot infection.

**Materials and Methods:** A prospective study was carried out in patients of diabetes mellitus Type II presenting with foot infection. This study was carried out in the Department of Surgery in collaboration with Department of Medicine, Gajara Raja Medical College associated with J.A. Group of Hospitals, Gwalior for a period of 15 months from July 2006 to October 2007.

**Observation:** In our study of 300 Type II diabetes patients who attended medical and surgical Out Patient Departments (OPD) in G.R. Medical College from July, 1<sup>st</sup> 2006 to October 31<sup>st</sup>, October 2007 over a period of 16 months. A total of 40 patients were found to have a variety of diabetic foot infection.

**Conclusion:** Totally 40 patients of diabetic foot infection were studied in patients from Gwalior and the surrounding areas for a period of 16 months from 1<sup>st</sup> July 2006 to October 2007. In our study, the incidence of diabetic foot infection in patients with Type II diabetes was found to be 13.34%.

**Key words:** Diabetic foot, Diabetes mellitus, infection

## INTRODUCTION

Diabetes mellitus is a well-known metabolic disorder of varying severity especially involving carbohydrate metabolism. It is present in 2-3 of the general population, which may be higher (4-5%) in populations above 40 years of age. It occurs with an almost same frequency in both sexes, and no nation or race is immune to it. Due to mistaken belief and relative simplicity of diabetic foot, to its more glamorous cousins such as nephropathy and retinopathy, this problem has not been given due respect in scientific publications.<sup>1</sup>

The progression of the disease in the foot is a combined effect of peripheral neuropathy, vasculopathy, and hyperglycemia. Due to these factors, minor lesions like cracks; blisters and ingrown toe nails may develop into a serious necrotizing infection with tissue loss. Normal adjustment of the foot in weight bearing do not occur, and heavy calluses form over pressure points, adding to the pressure and causing necrosis under the callus. This chain of events, if not controlled adequately and in time, may lead to precipitate an amputation of the extremity.

If one has to prevent these complications and save the limb, the key is to know them, look for them, diagnose them early and correct them or prevent the progression through early treatment and precautions.<sup>2</sup>

## Aims and Objectives

1. Strategies to study the clinical presentation of diabetic foot infection

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Month of Submission : 11-2014  
Month of Peer Review : 01-2015  
Month of Acceptance : 01-2015  
Month of Publishing : 02-2015

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2. To study the various factors having causal relation with diabetic foot infection
3. To study various modalities available for treatment of diabetic foot infection
4. To correlate these factors and management with prognosis of diabetic foot infection.

## MATERIAL AND METHODS

A prospective study was carried out in patients of diabetes mellitus Type II presenting with foot infection. This study was carried out in the Department of Surgery in collaboration with Department of Medicine, Gajara Raja Medical College associated with J.A. Group of Hospitals, Gwalior for a period of 15 months from July 2006 to October 2007.

A wide variety of presentation of diabetic foot was in the study. The patients were further studied in detail and the information regarding their history, presentation and complications were recorded on a predesigned proforma.

A detailed history regarding duration of diabetes, treatment, family history, addiction to alcohol, tobacco, precipitating factors such as trauma, massage, shoe bite, pain in lower limbs, fever and associated comorbidities was taken. Information about foot wear use was elicited. Relevant positive findings in systemic examination were recorded. A detailed foot examination was carried out with respect to the presence of ulcer or ulcers, cellulitis, callus, gangrene, previous operative scars, foot deformities, etc.

Assessment of vasculopathy was done based on ankle brachial index (ABI), palpation of the femoral artery, popliteal artery, dorsal pedis artery was done in both lower limbs. If the arteries were palpable at ankle level, we measured ABI for both lower limbs.

	ABI
Normal	0.9-1.1
Mild	0.7-0.8
Moderate	0.5-0.6
Severe	0.3-0.4
Atherosclerosis	≥1.2

ABI: Ankle brachial index

Neuropathy was assessed by biothesiometry and monofilament test in our study. Vibration sense which are carried by long nerve fibers was quantified using biothesiometry. In our study, we tested vibration sense on bony points like medial malleolus and tip of great toe for both feet.

A biothesiometer works on the principle of application of electric energy to a calibrated vibrator. This voltage can be increased from 0 to 60 V by turning the control switch to the right in a clockwise manner gradually. The procedure is done separately for medial malleolus and great toe. The patient labeled as having mild, moderate or severe neuropathy based on the value of vibration perception threshold (VPT) which are as under.

Neuropathy	VPT
Normal	<15
Mild	15-19
Moderate	20-24
Severe	>24

VPT: Vibration perception threshold

Biochemical evaluation included an examination of blood sugar, blood urea, creatinine, micro albumin in the urine. A complete blood count and hemoglobin, erythrocyte sedimentation rate, packed cell volume, was done. Patients in which range of random sugar was above 200 mg% were considered as uncontrolled diabetics, whereas those which sugar level in the range of 140-200 mg% were considered as well controlled diabetics in our study.

Pus culture was advised in all cases. A probe test was done to find out the depth of the ulcer. It was considered positive if the probe touched the bone at base of the ulcer. In the case of positive probe test for osteomyelitis, X-ray foot was advised.

All the patients were kept on insulin for the management of diabetes. Broad spectrum antibiotics were started upon admission and later switched on to culture specific antibiotics.

A routine radical debridement was carried out in all cases. Some patients required minor or major amputation along with debridement. Few patients needed repeated debridement. Modified foot therapy was also given in patients with the use of weight relief shoes, total contact cast, slab, etc. A record was kept on the outcome of the patient regarding wound healing, number of days of healing was recorded, discharge left against medical advice absconded or death.

## OBSERVATIONS

In our study of 300 Type II diabetes patients who attended medical and surgical OPD in Gajara Raja Medical College from July 1<sup>st</sup>, 2006 to October 31<sup>st</sup>, 2007 over a period of 16 months. 40 patients were found to have a variety of diabetic foot infection.

### On General Examination

Anaemia	Number of patients	Percentage
Pallor present	26	65
Pallor absent	14	35

### Location of Ulcer

Characteristics	Number of patients	Percentage
Dorsum	6	15.0
Toes	15	37.5
Planter metatarsal head/mid foot/heel	14	35.0
Involvement of lower limb above ankle	5	12.5

### Foot Deformities: Incidence of Foot Deformities

Type of deformity	Number of patients	Percentage
Collapse of foot arch	10	25
Bony prominence	6	15
Hallux valgus/varus	4	10
Nail hypertrophy	17	42.5
Infection of toe nail	20	50

### Vasculopathy

Ankle brachial index	Number of patients	Percentage
>1.1	4	10
1.1-0.9	8	20
0.8-0.5	11	27.5
0.4-0.3	7	17.5
<0.3	10	25

### Neuropathy by Biothesiometry/Monofilament

In our study, assessment of neuropathy was done by measuring VPT using biothesiometer and measurement of light touch sensation by monofilament as follows:

	Number of patients	Percentage
Normal (<15 V)	8	20
Mild (15-19 V)	6	15
Moderate (20-24 V)	10	25
Severe (>25 V)	16	40

Monofilament testing	Number of patients	Percentage
≥3/5 reception	8	20
<3/5 reception	32	80

### Test for Nephropathy/Retinopathy

Test	Number of patients	Percentage
Nephropathy (microalbuminuria)	15	37.5
>30 µg%		
Retinopathy NPDR	8	20
Retinopathy PDR	4	10
Both	7	17.5

NPDR: Non-proliferative diabetic retinopathy

### Pus Discharge and Culture

Majority of diabetic foot infection are polymicrobial in nature, deep tissue culture was considered to be truly

representative specimen for culture in comparison to surface swab, which has commensals.

Culture bacteria	Number of patients	Percentage
<i>S. aureus</i>	10	27.77
<i>E. coli</i>	9	25.0
<i>Streptococcus</i>	8	22.22
<i>Klebsiella</i>	6	16.66
<i>Pseudomonas</i>	3	8.33

*S. aureus*: *Staphylococci aureus*, *E. coli*: *Escherichia coli*

### Complications

Complications	Number of patients	Percentage
Osteomyelitis	14	35.0
Gangrene	21	52.5

### Dressing Debridement and/or Amputation Debridement

	Number of patients	Percentage
Debridement	32	80
Debridement with minor amputation	6	15
Debridement with major amputation	2	5
Repeat debridements	11	27.5

### Pressure Offloading

In this study, we used foam and encircled it around the non-ulcerated part. This prevented the ulcer from further trauma. As it did not participate in weight bearing.

	Number of patients	Percentage
Offloading followed	22	55
Offloading not followed	18	45

### Modified Boot Therapy

Negative heel shoes, addition of the rocker bottom to outsoles. Total contact cast was given in purely neuropathic ulcer for redistribution of pressure.

“BOOT” is a mechanical device, which causes rhythmic compression and release and there by enhance circulation of the foot and improves healing when enclosed around lower leg and foot.

### Medical Therapy to Enhance Circulation

	Number of patients	Percentage
Antibiotics	30	75
Antibiotics+other drugs	34	82.5

### Duration of Healing, Discharge, Mortality

Mode of discharge	Number of patients	Percentage
Regular follow-up	31	82.5
Left against medical advice	6	15
Mortality	1	2.5
Absconded	2	5

## DISCUSSION

The prevalence of Type II diabetes in India is between 1% and 5% and it is estimated that there are 30 million Type II diabetic patients or 60 million potential diabetic feet in our country. Due to regional factors the clinical spectrum of diabetic foot problems showed variation.

The hallmark of diabetic foot problem in India is gross infection due to late presentation walking bare foot, walking even on ulcerated foot, late diagnosis of diabetes, uncontrolled diabetes and trust in faith healers due to illiteracy using Hawai chappals or slippers induced ulcer are seen between first and second toe due to presence of thong between the toes. The use of these slippers by naturopathic patients may cause further aggravation of clawing of toes and toe tip ulcer.

The vast majority of diabetic foot complications leading eventually to amputation begin with the formation of skin ulcer.

### On General Examination

Pallor was found in 65% of cases, and it was seen that these patients took greater time for the ulcer to heal. Mission *et al.* found in their study that the anemia was due to decrease in erythropoietin formation from kidney, which are usually hypofunctioning diabetic cases specially patients with microalbuminuria.

### Location of Ulcer

In majority of patients ulcer were located on toes 37.5% (15 out of 40 patients), followed by the plantar surface, including metatarsal head, mid foot and heel comprising 35.0% (14 out of 40 patients).

Patients having involvement of dorsum or toes only, shows better response to treatments whereas patients with involvement planter surface have shown poor response.

Apelquent *et al.*, in their study of 314 diabetic foot lesions showed that most common ulcer sites were that toes i.e., 51%, planter metatarsal heads, mid foot and heel formed 28%, dorsum of foot 14% and multiple ulcer 7%. The results of their study were fairly consistent with the results of this study.<sup>1,2</sup>

Reiber *et al.* conducted a study of 302 diabetic foot lesions, which showed that 52% of ulcers involved the toes, 37% involved the metatarsal heads, mid foot or heel and 11% involved dorsum of foot.<sup>3,4</sup>

In our study, similar results were found with ulcer involving metatarsal heads, mid foot or heel showing poor results.

### Foot Deformities

Of 12 patients, 8 had shown (66.6%) progression of the disease, but in this study presence of deformity has not been taken as independent risk factor.

In our study, foot lesions took significantly longer time to heal, especially in patients with abnormal bony prominence. Bose *et al.* in his 240 case of plantar abscess found that 70% of began as lesion near nail or nail bed, while 140 began as web infection and 30 were caused by direct penetration of sole.

### Vasculopathy

Pendsey has reported 23.21% patients who underwent amputations had vasculopathy causing ischaemia.<sup>5</sup>

It is generally believed that 75-90% of patients with foot lesions will have neuropathy in India and 10-15% will have vasculopathy. There would be some who have neuroischaemic foot as well.

In our study, 25% of patients had ABI <0.3 and 15 out of 21 cases of gangrene the ABI was found in the range of 0.8-1.1. This suggests that peripheral arterial disease is found in very few cases. Infection digital thrombosis appears to be a more common cause of gangrene.

### Neuropathy by Biothesiometry/Monofilament

Selby *et al.* reported that a VPT >25 V causes more chances of formation of foot ulcer when compared to VPT of <15 V.<sup>6</sup>

In study of 1010 consecutive patients of Type II diabetes a high prevalence of neuropathy was noted by considering the surrogate markers of neuropathy like dry skin (77%) (signifying sudomotor dysfunction as an indicator of autonomic neuropathy), heel fissures (59%), and callus (13%).

Mohan *et al.* reported foot ulcers in 69.85% as purely neuropathic ulcers and 23.3% having neuro-ischaemic ulcers.

Levin reports that the prevalence of neuropathy can be as high as 50% with diabetes of more than 25 years duration.<sup>7</sup>

In our study, 80% of patients (32 out of 40 were diagnosed to have neuropathy) emphasizing the fact that the diabetic foot infection is developed against the background of neuropathy. These neuropathic foot are more vulnerable to trauma, which results in the breakdown of skin barrier to infection.

In recent study by Armstrong *et al.* which attempted to identify on practical neurological screening test reported that a positive Semms-Weinstein test in which patient lacks perception at 2 out of 5 point on each foot. This test was 97% sensitive and 83% specific for positively identifying loss of protective sensation.



### Test for Nephropathy/Retinopathy

In patients of retinopathy due to reduced vision the patient cannot take proper care of their wound resulting in delayed in healing, they are more liable to foot injuries.

In patients of nephropathy, there is associated anemia and pedal edema resulting in a delay in healing.

In 1990 Gupta and Veith, noted microalbuminuria to be present in 26.6% of Type II patients studied by him in North India. Mohan *et al.*, of South India observed prevalence rate of 36.5% for macroalbuminemia among Type II patients. Patients with renal failure are at higher risk for amputation.<sup>8</sup>

### Pus Discharge and Culture

In our study, 90% of ulcer had discharge in the form of serous, serosanguinous, purulent, seropurulent nature etc. (36 out of 40 patients). Of 36 patients 9 (25%) have culture positive for *Escherichia coli*, 8 for *Streptococcus* (22.2%), 12 for *Staphylococcus* (27.77%), 7 for *Klebsiella* (16.66%), 4 patients had pseudomonas infection. In no case pus culture was sterile. Patric Laing in his article titled the development and complications of diabetic foot ulcer's have drawn the conclusion that most common aerobe isolated from diabetic foot ulcer was *Staphylococcus aureus* followed by *Streptococci* and *E. coli*. In our study, most common organisms were *Staphylococci*.

### Complications

In our study, 14 out of 40 patients (35.0%) were found to have bony involvement, and 21 patients (52.5%) were found to have gangrene.

Jason Culhoun received more than 2000 diabetic foot infections and related disorders requiring hospitalization at his institution. Of this 28% had osteomyelitis and 18% had gangrene. Coulhoun treated 128 patients with 60 having complication either in the form of osteomyelitis or gangrene, rest were without these complications.

48 out of 60 patients (80%) have shown progression of the disease. In our study, patients with complications have taken more time and other measures for complete healing of ulcers.

Both studies suggest a poor prognosis of patients with complications such as osteomyelitis and gangrene.

### Dressing, Debridement and Amputation with Debridement

In our study, 70.0% of the patients (28 out of 40 patients) were benefited by debridement as dressing of the wound leading to reepithelialization of diabetic foot ulcer.

In our study, 32 patients, i.e., 80% needed debridement while 8 patients i.e., 20% required debridement and amputation.

For dressing, we used normal saline and oxyferrin, oxum and other collageninase and other local antibiotics ointment for dressing after debridement. In our study, 11 cases required redebridement of the wound.

In our study, aggressive debridement followed by closed dressing with normal saline and oxyferrin was much more effective in comparison to routine debridement followed by hydrogen peroxide and chlorine water dressing.

In the study conducted by Apelquist *et al.*, 63% of the diabetic foot ulcers healed by re-epithelialization/primary healing. Similar studies by Reiber *et al.* showed that 81% of diabetic foot ulcers healed by re-epithelialization of primary healing. However, the finding of the present study with 58% of re-epithelialization of ulcers is similar to the findings of the study by Apelquist *et al.* in which 63% of ulcers healed similarly.<sup>1,2</sup>

In study by Pecarado *et al.*, and Reiber *et al.*, foot infection is often the proximate cause leading to tragic outcome of amputation in 25-50% of diabetic foot infections and lead to a minor (i.e. foot sparing amputation) while 10-40% require major amputation. Fiston has suggested to use safest, simplest and least expensive dressing. Wegner *et al.*, found that moist wound environment provides the best environment for wound regeneration and repair.<sup>3,4</sup>

### Pressure Offloading

We used foam in 22 out of 40 patients (55%) and the ulcer healed at faster rate compared to other patients with a foot ulcer. Offloading offers focal pressure relief by decreasing pressure. This prevents damage to new capillaries of granulation tissue.

### Modified Boot Therapy

A study at King's College in London showed that 83% recurrence of ulcer was seen when patient returned to wearing regular shoes, only 17% recurrence of ulcer was with special therapeutic shoes. Similarly a study by Ulbrecht *et al.*, reported that therapeutic shoes special designed for individuals with diabetes were effective in preventing relapse in patients with recurrent ulceration.<sup>9</sup>

Negative heel shoes for focal pressure relief rockers were further added. Total contact cast was given in purely neuropathic ulcer for redistribution of pressure.

“BOOT” is a mechanical device which causes rhythmic compression and release and enhance circulation of the

foot and improve healing when enclosed around lower leg and foot.

### Medical Therapy to Enhance Circulation

Addition of drug to increase the rheological property of blood, lipid lowering drugs, antiplatelet drugs, anti-thrombotic drugs improve the outcome of foot infection.

In 30 out of 40 patients we used drugs, which increase the rheological property (fluidity) of the blood, i.e., xantinol nicotinate and pentoxiphylline, drugs which decrease the platelet aggregation, reduces hyper permeability and stabilizes endothelial membrane of vessels i.e., clopidogrel and calcium dobesilate. It was found in these patients healing in fast in comparison to those using antibiotics alone.

In 34 out of 40 patients, we used higher antibiotics with a broad spectrum (amoxycillin with clavulanic acid or fourth generation cephalosporin along with metronidazole).

### Duration of Healing, Discharge, Mortality

The mean duration of healing in our study in the female population was 69.33 days, whereas for a male population it was 60.44 days.

In our study, mortality was 2.5%. Only one patient died due to septicemia and chronic renal failure. In our study, six patients left against medical advice and two were absconded. During the treatment.

Wagner *et al.*; in his study concluded that considerable international differences were found not only in the mortality rate following amputations, but they also vary according to the type of diabetes. In his opinion, non-insulin-dependent diabetes mellitus patients had an excess mortality in comparison to the general population. However, the results obtained in this study does not match with the opinion of Wang *et al.* This may be attributed to the geographical differences, differences in post-operative care set up and small sample size.<sup>10</sup>

## SUMMARY AND CONCLUSION

Forty patients of diabetic foot infection were studied in patients from Gwalior and the surrounding areas for a period of 16 months from July 1<sup>st</sup>, 2006 to October 2007.

Foot deformities were present in 70% of patients. In our study foot lesions took significantly longer time to heal, especially in patients with bony prominences.

Neuropathy was the most common factor resulting in the development of diabetic foot ulcers (60%) and was associated with poor response to treatment.

Peripheral vascular disease (PVD) was associated with 17.5% of diabetic foot lesion, and these patients had the worst response to treatment. Pallor was present in 65% of cases in our study vasculopathy was present in 70% of cases with 25% having ankle branchial index having <0.3. Neuropathy by biothesiometry and monofilament test was done, and 40% had severe impairment. With increase duration of diabetes mellitus microvascular complications like neuropathy, nephropathy, retinopathy set in. In associated comorbid conditions, for example, myocardial infarction, hypertension, ischemic heart disease, pulmonary tuberculosis, etc. morbidity was higher.

The most common location of diabetic foot ulcer was over the toes (37.5%), followed by plantar aspects of foot (including metatarsal head, mid foot, and heel) in 35.0%. Dorsum was involved in 15.0% of cases. Patients having involvement of dorsum or toes had shorter duration healing, whereas patients with involvement of the plantar surface had shown prolonged duration of healing.

In our study, predominant organism infecting the ulcer was *S. aureus* (27.7%).

Incidence of osteomyelitis in our study was 35.0% in diabetic foot ulcer while gangrene was reported in 52.5% of cases. Infective ulcer with these complications took more time to heal.

In our study, 70% of patients in our study were benefited from debridement and dressing and among them aggressive debridement, and dressing with normal saline, oxyferrin and oxum was more effective. In our study, 22.5% of patients i.e. 11 out of 40 required redebridement of the wound, 2 out of 40 patients required major amputation and 6 out of 40 required minor amputation.

Pressure offloading with foam was effective in the treatment of diabetic foot. In our study 22 out of 40 patients who followed offloading with foam, their ulcer healed at faster rate compared to other patients with a foot ulcer.

Modified therapeutic BOOT therapy led to better and early healing as compared to the cases where it was not feasible.

Higher antibiotics with broad spectrum antibiotics e.g. amoxicillin with clavulanic acid or fourth generation cephalosporin along with metronidazole were used.

To conclude presence of comorbidities, such as neuropathy or PVD, vasculopathy, nephropathy, retinopathy. Pus discharge, involvement of plantar surface, presence of osteomyelitis or gangrene, all had bad prognostic implications, whereas use of pressure offloading measures

or modified therapeutic “BOOT” therapy, aggressive debridement and closed dressing with saline and oxyferrin/oxum, use of medicines to enhance circulation and use of antibiotic all favored better and faster healing of diabetic foot lesions.

## REFERENCES

1. Apelqvist J, Larsson J, Agardh CD. The influence of external precipitating factors and peripheral neuropathy on the development and outcome of diabetic foot ulcers. *J Diabet Complications* 1990;4:21-5.
2. Apelqvist J, Larsson J, Nyberg P, Schersten B. Prevalence of foot ulcer and utilization of preventive foot care (Abstract). *Diabetes* 1998;47 Suppl 1:167A.
3. Reiber GE, Boyko EJ, Smith DG. Lower extremity foot ulcers and amputations. In: Harris ML, Cowie CC, Stern MP, Boyko EJ, Reiber GE, Bennet PH, editors. *Diabetes in America*. Washington, DC, U.S.: Govt. Printing Office; 1995. p. 409-28.
4. Reiber GE, Vileikyte L, Boyko EJ, Del Aguila M, Lavery LA, Boulton AJ. Casual pathways for incident lower extremity ulcers in patients with diabetes from two settings. *Diabetic Care* 1999;22:157-62.
5. Pendsey S. In: Das S, editor. *Indian Scenario: The Diabetic Foot. Complications of Diabetes in Indian Scenario*. USV Pharmaceuticals; 1991.
6. Selby PL, Young MJ, Boulton AJ. Bisphosphonates: A new treatment for diabetic Charcot neuroarthropathy? *Diabet Med* 1994;11:28-31.
7. Levin ME. An Overview of the diabetic foot: Pathogenesis management and prevention of lesions. Workshop on Diabetic Foot, SGPGIMS; 2000.
8. Gupta SK, Veith FJ. Inadequacy of diagnosis related group (DRG) reimbursements for limb salvage lower extremity arterial reconstructions. *Adhoc* committee of the joint council of the society for vascular surgery and the north American chapter of the international society for cardiovascular surgery. *J Vasc Surg* 1990;11:348-56.
9. Ulbrecht JS, Perry JE, Hewitt FG Jr, Cavanagh PR. Controversies in foot-war for the diabetic foot at risk. In: Kominsky SJ, editor. *The Diabetic Foot*. Vol. 1. Chicago: Mosby-Year Book; 1999. p. 441-53.
10. Wagner FW Jr. The dysvascular foot: A system for diagnosis and treatment. *Foot Ankle* 1981;2:64-122.

**How to cite this article:** Agrawal P, Ojha A, Tiwari S, Shrivastava BR, Chauhan A. Evaluation of Various Prognostic Factors in Diabetic Foot: A Clinical Study. *Int J Sci Stud* 2015;2(11):70-76.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Pattern of Head Injuries from the Fall in Pre-school Children

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## Abstract

**Introduction:** Fall is a major cause of the pediatric head injuries, particularly in the children of younger age group. Considering all pediatric trauma, fall is the most common cause and accountable of unintentional head injury.

**Materials and Methods:** A retrospective review of the pediatric patient of age 0-5 years admitted in Shri Guru Ram Rai Institute of medical and health sciences and Shri Mahant Indresh Hospital, Dehradun. It consisted of 100 cases of head injury due to fall from height in children aged 0-5 years who came for treatment.

**Results:** Maximum number of the cases 69% from the high level fall (HLF) in which male children were 41% and 38% were female children. While in low level fall (LLF) group male and female children were 17% and 14%, respectively. In LLF group, max cases were 0-1 years of age group i.e. 48.39% on the other side in high HLF maximum cases were in the 4-5 years of age group i.e. 40.58%. Alone skull fracture was present in 39% cases, and intra cranial hemorrhage was 34%. While the combination of both skull fracture and intracranial hemorrhage (ICH) was present in 25.8% in LLF and 27.54% in HLF. In HLF 60.87% cases had injuries other than skull fracture or ICH. Linear undisplaced fracture was the most common pattern i.e. 68.42% in LLF and 61.70 % in HLF.

**Conclusion:** This study showed that no age group up to the age of 5 years was spared from being fall with a peak incidence in the age group 0-1 years for <1 m fall and 4-5 year for more than 1 m fall.

**Key words:** Children, Head injury, Height of fall, Pediatric group, Skull fracture

## INTRODUCTION

Fall is a major cause of the pediatric head injuries, particularly in the children 4 years of the age or younger.<sup>1</sup> Considering all pediatric trauma, fall is the most common cause and accountable of unintentional head injury, they are accountable for up to 25-34% of pediatric trauma admission in the major urban trauma centers.<sup>2,3</sup> Falls are very common for many other fatalities. If the body falls on to the head, there is likely to be a massive fracture.<sup>4</sup>

According to the laws of physics, the more is the height of fall, the more will be the amount of kinetic energy and the more severe will be the resulting injury. Falls were classified as low level fall (LLF), fall from short distance such as sofa, bed, chair or table under 1 m and high level fall (HLF) is a fall from more than 1 m, such as balconies, roof, window, stairs and hills etc. and it was concluded that risk of intracranial injuries is same in both cases.<sup>5</sup> In the age group of 0-11 months, maximum injuries (27.4%) were caused due to fall from furniture.<sup>6</sup> Skull fractures in infants, who have thinner cranial bones, may result even from short falls.<sup>7,8</sup> The typical skull fracture caused by a low height fall is single, narrow, linear and located in the parietal bone. An accidental fall onto an object or against an edged surface from <5 feet can result in a depressed skull fracture in a young child.<sup>9-12</sup> The risk of fall injury increased 2-3 fold for equipment more than 2 m high.<sup>13,14</sup>

In order to suggest or analysis of methods or preventive measures to decrease mortality and morbidity arise due

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Month of Submission : 12-2014  
Month of Peer Review : 01-2015  
Month of Acceptance : 01-2015  
Month of Publishing : 02-2015

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to fall, in the pre-school children, it may be necessary to understand the characteristics of fall related injuries. Hence, this study was aimed at analyzing the pattern of head injuries sustained by fall and their relationship if any, to age and gender to determine demographic variables for prediction of clinical outcome.

## MATERIAL AND METHODS

A retrospective review of the pediatric patient (age 0-5 years) admitted in Shri Guru Ram Rai Institute of Medical and Health Sciences and Shri Mahant Indresh Hospital, Dehradun. Permission was obtained from ethical clearance committee. It consisted of 100 cases of head injury due to fall from height in children aged 0-5 years who came for treatment between the period from November 2013 to December 2014.

The information about the patients admitted were obtained from the emergency and then epidemiological features and injury characteristics were entered on a predesigned proforma, from the case sheets of the patients prepared and maintained by the consultants concerned. In the study we had not included brought dead i.e., death on the spot or died on the way to hospital, discharged after first aid, incomplete, missing case sheets and leave against medical advice or absconded cases.

## OBSERVATIONS AND RESULTS

Patient data, stratified by sex and height of fall in Table 1, maximum number of the cases 69% (69 cases) from the HLF in which male children were 41 cases (41%) and 38% (38 cases) were female children. while in LLF group male and female children were 17% and 14% respectively. Author found no relation between sex of child and the level of the height of fall.

From Table 2 author observed that in LLF group, max cases were 0-1 years of age group i.e., 48.39% (15 cases), followed by 35.48 % (11 cases) of 1-2 years of age group. On the other side in HLF maximum cases were in the 4-5 years of age group i.e., 40.58% (28 cases), followed by 28.98% (20 cases) in 3-4 years age group while minimum in 0-1 year age group (1.45%).

**Table 1: Demographic data of cases**

Sex n=100	LLF (%)	HLF (%)	Total
Male	17 (17)	41 (41)	58 (58)
Female	14 (14)	38 (38)	42 (42)
Total	31 (31)	69 (69)	100 (100)

LLF: Low level fall, HLF: High level fall

When the pattern of injury recorded in Table 3, author observed that only skull fracture was present in LLF 35.48% (11 cases) and In HLF 40.58% (28 cases) and overall it account 39% in all cases of head injury due to fall. Intra cranial hemorrhage was 38.71% (12 cases) and 31.88% (22 cases) in LLF and HLF respectively and over all accounts 34%. While the combination of both skull fracture and intracranial hemorrhage (ICH) was present in 25.8% (8 cases) in LLF and 27.54% (19 cases) in HLF. In LLF 12.9% (4 cases) had other injuries like other long bone fractures, soft tissue injuries or chest injuries etc. while in HLF 60.87% (42 cases) had injuries other than skull fracture or ICH.

From the Table 4, author tried to find out the pattern of skull fracture in LLF and HLF, and author found that linear undisplaced fracture was the most common pattern i.e. 68.42% (13 cases) in LLF and 61.70 % (29 case) in HLF.

## DISCUSSION

Fall from height is responsible for many serious injuries every year but the severity is not directly related to height of fall. As falls occurred most commonly in pre-school age group, it causes a loss in the future studies or life of a large

**Table 2: Cases according to height of fall**

Age (years)	LLF n=31 (%)	HLF n=69 (%)
0-1	15 (48.39)	1 (1.45)
1-2	11 (35.48)	12 (17.39)
2-3	0 (0.00)	8 (11.59)
3-4	2 (6.45)	20 (28.98)
4-5	3 (9.68)	28 (40.58)
Total	31 (100)	69 (100)

LLF: Low level fall, HLF: High level fall

**Table 3: Injuries due to fall**

Injuries	LLF n=31 (%)	HLF n=69 (%)	Total cases n=100
Skull fracture only	11 (35.48)	28 (40.58)	39
ICH only	12 (38.71)	22 (31.88)	34
Skull fracture+ICH	8 (25.81)	19 (27.54)	27
Other injuries present	4 (12.90)	42 (60.87)	46

ICH: Intracranial hemorrhage, LLF: Low level fall, HLF: High level fall

**Table 4: Pattern of skull fractures**

Skull fracture	LLF n=19 (%)	HLF n=47 (%)	Total n=66 (%)
Linear undisplaced fracture	13 (68.42)	29 (61.70)	42 (63.63)
Comminuted fracture	1 (5.26)	8 (17.02)	9 (13.63)
Depressed fracture	2 (10.52)	3 (6.38)	5 (7.58)
Comminuted+depressed fracture	3 (15.79)	7 (14.89)	10 (15.15)
Total	19 (100)	47 (100)	66 (100)

LLF: Low level fall, HLF: High level fall

part of victims of the fall. In the present study, of a total of 100 cases, maximum number of cases fell from a height of >1 m, comprising 69% cases. The age of the victims varied from 0 to 5 years. Younger children, particularly boys were more prone to sustain fall related injuries, whether it was low level or HLF but there was no relation between the height of fall involved and the sex of the child. These findings were supported by Park *et al.*<sup>15</sup>

0 year age was taken to be the age of 1 day. The peak incidence was observed in LLF the age group 0-1 years comprising 48.39% of the cases, and as age increased the incidence of LLF decreased. On the other hand in HLF, the peak incidence found in age group 4-5 years comprising 40.58% case, which is in conformity to other studies.<sup>7,16-18</sup> The reason for the fall to be common in the pediatric age group is that in the place of study, a good number of houses, especially of people in the lower socio-economic strata, do not have boundaries on their roof, are at increased risk of falling in such houses. Pre-school children are also at a risk of falling by either a lack of rails on beds, unprotected staircases, and open roofs etc.

Maximum number of cases of skull fractures 21 cases (alone) and 8 cases (with ICH), total 19 cases (61.29%) were seen in falls from height of <1 m and out of 19 cases, in which a skull fracture is seen, 68.42% were of linear undisplaced fracture, on other side maximum number of cases of skull fractures 28 cases (alone) and 19 cases (with ICH), total 47 cases (68.11%) were seen in falls from height of >1 m and out of 47 cases, in which a skull fracture is seen, 61.7% were of linear undisplaced fracture and the findings are consistent with the other studies.<sup>9-10,12,19</sup> The reason for the above is that almost all the cases in the study fell accidentally and on an un projected surface resulting in a simple linear fracture of the skull except those who fell from stairs or hills, some of those resulted in depressed fracture. It was contrary to the study done by Johnson *et al.*<sup>20</sup> as it was known that skull fractures occurs less commonly in children than in adults because children's skull is more elastic.<sup>21</sup> However, Berney *et al.*<sup>22</sup> found that low energy accidents were more common in babies and toddlers than in older age group but the skull fractures are more common in younger age group, which is consistent with our study.

Total 20 cases 64.51% (12 cases of ICH + 8 cases of ICH with skull fracture) in LLF and 41 cases 59.42% (22 cases of ICH + 19 cases of ICH with skull fracture) in HLF sustain intra cranial hemorrhage. This may be due to the impact of the head on the surface after an accidental fall especially in the children who cannot refrain themselves to protect their head during falling. Height of fall can influence clinical outcome in adults<sup>23</sup> but significant intracranial

injuries can occur in pediatric patients from LLF as well as HLFs.<sup>24,25</sup> Murray *et al.*<sup>24</sup> have found that patient who fell <15 feet had higher incidence of intracranial injuries and who fell more than 15 feet, but both the group had an identical incidence of skull fractures.

## CONCLUSION

This study showed that no age group up to the age of 5 years was spared from being fall with a peak incidence in the age group 0-1 years for <1 m fall and 4-5 year for more than 1 m fall. Skull fractures along with intracranial injuries were seen in most of the cases in different patterns, which may result in lifelong disability, so there must be certain recommendations to prevent childhood falls.

## REFERENCES

1. Frabncel PC, Park TS, Shaffrey ME, Jane JA. Diagnosis and treatment of moderate and severe head injuries in infants and children. In: Youmans JR, editor. Neurological Surgery. 4<sup>th</sup> ed., Vol. 3. Philadelphia: WB Saunders Company; 1996. p. 1730-66.
2. Adirim TA, Wright JL, Lee E, Lomax TA, Chamberlain JM. Injury surveillance in a pediatric emergency department. Am J Emerg Med 1999;17:499-503.
3. Musemeche CA, Barthel M, Cosentino C, Reynolds M. Pediatric falls from heights. J Trauma 1991;31:1347-9.
4. Knight B, Saukko P. Forensic Pathology. 3<sup>rd</sup> ed. London: Hodder Arnold; 2004.
5. Wang MY, Kim KA, Griffith PM, Summers S, McComb JG, Levy ML, *et al.* Injuries from falls in the pediatric population: An analysis of 729 cases. J Pediatr Surg 2001;36:1528-34.
6. Flavin MP, Dostaler SM, Simpson K, Brison RJ, Pickett W. Stages of development and injury patterns in the early years: A population-based analysis. BMC Public Health 2006;6:187.
7. Pickett W, Streight S, Simpson K, Brison RJ. Injuries experienced by infant children: A population-based epidemiological analysis. Pediatrics 2003;111:e365-70.
8. Bar-Joseph N, Rennert G, Tamir A, Ore L, Bar-Joseph G. Ethnic differences in the epidemiological characteristics of severe trauma due to falls from heights among children in northern Israel. Isr Med Assoc J 2007;9:603-6.
9. Nield LS, Larzo MR, Kamat DM. Fractures from short falls: Implications in children under age 5. Consult Pediatr 2006;5(5).
10. Al B, Yildirim C, Coban S. Falls from heights in and around the city of Batman. Ulus Travma Acil Cerrahi Derg 2009;15:141-7.
11. Shane SA, Fuchs SM. Skull fractures in infants and predictors of associated intracranial injury. Pediatr Emerg Care 1997;13:198-203.
12. Reece RM, Sege R. Childhood head injuries: Accidental or inflicted? Arch Pediatr Adolesc Med 2000;154:11-5.
13. Osmond MH, Brennan-Barnes M, Shephard AL. A 4-year review of severe pediatric trauma in eastern Ontario: A descriptive analysis. J Trauma 2002;52:8-12.
14. Khambalia A, Joshi P, Brussoni M, Raina P, Morrongiello B, Macarthur C. Risk factors for unintentional injuries due to falls in children aged 0-6 years: A systematic review. Inj Prev 2006;12:378-81.
15. Park SH, Cho BM, Oh SM. Head injuries from falls in preschool children. Yonsei Med J 2004;45:229-32.
16. Lyons TJ, Oates RK. Falling out of bed: A relatively benign occurrence. Pediatrics 1993;92:125-7.
17. Vish NL, Powell EC, Wiltsek D, Sheehan KM. Pediatric window falls: Not just a problem for children in high rises. Inj Prev 2005;11:300-3.
18. Reynolds BM, Balsano NA, Reynolds FX. Falls from heights: A surgical experience of 200 consecutive cases. Ann Surg 1971;174:304-8.

19. Kumar M, Husain M, Saeed S, Huda MF, Usmani J. Head injuries sustained by children due to fall from height: A comprehensive study. *J Indian Acad Forensic Med* 2013;35:305-7.
20. Johnson K, Fischer T, Chapman S, Wilson B. Accidental head injuries in children under 5 years of age. *Clin Radiol* 2005;60:464-8.
21. Goldstein B, Powers KS. Head trauma in children. *Pediatr Rev* 1994;15:213-9.
22. Berney J, Froidevaux AC, Favier J. Pediatric head trauma: Influence of age and sex. *Childs Nerv Syst* 1994;10:517-23.
23. Agalar F, Cakmakci M, Sayek I. Factors effecting mortality in urban vertical free falls: Evaluation of 180 cases. *Int Surg* 1999;84:271-4.
24. Murray JA, Chen D, Velmahos GC, Alo K, Belzberg H, Asensio JA, *et al.* Pediatric falls: Is height a predictor of injury and outcome? *Am Surg* 2000;66:863-5.
25. Kim KA, Wang MY, Griffith PM, Summers S, Levy ML. Analysis of pediatric head injury from falls. *Neurosurg Focus* 2000;8:e3.

**How to cite this article:** Dixit J, Kumar L, Dixit AK. Pattern of Head Injuries from fall in Pre-school Children. *Int J Sci Stud* 2015;2(11):77-80.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Effect of Alpha Blocker in Improving Double-J Ureteral Stent - Related Morbidity: A Prospective Randomized Study

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## Abstract

**Introduction:** Ureteral stents are commonly used by urologists for various urological procedures. These stents are often a source of stent-related morbidity such as flank pain, voiding symptoms etc.

**Objective:** This randomized controlled study was conducted to evaluate the effect of Tamsulosin 0.4 mg in improving stent-related morbidity in patients with Double-j (DJ) stents.

**Materials and Methods:** The study was conducted from September 2012 to August 2013. A total of 84 patients who underwent DJ stent following ureterorenoscopic removal of stone, were prospectively randomized into two groups of 42 patients. Group I received tamsulosin 0.4 mg once daily orally and Group II received placebo for 2 weeks. All patients received same post-operative antibiotic and analgesics. All patients completed the International Prostate Symptom Score (IPSS) and the Numeric Pain Rating Scale Scores post-operatively.

**Results:** The IPSS irritative and obstructive symptom scores were significantly lower in Group I than Group II at 1 and 2 weeks. The Numeric Pain Rating Scale Scores were also significantly better in Group I than Group II at 1 and 2 weeks.

**Conclusion:** Administration of tamsulosin 0.4 mg once daily improved both Stent-related urinary symptoms without causing serious side-effects.

**Key words:** Double-j stent, International Prostate Symptom Score, Numeric Pain Rating Scale, Tamsulosin

## INTRODUCTION

Ureteral stents are very often used by urologists for various urological procedures since the time of their first description by Zimskind *et al.*, in 1967.<sup>1</sup>

Ureteral stenting may be used as an adjunct to pre extracorporeal shockwave lithotripsy, post-percutaneous nephrolithotomy, post-ureterorenoscopic removal of

stone, post-endopyelotomy, open/laparoscopic ureteral surgery, ureteric injury and renal transplantation.<sup>2</sup> It is used for managing ureteral obstruction for stones, strictures, tumors, tuberculosis, retroperitoneal fibrosis, hydroureteronephrosis and conservative management of genitourinary fistulas in women.<sup>3</sup>

However, these stents are often a source of stent related symptoms such as frequency (50-60%), urgency (57-60%), dysuria (40%), incomplete emptying (76%), flank pain (19-32%), suprapubic pain (30%), incontinence and hematuria (25%).<sup>4-10</sup>

The mechanisms leading to the above mentioned symptoms:

Frequency results from mechanical stimulus that comes from the bladder coil. Daytime frequency distinguished by

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Month of Submission : 12-2014  
Month of Peer Review : 01-2015  
Month of Acceptance : 01-2015  
Month of Publishing : 02-2015

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the lack of coexisting nocturia suggests that mechanical stimulation relates to physical activities and/or awareness of this stimulation during the day, which would not be significant during the night.<sup>6</sup>

Urgency is thought to be a direct result from the presence of the stent, which may also unmask or exacerbate pre-existing subclinical detrusor overactivity.<sup>6</sup>

Dysuria is usually experienced at the end of voiding. It has been proposed that the dysuria is secondary to trigonal irritation by the distal end of the stent when it crosses the midline or forms an incomplete loop.<sup>10</sup>

Flank pain is most likely a result of urine reflux towards the kidney that leads to an excessive rise in intra-pelvic pressure that ultimately translates into pain.<sup>11,12</sup> It is usually mild to moderate and is not influenced by the position of the proximal coil either in the upper calyx or in the renal pelvis.<sup>13,14</sup>

Suprapubic pain can result from local bladder irritation by the distal coil or as a secondary sign of associated complication such as encrustation or infection.<sup>15</sup>

Hematuria may result from surgical management of existing disease and from the stent placement itself as well.<sup>14</sup>

Incontinence typically occurs in association with episodes of urgency or as a result of stent migration beyond the bladder neck into the proximal urethra bypassing the urethral sphincteric mechanism of continence.<sup>16</sup>

The role of alpha-blockers for treating the symptoms related to Double-j (DJ) ureteric stenting was investigated by Deliveliotis, *et al.*, in 2006, and found alfuzosin 10 mg once daily for 4 weeks caused a decrease in the mean urinary symptom index, frequency of stent-related pain and improvement in the general health score index.<sup>17</sup>

The aim of this study was to evaluate the effect of tamsulosin 0.4 mg once daily in improving stent-related symptoms in patients with DJ stents after ureterorenoscopic lithotripsy. Tamsulosin was used in this study as both tamsulosin and alfuzosin are safe and equally effective in reducing lower urinary tract symptoms.<sup>18,19</sup>

## MATERIALS AND METHODS

This study included 84 patients who underwent DJ stent following ureterorenoscopic lithotripsy for lower ureteric stones between September 2012 to August 2013 at Vijayanagar Institute of Medical Science, Bellary. Ethical clearance was taken from Ethical Committee of Vijaynagar Institute of Medical Science, Bellary.

The exclusion criteria were open surgery of ureter, bilateral ureteric stents, pregnancy, long term use of alpha-blocker as in benign prostatic hyperplasia, prostate cancer, history of chronic prostatitis, post-operative residual stone, renal stones and chronic use of analgesics.

All patients were evaluated with a history, physical examination, laboratory tests and radiological investigations such as ultrasonography, intravenous pyelogram or non-contrast computerized tomography scan.

Ureterorenoscopic lithotripsy was performed in all patients using swiss lithoclast and 6/7.5 Fr semirigid ureteroscope with complete removal of stones. All patients were inserted 4.5 Fr/26 cm, DJ ureteric stents made up of biocompatible polyurethane. Stents were removed at 2 weeks.

All patients were informed regarding the potential side-effects of tamsulosin, and all patients signed informed consent.

Patients were randomized into two groups using computer generated random-number table. Group I ( $n = 42$ ) were given tamsulosin 0.4 mg once daily, and Group II ( $n = 42$ ) were given a placebo once daily for 2 weeks.

The study was double-blinded by giving tamsulosin and placebo in numbered containers to patients by pharmacist and symptom scores were recorded by junior residents. Finally, data analysis was done by first and second authors.

The International Prostate Symptom Score was used to assess the symptoms at 1 and 2 weeks post-operatively.<sup>16</sup>

The numeric pain rating scale scores were used to assess pain at 1 and 2 weeks post-operatively.<sup>20</sup>

Data were analyzed using SPSS windows version 20.0.  $P < 0.05$  was considered as statistically significant.

## RESULTS

There was no statistically significant difference between the two groups with respect to age and sex distribution of study patients. Similarly, there was no statistically significant difference with respect to stone size among the patients of two groups (Table 1).

Irritative symptom scores were calculated in both groups at week 1 and week 2 and it was significantly lower in Group I as compared to Group II (week 1,  $P < 0.001$ ; week 2,  $P < 0.002$ ) (Table 2).

Obstructive symptom scores were calculated in both groups at week 1 and week 2 and it was significantly lower

in Group I than Group II (week 1,  $P < 0.043$ ; week 2,  $P < 0.048$ ) (Table 3).

Numeric pain rating scale score were calculated in both groups at week 1 and week 2 and it was significantly lower in Group I than Group II (week 1,  $P < 0.00001$ ; week 2,  $P < 0.00001$ ) (Table 4).

Pain scores using numeric pain rating scale score were calculated in both groups at week 1 and it was significantly lower in Group I than Group II ( $P < 0.00001$ ) (Graph 1).

**Table 1: Age, sex and ureteral stone size distribution of patients**

	Group I Tamsulosin group	Group II Control group	P value
Patient number (n)	42	42	
Age (in years) mean range	42 (20-64)	39 (19-59)	0.4994
Gender			0.6465
Male	28	30	
Female	14	12	
Stone size			0.81443
5 mm	3	2	
6 mm	8	6	
7 mm	10	14	
8 mm	9	11	
9 mm	8	6	
10 mm	4	3	

**Table 2: Irritative symptom scores**

Irritative symptoms	Group I Tamsulosin group n=42	Group II Placebo group n=42	P value
At week 1 (patients)	3 (Mean IPSS=4.33)	17 (Mean IPSS=7.65)	<0.001
At week 2 (patients)	3 (Mean IPSS=3.67)	14 (Mean IPSS=9.14)	

IPSS: International Prostate Symptom Score

Numeric pain rating scale score were calculated in both groups at week 2 and it was significantly lower in Group I than Group II ( $P < 0.00001$ ) (Graph 2).

## DISCUSSION

DJ stent is common useful tool in urology. Despite the improvement in design and material, many patients still develop stent related symptoms, sometimes requiring early removal.

It is well known that alpha-adrenergic receptors ( $\alpha$ -1a and  $\alpha$ -1d receptors) present in the distal ureter, bladder trigone and proximal urethral smooth muscle.<sup>21</sup> Tamsulosin acts as a selective inhibitor of  $\alpha$ -1a and  $\alpha$ -1d mediated contraction of the distal ureter, trigone, and proximal urethral smooth muscle. Relaxation of these smooth muscles decreases bladder outlet resistance and voiding pressure, thereby decreasing renal reflux and voiding symptoms.<sup>17</sup>

**Table 3: Obstructive symptom scores**

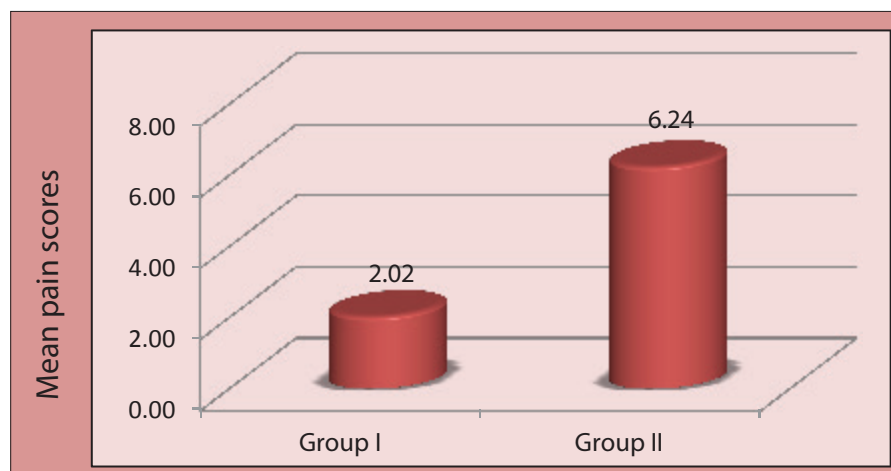
Obstructive symptoms	Group I Tamsulosin group n=42	Group II Placebo group n=42	P value
At week 1 (patients)	2 (Mean IPSS=2.5)	8 (Mean IPSS=4.75)	0.043
At week 2 (patients)	1 (Mean IPSS=2)	6 (Mean IPSS=2.87)	0.048

IPSS: International Prostate Symptom Score

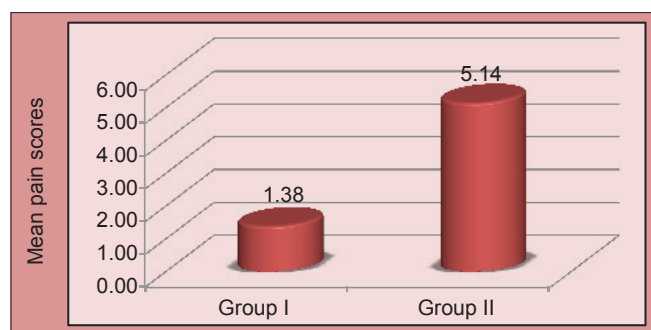
**Table 4: Numeric pain rating scale scores**

Descriptive statistics	Group I	Group II	t' statistic	P value
Pain score at week 1				
Mean	2.02	6.24	14.084	<0.00001
SD	1.093	1.605		
Pain score at week 2				
Mean	1.38	5.14	14.552	<0.00001
SD	1.103	1.260		

SD: Standard deviation



**Graph 1: Comparison of pain scores at week 1 among the patients of two groups**



**Graph 2: Comparison of pain scores at week 2 among the patients of two groups**

Damiano *et al.*, conducted a prospective randomized study in 75 patients (38 of whom received tamsulosin) comparing the efficacy of tamsulosin 0.4 mg daily versus placebo for stent-related symptoms. The stent-related morbidity was evaluated with Urinary Symptom Score Questionnaire. They reported that tamsulosin had positive effects on stent-related urinary symptoms.<sup>22</sup>

Wang *et al.*, conducted a prospective, randomized study in 79 patients with DJ stents comparing tamsulosin with placebo and found that tamsulosin improved stent-related symptoms and quality of life.<sup>23</sup>

Beddingfield and colleagues, in a prospective, randomized and placebo-controlled study, revealed that alfuzosin lessened the complaints in patients in whom the ureteral stent was used.<sup>24</sup>

In the present study, all patients tolerated the indwelling DJ stent for 2 weeks postoperatively. Irritative and obstructive symptoms at 1 and 2 weeks were lower and bodily pain was better in patients who received tamsulosin compared to the placebo group.

## CONCLUSION

Stent-related morbidity is a reality in the majority of patients. Use of selective alpha 1- blocker, such as tamsulosin improves ureteric stent-related urinary symptoms after ureterorenoscopic lithotripsy.

## REFERENCES

1. Zimskind PD, Fetter TR, Wilkerson JL. Clinical use of long-term indwelling silicone rubber ureteral splints inserted cystoscopically. *J Urol* 1967;97:840-4.
2. Hepperlen TW, Mardis HK, Kammandel H. The pigtail ureteral stent in the

3. cancer patient. *J Urol* 1979;121:17-8.
4. Zafar MN. Urologic J.J stents: Uses and complications. *J Pak Med Assoc* 1993;43:146.
5. Chew BH, Knudsen BE, Denstedt JD. The use of stents in contemporary urology. *Curr Opin Urol* 2004;14:111-5.
6. Haleblan G, Kijvikai K, de la Rosette J, Preminger G. Ureteral stenting and urinary stone management: A systematic review. *J Urol* 2008;179:424-30.
7. Joshi HB, Okeke A, Newns N, Keeley FX Jr, Timoney AG. Characterization of urinary symptoms in patients with ureteral stents. *Urology* 2002;59:511-6.
8. Hao P, Li W, Song C, Yan J, Song B, Li L. Clinical evaluation of double-pigtail stent in patients with upper urinary tract diseases: Report of 2685 cases. *J Endourol* 2008;22:65-70.
9. Thomas R. Indwelling ureteral stents: Impact of material and shape on patient comfort. *J Endourol* 1993;7:137-40.
10. Sur RL, Haleblan GE, Cantor DA, Springhart WP, Albala DM, Preminger GM. Efficacy of intravesical ropivacaine injection on urinary symptoms following ureteral stenting: A randomized, controlled study. *J Endourol* 2008;22:473-8.
11. Rane A, Saleemi A, Cahill D, Sriprasad S, Shrotri N, Tiptaft R. Have stent-related symptoms anything to do with placement technique? *J Endourol* 2001;15:741-5.
12. Mosli HA, Farsi HM, al-Zimaity MF, Saleh TR, al-Zamzami MM. Vesicoureteral reflux in patients with double pigtail stents. *J Urol* 1991;146:966-9.
13. Ho CH, Chen SC, Chung SD, Lee YJ, Chen J, Yu HJ, *et al.* Determining the appropriate length of a double-pigtail ureteral stent by both stent configurations and related symptoms. *J Endourol* 2008;22:1427-31.
14. Ramsay JW, Payne SR, Gosling PT, Whitfield HN, Wickham JE, Levison DA. The effects of double J stenting on unobstructed ureters. An experimental and clinical study. *Br J Urol* 1985;57:630-4.
15. Saltzman B. Ureteral stents. Indications, variations, and complications. *Urol Clin North Am* 1988;15:481-91.
16. Breaux RH, Norman RW. Optimal prevention and management of proximal ureteral stent migration and remigration. *J Urol* 2001;166:890-3.
17. Cockett AT, Aso Y, Denis L. On behalf of the members of the committees: Recommendations of the International Consensus Committee. In: Cockett AT, Aso Y, Chatelain C, editors. *Proceedings of The Second International Consultation on Benign Prostatic Hyperplasia (BPH)*. Paris: Pitie-Salpêtrière; 1993. p. 553-64.
18. Deliveliotis C, Chrisofos M, Gougousis E, Papatsoris A, Dellis A, Varkarakis IM. Is there a role for alpha1-blockers in treating double-J stent-related symptoms? *Urology* 2006;67:35-9.
19. Lefèvre-Borg F, O'Connor SE, Schoemaker H, Hicks PE, Lechaire J, Gautier E, *et al.* Alfuzosin, a selective alpha 1-adrenoceptor antagonist in the lower urinary tract. *Br J Pharmacol* 1993;109:1282-9.
20. Lepor H. Long-term evaluation of tamsulosin in benign prostatic hyperplasia: Placebo-controlled, double-blind extension of phase III trial. Tamsulosin Investigator Group. *Urology* 1998;51:901-6.
21. McCaffery M, Beebe A. Pain: Clinical Manual for Nursing Practice. St. Louis, MO: Mosby; 1989.
22. Shibasaki M, Sudoh K, Inagaki O, Uchida W, Honda K. Effect of the optical isomers of YM-12617 on increased intra-urethral pressure induced by phenylephrine in anesthetized dogs. *J Auton Pharmacol* 1992;12:263-8.
23. Damiano R, Autorino R, De Sio M, Giacobbe A, Palumbo IM, D'Armiento M. Effect of tamsulosin in preventing ureteral stent-related morbidity: A prospective study. *J Endourol* 2008;22:651-6.
24. Wang CJ, Huang SW, Chang CH. Effects of specific alpha-1A/1D blocker on lower urinary tract symptoms due to double-J stent: A prospectively randomized study. *Urol Res* 2009;37:147-52.

**How to cite this article:** Imdad Ali N, Mukesh Soni K, Rajesh Ranjan K, Ravishankar TH, Jayaprakash G, Shivshankarappa M. Effect of Alpha Blocker in Improving Double - J Ureteral Stent - Related Morbidity: A Prospective Randomized Study. *Int J Sci Stud* 2015;2(11):81-84.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Antibacterial Activity of Silver Nanoparticles Incorporated in Acrylic Resin - An *In vitro* Study

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## Abstract

**Background:** Self cure acrylic resin is a polymer widely used in dentistry for fabrication of orthodontic appliance, the provisional prosthesis, denture relining etc., However, it does not possess any inherent antibacterial property. Hence, various antibacterial agents have been added to resin and tested for the antibacterial activity.

**Aims:** The aim of this study was to investigate the antibacterial effect of silver nanoparticles incorporated into the resin matrix over a period.

**Materials and Methods:** The samples were divided into two groups, study and control. For control group, self-cure resin was polymerized in cylindrical molds of 9 mm diameter - 3 mm height. For study group, silver nanoparticles were added to monomer liquid in the concentration of 0.06% (0.6 mg/ml) and polymerized in similar molds. Agar diffusion assay was used to test for anti-bacterial activity of both groups against a cariogenic strain of *Streptococcus mutans*. The antibacterial activity was tested at 1, 7, 15 and 30 days time period. The readings were recorded and analyzed using unpaired *t*-test.

**Results:** The control group showed no zone of growth inhibition on agar plates. While study group (containing 0.06% silver nanoparticles) showed zone of growth inhibition around the acrylic tablets placed in agar plates. The zone of growth inhibition decreased over time. On day 30, no zone of growth inhibition was seen in study group.

**Conclusion:** When silver nanoparticles are added to the resin liquid in 0.06% concentration, the resin matrix shows antibacterial property without affecting its compressive strength. The antibacterial effect gradually decreased with time, as silver particles are released from the resin matrix.

**Key words:** Agar diffusion test, Self cure acrylic resin, Silver nanoparticles

## INTRODUCTION

Since centuries silver has been used in traditional Indian and Chinese medicine. The first documented use of silver in the field of medicine dates back to 8<sup>th</sup> century.<sup>1</sup> Silver is an oligodynamic antimicrobial, effective in low concentration against more than 650 microorganisms. Silver ions (Ag<sup>+</sup>) and its compounds have strong biocidal effects on many species of bacteria, but show very little toxicity toward

animal cells.<sup>2</sup> The nanoparticles of metallic silver are highly stable. They have large active surface area because of their nanometer size. This increases their antimicrobial action compared to silver compounds, which are not in nanometer size range.<sup>3</sup>

Self-cure resin is a polymethyl methacrylate based polymer containing no copolymer. Chemical reaction between the initiator and activator initiates polymerization. The double bonds in the polymer are broken down by the free radicals that are formed. In case of self-cure resin, surface characteristics such as roughness, surface energy, and porosity are high, whereas degree of polymerization and color stability are low. All these factors aid in the retention of bacteria and biofilm on the surface of resins.<sup>4</sup> It is also well documented that during the course of orthodontic

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Month of Submission : 12-2014  
Month of Peer Review : 01-2015  
Month of Acceptance : 01-2015  
Month of Publishing : 02-2015

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therapy, an alteration in biofilm, with increased levels of *Streptococcus mutans* and *Lactobacilli* are seen.<sup>5</sup>

Studies have been conducted on incorporation of various antimicrobial agents like cetyl pyridinium chloride, chlorhexidine diacetate, methacryloyloxydodecyl pyridinium bromide, and silver zeolite into the resin matrix. Results of these studies had shown that adding an antimicrobial agent rendered the resin matrix some antibacterial property.<sup>6</sup> However, this antibacterial property was largely dependent on the antibacterial agent and its concentration and the nature of the polymer in which agent is incorporated.<sup>7</sup> However, data regarding the duration of the antibacterial activity of different agents added to the resin are lacking. Therefore, the aim of the present study was to assess the antibacterial effect of silver nanoparticles incorporated into the acrylic resin, against *S. mutans* over a period of thirty days.

## MATERIALS AND METHODS

Silver nanoparticles used in the present study were obtained from the Indian Institute of Science (IISc), Bangalore. Mean particle size of these nanoparticles ranged from 3 nm to 22 nm. Particles were extracted from silver nitrate using a procedure developed by the dept. of chemical engineering, IISc, Bangalore.<sup>8</sup> These particles were then provided in liquid form, with silver concentration of 0.6 mg/ml.

The cariogenic strain of *S. mutans* was obtained from Institute of Microbial Technology, Chandigarh. The strain obtained was serotype C, microbial type culture collection no 1943 equivalent to NCTC 10449. *S. mutans* strain was maintained on brain heart infusion agar plates and liquid media. This bacterial suspension was used for the study.

Ethical clearance for the study was not required as it was an *in-vitro* study conducted on resin molds. Self-cure resin manufactured by dual polarization interferometry was used for the present study. Molds of 9 mm diameter and 3 mm height were cut from a disposable syringe using carborandum disc. For the control group, molds were placed on a flat glass surface and stabilized with wax. Following manufacturer's instruction acrylic powder and liquid were mixed in 3:1 ratio in a ceramic jar. The mix was then poured into the molds and molds were covered with a flat glass slab. For the study group, silver nanoparticles were mixed directly to the acrylic liquid to allow for uniform distribution of particles in the resin matrix. Silver was added in 0.06% concentration. Now acrylic powder and liquid were mixed in the same proportion in a different ceramic jar and poured into remaining molds using a similar procedure. Acrylic specimens with any surface irregularities were discarded. The remaining specimens in each group

(10 for the control group and 10 for the study group) were stored in two different glass containers in distilled water. On the specified day of the test, one sample from each group was randomly selected by the technician for the antibacterial test.

Agar diffusion test, a widely used method for testing antibacterial activity of various agents, was used in this study. A 3 mm thick layer of sterilized meuller hinton the agar was poured into petridishes and cooled. Optimum sterilization was maintained for preventing contamination of the agar medium. The bacterial suspension was then uniformly inoculated on the surface of the agar. Using hollow stainless steel pipes of 9 mm diameter, wells were created in the center of the agar. One specimen from each group was selected randomly and placed in the well in different plates. Each plate was then labeled as control and test. The plate was then covered and incubated at 37°C for 24 h. After incubation was completed, the zone of inhibition was measured for each group using a hi-antibiotic zone scale.

Five samples from each group were selected randomly for testing compressive strength of the specimen. The compressive strength testing was done using Universal testing machine at MSRT, Bangalore. The readings were recorded and analyzed using unpaired *t*-test. SPSS version 15 was used for the statistical analysis.

## RESULT

The zone of inhibition measured using Hi antibiotic zone scale at all the test periods are listed in Table 1. The control group showed no zone of growth inhibition throughout the study, whereas study group showed 16 mm zone of growth inhibition on day 1 (Figure 1), which decreased to 14 mm on day 7 (Figure 2), 10 mm on day 15 (Figure 3) and on day 30 no zone of growth inhibition was present (Figure 4). A graph of antibacterial activity (zone of growth inhibition) against time was plotted, and it showed a gradual decrease in the antibacterial effect (Graph 1). Another graph was plotted, which showed the extent to which the ions released travelled into the medium (Graph 2).

The readings of compressive strength testing were analyzed using "unpaired *t*-test." Compressive strength of the

**Table 1: Zone of inhibition observed on day 1, 7, 15, 30 respectively**

Day	Control group	Study group
1	0 mm	16 mm
7	0 mm	14 mm
15	0 mm	10 mm
30	0 mm	0 mm

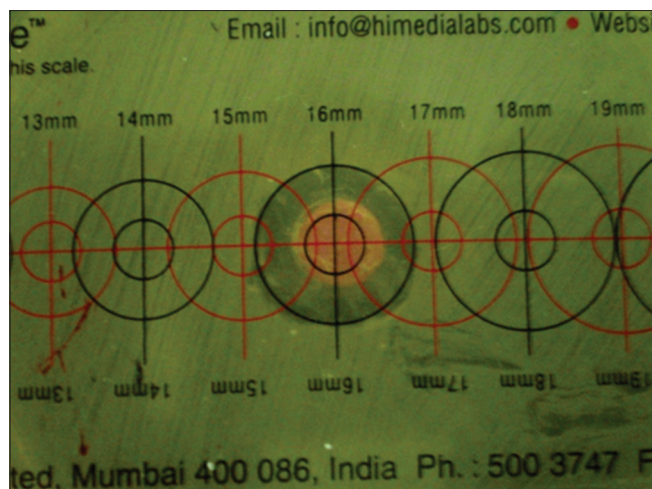


Figure 1: Zone of growth inhibition on day 1

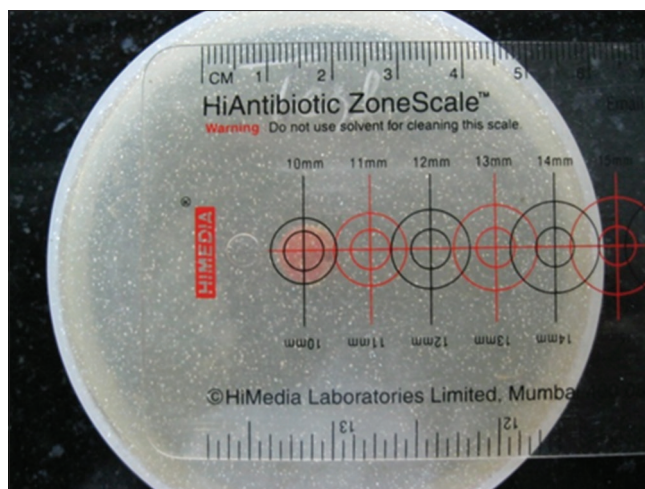


Figure 4: Zone of growth inhibition on day 30

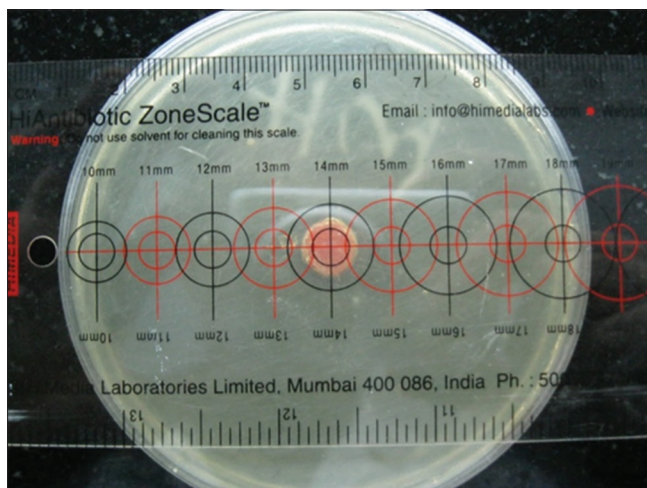
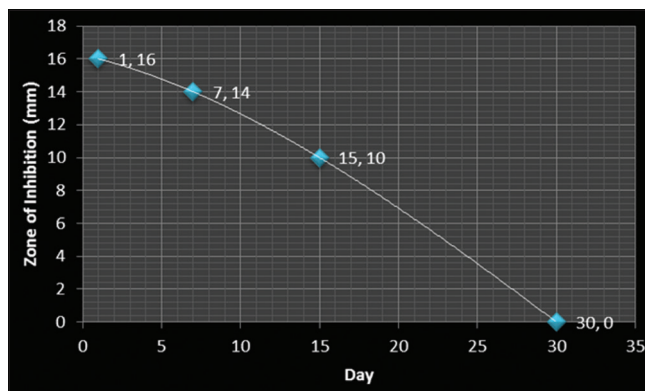


Figure 2: Zone of growth inhibition on day 7



Graph 1: Antibacterial activity plotted against time showing gradual decrease in the antibacterial effect

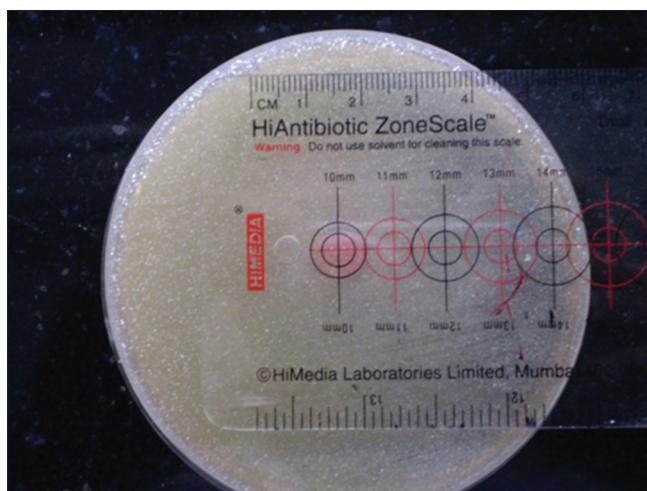
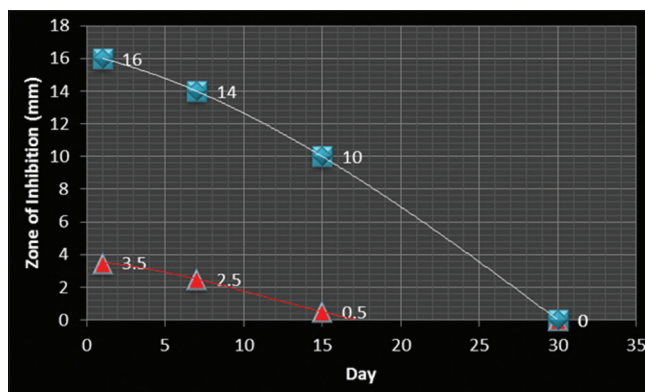


Figure 3: Zone of growth inhibition on day 15



Graph 2: Red line indicates extent to which silver ions have travelled into the medium

## DISCUSSION

Silver nanoparticles act mainly by two mechanisms,

- I. Ionic theory and
- II. Free radical theory.

According to Ionic theory, silver ion ( $\text{Ag}^+$ ) has a net positive charge. It is electrostatically attracted and adsorbed on to

control group was 137.2 Mpa (standard deviation [SD] = 20.8) and that of the study group was 139.2 Mpa (SD = 14.6). The difference was statistically insignificant.



the negatively charged cell wall of the bacteria. On the surface of cell wall, it competes for binding sites, and internally in the cell it binds to sulfur and phosphorus containing compounds, i.e. DNA. This causes it to condense and prevent replication. Also, it inhibits metabolic systems of bacteria like the respiratory system and electron chain transport. According to free radical theory, silver ion catalyzes lysis of water ( $H_2O$ ), to produce hydroxyl ( $OH^\cdot$ ) ion. Thus according to Ionic theory it can be assumed that silver ions released into the agar medium inhibit *S. mutans* growth. The free radical theory can be suitably associated with decrease surface attachment of *S. mutans*.

The release of silver ions from the resin matrix depends upon the following:<sup>8</sup>

- 1 Degree of polymerization
- 2 Molecular weight of the polymer
- 3 Copolymer (copolymerization)
- 4 Interaction with liquid or aqueous substances at interface
- 5 Concentration of silver.

As the molecular weight of the polymer increases the degree of polymerization increases. Increased enlargement in matrix is also seen. Due to this, the diffusion of antibacterial agent through the polymer matrix and subsequent release of silver are decreased, and the antibacterial effect can be prolonged. Copolymerization can decrease the harmful effect of free radical. Free radicals formed during polymerization reaction can decrease efficacy of silver particles.

Also, the concentration of silver nanoparticles required to produce desired antibacterial effect through the resin polymer is high.<sup>7</sup> In a study conducted by Juan Francisco Hernandez Sierra *et al.* Antimicrobial sensitivity of *S. mutans* was tested. They found that the minimum inhibitory concentration (MIC) for silver was  $4.86 \pm 2.71$   $\mu g/ml$ , and minimum bactericidal concentration was 6.25  $\mu g/ml$ .<sup>9</sup> But when silver particles are added to the composite material or polymer the MIC was in the range of 62.5-500  $\mu g/ml$ .<sup>7</sup> In studies where silver zeolite was used as an antibacterial agent, the concentration required was 1%.<sup>5</sup> Hotta *et al* in 2004 mixed 10% Ag-Zn zeolite to light-cured composite resin and tested antibacterial activity against *S. mutans* by the agar plate diffusion method. He found a zone of growth inhibition of 2-4 mm around the specimen.<sup>10</sup> In another study done by Ikeda *et al.* 5, 10, 15, 20, and 25% silver was used as an antibacterial agent incorporated in resin-sealing agents. The authors found a 2 mm zone of growth inhibition for *S. mutans*.<sup>11</sup> The findings of the present study are in accordance with all these previous studies, when antibacterial activity of silver

nanoparticles against *S. mutans* is considered. However, the present study utilized silver in much lower concentrations when compared to the above mentioned studies.

The results of the present study are also in agreement with a recent study conducted by Kasraei *et al.* where they had found that the composites containing nano zinc oxide particles or silver nanoparticles exhibited higher antibacterial activity against *S. mutans* and *Lactobacillus*.<sup>12</sup>

This study used a planktonic bacterial model. Planktonic bacteria are more susceptible to environmental factors and antibacterial agents when compared to attached species or biofilm based bacterial models. As a result, growth of *S. mutans* on agar plate was not uniform at 1, 7, 15, and 30 days.

## CONCLUSION

When silver nanoparticles are added to the resin liquid in 0.06% concentration, the resin matrix showed antibacterial property without affecting its compressive strength. The antibacterial effect gradually decreased with time, as silver particles are released from resin matrix. However, considerable amount of silver may be present on the surface and in the matrix which may decrease the surface attachment of *S. mutans* and plaque formation. Thus, it is essential to conduct further studies using biofilm based bacteria and test surface attachment of *S. mutans*. Also, different concentrations of silver particle should be used to obtain concentration range which will enhance antibacterial effect without affecting mechanical properties.

## REFERENCES

1. Shirley AD, Dayanand A. Antimicrobial activity of silver nanoparticles synthesized from novel streptomyces species. Dig J Nanomater Biostruct 2010;5:447-51.
2. Raffi M, Hussain F. Antibacterial characterization of silver nanoparticles against E: Coli atcc-15224. J Mater Sci Technol 2008;24:24-8.
3. Singh M, Singh S, Prasad S. Nanotechnology in medicine and antibacterial effect of silver nanoparticles. Dig J Nanomater Biostruct 2008;3:115-22.
4. Hilgenberg SP. Evaluation of surface physical properties of acrylic resin for provisional prosthesis. Mat Res 2008;11:32-6.
5. Jordan C, LeBlanc DJ. Influences of orthodontic appliances on oral populations of mutans streptococci. Oral Microbiol Immunol 2002;17:65-71.
6. Kuroki K, Hayashi T, Sato K, Asai T, Okano M, Kominami Y, *et al.* Effect of self-cured acrylic resin added with an inorganic antibacterial agent on *Streptococcus mutans*. Dent Mater J 2010;29:277-85.
7. Egger S, Lehmann RP, Height MJ, Loessner MJ, Schuppler M. Antimicrobial properties of a novel silver-silica nanocomposite material. Appl Environ Microbiol 2009;75:2973-6.
8. Kumar R, Howdle S, Münstedt H. Polyamide/silver antimicrobials: Effect of filler types on the silver ion release. J Biomed Mater Res B Appl Biomater 2005;75:311-9.
9. Hernández-Sierra JF, Ruiz F, Pena DC, Martínez-Gutiérrez F, Martínez AE, Guillén Ade J, *et al.* The antimicrobial sensitivity of

- Streptococcus mutans* to nanoparticles of silver, zinc oxide, and gold. Nanomedicine 2008;4:237-40.
10. Hotta M, Taki E, Saku S, Yamamoto K. Evaluation of antibacterial restorative materials to root caries of elderly people. Ag-Zn zeolite powders incorporated in light-cured resin composite. Jpn J Conserv Dent 2004;47:535-42.
  11. Ikeda S, Igarashi T, Goto N, Miyazaki T. Antibacterial activity of resinous temporary sealing material containing silver inorganic antibacterial agent to cariogenic bacteria. J Dent Mater 2001;20:184-8.
  12. Kasraei S, Sami L, Hendi S, Alikhani MY, Rezaei-Soufi L, Khamverdi Z. Antibacterial properties of composite resins incorporating silver and zinc oxide nanoparticles on *Streptococcus mutans* and *Lactobacillus*. Restor Dent Endod 2014;39:109-14.

**How to cite this article:** Babu NS, Dave P, Jha S, Patel P. Antibacterial Activity of Silver Nanoparticles Incorporated in Acrylic Resin - An *In vitro* Study. Int J Sci Stud 2015;2(11):85-89.

**Source of Support:** Nil, **Conflict of Interest:** None declared.



# Study of Isoniazid and Rifampicin Resistance among New Sputum Smear Positive Pulmonary Tuberculosis Patients by Line Probe Assay in Bikaner

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## Abstract

**Introduction:** An alarming increase in the global incidence of drug resistant *Mycobacterium tuberculosis* (TB) infection has created a critical need for methods that can rapidly identify drug resistant cases, why isoniazid and rifampicin (RIF) so important, isoniazid is the most powerful Mycobactericidal drug available that ensures early sputum conversion and helps in decreasing the TB transmission.

**Materials and Methods:** A total of 100 patients with new sputum smear positive for acid-fast bacilli were enrolled for study and patient excluded with the following criteria, took TB treatment for >1 month, sputum negative pulmonary TB, age >12 years, all extra pulmonary TB cases, patients who could not participate actively. We used molecular based mechanism to detect of the drug resistant mycobacterium, Line probe assay. Statistical package for the social sciences version 10 was used to analyze the results with  $P < 0.05$  taken as significant.

**Result:** Among the 100 new sputum positive patients, one of multi-drug resistant (MDR) TB, 12 are isonicotinic acid hydrazide (INH) mono resistant and none of the RIF mono resistant found in Bikaner, India. Our results also match with others previous studies, the prevalence of initial MDR was 1.1% in Bangalore (1980), 0.8% in Pondicherry (1985-1991), 0.9% in Jaipur (1989-1991), 1% in Pune (1992-1993), and many more study support our study and World Health Organization data of drug resistant.

**Conclusion:** Prevalence of MDR-TB in new sputum positive patient 1%, INH monoresistance is 12%, no monoresistance found for RIF. The status of initial MDR-TB is low in Bikaner district, which reflects the success of directly observed treatment, short-course in effective treatment of drug-susceptible TB and preventing the emergence of drug resistance. Since MDR-TB is rare among new TB cases, all new cases of pulmonary TB can be treated with empirical Category I regimen.

**Key words:** Antibacterial drug resistance, Multi drug-resistant, Tuberculosis

## INTRODUCTION

Tuberculosis (TB) is curable and preventable disease, which is caused by *Mycobacterium TB* (MTB). It most

commonly affects the lungs but can potentially involve any system or organ of the body. It is estimated that one untreated infectious TB patient is likely to infect 10-15<sup>1,2</sup> people because when they cough or sneeze, they expel large amount of droplets containing large number of bacteria, sputum smear positive (SSP) pulmonary TB patients are the most significant source of droplet nuclei, which carry infectious bacilli.<sup>3</sup> The situation is made worse by the emergence of drug resistant TB, particularly the multi-drug resistant (MDR) and extensively drug-resistant (XDR)<sup>4,5</sup> TB. A case of MDR-TB is about 20-40 times more expensive to manage than a case of drug-sensitive

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Month of Submission : 12-2014  
Month of Peer Review : 01-2015  
Month of Acceptance : 01-2015  
Month of Publishing : 02-2015

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TB.<sup>6</sup> Although drug resistance was observed in MTB isolates even in the early days of chemotherapy, the emergence of strains resistant to the two most potent anti-TB drugs-Isoniazid (H) and rifampicin (RIF) i.e. MDR-TB. The level of initial drug resistance is considered to be an epidemiological indicator to assess the success of the National TB Programmed.<sup>7</sup>

An alarming increase in the global incidence of drug-resistant MTB infection has created a critical need for methods that can rapidly identify drug-resistant cases.<sup>8,9</sup>

The choice of technology to be used for diagnosis of MDR-TB has been determined as per recommendations of the National Laboratory Committee.<sup>10,11</sup> Thus, for the drug sensitivity testing at certified laboratory wherever available molecular Department of Science and Technology (DST) (e.g. line probe assay [LPA]) is preferred diagnostic method because of the rapid and highly-accurate RIF results.<sup>12</sup>

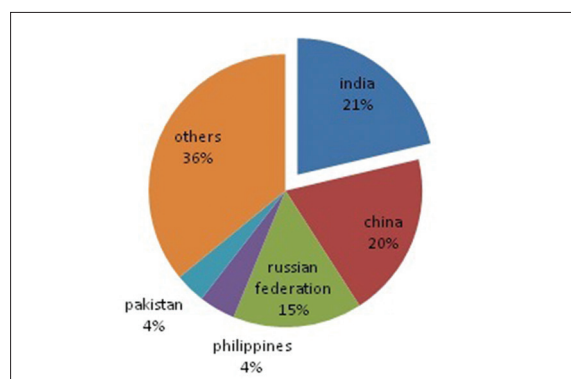
The emergence and spread of drug resistant TB are threatening to destabilize global TB control. The prevalence of drug resistant TB is increasing throughout the world both among new TB cases as well as among previously-treated ones (Figure 1). Depicts a pie chart showing proportion of estimated incident cases of MDR TB in 2012 World Wide.

Although previous treatment for TB is the strongest risk factor for the development of drug resistant TB,<sup>13-15</sup> naïve patients are also at risk due to either spontaneous mutations or transmission of resistant strains.<sup>16,17</sup> The risk of transmission of resistant strains from close contacts is increasing day-by-day because of the growing burden of drug resistant TB patients.<sup>18</sup> Therefore in the context to Bikaner division this study sought to determine the status of isoniazid and RIF resistance by LPA in Bikaner district. MTB undergoes spontaneous, slow but constant mutation resulting in resistant mutant organism.<sup>19,20</sup> This natural phenomenon varies for different anti-TB drug and

is genetically determinant. Spontaneous occurrence of drug-resistant mutants in wild strains of mycobacterium for RIF is 1 strain in  $10^8$  bacilli, for isoniazid, streptomycin, ethambutol, kanamycin and p-aminosalicylic acid is 1 strain in  $10^6$  bacilli and for ethionamide, cycloserine, capreomycin and thiacetazone is 1 strain in  $10^3$  bacilli. Spontaneous occurrence of resistant mutants for RIF and isoniazid both simultaneously is 1 strain in  $10^{14}$  bacilli.<sup>21</sup>

Thus in a 2.5 cm cavity, which harbors  $10^8$ - $10^9$  bacilli only one naturally RIF resistant and 100-1000 naturally isoniazid resistant strains may be found. This illustrates a very fundamental principle that MDR-TB is a man-made problem.<sup>22</sup> A high bacterial load and several cycles of inappropriate treatment are therefore needed for significant numbers of drug resistance bacilli to emerge (acquired drug resistance). These strains can also be transmitted to individuals who have never before had TB and they can present with drug resistance TB (primary drug resistance), resistance can be for mono drug, poly drug, MDR (resistant to isonicotinic acid hydrazide [INH] and regional integrated pest management) with and without other drug, XDR (MDR plus resistant to fluoroquinolones, kanamycin, amikacin, capreomycin. Poly drug resistant other than INH and RIF at a time, Total drug resistant, resistant to all first line and second line drug.<sup>23</sup>

Why INH and RIF so important, isoniazid is the most powerful Mycobactericidal drug available that ensures early sputum conversion and helps in decreasing the TB transmission. RIF because of its mycobactericidal and sterilizing activities is crucial for preventing relapses. Thus, Isoniazid and RIF are the keystones in TB management. Molecular mechanism of drug resistant of isoniazid resistant, mutation in *katG* is the main mechanism of INH resistance.<sup>24</sup> *KatG* S315T mutation is the most common mutation in INH-resistant strains, especially in high level resistant strains (minimum inhibitory concentration [MIC]>5 µg/ml) low-level resistant strains (MIC<1 µg/ml) often still possess catalase activity.<sup>25,26</sup> Accounting for 50–95% of INH-resistant clinical isolates.<sup>27</sup> Mutations in *inhA* or its promoter region are usually associated with low-level resistance (MICs = 0.2-1 µg/ml) and are less frequent than *katG* mutations. INH-resistant MTB harboring *inhA* mutations could have additional mutations in *katG*, conferring higher levels of INH resistance<sup>28,29</sup> mutations in *inhA* not only cause INH resistance, they also confer cross-resistance to the structurally related drug, ethionamide. RIF resistant, RIF is a potent inhibitor of DNA dependent RNA polymerase. RNA polymerase consists a core enzyme having 4 polypeptide chains  $\alpha_2\beta\beta'$  and an additional subunit  $\sigma$  that allows promoter recognition for initiation of transcription. These proteins and subunits ( $\alpha\beta\beta'\sigma$ ) are coded by different genes known as *rpoA*, *rpoB*, *rpoC* and *rpoD* respectively.



**Figure 1: Proportion of estimated incident cases of MDR TB in 2012**

RIF resistance (>96%) has been associated with mutations in the *rpoB* gene. Genetic probes which detect drug resistance to RIF with >95% accuracy are very suggestive of MDR-TB; <10% of RIF resistance is monoresistant so the RIF resistance is a surrogate marker for MDR-TB in >90% of cases. In an Indian study Siddhiq *et al.*<sup>30,31</sup> found that most isolates had mutations at cod on 531. Mutations at 516 and 521 are associated with low level resistance (MIC <40 µg/ml) and mutations at 510, 526, 527, 528, 531 are associated with high level resistance (MIC >64 µg/ml). LPA It is a manual and automated system, which is validated for SSP samples. Two commercial assay are available INNO-Lipa test a geno type MTB complex assay use for *rpoB* gene mutation for RIF. *InhA* and *KatG* mutation for isoniazid, these also can be used for disease differentiation form MOTT. LPA s are highly sensitive (≥97%) and specific (≥99%) for the detection of RIF resistance, alone or in combination with isoniazid (sensitivity ≥90%; specificity ≥99%), on isolates of MTB and on smear-positive sputum specimens.<sup>32,33</sup> Overall accuracy for detection of MDR-TB was equally high at 99% and retained when RIF resistance alone was used as a marker for MDR.<sup>34</sup>

LPA s are not a complete replacement for conventional culture and DST, as mycobacterial culture is still required for smear-negative specimens while conventional DST is still necessary to confirm XDR-TB.<sup>35,36</sup> Limitation of LPA: Not applicable for sputum negative and extra pulmonary TB cases. Requires highly sophisticated infrastructure. Skilled and highly trained persons are required. The global incidence of primary and secondary resistance was 3.6% and 20.2%, respectively. Drug XDR TB had been reported by 92 countries globally by the end of 2012.

Revised National TB Control Programme (RNTCP) has recently undertaken three communities based state level drug resistance surveillance studies in Gujarat, Maharashtra and Andhra Pradesh and estimated the prevalence of MDR-TB to be about 3% in new cases and 12-17% in re-treatment cases.

## MATERIALS AND METHODS

One hundred patients with new SSP for acid-fast bacilli (AFB) were included in this prospective study.

The patients who had taken TB treatment for >1 month, sputum negative pulmonary TB, age >12 years, all extra pulmonary TB cases, patients who could not participate actively were excluded from the study. Thorough examination of the respiratory system and sputum for AFB smears × 2 samples as per RNTCP guidelines the samples were transported immediately to intermediate reference laboratory (IRL), Ajmer.<sup>37</sup> Other investigation

including hematology (complete blood count, rythrocyte sedimentation rate), X-ray chest posterioranterior View, blood Sugar and HIV were done. LPA technology involves the following steps.<sup>38</sup> DNA is extracted from MTB isolates or directly from clinical specimens. Polymerase chain reaction (PCR) amplification of the resistance-determining region of the gene under question is performed using biotinylated primers. Following amplification, labeled PCR products are hybridized with specific oligonucleotide probes immobilized on a strip. Captured labeled hybrids are detected by colorimetric development, enabling detection of the presence of MTB complex, as well as the presence of wild-type and mutation probes for resistance. LPA testing should be performed in three separate rooms and World Health Organization (WHO) recommendation manner. DNA extraction should be performed in the biosafety level-3 (BSL-3) laboratory, master mix preparation in a second room, and PCR and hybridization were performed in a third laboratory. If a mutation is present in one of the target regions, the amplicon will not hybridize with the relevant probe. Mutations are therefore detected by the lack of binding to wild-type probes, as well as by binding to specific probes for the most commonly occurring mutations.<sup>39</sup> The post-hybridization reaction leads to the development of colored bands on the strip at the site of probe binding and is observed by eye.

LPA are highly sensitive (≥97%) and specific (≥99%) for the detection of RIF resistance, alone or in combination with isoniazid (sensitivity ≥90%; specificity ≥99%), on isolates of MTB and on smear-positive sputum specimens. Overall accuracy for detection of MDR was equally high at 99% and retained when RIF resistance alone was used as a marker for MDR. LPA are not a complete replacement for conventional culture and DST, as mycobacterial culture is still required for smear-negative specimens while conventional DST is still necessary to confirm XDR-TB. Sputum samples, which were found positive by ziehl-neelsen staining at the IRL lab, Ajmer, were subjected to LPA testing to detect isoniazid and RIF resistance.

The geno type MTB plus LPA was performed according to the manufacturer's (Hain Lifescience, Nehren, Germany) instructions. Three steps for LPA test included DNA extraction, multiplex PCR amplification and reverse hybridization. These steps were carried out in three separate rooms with restricted access and unidirectional workflow. Mycobacterium DNA was extracted in BSL-3 laboratory according to manufacturers' instructions. Briefly, 500 µl of decontaminated sputum sample was centrifuged at 10,000 × g for 15 min, the supernatant was discarded, 100 µl lysis buffer (A-LYS) was added. Then it was resuspended and incubated for 5 min at 95°C, 100 µl neutralization buffer (A-NB) was added and centrifuged for 5 min at



full speed in a centrifuge. A volume of 5 µl of the DNA supernatant was used for PCR while the remainder was stored at 20°C. Master mixture for amplification consisted of 10 µl amplification mix-A (provided with kit), 35 µl of amplification mix-B (provided with kit) and 5 µl of DNA supernatant in a final volume of 50 µl. The amplification protocol consisted of 15 min of denaturation at 95°C, followed by 20 cycles comprising denaturation at 95°C for 30 s and 65°C for 2 min. This was followed by 30 cycles comprising 95°C for 25 s, 50°C for 40 s and 70°C for 40 sec and a final extraction at 70°C for 8 min. Hybridization was performed with the automatic machine (GT blot-48). After hybridization and washing, strips were removed, fixed on paper and results were interpreted.<sup>39</sup> Each strip of LPA had 27 reaction zones (bands), including six controls (conjugate, amplification, MTB complex (TUB), rpoB, katG and inhA controls), eight rpoB wild-type (wt1-wt8) and four mutant probes (rpoBMUT1, rpoBMUT2A, rpoBMUT2B, and rpoBMUT3), one katG wild-type and two mutant probes (katGMUT1 and katGMUT2), and two inhA wild type and four mutant probes (inhAMUT1, inhAMUT2, inhAMUT3A, inhAMUT3B). Either missing of wild-type band or the presence of mutant band was taken as an indication of a resistant strain. Incomplete amplification of RIF and/or INH genes was considered as an invalid result.

### Statistical Analysis

According to the reports of IRL lab Ajmer, statistical analysis was done. Appropriate test was applied as and when required using statistical package for the Social Sciences Software version 10.0 and isoniazide and RIF and both resistances were calculated. Ethical approval for the study was obtained by the Institutional Review Board.

## OBSERVATION AND RESULTS

Observations of 100 patients in different parameters e.g., data according geographical distribution, out of that most of the patient form rural (57.1%) of Bikaner and there were 43% from urban back ground. Majority of the cases were farmers (28%) followed by house wives (27%). Laborer and students constituted to the tune of 13%, and others were 12%. Seven percent of cases were Government employees. The addiction to smoking in 25% cases and 9% were for alcohol, and 5% were for tobacco. Only one case was consuming opium, 68% cases had no addiction symptomatically Majority of cases were having cough (94%), fever in 89% cases. 49% cases reported expectoration, 39% loss of appetite, 46% had weight loss (Table 1). Breathlessness and chest pain was reported by 24 and 34% cases, respectively. Comorbiditize were: Diabetes 7%, HIV 3%, Hypertension 2%, ischemic heart disease 2%. Resistance to isoniazid 12%, RIF 0 and MDR in only one

**Table 1: Distribution of the study patients according to their symptoms**

Symptoms	Number n=100	Percentage
Cough	94	94.00
Expectoration	49	49.00
Loss of appetite	39	39.00
Weakness	59	59.00
Weight loss	46	46.00
Fever	89	89.00
Hemoptysis	17	17.00
Breathlessness	24	24.00
Chest pain	34	34.00

case. According to age, it is evident that out of 12 cases having resistance with Isoniazid, 4 cases were present in age group 51-60 years followed by 3 cases each in age group 12-20 and 21-30 years (Table 2). One case was in 41-50 age group and one was in 61-70 age group. Only 1 MDR case found in age group 61-70 year of age. The data show that out of 12 isoniazid resistant cases, 6 were males and 6 were females, and 1 MDR case was male. Of 12 cases having resistance to isoniazid, 3 were farmers, 4 were house wives, 2 were students, 1 was Government employee, 1 laborer and others. The 1 case of MDR was farmer. None of the patients had RIF monoresistance. Perusal of data reveals that out of 12 cases resistant to isoniazid, 7 were having no addiction. However, 5 cases were addicted to smoking and alcohol both, out of which 1 case was addict to opium also in addition to smoking and alcohol. The only case of MDR was habitual of smoking and alcoholism.

Out of total resistant cases, only one (diabetes) co morbidity was found. Majority of cases having isoniazid resistance were recorded in socio-economic status (SES) Class III-V ( $P < 0.001$ ). Data reveals that the 7 isoniazid resistant cases had a history of contact with known case of TB and 1 multi drug resistant case had a history of contact with known case of MDR-TB.

## DISCUSSION

The present study was prospective done on consecutively enrolled 100 patients in the Department of Respiratory Medicine, Sardar Patel Medical College, Bikaner, Rajasthan. The demographic profile of our patients was similar to other series, with a majority (61.89%) of male patients in the economically productive age group.

The mean age of our cohort was 41.7 years whereas mean age for males and females was 44.14 years and 37.54 years, respectively. Majority (63%) of patients belong to economically productive age group. In a similar study at Delhi, mean age of the patients was  $27.8 \pm 10.2$  year; 59 (27%) were females.



**Table 2: Distribution of various parameters in the patients with resistance to anti-tubercular drug**

Parameter	Isoniazid resistance	RIF resistance	MDR
Age group			
12-20	3	0	0
21-30	3	0	0
31-40	0	0	0
41-50	1	0	0
51-60	4	0	0
61-70	1	0	1
>70	0	0	0
Gender			
Male	6	0	0
Female	6	0	0
Occupation			
Farmer (n=28)	3	0	1
Government employee (n=07)	1	0	0
Laborer (n=13)	1	0	0
Housewife (n=27)	4	0	0
Student (n=13)	2	0	0
Other (n=12)	1	0	0
Comorbidity			
Diabetes mellitus (07)	01	0	0
HIV (03)	0	0	0
Hypertension (02)	0	0	0
IHD (02)	0	0	0
Socio economic scale (Modified kuppusswamy scale)			
I	0	0	0
II	01	0	0
III	0	0	0
IV	03	0	0
V	09	0	01
Addiction			
Nil (n=68)	7	0	0
Smoker (n=25)	5	0	1
History of contact			
Yes	7	0	1
No	5	0	0
Education			
Illiterate (n=61)	06	0	01
R and W (n=06)	0	0	0
Primary (n=07)	02	0	0
Middle (n=08)	02	0	0
Secondary (n=07)	02	0	0
Senior secondary (n=05)	01	0	0
Graduate (n=06)	0	0	0

MDR: Multi drug resistance, RIF: Rifampicin

According to WHO global report 2013, prevalence of primary/initial drug resistance in India was around 2.2%. The prevalence of initial MDR, isoniazid monoresistance and RIF monoresistance observed in different studies in different institutes and tertiary care centers India and result were founds, ranged from 0.5% to 3%, 10.4-15.2% and 0.5-2% respectively from years 1999 to 2005.<sup>40</sup>

In the previous studies the prevalence of initial MDR was 1.1% in Banglore<sup>41</sup> (1980), 0.8% in Pondicherry<sup>42</sup> (1985-1991), 0.9% in Jaipur<sup>43</sup> (1989-1991), 1% in Pune<sup>44</sup> (1992-1993), and many more study support our study. However,

Anuradha *et al.*, showed 1.5% RIF monoresistance. In the present study monoresistance to, isoniazid was 12%. In 2009, Ramachandran *et al.*, also found (11%) similar results.

Risk factors for drug resistant TB: Here factors are, contact history, low SES and illiteracy were found to be associated with drug resistance.

In this study, the association between age and gender with drug resistance not significant. However, according to WHO report on MDR and XDR surveillance 2010 data from many countries showed no association between drug resistance and gender of the patient. MDR-TB surveillance data in 13 Countries of Central and Eastern Europe showed that peak of MDR-TB was seen at 35-44 years of age.<sup>45</sup>

Our work showed that the association known for centuries between TB and poverty also applies to MDR-TB. In this study, majority of drug resistant TB patients were of low SES and uneducated, which was similar to Turkey study.<sup>46</sup> In the present study, no significant association was found between addiction and initial drug resistance. The issue of HIV infection being a risk factor for drug resistant TB has been discussed for several years. Here 3% patient were positive for HIV and none of them were having drug resistance, Therefore, the HIV positive status and MDR may be events independent of each other in the present study. Bashar *et al.*, found a significant association between diabetes and MDR-TB. In present study, 7 patients were diabetic, and none of them are MDR TB, was isoniazid monoresistance. In the present study, significant association was found between contact history and drug resistance.<sup>1</sup>

## CONCLUSIONS

The status of initial MDR-TB is low in Bikaner district, which reflects the success of directly observed treatment, short-course in effective treatment of drug-susceptible TB and preventing the emergence of drug resistance. Since MDR-TB is rare among new TB cases, all new cases of pulmonary TB can be treated with empirical Category I regimen.

## REFERENCES

1. Chakraborty AK. Epidemiology. In: Sharma SK, Mohan A, Raviglione MC, editors. Tuberculosis. 2nd ed. 2011. p. 16-51.
2. Key facts about tuberculosis. Available from: <http://www.who.int/mediacentre/factsheets/fs104/en>. [Last accessed on 2015 Jan 10].
3. TB India 2013. Revised National Tuberculosis Control Programme. Annual Status Report; Introduction. 2013. p. 12.
4. Pratt RJ. Extensively drug-resistant (XDR) tuberculosis: A new threat to global public health. Br J Infect Control 2007;8:20-2.
5. Dheda K, Shean K, Zumla A, Badri M, Streicher EM, Page-Shipp L, *et al.* Early treatment outcomes and HIV status of patients with extensively drug-resistant tuberculosis in South Africa: A retrospective cohort study. Lancet 2010;375:1798-807.

6. World Health Organization. On Anti-tuberculosis Drug Resistance Surveillance. Publication No. WHO/HTM/TB/2008.394. Geneva, Switzerland: World Health Organization; 2008.
7. Farmer P, Bayona J, Becerra M, Furin J, Henry C, Hiatt H, *et al.* The dilemma of MDR-TB in the global era. *Int J Tuberc Lung Dis* 1998;2:869-76.
8. Moore DA, Evans CA, Gilman RH, Caviedes L, Coronel J, Vivar A, *et al.* Microscopic-observation drug-susceptibility assay for the diagnosis of TB. *N Engl J Med* 2006;355:1539-50.
9. Guidelines for PMDT in India. Available from: <http://www.tbcindia.nic.in/pdfs/Guidelines%20for%20PMDT%20in%20India%20-%20May%202012.pdf>. [Last accessed on 2015 Jan 10].
10. Sharma SK, Mohan A. Multidrug-resistant tuberculosis: A menace that threatens to destabilize tuberculosis control. *Chest* 2006;130:261-72.
11. Espinal MA, Laserson K, Camacho M, Fusheng Z, Kim SJ, Tlali RE, *et al.* Determinants of drug-resistant tuberculosis: Analysis of 11 countries. *Int J Tuberc Lung Dis* 2001;5:887-93.
12. Casal M, Vaquero M, Rinder H, Tortoli E, Grosset J, Rüsch-Gerdes S, *et al.* A case-control study for multidrug-resistant tuberculosis: Risk factors in four European countries. *Microb Drug Resist* 2005;11:62-7.
13. Paramasivan CN, Venkataraman P. Drug resistance in tuberculosis in India. *Indian J Med Res* 2004;120:377-86.
14. Snider DE Jr, Kelly GD, Cauthen GM, Thompson NJ, Kilburn JO. Infection and disease among contacts of tuberculosis cases with drug-resistant and drug-susceptible bacilli. *Am Rev Respir Dis* 1985;132:125-32.
15. Zignol M, Hosseini MS, Wright A, Weezenbeek CL, Nunn P, Watt CJ, *et al.* Global incidence of multidrug-resistant tuberculosis. *J Infect Dis* 2006 15;194:479-85.
16. Sharma SK, Mohan A. The implications of multidrug resistant tuberculosis. *Eur Infect Dis* 2007;1:52-4.
17. Sharma SK, Turaga KK, Balamurugan A, Saha PK, Pandey RM, Jain NK, *et al.* Clinical and genetic risk factors for the development of multi-drug resistant tuberculosis in non-HIV infected patients at a tertiary care center in India: A case-control study. *Infect Genet Evol* 2003;3:183-8.
18. Sharma SK, Guleria R, Jain D, Chawla TC, Saha P, Mohan A, *et al.* Effect of additional oral ofloxacin administration in the treatment of multidrug-resistant tuberculosis. *Indian J Chest Dis Allied Sci* 1996;38:73-9.
19. Bustreo F, Migliori GB, Nardini S, Raviglione MC. Antituberculosis drug resistance: Is it worth measuring? The WHO/IUATLD Working Group on Antituberculosis Drug Resistance Surveillance. *Monaldi Arch Chest Dis* 1996;51:299-302.
20. Zhang Y, Yew WW. Mechanisms of drug resistance in Mycobacterium tuberculosis. *Int J Tuberc Lung Dis* 2009;13:1320-30.
21. Mendez AP. How many drug-resistant tubercle bacilli can be found in the sputum of patients who have never received treatment for tuberculosis? In: Toman's Tuberculosis; Case Detection, Treatment, And Monitoring – Questions And Answers 2<sup>nd</sup> ed. Geneva: WHO; 2004. p. 203-06.
22. Espinal M. What is the “fall and rise” phenomenon and the “sequential regimen” mechanism? Toman's Tuberculosis Case Detection, Treatment, and Monitoring – Questions and Answers. 2<sup>nd</sup> ed. Geneva: WHO; 2004. p. 200-1.
23. Udwadia Z. Emergence of new forms of totally drug-resistant tuberculosis bacilli. *Chest* 2009;134:187-192.
24. Shueb HA, Bowman BU Jr, Ottolenghi AC, Merola AJ. Peroxidase-mediated oxidation of isoniazid. *Antimicrob Agents Chemother* 1985;27:399-403.
25. Middlebrook G. Isoniazid-resistance and catalase activity of tubercle bacilli; A preliminary report. *Am Rev Tuberc* 1954;69:471-2.
26. Hazbón MH, Brimacombe M, Bobadilla del Valle M, Cavatore M, Guerrero MI, Varma-Basil M, *et al.* Population genetics study of isoniazid resistance mutations and evolution of multidrug-resistant Mycobacterium tuberculosis. *Antimicrob Agents Chemother* 2006;50:2640-9.
27. Heym B, Alzari PM, Honoré N, Cole ST. Missense mutations in the catalase-peroxidase gene, katG, are associated with isoniazid resistance in Mycobacterium tuberculosis. *Mol Microbiol* 1995;15:235-45.
28. Deretic V, Philipp W, Dhandayuthapani S, Mudd MH, Curcic R, Garbe T, *et al.* Mycobacterium tuberculosis is a natural mutant with an inactivated oxidative-stress regulatory gene: Implications for sensitivity to isoniazid. *Mol Microbiol* 1995;17:889-900.
29. Musser JM. Antimicrobial agent resistance in mycobacteria: Molecular genetic insights. *Clin Microbiol Rev* 1995;8:496-514.
30. Kapur V, Li LL, Iordanescu S, Hamrick MR, Wanger A, Kreiswirth BN, *et al.* Characterization by automated DNA sequencing of mutations in the gene (rpoB) encoding the RNA polymerase beta subunit in rifampin-resistant Mycobacterium tuberculosis strains from New York City and Texas. *J Clin Microbiol* 1994;32:1095-8.
31. Siddiqi N, Shamim M, Hussain S, Choudhary RK, Ahmed N, Prachee, *et al.* Molecular characterization of multidrug-resistant isolates of Mycobacterium tuberculosis from patients in North India. *Antimicrob Agents Chemother* 2002;46:443-50.
32. Drobniowski FA, Pozniak AL. Molecular diagnosis, detection of drug resistance and epidemiology of tuberculosis. *Br J Hosp Med* 1996;56:204-8.
33. World Health Organisation. Policy statement. Molecular line probe assays for rapid screening of patients at risk of multidrug resistant tuberculosis (MDR-TB), 27 June 2008. Available from: [http://www.who.int/tb/dots/laboratory/lpa\\_policy.pdf](http://www.who.int/tb/dots/laboratory/lpa_policy.pdf). [Last accessed on 2015 Jan 10].
34. Singhal R, Arora J, Lal P, Bhalla M, Myneedu VP, Behera D. Comparison of line probe assay with liquid culture for rapid detection of multidrug resistance in Mycobacterium tuberculosis. *Indian J Med Res* 2012;136:1044-7.
35. WHO Multidrug-resistant tuberculosis (MDR-TB), 2013. Available from: <http://www.who.int/tb/challenges/mdr>. [Last accessed on 2015 Jan 10].
36. Global Tuberculosis Control, 2011. WHO: Geneva; 2011. Available from: [http://www.who.int/tuberculosis/publications/global\\_report/](http://www.who.int/tuberculosis/publications/global_report/). [Last accessed on 2015 Jan 10].
37. Revised National Tuberculosis Control Programme (RNTCP), Central TB Division Directorate General of Health Services, Manual For Laboratory Technicians, May 1999. p. 14.
38. Albert H, Bwanga F, Mukkaka S, Nyesiga B, Ademun JP, Lukyamuzi G, *et al.* Rapid screening of MDR-TB using molecular Line Probe Assay is feasible in Uganda. *BMC Infect Dis* 2010;10:41.
39. Anek-Vorapong R, Sinthuwattanawibool C, Podewils LJ, McCarthy K, Ngamlerit K, Promsarin B, *et al.* Validation of the GenoType MTBDRplus assay for detection of MDR-TB in a public health laboratory in Thailand. *BMC Infect Dis* 2010 20;10:123.
40. D'souza DT, Mistry NF, Vira TS, Dholakia Y, Hoffner S, Pasvol G, *et al.* High levels of multidrug resistant tuberculosis in new and treatment-failure patients from the Revised National Tuberculosis Control Programme in an urban metropolis (Mumbai) in Western India. *BMC Public Health* 2009 29;9:211.
41. Chandrasekaran S, Chauhan MM, Rajalakshmi R, Chaudanti-tuberculosis drugs in patients attending an urban district tuberculosis centre. *Indian J Tuber* 1990;37:215-6.
42. Jena J, Panda BN, Nema SK, Ohri VC, Pahwa RS. Drug resistance pattern of mycobacterium tuberculosis in a chest diseases hospital of armed forces. *Lung India* 1995;13:56-9.
43. Joseph MR, Shoby CT, Amma GR, Chauhan LS, Paramasivan CN. Surveillance of anti-tuberculosis drug resistance in Ernakulam District, Kerala State, South India. *Int J Tuberc Lung Dis* 2007;11:443-9.
44. Chandrasekaran S, Jagota P, Chaudhuri K. Initial drug resistance to antituberculosis drugs in urban and rural district tuberculosis programme. *Indian J Tuber* 1992;39:171-5.
45. Fleming MF, Krupitsky E, Tsoy M, Zvartau E, Brazhenko N, Jakubowiak W, *et al.* Alcohol and drug use disorders, HIV status and drug resistance in a sample of Russian TB patients. *Int J Tuberc Lung Dis* 2006;10:565-70.
46. Spellman CW, Matty KJ, Weis SE. A survey of drug-resistant Mycobacterium tuberculosis and its relationship to HIV infection. *AIDS* 1998;12:191-5.

**How to cite this article:** Saugat R, Soni G, Chabda M, Mathur BB, Gujrani M, Thakral P, Modi CS, Kapoor A. Study of Isoniazid and Rifampicin Resistance among New Sputum Smear Positive Pulmonary Tuberculosis Patients by Line Probe Assay in Bikaner. *Int J Sci Stud* 2015;2(11):90-95.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# P53 and ki67 Immunostaining in Gastric Biopsies: A Histopathological Study

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## Abstract

**Background:** Gastrointestinal (GI) tract tumors are most common malignancies in western countries. The esophagus, stomach, and colon (including rectum) are the most common site of malignancy.

**Objective:** The present study was conducted to show the advantages of immunohistochemistry, which includes not only its remarkable sensitivity and specificity but also its applicability to routinely processed formaline fixed material.

**Materials and Methods:** The present study has been conducted in the Department of Pathology, BRD Medical College, Gorakhpur, Uttar Pradesh. The patients included were both in-patient department and out-patient department patients in whom endoscopic biopsies were conducted for gastric lesions. Further, all these biopsies were studied by immunohistochemical (IHC).

**Result:** The present study included 30 cases of gastric endoscopic biopsy. Benign lesions amounted to 10 and malignancies were 20. The significant findings in this study showed p53 and ki-67 positivity in only 30% of benign gastric tumors. However, it was interesting to note that malignant gastric tumors were highly positive for p53 (80%) and ki-67 had a high positive index (85%).

**Conclusion:** Most GI tumors can be differentiated by their unique IHC profile. P53 and ki-67 show much more positivity in case of malignant gastric tumors. In case of p53, Yate's Chi-square is 5.185 and *P* value came out to be 0.023 i.e. significant, whereas ki-67 showed Yate's Chi-square to be 6.769 and *P* value to be 0.0009, which is also significant.

**Key words:** Gastric biopsies, Immunohistochemistry, Ki-67, P53

## INTRODUCTION

Gastrointestinal (GI) tract tumors include a wide variety of vastly different tumors and on a whole are one of the most common malignancies in western countries.<sup>1</sup> These tumors often present as distant metastasis at late stages, which are difficult to differentiate on biopsy.<sup>1</sup> The esophagus, stomach, and colon (including rectum) are the most common site of malignancy.<sup>2</sup> Collectively, GI cancers account for more than 250,000 new cases each year and over 100,000 deaths each year World Wide.<sup>3</sup> The American Cancer Society estimates that GI cancers accounted for

19% of all new cases diagnosed and more than 24% of all cancer death in 2009.<sup>4</sup>

Usually, GI tract cancers occur in the age group of 60 years and above but in the last couple of years, the cancers are occurring in the age group of 20-40 years. This is mainly because of smoking, high fat diet, junk food, sedentary lifestyle, more of non-vegetarian food rather than the fiber rich fruits and vegetable.<sup>5</sup>

Most GI tumors can be differentiated by their unique immunohistochemical (IHC) profile. As the size of biopsies decrease, the role of IHC stains will become even more important in determining the origin and differentiation of GI tract tumours.<sup>6</sup>

Gastric adenocarcinoma is the second most common cancer World Wide with the highest rates in Asia. It is more common in males and has been associated with risk factors such as low socioeconomic status, cigarette

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Month of Submission : 12-2014  
Month of Peer Review : 01-2015  
Month of Acceptance : 01-2015  
Month of Publishing : 02-2015

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smoking, nitrites, chronic gastritis and *Helicobacter pylori*.<sup>6</sup> The expression of p53 was closely related to the potential for tumor advance and a poorer post-operative prognosis for patients with gastric cancer.<sup>7</sup>

Ki-67 is an excellent marker to determine the growth fraction of a given cell population. The fraction of ki-67-positive tumor cells (the ki-67 labeling index) is often correlated with the clinical course of cancer.<sup>8</sup> High ki-67 is a sign of poor prognosis associated with a good chance of clinical response to chemotherapy, but its independent significance is modest and does not merit measurements in most routine clinical scenarios.<sup>9</sup>

## MATERIALS AND METHODS

The present study has been conducted in the Department of Pathology, BRD. Medical college, Gorakhpur, on the patients attending surgery indoor and out patient department in Nehru Chikitsalaya during a period ranging from August 2012 to October 2013.

Freshly biopsied specimens were subjected to overnight fixation and were processed routinely in the histopathology laboratory, and retrospective study has also been performed on preserved blocks.

All the paraffin blocks were preserved for section cutting. Thin sections of 4-5  $\mu$  have been cut after dewaxing, and then were stained by hematoxylin and eosin stain. Histopathological diagnosis was made, and then freshly cut sections were also used for immunostaining.

Sections from 2 representative paraffin blocks of each case were immunostained with p53 (mouse monoclonal antibody, clone DO-1) and ki-67 (mouse monoclonal antibody, clone MIB1).

Sections were mounted on silanized slides, deparaffinised, and rehydrated through graded alcohol to water. Next, slides were microwaved at 95°C for 6 cycles of 5 min each in a 10-mm ol/l concentration of sodium citrate buffer (pH 6.0) for ki-67 or for 7 cycles of 5 min each for p53. Then the slides were allowed to cool for approximately 1 h at room temperature to enhance antigen retrieval.

Then specimens were treated with 10% normal rabbit serum for 10 min at room temperature in a cover plate. Primary antibodies were incubated with tissue sections for 18 h at 4°C. After washing with a 0.01-mol/l concentration of phosphate-buffered saline, they were incubated with biotin-conjugated antimouse immunoglobulin for 10 min at room temperature and then incubated with peroxidase-

conjugated streptavidin for 5 min at room temperature using a histofine kit. Demonstration of binding sites with the peroxidase reaction was achieved with 3,3-diaminobenzidine tetrahydrochloride (0.25 mg dissolved in 1 ml of 0.02% hydrogen peroxide). Faint nuclear staining, sufficient to aid in orientation but not enough to influence the judgment of positivity, was performed with Mayer hematoxylin solution. The p53 label was determined as positive or negative by calculating the number of positive nuclei per 500 gastric epithelial cells and cancer cells in 1 representative section. The count was performed under low magnification ( $\times 100$ ) using a double-headed light microscope. The staining intensity was arbitrarily graded on a scale of four grades: 0, no staining of cancer cells; 1, weak staining; 2, moderate staining; 3, strong staining. The percentage of staining area was also graded on a scale with four grades: 0, none; 1, <10%; 2, 10-50%; 3, >50%. Theoretically, the overall scores could range from 0 to 8. The specimens with a score of more than 4 were regarded as positive expression and those with a score  $\leq 4$  as a negative expression.

The intensity of positivity for ki67 was scored as follows: 0 negative; 1 weak; 2 moderate; 3 strong. The extent of positivity was scored according to the percentage of cells showing positive staining: 0, <5%; 1, >5-25%; 2, >25-50%; 3, >50-75%; 4, >75% of the cells in the respective lesions. The final score was determined by multiplying the intensity of positivity and the extent of positivity scores, yielding a range from 0 to 12. Any score that was above 4 was interpreted as positive for ki-67.

- Stain positive nuclei - Brown
- Counter stained areas - Blue.

All gastric biopsies, which were processed for IHC by p53 and ki-67. They were processed along with positive and negative controls. The positive controls were previously positive p53 colonic carcinomas with high ki-67 labeling index.

## RESULTS

The present study included 30 cases of gastric endoscopic biopsy. Benign lesions amounted to be 10 (33.3%) and malignancies were 20 (66.6%). The relative incidence of gastric tumors was found to be 10.2%.

Most common age group of gastric cancer was found to be 75-85 years. According to our study 5 cases (25%) of adenocarcinoma and 1 case (5%) of lymphoma lie in this group. In age group of 65-75 years, 5 cases have been found (3 [15%] adenocarcinoma and 2 [10%] lymphoma). 4 cases (2 [10%] adenocarcinoma and 2 [10%] lymphoma) have been seen in age group between 55 and 65 years. 2 (1 [5%])



adenocarcinoma and 1 [5%] undifferentiated carcinoma) cases were seen beyond 85 years and only 3 cases (1 [5%] adenocarcinoma, 1 [5%] adenosquamous carcinoma and 1 [5%] lymphoma) were seen <55 years. Mean age for gastric cancer came out to be 70 years.

Most common benign gastric tumor shown in our study was gastrointestinal stromal tumors (GIST). 8/10 cases (80%) p53 was positive in 3 (30%) out of the 10 benign cases, and incidentally all were GIST's. ki-67 score in all 3(30%) cases of GIST was 4. All GIST was confirmed with CD117.

Our study included 20 cases of malignancy in the stomach. The most common malignancy was adenocarcinoma (12/20 cases [60%]) (Figure 1), followed by non-hodgkins lymphoma (6/20 cases [30%]). Two other malignancies were encountered in our study, which included one case of adenosquamous and one case of undifferentiated carcinoma.

11 out of 12 cases of adenocarcinoma were positive for p53, which amounted to 91.6%. 5 cases of 6 lymphomas were positive for p53, which amounted to 83.3%. One case each of adenocarcinoma and lymphoma were negative for p53. Adenosquamous and undifferentiated carcinoma was also negative for p53.

All 11 cases which were positive for p53 also showed a high ki-67 labeling index (Figure 2). A mean score of 8 was obtained for adenocarcinomas. All 6 cases of lymphomas showed a high ki-67 score which was scored as 7-9. Incidentally, adenosquamous and undifferentiated carcinoma showed low ki-67 labeling index.

Among 30 gastric cases, 22 cases (73.4%) were males and 8 cases (26.6%) were females with male:female ratio of 2.7:1. In the present study, it was found that gastric cancers

are more prevalent in hindus (73%) of urban places (80%) as compared to rural places (20%).

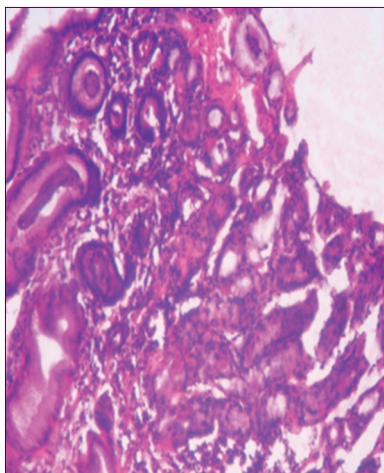
The most common mode of presentation of gastric tumor is epigastric pain (36%) which was seen in 11 cases. Among these 11 cases 6 (54.5%) cases were of adenocarcinoma, 3 (27.2%) cases were of GIST and 2 (18.2%) cases were of lymphoma. Next common presentation is vomiting and hematemesis (25%) which included 5 (71.4%) cases of adenocarcinoma and 2 (28.5%) cases of lymphoma. Other mode of presentation was mass abdomen, dysphagia, malena and anemia, i.e. 40% and these included rest 12 cases.

According to our study the most common location of gastric tumors were found to be antrum (47.5%), which included 14 cases (6 [42.8%] cases of adenocarcinoma, 3 [21.4%] cases of lymphoma, 3 [21.4%] cases of GIST and 2 [14.2] cases of adenoma). Next in sequence comes body which includes 12 cases i.e. 4 (33.3%) cases of adenocarcinoma and GIST, 2 (16.6%) cases of lymphoma and 1 (8.33%) undifferentiated carcinoma and adenosquamous carcinoma each. Least common location of gastric tumors is cardiac which included 4 cases. 1 cases of lymphoma, 1 case of GIST and 2 cases of adenocarcinoma were seen at this location.

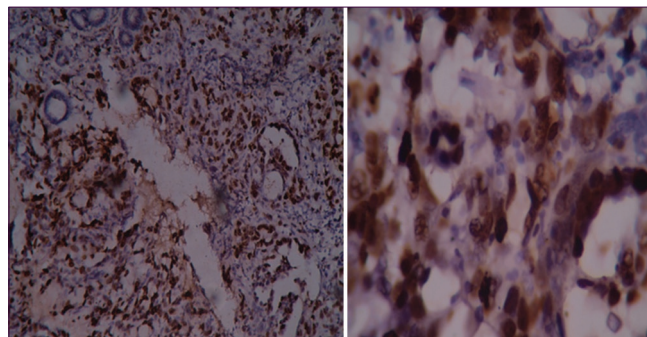
The significant findings in this study showed p53 and ki-67 positivity in only 30% of benign gastric tumors. However, it was interesting to note that malignant gastric tumors were highly positive for p53 (80%) and ki-67 had a high positive index (85%) (Table 1). Statistically for p53, Yate's chi square is 5.185 and *P* value came out to be 0.023, i.e. significant, whereas ki-67 showed Yate's chi square to be 6.769 and *P* value to be 0.0009 which is also significant (Table 2).

**Table 1: Comparative evaluation of p53 and ki67 in gastric tumours**

Distribution	p53+cases	%	ki67+cases	%
Benign	3	30	3	30
Malignant	16	80	17	85



**Figure 1: Well differentiated gastric adenocarcinoma (H and E ×400)**



**Figure 2: Well differentiated gastric adenocarcinoma (same case) tumor cells show nuclear positivity for Ki67 and p53 (H and E ×400)**

In the present study, the sensitivity and specificity of p53 in gastric cancer came out to be 80% and 70% respectively. Whereas sensitivity and specificity of ki-67 in gastric cancer was found to be 85% and 70%, respectively (Table 3).

## DISCUSSION

In the present study, the relative incidence of gastric tumors (among all GI lesions) received in our department was found to be 10.2%.

We studied 30 cases of gastric tumors out of which 10 (33.3%) cases were benign and 20 cases (66.6%) were malignant.

Stomach cancer incidence rates have decreased overall. Much of this can be attributed to a decline in the prevalence of *H. pylori* (a major cause of stomach cancer) and increase in fresh food in the diet.<sup>10</sup> Present study shows GIST as the most common benign gastric tumor, 8/10 cases (80% cases) which was similar to the study of Minnes *et al.* 1936 who also found GIST to be most common benign tumor.<sup>11</sup>

The most common malignant gastric tumors shown in our study was adenocarcinoma, i.e. 12/20 cases (60%). Similar result was seen by Durrani *et al.* 2009.<sup>12</sup>

In the context to the 30 cases of gastric tumors selected for study maximum number of cases were found to be in their 7<sup>th</sup> and 8<sup>th</sup> decade of life. Mean age for gastric cancer is 70 years. On the other hand Khuroo *et al.* 1992 found the peak incidence between 65 and 75 years.<sup>13</sup>

Among 30 gastric cases, 22 cases (73.4%) were males and 8 cases (26.6%) were females with male:female ratio of 2.7:1. Joo *et al.* 2006 reported similar figures with male:female ratio of 2.4:1 in his study.<sup>14</sup> Zohreh Sanaat *et al.* studied 100 patients with gastric cancer and found that 76 (76%) were men and 24 (24%) were women with male to female ratio 3:1.<sup>15</sup>

**Table 2: Benign versus malignant gastric tumours**

Histology	Markers	P value	Significance
Benign versus malignant gastric tumours	p53	<0.05 (0.023)	Significant
Benign versus malignant gastric tumours	ki67	<0.05 (0.009)	Significant

**Table 3: Sensitivity and specificity of p53 and ki67 in gastric cancer**

	p53 (%)	ki67 (%)
Sensitivity	80	85
Specificity	70	70

Among gastric tumors, majority of cases were Hindus i.e. 22 (73%) and minority were Muslims 18 (27%) which was in concordance with the study of Saha *et al.* 2012.<sup>16</sup>

The most common mode of presentation of gastric cancer is epigastric pain (36%), followed by vomiting, hematemesis (25%) and mass abdomen (16%). Other mode of presentation is dysphagia, malena and anemia with frequency of 10%, 6% and 5% respectively. Durrani *et al.* 2009 observed 175 cases and found that the commonest mode of presentation was epigastric pain, followed by vomiting and hematemesis.

As seen in our study the most common anatomic site of gastric cancer is antrum. 10 cases (47.5%) lie in this group, then comes body and cardiac which include 8 cases (38.8%) and 2 cases (13.7%) respectively. Our study was in concordance with the study of Khuroo *et al.* 1992 who found a similar result. However, Zohreh Sanaat *et al.* and Shafigh *et al.* found different results. In studies conducted by Zohreh Sanaat *et al.* it was found that 63 (63%) patients had a cancer on body of stomach, 33 (33%) on cardia, 3 (3%) on antrum and one (1%) in pylorus. The study by Shafigh *et al.* reported the frequent sites of gastric cancer as follows: Cardia (50%), fundus (33%), antrum (17%).<sup>17</sup>

In the present study, IHC revealed that in case of benign gastric tumors p53 showed positivity in 3/10 cases, i.e. 30% whereas ki-67 showed positivity in 3/10 cases, i.e. 30% only.

Malignant gastric tumors showed p53 positivity in 16/20 cases, i.e. 80% and ki-67 showed positivity (score >4) in 17/20 cases, i.e. 85%. Easterwood *et al.* (2012) in their study showed that out of 27 cases of gastric cancer 84.2% were p53 positive and 88.9% were ki-67 positive.<sup>18</sup> In studies done by Zohreh Sanaat *et al.* p53 was positive in 35 (35%) patients and ki-67 was positive in 53 (53%) patients. There was no significant association between positive ki-67 and p53 and sex, stage, pathology type, and anatomic site.

A study by Shafigh *et al.* showed that in patients with gastric cancer who were younger than 60 years, p53 was positive in 14% of patients while in patient over 60 years of age it increased to 19%. He reported 75.9% of patients with gastric cancer ki-67 positive. Our study showed that below 65 years of age, 20% of the patients were positive for p53 whereas 60% patients showed positivity above 65 years of age.

Al-Mondhri *et al.* reported the prevalence of p53 in their patients with gastric cancer to be 54% and ki-67 to be 70% positive.<sup>19</sup>

On the other hand Chikanori Niimi *et al.* 2002 included in his study 987 cases in which 62% were positive for p53 and 94 % were positive for ki-67.<sup>20</sup>

Joo *et al.* 2006, in his study observed that out of 119 cases, 34% showed positivity for p53 and 52% showed positivity for ki-67.

P53 and ki-67 also show overexpression in tumors of other sites also. Khodaeiani *et al.* collected 50 biopsy samples, which included 30 basal cell carcinomas (BCCs), 10 squamous cell carcinomas (SCCs), 8 keratoacanthomas (KAs), and 2 trichoepitheliomas (TEs). These were IHC evaluated for p53 and ki-67 expression. The expression rate of p53 was 67.77% for the BCCs, 50.20% for the SCCs, and null for the KAs. For both TEs, it was 50%. The expression rate of ki-67 was 57.33% for the BCCs, 47.70% for the SCCs, 37.5% for the KAs, and 0.0% for TEs.<sup>21</sup>

Francholumachi *et al.* 2012 retrospectively studied 31 men (median age 65, range 48-75 years) with confirmed Dukes B colorectal adenocarcinoma. The percentage positivity for ki-67 and p53 in cancer tissues was  $46.9 \pm 19.2$  and  $48.7 \pm 14.2$ , respectively.<sup>22</sup>

Luminița Nicoleta Giurgea *et al.* studied total number of 125 patients diagnosed with epithelial ovarian neoplasms. There were 26 (50%) malignant cases, 15 (28.8%) borderline and 11 (21.15%) benign. P53 immunoreactions were positive in 41.66% of malignant serous tumors, most of them (90%) high-grade carcinomas; 6.66% of borderline and none benign tumors were positive. Ki-67 was positive in 61.53% of malignant cases, with higher percents in advanced clinical stages. Ki-67 immunoreactions were also positive in borderline and benign tumors, with lower percents, 13.3% respectively 9.09%.<sup>23</sup>

Hiroko Yamashita *et al.* studied 506 primary invasive ductal carcinomas in which 29.0% and 53.6% were positive for p53 protein accumulation, and ki-67 expression, respectively.<sup>24</sup>

According to present study p53 and ki-67 show much more positivity in case of malignant gastric tumors as compared to benign ones. In case of p53, Yate's chi square is 5.185 and P value came out to be 0.023 i.e. significant, whereas ki-67 showed Yate's chi square to be 6.769 and p value to be 0.0009, which is also significant.

In the present study, the sensitivity and specificity of p53 in gastric cancer came out to be 80% and 70% respectively. Whereas sensitivity and specificity of ki-67 in gastric cancer were found to be 85% and 70% respectively. Easterwood *et al.* (2012) who found similar results in his study with sensitivity and specificity of p53 to be 77.8% and 59.5% respectively and sensitivity and specificity of ki-67 to be 88.9% and 76.2% respectively.

## CONCLUSION

In the present study, our results showed an altered expression of p53 and ki-67 during the process of carcinogenesis. p53 and ki-67 showed an increasing expression from benign to malignant tumors. The result support that high proliferation measured by ki-67 could predict the extent of the primary tumor and helpful in preoperative pathological diagnosis but these findings require further studies. The tumor suppressor protein p53 is a crucial factor for the maintenance of the genomic stability. Immunostaining pattern of p53 could be used as predictive and prognostic factor in gastric and esophageal tumors. Additional studies should be performed to verify the prognostic role of p53.

## ACKNOWLEDGMENT

First of all I would like to thank the almighty for all the blessings and the unconditional love he has showered upon me and making his presence known in every second of my life.

I would like to thank my guide, Dr. Arvind Pallipady, Associate Professor, Department of Pathology, AJ Institute of Medical Sciences and research centre, for his constant suggestions, patience, praise and encouragement.

I would also like to whole heartedly thank Dr. Rajeev Misra, HOD of B.R.D Medical college, Gorakhpur, U.P who have guided me and taught me.

My heartfelt thanks go to each and every patient who agreed to be a part of this study and also my apologies to them in case of any inconvenience caused.

Last but definitely not the least, I would like to thank my precious parents, my in laws and my husband Dr. Saurabh for their unconditional love, support and encouragement in all my endeavors and for believing in me.

Date: 18-12-2014  
Place: Mangalore

DrEktaTiwari

## REFERENCES

1. Wong HH, Chu P. Immunohistochemical features of the gastrointestinal tract tumors. *J Gastrointest Oncol* 2012;3:262-84.
2. Fleming M, Ravula S, Tatishchev SF, Wang HL. Colorectal carcinoma: Pathologic aspects. *J Gastrointest Oncol* 2012;3:153-73.
3. Dikshit RP, Mathur G, Mhatre S, Yeole BB. Epidemiological review of gastric cancer in India. *Indian J Med Paediatr Oncol* 2011;32:3-11.
4. Chao A, Connell CJ, Cokkinides V, Jacobs EJ, Calle EE, Thun MJ. Underuse of screening sigmoidoscopy and colonoscopy in a large cohort of US adults. *Am J Public Health* 2004;94:1775-81.
5. Dicken BJ, Bigam DL, Cass C, Mackey JR, Joy AA, Hamilton SM. Gastric



- adenocarcinoma. *Ann Surg* 2005;241:27-39.
6. Sasajima K, Takai A, Taniguchi Y, Yamashita K, Hao K, Takubo K, *et al.* Polypoid squamous cell carcinoma of the esophagus. *Cancer* 1989;64:94-7.
7. Allred DC, Clark GM, Elledge R, Fuqua SA, Brown RW, Chamness GC, *et al.* Association of p53 protein expression with tumor cell proliferation rate and clinical outcome in node-negative breast cancer. *J Natl Cancer Inst* 1993;85:200-6.
8. Schonk DM, Kuijpers HJ, van Drunen E, van Dalen CH, Geurts van Kessel AH, Verheijen R, *et al.* Assignment of the gene(s) involved in the expression of the proliferation-related Ki-67 antigen to human chromosome 10. *Hum Genet* 1989;83:297-9.
9. Urruticoechea A, Smith IE, Dowsett M. Proliferation marker Ki-67 in early breast cancer. *J Clin Oncol* 2005;23:7212-20.
10. Quinn M, Wood H, Cooper N, Rowan S, editors. *Cancer Atlas of the United Kingdom and Ireland. 1991-2000. Studies on Medical and Population Subjects No. 68.* London: ONS; 2005.
11. Ackman FD. Multiple adenopapillomata of the stomach with report of case showing varying degrees of malignancy. *Can Med Assoc J* 1930;23:391-9.
12. Durrani AA, Yaqoob N, Abbasi S, Siddiq M, Moin S. Pattern of upper gastro intestinal malignancies in Northern Punjab. *Pak J Med Sci* 2009;25:302-7.
13. Khuroo MS, Waterhouse J, Shanmugaratnam K, Muir C, Powell J. Cancer incidence in five continents. Vol. 4. IARC Scientific Publicationno 42. Lyon: IARC; 1982. p. 390-7.
14. Joo YE, Rew JS, Seo YH, Choi SK, Kim YJ, Park CS, *et al.* Cyclooxygenase-2 overexpression correlates with vascular endothelial growth factor expression and tumor angiogenesis in gastric cancer. *J Clin Gastroenterol* 2003;37:28-33.
15. Sanaat Z, Halimi M, Ghojzadeh M, Pirovi AH, Gharamaleki JV, Ziaee AE, *et al.* Immunohistochemical analysis of p53, Ki-67, CD44, HER-2/ neu expression patterns in gastric cancer, and their association with one year survival in north-west of Iran. *Int J Hematol Oncol Stem Cell Res* 2013;7:15-20.
16. Saha AK, Day NE, Munoz N. Oesophagus. In: Schottenfeld D, Fraumeni J, editors. *Cancer Epidemiology and Prevention.* New York: Oxford University Press; 1996. p. 681-706.
17. Shafiq E, Abdolazimi Y, Shafaie SH, Hajiahmadi M. Expression of biomarkers Ki-67, p27KIP1, p53 in gastric cancer and their association with histopathologic indicators of gastrectomy samples of patients referred to Shahid Beheshti hospital Babol Iran in 2000-2006. *Univ Med Sci Babol* 2007;9:7.
18. Easterwood. The Expression of P53, MUC2, Ki67, PCNA in Gastric Cancer and Precancerous Lesions and Diagnostic Value, 2012.
19. Al-Moundhri MS, Nirmala V, Al-Hadabi I, Al-Mawaly K, Burney I, Al-Nabhani M, *et al.* The prognostic significance of p53, p27 kip1, p21 waf1, HER-2/neu, and Ki67 proteins expression in gastric cancer: A clinicopathological and immunohistochemical study of 121 Arab patients. *J Surg Oncol* 2005;91:243-52.
20. Niimi C, Goto H, Ohmiya N, Niwa Y, Hayakawa T, Nagasaka T, *et al.* Usefulness of p53 and Ki-67 immunohistochemical analysis for preoperative diagnosis of extremely well-differentiated gastric adenocarcinoma. *Am J Clin Pathol* 2002;118:683-92.
21. Khodaeiani E, Amirnia M, Nazhad SB, Esmaceli H, Karimi ER, Alikhah H. Clinico pathologic study of basal cell carcinoma. *Res J Biol Sci* 2010;5:293-6.
22. Lumachi F, Orlando R, Marino F, Chiara GB, Basso SM. Expression of p53 and Ki-67 as prognostic factors for survival of men with colorectal cancer. *Anticancer Res* 2012;32:3965-7.
23. Giurgea LN, Ungureanu C, Mihailovici MS. The immunohistochemical expression of p53 and Ki67 in ovarian epithelial borderline tumors. Correlation with clinicopathological factors. *Rom J Morphol Embryol* 2012;53:967-73.
24. Yamashita H, Nishio M, Toyama T, Sugiura H, Zhang Z, Kobayashi S, *et al.* Coexistence of HER2 over-expression and p53 protein accumulation is a strong prognostic molecular marker in breast cancer. *Breast Cancer Res* 2004;6:R24-R30.

**How to cite this article:** Tiwari E, Pallipady A, Misra R, Mishra S. P53 and ki67 Immunostaining in Gastric Biopsies: A Histopathological Study. *Int J Sci Stud* 2015;2(11):96-101.

**Source of Support:** Nil, **Conflict of Interest:** None declared.



# Abnormal Presentation of Transverse Foramen of atlas in South Indian Population

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## Abstract

**Introduction:** Atlas is the first cervical vertebra. It is characterized by the presence of foramen transversarium (FT) or transverse foramen. We study the anterior and the posterior root and also variation in size and number of the FT. This information is very important in clinical practice.

**Aims and Objectives:** This study may be helpful when applied in developmental studies of the transverse process of atlas and also important to understanding of the pathological condition related to the vertebral artery.

**Materials and Methods:** The 300 macerated human atlas vertebrae were selected from the Department of Anatomy, Ganesh Shankar Vidyarthi Memorial Medical College, Kanpur. Age and sex were not taken into consideration. Each atlas was observed for morphological variations of FT.

**Results:** Of 300 atlases, incomplete FT was seen in 12 (4%) atlases (5 left side, 3 right and 4 bilateral). Thin anterior bar (costal element) of the FT was found in 3 atlases. The posterior bar was found very thin in only one vertebra (right side). The double transverse foramen was recorded in 12 (4%) atlases (1% left side, 2% right and 1% bilateral). The difference between the sizes of FT was found in 5 (1.67%) specimens.

**Conclusion:** The FT consists of an anterior and posterior bar, it was found many variations like partially developed anterior bar of FT (costal element), thin anterior and posterior bar and double FT. The knowledge of these variations is important in clinical practice.

**Key words:** Anterior bar, Costal element, Transverse foramen, Variations

## INTRODUCTION

Like other regions of the body, the neck has a central bony skeletal core upon which other structures attached or are related. The bones of the neck consist of the base of the skull and the cervical vertebrae. Vertebrae are defined by regions. Cervical vertebrae are those in the neck area and can range from a single vertebra in amphibians, to seven in most mammals and reptiles, and plesiosaur *Elasmosaurus* (Rahilly, Muller; 1983).<sup>1</sup> Atlas is the first cervical vertebra. Individual vertebra is composed of a centrum, arches

protruding from the bottom of the centrum, and various processes projecting from the centrum and/or arches. Each transverse process is pierced by the transverse process or foramen transversarium (FT). It consists of an anterior and posterior root, connected to each other on the lateral side of the FT by an intertubercular lamella of bone (often, quite incorrectly, called the costo-transverse bar (William, 1989).<sup>2</sup> In all except the 7<sup>th</sup> cervical vertebra, the FT transmits the vertebral artery and veins and a branch from the inferior cervical ganglion of the sympathetic trunk. In rare cases the lateral mass, of the atlas vertebra fuse with the occipital bone (occipitalization of atlas).<sup>3,4</sup> The transverse process of atlas homologous with the posterior tubercle of the transverse process of a typical cervical vertebra. The costal processes chondrify separately and in the thoracic region they extend ventrally. They are separated from the developing transverse processes (TP) by non-chondrified mesenchyme in which the costo-transverse joints will appear. At other than thoracic levels the developing costal

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Month of Submission : 12-2014  
Month of Peer Review : 01-2015  
Month of Acceptance : 01-2015  
Month of Publishing : 02-2015

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process (or pleuropophysis) becomes incorporated into the transverse process and it should also be noted that the FT may be divided into two in any of the cervical Vertebrae.<sup>5</sup> In cervical vertebrae the transverse process is dorsal to the FT, while the costal process, corresponding to the head and neck of a rib, limit the FT ventrolaterally. The distal parts of these cervical costal processes do not develop. There is a controversy about the development of the tip of the transverse process of the atlas vertebra. Arey<sup>6</sup> described that it develop from true transverse element and according Hamilton<sup>7</sup> and Warwick and Williams<sup>8</sup>, it develop from costal element. The anterior element of the transverse process may be absent or partially developed, leaving the FT open in front, and the artery protected externally by a large tubercle.<sup>9,10</sup> The variations of the size and shape of the FT may be due to the large diameter of vein or presence of connective tissue.<sup>11</sup> The vertebral artery arises from the upper and posterior part of the first part of the subclavian artery. It ascends through the foramina in the TP of all the cervical vertebrae save the seventh, winds behind the lateral mass of atlas, enters the skull through the foramen magnum. The morphological variants of the transverse process and FT may be helpful when applied in developmental studies of the transverse process of atlas and also important to the understanding and diagnosis of the pathological condition related to the vertebral artery and its sympathetic plexus.<sup>12</sup> The Knowledge of these variations is also helpful during the posterior approach of the cervical spine.

## MATERIALS AND METHODS

The present study is based on the observation of 300 atlas vertebrae, randomly selected from stock of vertebrae belonging to North India, present in the anthropology museum of Department of Anatomy, Ganesh Shankar Vidyarthi Memorial Medical College, Kanpur, Uttar Pradesh. The macerated atlas vertebrae were randomly selected. The age and sex of the vertebrae were not taken into consideration. Each vertebra was carefully examined for the TP, FT, its anterior and posterior bar and presence of any accessory foramen. The photographs were taken by the sony digital camera and anatomical parameters measured with the help of digital vernior caliper.

## RESULTS

A total of 300 atlas vertebrae were studied. The anterior incomplete FT was found in 12 (4%) atlases (5 left side, 3 right and 4 bilateral) (Table 1/Figure 1a-b). The anterior bar (costal element) of the FT was found very thin in 1% specimen. In one vertebra, the posterior bar was found very thin on the right side (Figure 2a-b). The double transverse

foramen was recorded in 12 (4%) atlases, 1% left side, 2% right and 1% bilateral (Table 2/Figure 3a-b). The difference between the sizes of FT was found in 5 (1.67%) atlases (Figure 4). The antero-posterior diameter of FT ranging between 3 and 10 mm (mean 6.30) and transverse diameter between 3 and 8 mm (mean 5.30) (Table 3).

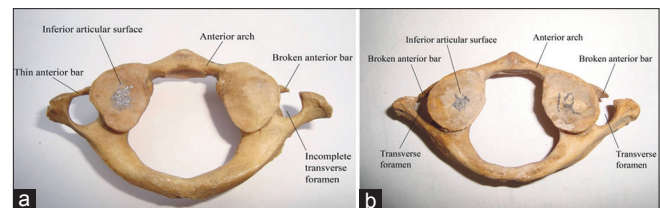
**Table 1: Presence of AIFT**

Specimen	Incidence	No. of atlases (%)			Total (%)
		Left	Right	Total	
Atlas (300)	Unilateral	5 (1.66)	3 (1.0)	8 (2.66)	12 (4)
	Bilateral	4 (1.33)			

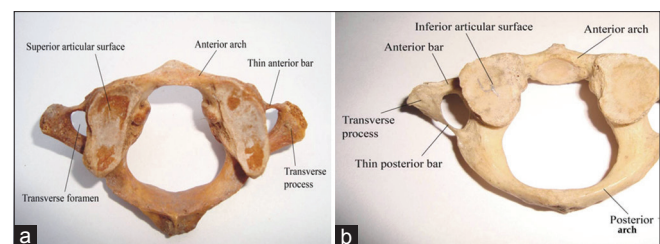
AIFT: Anterior incomplete foramen transversarium

**Table 2: Incidence of accessory (double) foramen transversarium**

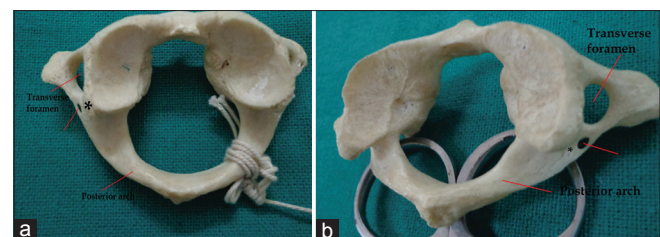
Specimen	Incidence	No. of atlases (%)		Total (%)	Total (unilateral+ bilateral)
		Left	Right		
Atlas (300)	Unilateral	3 (1)	6 (2)	9 (3)	12 (4)
	Bilateral	3 (1)			



**Figure 1: (a) Incomplete transverse foramen (left side) and very thin anterior bar on right side, (b) Transverse process showing incomplete transverse foramen (bilateral)**



**Figure 2: (a) Transverse process showing complete transverse foramen, but thin anterior bar (bilateral), (b) Transverse foramen with thin posterior bar**



**Figure 3: (a) Unilateral (left) double transverse foramen (\*), (b) Double transverse foramen (\*)**

## DISCUSSION

The TP of each atlas was observed for their status and their presence was accounted. All the TP had the FT. Many TP had broken anterior bar of the FT and formed anterior incomplete foramen. The anterior incomplete FT was found in 12 (4%) atlases. It was observed in 5 (1.66%) atlases on the left side, 3 (1%) on the right side and bilaterally in 4 (1.33%) atlases (Table 1/Figure 1a-b). Rekha *et al.*<sup>13</sup> reported it in 6 (3.92%) atlases in south Indian population, which is very close to our finding. The partially developed transverse foramen of the atlas has been observed by various authors in 4%-15.2% of cases (Table 4). Poplewski *et al.*<sup>9</sup> reported the incidence of this variant is 15.2% while Bergman<sup>10</sup> observed in 12% of specimen. These values are being considerably higher than those obtained in our study (4%). This difference can be explained by the differing composition of the population examined, since Poplewski had studied material originating from central Poland while Bergman investigated material from the South-Westerly regions of Poland. Avinash *et al.*<sup>14</sup> found bilateral incomplete FT in 1 atlas. He reported that the atlas contributes to the maximum anatomical variations of the cervical part of spine. Wysocki *et al.*<sup>15</sup> were found 2.7% anteriorly incomplete FT in male vertebrae and 6.7% in female vertebrae. In our study it was found that the anterior bar (costal element) of the FT is very thin in 1% specimen, while the posterior bar did not show any abnormality, except in one vertebra, it was found very thin on the right side (Figure 2a-b). The thinned or partially deficient, costal lamella of FT have reported in C7 vertebra,<sup>14</sup> but there is no mention of this fact for atlas in the available literature. The incidence of double FT (accessory foramen) was reported by the various authors from 4% to 22% in the cervical vertebrae without specific reference to the atlas.<sup>11,16</sup> It observed in lower cervical vertebra mostly in C6 (70%) vertebra.<sup>17</sup> The double FT was recorded in 5 (22.7%) vertebrae, unilateral in 3 and bilateral in two.<sup>16</sup> Divya *et al.*<sup>18</sup>

found these variations in 3.75% cervical vertebrae (2.5% unilateral, 1.25% bilateral) without specific reference to atlas. Rekha<sup>13</sup> found it in 10 atlases (6.54%). In our study it was recorded in 12 (4%) atlases, 1% left side, 2% right and 1% bilateral (Table 2/Figure 3a-b). Vasudeva *et al.*<sup>19</sup> reported the absence of FT in one atlas vertebra on the left side. Such type of variation in our study was not found in any atlases. The difference between the sizes of FT was found in 5 (1.67%) specimens (Figure 4). Kaya *et al.*<sup>16</sup> found this condition in 4.5% cervical vertebrae, without specific reference to atlas. The FT presented mainly two shapes, Oval and circular with antero-posterior diameter ranging between 3 and 10 mm (mean 6.30) and transverse diameter between 3 and 8 mm (mean 5.30) (Table 3). There is a definite embryological controversy in the literature about the development of transverse process of cervical vertebrae. Wysocki, Chauhan R<sup>15,20</sup> reported that the incomplete FT was formed due to the partially developed anterior bar (costal element) of the FT and never of the posterior bar. Also in our study, it was concluded that the incomplete FT was formed due to the partially developed costal element (Figure 5). The posterior bar did not show any abnormality except for variable thickness, which also confirms the observations of Wysocki.<sup>15</sup> The knowledge of these variations is important to the understanding and diagnosis of pathological conditions related to the vertebral artery and its sympathetic plexus. These findings may be of clinical interest to radiologists, neurologists, orthopedic surgeons, anthropologists and forensic personnel.

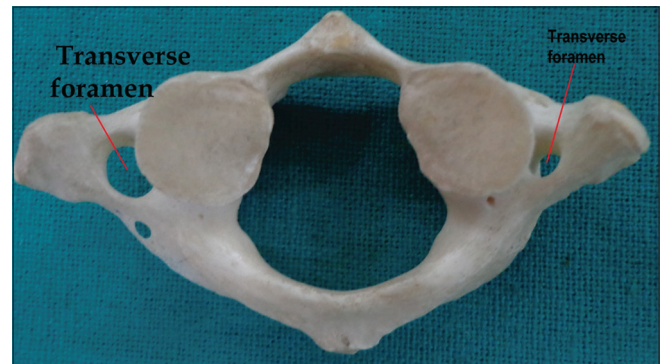
**Table 3: Diameter of foramen transversarium (mm)**

Diameter	Maximum	Minimum	Mean
Antero-posterior	10.00	3.00	6.30
Transverse	8.00	3.00	5.30

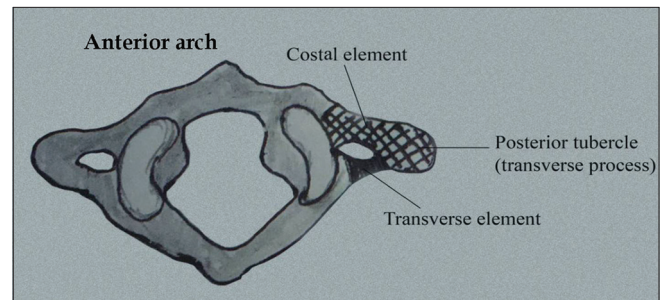
**Table 4: Comparative study of the AIFT**

Authors	No. of sample (atlases)	Incidence of AIFT (%)	Population
Wysocki <i>et al.</i> <sup>15</sup>	55	8 (14.54)	Polish
Chauhan <i>et al.</i> <sup>20</sup>	50	5 (10)	Indian
Rekha <i>et al.</i> <sup>13</sup>	153	6 (3.92)	Indian
Karau <i>et al.</i> <sup>12</sup>	-	8	Kenyaans
Present study	300	12 (4)	Indian

AIFT: Anterior incomplete foramen transversarium



**Figure 4: Difference between the size of transverse foramen**



**Figure 5: Transverse process showing costal and transverse element (atlas)**



## CONCLUSION

Atlas is the first cervical vertebrae. Each transverse process of cervical vertebrae is pierced by the FT. It consists of an anterior and posterior bar, connected to each other on the lateral side by an intertubercular lamella of bone. It was found many variations like partially developed anterior bar of FT (costal element), thin anterior and posterior bar and double FT. The knowledge of these variations is important in clinical practice.

## REFERENCES

- O'Rahilly R, Müller F, Meyer DB. The human vertebral column at the end of the embryonic period proper 2. The occipitocervical region. *J Anat* 1983;136:181-95.
- Williams PL, Warwick R. The axial skeleton. *Gray's Anatomy*. 37<sup>th</sup> ed. Edinburgh: Churchill Livingstone, Longman Group Ltd.; 1989. p. 317-8.
- Nayak S, Vollala V, Raghunathan D. Total fusion of atlas with occipital bone. *Neuroanatomy* 2005;4:39-40.
- Jayanthi V, Kulkarni R. Atlanto-occipital fusion. Report of two cases. *J Anat Soc India* 2003;52:71-3.
- Cave AJ. The morphology of the mammalian cervical pleurapophysis. *J Zool London* 1975;177:377-93.
- Arey LB. The axial skeleton, developmental anatomy. A Text Book and Laboratory Manual of Embryology. 7<sup>th</sup> ed. Philadelphia, PA: WB Saunders Co.; 1974.
- Hamilton WJ. Vertebral column. *Text Book of Human Anatomy*. 2<sup>nd</sup> ed. London: Mac Millan Publishers Ltd.; 1987. p. 43-53.
- Warwick R, Williams P. The axial skeleton. *Gray's Anatomy*. 35<sup>th</sup> ed. Edinburgh: Longman Group Ltd.; 1973. p. 111-4.
- Poplewski R. Badania nad kregiem szczytowym polakow. *Kosmos* 1925;50:749-97.
- Bergman P. Varieties of atlas in man. *Folio Morphol* 1967;26:129-39.
- Taitz C, Nathan H, Arensburg B. Anatomical observations of the foramina transversaria. *J Neurol Neurosurg Psychiatry* 1978;41:170-6.
- Karau PB, Odula P. Some anatomical and morphometric observations in the foramina of the atlas among Kenyans. *Anat J Afr* 1212;2:61-6.
- Rekha BS, Dhanalaxmi D. Variations in foramen transversarium of atlas: An osteological study in south Indians. *Int J Res Health Sci* 2014;2:224-8.
- Avinash A, Siddiqui MS. Bilateral anteriorly deficient foramen transversarium of human atlas vertebra. *J Anat Soc India* 2005;54:251-2.
- Wysocki J, Bubrowski M, Reymond J, Kwiatkowski J. Anatomical variants of the cervical vertebrae and the first thoracic vertebra in man. *Folia Morphol (Warsz)* 2003;62:357-63.
- Kaya S, Yilmaz ND, Pusat S, Kural C, Kirik A, Izci Y. Double foramen transversarium variation in ancient Byzantine cervical vertebrae: Preliminary report of an anthropological study. *Turk Neurosurg* 2011;21:534-8.
- Jaffar AA, Jawad HM, Adil SN. Morphology of foramen transversarium. A correlation with causative factors. *AI-Kindy Col Med J* 2004;2:61-4.
- Divya A, Mohanty BB, Sethy S, Parija B, Hazary SK, Chinara PK. Variation in foramen transversarium-An osteological study in eastern India. *Int J Curr Res* 2012;4:120-2.
- Vasudeva N, Kumar R. Absence of foramen transversarium in the human atlas vertebra: A case report. *Acta Anat (Basel)* 1995;152:230-3.
- Chauhan R, Khanna J. Absence of costal element of the foramen transversarium of atlas vertebrae. *Int J Res Med Sci* 2013;1:66-8.

**How to cite this article:** Gopal K, Ali S, Choudhary AK, Saxena A. Abnormal presentation of transverse foramen of atlas in south Indian population. *Int J Sci Stud* 2015;2(11):102-105.

**Source of Support:** Nil, **Conflict of Interest:** None declared.



# Outcome of Index Upper Gastrointestinal Endoscopy in Patients Presenting with Dyspepsia in a Tertiary Care Hospital

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## Abstract

**Background:** Dyspepsia is a common symptom seen in clinical practice. It is necessary to differentiate between functional and organic dyspepsia as peptic ulcers and gastrointestinal (GI) malignancy are increasing in incidence.

**Objective:** In this study, the outcome of index upper gastrointestinal (UGI) endoscopy in patients with dyspeptic symptoms was evaluated prospectively.

**Materials and Methods:** Between December 2011 and December 2012, 500 consecutive dyspeptic outpatients underwent prospective evaluation with a standardized questionnaire and then UGI endoscopy. Data were analyzed to see the number and frequency of abnormal findings in UGI tract and their significance in relation to the presenting symptoms. Endoscopic findings were defined as important if lesions seen were gastric or duodenal ulcers, moderate to severe gastritis, severe esophagitis, adenomatous polyps or cancer. Histological examination results were obtained for patients who underwent endoscopic biopsy.

**Results:** The mean age of patients was 40 years. Dyspeptic symptoms were more common in 21-40 years age group. No important finding was found in 168 patients, and 433 pathologies were detected in the remaining 332 patients, of which 321 patients had benign findings and 11 patients showed findings suggestive of malignancy. Multiple pathologies were seen in 86 patients and found to be more among males. Reflux esophagitis (17%), erythematous gastritis (18%) and erosive duodenitis (6%) were the common findings.

**Conclusion:** Erythematous gastritis followed by reflux esophagitis, was the most common endoscopic abnormality. The yield of important findings in index UGI endoscopy was statistically significant in patients who presented with dyspepsia.

**Key words:** Duodenitis, Dyspepsia, Endoscopy, Esophagitis, Gastritis

## INTRODUCTION

Multiple diagnostic tests are available for evaluating dyspepsia, including therapeutic trials, testing for *Helicobacter pylori*, upper gastrointestinal (UGI) radiography, and endoscopy. Endoscopy is recommended as the first investigation in the work-up of a patient with dyspeptic symptoms.<sup>1</sup>

Endoscopic examination is essential in the classification of the patient's condition as organic or functional dyspepsia. Ideally, endoscopy should be carried out during a symptomatic phase of the disease and in the absence of any drug therapy, particularly acid suppressants, that may obscure relevant features or interfere with the interpretation of endoscopic abnormalities.

A randomized controlled clinical trial found that initial endoscopy, followed by directed therapy is associated with lower costs and fewer days out of work than empiric therapy with histamine (H<sub>2</sub>) receptor antagonists.<sup>2</sup> Endoscopy is the most accurate method of diagnosis of most conditions associated with dyspepsia, including gastric cancer, peptic ulcer disease, esophagitis, and gastroduodenitis.

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**Month of Submission :** 12-2014  
**Month of Peer Review :** 01-2015  
**Month of Acceptance :** 01-2015  
**Month of Publishing :** 02-2015

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However, endoscopy involves some discomfort, significant social inconvenience and cost. Attempts to identify those patients most likely to benefit from endoscopy have met with variable success. Clinical parameters such as dyspepsia subtypes (ulcer-like, reflux like, and motility-like) have been shown not to predict pathological conditions.

Other factors including age and “alarm symptoms,” such as weight loss, recurrent vomiting, dysphagia, bleeding, or anemia have been shown to be predictive in some studies,<sup>3,4</sup> but not in others.<sup>5</sup> The American Gastroenterological Association currently recommends endoscopy in all patients over the age of 45 and those with alarm symptoms.<sup>6</sup>

In this study, the outcome of index UGI tract endoscopy in patients with dyspeptic symptoms was evaluated, and the prevalence of important endoscopic lesions in these patients was determined.

## MATERIALS AND METHODS

A total of 500 consecutive patients with dyspepsia and attending the outpatient clinic of the General Medicine Department of Sri Ramachandra Medical College and Research Institute between December 2011 and December 2012, were requested for their clinical history and subjected to a systematic examination and an UGI endoscopy. The data were recorded on a pre-structured proforma.

Patient information included demographical data, details of smoking, alcohol consumption and use of non-steroidal anti-inflammatory drugs (NSAIDs). Clinical details included the duration of symptoms and details of alarm symptoms, *viz.* anorexia, weight loss, dysphagia, GI bleed, mass abdomen and anemia.

Dyspepsia was defined according to the Rome III consensus criteria as: Moderate to severe pain or discomfort centered in the upper abdomen lasting for at least 4 weeks. Dyspepsia subtypes were classified as reflux like, ulcer-like and dysmotility-like as previously described in a number of studies.

Following administration of 0.02% lignocaine pharyngeal spray, UGI endoscopy was performed, using Olympus (GIF 30), forward viewing, flexible, fiber optic esophagogastroduod endoscope, following established guidelines. The patients were closely monitored during the procedure. Multiple biopsy samples from the gastric antrum, gastric ulcers, gastric tumors and other suspicious lesions were taken for histology.

The outcomes of endoscopy were categorized as normal, benign and malignant. Benign lesions included:

Inflammatory changes in the esophagus, stomach and duodenum, esophageal web, and erosive and ulcer lesions of the stomach and duodenum. A biopsy was taken whenever malignancy was suspected.

Exclusion criteria were individuals who had an endoscopy for indications other than dyspepsia, those with a known ulcer disease, the second look endoscopy for suspected malignancy, and the post-gastric surgery on follow-up.

Hospital ethics committee approval and informed and written consent by the patient were obtained before undertaking the study. Demographical variables, social habits, and outcome were given in frequencies with their percentages. Mean and standard deviation were calculated, where appropriate. Diagnostic parameters such as sensitivity, specificity and area under the curve were given separately for both genders. The Statistical Package for Social Sciences version 11.5 (SPSS Inc., Chicago, IL, USA) was used for the statistical analysis. A p value < 0.05 was taken as being statistically significant.

## RESULTS

Among the 500 dyspeptic patients who were evaluated in this study with ages ranging from 14 to 75 years, the mean age was 40 (standard deviation [SD]  $\pm$  14) Years. Of these patients, 57% (286) were males and 43% (214) were females. Maximum occurrence of dyspepsia was noted in 266 (53.2%) patients in the age group of 21-40 years, whereas it was 4%, 34.4% and 8.4% among <20 years, 41-60 years and above 60 age groups respectively.

Overall the most common presenting complaints were epigastric burning sensation and epigastric pain, found in 485 patients (97%) and 460 (92%) patients respectively, which were generally mild to moderate intensity with a frequency of minimum once a week. The pattern of predominant symptom is shown in Figure 1.

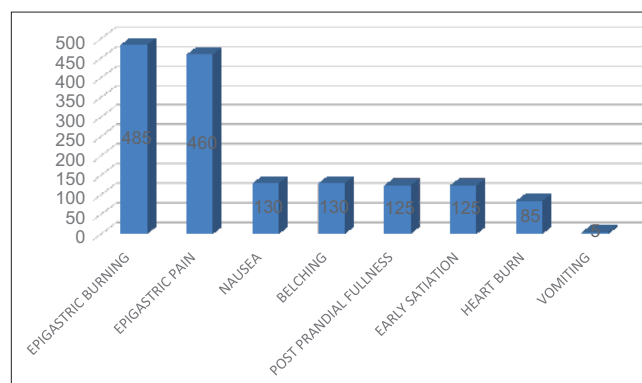


Figure 1: Symptom analysis

Dyspepsia was more common in patients with NSAID use, alcoholics and smokers (Table 1).

Among the 500 patients who underwent UGI endoscopy, 332 patients had important findings and 168 patients had no important findings ( $P \leq 0.001$ ). Totally 321 patients had benign findings, and 11 patients had findings suggestive of malignancy for whom biopsy was taken and confirmed.

The major endoscopic abnormality in our group of dyspeptics was erythematous gastritis (18%), followed by reflux esophagitis (17%) and erosive gastritis (14%).

Esophagitis was found in 83 (16.6%) patients; 56 (67.46%) were male and 27 (32.54%) were female. Mean age of these patients was 38.92; age range was 18-73. Esophageal candidiasis was found in 8 (1.6%); 5 (62.5%) were male and 3 (37.5%) were female. Mean age of these patients was 41.5 years; age range was 22-60 years (Tables 2 and 3).

Gastritis was found in 160 (32%) patients; 97 (60.62%) were male; 63 (39.37%) were female. Mean age of these patients was 41-42 years; age range was 17-72 years. Carcinoma (stomach [10] and esophagus [1]) was found in 11 (2.2%) patients; 7 (63.63%) were male and 4 (36.37%) were female. Mean age of these patients was 53 years; age range was 29-70 years (Tables 2 and 3).

Duodenal ulcer was found in 38 (7.6%); 27 (71.05%) were male and 11 (28.95%) were female. Mean age of these patients was 42.4 years; age range was 22-70 years. Duodenitis was found in 38 (7.6%) patients; 27 (71.05%)

were males and 11 (28.95%) were females. Mean age of these patients was 38-58 years; age range was 19-70 years (Tables 2 and 3).

Peptic ulcer was found in 26 (5.2%) of the patients. Duodenal ulcer was much more common, being found in 25 patients while gastric ulcer was found only in one patient.

All duodenal ulcers were located in the first part of the duodenum. 19 patients had a single ulcer with sizes ranging from 0.5 to 1.25 cm. 6 patients had multiple ulcers. There was no significant difference in the distribution of duodenal ulcer among male and female ( $P = 0.481$ ).

Duodenitis was present in 38 (7.6%) patients of which 30 (6%) were erosive and 8 (1.6%) were erythematous. Both were mainly of mild to moderate severity and endoscopically restricted to the first part of duodenum. Erythematous duodenitis was found only in males (8 [2.8%]) ( $P = 0.014$ ).

Hiatus hernia was found in 23 (4.6%) patients; 19 (82.6%) were males and 4 (17.4%) were females. Mean age of these patients was 41-43 years; age range was 20-75 years. Multiple pathologies were found in 85 (17%) patients; 57 (67.05%) were males and 28 (32.95%) were females. Mean age of these patients was 36-48 years; age range was 19-63 years (Table 1 and 4).

Among the 500 dyspeptic patients, 106 patients gave a history of smoking. Important findings were significantly found more common in smokers (86 [25.9%]) ( $P < 0.001$ ).

Duodenal ulcer (12 [11.3%]) and esophageal candidiasis (4 [3.8%]) were significantly found more common in smokers ( $P = 0.001$  and  $0.045$ , respectively). No significant relationship was seen between smoking and erosive gastritis ( $P = 0.216$ ), erythematous gastritis ( $P = 0.164$ ), reflux esophagitis ( $P = 0.06$ ), erosive duodenitis ( $P = 0.76$ ) and erythematous duodenitis ( $P = 0.79$ ) (Table 5).

**Table 1: Clinical characteristics**

Characteristics	Total	No important findings (168)	Important findings (332)	P value
Dyspepsia	500	168	332	<0.001
Smoking	107	20	87	<0.001
Alcohol	142	40	102	0.105
NSAIDs	163	28	135	<0.001

NSAIDs: Non-steroidal anti-inflammatory drugs

**Table 2: Gender and age distribution of various UGI endoscopy findings**

Finding	Male			Female			Total		
	No (%)	Mean age (years)	Range (years)	No (%)	Mean age (years)	Range (years)	No (%)	Mean age (years)	Range (years)
Esophagitis	56 (67.46)	38.83	18-73	27 (32.54)	39.12	19-65	83 (16.6)	38.92	18-73
Esophageal candidiasis	5 (62.5)	37.4	24-46	3 (37.5)	45.60	22-60	8 (1.6)	41.5	22-60
Gastritis	97 (60.62)	39.44	17-72	63 (39.37)	43.40	19-70	160 (32)	41.42	17-72
Carcinoma	7 (63.63)	55	29-70	4 (36.37)	51	45-60	11 (2.2)	53	29-70
Duodenal ulcer	16 (64)	40.2	22-70	9 (36)	44.6	23-66	25 (5)	42.4	22-70
Duodenitis	27 (71.05)	35.6	21-70	11 (28.95)	41.5	19-69	38 (7.6)	38.58	19-70
Multiple pathologies	61 (67.05)	36.6	21-68	25 (32.95)	36.37	19-65	86 (17)	36.48	19-68
Hiatus hernia	19 (82.6)	44.36	20-75	4 (17.4)	38.5	27-60	23 (4.6)	41.43	20-75
No important finding	78 (46.42)	34.63	14-74	90 (53.58)	39.8	19-70	168 (33.6)	37.21	14-74

UGI: Upper gastrointestinal

**Table 3: UGI endoscopy findings in male and female**

Findings	Total	Male (286)	Female (214)	P value
Erythematous gastritis	89	56	33	0.229
Reflux esophagitis	83	56		0.038
Erosive gastritis	71	41	30	0.920
Lax les	45	25	20	0.815
Erosive duodenitis	30	19	11	0.484
Hiatus hernia	23	19	4	0.012
Duodenal ulcer	25	16	9	0.481
Erythematous duodenitis	8	8	0	0.014
Esophageal candidiasis	8	5	3	0.761
Malignancy	11	7	4	0.663
Multiple findings	86	61	25	0.005

UGI: Upper gastrointestinal

**Table 4: Significant endoscopy findings in alcohol consumers**

Findings	Total	Alcohol (142)	No alcohol (358)	P value
Erosive duodenitis	30	19	11	<0.001
Duodenal ulcer	25	14	11	0.002
Reflux esophagitis	83	32	51	0.065
Erosive gastritis	71	24	47	0.276
Erythematous duodenitis	8	5	3	0.031
Malignancy	11	6	5	0.052

**Table 5: Significant endoscopy findings in smokers**

Findings	Total	Smoker (107)	Non-smoker (393)	P value
Reflux esophagitis	83	24	59	0.06
Erosive gastritis	71	19	52	0.216
Erythematous gastritis	89	14	75	0.164
Duodenal ulcer	25	12	13	0.001
Erosive duodenitis	30	7	23	0.76
Esophageal candidiasis	8	4	4	0.04

142 (28.4%) patients had history of alcohol consumption. 102 (71.83%) patients had significant findings and 40 (28.16%) had no important findings ( $P = 0.105$ ). Reflux esophagitis, duodenal ulcer, erosive duodenitis and erythematous duodenitis were significantly more common in patients who consumed alcohol ( $P = 0.025, 0.002, < 0.001$  and  $0.031$ , respectively) (Table 4).

No significant relation was seen between alcohol and erosive gastritis ( $P = 0.276$ ), erythematous gastritis ( $P = 0.104$ ), hiatus hernia ( $P = 0.468$ ) and esophageal candidiasis ( $P = 0.83$ ).

Among the 500 patients evaluated for dyspepsia 162 patients (32.4%) gave history of NSAID consumption (male 72, female 90), of which 133 (40.1%) had important findings and 29 (17.3%) had no significant finding on UGI endoscopy (significant  $P \leq 0.001$ ).

168 (33.6%) patients had no important finding on endoscopy; 78 (46.42%) were males and 90 (53.58%) were females. Mean age of these patients was 37.21 years; age range was 14-74 years.

## DISCUSSION

The most important issue in the treatment of dyspepsia is to discriminate between functional dyspepsia and organic causes, such as peptic ulcers, cholelithiasis, and chronic pancreatitis. When there is no identifiable pathological condition, functional dyspepsia can be diagnosed. Chronic dyspepsia remains a serious problem for both clinicians and investigators. While dyspepsia may be functional, it may also be due to gastric cancer, which is one of the most fatal diseases worldwide. Especially in patients older than 45 years of age, new onset dyspepsia should be seriously investigated.

Endoscopy is accepted as the gold standard in the diagnosis of UGI pathologies. According to research, endoscopy is strictly recommended in dyspeptic patients 45 years and older in Europe and 50 years and older in America. Endoscopy should also be conducted in young patients if they have severe dyspeptic complaints.

The prevalence of dyspepsia has ranged from 19% to 41% in western countries. Dombal identified no less than 20 different definitions and an Expert Committee listed 11 definitions of dyspepsia (including their own) which had been used over a period of nearly 25 years.<sup>7</sup> In a study from Jordan, dyspepsia in previous 12 months was reported in 60.1% of subjects.<sup>8</sup> Jones and Lydeard in a community based questionnaire study of 2066 patients found the prevalence of dyspepsia over a 6 months period to be 38%.<sup>9</sup> This variation in prevalence rate may be due to differences in diet or other contributory factors. It could also be due to different definitions of dyspepsia and survey methods used.

In our study, the type of dyspeptic symptoms did not vary between males and females. Jones and Lydeard had noticed that the frequency of dyspeptic symptoms declined with age, particularly in men.<sup>9</sup> Talley *et al.* in a questionnaire study conducted in Minnesota, involving 1644 patients in the age group of 20-64 years reported that dyspepsia was significantly more common in younger subjects and females.<sup>10</sup> Females under psychological stress were found to be at greater risk in developing dyspepsia.

Studies have shown that chronic use of aspirin and other NSAIDs provoke the dyspepsia in 10-25% of patients. In our study, 32.4% of patients had a history of intake of NSAIDs like diclofenac, aceclofenac and ibuprofen and



antipyretic drugs like paracetamol. It was found that, among the patients presenting with epigastric pain, significant numbers had taken NSAIDs. However, Talley *et al.* did not find any increased risk of dyspepsia with consumption of NSAIDs like aspirin in younger age group, but they were associated with almost two fold increase in risk in elderly patients.<sup>10</sup>

History of alcohol consumption with a frequency of 3-7 times per week for a mean duration of 17.5 years (5-30 years) was reported in 28.4% of our patients. Also, 21.2% of our subjects were smokers with an average of 5-6 cigarettes per day for a mean duration of 10 years (1-20 years). Increased prevalence of dyspeptic symptoms among smokers and those who consume alcohol has been reported earlier by Shah *et al.* However, Talley *et al.* suggested that smoking and alcohol were not important risk factors for dyspepsia in the age group of 20 to 64.<sup>10</sup> A similar inference was reported by Talley *et al.* in another questionnaire study involving 73 patients.<sup>11</sup>

In our study, increased prevalence of dyspeptic symptoms and important findings in UGI endoscopy was significantly more among smokers. Reflux esophagitis, duodenal ulcer, erosive duodenitis and erythematous duodenitis were significantly more common in patients who consumed alcohol ( $P = 0.025, 0.002, 0.000$  and  $0.031$  respectively). Duodenal ulcer (12[11.3%]) and oesophageal candidiasis (4[3.8%]) were significantly found more common in smokers ( $P = 0.001$  and  $0.045$  respectively).

In our study, the prevalence of important findings in UGI endoscopy was found to be more significant in those who consumed NSAIDs ( $P = 0.000$ ). Erosive gastritis and duodenal ulcer were significantly found more common among patients who consumed NSAIDs compared to patients who gave no history of NSAID consumption ( $P = 0.00$  and  $0.001$  respectively).

Multiple findings were seen in 86 (17%) of the patients. It was significantly more common in males (61 patients) when compared to females (25) ( $P = 0.005$ ).

Epigastric pain and epigastric burning sensation were the most common symptoms, which were present in 92% and 97% of our subjects respectively which were of mild to moderate intensity and not affecting their daily activities. Upper abdominal pain has been reported in 15.7-58% of the population in other studies. Abdominal pain in our subjects was more in those with a history of NSAID consumption. Other symptoms included nausea, vomiting, belching, post-prandial fullness, early satiation, and heartburn. We found the symptom of heartburn to

be present in 17% of our patients, and they were mainly smokers and those with history of alcohol consumption. No association was seen between any of the dyspeptic symptoms with age, sex, occupation, and diet.

Majority of our dyspeptic patients had erythematous and erosive gastritis on endoscopy, accounting for 17.8% and 14.2% respectively. They were of mild to moderate severity.

In our study, normal UGI endoscopy was seen in 33.6% of patients. In a prospective study of 200 dyspeptic patients by Eman *et al.* in Kuwait, normal endoscopic study was present in 32% patients.<sup>12</sup>

## CONCLUSION

The present study was aimed at emphasizing the importance of UGI endoscopy as the initial investigation in patients with dyspepsia especially of new onset and in patients above 45 years. Erythematous gastritis followed by reflux esophagitis was the most common endoscopic abnormality. The yield of important findings in index UGI endoscopy was statistically significant in patients who presented with dyspepsia.

## ACKNOWLEDGMENT

We are grateful to Dr. S. Manjunath, former Professor and HOD of General Medicine in SRMC, Chennai who had been helping us throughout the study.

## REFERENCES

1. Talley NJ, Stanghellini V, Heading RC, Koch KL, Malagelada JR, Tytgat GN. Functional gastroduodenal disorders. *Gut* 1999;45 Suppl 2:II37-42.
2. Bytzer P, Hansen JM, Schaffalitzky de Muckadell OB. Empirical H2-blocker therapy or prompt endoscopy in management of dyspepsia. *Lancet* 1994;343:811-6.
3. Adang RP, Vismans JF, Talmon JL, Hasman A, Ambergen AW, Stockbrügger RW. Appropriateness of indications for diagnostic upper gastrointestinal endoscopy: Association with relevant endoscopic disease. *Gastrointest Endosc* 1995;42:390-7.
4. Gillen D, McColl KE. Does concern about missing malignancy justify endoscopy in uncomplicated dyspepsia in patients aged less than 55? *Am J Gastroenterol* 1999;94:2329-30.
5. Bytzer P, Schaffalitzky de Muckadell OB. Prediction of major pathologic conditions in dyspeptic patients referred for endoscopy. A prospective validation study of a scoring system. *Scand J Gastroenterol* 1992;27:987-92.
6. American Gastroenterological Association medical position statement: Evaluation of dyspepsia. *Gastroenterology* 1998;114:579-81.
7. Dombal FT. Analysis of foregut symptoms. In: Baron JH, Moody FG, editors. *Butterworths International Medical Reviews. Gastroenterology*. London: Butterworths; 1981. p. 49-66.
8. Farsakh NA, Saadeh A, Rawshdeh M, Farsakh HA. Dyspepsia in the general population in Jordan. *Indian J Gastroenterol* 2000;19:68-70.
9. Jones R, Lydeard S. Prevalence of symptoms of dyspepsia in the community. *BMJ* 1989;298:30-2.
10. Talley NJ, Zinsmeister AR, Schleck CD, Melton LJ 3<sup>rd</sup>. Smoking, alcohol,

- and analgesics in dyspepsia and among dyspepsia subgroups: Lack of an association in a community. *Gut* 1994;35:619-24.
11. Talley NJ, Weaver AL, Zinsmeister AR. Smoking, alcohol, and nonsteroidal anti-inflammatory drugs in outpatients with functional dyspepsia and among dyspepsia subgroups. *Am J Gastroenterol* 1994;89:524-8.
12. Abahussain EA, Hasan FA, Nicholls PJ. Dyspepsia and *Helicobacter pylori* infection: Analysis of 200 Kuwaiti patients referred for endoscopy. *Ann Saudi Med* 1998;18:502-5.

**How to cite this article:** Yuvaraj NA, Vengadakrishnan K. Outcome of Index Upper Gastrointestinal Endoscopy in Patients Presenting with Dyspepsia in a Tertiary Care Hospital. *Int J Sci Stud* 2015;2(11):106-111.  
**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Comparing the Biomedical Waste Management Practices in Major Public and Private Sector Hospitals of Shimla City

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## Abstract

**Purpose:** Biomedical waste (BMW) management seems to be neglected and usually ends up in a blame game as the generators keep blaming the housekeeping staff for the improper management and vice versa. The generators, i.e. doctors, paramedics forget the most important step of BMW management, i.e. segregation that compounds the problem of proper management of the same. In common parlance, people say the private sector is better than the public one.

**Aim and Objective:** To look at the differences in BMW management practices if any between the between major public and private hospitals of the Shimla city.

**Methodology:** Cross-sectional study was conducted in four major public and three major private hospitals of Shimla city respectively. We collected the data through predesigned interview schedules and observational survey checklist of International Clinical and Epidemiology Network.

**Results:** The mean hazardous BMW generated by the private hospitals was calculated to be 51.33 g/bed/day (standard deviation [SD] 34.96) in comparison to 191.5 g/bed/day (SD 93.83) for the public hospitals. There was a significant difference in segregation of wastes in public and private hospitals with private hospitals showing results better in terms of segregation of wastes according to the guidelines. It revealed that none of the patient care areas had designated waste route inside the hospital. All the hospitals except one public hospital had central waste storage facility. None of the major private hospitals had facilities for treatment and disposal. None of housekeeping staff was using the personal protective equipment.

**Conclusion:** All major hospitals of Shimla city in the study area practiced poor management of BMWs. Major improvement was required in all the sectors of BMW management.

**Key words:** Biomedical, Hospitals, Management, Waste

## INTRODUCTION

The bio-medical waste (BMW) means any solid, liquid waste material, generated during the process of diagnosis, treatment and immunization of human being or animal. These waste materials could cause serious hazards to health

and environment in case of indiscriminate management. All the hospital personnel are at a risk to get many fatal infections like human immunodeficiency virus, hepatitis B virus, hepatitis C virus and injuries by these infectious materials. Wherever biomedical solid waste is generated, safe and reliable methods for its handling are therefore essential and hence due emphasis has been placed on segregation, safe collection, storage and treatment and final disposal at site to minimize if not eliminate the health hazards.

The Government of India (Notification, 1998)<sup>1</sup> specifies that Hospital Waste Management is part of hospital hygiene and maintenance activities. This involves management of a

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**Month of Submission :** 12-2014  
**Month of Peer Review :** 01-2015  
**Month of Acceptance :** 01-2015  
**Month of Publishing :** 02-2015

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range of activities, which are mainly engineering functions, such as collection, transportation, operation/treatment of processing systems, and disposal of waste. However, initial segregation and storage activities are the direct responsibility of doctors and nursing personnel who are engaged in the hospital. If the infectious component gets mixed with the general non-infectious waste, the entire mass becomes potentially infectious.<sup>2,3</sup>

The actual BMW management situation in the democratic developing country like India is grim. Even though there are rules stipulating the method of safe disposal of BMW, hospital waste generated by Government Hospitals is still largely being dumped in the open, waiting to be collected along with general waste.<sup>4</sup>

In common parlance, people say the private sector is better than the public one. Looking into the existing scenario of BMW management in the country and the fact that such a comprehensive study had not been done in Himachal Pradesh, this study was undertaken to look into the differences in BMW management practices if any between the between major public and private hospitals of the Shimla city.

## METHODOLOGY

The study was conducted in the major public and private hospitals of Shimla city. In the study area, there were 72 health facilities that fell under the jurisdiction of both the municipal corporation and Himachal Pradesh State Pollution Control Board, Shimla Head Quarter. The study comprised of cross-sectional survey of the personnel handling and monitoring the BMW and observational survey of the four major public and three major private hospitals, the criteria for major hospital being the hospitals with more than 15 beds. The data was collected in three stages. In the stage one of data collection, hospital superintendents/hospital administrators, ward sisters/sister in charge, chief lab technicians and housekeeping staff of, respective hospitals, were interviewed. Stage two of data collection, comprised of studying the waste handling and hospital waste management of the public sector and private sector hospitals as per the observational checklist of International Clinical Epidemiology Network.

In the stage three of data collection, information was gathered on the quantity of hazardous and non-hazardous waste material generated per bed per day on the basis of the three random visits conducted. An average of the three measurements gave the quantum of biomedical solid waste generated per bed per day in the public and private hospitals respectively.

The study was conducted through October 2009 to September 2010. The data so collected were entered and analyzed using SPSS 14 evaluation version. The results were expressed in percentages. The mean amount of waste generated in the various hospitals was calculated with a standard deviation under 95% confidence intervals. The results were described under segregation and collection, transport, storage, final treatment and disposal and quantification.

The study did not involve any experimental diagnostic tests or administration of medicines to participants. Written informed consent of all participants was obtained before gathering any information.

## RESULTS

The study was conducted in the seven major hospitals of Shimla city namely, Indira Gandhi Medical College, Kamla Nehru Hospital, Deen Dayal Upadhyay Hospital, HP Government Dental College (Public hospitals) and Indus Hospitals, Shimla Sanitarium and Sri Ram Hospital (Private Hospitals).

During the study, 7 Hospital Superintendents/Hospital administrators/CEO/Vice President/Nodal officer, 52 nursing staff (Ward Sister/nursing in Charge), 13 lab technicians, 102 housekeeping staff, respectively were interviewed regarding the BMW management practices being followed in their respective hospitals. In order to verify the results of the interview schedules, observation survey was conducted in total 107 patient care areas of the respective hospitals.

### Segregation and collection

#### *Results of interview*

Majority of the nursing staff, chief lab technician in both public and private hospitals stressed that there was strict implementation of BMW management in the patient care area but labeling the name of the patient care area was usually not done (Table 1).

The nursing in charges said that 45 (88.2%), 39 (90.7%), 46 (88.5%) and 42 (85.7%) of the patient care areas had yellow, blue, red and black waste bags in the correct position. In all the patient care areas supervised by nursing in charge in the private hospitals, the waste bags were correctly positioned. It was further told that BMW management guidelines were not present 50 (96.2%) in the areas supervised by them.

According to the chief lab technicians, in 10 (83.3%), 8 (72.7%), 8 (72.7%) and 9 (75%) of the labs supervised by them had correctly positioned yellow, blue, red and



**Table 1: Components of segregation and collection (interview schedule)**

Ward sisters	Private hospitals (I/c patients care areas) (n=7) (%)	Public hospitals (I/c patients care areas) (n=45) (%)	Total (I/c patients care areas) (n=52) (%)	P value
Labeled and signed				
Yes	1 (14.3)	0	1 (1.9)	0.14
No	6 (85.7)	45 (100)	51 (98.1)	
Strict implementation				
Yes	4 (57.1)	34 (75.6)	38 (73.1)	0.57
No	3 (42.9)	11 (24.4)	14 (26.9)	
Chief lab technicians	Private hospitals (n=3)	Public hospitals (n=10)	Total (n=13)	
Labeled and signed				
Yes	1 (33.3)	0	1 (7.7)	0.23
No	2 (66.7)	10 (100)	12 (92.3)	
Strict implementation				
Yes	2 (66.7)	8 (80)	10 (76.9)	1.00
No	1 (33.3)	2 (20)	3 (23.1)	

black bags respectively. In all the labs supervised by chief lab technicians private hospitals, only 2 (66.7%) and 1 (50%) of the labs had correctly positioned red and black bags respectively, whereas other colored waste bags were correctly positioned in 100 % of the labs of private hospitals. They also told that guidelines regarding BMW management were displayed in only 4 (30.8%) labs.

### Observation survey findings

There was significant difference in segregation of wastes in public and private hospitals with private hospitals showing results better in terms of segregation of wastes according to the guidelines, segregation of wastes at the site of generation and collection of plastic waste unmixed in red bags (Table 2).

It was revealed that in nearly half the patient care areas of the hospitals, containers with colored bags were not located at the site of generation. There was no significant difference in private and public hospitals as far as the position of containers with colored bags at the site of generation was concerned. Observational survey revealed that only 7 (6.5%) of the patient care areas had guidelines/charts displayed.

### On Site Transport

#### Interview schedule results

All the housekeeping staff interviewed in the various hospitals told that they closed the waste bags by tying the knot and carried them to the central waste storage facility in hands.

According to Hospital superintendents, all the hospitals except one were having separate/specific time schedule

**Table 2: Components of segregation and collection (observational survey)**

Components	Private hospitals (patients care areas) (n=16) (%)	Public hospitals (patients care areas) (n=91) (%)	Total (patients care areas) (n=107) (%)	P value
Segregation of wastes				
No	6 (37.5)	85 (87.9)	91 (85.1)	NA
As per guidelines	6 (37.5)	4 (4.4)	10 (9.3)	
NA	4 (25)	2 (2.2)	6 (5.6)	
Segregated at the site of generation				
No	6 (37.5)	80 (87.9)	86 (80.4)	NA
Yes	6 (37.5)	9 (9.9)	15 (14)	
NA	4 (25)	2 (2.2)	6 (5.6)	
Biohazard labels				
No	1 (6.3)	8 (8.8)	9 (8.4)	1.00
Present	14 (87.5)	75 (82.4)	89 (83.2)	
NA	1 (6.3)	8 (8.8)	9 (8.4)	
Bags not 3/4 <sup>th</sup> full				
No	0	12 (13.2)	12 (11.2)	0.34
Yes	12 (75)	70 (76.9)	82 (76.6)	
NA	4 (25)	9 (9.9)	13 (12.2)	
Syringe plunger collected in red bags				
No	1 (6.3)	5 (5.5)	6 (5.6)	0.57
Yes	11 (68.8)	73 (80.2)	84 (78.5)	
NA	4 (25)	13 (14.3)	17 (15.9)	
Plastic waste collected in red bags				
No	2 (12.5)	3 (3.3)	5 (4.7)	NA
Yes	8 (50)	9 (9.9)	17 (15.9)	
Mixed	5 (31.3)	65 (71.4)	70 (65.4)	
NA	1 (6.3)	14 (15.4)	15 (14)	

NA: Not applicable

to remove infectious waste and general wastes from the wards. BMW was being removed from the patient care areas for storage/treatment and final disposal in more than once a week, and the remaining hospitals were removing it as and when sufficient quantity of BMW accumulated. A dedicated waste route designated to avoid the passage of wastes through patient care areas was only in two of the hospitals one in a private and public sector each.

### Observation survey findings

It revealed that none of the patient care areas had designated waste route inside the hospital. Even the time of removal of infectious waste from non-infectious waste was different only in 8.4% (n=9) patient care areas and those 9 patient care areas belonged to public hospitals. In 6.5% (n=7) patient care areas only that too of private hospitals (43.8% [n=7]) small buckets were being used to carry the wastes to the central storage facility but they were not labeled with the biohazard symbol.

### Storage

All the hospitals except one public hospital had central waste storage facility. So it was excluded from the further analysis.

Storage areas were secured by lock and key in the hospitals except for one private hospital. Proper log book was not maintained for receipt and register of the BMW at any of the hospitals although a designated person was there for the storage area. It was observed that the waste bags were not labeled with the site of generation and were stored together except in one private hospital where they were stored separately.

Functional facility to weigh the waste was there in 4 (57.2%) of the hospitals with the three public hospitals having it. The state of cleanliness in the central storage facilities in all the public hospitals was poor. The private hospitals fared better in this aspect as 2 (66.7%) had central storage facility in a relatively better condition compared to the public hospitals.

### **Treatment and Final Disposal**

#### ***Sharps management***

Totally, 29 (56.9%) of the nursing staff said that in their patient care areas sharps were destroyed individually. The major reason behind the destruction of sharps in bulk was found to be excess workload. Though sufficient disinfectant was available in 41 (80.4%) of the patient care areas supervised by nursing staff, in only 5 (9.8%) patient care areas, the disinfectant solution was being replaced in each shift as per the guidelines.

In 3 (42.9%) of the patient care areas of the private hospitals supervised by nursing staff sharps were destroyed individually whereas it was seen in 26 (57.8%) of the patient care areas of public hospitals according to the interview of the nursing in charge. Only in 11.1% (n=5) of the patient care areas supervised by nursing staff of the public hospitals disinfectant solution for treating the plastic wastes was replaced as per guidelines. There was no significant association with various aspects of sharps treatment with type of hospitals in relation to ward sisters/nursing in charge.

#### ***Observational survey findings***

Totally, 74 (69.2%) of the patient care areas had a functional needle destroyer easily available and 64 (59.8%) of the patient care areas (Figure 1) were destroying the needles after every injection. Higher proportion of the public hospitals patient care areas were performing better regarding sharps management.

Only two of the hospitals (public hospitals) had a central storage cum treatment facility. Autoclave and shredder were available in both the settings. Only the plastic waste was treated with the machine, i.e. autoclaved and shredded and then it was being sold to a contractor for recycling measure. One of the hospital was operating the machine

twice weekly, and the other hospital was operating the machine on a daily basis for nearly 5 h.

There were no reports of scavenging from these sites in any of the two central storage cum treatment facilities. At only one of the central storage cum treatment facilities, an open pit was there for sharps disposal of the size of  $10 \times 10 \times 12$  Cubic feet. A new pit had been constructed which was provided with a pipe for putting the sharps inside the pit and adding disinfectant to it.

#### **Quantification of BMW**

The mean weight of hazardous BMW/per bed/day came to be 131.42 g/bed/day (SD 102.09) of all the hospitals. The mean hazardous BMW generated by the private hospitals was calculated to be 51.33 g/bed/day (SD 34.96) in comparison to 191.5 g/bed/day (SD 93.83) for the public hospitals. There was no significant difference between the mean hazardous waste generated in public and private hospitals.

## **DISCUSSION**

BMW management requires diligence and care from a chain of people, starting with the nurse or doctor who use the equipment and supplies that become waste, continuing through housekeeping staff who carries away the waste, on to off-site transport companies, and finishing with the technology operator responsible for ensuring that residues are disposed of in the correct way. If any of these are careless in their work or allow scavengers access to the waste, the chain is broken, and dangers follow.

The present study was conducted to compare the BMW management practices in public and private hospitals.

#### **Segregation and collection**

Difference was observed in the interview schedule results and the results of the observational survey regarding various components of segregation and collection except for labeling and signing on the waste bags. The difference clearly indicated the lack of attitude on the part of the nursing staff in charge and chief lab technicians in managing the segregation and collection in their respective supervised patient care areas.

Observational survey revealed that in the majority of the patient care areas waste segregation was not done at the site of generation, and even the guidelines were not followed in most of the patient care areas. But the private hospitals performed significantly better in regarding onsite waste segregation. Similar results were observed by Askarian *et al.*,<sup>5</sup> Pandit *et al.*,<sup>6</sup> Gupta *et al.*,<sup>7</sup> Tsakona *et al.*,<sup>8</sup> Pandit *et al.*,<sup>9</sup> Bdour *et al.*<sup>10</sup> and Abor and Bouwer<sup>11</sup> respectively.

One of the probable reasons may be the absence of the containers with colored bags at the site of generation as revealed in the observational survey.

In the present study, it was found that neither the guidelines were displayed in the majority of the patient care areas nor were the waste bags labeled and signed before being transported to the central waste storage facilities. Similar findings were seen by Verma *et al.*<sup>12</sup> in Delhi.

### Onsite Transport

There were contrasting results obtained from the interviews of the hospital superintendents and the observational survey with the latter depicting that none of the hospitals had designated waste route for the transportation of BMW. Even the time of removal of infectious waste from non-infectious waste was not different in the majority of the patient care areas.

In the present study, it was revealed that all the housekeeping staff used to transport the waste bags manually without using any trolleys (Figure 2). This practice exposed visitors and patients to possible contamination. Contrary to our finding better onsite transport facilities were observed in many studies.<sup>8,10,13,14</sup>

### Storage

The characteristics of storage locations have a direct impact on the environment and potential health risks at the hospital. Evidently, they must be well-disinfected and secured so that only authorized personnel can have access to them.<sup>15</sup>

Proper log book was not maintained for receipt and register of the BMW at any of the hospitals although a designated person was there for the storage area. Tsakona *et al.*<sup>8</sup> and El Salam MMA<sup>16</sup> also found the similar thing that all the central storage chambers had a limited access to only the personnel responsible of waste handling.

It was observed that the waste bags were not labeled with the site of generation and were stored together except in one private hospital where they were stored separately. Similar findings were observed by Tsakona *et al.*<sup>8</sup> and Rouyan *et al.*<sup>17</sup>

Functional facility to weigh the waste was there in 4 (57.2%) of the hospitals with the three public hospitals having it. The central storage areas of private hospitals were found to be better than that of public hospitals in terms of overall hygiene. But sufficient cleaning was not done in any of the hospitals that was found to be similar to other studies.<sup>10,16,17</sup>

### Treatment and Final disposal

Encouraging results were seen in the sharps management in the present study as the sharps (needles) were being

destroyed individually in large number of the patient care areas. But in spite of the sufficient availability of the disinfectant, its solution was not being replaced as per the guidelines in almost all the patient care areas.<sup>18</sup>

Only two of the hospitals (public hospitals) had a central storage cum treatment facility. Autoclave and shredder were available in both the settings (Figure 3). Only the plastic waste was being treated with the machine, i.e. autoclaved and shredded and then it was being sold to a contractor for recycling measure.

Wastes from other hospitals in the present study used to come to the regional incinerator plant run by Municipal Corporation. The yellow bags containing soiled wastes was, of the above-mentioned hospitals were also transported to this plant for incineration. Mixed waste was being treated incinerated daily and hence putting at risk the lives of not just the technology operators but also the people living in the vicinity. Similar results were seen by Tsakona *et al.*<sup>8</sup> and Bendjoudi *et al.*<sup>19</sup> as large amount of municipal wastes and liquids were incinerated with the infectious waste.

### Quantitative analysis

The amount of medical waste and the risks to waste handlers can be reduced effectively with proper waste handling, such as proper segregation and resource recycling.<sup>20,21,22</sup>

The waste generation rates ranged from 0.25 to 7.0 kg/bed/day<sup>23</sup> in seven European countries and the US, 0.4-5.5 kg/patient/day<sup>24</sup> in 12 developing and developed countries and 0.11–3.9 kg/bed/day<sup>25</sup> at hospitals of Japan, Turkey, US, Canada, India, Thailand, and Bangladesh.

In the present study, the mean weight of hazardous solid BMW/per bed/day came to be 131.42 g/bed/day (SD 102.09) of all the hospitals. The mean hazardous solid BMW generated by the private hospitals was calculated to be 51.33 g/bed/day (SD 34.96) in comparison to 191.5 g/bed/day (SD 93.82) for the public hospitals. There was no significant difference between the mean hazardous solid BMW generated/bed/day in public and private hospitals. Similar findings were seen in a study of rural and urban areas of U.T. Chandigarh, where the rate of generation of BMW varied from 0.06 kg/bed/day to 0.25 kg/bed/day.<sup>26</sup> Jang *et al.*<sup>27</sup> also found similar BMW generation rates in Daejeon, South Korea. Even the other medical college in Himachal Pradesh i.e. Dr. R.P.G.M.C. Tanda had also reported a similar average waste generation/bed/day.<sup>28</sup> Bdour *et al.* and Abdulla *et al.* found higher BMW generation rate in their respective studies.<sup>10,14</sup> The probable reason could be the availability of data on infectious BMW only in the hospitals under study.





**Figure 1: Investigator looking into the waste bins to observe segregation process**



**Figure 2: Inadequate use of personal protective equipment's by housekeeping staff**



**Figure 3: Autoclave and shredder at waste treatment facility of a public hospital**

## CONCLUSION

All major hospitals of Shimla city in the study area practiced poor management of BMWs. Typically, handling of these wastes was assigned to housekeeping staff who performed

all activities without proper training or guidance, and with insufficient personal protective measures. However, there were significantly higher number of needle/sharp induced injuries in housekeeping staff of public hospitals. Poor segregation and classification procedures of the generated wastes were observed at all of the surveyed hospitals but the private hospitals performed significantly better in relation to segregation of wastes at the site of generation. The infectious BMW was still being dumped and mixed with the domestic waste. Collection, internal transportation and storage facilities in the hospitals failed to meet the BMW (management and handling) rules 1998. Onsite treatment facilities (autoclave and shredder) were available in only two of the hospitals that were operated by contractual staff having incomplete personal protective measures.

The most frequently used treatment for solid BMW was incineration; all the hospitals of Shimla city. The efficiency of incineration practices was still questionable which might be adversely reflected on the health of the technology operators and surrounding communities.

Average generation rate of hazardous BMW in the major hospitals of Shimla city was found to be 131.42 g/bed/day (SD 102.09) of all the hospitals. There was no significant difference between the mean hazardous BMW generated/bed/day in public and private hospitals.

## ACKNOWLEDGMENT

Author wants to acknowledge the funding by Indian Council of Medical Research as a part of MD/MS thesis grants (2010) for this research study. He also wants to acknowledge the International Clinical Epidemiology Network for providing him the data collection tools. Also, Author acknowledges Dr. Anjali Mahajan, Assistant Professor, Department of Community Medicine, IGMC Shimla, who helped him in the statistical analysis.

## REFERENCES

1. Info Nugget, Hospital Waste Management and Bio-degradable Waste. Government of India, Press Information Bureau. Available from: <http://www.pib.nic.in/infonug/infaug.99/i3008991.html>. [Last cited on 2014 Nov 4].
2. Patil GV, Pokhrel K. Biomedical solid waste management in an Indian hospital: A case study. *Waste Manag* 2005;25:592-9.
3. Chaerul M, Tanaka M, Shekdar AV. A system dynamics approach for hospital waste management. *Waste Manag* 2008;28:442-9.
4. Biomedical Wastes. Available from: <http://www.swachdelhi.comNew.htm>. [Last cited on 2014 Nov 4].
5. Askarian M, Vakili M, Kabir G. Results of a hospital waste survey in private hospitals in Fars province, Iran. *Waste Manag* 2004;24:347-52.
6. Pandit NB, Mehta HK, Kartha GP, Choudhary SK. Management of bio-medical waste: Awareness and practices in a district of Gujarat. *Indian J Public Health* 2005;49:245-7.
7. Gupta S, Boojh R, Mishra A, Chandra H. Rules and management of



- biomedical waste at Vivekananda Polyclinic: A case study. *Waste Manag* 2009;29:812-9.
8. Tsakona M, Anagnostopoulou E, Gidarakos E. Hospital waste management and toxicity evaluation: A case study. *Waste Manag* 2007;27:912-20.
  9. Pandit NA, Tabish SA, Qadri GJ, Mustafa A. Biomedical waste management in a large teaching hospital. *JK Pract* 2007;14:57-9.
  10. Bdour A, Altrabsheh B, Hadadin N, Al-Shareif M. Assessment of medical wastes management practice: A case study of the northern part of Jordan. *Waste Manag* 2007;27:746-59.
  11. Abor PA, Bouwer A. Medical waste management practices in a Southern African hospital. *Int J Health Care Qual Assur* 2008;21:356-64.
  12. Verma LK, Mani S, Sinha N, Rana S. Biomedical waste management in nursing homes and smaller hospitals in Delhi. *Waste Manag* 2008;28:2723-34.
  13. Mohamed Soliman S, Ibrahim Ahmed A. Overview of biomedical waste management in selected Governorates in Egypt: A pilot study. *Waste Manag* 2007;27:1920-3.
  14. Abdulla F, Abu Qdais H, Rabi A. Site investigation on medical waste management practices in northern Jordan. *Waste Manag* 2008;28:450-8.
  15. Cheng YW, Sung FC, Yang Y, Lo YH, Chung YT, Li KC. Medical waste production at hospitals and associated factors. *Waste Manag* 2009;29:440-4.
  16. Abd El-Salam MM. Hospital waste management in El-Beheira Governorate, Egypt. *J Environ Manage* 2010;91:618-29.
  17. Ruoyan G, Lingzhong X, Huijuan L, Chengchao Z, Jiangjiang H, Yoshihisa S, *et al.* Investigation of health care waste management in Binzhou District, China. *Waste Manag* 2010;30:246-50.
  18. Infection control for viral haemorrhagic fevers in the African Health Care settings. Available from: <http://www.cdc.gov/vhf/abroad/vhf-manual.html>. [Last cited on 2014 Nov 20].
  19. Bendjoudi Z, Taleb F, Abdelmalek F, Addou A. Healthcare waste management in Algeria and Mostaganem department. *Waste Manag* 2009;29:1383-7.
  20. Almuneef M, Memish ZA. Effective medical waste management: It can be done. *Am J Infect Control* 2003;31:188-92.
  21. Lee BK, Ellenbecker MJ, Moure-Ersaso R. Alternatives for treatment and disposal cost reduction of regulated medical wastes. *Waste Manag* 2004;24:143-51.
  22. Tudor TL, Barr SW, Gilg AW. Strategies for improving recycling behaviour within the Cornwall National Health Service (NHS) in the UK. *Waste Manag Res* 2007;25:510-6.
  23. Liberti L, Tursi A, Costantino N, Ferrara L, Nuzzo G. Optimization of infectious hospital waste management in Italy Part II. Waste characterization by origin. *Waste Manag Res* 1996;14:417-31.
  24. Chung SS, Lo CW. Evaluating sustainability in waste management: The case of construction and demolition, chemical and clinical wastes in Hong Kong. *Res Conserv Recycling* 2003;37:119-45.
  25. Mohee R. Medical wastes characterization in healthcare institutions in Mauritius. *Waste Manag* 2005;25:575-81.
  26. Singh K, Arora SK, Dhadwal PJ, Singla A, John S. Biomedical waste management in the Union territory of Chandigarh. *J Environ Sci Eng* 2004;46:55-60.
  27. Jang YC, Lee C, Yoon OS, Kim H. Medical waste management in Korea. *J Environ Manage* 2006;80:107-15.
  28. Biomedical waste management in Himachal Pradesh. Available from: <http://www.cpcb.nic.in/oldwebsite/highlights/ch10.htm>. [Last cited on 2014 Nov 29].

**How to cite this article:** Kumar S, Mazta SR, Gupta AK. Comparing the Biomedical Waste Management Practices in Major Public and Private Sector Hospitals of Shimla City. *Int J Sci Stud* 2015;2(11):112-118.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Clinical Study of Anthropometry in Diabetes Mellitus: A Prospective Study

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## Abstract

**Background:** Diabetes mellitus is the most common among endocrine and metabolic disorders. Anthropometry is the single most universally applicable inexpensive and non-invasive method available to assess the size, proportions and composition of the human body. Generalized obesity and central obesity both predispose the individual to insulin resistance and development of diabetes mellitus.

**Objective:** (1) To study anthropometric measurements, like body mass index (BMI), waist-hip ratio (WHR), skinfold thickness in Type I and Type II diabetic subjects. (2) To compare with healthy control subjects of the same age, sex and socio-economic status.

**Methods:** A prospective controlled study of 50 consecutive diabetes mellitus patients grouped into 25 non-insulin-dependent diabetes mellitus (NIDDM) and 25 *insulin-dependent diabetes mellitus* (IDDM) were compared with healthy controls of same age, sex and socio-economic status.

**Results:** The following parameters were found significant. BMI: In IDDM females. WHR: In IDDM females, NIDDM males and females. Fat mass as percentage of body weight in IDDM males and females, NIDDM females were found significant.

**Conclusion:** In IDDM group, generalized wasting was present compared to controls. Increased WHR is not always an indicator of central obesity. In NIDDM group, generalized obesity, central obesity and increased fat mass were present compared to controls.

**Key words:** Anthropometry, Body mass index, Skinfold thickness, Waist-hip ratio

## INTRODUCTION

Diabetes mellitus is a syndrome characterized by chronic hyperglycemia and disturbances of carbohydrate, fat and protein metabolism associated with absolute or relative deficiencies in insulin secretion and/or insulin action. When fully expressed, diabetes is characterized by fasting hyperglycemia, but the disease can also be recognized during less overt stages and before fasting hyperglycemia appears, most usually by the presence of

glucose intolerance. Diabetes mellitus may be suspected or recognized clinically by the presence of characteristic symptoms such as excessive thirst, polyuria, pruritus, otherwise unexplained weight loss or 1 or more of the many complications associated with or attributable to the disease.<sup>1</sup>

Diabetes mellitus is the most common among endocrine and metabolic disorders. Ranked seventh among the leading causes of death. It has been rated third when all its complications are taken into account. Besides diabetes is the leading cause of acquired blindness and accounts for over 25% of cases with end stage renal failure as well as 50% of lower limb amputations.<sup>2</sup>

There are an estimated 80 million diabetics in the world. Around 50 million of them belong to heavily populated developing countries. In India, it is close to 1.5% among the urban population and 0.8% in rural areas.<sup>2</sup>

### Access this article online



www.ijss-sn.com

**Month of Submission :** 12-2014  
**Month of Peer Review :** 01-2015  
**Month of Acceptance :** 01-2015  
**Month of Publishing :** 02-2015

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In the last second or third decades, interests in diabetes and related problems has been greatly aroused and remarkably well sustained.<sup>3</sup>

The science deals with measurement of the size, weight and proportions of the human body.<sup>4</sup>

Anthropometric measurements assess body size and composition and reflect inadequate or excess food intake, insufficient exercise, and disease. They demonstrate that deprivation and excess may co-exist not only across, but also within, countries and even households, and show too that certain kinds of development and health policy enhance nutrition while others do not. Simple body measurements also permit the selection of individuals, families and communities for interventions designed to improve not only nutrition but health in general and thus survival.<sup>5</sup>

“Anthropometry is the single most universally applicable inexpensive, and noninvasive method available to assess the size, proportions and composition of the human body.”<sup>5</sup>

#### Body Mass Index (BMI) a Measure of the Nutritional Status

One of the recent methods suggested for assessing the chronic energy deficiency rate of individuals is based on BMI. This method is relatively simple, easy to measure and does not suffer from estimation errors encountered in energy methods and energy expenditure methods (Reddy, 1988).<sup>6</sup>

#### Waist-Hip Ratio (WHR)

The WHR gives an excellent indication of the degree. Central obesity is judged by utilizing the WHR. Epidemiological studies have borne out the fact that WHR has a strong independent correlation with diabetes, dyslipidemias, hypertension, and atherosclerosis, by virtue of playing an important role in leading to insulin resistance and the consequent hyperinsulinemia.

The risk of diabetes is higher in cases with WHR above 1 in males and 0.8 in females.<sup>2</sup>

#### Skinfold Thickness

Unfortunately, determinations of body fat based on measurements of body water, body potassium or body density are not possible in clinical practice.

However, an assessment can be made from measurements of skinfold thickness. For this purpose, various calipers are available. The Harpenden calipers or the Holtain calipers are recommended.<sup>7</sup>

Measurements should be made at four sites:

1. Triceps, at a point equidistant from the tip of the acromion and the olecranon.
2. Biceps, at the mid-point of the muscle with the arm hanging vertically.
3. Subscapular, just below the tip of the inferior angle of the scapula.
4. Suprailiac, over the iliac crest in the mid-axillary line.

Durnin and Womersley conclude that the use of their table for assessing total body fat with relative ease and reasonable accuracy on men and women of widely differing age should make it of common use in many fields of medicine, physiology, nutrition and anthropology.<sup>7</sup>

1. Balamuugan *et al.* (1994),<sup>8</sup> 100 consecutive non-insulin-dependent diabetes mellitus (NIDDM) subjects (50 males and 50 females) were studied. Anthropometric measures were taken to calculate BMI and WHR. Among male subjects, 14% (7) and among females 28% (14) were obese, High WHR was present in 46% (23) of male subjects ( $>0.95$ ), and 74% (37) of female subjects ( $>0.8$ ). Among nonobese subjects, 41.9% (18/43) of males and 73% (27/36) of females had high WHR.
2. Chandrashekar and Vagesh Ayyar (1998),<sup>9</sup> 400 consecutive cases of NIDDM patients were studied (200 males and 200 females), along with 200 controls. Somatic measurements were carried out to calculate BMI, WHR, triceps skinfold thickness. Results were compared with controls. Generalized obesity was present in 13% of males and 53% female NIDDM subjects. Central obesity was present in 62% of males and NIDDM subjects. Triceps skinfold thickness was increased in 43% of males and 56% of females in NIDDM subjects. All the three parameters were increased in 24% of female and 6% of male NIDDM patients.
3. Caeiro *et al.* (1993)<sup>10</sup> The study group comprised of 124 male NIDDM subjects between the ages of 30 and 35 year, 124 healthy male subjects without any known metabolic aberrations served as controls. The controls were matched for age and BMI with the diabetic group. The diabetic subjects had higher WHR as compared to the control group.
4. Bandodkar *et al.* (1994)<sup>11</sup> 250 diabetics were studied. Subjects were further classified into insulin-dependent diabetes mellitus (IDDM) and NIDDM. The weights and heights of male subjects were found to be higher than that of female subjects. Between the two categories of diabetes, subjects with NIDDM category were found to be slightly taller than IDDM. Subjects with normal weight according to BMI were 44%. However, underweight, over weight and obesity were present in 18.32 and 6% of the subjects respectively.

Between the two categories of diabetes, mean triceps skinfold thickness was found to be higher in NIDDM group than in IDDM group. Females in the study had higher triceps skinfold thickness than males.

5. Feldman *et al.* (1969).<sup>12</sup> 379 diabetic subjects, 295 Caucasian and 84 Negro subjects were studied. The number of non-diabetic Caucasian subjects in the studied population made possible a 3-1 match for race, sex, age, height and weight for each of the 138 diabetic Caucasian women and 149 diabetic Caucasian men. The smaller number of non-diabetic Negro subjects in the examined population made possible a one to one match for these factors for each of 31 Negro women and 42 Negro men.

Skinfold thickness was measured at different sites. Skinfold measurements of Caucasian female diabetics were significantly larger, however than those of the matched controls at subscapular, chest, waist and abdominal sites.

The study of Chowdhury *et al.* showed that 13.3% of females and none of the male patients were overweight. 93.3% females and 86.7% of males had central distribution of fat.

The study of Balamurugan *et al.* showed that 14% of males and 28% of females were obese. High WHR was present in 46% of male subjects and 74% of female subjects.

The study of Bandodkar *et al.* showed that weights and heights of male NIDDM subjects were found to be higher than that of females. Whereas the study of Kawahara and Amemiya showed that female diabetics weighed more than the male counterparts.

Since there are different conclusions from different studies, the present study of anthropometric measurements in NIDDM and IDDM subjects is taken up in KIMS Hospital, Hubli, and it is compared with healthy controls of same age and sex.

## METHODS

Prospective controlled study of anthropometric measurements in Type I and Type II diabetic patients was done compared with healthy controls of same age, sex, and socio-economic status.

### Inclusion Criteria

Totally, 50 consecutive diabetic patients grouped into 25 NIDDM and 25 IDDM were selected for the study.

### Exclusion Criteria

Patients with liver failure, renal failure, alcoholism, pulmonary tuberculosis, thyroid and other endocrine disorders, pregnant ladies were excluded.

A detailed case history, including dietary history was taken, and a meticulous physical examination was done for each patient.

Diagnosis was based on clinical history, physical examination, lab investigations like fasting blood sugar  $\geq 120$  mg% and post prandial blood sugar  $> 180$  mg% World Health Organization criteria.

## RESULTS

The prospective controlled study of anthropometry in diabetes mellitus compared with healthy controls of same age, sex, and socio-economic status. The data collected are presented Tables 1-12.

## DISCUSSION

1. In the present study among the IDDM group, majority of patients were males 15 (60%) and remaining 10 (40%) were females. Youngest patient was 12 years, oldest was 33 years. In the NIDDM group. Majority of patients were males 13 (52%) and 12 (48%) were females. The youngest patient was 42 years, and eldest was 68 years.
2. In both IDDM and NIDDM group, most of the patients were non sedentary by occupation 64% and 52% respectively.
3. In both IDDM group and NIDDM group, majority of the patients belonged to the lower socio-economic class 23 (92%) 17 (68%) respectively which indicates that diabetes is prevalent in the lower socio-economic class.
4. Among the IDDM group, rural patients were more 15

**Table 1: The age and sex distribution of diabetic patients**

Age (years)	N (%)					
	Male	Female	Total	Male	Female	Total
<b>Type I, IDDM</b>			<b>IDDM controls</b>			
10-19	5 (33.34)	6 (60)	11 (44)	5 (33.34)	6 (60)	11 (44)
20-29	9 (60)	3 (30)	12 (48)	9 (60)	3 (30)	12 (48)
30-39	1 (6.66)	1 (10)	2 (8)	1 (6.66)	1 (10)	2 (8)
Total	15 (100)	10 (100)	25 (100)	15 (100)	1 (100)	25 (100)
<b>Type II, NIDDM</b>			<b>NIDDM controls</b>			
40-49	4 (30.76)	2 (16.66)	6 (24)	4 (30.76)	2 (16.66)	6 (24)
50-59	3 (23.09)	9 (75)	12 (48)	3 (23.09)	9 (75)	12 (48)
60-69	6 (46.15)	1 (8.34)	7 (28)	6 (46.15)	1 (8.34)	7 (28)
Total	13 (100)	12 (100)	25 (100)	13 (100)	12 (100)	25 (100)

NIDDM: Non-insulin-dependent diabetes mellitus, IDDM: Insulin-dependent diabetes mellitus



**Table 2: The mean weights, heights and BMI in IDDM Subjects and controls**

Age (years)	Mean weight (kg)		Mean height (m)		Mean BMI	
	IDDM	Controls	IDDM	Controls	IDDM	Controls
Male						
10-19	35.9	55.4	1.49	1.72	16.1	18.58
20-29	38.77	54.22	1.57	1.66	15.5	19.56
30-39	39	81	1.66	1.73	14.15	27.09
Combined	37.83±23.24	56.4±36.45	1.55±0.32	1.68±0.21	15.31±8.53	19.74±11.36
Female						
10-19	31.83	43.33	1.46	1.52	14.65	18.63
20-29	25.66	50	1.47	1.55	11.73	20.82
30-39	35.5	54	1.39	1.55	18.37	22.5
Combined	30.35±17.83	46.4±26	1.46±0.13	1.53±0.16	14.15±7.61	19.67±9.42

NIDDM: Non-insulin-dependent diabetes mellitus, IDDM: Insulin-dependent diabetes mellitus, BMI: Body mass indices

**Table 3: The mean weights, heights and BMI in NIDDM Subjects and controls**

Age (years)	Mean weight (kg)		Mean height (m)		Mean BMI	
	NIDDM	Controls	NIDDM	Controls	NIDDM	Controls
Male						
40-49	58.75	50.37	1.68	1.6	25.82	19.52
50-59	70.66	59	1.68	1.66	25.05	21.42
60-69	71.83	55.08	1.69	1.64	25.16	20.41
Combined	67.53±39.39	54.53±30.44	1.68±0.14	1.63±0.22	23.80±13.93	20.37±13.22
Female						
40-49	50	57	1.55	1.54	20.77	24.04
50-59	54.53	46.16	1.51	1.53	23.46	19.14
60-69	42	38	1.52	1.62	17.32	14.5
Combined	52.58±26.23	47.29±22.03	1.52±0.14	1.54±0.11	22.50±11.52	19.57±9.25

NIDDM: Non-insulin-dependent diabetes mellitus, IDDM: Insulin-dependent diabetes mellitus, BMI: Body mass indices

**Table 4: Range of WHR in IDDM male and female subjects and controls**

Range of WHR	Male IDDM subjects (%)	Controls (%)	Female IDDM subjects (%)	Controls (%)
0.73-0.78	1 (6.66)	3 (20)	0	5 (50)
0.79-0.84	3 (20)	4 (26.66)	2 (20)	5 (50)
0.85-0.90	0	7 (46.66)	3 (30)	0
0.91-0.96	9 (60)	1 (6.66)	4 (40)	0
0.97-1.02	2 (13.33)	0	1 (10)	0
Total	15 (100)	15 (100)	10 (100)	10 (100)

IDDM: Insulin-dependent diabetes mellitus, WHR: Waist-hip ratio

**Table 5: Range of WHR in NIDDM male and female subjects and controls**

Range of WHR	Male NIDDM subjects (%)	Controls (%)	Female NIDDM subjects (%)	Controls (%)
0.73-0.78	-	-	-	6 (50)
0.79-0.84	-	1 (7.69)	2 (16.66)	4 (33.33)
0.85-0.90	-	5 (38.46)	7 (58.33)	1 (8.33)
0.91-0.96	5 (38.46)	5 (38.46)	-	1 (8.33)
0.97-1.02	6 (46.15)	2 (15.38)	3 (25)	-
1.03-1.08	2 (15.38)	-	-	-
Total	13 (100)	13 (100)	12 (100)	12 (100)

NIDDM: Non-insulin-dependent diabetes mellitus, WHR: Waist-hip ratio

(60%) than urban patients 10 (40%). In the NIDDM group, majority of the patients were from urban region

**Table 6: The mean values of waist, hip measurements and mean WHR in the IDDM group**

Anthropometric parameter	Male IDDM subjects	Controls	Female IDDM subjects	Controls
Waist in cm	65.73±17.28	73.1±25	63.25±17.5	65.9±22.26
Hip in cm	71.7±18.54	86.93±21.87	70.2±16.46	83.5±21
WHR	0.90±0.24	0.84±0.17	0.89±0.16	0.78±0.10

IDDM: Insulin-dependent diabetes mellitus, WHR: Waist-hip ratio

**Table 7: The mean values of waist, hip measurements and mean WHR in the NIDDM group**

Anthropometric parameter	Male NIDDM subjects	Controls	Female NIDDM subjects	Controls
Waist in cm	94±36.95	78.30±33.97	85.91±32.91	70.08±31.65
Hip in cm	95.52±33.04	85±21.93	95.83±33.26	86.66±26.93
WHR	0.98±0.12	0.91±0.18	0.89±0.16	0.80±0.17

NIDDM: Non-insulin-dependent diabetes mellitus, WHR: Waist-hip ratio

19 (76%) and others 6 (24%) belonged to the rural area.

### Weight, height and BMI

In the present study among the IDDM group, the mean weight of male and female subjects were 37.83 ± 23.24

**Table 8: The male and females NIDDM subjects and controls with increased BMI and WHR**

	Male NIDDM subjects (%)	Controls (%)	Female NIDDM subjects (%)	Controls (%)
BMI	2 (15.38)	1 (7.69)	4 (33.33)	1 (8.33)
WHR	8 (61.53)	3 (235)	12 (100)	5 (41.66)

BMI>27 for males>25 for females, WHR>0.95 for males and >0.8 for females.

NIDDM: Non-insulin-dependent diabetes mellitus, WHR: Waist-hip ratio, BMI: Body mass indices

**Table 9: The mean values of biceps, triceps subscapular and suprailiac skinfold thickness and sum of all four skinfold thickness in IDDM group and controls**

Skinfold thickness in (mm)	Male IDDM subjects	Controls	Female IDDM subjects	Controls
Biceps	5.14±6.69	7.18±12.34	4.78±5	9.76±11.46
Triceps	6.78±6.79	14.53±16.99	7.74±10.56	16±16.66
Subscapular	9.01±11.11	20.45±23.95	7.62±7.4	16.2±15.46
Suprailiac	7.24±11.11	20.45±23.95	7.62±7.4	16.2±15.46
Sum of 4 skinfold thickness	27.52±26.98	60.81±63.65	28.78±22.96	57.88±53.65

IDDM: Insulin-dependent diabetes mellitus

**Table 10: The mean values of biceps, triceps subscapular and suprailiac skinfold thickness and sum of all four skinfold thickness in NIDDM group and controls**

Skinfold thickness in (mm)	Male NIDDM subjects	Controls	Female NIDDM subjects	Controls
Biceps	9.56±14.16	6.23±9.14	11.78±10.56	10.41±19.48
Triceps	17.89±34.37	11.76±15.69	15.18±14.90	14.03±16.19
Subscapular	18.95±16.38	14.73±15.07	20.51±24.07	16.23±15.07
Suprailiac	22.23±23.27	18.12±27.14	16.88±12.69	15.16±17.77
Sum of 4 skinfold thickness	68.64±82.21	50.86±50.32	64.36±34.39	55.85±48.78

NIDDM: Non-insulin-dependent diabetes mellitus

and  $30.35 \pm 17.83$  respectively which is less compared to controls.

In the NIDDM group, the mean weight height and BMI of male and female subject are comparable to the studies of Bandodkar *et al.*<sup>11</sup> and Chowdhury *et al.*<sup>13</sup>

In the present study, among the NIDDM group, generalized obesity was present in 8% of males and 16% of female subjects which is comparable to the study of Chowdhury *et al.*<sup>13</sup> Others reports are mentioned above.

BMI of females in the present study is comparable to Chowdhury *et al.*<sup>13</sup> study, but the BMI of males was  $18.52 \pm 2.7$  in this study.

**Table 11: The body fat mass as a percentage of body weight for a range of values for the sum of four skinfolds in IDDM and NIDDM subjects and controls**

Male IDDM subjects	Controls	Female IDDM subjects	Controls
11.80±11.62	20.75±14.42	18.78±9.26	27.93±12.92

Male NIDDM subjects	Controls	Female NIDDM subjects	Controls
29.63±16.69	25.17±17.26	36.12±5.81	33.58±3.32

NIDDM: Non-insulin-dependent diabetes mellitus, IDDM: Insulin-dependent diabetes mellitus

**Table 12: The significant anthropometric parameters in the study group and the control group**

Anthropometric parameter	t-test	P	DF	Significant
BMI of IDDM females	1.367	0.2	18	Significant
WHR of IDDM females	1.774	0.1	18	Significant
WHR of NIDDM females	1.123	2	24	Significant
WHR of NIDDM females	1.279	0.2	22	Significant
Fat mass in NIDDM females	1.259	0.2	22	Significant
Fat mass in IDDM males	1.809	0.1	28	Significant
Fat mass in IDDM females	1.729	0.1	18	Significant

NIDDM: Non-insulin-dependent diabetes mellitus, IDDM: Insulin-dependent diabetes mellitus, WHR: Waist-hip ratio, BMI: Body mass indices

## WHR

In the IDDM group, the mean WHR was  $0.90 \pm 0.24$  in males that is more than that of controls ( $0.84 \pm 0.17$ )

Among female, the WHR was  $0.89 \pm 0.16$  which is more than that of the controls ( $0.78 \pm 0.10$ ). WHR in IDDM females was found significant  $P (0.10) t = 1.774$ , DF = 18.

In the NIDDM group, The mean WHR in males was  $0.89 \pm 0.12$  and in controls  $0.91 \pm 0.18$ . It was found significant statistically  $P (0.20) t = 1.123$ . DF = 24.

Among females, the mean WHR was  $0.89 \pm 0.16$  and in controls  $0.80 \pm 0.17$  it was found significant statistically  $P (0.20) t = 1.259$  DF = 22.

In the present study among NIDDM subjects, central obesity was present in 61.53% of males and all the female patients (100%).

In the control group, central obesity was present in 23% of male controls and 41.66% of female controls that is comparable with the controls of Chandrashekar and Vagesh Ayyar<sup>9</sup> study.

The male subjects are also comparable with Chandrashekar and Vagesh Ayyar<sup>9</sup> male subjects.

In the present study, among controls central obesity was present in 41.66% females whereas Chandrashekar and Vagesh Ayyar<sup>9</sup> reported 51% that is comparable.

### Skinfold Thickness (Tables 9-11)

In the present study, among IDDM group, the mean biceps, triceps, subscapular, suprailiac and sum of 4 skinfold thickness were less in both male and female subjects than that of the control group.

The fat mass as a percentage of body weight was less in both male and female subjects compared to controls. Females had more fat mass than males.

Among the NIDDM group the mean biceps, triceps, subscapular, suprailiac and some of 4 skinfold thickness were more in both male and female subjects than that of controls.

The fat mass as a percentage of body weight was more in both male and female subjects compared to controls. Female had more fat mass than males.

Fat mass as percentage of body weight was found statistically significant in NIDDM females ( $P = 0.20$ ,  $t = 1.259$ ,  $DF = 22$ ).

Fat mass as percentage of body weight was also found significant in IDDM males and females ( $P = 0.10$ ,  $t = 1.8091$ ,  $DF = 28$ ), ( $P = 0.10$ ,  $t = 1.729$ ,  $DF = 18$ ) respectively.

### CONCLUSION

1. In the IDDM group,
  - A. Generalized wasting was present compared to controls.
  - B. Increased WHR is not always an indicator of central obesity.
1. In the NIDDM group,

- A. Generalized obesity, central obesity and increased fat mass was present compared to controls.

### REFERENCES

1. Bennett PH. Definition, diagnosis and classification of diabetes mellitus and impaired glucose tolerance. In: Ronald Kahr C, Weir GC, editors. Joslin's Diabetes Mellitus. 13<sup>th</sup> ed., Ch. 11. Philadelphia: Lea and Febiger; 1994. p. 193.
2. Shah SN, Tripathy BB. Diabetes mellitus. In: Sainani GS, editor. API Text Book of Medicine. 5<sup>th</sup> edition Revised Reprint., Ch. 4. Bombay: Association of Physicians of India; 1997. p. 204.
3. Alexander M. Current concepts of diabetes. In: Marble A, White P, Brady RF, Krall LP, editors. Joslin's Diabetes Mellitus. 11<sup>th</sup> ed., Ch. I. Philadelphia: Lea and Febiger; 1971. p. I.
4. Anderson D. In: Anderson D, Keith J, Novak PD, editors. Dorlands Illustrated Medical Dictionary. 20<sup>th</sup> ed. Philadelphia: W.B. Saunders Company; 1994. p. 92.
5. WHO. Physical Status: The Use and Interpretation of Anthropometry, Report of a WHO Expert Committee, WHO Technical Report Series. Geneva: WHO; 1995. p. 6-8, 324-8.
6. Janardhan V, Soundararajan P, Rani NV, Kannan G, Thennarasu P, Chacko RA, *et al.* Prediction of malnutrition using modified subjective global assessment-dialysis malnutrition score in patients on hemodialysis. Indian J Pharm Sci 2011;73:38.
7. Davidson S, Passmore R. Obesity. In: Passmore R, East Wood MA, editors. Human Nutrition and Dietetics. 8<sup>th</sup> ed., Ch. 28. Edinburgh: Churchill Livingstone; 1986. p. 270.
8. Balamurugan R. Prevalence and correlates of body mass index and waist hip ratio in NIDDM subjects. Novo Nordisk Diabetes Update Proceedings. 1994. p. 117-9.
9. Chandrashekar P, Vagesh Ayyar S. Clinical profile of lean NIDDM. Karnataka J Med Sci 1998;1:39.
10. Caeiro I, Colaco J, Bhadrari NO. The role of WHR in the prediction of diabetes mellitus. J Diabetes Assoc India 1993;33:25-7.
11. Boulton AJ, Malik RA, Arezzo JC, Soskeno JM. Diabetic somatic neuropathies. Diabetes Care 2004;27:1458-86.
12. Feldman R, Sender AJ, Siegelau AB. Difference in diabetic and nondiabetic fat distribution patterns by skinfold measurements. Diabetes 1969;18:478-86.
13. Chowdhury S, Mukhopadhyay S, Sengupta BR. Correlation between adiposity indices and plasma lipids in NIDDM. J Diabetes Assoc India 30:28-31.

**How to cite this article:** Rekha MC, Dambal A, Hegde AC, Narashimhaswamy P. Clinical Study of Anthropometry in Diabetes Mellitus: A Prospective Study. Int J Sci Stud 2015;2(11):119-124.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Etiology and Antimicrobial Susceptibility Pattern of Bacterial Agents from Urinary Tract Infection in a Tertiary Care Centre

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## Abstract

**Introduction:** The term urinary tract infection (UTI) encompasses a range of infection from cystitis (bladder) to the infection of the entire urinary tract, including the renal pelvis and kidney. Among the infections, UTI is the one of the most important infections in humans. Treatment of urinary tract infection (UTI) was determined by antibiotic susceptibility pattern of bacteria in a population.

**Objective:** The objective of the study is to isolate the common uropathogens in a population and to know the antibiogram for the appropriate empirical treatment.

**Materials and Methods:** A total 135 patient's clean-catch mid-stream urine samples were collected. Samples were cultured onto blood agar and McConkey agar by standard loop method. Isolated bacteria identified by biochemical tests and antibiotic susceptibility testing were done in Muller Hinton Agar by Kirby Bauer method.

**Result:** Among this, 77 culture was positive and showed significant bacteriurea. The predominant bacteria was *Escherichia coli* (33.8%) followed by *Klebsiella* sp. (18.2%), *Enterococcus* sp. (18.2%), *Acinetobacter* sp. (9.1%), *Pseudomonas aeruginosa* (7.8%) and *Candida* sp. (5.2%). All Gram-negative bacteria were resistant to ampicillin and sensitive to tobramycin, amikacin and nitrofurantoin.

**Conclusion:** Gram-negative bacteria were the major isolates in our study, and *E. coli* was the predominant uropathogen isolated. The knowledge of antibiotic sensitivity pattern in this study will be helpful for the effective treatment of the UTI in this population.

**Key words:** Gram-negative bacilli, Sensitivity pattern, Uropathogens

## INTRODUCTION

Urinary tract infection (UTI) is the commonest infection encountered in developing countries like India. UTI may involve only lower or both lower and upper urinary tract. According to the site involved UTI classified as cystitis (bladder), pyelonephritis (kidney) or bacteriurea (urine) and also can be as symptomatic and asymptomatic. UTI is common in females than males, because of the short length of the urethra and its proximity to anus. The

other main factors that make females more exposed to UTI are pregnancy and sexual activity.<sup>1</sup> Many different bacteria are causing UTI, mainly Gram-negative bacteria including *Escherichia coli*, *Enterobacter aerogens*, *Klebsiella* sp., *Proteus* species, *Pseudomonas aeruginosa*, *Citrobacter* sp. and Gram-positive include *Staphylococcus aureus*, *Staphylococcus saprophyticus* and enterococci and fungi like *Candida*. *S. saprophyticus* mainly causes infection in young women of sexually active age group.<sup>2</sup> Depending on age, sex, catheterization and hospitalization the frequency of microorganism also varies.<sup>3</sup> Most of UTI are not life threatening and does not cause any irretrievable damage, however, there is an involvement of the kidney it may lead to irreparable damage.

The aims of the study were isolation of the pathogenic agents involving UTI and determination of their antibiotic susceptibility pattern.

### Access this article online



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Month of Submission : 12-2014  
Month of Peer Review : 01-2015  
Month of Acceptance : 01-2015  
Month of Publishing : 02-2015

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## MATERIALS AND METHODS

Total 135 mid-stream urine samples were collected from the patients with clinical symptoms of UTI from a tertiary care center in Palakkad, Kerala. There were 72 (53.3%) females and 63 (46.7%) males with an age range of 22-90 years. The clean catch mid-stream urine samples were collected in a sterile container and cultured onto the blood agar (Himedia) and McConkey agar (Himedia). All the isolated bacteria from the urine were identified using different biochemical tests.<sup>4,5</sup>

Antibiotic sensitivity testing of all isolates was done on Muller Hinton Agar (Himedia) using disc diffusion (Kirby Bauer) method. This method was done according to CLSI guidelines to determine the susceptibility pattern of bacterial agents.<sup>6</sup> The following standard antibiotic disc were used for the isolates, penicillin (10 µg), ampicillin (AMP) (10 µg), erythromycin (15 µg), vancomycin (30 µg), doxycycline (30 µg) amikacin (AK) (30 µg), nalidixic acid (30 µg), nitrofurantoin (30 µg), cotrimoxazole (COT) (25 µg), tobramycin (TOB) (10 µg), cefotaxime (CTX) (30 µg), gentamicin (10 µg) ciprofloxacin (5 µg) and levofloxacin (5 µg).

**Table 1: Frequency of bacterial agents isolated from urine specimens and their relation to sex in this study**

Isolated bacteria	Number (%)	Female (%)	Male (%)
<i>E. coli</i>	26 (33.8)	80.8	19.2
<i>Klebsiella</i> spp.	14 (18.2)	78.6	21.4
<i>P. aeruginosa</i>	6 (7.8)	16.7	83.3
<i>Acinetobacter</i> spp.	7 (9.1)	71.4	28.6
<i>Citrobacter</i> spp.	1 (1.3)	100	0
<i>Proteus</i> spp.	3 (3.9)	33.3	66.7
<i>Enterococcus</i> spp.	14 (18.2)	64.3	35.7
<i>S. aureus</i>	1 (1.3)	0	100
<i>S. saprophyticus</i>	1 (1.3)	100	0
<i>Candida</i> spp.	4 (5.2)	75	25

*E. coli*: *Escherichia coli*, *P. aeruginosa*: *Pseudomonas aeruginosa*, *S. aureus*: *Staphylococcus aureus*, *S. saprophyticus*: *Staphylococcus saprophyticus*

## RESULTS

In this study, 77 (57.03%) patients out of 135 were showed to be urine culture positive (showed significant bacteriurea ( $>10^5$  cfu/ml). There were 53 (68.8%) females, 24 (31.2%) males with urine positive culture. More than 74% of isolates were Gram-negative bacilli. The most frequently isolated species was *E. coli* (33.8%) followed by *Klebsiella* sp. (18.2%) and *Enterococcus* sp. (18.2%). The frequency of isolated microorganisms and their relation to sex is given in Table 1. The isolated bacteria were showed different susceptibility pattern to the tested antibiotics. The antibiotic sensitivity pattern of the isolates is presented in Table 2. In this study, all the bacteria isolated from UTI showed the highest degree of resistant to AMP. The Gram-negative bacilli isolated from UTI were sensitive to AK (57-100%) and Gram-positive cocci sensitive to doxycycline and tobramycin (100%). *E. coli* showed sensitivity to AK (75.6%), nitrofurantoin (80.76%) and gentamicin (30%). 14.29% of enterococci showed resistant to vancomycin. Most of the isolated bacteria in this study were resistant to AMP.

## DISCUSSION

UTI is one of the most common infections worldwide, and the antibiotic pattern of microbial isolates varies in different regions. In this study, the isolation of bacteria from the urine sample was 57.03%, the similar results were found in other studies also.<sup>7</sup> The incidence of UTI was high among the females (68.8%) than the males (31.2%), this is due to anatomic and physical factors.<sup>8,9</sup>

The frequency of Gram-positive cocci was not high in our study; this is similar to the other studies.<sup>10,11</sup> In present study *E. coli* is the predominant isolate, this corresponds with the data obtained by previous studies.<sup>12,13</sup> Other isolated bacteria from UTI cases were *Klebsiella* sp. (18.2%) and *Enterococcus* sp. (18.2%), followed by *Acinetobacter* (9.1%).

**Table 2: Antimicrobial sensitivity pattern of bacterial agents isolated from urine samples**

Isolates	Amp	CIP	AK	Na	NF	COT	TOB	CTX	G	E	Va	P	Do	Le
<i>E. coli</i>	11.5	23.7	75.6	30.8	80.76	23.1	27	23.1	30	-	-	-	-	-
<i>Klebsiella</i> spp.	21.4	50	78.6	78.6	57.1	42.9	85.7	71.4	50	-	-	-	-	-
<i>P. aeruginosa</i>	33.3	66.7	66.7	33.3	50	66.7	83.3	66.7	50	-	-	-	-	-
<i>Acinetobacter</i> spp.	28.6	28.6	57.1	14.3	42.9	57	85.7	85.7	42.9	-	-	-	-	-
<i>Citrobacter</i> spp.	100	100	100	100	0	100	100	100	100	-	-	-	-	-
<i>Proteus</i> spp.	66.6	100	100	66.6	33.3	66.6	100	66.6	33.3	-	-	-	-	-
<i>Enterococcus</i> spp.	21.42		35.7			64.3	71.4	64.3		50	85.71	21.42	64.3	35.7
<i>S. aureus</i>	0							100			100	0	100	100
<i>S. saprophyticus</i>	0							100		100		0	100	100

AMP: Ampicillin, CIP: Ciprofloxacin, AK: Amikacin, Na: Nalidixic acid, NF: Nitrofurantoin, COT: Cotrimoxazole, TOB: Tobramycin, CTX: Cefotaxim, G: Gentamicin, P: Penicillin, Do: Doxycycline, Le: Levofloxacin, *E. coli*: *Escherichia coli*, *P. aeruginosa*: *Pseudomonas aeruginosa*, *S. aureus*: *Staphylococcus aureus*, *S. saprophyticus*: *Staphylococcus saprophyticus*

*Klebsiella* sp. was reported as the second most frequently implicated the organism in UTI in some other studies.<sup>14,15</sup>

The present study, all bacteria show a moderate level of resistance to AMP. This is similar to previous studies.<sup>16,17</sup> *E. coli*, the predominant pathogenic organism isolated from UTI patient in this study showed highest susceptibility to nitrofurantoin (80.76%) followed by AK (75.6) and highest resistance was toward COT (76.9%) and CTX (76.9%). This finding was similar to the studies done by Munjanath *et al.*<sup>18</sup> and Shigemura *et al.*<sup>19</sup>

## CONCLUSION

It is concluded that Gram-negative bacilli were responsible for UTI s than Gram-positive bacteria. The most common isolate was *E. coli*, and most effective antibiotics were AK, nitrofurantoin and TOB. This study has been done to establish local prevalence of causative organisms and their antibiotic susceptibility pattern in this region. The knowledge of antibiotic sensitivity pattern helps in selecting appropriate empirical treatment thus reducing drug resistance in uropathogens.

## REFERENCES

- Adedeji BA, Abdulkadir OA. Etiology and antimicrobial resistance pattern of bacterial agents of urinary tract infections in students of tertiary institution in Yola metropolis. *Adv Biol Res* 2009;3:67-70.
- Schneider PF, Riley TV. *Staphylococcus saprophyticus* urinary tract infections: Epidemiological data from Western Australia. *Eur J Epidemiol* 1996;12:51-4.
- Hvidberg H, Struve C, Krogfelt KA, Christensen N, Rasmussen SN, Frimodt-Møller N. Development of a long-term ascending urinary tract infection mouse model for antibiotic treatment studies. *Antimicrob Agents Chemother* 2000;44:156-63.
- Mandell GL, Bennett JE, Bolin R. Principles and Practice of Infectious Diseases. Philadelphia: Churchill Livingstone; 2005. p. 881-2.
- Forbes BA, Sahm DF, Weissfeld AS. Bailey Scott's Diagnostic Microbiology. 12<sup>th</sup> ed. St. Louis: Mosby Elsevier; 2007. p. 842-55.
- Clinical and Laboratory Standards Institute. Performance Standards for Antimicrobial Susceptibility Testing. 12 Informational Supplement. CLSI Document M100-S12. Pennsylvania, USA: CLSI; 2002. p. 1.
- Manjula M, Sonia B, Jyothi S. Prevalence and antibiotic susceptibility pattern of multi drug resistant *E. coli* isolates from urinary tract infection (UTI) patients. *Int J Life Sci Pharm Res* 2012;2:L6-11.
- Kumar MS, Lakshmi V, Rajagopalan R. Occurrence of extended spectrum beta-lactamases among *Enterobacteriaceae* spp. isolated at a tertiary care institute. *Indian J Med Microbiol* 2006;24:208-11.
- Khan AU, Musharraf A. Plasmid-mediated multiple antibiotic resistance in *Proteus mirabilis* isolated from patients with urinary tract infection. *Med Sci Monit* 2004;10:CR598-602.
- Astal ZY, Sharif FA. Relationship between demographic characteristics and community-acquired urinary tract infection. *East Mediterr Health J* 2002;8:164-71.
- Kothari A, Sagar V. Antibiotic resistance in pathogens causing community-acquired urinary tract infections in India: A multicenter study. *J Infect Dev Ctries* 2008;2:354-8.
- Zhanell GG, Hisanaga TL, Laing NM, DeCorby MR, Nichol KA, Palatnik LP, *et al.* Antibiotic resistance in outpatient urinary isolates: Final results from the North American Urinary Tract Infection Collaborative Alliance (NAUTICA). *Int J Antimicrob Agents* 2005;26:380-8.
- Andrade SS, Sader HS, Jones RN, Pereira AS, Pignatari AC, Gales AC. Increased resistance to first-line agents among bacterial pathogens isolated from urinary tract infections in Latin America: Time for local guidelines? *Mem Inst Oswaldo Cruz* 2006;101:741-8.
- Abubakar EM. Antimicrobial susceptibility pattern of pathogenic bacteria causing urinary tract infections at this specialist hospital, Yola, Adamawa state Nigeria. *J Clin Med Res* 2009;1:001-8.
- Al Sweih N, Jamal W, Rotimi VO. Spectrum and antibiotic resistance of uropathogens isolated from hospital and community patients with urinary tract infections in two large hospitals in Kuwait. *Med Princ Pract* 2005;14:401-7.
- Presanna G. Study of antibiotic resistance pattern in uropathogens at a tertiary care hospital. *J Evol Med Dent Sci* 2011;???:156.
- Sahm DF, Thornsberry C, Mayfield DC, Jones ME, Karlowsky JA. Multidrug-resistant urinary tract isolates of *Escherichia coli*: Prevalence and patient demographics in the United States in 2000. *Antimicrob Agents Chemother* 2001;45:1402-6.
- Manjunath GN, Prakash R, Vamseedhar A, Kiran S. Changing trends in the spectrum of antimicrobial drug resistance pattern of uropathogens isolated from hospitals and community patients with urinary tract infections in Tumkur and Bangalore. *Int J Biol Med Res* 2011;2:504-7.
- Shigemura K, Arakawa S, Tanaka K, Fujisawa M. Clinical investigation of isolated bacteria from urinary tracts of hospitalized patients and their susceptibilities to antibiotics. *J Infect Chemother* 2009;15:18-22.

**How to cite this article:** Rudramurthy KG, Kumaran R, Geetha RK. Etiology and Antimicrobial Susceptibility Pattern of Bacterial Agents from Urinary Tract Infection in a Tertiary Care Centre. *Int J Sci Stud* 2015;2(11):125-127.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Use of Tobacco among Pre-University Male Students in Mysore City, India: A Questionnaire Study

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## Abstract

**Introduction:** Adolescents are vulnerable targets for the tobacco industry, being easily influenced by television, cinema, advertisements and by their peers. In India, approximately 5500 children and adolescents start using tobacco products daily, some as young as 10 years old.

**Methodology:** Using the estimation technique with proportion of tobacco usage in India varying from 6.9% to 22.5%, admissible error of 5%, level of significance 5%, the sample size was calculated to be in the interval 103-279. Based on the ease of availability of observations, 400 pre-university students were sampled. A pretested semi-structured questionnaire was used to collect information. Data were entered and analyzed using R software. Univariate and bivariate analysis were done.

**Results:** Totally, 32 students (7.57%) had ever tried smoking cigarettes, 21 (4.97%) had smoked for the first time at the age of 16 years and 8 (1.9%) had first smoked by 14 years. About 29 (5%) had used tobacco products other than cigarettes in the previous month. As for Parents smoking habits, fathers' smoking proportion was 10.4%, and mothers' was only 0.24%. That smoking was harmful to health was felt by 65.72% of respondents. Nearly 58.63% felt that others smoking (passive smoking) is harmful to them. About 67.61% respondents favored banning smoking in all public places. About 60.05% of the respondents said that their teacher had talked about the dangers of smoking. Nearly 47.75% respondents said that the ill effects of smoking had been discussed in school discussions during the past year.

**Conclusions:** In conclusion, several factors related to family and peer groups influence smoking by adolescents from an early age. Joint efforts from family, school/college, social welfare groups are needed to address these factors for effective prevention, in addition to raising awareness against tobacco use among the students.

**Key words:** Adolescents, Knowledge, Passive smoking, Tobacco smoking

## INTRODUCTION

The WHO estimates that 70% of premature deaths among adults are due to behavioral patterns that emerge in adolescence, including smoking, violence and sexual behavior. Tobacco use is harmful and addictive. All forms of tobacco cause fatal and disabling health problems throughout life. Tobacco is used in different forms. Smoking is through cigarettes, bidis, hukka, and

chilam (ganja). Smokeless tobacco products include tobacco that is used in paan (betel leaf), gutkha, zarda, khaini, and dohra. Tobacco use is influenced by a variety of factors including individual attitudes and beliefs, social norms and acceptability, availability and advertising campaigns.

A body of irrefutable evidence has been built up in the last century on the deleterious effect tobacco has on human health. It is estimated that among all the people who smoke worldwide, 16.6% live in India, which translates to an absolute figure of 182 million.<sup>1</sup> In India, there is particularly strong evidence available from several large-scale studies on the association between tobacco use and mortality.<sup>2-4</sup> The total projected annual number of deaths in men and women in India, attributable to tobacco use was 1 million in 2010.<sup>5</sup> Adolescents are particularly vulnerable targets

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**Month of Submission :** 12-2014  
**Month of Peer Review :** 01-2015  
**Month of Acceptance :** 01-2015  
**Month of Publishing :** 02-2015

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for the growing tobacco industry, being easily influenced by cinema, television, advertisements and by their peers and family members. In India approximately 5500 children and adolescents start using tobacco products daily, some as young as 10 years old.<sup>6</sup>

Mysore city in South India is known for its great culture and better environmental conditions and is a heritage city. Due to rapid industrialization that has led to increased population growth in Mysore, the social networking has increased in recent times that leads to more chances of exposure to tobacco use among the younger population, particularly adolescents. Hence, it was thought appropriate to conduct a study on the use of tobacco in adolescent students in Mysore city.

## METHODOLOGY

### Sample Size Calculation

Using the estimation technique with proportion of tobacco usage in India varying from 6.9% to 22.5%, admissible error of 5% and a level of significance of 5%, the sample size was calculated to be in the interval 103-279. The maximum sample size was rounded off to 300. Based on the ease of availability of observations 400 pre-university students were included in this study.

The target population is the pre-university adolescent males in Mysore city. The heterogeneity among the population was removed based on the stratification factor “segment” that takes two values – Government and Private. Based on the information from the district statistical office, 42% of students were in government and 58% were in private segments. As a result, 168 students were sampled from the government and 232 from private segments.

The intra heterogeneity among the groups was removed through the second stratification factor “College Codes.” Accordingly, the college enrolment strength was taken from the pre-university board. The college code selection was done based on the simple random sampling technique using a lottery method. The sampling distribution for both government and private segments was done using the proportionate allocation technique. The attendance register of the college was the sampling frame. The required sample observations were made from the colleges based on simple random sampling technique using Rand Corporation generated random number table on the sampling frame.

### Data Collection

A pretested semi-structured questionnaire was used covering socio-demographic variables, tobacco smoking,

tobacco chewing, other smokeless tobacco use and its habits, its initiation, duration and amount, reasons, factors that influence their habits, and their perceptions.

Ethical clearance was obtained from Institutional Ethical Committee. Permission for the study was obtained from the principals of the respective colleges and investigators visited the colleges on the prescheduled date and time. Students were first explained the purpose of the study and its implications and informed consent was taken from them. The questionnaire was distributed in their respective classrooms and sufficient time was given to them to fill it up.

### Data Analysis

Data were entered and analyzed using R software. Results were reported as frequencies and percentages. Univariate and bivariate analysis were done to study the statistical significance. Association was studied between tobacco use and various factors using Chi-square test for proportion and contingency co-efficient.

## RESULTS

A few important variables are discussed here. The rest can be understood on similar lines looking at the respective tables.

Among all the students surveyed, 32 students (7.57%) had ever tried smoking cigarettes, 21 (4.97%) had smoked for the first time at the age of 16 years and only 8 (1.9%) had first smoked by 14 years. A total of 6 respondents (1.42%) had smoked >20 cigarettes per day in the last month and about 29 (5%) had used tobacco products other than cigarettes in the previous month. Totally, 7 respondents (1.66%) had smoked in public places and only 3 (0.7%) at home (Table 1). It can be observed from Table 1 that upon univariate analysis of tobacco consumption practices the cell frequencies for the particular variables/parameters assessed are significantly different in both government and private colleges ( $P < 0.005$ ) indicating the wide variability among the responses coded. Further upon bivariate analysis it was noted that there was a significant association between the type of colleges whether government or private and some of the variables (variables 5, 9 and 10) as indicated by the  $P$  values in Table 2 indicating that the practices of tobacco consumption were different amongst the government and private college students.

As for parents smoking habits, fathers’ smoking proportion was around 10.4%, and mothers’ was only 0.24%. As per the perception of students, 20.8% opined



**Table 1: Univariate analysis for tobacco practice parameters in government and private colleges**

Variable	College	a	b	c	d	e	f	g	h	Total	P value
1	Government	9 (2.13)	157 (37.12)							166 (39.24)	<0.005
	Private	23 (5.44)	234 (55.32)							257 (60.76)	<0.005
Total		32 (7.57)	391 (92.44)								
2	Government	157 (37.12)	1 (0.24)	0	0	0	4 (0.95)	4 (0.95)		166	<0.005
	Private	236 (55.80)	0	0	0	0	4 (0.95)	17 (4.02)		257	<0.005
Total		393 (92.92)	1 (0.24)	0	0	0	8 (1.9)	21 (4.97)			
3	Government	158 (37.35)	1 (0.24)	2 (0.47)	0	1 (0.24)	2 (0.47)	2 (0.47)		166	<0.005
	Private	247 (58.39)	4 (0.95)	0	1 (0.24)	2 (0.47)	0	3 (0.71)		257	<0.005
Total		405 (95.75)	5 (1.18)	2 (0.47)	1 (0.24)	3 (0.71)	2 (0.47)	5 (1.18)			
4	Government	158 (37.35)	2 (0.47)	3 (0.71)	2 (0.47)	1 (0.24)	0	0		166	<0.005
	Private	242 (57.21)	4 (0.95)	2 (0.47)	2 (0.47)	0	1 (0.24)	6 (1.42)		257	<0.005
Total		400 (94.56)	6 (1.42)	5 (1.18)	4 (0.95)	1 (0.24)	1 (0.24)	6 (1.42)			
5	Government	158 (37.35)	5 (1.18)	1 (0.24)	2 (0.47)	0	0	0		166	<0.005
	Private	242 (57.21)	1 (0.24)	3 (0.71)	2 (0.47)	3 (0.71)	6 (1.42)	0		257	<0.005
Total		400 (94.56)	6 (1.42)	4 (0.95)	4 (0.95)	3 (0.71)	6 (1.42)	0			
6	Government	158 (37.35)	3 (0.71)	2 (0.47)	3 (0.71)	0	0	0		166	<0.005
	Private	242 (57.21)	3 (0.71)	0	8 (1.9)	0	3 (0.71)	1 (0.24)		257	<0.005
Total		400 (94.56)	6 (1.42)	2 (0.47)	11 (2.6)	0	3 (0.71)	1 (0.24)			
7	Government	158 (37.35)	3 (0.71)	0	1 (0.24)	4 (0.95)	0			166	<0.005
	Private	245 (57.92)	2 (0.47)	1 (0.24)	1 (0.24)	1 (0.24)	7 (1.66)			257	<0.005
Total		403 (95.27)	5 (1.18)	1 (0.24)	2 (0.47)	5 (1.18)	7 (1.66)				
8	Government	158 (37.35)	3 (0.71)	0	4 (0.95)	0	1 (0.24)	0	0	166	<0.005
	Private	239 (56.5)	4 (0.95)	1 (0.24)	1 (0.24)	1 (0.24)	0	1 (0.24)	10 (2.36)	257	<0.005
Total		397 (93.85)	7 (1.66)	1 (0.24)	5 (1.18)	1 (0.24)	1 (0.24)	1 (0.24)	10 (2.36)		
9	Government	158 (37.35)	5 (1.18)	1 (0.24)	1 (0.24)	1 (0.24)	0	0	0	166	<0.005
	Private	241 (56.96)	0	1 (0.24)	1 (0.24)	0	1 (0.24)	1 (0.24)	12 (2.84)	257	<0.005
Total		399 (94.33)	5 (1.18)	2 (0.47)	2 (0.47)	1 (0.24)	1 (0.24)	1 (0.24)	12 (2.84)		
10	Government	147 (34.75)	3 (0.71)	4 (0.95)	4 (0.95)	1 (0.24)	3 (0.71)	4 (0.95)		166	<0.005
	Private	138 (32.62)	6 (1.42)	13 (3.07)	3 (0.71)	24 (5.67)	35 (8.27)	38 (8.98)		257	<0.005
Total		285 (67.34)	9 (2.13)	17 (4.02)	7 (1.66)	25 (5.91)	38 (8.98)	42 (9.93)			
11	Government	156 (36.88)	5 (1.18)	5 (1.18)						166	<0.005
	Private	233 (55.08)	8 (1.89)	16 (3.78)						257	<0.005
Total		389 (91.96)	13 (3.07)	21 (4.96)							
12	Government	11 (2.6)	155 (36.64)							166	<0.005
	Private	18 (4.26)	239 (56.5)							257	<0.005
Total		29 (6.86)	394 (93.14)								
13	Government	158 (37.35)	0	1 (0.24)	0	2 (0.47)	0	3 (0.71)	2 (0.47)	166	<0.005
	Private	232 (54.85)	3 (0.71)	1 (0.24)	2 (0.47)	3 (0.71)	1 (0.24)	4 (0.95)	11 (2.6)	257	<0.005
Total		390 (92.12)	3 (0.71)	2 (0.47)	2 (0.47)	5 (1.18)	1 (0.24)	7 (1.66)	13 (3.07)		
14	Government	157 (37.12)	4 (0.95)	2 (0.47)	2 (0.47)	1 (0.24)				166	<0.005
	Private	230 (54.37)	11 (2.6)	9 (2.13)	2 (0.47)	5 (1.18)				257	<0.005
Total		387 (91.49)	15 (3.55)	11 (2.6)	4 (0.95)	6 (1.42)					

that smokers feel more comfortable in parties or social gatherings while smoking and 44.68% felt that they were less comfortable. About 14.89% respondents opined that boys who smoke look more attractive and 57.21% felt that they look less attractive, and 27.9% felt that there was no perceptible difference. About 7.8% students felt that smokers gain weight after smoking while 59.8% felt they would lose weight. That smoking was harmful to health was opined by 65.72% of respondents. Nearly 58.63% felt that other peoples' smoking (passive smoking) is harmful to them. About 28.43% felt that a man who smokes lacks confidence, and 60.85% felt that he is stupid, and only 1.49% felt that he was a successful man. About 67.61% respondents favoured banning smoking in all public places, and 17.26 did not favour it at all (Table 3).

About 2.36% of respondents felt that the main reason to stop smoking was to improve their health and only 1.18% felt that it was to save money. About 3.07% respondents received help to stop smoking from a friend and 2.36% from a family member. About 1.89% respondents had received help from a professional or a program to quit smoking.

About seeing or hearing anti-smoking messages, about 35.46% students reported seeing a lot of such messages and about 25.77% reported seeing no messages at all. Around 23.4% respondents reported seeing their favorite actors smoking a lot on screen. During the viewing of television sports events, big cigarette brand names were seen by 11.82% respondents.

**Table 2: Bivariate analysis for practice parameters in government and private colleges**

Variable number	Variables	P value	Contingency coefficient
1	Ever tried smoking	0.25	0.065
2	Age at first smoking	0.17	0.121
3	Number of days of smoking in last month	0.263	0.133
4	Number of cigarettes per day	0.297	0.13
5	Source of cigarettes	0.047*	0.161
6	Cigarette brand	0.249	0.124
7	Cigarettes bought by self for own use	0.086	0.147
8	Cigarette pack cost	0.6	0.176
9	Money spent on cigarettes in 1 month	0.01*	0.205
10	Pocket money received	0.005*	0.366
11	Shop keeper refused to sell because of age	0.48	0.076
12	Used tobacco products other than cigarettes	1	0.007
13	Common place of smoking	0.39	0.131
14	Smoking first thing in morning	0.308	0.106

\*Indicates significance, i.e. Influence on the college students

About 60.05% of the respondents said that their teacher had talked about the dangers of smoking. Nearly 47.75% respondents said that the ill effects of smoking had been discussed in school/college discussions during the past year, and 32.39% said that there was no such discussion (Table 3).

It can be observed from Table 3 that upon univariate analysis of knowledge and attitude variables the cell frequencies for the particular variables/parameters assessed are significantly different in both government and private colleges ( $P < 0.005$ ) indicating the wide variability among all the responses coded. Further upon bivariate analysis of knowledge and attitude variables in Table 4 it was noted that there was a significant association between the type of colleges whether government or private and some of the variables as indicated by the  $P$  values in Table 4 indicating that the knowledge and attitude levels were very different amongst the government and private college students.

**Table 3: Univariate analysis of knowledge and attitude toward tobacco usage**

Parameter assessed	Variable	College	a	b	c	d	e	f	g	Total	P value
Knowledge and attitude toward tobacco	15	Government	109 (25.7)	2 (0.47)	28 (6.62)	0	27 (6.38)			166	<0.005*
		Private	231 (54.6)	2 (0.47)	16 (3.78)	1 (0.24)	7 (1.66)			257	<0.005*
	Total		340 (80.3)	4 (0.95)	44 (10.4)	1 (0.24)	34 (8.04)				
	16	Government	139 (32.8)	7 (1.66)	7 (1.66)	13 (3.07)				166	<0.005*
		Private	216 (51.0)	12 (2.84)	15 (3.55)	14 (3.31)				257	<0.005*
	Total		355 (83.9)	19 (4.49)	22 (5.2)	27 (6.38)					
	17	Government	82 (19.3)	84 (19.86)						166	0.877
		Private	168 (39.7)	89 (21.04)						257	<0.005*
	Total		250 (59.1)	173 (40.90)							
	18	Government	149 (35.2)	5 (1.18)	6 (1.42)	6 (1.42)				166	<0.005*
		Private	22 (52.2)	10 (2.36)	18 (4.25)	8 (1.89)				257	<0.005*
	Total		370 (87.4)	15 (3.55)	24 (5.67)	14 (3.31)					
	19	Government	149 (35.2)	10 (2.36)	5 (1.18)	2 (0.47)				166	<0.005*
		Private	190 (44.9)	41 (9.69)	12 (2.84)	14 (3.31)				257	<0.005*
	Total		339 (80.1)	51 (12.06)	17 (4.02)	16 (3.78)					
	20	Government	99 (23.4)	11 (2.6)	17 (4.02)	39 (9.22)				166	<0.005*
		Private	110 (26.0)	22 (5.2)	59 (13.95)	66 (15.6)				257	<0.005*
	Total		209 (49.4)	33 (7.80)	76 (17.97)	105 (24.82)					
	21	Government	44 (10.4)	42 (9.93)	80 (18.91)					166	<0.005*
		Private	111 (26.2)	86 (20.33)	60 (14.18)					257	0.001*
	Total		155 (36.6)	128 (30.26)	140 (33.10)						
	22	Government	28 (6.62)	54 (12.77)	84 (19.86)					166	<0.005*
		Private	46 (10.8)	152 (35.93)	59 (13.95)					257	<0.005*
	Total		74 (17.4)	206 (48.70)	143 (33.81)						
	23	Government	28 (6.62)	57 (13.48)	81 (19.15)					166	<0.005*
		Private	60 (14.1)	132 (31.21)	65 (15.37)					257	<0.005*
	Total		88 (20.8)	189 (44.68)	146 (34.52)						
	24	Government	30 (7.09)	75 (17.73)	61 (14.42)					166	<0.005*
		Private	33 (7.80)	167 (39.48)	57 (13.48)					257	<0.005*
	Total		63 (14.8)	242 (57.21)	118 (27.90)						
	25	Government	14 (3.31)	93 (21.99)	59 (13.95)	0 (0.00)				166	<0.005*
		Private	22 (5.20)	152 (35.93)	82 (19.39)	1 (0.24)				257	<0.005*
	Total		36 (8.51)	245 (57.92)	141 (33.33)	1 (0.24)					
	26	Government	14 (3.31)	116 (27.42)	34 (8.04)	2 (0.47)				166	<0.005*
		Private	19 (4.49)	137 (32.39)	93 (21.99)	8 (1.89)				257	<0.005*
	Total		33 (7.80)	253 (59.81)	127 (30.02)	10 (2.36)					

Contd...

Table 3: Contd...

Parameter assessed	Variable	College	a	b	c	d	e	f	g	Total	P value
???	27	Government	56 (13.2)	11 (2.60)	4 (0.95)	95 (22.46)				166	<0.005*
		Private	52 (12.2)	6 (1.42)	16 (3.78)	183 (43.26)				257	<0.005*
	Total		108 (25.5)	17 (4.02)	20 (4.73)	278 (65.72)					
	28	Government	103 (24.35)	45 (10.64)	9 (2.13)	9 (2.13)				166	<0.005*
		Private	117 (27.66)	107 (25.30)	18 (4.26)	15 (3.55)				257	<0.005*
	Total		220 (52.01)	152 (35.93)	27 (6.38)	24 (5.67)					
	29	Government	26 (6.15)	110 (26.01)	19 (4.49)	5 (1.18)	2 (0.47)	4 (0.95)		166	<0.005*
		Private	69 (16.31)	144 (34.04)	22 (5.20)	1 (0.24)	8 (1.89)	13 (3.07)		257	<0.005*
	Total		95 (22.46)	254 (60.05)	41 (9.69)	6 (1.42)	10 (2.36)	17 (4.02)			
	30	Government	31 (7.33)	101 (23.88)	23 (5.44)	4 (0.95)	2 (0.47)	5 (1.18)		166	<0.005*
		Private	61 (14.42)	109 (25.77)	38 (8.98)	6 (1.42)	8 (1.89)	35 (8.27)		257	<0.005*
	Total		92 (21.75)	210 (49.65)	61 (14.42)	10 (2.36)	10 (2.36)	40 (9.46)			
Passive smoking	31	Government	112 (26.48)	22 (5.2)	11 (2.60)	21 (4.97)				166	<0.005*
		Private	158 (37.35)	31 (7.33)	37 (8.75)	31 (7.33)				257	<0.005*
	Total		270 (63.83)	53 (12.53)	48 (11.35)	52 (12.29)					
	32	Government	53 (12.53)	2 (0.47)	17 (4.02)	93 (21.99)	1 (0.24)			166	<0.005*
		Private	54 (12.77)	11 (2.60)	38 (8.98)	154 (36.41)	0 (0.00)			257	<0.005*
	Total		107 (25.30)	13 (3.07)	55 (13.00)	247 (58.39)	1 (0.24)				
	33	Government	111 (26.24)	25 (5.91)	7 (1.66)	6 (1.42)	17 (4.02)			166	<0.005*
		Private	213 (50.36)	20 (4.73)	9 (2.13)	5 (1.18)	10 (2.36)			257	<0.005*
	Total		324 (76.60)	45 (10.64)	16 (3.79)	11 (2.60)	27 (6.38)				
	34	Government	79 (18.68)	42 (7.57)	8 (1.89)	12 (2.84)	35 (8.27)			166	<0.005*
		Private	132 (31.21)	55 (13.00)	31 (7.33)	15 (3.55)	24 (5.67)			257	<0.005*
	Total		211 (49.88)	87 (20.57)	39 (9.22)	27 (6.38)	59 (13.95)				
Attitude toward stopping smoking	35	Government	99 (23.40)	17 (4.02)	48 (11.35)	2 (0.47)	0 (0.00)			166	<0.005*
		Private	187 (44.21)	41 (9.69)	25 (5.91)	1 (0.24)	3 (0.71)			257	<0.005*
	Total		286 (67.61)	58 (13.71)	73 (17.26)	3 (0.71)	3 (0.71)				
	36	Government	157 (37.12)	4 (0.95)	5 (1.18)	0 (0.00)				166	<0.005*
		Private	232 (54.85)	8 (1.89)	9 (2.13)	8 (1.89)				257	<0.005*
	Total		389 (91.96)	12 (2.84)	14 (3.31)	8 (1.89)					
	37	Government	132 (31.21)	4 (0.95)	12 (2.84)	18 (4.26)				166	<0.005*
		Private	220 (52.01)	11 (2.60)	11 (2.60)	15 (3.55)				257	<0.005*
	Total		352 (83.22)	15 (3.55)	23 (5.44)	33 (7.80)					
	38	Government	157 (37.12)	1 (0.24)	1 (0.24)	3 (0.71)	3 (0.71)	0	1 (0.24)	166	<0.005*
		Private	234 (55.32)	15 (3.55)	7 (1.66)	0 (0.00)	0 (0.00)	0	1 (0.24)	257	<0.005*
	Total		391 (92.44)	16 (3.79)	8 (1.89)	3 (0.71)	3 (0.71)	0	2 (0.47)		
Knowledge of media messages	39	Government	152 (35.93)	1 (0.24)	6 (1.42)	3 (0.71)	3 (0.71)	0	1 (0.24)	166	<0.005*
		Private	230 (54.37)	6 (1.42)	4 (0.95)	2 (0.47)	1 (0.24)	0	14 (3.31)	257	<0.005*
	Total		382 (90.31)	7 (1.66)	10 (2.36)	5 (1.18)	4 (0.95)	0	15 (3.55)		
	40	Government	157 (37.12)	0 (0.00)	6 (1.42)	3 (0.71)				166	<0.005*
		Private	220 (52.01)	7 (1.66)	17 (4.02)	13 (3.07)				257	<0.005*
	Total		377 (89.13)	7 (1.66)	23 (5.44)	16 (3.79)					
	41	Government	148 (34.99)	5 (1.18)	7 (1.66)	3 (0.71)	0 (0.00)	3 (0.71)		166	<0.005*
		Private	224 (52.96)	3 (0.71)	6 (1.42)	7 (1.66)	5 (1.18)	12 (2.84)		257	<0.005*
	Total		372 (87.94)	8 (1.89)	13 (3.07)	10 (2.36)	5 (1.18)	15 (3.55)			
	42	Government	148 (34.99)	3 (0.71)	15 (3.55)	0 (0.00)				166	<0.005*
		Private	226 (53.43)	10 (2.36)	20 (4.73)	1 (0.24)				257	<0.005*
	Total		374 (88.42)	13 (3.07)	35 (8.27)	1 (0.24)					
	43	Government	61 (14.42)	44 (10.40)	61 (14.42)	0 (0.00)				166	0.175
		Private	89 (21.04)	120 (28.37)	43 (10.17)	5 (1.18)				257	<0.005*
	Total		150 (35.46)	164 (38.77)	104 (24.59)	5 (1.18)					
	44	Government	22 (5.20)	29 (6.86)	49 (11.58)	66 (15.60)				166	<0.005*
		Private	39 (9.22)	49 (11.58)	138 (32.62)	31 (7.33)				257	<0.005*
	Total		61 (14.42)	78 (18.44)	187 (44.21)	97 (22.93)					
	45	Government	90 (4.49)	43 (10.17)	52 (12.29)	52 (12.29)				166	0.001*
		Private	25 (5.91)	99 (23.40)	120 (28.37)	13 (3.07)				257	<0.005*
	Total		44 (10.40)	142 (33.57)	172 (40.66)	65 (15.37)					
	46	Government	15 (3.55)	150 (35.46)	0 (0.00)	1 (0.24)				166	<0.005*
		Private	34 (8.04)	210 (49.65)	12 (2.84)	1 (0.24)				257	<0.005*
	Total		49 (11.58)	360 (85.11)	12 (2.84)	2 (0.47)					
	47	Government	25 (5.91)	15 (3.55)	59 (13.95)	67 (15.84)				166	<0.005*
		Private	29 (6.86)	35 (8.27)	116 (27.42)	77 (18.20)				257	<0.005*
	Total		54 (12.77)	50 (11.82)	175 (41.37)	144 (34.04)					
	48	Government	31 (7.33)	56 (13.24)	78 (18.44)	1 (0.24)				166	<0.005*

Contd...

**Table 3: Contd...**

Parameter assessed	Variable	College	a	b	c	d	e	f	g	Total	P value
College discussion on smoking	Total	Private	48 (11.35)	106 (25.06)	101 (23.88)	2 (0.47)				257	<0.005*
		Government	79 (18.68)	162 (38.30)	179 (42.32)	3 (0.71)				166	<0.005*
	49	Private	26 (6.15)	50 (11.82)	89 (21.04)	1 (0.24)				257	<0.005*
		Government	37 (8.75)	133 (31.44)	84 (19.86)	3 (0.71)				166	<0.005*
	50	Private	63 (14.89)	183 (43.26)	173 (40.90)	4 (0.95)				257	<0.005*
		Government	23 (5.44)	14 (3.31)	55 (13.00)	74 (17.49)				166	<0.005*
	51	Private	20 (4.73)	44 (10.40)	115 (27.19)	78 (18.44)				257	<0.005*
		Government	43 (10.17)	58 (13.71)	170 (40.19)	152 (35.93)				166	<0.005*
	52	Private	16 (3.78)	148 (34.99)	1 (0.24)	1 (0.24)				257	<0.005*
		Government	30 (7.09)	220 (52.01)	5 (1.18)	2 (0.47)				166	<0.005*
	53	Private	46 (10.88)	368 (87.00)	6 (1.42)	3 (0.71)				257	<0.005*
		Government	97 (22.93)	43 (10.17)	26 (6.15)	0 (0.00)				166	<0.005*
	54	Private	157 (37.12)	69 (16.31)	26 (6.15)	5 (1.18)				257	<0.005*
		Government	254 (60.05)	112 (26.48)	52 (12.29)	5 (1.18)				166	<0.005*
	55	Private	67 (15.84)	41 (9.69)	8 (1.89)	50 (11.82)				257	<0.005*
		Government	78 (18.44)	70 (16.55)	25 (5.91)	84 (19.86)				166	0.002*
Background information	Total	Private	145 (34.28)	111 (26.24)	33 (7.80)	134 (31.68)				257	<0.005*
		Government	72 (17.02)	59 (13.95)	35 (8.27)	0 (0.00)				166	<0.005*
	56	Private	130 (30.73)	78 (18.44)	48 (11.35)	1 (0.24)				257	<0.005*
		Government	202 (47.75)	137 (32.39)	83 (19.62)	1 (0.24)				166	<0.005*
	57	Private	115 (27.19)	18 (4.26)	10 (2.36)	7 (1.66)	4 (0.95)	12 (2.84)		257	<0.005*
		Government	107 (25.30)	54 (12.77)	32 (7.57)	10 (2.36)	9 (2.13)	45 (10.64)		166	<0.005*
	58	Private	222 (52.48)	72 (17.02)	42 (4.02)	17 (4.02)	13 (3.07)	57 (13.48)		257	<0.005*
		Government	1 (0.24)			0 (0.00)	0 (0.00)	20 (4.73)		166	<0.005*
	59	Private	1 (0.24)			6 (1.42)	2 (0.47)	31 (7.33)		257	<0.005*
		Government	2 (0.47)			6 (1.42)	2 (0.47)	51 (12.06)		166	Not applicable
	60	Private	166 (39.24)	0 (0.00)						257	<0.005*
		Government	254 (60.05)	3 (0.71)						166	Not applicable
	61	Private	420 (99.29)	3 (0.71)						257	Not applicable
		Government	0 (0.00)	166 (39.24)						166	Not applicable
	62	Private	257 (60.76)	0 (0.00)						257	Not applicable
		Government	257 (60.76)	166 (39.24)						166	<0.005*
	63	Private	2 (0.47)	79 (18.68)	85 (20.10)					257	<0.005*
		Government	31 (7.33)	145 (34.28)	81 (19.15)					166	<0.005*
	64	Private	33 (7.80)	224 (52.96)	166 (39.24)					257	<0.005*
		Government	0 (0.00)	160 (37.83)	6 (1.42)	0 (0.00)	0 (0.00)			166	<0.005*
	65	Private	1 (0.24)	240 (56.74)	7 (1.66)	3 (0.71)	6 (1.42)			257	<0.005*
		Government	1 (0.24)	400 (94.56)	13 (3.07)	3 (0.71)	6 (1.42)			166	<0.005*

\*Indicates significance

**Table 4: Bivariate analysis for knowledge and attitude toward smoking**

Parameter assessed	Variable number	Variables	P value	Contingency coefficient
Knowledge	15	Do parents smoke	<0.005*	0.301
Knowledge	16	Friend offered cigarette	0.693	0.059
Knowledge	17	Family discussion on harmful effects	0.001*	0.157
Knowledge	18	Future use of cigarette in next year	0.475	0.077
Knowledge	19	Will you be smoking 5 years from now	0.001*	0.196
Knowledge	20	Is quitting difficult	0.001*	0.188
Knowledge	21	Boy smokers have more or less friends	<0.005*	0.252
Knowledge	22	Girl smokers have more or less friends	<0.005*	0.285
Knowledge	23	Comfort level in parties	<0.005*	0.235
Knowledge	24	Boys look more or less attractive when smoking	<0.005*	0.193
Knowledge	25	Girls look more or less attractive when smoking	0.749	0.054
Knowledge	26	Weight gain or loss after smoking	0.002*	0.183
Knowledge	27	Smoking is harmful to health	<0.005*	0.202
Knowledge	28	Closest friends smoke	0.009*	0.164
Knowledge	29	Opinion on male smoker	0.006*	0.193
Knowledge	30	Opinion on women smokers	0.001*	0.221



**Table 4: Contd...**

Parameter assessed	Variable number	Variables	P value	Contingency coefficient
Knowledge	31	Safe to smoke for 1 or 2 years	0.108	0.119
Knowledge	32	Passive smoke harmful	0.024*	0.161
Knowledge	33	At home how many people smoked last week	0.003*	0.191
Knowledge	34	outside home how many people smoked last week	0.002*	0.194
Knowledge	35	Favour public ban	<0.005*	0.255
Knowledge	36	Will stop smoking now	0.132	0.115
Knowledge	37	Stopped smoking last year	0.098	0.121
Knowledge	38	Quitting time	0.002*	0.209
Knowledge	39	Reasons for quitting	0.02*	0.175
Knowledge	40	Willing to stop smoking	0.019*	0.151
Knowledge	41	Received advise	0.111	0.144
Knowledge	42	Do parents know	0.516	0.073
Knowledge	43	Media messages	<0.005*	0.259
Knowledge	44	Anti-smoke messages during events	<0.005*	0.318
Knowledge	45	TV actors smoking frequency	<0.005*	0.342
Knowledge	46	Logo on shirts	0.016*	0.154
Knowledge	47	Sports TV advertisements frequency	0.039*	0.139
Knowledge	48	Bill board advertisements	0.401	0.083
Knowledge	49	News-papers advertisements	<0.005*	0.223
Knowledge	50	Concerts advertisements	<0.005*	0.204
Knowledge	51	Cigarettes company offers	0.603	0.066
Attitude	52	School/college teachers	0.116	0.117
Attitude	53	School/college discussion reason	0.089	0.123
Attitude	54	School/college discussion effect	0.41	0.082
Attitude	55	Lessons on smoking	<0.005*	0.27
Attitude	56	Age	0.252	0.112
Attitude	57	Gender	0.162	0.068
Attitude	58	Grade of college studying	<0.005*	0.707
Attitude	59	Have boyfriend/girlfreind	<0.005*	0.244
Attitude	60	Boyfriend/girlfreind smoking	0.146	0.126

\*Indicates significance i.e., influence on the college students

## DISCUSSION

We found in our study that 32 students (7.57%) had ever tried smoking cigarettes, 21 (4.97%) had smoked for the first time at the age of 16 years and only 8 students (1.9%) had first smoked by 14 years. Only 29 students (5%) had used tobacco products other than cigarettes in the previous month. Similar results were reported in several studies. In a study among school students in West Bengal, ever tobacco use was reported by 23% students, over 18% students first tried tobacco at less than 10 years of age, nearly 9.8% currently smoked and 9.5% currently used smokeless tobacco products.<sup>7</sup> In a study by Bagchi *et al.* in Kolkata the mean age of initiation of smoking was found to be 13.46 years.<sup>8</sup> Narain *et al.* in their study in Noida had reported a tobacco use prevalence of 11.2% and mean age of initiation around 12.4 years.<sup>9</sup>

Our study showed that as per the respondents' parents smoking habits, fathers' smoking proportion was around 10.4%, and mothers' was only 0.24%. This was in accordance with some other studies carried out on this parameter. Mukherjee *et al.* in their study had found that the history of parental tobacco intake accounted for 18.5%

of study population.<sup>10</sup> Sinha *et al.* in their study found that over 65% of users reported initiation at 10 years of age or earlier and a positive association between tobacco use by parents and close friends with tobacco use by the students.<sup>11</sup> In a study in Goa by Pednekar *et al.*, ever tobacco use was found to be 4.5%, and tobacco use by parents and friends was strongly associated with tobacco use by the students.<sup>12</sup> Kapoor *et al.* in their study had shown that male sex, age >15 years, smoking by father, mother, sister and friends were significantly associated with adolescent smoking.<sup>13</sup>

In our study, we found that the perception that smoking was harmful to health was felt by 65.72% of the respondents, and 58.63% had felt that others' smoking (passive smoking) was harmful to them. Around 28.43% subjects felt that a man who smokes lacks confidence, and 60.85% felt that he is stupid, and only 1.49% felt that he was a successful man. About seeing or hearing anti-smoking messages, 35.46% students reported seeing a lot of such messages and about 25.77% reported seeing no messages at all. Around 23.4% respondents in our study reported seeing their favorite actors smoking a lot on screen. During the viewing of television sports events, big cigarette brand names were seen by 11.82% of respondents. About 2.36% respondents

in our study felt that the main reason to stop smoking was to improve their health, and 1.18% felt that it was to save money. Nearly 3% of the respondents had received help to stop smoking from a friend and 2.36% from a family member. Around 2% respondents had received help from a professional or a program to stop smoking. A significant majority of respondents in our study (67.61%) favored banning smoking in all public places. These findings are consistent with the reports in various similar studies as quoted hereby. A study by Majra *et al.*<sup>14</sup> in Sikkim showed that nearly 36.5% of the students felt that tobacco users look more attractive, and 17.2% thought that they made more friends. A large number of respondents reported seeing their favorite celebrity smoking cigarettes (43.5%) and nearly 31.6% students reported that their fathers' smoked. In a study by Mukherjee *et al.*, around 89% of students had seen anti-tobacco advertisements in the media last month and 76% of students had watched their favorite heroes smoking on television or cinemas. This study also showed that nearly 26% students thought that smoking causes no health problems, and 47% students opined that those who smoke are not mentally strong. About 70% of them would refuse their best friend if offered tobacco and 7% opined that quitting tobacco is possible. Regarding the knowledge of harmful effects of tobacco the overall correct knowledge level varied from 49% to 80% among the respondents.<sup>10</sup>

We found in our study that 60% of the respondents said that their teacher had talked about the dangers of smoking. Nearly 47.75% respondents said that the ill effects of smoking had been discussed in school discussions during the past year, and 32.39% said that there was no such discussion. This was in accordance with a study carried out by Mukherjee *et al.* in which nearly 80% students said that there was no discussion about hazards of tobacco in school.<sup>10</sup>

A limitation of this study is that the findings and interpretations are restricted to adolescent students only. Further studies are required to cover the groups of adolescents who are out of schools or colleges as the prevalence of health risk behaviors is likely to be higher among them. Qualitative research methods like focused group discussions can be utilized in future studies to have in-depth analysis of the reasons for tobacco use among adolescents students.

## CONCLUSIONS

Tobacco is the second major cause of death in the world and the fourth most common risk factor for disease worldwide.<sup>15</sup> However, it is an irony that tobacco use is a preventable cause of death, and it is amenable to simple cost effective interventions.

The findings in his study suggest that tobacco use is an important risk behavior among adolescent students. This study found evidence of a strong association of tobacco use by the adolescents with having seen various role models including their parents and peers ever smoking. Tobacco use cessation programs targeting the adolescents would need to be heedful of this influence of the role models on their target population.

Regarding tobacco use among pre-university students, several steps need to be taken. Tobacco consumption in the campus must be strictly prohibited. Teachers need to be motivated to not set any bad example using tobacco in front of their students. Though the importance of Information, Education and Communication (IEC) in addressing the problem of tobacco abuse is well known, we found there was hardly any discussion on this matter in the schools/colleges during the past year. Focused IEC activities emphasizing the roles of primary prevention including health education and implementation of the National Tobacco Control Programs are very critical measures in tackling this huge menace. IEC activities are also needed to promote healthy behavior in the community because the behavior of various role models in their environment was seen to significantly influence the adolescents' own risk status. Involvement of teachers, parents, government and non-governmental organizations will go a long way in addressing this problem in the coming years.

In conclusion, several factors related to family and peer groups influence smoking by adolescents from an early age. Joint efforts from family, school/college and social welfare groups are needed to address these factors for effective prevention in addition to raising awareness against tobacco use among the students.

## REFERENCES

1. Shimkhada R, Peabody JW. Tobacco control in India. *Bull World Health Organ* 2003;81:48-52.
2. Gupta PC, Bhonsle RB, Mehta FS, Pindborg JJ. Mortality experience in relation to tobacco chewing and smoking habits from a 10-year follow-up study in Ernakulam District, Kerala. *Int J Epidemiol* 1984;13:184-7.
3. Gajalakshmi V, Peto R, Kanaka TS, Jha P. Smoking and mortality from tuberculosis and other diseases in India: Retrospective study of 43000 adult male deaths and 35000 controls. *Lancet* 2003;362:507-15.
4. Gupta PC, Mehta HC. Cohort study of all-cause mortality among tobacco users in Mumbai, India. *Bull World Health Organ* 2000;78:877-83.
5. Jha P, Jacob B, Gajalakshmi V, Gupta PC, Dhingra N, Kumar R, *et al.* A nationally representative case-control study of smoking and death in India. *N Engl J Med* 2008;358:1137-47.
6. Patel DR, Greydanus DE. Substance abuse: A pediatric concern. *Indian J Pediatr* 1999;66:557-67.
7. Sinha DN. Tobacco Use among Students. In: West Bengal: India-West Bengal GYTS; 2000.
8. Bagchi NN, Ganguly S, Pal S, Chatterjee S. A study on smoking and associated psychosocial factors among adolescent students in Kolkata,

- India. Indian J Public Health 2014;58:50-3.
9. Narain R, Sardana S, Gupta S, Sehgal A. Age at initiation & prevalence of tobacco use among school children in Noida, India: A cross-sectional questionnaire based survey. Indian J Med Res 2011;133:300-7.
  10. Mukherjee A, Sinha A, Taraphdar P, Basu G, Chakrabarty D. Tobacco abuse among school going adolescents in a rural area of West Bengal, India. Indian J Public Health 2012;56:286-9.
  11. Sinha DN, Gupta PC, Pednekar MS. Tobacco use among students in the eight North-eastern states of India. Indian J Cancer 2003;40:43-59.
  12. Pednekar MS, Gupta PC. Tobacco use among school students in Goa, India. Indian J Public Health 2004;48:147-52.
  13. Kapoor SK, Anand K, Kumar G. Prevalence of tobacco use among school and college going adolescents of Haryana. Indian J Pediatr 1995;62:461-6.
  14. Majra J, Basnet J. Prevalence of tobacco use among the children in the age group of 13-15 years in Sikkim after 5 years of prohibitory legislation. Indian J Community Med 2008;33:124-6.
  15. Katharine ME, Stephen RL. The Millenium Development Goals and Tobacco Control. Geneva: World Health Organization; 2001.

**How to cite this article:** Ahmed M, Vadiraja N, Ravi A, Hebbar B, Kasturi S. Use of Tobacco among Pre-University Male Students in Mysore City, India: A Questionnaire Study. Int J Sci Stud 2015;2(11):128-136.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Comparative Study of Low-Dose Morphine on the Characteristic of Intrathecal Lignocaine: A Prospective Randomized Study

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## Abstract

**Introduction:** Spinal anesthesia is commonly used technique for caesarian sections. A number of adjuvants are used to improve the quality of subarachnoid block. Morphine sulfate is used in various clinical trials.

**Aim:** Aim of the study, to compare the subarachnoid block characteristics with low-dose morphine to intrathecal lignocaine.

**Methodology:** Totally, 50 parturients, ASA I and II between 16 and 35 years randomly allocated into 2 equal groups. One received 1.0 ml of Hyperbaric Lignocaine, other 100 µg morphine in addition to lignocaine achieve subarachnoid block. Sensory, motor, duration of analgesia, apgar score, statistical analysis compared in groups. Duration of sensory blockade is longer, whereas motor blockade, higher to some extent, time to 1<sup>st</sup> request of analgesia significantly longer in Group-II than Group-I ( $P < 0.001$ ).

**Results:** Duration of sensory blockade was significantly longer in Group-II than in Group-I ( $P < 0.01$ ). Duration of Motor blockade was also higher in Group-II only to some extent ( $P > 0.01$ ). Time to 1<sup>st</sup> request of analgesia was significantly longer in Group-II than Group-I ( $P < 0.001$ ).

**Conclusion:** Addition of morphine to intrathecal lignocaine prolonged the duration of sensory, motor blockade and post-operative analgesia without causing side effects on mother and fetus.

**Key words:** Analgesia, Caesarian section, Intrathecal, Lignocaine, Morphine

## INTRODUCTION

Spinal anesthesia is the most commonly used technique for the caesarian section surgeries. Comparatively it is very economical and easy to administer and safe. However, using local anesthetics alone for subarachnoid block associated with relatively short duration of action. Addition of adjuvants like midazolam, fentanyl, ketamine and clonidine etc., to intrathecal lignocaine, significantly prolong the duration of spinal anesthesia and also improved the quality of spinal blockade in various clinical studies.<sup>1,2</sup> A common problem during caesarian section surgeries under spinal

anesthesia is visceral pain, nausea and vomiting. This problem can be overcome by the addition of anti-emetics preoperatively and the addition of adjuvants to improve the quality of block. Low-dose morphine an opioid has been proved in various clinical studies to increase the duration of sensory and motor blockade, duration of analgesia and quality of the subarachnoid blockade with minimal side effects.<sup>3,4</sup>

The aim of the study was to compare the characteristics of sensory and motor blockade, time to first request of analgesia, hemodynamic changes and adverse effects following intrathecal lignocaine versus intrathecal lignocaine with low-dose morphine.

## METHODOLOGY

After Institutional Ethics Committee Approval and written informed consent 50 parturients aged between 16 and

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Month of Submission : 12-2014  
Month of Peer Review : 01-2015  
Month of Acceptance : 01-2015  
Month of Publishing : 02-2015

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35 years belonging to ASA I and II were included in the prospective controlled and randomized study. This study was done in Government General Hospital, Vijayawada Siddhartha Medical College. Randomization was done using computer generated random number tables.

### Exclusion Criteria

- ASA Grade > III.
- Patients below 16 years and above 35 years of age.
- Patients with a history of any contraindications to spinal anaesthesia.
- Patients with severe systemic diseases, metabolic disorder, neurological, congenital and cardio-vascular diseases.
- Patients with a history of allergy to study drugs. Ex: Lignocaine, Morphine.

Two investigators were involved in the study. The observer and anesthesiologist who did intraoperative and postoperative monitoring was blinded to study. Patients were randomized into 2 groups, 25 each into Group-1 and Group-2. Baseline parameters like heart rate (HR), pulse rate (PR), non-invasive blood pressure (NIBP), SPO2 were recorded in all the two groups. After shifting the patient to the operating room, routine monitors like NIBP, SPO2 and electrocardiogram were applied to the patient. 18G intravenous (IV) cannula was secured. All emergency, resuscitation equipment was kept ready. All patients were preloaded with 500 ml of ringer's lactate prior to spinal anaesthesia.

Group 1 ( $n = 25$ ) patients received 1 ml of 5% hyperbaric lignocaine with 0.1 ml of 0.9% saline.

Group 2 ( $n = 25$ ) patients received 1 ml of 5% hyperbaric lignocaine with 0.1 ml (100 µg) of morphine sulphate. In all the groups, the total volume administered was made up to 1.1 ml to achieve subarachnoid block. Under strict aseptic conditions, lumbar puncture was performed by midline approach using disposable 25G quincke bobcocks needle at L3-L4 interspace. Intra operatively bradycardia was treated with 0.5 mg of IV atropine, hypotension was treated with rapid bolus of IV fluids and incremental doses of 6 mg of ephedrine. The following parameters were observed.

- Sensory block was assessed using a pinprick method. Onset time and duration of sensory blockade were recorded.
- Motor block was assessed using Bromage scale (Table 1). Onset time and duration of motor blockade was noted between two groups.
- Hemodynamic parameters like HR, blood pressure (BP) were noted between two groups.
- Time to 1st request analgesia (the duration of post-

**Table 1: Bromage scale**

Grade	???	Percentage of block	Degree of motor blockade
0	No block	0	Full flexion of knees and feet possible
1	Partial block	33	Able to flex knees and resist gravity with full movement of feet possible
2	Almost complete	66	Unable to flex knees, still flexion of feet block possible
3	Complete block	100	Unable to move legs or feet

operative analgesia) was compared between the two groups.

- Adverse effects were also noted between the groups. The possible adverse effects of hypotension, bradycardia, nausea, vomiting, sedation, urinary retention, pruritus, respiratory depression etc., were noted. Patients were assessed for grading of sedation using the sedation score by Wilson *et al.*, 1990.

### Grade

- Awake and alert
- Awake but drowsy
- Eyes closed but arousable to command
- Eyes closed but arousable to mild physical stimulation
- Eyes closed and not arousable to mild physical Stimulation

### Statistical analysis

Demographic data were analyzed using Fischer's test. Sensory and motor block characteristics analyzed using one-way Analysis of Variance Student's *t*-test. Time to 1<sup>st</sup> request of analgesia was assessed using Student's *t*-test. Data were expressed in mean, standard deviation, absolute numbers and percentage.  $P < 0.01$  was considered significant.

## RESULTS

Totally, 50 parturients were included in the study, all had completed the study and none had inadequate/failed block.

All patients were comparable regarding demographic characteristics like age, height, weight, ASA status and duration of surgery. The age distribution in Group-I was 16-30 years, whereas in Group-II was 18-30 years. The mean age in Group-I was 23.36 and Group-II was 21.8 (Table 2). The mean weight in Group-I was 67.68kgs, in Group-II was 67.68 kg (Table 3). The height range in Group-I was between 138 cm and 166 cm whereas in Group-II was between 136 cm and 170 cm. The mean height in Group-I was 154.28 cm whereas in Group-II was 158.04 cm. (Table 4) No sedation was noted in Group-I,

**Table 2: Age distribution**

Age in years	Group I	Group II
Minimum	16	18
Maximum	30	30
Mean	23.36	21.8
16-25	16	21
26-35	9	4
Total	25	25

**Table 3: Weight distribution**

Weight in kg	Group-I	Group-II
Minimum	56	58
Maximum	76	78
Mean	67.68	67.68

whereas sedation was noted in some patients in Group-II ranging from Grade II to III (Table 5). The mean time of onset of sedation and the mean time of duration of sedation in Group-II was 14.84 min and 1152 min respectively (Table 6). There were no significant differences in the baseline Hemodynamic parameters like PR, BP in all the 2 groups.

After intrathecal lignocaine, there is invariable fall in systolic BP in all the 2 groups between 1st 15 and 20 min followed by a gradual recovery. The difference of fall in systolic BP between groups at different time intervals was statistically insignificant. The onset of sensory blockade was 2.00 to 3.20 min in Group I, 1.58-3.10 min in Group-II. The difference between the 2 groups was statistically significant ( $P < 0.01$ ) (Table 7).

The onset of motor blockade was 2.04-3.22 min in Group-I, 2.00-3.12 min in Group-II. The difference between the 2 groups was statistically not significant  $P > 0.01$  (Table 7).

The time to complete sensory recovery was 64-80 min in Group-I whereas 70-92 min in Group-II. The difference between groups was statistically significant ( $P < 0.01$  Table 7).

The time for complete motor recovery was 44-64 min in Group-I, 46-70 min in Group-II. The difference between groups was statistically insignificant. ( $P > 0.01$  Table 7) The duration of post-operative analgesia was 75-126 min in Group-I with mean value of 107 min, 960-1920 min with mean value of 1315.2 min in Group-II. The difference between two groups was statistically highly significant ( $P < 0.001$  Table 8). The time to two segment regression mean value in Group-I was 66.96 (standard deviation [SD] of 4.51), 50.8 (SD of 7.39) in Group-II. The difference between 2 groups was slightly increased in Group-II. The Neonatal APGAR score in 1st min of delivery in Group-I

**Table 4: Height distribution**

Height in cms	Group-I	Group-II
Minimum	138	136
Maximum	166	170
Mean	154.28	158.04

**Table 5: Sedation**

Sedation score	Group-II
Grade-I	12
Grade-II	9
Grade-III	4
Grade-IV	-
Grade-V	-
Total	25

**Table 6: Mean time for onset of sedation and duration of sedation**

	Onset of sedation (mts)	Duration of sedation (mts)
Range	5-26	960-1320
Mean	14.84	1152

was 8-10, (mean 9.32) whereas 7-9 (mean 8.2) in Group-II. It was equal in both the groups after 5 min of delivery. The difference between 2 groups was statistically not significant  $P > 0.01$  (Table 9). Time to 1st request of analgesia by the patient was 75-126 min in Group-I whereas 960-1920 min in Group-II. The difference between the groups was highly significant. There was no significant difference in the incidence of hypotension and bradycardia between the groups. The incidence of nausea, vomiting, sedation, urinary retention, pruritus are highest in Group-II when compared to Group-I. None of the patients in all the groups had respiratory depression (Table 10).

## DISCUSSION

Spinal anesthesia is the most commonly used regional anesthesia technique, especially for lower section caesarean section surgeries using local anesthesia alone will provide less duration of analgesia. In order to improve the quality of analgesia as well as to provide extended post-operative analgesia various adjuvants are being added to intrathecal local anesthetics. Of which opioids have gained prominence due to their multiple beneficial effects like prolonged post-operative analgesia, stable hemodynamics, reducing post-operative analgesia requirements, facilitate early ambulation and reduced hospital stay.<sup>5,6</sup> The procedure should not cause complications, simple, easy and not time-consuming. It should be prevent discomfort due to multiple pricks of intramuscular/IV injections relieve more workload on nursing staff; it must be cheap and affordable to the patients.

**Table 7: Sensory and motor blockade characteristics**

	Range (mts)		Mean		SD		P value
	Group-I	Group-II	Group-I	Group-II	Group-I	Group-II	
Onset of sensory blockade	2.00-3.20	1.58-3.10	2.76	2.49	0.475	0.434	<0.01 significant
Onset of motor blockade	2.04-3.22	2.00-3.12	2.81	2.57	0.47	0.43	>0.01 not significant
Duration of sensory blockade	64-80	70-92	71.12	81.8	4.53	8.001	<0.01 significant
Duration of motor blockade	44-64	46-70	53.08	53.8	6.26	7.45	>0.01 not significant

SD: Standard deviation

**Table 8: Duration of post-operative analgesia**

Group	Range (mts)	Mean	SD
I	75-126	107	10.75
II	960-1920	1315.2	236.17

SD: Standard deviation,  $P < 0.001$  highly significant**Table 9: Neonatal Apgar scores**

Group	1 <sup>st</sup> min	5 min
I	8-10	10
II	7-9	10

 $P > 0.01$  not significant**Table 10: Incidence of side effects**

Intra and post-operative complication	Group I		Group II	
	Patients	Percentage	Patients	Percentage
Hypotension	15	60	14	56
Bradycardia	10	40	8	32
Nausea, vomiting	-	-	16	64
Sedation	-	-	13	52
Urinary retention	-	-	3	12
Pruritus	-	-	2	8
Respiratory depression	-	-	-	-

The principle mechanism by which intrathecal low-dose morphine provide analgesia by binding to specific  $\mu$  receptors located in the brain and substantia gelatinosa of the spinal cord involved in the transmission and modulation of pain<sup>7</sup> and responsible for analgesia, euphoria, miosis, bradycardia, hypothermia, depression of ventilation, physical dependence and marked constipation. Opioid receptors are coupled to a potassium conductance that inhibits neurotransmitter release and hyperpolarises the cell membrane.<sup>8,9</sup>

The patients studied across the 2 groups did not vary much with respect to demographic variables.

In the present study, the incidence of nausea and vomiting that was treated with antiemetics was significantly high in Group-II. Sedation, urinary retention and pruritus are also high in Group-II. The incidence of hypotension and bradycardia are almost equal in both the groups. The overdose of morphine sulfate was treated with naloxone.<sup>10-12</sup> In a study conducted by Gerancher *et al.* who performed

double-blind study in 40 patients who were posted for elective caesarean section surgeries. The study group patients received intrathecal morphine provides good analgesia post-operatively and patient satisfaction, time and less cost effective than other group received I V morphine.<sup>13</sup> Kong *et al.* studied the use of the intrathecal morphine for post-operative pain relief after elective laparoscopic colorectal surgeries. They conducted prospective double-blinded randomized study on 36 patients. All are received intrathecal local anesthetics in addition to general anesthesia. One group received intrathecal morphine, had no adverse cardiovascular effects of the combined anesthesia technique, and post-operative analgesia is excellent, compared to patients received intrathecal local anesthetics alone.<sup>14</sup> Rathmel *et al.* conducted randomized controlled dose ranging study in 80 patients who received 0.2-0.3 mg of intrathecal morphine were more satisfied than those received 0.0 or 0.1 mg after both hip and knee arthroplasty.<sup>15</sup>

The results of the above studies correlated with the observations of our study with respect to Sensory and motor characteristics and prolonged post-operative analgesia.

In the present study, the onset times of sensory blockade between groups were statistically insignificant ( $P > 0.01$ ). The onset time of motor blockade was significantly less between groups in our study.

## CONCLUSION

We concluded that supplementation of intrathecal 100  $\mu$ g of morphine to 5% hyperbaric Lignocaine improves the quality of spinal anesthesia and increases the duration of post-operative analgesia without significant deleterious effects either on mother or on neonate.

## REFERENCES

- Cousins MJ, Mather LE. Intrathecal and epidural administration of opiates. *Anesthesiology* 1984;61:276-80.
- Akerman B, Arweström E, Post C. Local anesthetics potentiate spinal morphine antinociception. *Anesth Analg* 1988;67:943-8.
- Morgan M. The rational use of intrathecal and extradural opioids. *Br J Anaesth* 1989;63:165-88.
- Matsuda M, Ueki R, Murakawa K, Sasaki K, Boo K, Tashiro C. Low dose

- intrathecal morphine and postoperative pain relief in elderly patients. *Masui* 2001;50:1096-100.
5. Rygnestad T, Zahlsen K, Bergslien O, Dale O. Focus on mobilisation after lower abdominal surgery. A double-blind randomised comparison of epidural bupivacaine with morphine vs. lidocaine with morphine for postoperative analgesia. *Acta Anaesthesiol Scand* 1999;43:380-7.
  6. Campbell DC, Riben CM, Rooney ME, Crone LA, Yip RW. Intrathecal morphine for postpartum tubal ligation postoperative analgesia. *Obstet Anesth Dig* 2002;22:41-3.
  7. Guyton C. *Text Book of Medical Physiology*. 8<sup>th</sup> ed. Philadelphia: Saunders; 1991.
  8. Stoelting RK. *Pharmacology and Physiology in Anesthetic Practice*. 3<sup>rd</sup> ed. Philadelphia: Lippincott Williams & Wilkins; 1999.
  9. Katzung BG. *Basic and Clinical Pharmacology*. 8<sup>th</sup> ed. New York: McGraw-Hill; 2001.
  10. Healy TJ, Knight PR. Wylie and Churchill-Davidson *Practice of Anaesthesia*. 5<sup>th</sup>, 6<sup>th</sup>, 7<sup>th</sup> ed. Boca Raton: Taylor & Francis Group; 2003.
  11. Miller RD. *Anesthesia*. 5<sup>th</sup> ed. Philadelphia: Churchill Livingstone; 2000.
  12. Prithvi Raj P. *Practical Management of Pain*. 3<sup>rd</sup> ed. St. Louis: Mosby; 2000.
  13. Gerancher JC, Floyd H, Eisenach J. Determination of an effective dose of intrathecal morphine for pain relief after cesarean delivery. *Anesth Analg* 1999;88:346-51.
  14. Kong SK, Onsiong SM, Chiu WK, Li MK. Use of intrathecal morphine for postoperative pain relief after elective laparoscopic colorectal surgery. *Anaesthesia* 2002;57:1168-73.
  15. Rathmell JP, Pino CA, Taylor R, Patrin T, Viani BA. Intrathecal morphine for postoperative analgesia: a randomized, controlled, dose-ranging study after hip and knee arthroplasty. *Anesth Analg* 2003;97:1452-7.

**How to cite this article:** Songa VK, Gera KK. Comparative Study of Low-Dose Morphine on the Characteristic of Intrathecal Lignocaine: A Prospective Randomized Study, *Int J Sci Stud* 2015;2(11):137-141.

**Source of Support:** Nil, **Conflict of Interest:** None declared.



# Functional Outcome of Dynamic Hip Screw in Elderly People: A Clinical Study

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## Abstract

**Background:** Fractures of the proximal femur are amongst the most often encountered fractures by an orthopedic surgeon. Many treatment techniques are described in literature, but internal fixation with dynamic hip screw (DHS) is the treatment of choice for elderly.

**Objectives:** This study analyzes the outcome of treatment of intertrochanteric fracture DHS with elderly people. To determine the rate of union, complications, and functional outcomes in elderly people with intertrochanteric fractures treated by DHS.

**Materials and Methods:** Between September 2012 and March 2014, 35 patients with intertrochanteric fracture who got admitted in A.J. Institute of Medical Sciences and Hospital, Mangalore, in the Department of Orthopedics were subjected to internal fixation with DHS and the results were evaluated.

**Results:** Average age incidence in the present study was 67.22 years. Male:female ratio was almost equal 47:53. All the fractures occurred after a fall, only one is road traffic accident. Boyd and Graffins Type II were more common. Out of the 35 cases, three patient died and miss the follow-up and out of other 32 patient functional outcome evaluated using Kyle's criteria at their last follow-up: 8 cases (25%) had excellent, 12 cases (37.5%) good, 7 cases (21.9%) fair and 5 cases (15.6%) poor.

**Interpretation and Conclusion:** Internal fixation with DHS is the treatment of choice for treatment of intertrochanteric fractures in elderly people.

**Key words:** Dynamic hip screw, Intertrochanteric fracture, Kyle's criteria, Tip apex distance

## INTRODUCTION

The demographics of world populations are set to change, with more elderly living in developing countries. The highest hip fracture rates are seen in North Europe and the US and lowest in Latin America and Africa. Asian countries have intermediate hip fracture rates. With rising life expectancy throughout the globe, the number of elderly individuals is increasing in every geographical region, and it is estimated that the incidence of hip fracture will rise from 1.66 million in 1990-6.26 million by 2050.<sup>1</sup>

As three-quarters of the world's population live in Asia, it is projected that Asian countries will contribute more to the pool of hip fractures in coming years. The highest incidence of hip fractures from Asia has been reported from Singapore.<sup>2</sup> It is estimated that by 2050 more than 50% of all osteoporotic trochanteric fractures will occur in Asia. This variation in the distribution of hip fracture over different regions of the world demonstrates that genetic and environmental factors play a role in the etiology of hip fracture.<sup>3</sup>

Intertrochanteric fractures unite readily due to broad fracture surfaces, adequate blood supply and they rarely lead to non-unions. If proper precautions are not taken fractures unite in malposition resulting in shortening, limp and restricted.<sup>4</sup>

### Trochanteric Fractures<sup>2</sup>

Trochanteric fracture is defined as the fracture in which the main plane of bony separation passes the tip of the greater

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Month of Submission : 12-2014  
Month of Peer Review : 01-2015  
Month of Acceptance : 01-2015  
Month of Publishing : 02-2015

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trochanter obliquely downward, inward to or through the lesser trochanter. Trochanteric fractures occur in the area just distal to the capsule of the hip joint, and above the area of the isthmus of the medullary canal.

### Classification of Trochanteric Fractures

#### *Boyd and Griffin (1949) classification*

This classification includes all the fractures from extracapsular part of the neck to a point 5 cm distal to lesser trochanter.

Type I: Fractures that extend along the intertrochanteric line. Reduction usually is simple and is maintained with little difficulty.

Type II: Comminuted fracture, the main fracture being along intertrochanteric line but with multiple fractures in the medial cortex. Reduction of these fractures is difficult.

Type III: Fractures that are basically subtrochanteric with at least one fracture passing the proximal end of the shaft, just distal to or at the lesser trochanter. Varying degree of comminution is more difficult to reduce and results in more complications.

Type IV: Fractures of the trochanteric region and the proximal shaft, with fracture in at least 2 planes, with one fracture along the sagittal plane. If open reduction and internal fixation are used, two plane fixation is required.<sup>3</sup>

Others classifications of trochanteric fracture are:

- a. Evans classification (1949)
- b. Ramadier's (1956)
- c. Enders (1970)
- d. Tronzo (1973)
- e. Kyles (1980)
- f. A.O classification (1981)

### Management of Trochanteric Fractures

The goal of treatment of patients with intertrochanteric hip fractures should be the early Mobilization of the patient, with a prompt return to the pre-fracture level of functioning. This approach minimizes patient morbidity as well as the impact on health care resources. For displaced fractures, this goal is rarely, if ever, achieved without surgical intervention.

Hence the trochanteric fractures can be managed in two ways:

1. Conservative or non-operative method.
2. Operative method.

## MATERIALS AND METHODS

### Source of Data

The study was conducted on patients undergoing fixation of intertrochanteric fractures with DHS in Department of Orthopedics, A.J. Institute of Medical Sciences and Research Centre, Kuntikana, Mangalore, during the study period September 2012-March 2014.

### Methods of Data Collection

#### *Type of study*

The study is a clinical, prospective and observational study conducted at A.J. Institute of Medical Science, Kuntikana, Mangalore.

This is a prospective clinical study from September 1, 2012 to March 31, 2014. Patients will be followed up for a minimum period of 6 months.

Ethical clearance was obtained from Ethical Committee of institution and consent from patients was obtained.

With each follow-up clinical and radiological evaluation was done. The data collected was collected and transferred into a master chart that is subjected to statistical.

### Statistical Analysis

Functional outcome of the patients will be evaluated by HIP assessment scoring system (Kyle's criteria)<sup>4</sup> and results were analyzed by prospective study and percentage.

## INCLUSION CRITERIA

- Patients above 50 years of age.
- All intertrochanteric fractures treated with DHS.

### Exclusion Criteria

- Subtrochanteric fracture patient.
- Patient below 50 years of age.

### Procedure of the Study

#### *Pre-operative*

Patients admitted with trochanteric fractures were examined, and X-rays of the hip in antero-posterior and lateral views obtained. In the pre-operative radiographs, the Evans type of fracture and quality of bone by Singh's index was assessed. Skin traction with weight of 3-4 kg was applied. Oral and parenteral non-steroidal anti-inflammatory drugs available in the hospital were used in most cases to relieve pain. Routine blood investigations, hemoglobin level, urine routine, bleeding and clotting time, blood

urea, serum creatinine, blood grouping typing, random blood sugar, electrocardiograph chest radiographs were obtained routinely. Physician opinion regarding fitness was obtained and echocardiography obtained as per cardiologist opinion if needed. Fractures were classified according to Evans. Patient was advised to perform chest physiotherapy, static quadriceps exercises preoperatively. Pre-anesthetic evaluation was done for all cases. Parenteral 3<sup>rd</sup>-generation cephalosporin was administered 1 h prior to surgery.

Part preparation was done on the morning of surgery or before shifting patient to the operation theater. Foley's catheterization was done prior to surgery.

In this series, 35 patients with trochanteric fracture of these three were excluded as they were lost in follow-up.

The following observations were made from data collected during this study:

Table 1 shows distributions of number of patient according to their age and total percentage of different age group of patient.

Graph 1 shows the distribution of number of patient according to Boyd and Griffins classification and types of fracture.

Table 2 shows that total number of patients and their percentage of the result in the subdivision of poor, fair, good and excellent according to Kyle's criteria after 1-year of study.

Table 3 shows total number of patients and their percentage of the result in the subdivision of poor, fair, good and excellent according to Kyle's criteria after 6 months and 1-year of study corresponding to age.

**Table 1: Distributions of subjects according to age**

Age groups in years	Number	Percentage
50-60	12	37.5
61-70	8	25
71-80	7	21.9
81-90	5	15.6
Total	32	100

**Table 2: Kyles criteria in 1-year**

Kyle's criteria (6 months)	Kyle's criteria (1-year) (%)				
	P	F	G	E	Total
P	4 (66.7)	1 (16.7)	1 (16.7)	0 (0.0)	6 (100.0)
F	1 (7.1)	5 (35.7)	7 (50.0)	1 (7.1)	14 (100.0)
G	0 (0.0)	1 (8.3)	4 (33.3)	7 (58.3)	12 (100.0)
Total	5 (15.6)	7 (21.9)	12 (37.5)	8 (25.0)	32 (100.0)

## DISCUSSION

Patients admitted here were evaluated pre-operatively; details were collected in a proforma, operated and followed up regularly on OPD basis. The data collected in this series is analyzed and compared with other studies for age incidence

### Age Incidence Compared with Other Studies

The age incidence in various studies were as in Baumgaertner *et al.*<sup>5</sup> 77 years, Bolhofner *et al.*<sup>6</sup> 79 years, Sahlstrand<sup>7</sup> 75 years, Sedighi<sup>8</sup> 76.7 years, Kanojia *et al.*<sup>9</sup> 56.79 years. For our present study age incidence was 69 years.

The mean and standard deviation of the age of the patients in this study is  $67.22 \pm 10.998$ . The average age is higher in western countries compared to our country.

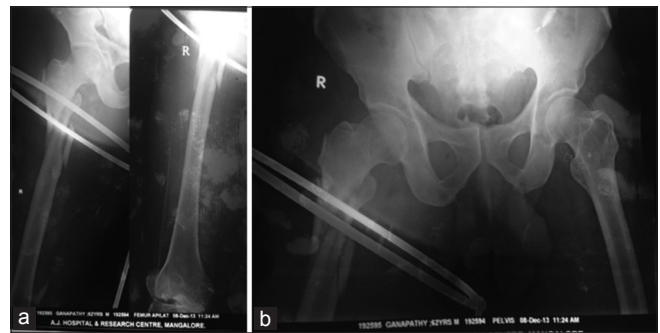
1. The contributing factors for the low average age in Indians will be malnutrition and osteoporosis.
2. The life expectancy of the people from western countries is 10 years more than Indian population.

### Position of Implant Post-operatively

In this study, the post-operative screw placement shows that in 24 patients it is centrally placed, superior in 2 patients, posterior-inferior in 6 patients, centro-posterior in 8 patients, centro-inferior in 5 patients.

Patients with lag screw placed in central and centro-inferior positions had given good functional outcome.

According to Parmar<sup>10</sup> also lag screw placement in central and inferior positions had given good outcomes.



**Figure 1: (a and b) Pre-operative patients X-ray**

**Table 3: Age and Kyle's criteria in 6 months and 1-year**

	n (%)			
	P	F	G	E
Kyles criteria (6 months)	6 (18.8)	14 (43.8)	12 (37.5)	0 (0.0)
Kyles criteria (1-year)	5 (15.6)	7 (21.9)	12 (37.5)	8 (25.0)

Wilcoxon signed rank test  $Z=3.392$ ;  $P=0.001$ , HS: Highly specific

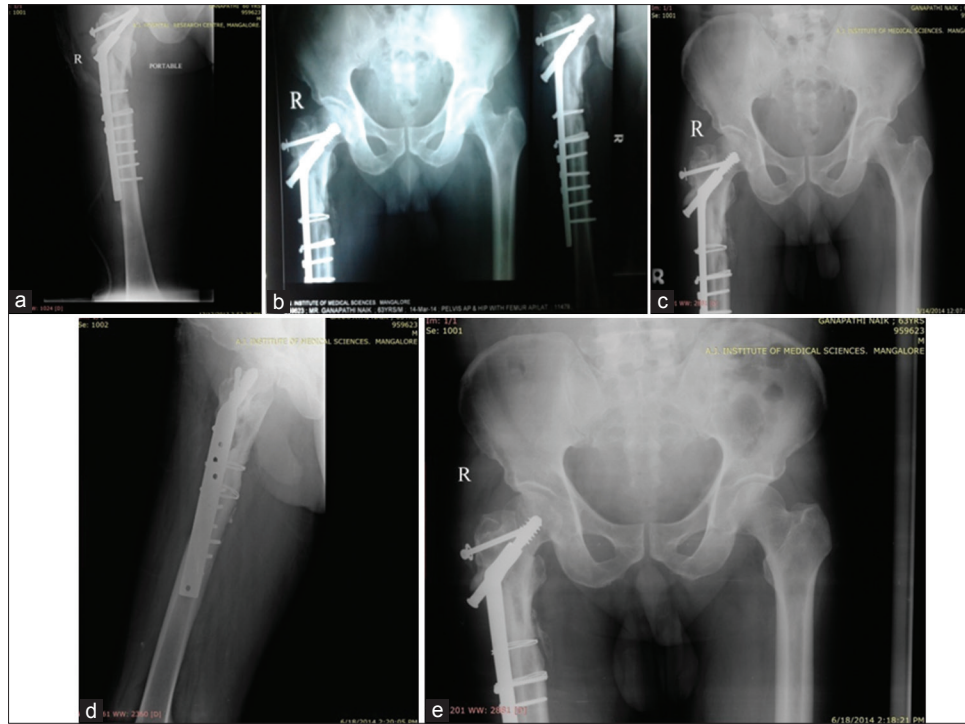
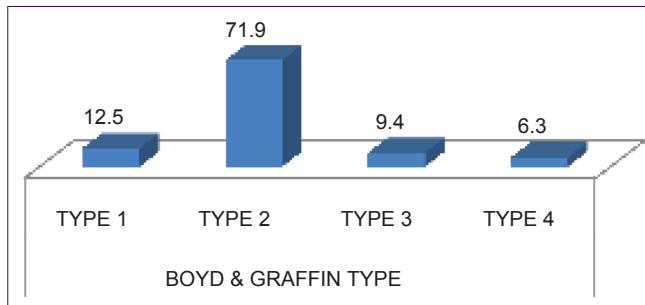


Figure 2: Post-operative observations (a) Post-operative (b) 6 weeks (c) 6 months (d and e) 1-year



Graph 1: Distribution according to Boyd and Graffin classification

### Kyles Criteria at 1-Year

This study has given results that 14 patients have given fair results and 12 patients have good results and no excellent result at 6 months out of 32 patients and finally 8 patients have improved to excellent at the end of 1-year.

Present study, Wilcoxon signed rank test  $Z = 3.392$ ,  $P = 0.001$ , after 1-year, which is highly significant.

The functional outcome results show that even today intertrochanteric fractures treated with dynamic hip screw (DHS) give good functional results.

### Summary

In the present study, 32 cases of intertrochanteric fracture of the femur were managed by DHS and barrel plate. The data obtained was analyzed, and results evaluated.

- Average age incidence in the present study was 67.22 years.
- Male:female ratio was almost equal 47:53.
- Boyd and Griffins Type II fractures were more common.
- 3 Patient died on due to medical complications. So they lost for 1-year follow-up, however, tip apex distance was calculated post-operatively.
- Position of implant in the immediate post-operative X-ray and results was evident that results and functional outcome was good when positioned centrally.
- Overall 32 cases were followed up for 1-year.
- Out of the 32 cases, evaluated using Kyles criteria at their last follow-up
- 8 cases (25%) had excellent, 12 cases (37.5%) good, 7 cases (21.9%) fair and 5 cases (15.6%) with Wilcoxon signed rank test  $Z = 3.392$ ,  $P = 0.001$ , which is highly specific.

### CONCLUSION

- Early surgery on patients with trochanteric fractures improved the ability to return to independent living and complications of prolonged immobilization are prevented.
- DHS provides a satisfactory fixation, but success is dependent on many factors like fracture type, tip apex distance, post-operative care and rehabilitation.
- This study showed DHS to be a versatile, stable,



acceptable implant fixation in trochanteric fractures for elderly people.

## REFERENCES

1. Eventov I, Moreno M, Geller E, Tardiman R, Salama R. Hip fractures in patients with Parkinson's syndrome. *J Trauma* 1983;23:98-101.
2. Lindskog DM, Baumgaertner MR. Unstable intertrochanteric hip fractures in the elderly. *J Am Acad Orthop Surg* 2004;12:179-90.
3. Dhanwal DK, Cooper C, Dennison EM. Geographic variation in osteoporotic hip fracture incidence: the growing importance of Asian influences in coming decades. *J Osteoporos* 2010;2010:757102.
4. Kyle RF, Gustilo RB, Premer RF. Analysis of six hundred and twenty-two intertrochanteric hip fractures. *J Bone Joint Surg Am* 1979;61:216-21.
5. Baumgaertner MR, Curtin SL, Lindskog DM, Keggi JM. The value of the tip-apex distance in predicting failure of fixation of peritrochanteric fractures of the hip. *J Bone Joint Surg Am* 1995;77:1058-64.
6. Bolhofner BR, Russo PR, Carmen B. Results of intertrochanteric femur fractures treated with a 135-degree sliding screw with a two-hole side plate. *J Orthop Trauma* 1999;13:5-8.
7. Sahlstrand T. The Richards compression and sliding hip screw system in the treatment of intertrochanteric fractures. *Acta Orthop Scand* 1974;45:213-9.
8. Sedighi A, Sales JG, Alavi S. The prognostic value of tip-to-apex distance (TAD index) in intertrochanteric fractures fixed by dynamic hip screw. *Orthop Rev (Pavia)* 2012;4:e32.
9. Kanojia RK, Kulshreshtha K, Tripathi KD, Verma AN. Medialisation in management of unstable intertrochanteric fractures. *Indian J Orthop* 2002;36:10.
10. Parmar V, Kumar S, Aster A, Harper WH. Review of methods to quantify lag screw placement in hip fracture fixation. *Acta Orthop Belg* 2005;71:260-3.

**How to cite this article:** Deka RP, Shetty S, Shetty M, Mohapatra A, Poulouse PJ, Krishna V. Functional Outcome of Dynamic Hip Screw in Elderly People: A Clinical Study. *Int J Sci Stud* 2015;2(11):142-146.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Toxic Effects of Formalin on Medical Students and Professionals: A Questionnaire Survey

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## Abstract

**Introduction:** Formaldehyde is most commonly used and preferred fixative for preservation of cadavers. Formalin fumes evaporated from embalmed bodies is responsible for its harmful effects. A cross-sectional survey was conducted on anatomy staff and medical students to elaborate the real health hazards of formaldehyde commonly experienced by them.

**Materials and Methods:** A questionnaire containing 15 symptoms arising due to inhalation of formalin fumes were prepared. A total of 120 medical students and professionals were participated.

**Results:** Most distressing symptoms experienced were pungent odor, redness/itching of the eyes, excessive lacrimation and nausea/vomiting.

**Conclusion:** Adverse effects of formalin fumes can be reduced by several preventive measures such as good exhaust ventilation systems, use of embalming fluid with a lesser concentration of formaldehyde, installation of eye washing stations, etc.

**Key words:** Anatomy staff, Embalming fluid, Formaldehyde, Formalin, Students

## INTRODUCTION

Embalming is the process for preservation of cadavers in which fixative solutions are introduced into dead body tissues to maintain a life like state, as well as appearance of the dead body. Furthermore, it enables us to retain the relationships of human anatomy as are required for dissection purposes.

Formaldehyde (HCHO) is a colorless, noxious, extremely water soluble, flammable gas. Formaldehyde is most commonly used fixative chemical for embalming. It is commercially available as 37% solution in water known as formalin.<sup>1</sup> It metabolizes rapidly to formic acid. It is widely used industrial chemical for paint, textile, plastic, chemical, construction, paper and adhesive industries.<sup>2</sup> The concentration of formaldehyde is usually expressed

in terms of parts per million (1 ppm = 1.248 mg/cu.m).<sup>1</sup> There is hardly any group of professionals more exposed to formaldehyde than anatomists-technicians embalming bodies (embalmers), histology technicians, pathologists and medical students during their dissection schedule.

Gas evaporated from embalmed bodies is an important factor, which is responsible for its harmful effects. In the USA, the permissible limits of exposure to formaldehyde are 3 ppm in a time weighted average concentration during an 8 h period, limit of formaldehyde which should not exceed during working hours even for an instance known as ceiling concentration is 5 ppm.<sup>2</sup>

The adverse effects of exposure to formalin can be irritation of mucous membranes, contact dermatitis and carcinogenicity. Previous studies suggest that formalin can also initiate an allergic reaction.<sup>3</sup> Concentration of this formaldehyde gas will be highest as the bodies are removed from the tanks after embalming, and it slowly decreases with time.

A cross sectional survey was conducted on anatomy staff and medical students to elaborate the real health hazards of formaldehyde commonly experienced by the

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Month of Submission : 12-2014  
Month of Peer Review : 01-2015  
Month of Acceptance : 01-2015  
Month of Publishing : 02-2015

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study population, and results were analyzed to assess the magnitude of the problem. Recommendations will be given as to how to minimize formaldehyde's exposure.

## MATERIALS AND METHODS

In the present study, various adverse effects of the embalming fluid on the medical students and the medical professionals who are exposed to the formaldehyde fumes during the course of their dissection schedule were evaluated. A questionnaire containing 15 symptoms arising due to inhalation of formalin fumes were prepared. A total of 120 medical students and professionals were participated. Symptoms that were evaluated were: Pungent odor, dry or sore nose, running or congested nose, redness/itching of eyes, excessive lacrimation, nausea/vomiting, headache, itching of the hands, fainting episode, dry or sore throat, unusual tiredness, gastrointestinal disturbances (abdominal pain), skin eruptions on the face or neck (contact dermatitis), respiratory distress (breathlessness) and vertigo/convulsions. Grading of symptoms was done on a scale of 1-3. Grade 1 - not at all/never experienced, Grade 2 - experienced occasionally, Grade 3 - strong, prominent and irritating/intolerable. These grades were then analyzed, and incidences of occurrence for each symptom were calculated.

## RESULTS

Table 1 shows incidence of symptoms experienced by medical students and professionals. From the Table 1 it is clearly evident that most distressing symptoms experienced were pungent odor, redness/itching of the eyes, excessive lacrimation and nausea/vomiting.

## DISCUSSION

Formalin fumes that arise in the dissecting and embalming rooms can cause various deleterious effects on human being as described. Also, Mizuki and Tsuda proved atopic individuals show exacerbation of basic allergic symptoms by exposure of formaldehyde.<sup>4</sup> Many studies in which nasal squamous cell carcinoma in rats have been induced due to exposure to formaldehyde have been conducted.<sup>5</sup>

A good ventilation system dissection halls and embalming rooms can reduce the formaldehyde concentrations and thereby fumes. For reducing toxic effects on eyes (itching/redness/excessive lacrimation), eye washing stations should be at the workplace. Use of mask also helps in combating the unpleasant smell. Ohmichi *et al.* stated that indoor concentrations varied depending on the contents

**Table 1: Incidence of symptoms experienced by subjects**

Symptoms	Grade 1 (not at all/never experienced)	Grade 2 (occasionally experienced)	Grade 3 (strong, prominent and irritating/intolerable)
Pungent odor	0	5	95
Dry or sore nose	18	42	40
Running or congested nose	20	44	36
Redness/itching of eyes	17	27	56
Excessive lacrimation	19	36	45
Nausea/vomiting	18	38	44
Headache	46	36	18
Itching of the hands	72	18	10
Fainting episode	88	8	4
Dry or sore throat	87	9	4
Unusual tiredness	88	10	2
Gastrointestinal disturbances	82	12	6
(abdominal pain)			
Skin eruptions on the face or neck (contact dermatitis)	71	10	19
Respiratory distress (breathlessness)	75	21	4
Vertigo/convulsions	92	4	4

of laboratory sessions and seemed to increase when body cavity or deep structures were being dissected. He compared formaldehyde exposure in dissection hall and with personal exposure level and found out personal exposure level is higher.<sup>6</sup>

Wei *et al.* stated that symptoms due to formalin during the anatomy dissection course were related to the time spent in the dissection halls and suggested that reducing the time of each dissection schedule and reduction of the number of cadaver tables could help in reducing symptoms.<sup>7</sup>

Other alternative chemicals for embalming purposes in place of formaldehyde were also discovered by various researchers. Frölich *et al.* in 1984 had discovered phenoxyethanol as its non-toxic substitute. But, it is impractical as approximately 600 liters was required for a cadaver for embalming. Also continuous immersion in chemical is needed to prevent mold formation and process takes around 5-10 months.<sup>8</sup> Glutaraldehyde is an aldehyde were also tried in past. It is related to formaldehyde, with similar fixation qualities. But because of the volumes that would be required, it is expensive and impractical. Eisma *et al.* suggested use of thiel embalming as an alternative to formalin fixation. Specimen's fixation by thiel compounds have more life visual but are more expensive and have restrictions for students dissection in facilities with limited storage space and air circulation.

Also, these specimens are not suitable for histological investigations.<sup>9</sup>

Despite of its various toxic effects, currently formalin is the popular choice as a tissue fixative because of its efficiency and the consistency of results obtained on cadavers. Reduction in proportion of formaldehyde in the embalming fluid resulted in Vapor levels that were within the limits set by the US Government. Furthermore, reduction in formaldehyde concentration is not deleterious to specimen preservation, but leads to a safer working environment.<sup>10</sup>

## CONCLUSION

The toxic effects of formalin fumes on medical professionals and students in dissection halls can be reduced by several preventive measures like good exhaust ventilation systems, use of embalming fluid with a lesser concentration of formaldehyde, taking out the cadavers from tanks well before starting of dissection, installation of eye washing stations, use of gloves and mask to avoid direct skin contact, avoiding spillage of embalming fluid and having facilities to check formalin gas levels in dissection halls and individual exposure levels.

## REFERENCES

1. Pabst R. Exposure to formaldehyde in anatomy: An occupational health hazard? *Anat Rec* 1987;219:109-12.
2. Bernstein RS, Stayner LT, Elliott LJ, Kimbrough R, Falk H, Blade L. Inhalation exposure to formaldehyde: An overview of its toxicology, epidemiology, monitoring, and control. *Am Ind Hyg Assoc J* 1984;45:778-85.
3. Putz R, Poisel S, Teifenbrunner F. Probleme mit Konservierung flüssigkeiten im anatomischen Präparatesaalbetrieb. *Acta Anat* 1974;90:394-402.
4. Mizuki M, Tsuda T. Relationship between atopic factors and physical symptoms induced by gaseous formaldehyde exposure during an anatomy dissection course. *Aerugi* 2001;50:21-8.
5. Ahmed HO. Preliminary study: Formaldehyde exposure in laboratories of Sharjah university in UAE. *Indian J Occup Environ Med* 2011;15:33-7.
6. Ohmichi K, Komiyama M, Matsuno Y, Takanashi Y, Miyamoto H, Kadota T, *et al.* Formaldehyde exposure in a gross anatomy laboratory – personal exposure level is higher than indoor concentration. *Environ Sci Pollut Res Int* 2006;13:120-4.
7. Wei CN, Harada K, Ohmori S, Wei QJ, Minamoto K, Ueda A. Subjective symptoms of medical students exposed to formaldehyde during a gross anatomy dissection course. *Int J Immunopathol Pharmacol* 2007;20:23-5.
8. Frølich KW, Andersen LM, Knutsen A, Flood PR. Phenoxymethanol as a nontoxic substitute for formaldehyde in long-term preservation of human anatomical specimens for dissection and demonstration purposes. *Anat Rec* 1984;208:271-8.
9. Eisma R, Lamb C, Soames RW. From formalin to Thiel embalming: What changes? One anatomy department's experiences. *Clin Anat* 2013;26:564-71.
10. O'Sullivan E, Mitchell BS. An improved composition for embalming fluid to preserve cadavers for anatomy teaching in the United Kingdom. *J Anat* 1993;182 ( Pt 2):295-7.

**How to cite this article:** Bindra GS, Mohan A. Toxic Effects of Formalin on Medical Students and Professionals: A Questionnaire Survey. *Int J Sci Stud* 2015;2(11):147-149.

**Source of Support:** Nil, **Conflict of Interest:** None declared.



# Concentration of Proteins in Intra-Osseous Jaw Cysts as an Adjunct to Diagnosis

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## Abstract

**Introduction:** Cysts of the jaw are a recognized clinical entity for a long time and are a benign bone destroying lesion. Their remains a diagnostic ambiguity between cysts and cyst-like lesions of the jaws.

**Objective:** The main objective of this study was to assess the total soluble protein content in fluid aspirates of intra osseous cyst of maxilla and mandible.

**Materials and Methods:** A total number of 43 patients provisionally diagnosed being afflicted by intra-osseous jaw cysts on the basis of clinical, and radiological examination were selected randomly irrespective of caste, creed, age, sex and religion. The chief consideration was radicular, dentigerous and odontogenic keratocysts along with its albumin and different globulin fractions and corroborating them with the clinical, radiological and histopathological findings.

**Results:** Among the total number of 43 uninfected intra-osseous jaw cysts histopathological evaluation revealed 24 cases to be radicular cysts, 11 cases were odontogenic keratocysts and 5 cases were dentigerous cysts. Calcifying odontogenic cyst, Nasopalatine duct cyst and residual cyst were one each in a number in the total sample. A peak frequency of radicular cysts was observed in the 4<sup>th</sup> decade of life dentigerous cysts in the second decade while keratocysts in the 3<sup>rd</sup> decade. All the cases revealed a male preponderance.

**Conclusion:** Today there remains an ambiguity in the diagnosis and treatment planning of intra-osseous jaw cysts. For this reason, it is necessary to evaluate and corroborate the clinical, radiological and biochemical findings with the histopathological features of cystic lesions with a view to proper diagnosis and treatment planning.

**Keywords:** Cystic fluid protein, Electrophoresis, Jaw cysts, Odontogenic keratocyst

## INTRODUCTION

Many of the bone lesions in the oral and maxillofacial region are cystic or have features similar to cystic lesions. Spectrum of the lesions having cyst-like radiolucency in the oral and maxillofacial region include benign odontogenic cysts, aggressive cysts like keratocyst, calcifying odontogenic cyst, cystic tumors such as cystic ameloblastoma and other radiolucent non-odontogenic lesions. There is a large group of lesions that does not show any specific clinical

and radiographical finding.<sup>1</sup> Cysts in jaws enlarge when the permeability of the cyst wall changes, which the proteins of cyst fluid increase, and that the intracystic fluid pressure on the jaw bone increases because of inflammation. On the other hand, it is also believed that cysts enlarge when a prostaglandin-like substance, which is generated in the wall, acts chemically in the resorption of the jaw bone.<sup>2</sup> Jaw cyst lining cells have an active transporting mechanism for Na<sup>+</sup> ion and K<sup>+</sup> ion, a secreting mechanism and a selecting mechanism, and they allow permeation of electrolytes, lipids and protein into cysts.<sup>3</sup> Although odontogenic keratocysts are benign, they are often locally destructive and tend to recur after conservative surgical treatment. They must therefore be distinguished from other cysts of the jaw.<sup>4</sup> Since odontogenic cysts constitute an important part of facial lesions, diagnosing them before surgery will help a lot to determine surgical procedure for preventing the future recurrence of the cyst.<sup>5</sup>

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Month of Submission : 12-2014  
Month of Peer Review : 01-2015  
Month of Acceptance : 01-2015  
Month of Publishing : 02-2015

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## Objectives

To evaluate the different clinical, radiological, biochemical, intra-operative and light microscopic features of intra-osseous jaw cysts and to compare and corroborate the findings, which will help to establish the diagnostic parameters for the intra-osseous jaw cysts. The surgical management of such jaw cysts thereby will vary accordingly.

## METHODOLOGY

A total number of 43 patients provisionally diagnosed being afflicted by intra-osseous jaw cysts on the basis of clinical, and radiological examination were selected randomly irrespective of caste, creed, age, sex and religion. The bone overlying the cystic lesion was incompressible and thick, compressible and thin or fluctuant with destruction of overlying bone. In all the cases after infiltrating the overlying mucosa with local anesthetic solution under aseptic condition, the cystic content was aspirated in a sterile 5 ml. Disposable syringe by a sterile, thick, wide-bore 18 gauge needle thick enough to penetrate a thin layer of bone overlying the lesion. Where the overlying bone was thick enough, a suitable mucoperiosteal flap was reflected and with a No.8 surgical round bur the superficial portion of the cortical bone was thinned out in such a way so that the remaining portion of bone was thin enough to be penetrated by an 18 gauge needle. Bone removed by the surgical bur was done at a low speed with a continuous flow of normal saline solution. Specimens, which contained visible quantities of fresh blood or pus were discarded. The cystic content not <1 ml. was then collected in a sterile test-tube, tightly stoppered and stored.

Under natural light the specimens were examined for their color, consistency, presence of cholesterol crystals with their characteristic shimmering effect or Keratin flecks, which present themselves as yellowish white thread-like strands, which appear to be pus but without any offensive odor and lack of confirmation of secondary infection in the history of the lesion.

## Biochemical Analysis

In all the cases 5 ml. of blood was drawn by venepuncture from the ante cubital vein under proper aseptic condition and collected in non-heparinized sterile test tube and kept at room temperature for 1 h. The blood specimen and the cystic content were then centrifuged at 2,000 rev/min for 5 min to remove the cell debris and deposits. The supernatant cystic fluid and autologous serum thus collected were subsequently analyzed for their protein contents by cellulose acetate membrane (CAM) electrophoresis.

The protein content and its different fractions were also quantitated by scanning the CAM strips in a densitometer

at 590 nm (green filter) and the relative percentage and absolute value of the different protein fractions were recorded directly. The various biochemical findings were then recorded and analyzed according to the total soluble protein content, albumin and globulin content along with the different globulin fractions (alpha-1, alpha-2, Beta and Gamma Globulin).

## Radiological Finding

The radiological features were recorded and corroborated with other relevant parameters using Intra-oral periapical radiographs, orthopantomograph and paranasal sinus views.

## Intra-operative Finding

All the cases were operated under local anesthesia or general anesthesia either by enucleation or marsupialization depending on the individual patients and various other operative findings were recorded and the specimens were subjected to histopathological evaluation.

## RESULTS AND OBSERVATIONS

Amongst the total number of 43 uninfected intra-osseous jaw cysts histopathological evaluation revealed 24 cases to be radicular cysts, 11 cases were odontogenic Keratocysts and 5 cases were dentigerous cysts. Calcifying odontogenic cyst, nasopalatine duct cyst and residual cyst were one each in a number in the total sample. A peak frequency of radicular cysts was observed in the 4<sup>th</sup> decade of life dentigerous cysts in the 2<sup>nd</sup> decade while Keratocysts in the third decade. All the cases revealed a male preponderance. 19 of the 24 cases of radicular cysts showed a significant degree of expansion, 4 out of 5 cases in dentigerous cysts while none in the case of odontogenic keratocysts. Egg-shell crackling was found in 80% of dentigerous cysts and 33% in case of dentigerous cysts. About 16% cases of radicular cysts were radiologically observed to be multilocular, all cases of dentigerous to be unilocular while 64% cases of odontogenic keratocysts were multilocular. All the cases of dentigerous cysts had an impacted tooth in the lesion with marked root resorption in 40% cases. About 67% of radicular cysts were associated with carious exposed tooth/teeth and intra-operatively the cystic lining was found to be adherent to the root apex of the carious tooth/teeth. The mean value of the total soluble protein content in the cystic fluid (6.85gm/dl) of radicular cysts was higher (Table 1) than that in autologous serum (6.10 g/dl). Analysis by *t*-test revealed the observation to be statistically significant (*t* = 2.78). However, the mean albumin level in the cystic fluid (3.76 g/dl) was found to be lower (Table 2) than that in autologous serum (4.04g/dl). The mean globulin level in (Table 3) was found to be higher (3.13 g/dl) than autologous serum (2.49 g/dl). In dentigerous cysts, the

**Table 1: Total soluble protein content in cystic fluid and autologous serum**

Type of jaw cyst	Nature of specimen	Mean value (g/dl)	SD ( $\pm$ )	Minimum value (g/dl)	Maximum value (g/dl)	t value
Radicular cyst	Cystic fluid	6.85	1.01	5.20	8.80	2.78
	Autologous serum	6.10	0.77	5.20	7.60	2.78
Odontogenic keratocyst	Cystic fluid	4.14	0.63	3.10	5.80	13.28
	Autologous serum	7.46	0.47	6.40	7.90	13.28
Dentigerous cyst	Cystic fluid	5.60	0.45	5.20	6.40	0.21
	Autologous serum	5.66	0.37	5.20	6.30	0.21

SD: Standard deviation

**Table 2: Albumin content in cystic fluid and autologous serum**

Type of jaw cyst	Nature of specimen	Mean value (g/dl)	SD ( $\pm$ )	Minimum value (g/dl)	Maximum value (g/dl)	t value
Radicular cyst	Cystic fluid	3.76	0.55	2.60	4.80	1.65
	Autologous serum	4.04	0.58	2.90	4.90	1.65
Odontogenic keratocyst	Cystic fluid	2.92	0.33	2.30	3.60	13.62
	Autologous serum	4.69	0.26	4.40	5.40	13.62
Dentigerous cyst	Cystic fluid	3.30	0.24	2.90	3.60	0.81
	Autologous serum	3.08	0.48	2.60	3.70	0.81

SD: Standard deviation

**Table 3: Globulin content in cystic fluid and autologous serum**

Type of jaw cyst	Nature of specimen	Mean value (g/dl)	SD ( $\pm$ )	Minimum value (g/dl)	Maximum value (g/dl)	t value
Radicular cyst	Cystic fluid	3.13	0.69	2.00	4.50	4.00
	Autologous serum	2.49	0.34	1.80	3.02	4.00
Odontogenic keratocyst	Cystic fluid	1.22	0.39	0.80	2.20	8.61
	Autologous serum	2.77	0.43	1.80	3.30	8.61
Dentigerous cyst	Cystic fluid	2.50	0.47	2.00	3.20	1.00
	Autologous serum	2.78	0.31	2.30	3.20	1.00

SD: Standard deviation

mean value of the total soluble protein content in the cystic fluid was 5.60 g/dl, which was less (Table 1) than that in autologous serum (5.66 g/dl). However the mean albumin level in the cystic fluid (3.30 g/dl) was found to be higher (Table 2) than that in autologous serum (3.08 g/dl). The mean globulin level in dentigerous cysts (Table 3) was found to be lower (2.50 g/dl) than autologous serum (2.78 g/dl). In odontogenic keratocysts, the mean value of the total soluble protein content in the cystic fluid was 4.14g/dl, which was less (Table 1) than that in autologous serum (7.46 g/dl). However the mean albumin level in the cystic fluid (2.92 g/dl) was found to be lower (Table 2) than that in autologous serum (4.69 g/dl), which was statistically significant ( $t = 13.62$ ). The mean globulin level (Table 3) was found to be lower (1.22 g/dl) than autologous serum (2.77 g/dl) and was also statistically significant ( $t = 8.61$ ). Tables 4-7 reveals the different values of alpha 1, alpha 2, beta and gamma globulin fractions in different cystic fluids and autologous serum. The mean alpha 1 globulin level in radicular cyst was 0.31 g/dl, while in dentigerous cyst it was 0.16 g/dl and 0.19 g/dl in odontogenic keratocysts, which was found to be statistically significant ( $t = 3.0$ ). The mean alpha 2 globulin level in radicular cyst was 0.44 g/dl, while in dentigerous cyst it was 0.29 g/dl and 0.32 g/dl

in odontogenic keratocysts, which were also statistically significant ( $t = 3.17$ ). The mean beta globulin fraction in cystic fluid of radicular cyst was found to be 0.73 g/dl, while in dentigerous cyst it was 0.45 g/dl and 0.25 g/dl in odontogenic keratocysts with a  $t$  value of 6.77. The mean gamma globulin level in cystic fluid of radicular cyst was 1.71 g/dl ( $t = 2.72$ ), while in dentigerous cyst it was 1.39 g/dl and in odontogenic keratocysts 0.46 g/dl and was statistically significant ( $t = 6.77$ ).

### Radicular Cyst

24 cases (55.8%) were of radicular variety. The peak frequency was in the 4<sup>th</sup> decade with equal involvement of both anterior and posterior regions. All cases had either a carious discolored tooth/teeth with a history of trauma in the involved region. Aspiration of cystic content revealed straw-colored fluid. All the cases revealed a regular radiological outline and intra-operatively a thick and intact lining with a smooth surface texture were found to be firmly attached to the carious or discolored tooth/teeth. Electrophoretic analysis revealed that the total soluble protein content of cystic fluid was higher than that of autologous serum, and the % of albumin and globulin was 54.89 and 45.11 respectively (Figure 1).

### Odontogenic Keratocyst

25.58% cases were Odontogenic keratocysts with a peak frequency in the 3<sup>rd</sup> decade. Marked preponderance was found in the mandibular posterior region with least expansion of bony cortical plates and having maximum, radiological involvement of the jaw bone. Only 1-3<sup>rd</sup> of the cases revealed true anodontia. Dirty-white cheesy inspissated material was found on aspiration in all the cases. Keratin squames in the aspirated cystic fluid was a constant finding. Intra-operatively the cystic lining was thin and fragile with an irregular surface texture in majority of the cases. Electrophoretic analysis revealed that the total soluble protein content of the cystic fluid was lower than that in serum. Calcifying odontogenic cyst, nasopalatine duct cyst and residual cyst were one each in a number in the total sample (Figure 2).

### Dentigerous Cyst

5 cases (11.62%) were of dentigerous variety with a peak frequency in the 2<sup>nd</sup> decade with all the cases revealing clinical anodontia and radiologically having impacted teeth within the lesion. A marked preponderance involving the maxillary canines was observed. Intra-operatively the cystic lining was mostly thick and intact in nature with a smooth surface texture associated with an impacted tooth. Biochemical analysis revealed that the total soluble protein content of the cystic fluid was similar to that in autologous serum with 58.93% albumin and 41.07% globulin (Figure 3).

## DISCUSSION

Electrophoresis is the name given to the movement of charged particles through an electrolyte subjected to an electric field and was 1<sup>st</sup> developed by Toller in 1936.<sup>6</sup> Proteins in fluid from non-keratinizing jaw cysts showed separation patterns on CAM and percentage distribution of the electrophoretic fractions.<sup>7</sup> Electrophoresis separates proteins based on their physical properties and the subsets of these proteins are used in interpreting the results.<sup>8</sup> Various plasma proteins have different surface charges. They, therefore, migrate at different rates from the point of application of the protein mixture to the other end of the CAM strip.<sup>9</sup>

Different authors have shown the use of electrophoresis for the separation of the different protein fractions in the fluids of jaw cysts and thereby to distinguish between the different protein fractions both qualitatively and quantitatively.<sup>6,7,10,11</sup> Quantitative determinations of the protein fractions can be carried out either by elution or by scanning of the stained CAM strips by densitometer, which convert bands to characteristic peaks of albumin, alpha 1,



Figure 1: Radicular cyst

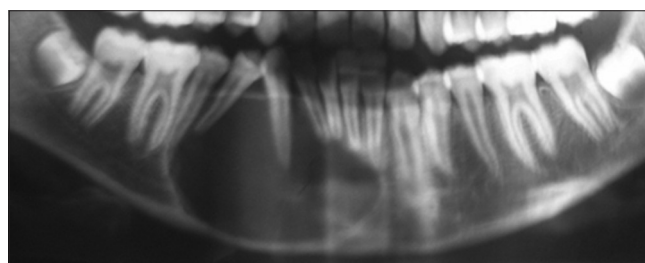


Figure 2: Odontogenic keratocyst

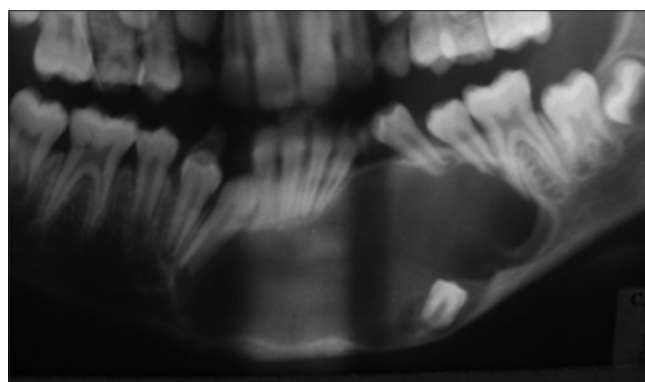


Figure 3: Dentigerous cyst

alpha 2, globulin, and gamma globulin. The areas below each section of the curve can be measured during scanning by an integrator. Each fraction can then be calculated as a percent of the total by simple proportion.<sup>12</sup>

In the present study, the albumin content in the cystic fluid of odontogenic keratocysts ranged from 2.30 g/dl to 3.60 g/dl with a mean level of 2.92 g/dl while the albumin content in autologous serum ranged from 4.40 g/dl to 5.40 g/dl with a mean value of 4.69 g/dl. The mean albumin level in the cystic fluid was lower than that in autologous serum, which was statistically significant. Toller (1970) postulated that soluble protein levels for non-keratinizing cysts were in the range of 5.0-11.0 g per 100 ml. with a mean



of 7.1 g per 100 ml while all the Keratinizing cysts fluids exhibited soluble protein levels below 3.5 g per 100 ml.

Browne observed that the continuous layer of keratinized epithelium lining the keratocyst forms a less readily penetrable barrier than the frequently discontinuous, non-keratinized epithelium lining the other cysts and thus the proteins would accumulate in the cystic fluid only with difficulty.<sup>10</sup>

Majority of the cases of odontogenic keratocysts were treated either when the diagnosis was not made at the time of treatment, or the significance of the diagnosis was not understood. An extra-oral approach and even jaw resection are often recommended.<sup>7</sup> Ahlfors *et al.* (1984)<sup>13</sup> designated the term “benign cystic tumor” for odontogenic Keratocysts. Bornstein *et al.* (2005)<sup>14</sup> opined that besides a predilection for recurrence, the keratocysts, in contrast to other odontogenic cysts, show a more aggressive clinical behavior and demonstrate a high mitotic count and higher turnover rate of the epithelium. This led to the tentative suggestion that the keratocyst might be a benign cystic neoplasm rather than simply an odontogenic cyst. DeGould *et al.* (1991).<sup>15</sup> Reported of recurrence of odontogenic keratocyst in a bone graft after partial mandibulectomy and reconstruction. Macroscopic examination of the removed dentigerous cyst occasionally reveals mural thickenings which, on microscopical investigation, proved to be ameloblastic changes. Eversole *et al.* (1975)<sup>16</sup> reported of 36 cases of intra-osseous squamous cell carcinoma of which 27 (75%) appeared to originate in odontogenic cysts. Hamidreza *et al.* (2012)<sup>5</sup> postulated that odontogenic keratocyst Oklahoma City has a more aggressive nature than other odontogenic cysts and its recurrence after surgery is higher than other cysts.

In this study, the mean gamma globulin level in cystic fluid of radicular cyst was 1.71 g/dl ( $t = 2.72$ ) and in odontogenic keratocysts 0.46 g/dl, which was also statistically significant ( $t = 6.77$ ). Compared with serum, the fluid of radicular cysts contain more gamma globulin probably due to the high level of immunoglobulins in cystic fluid, which are the result solely of their exudation from the blood vessels in the cyst capsule into the cyst cavity. The concentration of some non-immunoglobulin proteins in cyst fluids is proportional to their concentration in their plasma and inversely proportional to their molecular weight.<sup>4</sup>

The cyst levels of alpha-1 globulin were found to be higher than that of autologous serum in case of radicular and dentigerous cysts whereas the alpha-2 globulin levels were found to be lower than the autologous serum in radicular and keratocysts. While that of dentigerous cyst was marginally higher. Similar were the observations of Browne (1976)<sup>10</sup> and Skaug (1977)<sup>11</sup> who found that the

cyst levels of alpha-2 globulin lower than the autologous serum in majority of the jaw cysts. They postulated that cystic fluid is primarily exudates with an increased gamma globulin fraction and not simply a dialysate from the blood plasma produced by filtration through the cyst capsule.

## CONCLUSIONS

Since odontogenic cysts encompass an important part of oral and maxillofacial lesions, diagnosing them before surgery will help us to determine surgical procedures, conservative or radical, for preventing the future recurrence of the cyst. Odontogenic keratocyst has a more aggressive character than any other odontogenic jaw cysts, and its recurrence rate following surgery is comparatively higher than that of other jaw cysts. The different biochemical findings can be used for diagnosing cysts before surgery and thereby formulating the surgical procedure to minimize the chances of recurrence. In odontogenic keratocysts, the mean value of the total soluble protein content in cystic fluid was significantly less than that in autologous serum along with a significantly lower albumin and globulin levels in sharp contrast to that of the radicular or dentigerous varieties. Concentration of  $\alpha$  1 and  $\beta$  globulin in radicular cysts was found to be higher than other varieties. Still today there remains an ambiguity in the diagnosis and treatment planning of intra-osseous jaw cysts. For this reason, it is necessary to evaluate and corroborate the clinical, radiological and biochemical findings with the histopathological features of cystic lesions with a view to proper diagnosis and treatment planning.

## REFERENCES

1. Guyot JP, Obradovic D, Krayenbuhl M, Zbaeren P, Lehmann W. Fine-needle aspiration in the diagnosis of head and neck growths: is it necessary? *Otolaryngol Head Neck Surg* 1990;103:697-701.
2. Suzuki M. A biochemical study of the nature of jaw cysts (II). The role of lipids in the enlargement of cysts. *J Maxillofac Surg* 1984;12:213-24.
3. Suzuki M. A study of biological chemistry on the nature of jaw cysts. On the maintenance of homeostasis in jaw cyst fluid. *J Maxillofac Surg* 1975;3:106-18.
4. Singh M, Gupta KC. Surgical treatment of odontogenic keratocyst by enucleation. *Contemp Clin Dent* 2010;1:263-7.
5. Arabiun H, Fani MM, Nejad SH. Comparison of the concentration and types of the proteins present in maxillofacial odontogenic cysts fluid. *Afr J Microbiol Res* 2012;6:2816-21.
6. Toller PA. Protein substances in odontogenic cyst fluids. *Br Dent J* 1970;128:317-22.
7. Skaug N, Hofstad T. Proteins in fluid from non-keratinizing jaw cysts. 1. Separation patterns on cellulose acetate membranes and percentage distribution of the electrophoretic fractions. *J Oral Pathol* 1973;2:112-25.
8. O'Connell TX, Horita TJ, Kasravi B. Understanding and interpreting serum protein electrophoresis. *Am Fam Physician* 2005;71:105-12.
9. Keele CA, Neil E, Joels N. Samson Wright's Applied Physiology. 13<sup>th</sup> ed. New York: Oxford University Press; 1982. p. 20-2.
10. Browne RM. Some observations on the fluids of odontogenic cysts. *J Oral Pathol* 1976;5:74-87.

11. Skaug N. Soluble proteins in fluid from non-keratinizing jaw cysts in man. *Int J Oral Surg* 1977;6:107-21.
12. Smith I. Chromatographic and electrophoretic techniques. *Zone Electrophoresis*. 4<sup>th</sup> ed., Vol. 2. London: Heinemann; 1976.
13. Ahlfors E, Larsson A, Sjögren S. The odontogenic keratocyst: A benign cystic tumor? *J Oral Maxillofac Surg* 1984;42:10-9.
14. Bornstein MM, Filippi A, Altermatt HJ, Lambrecht JT, Buser D. The odontogenic keratocyst– Odontogenic cyst or benign tumor? *2005;115:110-28*.
15. DeGould MD, Goldberg JS. Recurrence of an odontogenic keratocyst in a bone graft. Report of a case. *Int J Oral Maxillofac Surg* 1991;20:9-11.
16. Eversole LR, Sabes WR, Rovin S. Aggressive growth and neoplastic potential of odontogenic cysts: with special reference to central epidermoid and mucoepidermoid carcinomas. *Cancer* 1975;35:270-82.

**How to cite this article:** Das AK, Prajapati VK. Concentration of Proteins in Intra-Osseous Jaw Cysts as an Adjunct to Diagnosis. *Int J Sci Stud* 2015;2(11):150-155.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Advanced Oxidation Protein Products in Psoriasis and its Correlation with Disease Severity

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## Abstract

**Background:** Psoriasis is a common chronic inflammatory skin disorder characterized by hyperproliferation and reduced differentiation of keratinocytes. Oxidative changes of proteins lead to several consequences like inhibition of enzymatic and binding activities, increased or decreased uptake by cells, increased susceptibility to aggregation and proteolysis and alters their immunogenicity. Protein oxidative stress is a useful marker of oxidative stress *in vivo*. Oxidative stress is believed to be an important factor in the pathogenesis of psoriasis.

**Objectives of the study:** To estimate serum Advanced Oxidative Protein Products (AOPP) levels in patients with psoriasis and a group of healthy controls. To evaluate the correlation between AOPP levels and the severity of the disease.

**Materials and Methods:** Serum AOPP was estimated in patients and controls. The degree of severity of psoriasis was clinically assessed by Psoriasis Area and Severity Index (PASI) score for each patient. The statistical significance was evaluated using Unpaired *t*-test and Pearson's correlation.

**Results:** The mean levels of AOPP in psoriasis cases were found to be higher compared with controls, and it was statistically significant ( $P < 0.001$ ). However, there was no significant correlation between the AOPP levels of cases with the PASI.

**Conclusion:** This study suggests the potential utility of serum AOPP as a biomarker of oxidative stress in psoriasis.

**Key words:** Advanced oxidation protein products, Oxidative stress, Psoriasis

## INTRODUCTION

Psoriasis is a chronic inflammatory, immune mediated, skin disease in which the most prominent microscopic abnormality is hyper proliferation and altered differentiation of keratinocytes.<sup>1</sup> Genetic predisposition in conjunction with an environmental trigger such as infection or stress plays an important event for the disease expression.<sup>2</sup> The systemic inflammation present in psoriasis, various systemic treatments for psoriasis and an increased prevalence of unhealthy life style factors may all contribute to this unfavorable risk profile.<sup>3</sup>

Free radicals are produced continuously as the body uses oxygen to generate energy. These by products are generally reactive oxygen species (ROS) and reactive nitrogen species. Free radicals have an affinity for lipids, carbohydrates and nucleic acids.<sup>4</sup> It has been established that depending on its concentration and environment ROS it could be both beneficial and harmful in the biological system.<sup>5,6</sup> ROS are molecules like hydrogen peroxide, ions like hypochlorite ion, hydroxyl radical and superoxide anion.<sup>7</sup> Deleterious effect could be due to high concentration of ROS, which mediates damage to the cell structures, lipids and proteins and nucleic acids.<sup>8</sup>

**Protein oxidation:** Is defined as covalent modification of a protein induced either directly by ROS or indirectly by reaction with secondary by products of oxidative stress. Oxidative changes to proteins lead to several consequences like inhibition of enzymatic and binding activities, increased or decreased uptake by cells, increased

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**Month of Submission :** 12-2014  
**Month of Peer Review :** 01-2015  
**Month of Acceptance :** 01-2015  
**Month of Publishing :** 02-2015

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susceptibility to aggregation and proteolysis and alters immunogenicity. Protein oxidative stress is a useful marker of oxidative stress *in vivo*. Protein oxidation has both advantages and disadvantages when compared to lipid and DNA oxidation.<sup>9</sup>

Oxidative stress and inflammation in psoriasis: Oxidative stress is believed to be an important factor in the pathogenesis of psoriasis. It is an imbalance between products of ROS and antioxidant defense. It has been suggested that increased production of ROS may be involved in the pathogenesis of the disease.<sup>10</sup>

Advanced oxidation protein products are proposed as one of the possible markers of oxidative injury. It originates as a result of free radicals on protein and act as inflammatory mediators triggering the “ignition” of neutrophils, monocytes, and T-lymphocytes there by causing excessive stimulation and up regulation of dendritic cells.<sup>11</sup>

## MATERIALS AND METHODS

### Study Design

Case control study the study was conducted in the Department of Dermatology, Yenepoya Medical College hospital, Deralakatte, Mangalore, Karnataka, India from October 2012 to May 2014

### Sampling

Fifty patients above the age of 18 years who were clinically diagnosed with psoriasis were included in the study. Fifty healthy age-and sex-matched controls were also studied over this period. Patients with acute febrile illness, active systemic diseases, or events such as arthritis, hepatic disease, renal disease, malignancies, pregnancy, and patients on systemic therapy or photo therapy for psoriasis for the past 1 month were excluded from the study.

### Clinical Assessment

All participants were subjected to a detailed clinical examination. The degree of severity of psoriasis was clinically assessed by Psoriasis Area and Severity Index (PASI) score for each patient.

### Blood Sampling

Blood was collected by puncturing the vein from the patients and controls. Serum was separated by centrifugation and stored 20°C until the estimation.

### Assay

Advanced Oxidative Protein Products (AOPP) was estimated by Witko-Sarsat *et al.* method.<sup>12</sup>

### Statistical analysis

The statistical significance was evaluated using Student's unpaired *t*-test and Pearson's correlation. Software SPSS version 17 was used for statistical analysis. Data were analyzed using Student's unpaired *t*-test and Pearson's correlation coefficient. All values were expressed as mean  $\pm$  standard deviation (SD).  $P < 0.05$  was considered statistically significant.

## RESULTS

Out of the 50 cases taken for the study, 4% had mild psoriasis, 22% had moderate and 74% had severe psoriasis. We classified the patients into mid moderate and severe based on the PASI score. Patients with score  $<3$  as mild, 3-10 as moderate and more than 10 as severe psoriasis.<sup>13</sup>

Mean  $\pm$  SD of AOPP levels in controls and patients with Psoriasis is described in Table 1.

The mean AOPP levels of cases were found to be higher compared with controls, and it was statistically significant ( $P < 0.001$ ) (Table 2).

There was no significant correlation between the AOPP levels of cases with the PASI scoring. The  $P = 0.875$  and coefficient of correlation 0.023 (Figure 1).

## DISCUSSION

Psoriasis is a clinically inflammatory skin disease, which may per se impose an oxidative stress condition.<sup>14</sup>

AOPP has been found to be increased in oxidative stress, and inflammatory conditions.<sup>15,16</sup> Studies have been done on AOPP in patients with coronary artery disease to determine the role of AOPP in atherosclerosis. Both

**Table 1: Comparison of levels between psoriasis and controls**

Group	Number (n)	Mean $\pm$ SD	Z	P
Cases	50	119.820 $\pm$ 16.732	8.823	<0.001
Controls	50	97.542 $\pm$ 6.230		

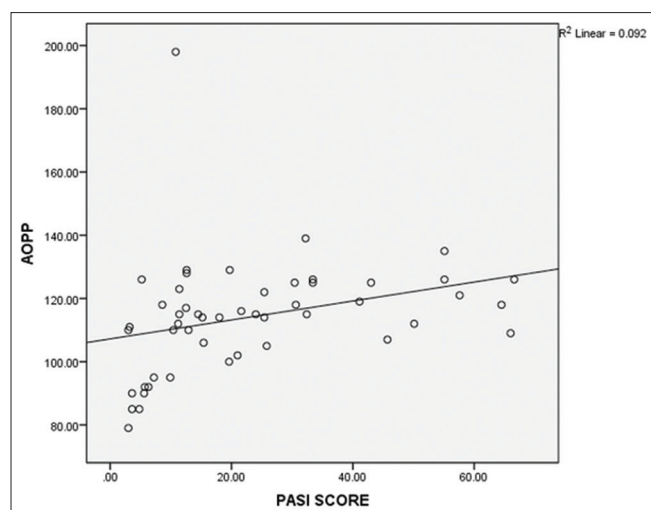
SD: Standard deviation  $P < 0.05$  considered significant

**Table 2: Percentage of mild, moderate and severe psoriasis cases based on the PASI score**

Cases-severity	Frequency	Percentage
Mild	2	4.0
Moderate	11	22.0
Severe	37	74.0
Total	50	100.0

PASI: Psoriasis area and severity index





**Figure 1: Correlation of Advanced Oxidative Protein Products with Psoriasis Area and Severity Index score**

psoriasis and atherosclerosis have common risk factors such as, history of smoking, alcohol intake, hypertension, diabetes mellitus, obesity, and family history of similar complaints. They found a significant increase in AOPP. Pathogenic mechanism common in both the conditions is inflammation and oxidative stress.<sup>15</sup> There are studies, which determined AOPP as marker of oxidant mediated protein damage in sera of patients with oral cancers. It stated that reactive oxygen and nitrogen stress has been implicated in the genesis of oral squamous cell carcinomas.<sup>16</sup> Similarly, in our study we found that AOPP raised patients with psoriasis as compared to the controls.

Interestingly, diseases such as psoriasis, diabetes mellitus, rheumatoid arthritis, inflammatory bowel disease are referred to as “oxidative stress conditions.” Baskol *et al.* conducted a study on advanced oxidation protein products as a marker of oxidative stress in ulcerative colitis. It determined the importance of neutrophil activation and the role of oxidative stress in the pathogenesis of UC, by estimation of AOPP and total thiol levels as markers of oxidative protein damage. The results showed an increase in the serum levels of AOPP, which supports the presence of oxidative stress and protein oxidation in ulcerative colitis.<sup>17</sup>

Kalousová *et al.* conducted a study on advanced glycation end products and products of protein oxidation in diabetes and found that AOPP levels were elevated in diabetes.<sup>18</sup>

In the present study, protein oxidation marker AOPP levels were increased significantly in the serum of patients with psoriasis. Psoriasis as a clinically inflammatory skin disease may per se impose an oxidative stress condition. The raise in AOPP may be due to increased generation of ROS due to the excessive oxidative damage generated in

these patients. These oxygen species in turn can oxidize many other important biomolecules like lipids, proteins and DNA. Several studies have reported multiple displacement amplification as an end product of lipid peroxidation to be elevated in patients with psoriasis.<sup>19</sup> There are many studies done on lipid peroxidation but very few studies on protein oxidation in psoriasis.

Our study showed a significant increase in the levels of AOPP in cases when compared to the controls, this supports the evidence that protein oxidation plays a role in the pathogenesis of psoriasis, which was documented by a previous study done on psoriatic arthritis.<sup>20</sup>

In our study, we observed a significant increase in the serum AOPP levels compared with controls ( $P < 0.001$ ). However, there was no significant correlation between AOPP levels and severity of the disease. In conclusion, this study suggests the potential utility of serum AOPP as a biomarker of oxidative stress in psoriasis.

## REFERENCES

- Gisondi P, Ferrazzi A, Girolomoni G. Metabolic comorbidities and psoriasis. *Acta Dermatovenereol Croat* 2010;18:297-304.
- Henseler T, Christophers E. Psoriasis of early and late onset: characterization of two types of psoriasis vulgaris. *J Am Acad Dermatol* 1985;13:450-6.
- Wakkee M, Thio HB, Prens EP, Sijbrands EJ, Neumann HA. Unfavorable cardiovascular risk profiles in untreated and treated psoriasis patients. *Atherosclerosis* 2007;190:1-9.
- Sivanandham V. Free radicals in health and diseases-A mini review. *Pharmacologyonline* 2011;1:1062-77.
- Lopaczynski W, Zeisel SH. Antioxidants, programmed cell death, and cancer. *Nutr Res* 2001;21:295-307.
- Glade MJ. The role of reactive oxygen species in health and disease. *Amerst Nutr* 2003;19:401-3.
- Poli G, Leonarduzzi G, Biasi F, Chiarotto E. Oxidative stress and cell signalling. *Curr Med Chem* 2004;11:1163-82.
- Halliwell B, Murcia MA, Chirico S, Aruoma OI. Free radicals and antioxidants in food and *in vivo*: what they do and how they work. *Crit Rev Food Sci Nutr* 1995;35:7-20.
- Valko M, Izakovic M, Mazur M, Rhodes CJ, Telser J. Role of oxygen radicals in DNA damage and cancer incidence. *Mol Cell Biochem* 2004;266:37-56.
- Shacter E. Quantification and significance of protein oxidation in biological samples. *Drug Metab Rev* 2000;32:307-26.
- Skvarilová M, Bulava A, Stejskal D, Adamovská S, Bartek J. Increased level of advanced oxidation products (AOPP) as a marker of oxidative stress in patients with acute coronary syndrome. *Biomed Pap Med Fac Univ Palacky Olomouc Czech Repub* 2005;149:83-7.
- Witko-Sarsat V, Friedlander M, Nguyen Khoa T, Capeillère-Blandin C, Nguyen AT, Canteloup S, *et al.* Advanced oxidation protein products as novel mediators of inflammation and monocyte activation in chronic renal failure. *J Immunol* 1998;161:2524-32.
- Mallbris L, Granath F, Hamsten A, Ståhle M. Psoriasis is associated with lipid abnormalities at the onset of skin disease. *J Am Acad Dermatol* 2006;54:614-21.
- Jyothi RS, Govindswamy KS, Gurupadappa K. Psoriasis: An oxidative stress condition. *J Clin Diagn Res* 2011;5:252-3.
- Kremers HM, McEvoy MT, Dann FJ, Gabriel SE. Heart disease in psoriasis. *J Am Acad Dermatol* 2007;57:347-54.
- Abhishek SN. Advanced oxidation protein products in oral SCC. *Middle East J Cancer* 2013;4:101-8.

17. Baskol M, Baskol G, Koçer D, Ozbakir O, Yucesoy M. Advanced oxidation protein products: a novel marker of oxidative stress in ulcerative colitis. *J Clin Gastroenterol* 2008;42:687-91.
18. Kalousová M, Skrha J, Zima T. Advanced glycation end-products and advanced oxidation protein products in patients with diabetes mellitus. *Physiol Res* 2002;51:597-604.
19. Corrocher R, Ferrari S, de Gironcoli M, Bassi A, Olivieri O, Guarini P, *et al.* Effect of fish oil supplementation on erythrocyte lipid pattern, malondialdehyde production and glutathione-peroxidase activity in psoriasis. *Clin Chim Acta* 1989;179:121-31.
20. Lykkesfeldt J. Malondialdehyde as biomarker of oxidative damage to lipids caused by smoking. *Clin Chim Acta* 2007;380:50-8.

**How to cite this article:** Shree UG, Vishal B, Sindhu, Shenoy MM, Shenoy C. Advanced Oxidation Protein Products in Psoriasis and its Correlation with Disease Severity. *Int J Sci Stud* 2015;2(11):156-159.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Comparative Scanning Electron Microscopic Evaluation of Resin Tag Formation on Dentin Substrate Using Caries Infiltrant and Etch and Rinse Adhesive

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## Abstract

**Introduction:** Adhesion is the core of modern dentistry and the resin tag forming ability of various bonding agents is the key factor in it. Newly developed Caries Infiltrant is a low viscosity resin that is capable of penetrating several micrometers into the enamel lesions. But the depth of penetration into dentinal tubules has not been yet studied.

**Purpose:** The purpose of this *in vitro* study was to compare the resin tag formation between a low viscosity resin (Caries Infiltrant) and Etch and Rinse Adhesive system.

**Materials and Methods:** Fifteen human third molar teeth were sectioned into two pieces. All pieces were flattened with silicon carbide paper and divided into two groups: Group I – Caries Infiltrant, Group II – Etch and Rinse Adhesive. The tooth fragments were evaluated under scanning electron microscope. Statistical analysis was done using Student's unpaired *t*-test.

**Conclusion:** There was a significant difference between the resin tag formations on dentin substrate using Caries Infiltrant and Etch and Rinse Adhesive.

**Key words:** Adhesion, Bond strength, Caries Infiltrant, Low viscosity resin, Resin tag

## INTRODUCTION

Despite advancements in oral disease science, dental caries is a worldwide health concern; that affects humans of all ages, especially children. Treatment strategy for enamel caries lesions is based on remineralization and topical application of fluoride. Initial caries can be arrested by the use of light curing resins for infiltration, also called as Caries Infiltrants.<sup>1,2</sup> Caries Infiltrant occludes the pores, and thus prevents

acid penetration into the lesions. Many *in vitro* studies have revealed less progression of the lesion that were infiltrated by resin.<sup>2,4</sup> Many studies used adhesive systems and sealants for infiltration of enamel caries lesion.<sup>1,5-9</sup> Penetration of shallow lesions was observed, and deeper lesions were infiltrated only superficially.<sup>10</sup> Adhesion is the main purpose for using adhesives and sealants, so it is expected to show lower penetration capability.<sup>11,12</sup> Therefore, resins with high penetration coefficient might be a preferred option.

The higher the PC of a liquid, the faster it penetrates into a given porous solid driven by capillary forces. Nakabayashi *et al.* (1982) claimed improvement in dentin bonding due to resin infiltration and resin tag formation. These modes of retention due to resin tag formation became widely accepted as the fundamental basis of dentin adhesion.<sup>13,14</sup> Generations of bonding agents have been developed with

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Month of Submission : 12-2014  
Month of Peer Review : 01-2015  
Month of Acceptance : 01-2015  
Month of Publishing : 02-2015

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different claims and properties to suit the nature of dentin. The “Etch and rinse” adhesives claim to produce relatively high bond strength values to dentin.<sup>15,16</sup> Length of resin tag is an important factor when considering the bond strength of the adhesive system. More the length of resin tags more is the bond strength.<sup>15</sup>

According to De Munck *et al.* Etch and Rinse Adhesives claimed more bond strength as compared to others. Several studies have been carried out to check the depth of penetration into enamel pores and to measure the shear bond strength on sound and demineralized enamel. But no significant studies have been carried out to check whether the Caries Infiltrant resin is penetrable into dentin. Several adhesive systems that we use today for bonding to dentin are based upon the formation of resin tags in dentinal tubules. The length of resin tags determines the durability of adhesion. So, this study was carried out to evaluate the length and depth of resin tag formation using a low viscosity resin (Caries Infiltrant) compared with Etch and Rinse Adhesive system (Fifth-generation).

## MATERIALS AND METHODS

Fifteen recently extracted erupted third human molars were selected for this study. These teeth had no caries, nor previous restorations. They were stored in distilled water at room temperature for 1 month. In order to evaluate adhesive infiltration in the dentin, the teeth were sectioned longitudinally following the buccal-lingual groove direction, obtaining 2 halves. The occlusal surfaces were removed 1 mm below the dentinal-enamel junction, which corresponded to the central groove. With a transversal section, their roots were also eliminated. They underwent cutting procedures under the occlusal dentin surface, so as to obtain 3 mm thick discs for a total of 30 specimens. These were cut with a double-faced diamond disc, and water was used for cooling. The dentin samples were flattened and polished using number 600-1200 wet silicon carbide papers. Teeth fragments were divided into two groups of 15 dentin samples each. Infiltrant and adhesive application were carried out as follows.

### Group I: Caries Infiltrant

The enamel surface was etched with 15% hydrochloric acid gel (Icon Etch, DMG,

Hamburg, Germany) for 2 min and then rinsed with water for 30 s. The surface was dried with ethanol (Icon Dry, DMG, Hamburg, Germany), applied for 30 s. Then, the low viscosity Infiltrant resin (Icon Infiltrant, DMG, Hamburg, Germany) was applied on the surface for 3 min with a sponge applicator. The Infiltrant was light-cured for

40 s. After light curing, the Infiltrant was applied again for 1 min and light-cured for 40 s.

### Group II: Etch and Rinse Adhesive (Prime and Bond NT)

Acid conditioning of the tooth surface with 37% phosphoric acid was done and rinsed with water. Following blot drying; prime and Bond NT was directly applied onto a fresh applicator tip. Immediately the adhesive was applied thoroughly to wet all cavity surfaces. Light cured for a period of 10 s.

Tooth samples were examined under scanning electron microscope, and statistical analysis was done using unpaired *t*-test.

By applying Student's unpaired *t*-test, there is a highly significant difference in mean values of length of resin tag formation in Group I (Caries Infiltrant) and Group II (Etch and Rinse Adhesive) ( $P < 0.001$ )

## RESULTS

On the dentin samples where infiltrant was applied, irregular pattern of resin tag formation was found (Figure 1).

In the group of Caries Infiltrant, there was evidence of resin tag formation. The penetration depth was ranging from 32 to 47  $\mu\text{m}$  (Figure 2).

In the group of Etch and Rinse Adhesive, there was evidence of resin tag formation. The penetration depth was ranging from 25 to 32  $\mu\text{m}$  (Figure 3).

The length of resin tag formation for each sample tested in both the groups (Table 1)

The mean and standard deviation values of resin tag formation in Group I and Group II were analyzed. This showed highly significant difference between the two (Table 2).

Graphical comparison of both the groups tested (Figure 4).

Analysis of the dentin samples showed evident resin tag formation, but an irregular pattern was observed. The depth of the penetration was measured from the photomicrographs. The penetration depth ranged across 32-47  $\mu\text{m}$  for Group I and 25-32  $\mu\text{m}$  for Group II. Mean depth was 39.902  $\mu\text{m}$  for Group I and 29.04  $\mu\text{m}$  for Group II.

## DISCUSSION

History shows that the development of science has always been highly influenced by paradigms, and revolutionary



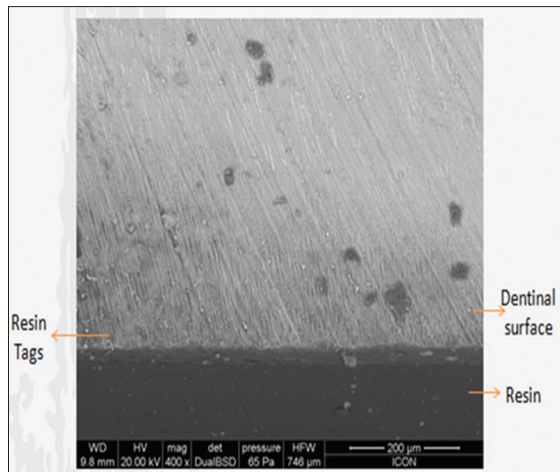


Figure 1: Resin tags

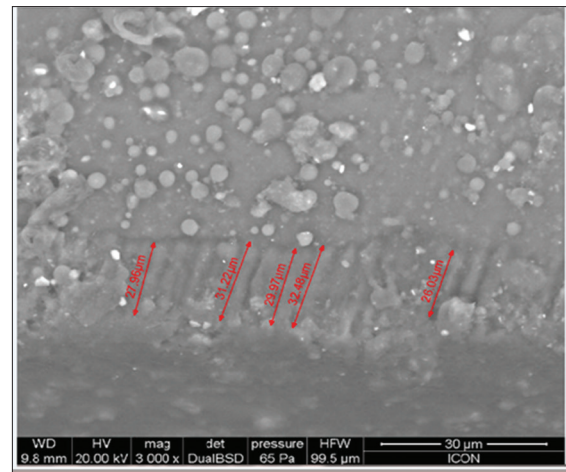


Figure 3: Group II (Etch and Rinse Adhesive)

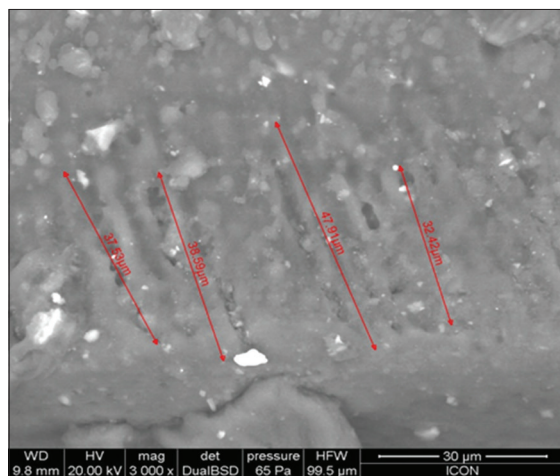


Figure 2: Group I (Caries Infiltrant)

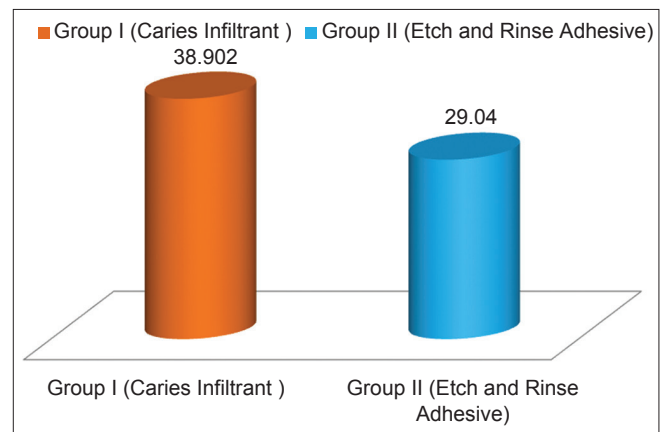


Figure 4: Comparison of mean values of length of resin tag formation (μm) in Group I (Caries Infiltrant) and in Group II (Etch and Rinse Adhesive)

Table 1: Length of resin tags

Length of resin tag formation (μm)	
Group I (Caries Infiltrant)	Group II (Etch and Rinse Adhesive)
37.54	27.84
38.59	31.36
47.91	29.49
32.42	32.23
36.52	26.03
41.22	28.25
38.91	25.91
39.77	26.67
40.44	27.28
42.71	29.59
35.55	28.76
39.67	30.04
36.38	28.25
38.89	31.63
37.00	32.21

shifts in paradigms have not easily been brought. From the paradigm of how fluoride “prevents dental caries” to the paradigm of caries being “infectious and transmittable” to the present day paradigm, of considering dental caries as

Table 2: Comparison of mean and SD values of Length of resin tag formation (μm) in Group I (Caries Infiltrant) and in Group II (Etch and Rinse Adhesive) (n=15)

Length of resin tag formation (μm)			
Group I (Caries Infiltrant) (n=15)	Group II (Etch and Rinse Adhesive) (n=15)	Student's unpaired t-test value	P value and significance
Mean±SD	Mean±SD		
38.902±3.543	29.04±2.14	9.233	P<0.001, Highly significant

SD: Standard deviation

a “complex disease caused by an imbalance in physiologic equilibrium between tooth mineral and biofilm fluid” has taken about half a century to occur and has led to the better understanding of every aspect of the disease.<sup>17</sup> The journey to the present paradigm has also accompanied the continuous development of various better treatment approaches. This led to the shift from the traditional approach to the restorative dentistry approach.

The basic principle of adhesion is mainly dependent upon the exchange process in which inorganic portion of the tooth is replaced by the synthetic resin. In this, two processes are involved. First there is the removal of calcium phosphate due to which microporosities are exposed on the dentinal surface. In the other phase, the exposed microporosities are filled with the resin and are polymerized which results in hybridization.<sup>18</sup>

The most effective adhesives that are used in most of the laboratory studies are the Etch and Rinse Adhesives. They provide excellent bond strength when compared to others. So, the fifth-generation dentin bonding agents are considered to be the 'accepted standard' against which contemporary adhesives are evaluated.<sup>18</sup>

Therefore, in this study, the resin tag formation of fifth generation bonding agent was compared to the newly developed Caries Infiltrant, which is a low viscosity resin.

Low viscosity Caries Infiltrants being a form of the restorative dentistry was evaluated for the depth of penetration on dentin. The scanning electron microscopic results in this *in vitro* study showed low viscosity resins are capable of penetrating several  $\mu\text{m}$  into dentin. The observed results are in accordance with the study carried out by Meyer-Lueckel and Paris<sup>19</sup> that stated that materials with high penetration coefficient are capable of penetrating considerable length into the lesion.

In this study, the low viscosity resin formed the longer resin tags as compared to the di and trimethacrylate resin used in fifth generation bonding agent.

The monomer mixtures used for the caries infiltration are optimized for rapid capillary penetration. The high penetration coefficient of Icon-Infiltrant can be correlated to the TEG-DMA based resin matrix for to its lower viscosity.

Further clinical trials needs to be carried out for confirmation of the above fact and findings and if we can use these low viscosity resins for better bond strength in adhesive dentistry.

## CONCLUSION

There was a significant difference between the resin tag formations on dentin substrate using Caries Infiltrant and etches and rinse adhesive. The low viscosity caries Infiltrant

penetrated deep into the dentinal tubules forming the longer resin tags.

## ACKNOWLEDGMENT

Author would like to thank Dr. D.Y. Patil Dental College and Hospital for their constant help and support.

## REFERENCES

1. Meyer-Lueckel H, Paris S, Mueller J, Cölfen H, Kielbassa AM. Influence of the application time on the penetration of different dental adhesives and a fissure sealant into artificial subsurface lesions in bovine enamel. *Dent Mater* 2006;22:22-8.
2. Paris S, Meyer-Lueckel H, Mueller J, Hummel M, Kielbassa AM. Progression of sealed initial bovine enamel lesions under demineralizing conditions *in vitro*. *Caries Res* 2006;40:124-9.
3. Beavers RA, Bergenholtz G, Cox CF. Periodontal wound healing following intentional root perforations in permanent teeth of Macaca mulatta. *Int Endod J* 1986;19:36-44.
4. Mueller J, Meyer-Lueckel H, Paris S, Hopfenmuller W, Kielbassa AM. Inhibition of lesion progression by the penetration of resins *in vitro*: influence of the application procedure. *Oper Dent* 2006;31:338-45.
5. Meyer-Lueckel H, Mueller J, Paris S, Hummel M, Kielbassa AM. The penetration of various adhesives into early enamel lesions *in vitro*. *Schweiz Monatsschr Zahnmed* 2005;115:316-23.
6. Schoop U, Barylyak A, Goharkhay K, Beer F, Wernisch J, Georgopoulos A, et al. The impact of an erbium, chromium: yttrium-scandium-gallium-garnet laser with radial-firing tips on endodontic treatment. *Lasers Med Sci* 2009;24:59-65.
7. Gray GB, Shellis P. Infiltration of resin into white spot caries-like lesions of enamel: an *in vitro* study. *Eur J Prosthodont Restor Dent* 2002;10:27-32.
8. Robinson C, Brookes SJ, Kirkham J, Wood SR, Shore RC. *In vitro* studies of the penetration of adhesive resins into artificial caries-like lesions. *Caries Res* 2001;35:136-41.
9. Schmidlin PR, Zehnder M, Pasqualetti T, Imfeld T, Besek MJ. Penetration of a bonding agent into De- and remineralized enamel *in vitro*. *J Adhes Dent* 2004;6:111-5.
10. Paris S, Meyer-Lueckel H, Kielbassa AM. Resin infiltration of natural caries lesions. *J Dent Res* 2007;86:662-6.
11. Pashley DH, Sano H, Ciucchi B, Yoshiyama M, Carvalho RM. Adhesion testing of dentin bonding agents: a review. *Dent Mater* 1995;11:117-25.
12. Simonsen RJ. Pit and fissure sealant: review of the literature. *Pediatr Dent* 2002;24:393-414.
13. Van Meerbeek B, Perdigão J, Lambrechts P, Vanherle G. The clinical performance of adhesives. *J Dent* 1998;26:1-20.
14. Jacobsen T, Söderholm KJ. Some effects of water on dentin bonding. *Dent Mater* 1995;11:132-6.
15. De Munck J, Van Landuyt K, Peumans M, Poitevin A, Lambrechts P, Braem M, et al. A critical review of the durability of adhesion to tooth tissue: methods and results. *J Dent Res* 2005;84:118-32.
16. Kanca J 3<sup>rd</sup>. Wet bonding: effect of drying time and distance. *Am J Dent* 1996;9:273-6.
17. Fejerskov O. Changing paradigms in concepts on dental caries: consequences for oral health care. *Caries Res* 2004;38:182-91.
18. Subbiya A, Vivekanandhan P, Prakash V. Comparative evaluation of resin tag formation on dentin. *Indian J Multidiscip Dent* 2010;1:21-8.
19. Meyer-Lueckel H, Paris S. Improved resin infiltration of natural caries lesions. *J Dent Res* 2008;87:1112-6.

**How to cite this article:** Katkade A, Shetty R, Patel N, Agarwalla A, Somani S, Jagtap P, Hariyani N, Singh S. Comparative Scanning Electron Microscopic Evaluation of Resin Tag Formation on Dentin Substrate Using Caries Infiltrant and Etch and Rinse Adhesive. *Int J Sci Stud* 2015;2(11):160-163.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Evaluation of Condylar Morphology using Panoramic Radiography in Normal Adult Population

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## Abstract

**Introduction:** Even with the advent of sophisticated investigative techniques like cone beam computed tomography, computed tomography, orthopantomography still remain the radiologic tool of choice for most odontogenic problems. The present study highlighted variations in condylar morphology and association of pain with a particular morphology type.

**Materials and Methods:** Digital panoramic radiographs of 1435 subjects were retrieved randomly from the Out Patient Department of Oral Medicine and Radiology over a period of 2 years for the study. The images were cropped to include only the temporomandibular apparatus and were mutually evaluated by two examiners for the formulation of operational definitions of different types of condyles. Inquiry of painful episodes among a randomly selected subsample of 30 patients from each of the four condylar types was done to assess the link between variations in morphology and symptoms of temporomandibular diseases. Raw data were expressed in the form of frequency distribution tables. Categorical data for associations were tested using Chi-square test and  $P \leq 0.05$  was considered as statistically significant.

**Result:** Investigator identified four variants in condyle shapes: Oval, diamond, bird beak, crooked finger. Out of 1435 pairs of condyles assessed, oval (59.6%) and bird's beak (18.2%) were the most frequent shapes reported followed by diamond (15.9%), and crooked finger (6.3%). About 17.6% of subjects showed an asymmetric condylar pair. A statistically significant difference was observed between painful episodes and condylar symmetry and morphology type.

**Conclusion:** The present study showed that the oval shape is the most frequent shape found in the overall population. A significant association was found between intercondylar asymmetry and morphology with regards to temporomandibular joint pain. Findings of the present study could be used as a reference point to assess whether variations in condylar morphology are linked to symptoms of temporomandibular disorders.

**Key words:** Mandibular condyle, Panoramic Radiography, Temporomandibular joint

## INTRODUCTION

It is said, change is constant. For anything to evolve; new inventions have to be made; new forays have to be ventured into. Medicine like everything else is also changing. Newer investigative techniques, newer methods of treatment are discovered. But the age old clinical routines still hold

good. And in developing countries, where cost versus accessibility still count, older traditional modus operandi is still cost effective. Computed tomography (CT) and Magnetic resonance imaging (MRI) are extremely clear-cut methods, yet are extremely costly and generally out of reach for an average patient who spends from his own pocket. Developing countries have yet to cover dental insurance for the average citizen and in such cases the traditional panoramic radiography gives a dentist a basic yet almost precise view of the entire jaw.

Cost friendly investigative modalities like orthopantomography (OPG) yield replicable results, have a favorable cost-benefit relationship and exposes patients to relatively low doses of radiation.<sup>1,2</sup> Panoramic

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Month of Submission : 12-2014  
Month of Peer Review : 01-2015  
Month of Acceptance : 01-2015  
Month of Publishing : 02-2015

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radiography has been used as the initial imaging technique for temporomandibular joint (TMJ) screening when clinical examination suggests some type of joint pathology. Although there have been continued efforts toward studying the dimensional analysis of the condyle and its surrounding structures, little attention, however, has been paid to the variety of condylar morphology and configuration. The present study is aimed at observing whether variation in condylar morphology is related to pain episodes, a finding usually present in patients with temporomandibular disease (TMD). Investigators proposed the null hypothesis that there is no association between the occurrence of painful episodes and morphological types. This means that if a difference exists, then intercondylar asymmetry and morphology certainly has bearing on the occurrence of pain related to TMJ.

## MATERIALS AND METHODS

Digital panoramic radiographic data of 1435 subjects were retrieved from the Out-Patient Department of Oral Medicine and Radiology over a period of 2 years for the study. Sample comprised of subjects who were prescribed OPG as a routine investigation for odontogenic causes. Patients with any history of trauma/congenital/developmental/surgery were excluded from the present study. All OPGs were taken using OrthophosXG5DSCeph (Sirona Dental Systems GmbH, Germany). The images were cropped to include only the temporomandibular apparatus. Only those radiographs that were free from any projection errors and showed a full condylar view on either side with optimal density and contrast were chosen. These were mutually evaluated by two oral radiologists for the formulation of operational definitions. Condylar morphology of four types of was identified. A subsample of 120 patients (30 patients from each morphological type) was randomly selected from each condylar type and was recalled for further evaluation related to symptoms of TMD. An oral maxillofacial surgeon examined the patients and inquired about any history related to pain in the past 5 years. Statistical Package for Social Sciences SPSS v17.0 was used for data analysis. Data were expressed in the form of frequency distribution tables and graphs. Chi-square test was used for categorical data for testing the presumed hypothesis.  $P \leq 0.05$  was considered as statistically significant.

## RESULTS

### Morphological variations in shape of condyle as evident on orthopantomographs

A total of 2870 condyles were analyzed from 1435 subjects with ages ranging from 18 to 86 years (mean age

of 37.81 years), out of which 825 (57.5%) were males and 610 (42.5%) were females. Condyles of the sample population were categorized into 4 types according to the following operational definitions.

Type 1: “Oval shape” or an almost “egg shaped” or an “oblong” outline (Figure 1) with a near rounded condylar neck with or without any constrictions on the inferior border (1710 [59.6%]cases).

Type 2: “Diamond” shape (Figure 2) showing a broad flat superior surface with a constricted neck outline (457 [15.9%]cases).

Type 3: “Bird beak” shape (Figure 3) with the surface almost shaped like a bird’s head with the beak jutting out (523 [18.2%]cases).

Type 4: “Crooked finger” shape (Figure 4) condylar morphology showed an outline of a crooked index finger, a closed plane curve with an arch (180 [6.3%]cases).

Out of the 1435 subjects analyzed, asymmetry of the condyles was noted in 252 (17.6%) patients and symmetrical condylar morphology among 1183 (82.4%) subjects. The distribution of various morphological types among symmetric and asymmetric condyles is depicted in

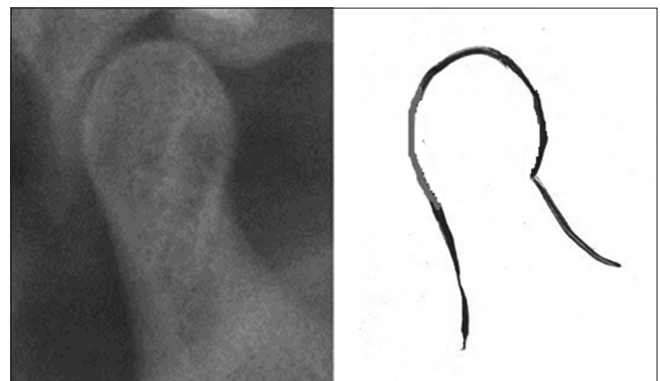


Figure 1: Oval shape

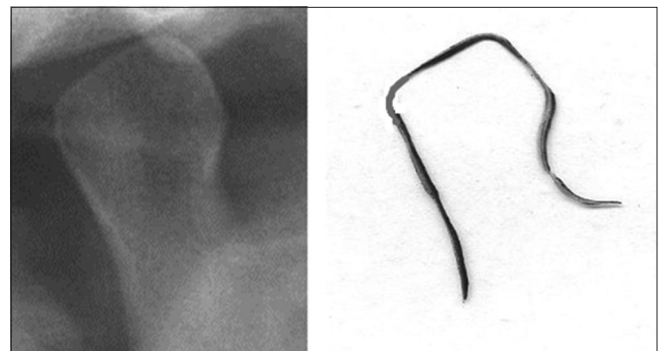


Figure 2: Diamond shape



Table 1. Further analysis among 120 randomly selected subjects showed a statistically significant difference between painful episode and condylar symmetry ( $\chi^2 = 24.54$  df:2,  $P < 0.05$ ; significant). Similarly, a statistically significant difference was also observed between painful episodes and morphology of condyle ( $\chi^2 = 30.06$  df:6,  $P < 0.05$ ; significant). Distribution and proportion of painful episodes among 120 subjects with condylar symmetry and various morphological types are presented in Tables 2 and 3.

## DISCUSSION

Panoramic radiography produces an image that includes both the maxillary and mandibular dental arches and other surrounding structures such as the maxillary antra, nasal fossa, TMJ, styloid processes, and hyoid bone.<sup>3</sup> It is a routine imaging method for obtaining general information about the teeth, mandible, and other regions of the jaw. It also yields replicable results, has a favorable cost-benefit relationship and exposes patients to relatively low doses of radiation.<sup>1,2</sup>

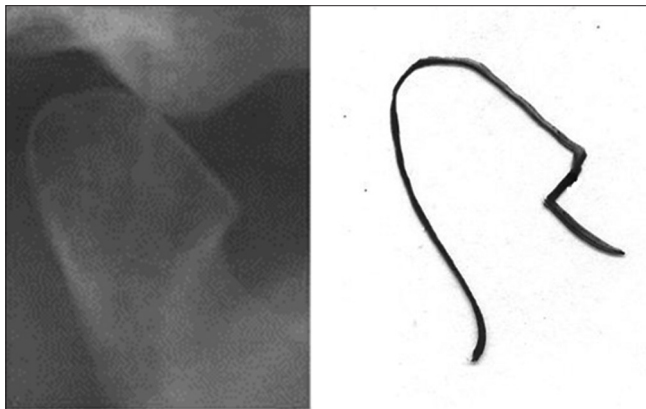


Figure 3: Bird beak shape

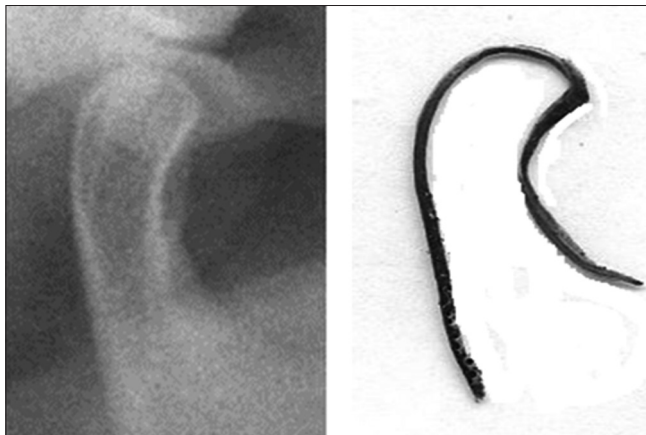


Figure 4: Crooked finger

Various imaging modalities are available for assessing changes in TMJ morphology and function<sup>3</sup>, including plain radiography, tomography, CT, arthrography, and MRI. Conventional radiographic methods are generally recommended initially, with the most sophisticated methods reserved for certain patients if the ailment so demands it.

**Table 1: Condylar morphology distribution for symmetry of condyles in pooled data of 1435 subjects**

Symmetry	Condylar morphology				Total
	Oval	Diamond	Bird beak	Crooked finger	
Symmetric					
Count	1465	371	418	112	1183
% within \$total	85.7	81.2	79.9	62.2	
Asymmetric					
Count	245	86	105	68	252
% within \$total	14.3	18.8	20.1	37.8	
Total					
Count	1710	457	523	180	1435

**Table 2: Occurrence of painful episodes of condylar pairs in a subsample of 120 subjects**

Symmetry	Pain episodes			Total
	No pain	Occasional	Pain often	
Symmetric				
Count	34	17	9	60
% within pain	69.4	63.0	20.5	50.0
Asymmetric				
Count	15	10	35	60
% within pain	30.6	37.0	79.5	50.0
Total				
Count	49	27	44	120
% within pain	100.0	100.0	100.0	100.0

$\chi^2=24.54$  df: 2,  $P<0.05$ , Significant

**Table 3: Occurrence of painful episodes in different morphology in a subsample of 120 subjects**

Morphology	Pain episodes			Total
	No pain	Occasional	Pain often	
Oval				
Count	20	6	4	30
% within pain	40.8	22.2	9.1	25.0
Diamond				
Count	14	11	5	30
% within pain	28.6	40.7	11.4	25.0
Bird Beak				
Count	10	5	15	30
% within pain	20.4	18.5	34.1	25.0
Crooked finger				
Count	5	5	20	30
% within pain	10.2	18.5	45.5	25.0
Total				
Count	49	27	44	120
% within pain	100.0	100.0	100.0	100.0

$\chi^2=30.06$  df: 6,  $P<0.05$ , significant

Panoramic radiography has been used as the initial imaging technique for TMJ screening when the clinical examination suggests some form of joint pathology. However, the use of panoramic radiographs for TMJ imaging is still controversial.<sup>4,5</sup> Some studies found the method reliable in depicting problems related to gross changes in condyles<sup>6,7</sup> whereas other studies showed that the findings on panoramic radiographs were not related to clinical TMJ signs and symptoms, possibly because of misinterpretation of distortion effects as signs of TMD.<sup>8,9</sup> Also, patients without TMD symptoms can present with condylar changes demonstrated by panoramic imaging.<sup>10</sup>

The present study does not attempt to highlight the utility of panoramic radiography for minor details per se, instead it tries to project it as a scout radiographic technique to evaluate gross changes in temporomandibular complex. A total of 1435 condylar pairs were observed for different forms of condyles in the normal population. The oval (59.6%) was the most commonly encountered shape followed by bird beak (18.2%), diamond (15.9%), and crooked finger shape (6.3%). Similar distribution was observed in 1183 subjects with symmetric condylar pair, however, 252 asymmetric pairs showed that the crooked finger shape (37.8%) followed by beaked, diamond and oval (Table 1). Using these results as a baseline parameter, we addressed a fundamental curiosity whether these observed changes in condylar morphology are related to inherent flaws of panoramic radiography or any physical manifestations of a disease process related to the TMJ.

There are a number of published articles on magnification and image distortion in panoramic radiographs,<sup>11-14</sup> and studies involving the use of panoramic radiographs in evaluating dentoskeletal specifications, they, however, focus mainly on intercondylar asymmetries and gonial angle measurements.<sup>14-16</sup> Many studies point to the fact that patient positioning has been shown to be crucial in panoramic imaging of the condyles. They do stress on the fact that the high prevalence of minor condylar changes seen in both the TMD and general dental population could reflect the positioning artefact, rather than remodelling.<sup>17</sup> Also, the special image formation process in panoramic radiography renders a two-dimensional shadow image within a certain depth-zone, which is very unique and produces some strange findings. Still, in practice clinicians often comment on changes in shape and surface of the condyle for cortical integrity. Maxillofacial surgeons and radiologists often on viewing a panoramic radiograph may encounter what they most likely interpret to be an altered or condylar shape. Investigators feel that the basis for this comment may derive from years of viewing routine OPG and may be a purely personal perceptive notion. This is entirely because of the fact that no studies so far have

ever enumerated/described normal or altered condylar morphology.

Although panoramic radiography depicts only the lateral and medial thirds of the condylar head<sup>18</sup>, bony lesions occur more frequent in the lateral third.<sup>19</sup> In addition, panoramic radiography has been reported to be reliable in depicting the condyle and in screening for TMJ abnormalities.<sup>6,7</sup> Quantitative measurements on panoramic radiography are difficult because of magnification differences and image distortions.<sup>20</sup> These distortions and projection artefacts may be misinterpreted as signs of TMD.<sup>8,9</sup>

Investigators then tried to assess whether any symptoms of TMD such as pain are related to particular condylar morphology or is a totally unrelated phenomenon. When qualitative frequency of pain episodes were compared to morphology among a subsample of 120 patients, we found that among symmetrical condylar morphology, the distribution of patients with 'no pain' was highest (69.4%), while among patients with asymmetrical condylar morphology 'pain often' was the highest (79.5%) (Table 2). A statistically significant difference was seen between subjects with symmetric and asymmetric condylar morphology with regards to painful episodes ( $\chi^2 = 24.5$  df:6  $P < 0.05$ : Significant).

Consequent to these findings, investigators tried to explore whether a particular morphology also has some bearing on the painful episodes during the past 5 years. Raw data revealed that the patients with a crooked finger morphology reported that they suffered from painful episodes often (45.5%). Patients with a diamond shaped condyle reported occasional episodes of pain (40.7%) while patients with an oval shaped condyle reported the maximum pain-free period (Table 3). Inferential statistics revealed a significant association between morphology type and maximum painful episodes.

A number of studies have proved bony changes on the articular surface of the mandibular condyle in patients with TMD.<sup>21,22</sup> In addition, deviations in form and morphology are more common in the lateral third of the condyle.<sup>14</sup> Results of the present study revealed intercondylar asymmetry and altered morphology are associated with painful symptoms of TMD. However, it is poignant to remember that pain is a subjective symptom that occurs in almost all cases of TMD with etiology ranging from articular to muscular to nervous or even psychological barring congenital or developmental causes. Present study did not focus on such diagnostic labels for association of morphology type and pain, we only solicited about the episodes of pain during the past 5 years, given a premise that gross morphological changes

do not happen overnight. Also, the present study was not designed as a longitudinal study; it is merely aimed at predicting this association.

## CONCLUSION

Oral shape is the most frequent shape present in the general population followed by bird beak, diamond and crooked finger respectively. Presence of condylar asymmetry and altered morphology are definitively associated with the occurrence of the painful episode related to the TMJ. The finding(s) of the study may be used as a reference point as an enquiry, in risk assessment among symptomatic TMD patients' that demonstrate a particular condylar shape on orthopantomograph. Further studies are required to explore this facet using advance imaging systems like CT, cone beam CT, etc.

## REFERENCES

1. Mongini F. The importance of radiography in the diagnosis of TMJ dysfunctions. A comparative evaluation of transcranial radiographs and serial tomography. *J Prosthet Dent* 1981;45:186-98.
2. Habets LL, Bezuur JN, Jimenez Lopez V, Hansson TL. The OPG: an aid in TMJ diagnostics. III. A comparison between lateral tomography and dental rotational panoramic radiography (Orthopantomography). *J Oral Rehabil* 1989;16:401-6.
3. Westesson PL. Reliability and validity of imaging diagnosis of temporomandibular joint disorder. *Adv Dent Res* 1993;7:137-51.
4. Habets LL, Bezuur JN, van Ooij CP, Hansson TL. The orthopantomogram, an aid in diagnosis of temporomandibular joint problems. I. The factor of vertical magnification. *J Oral Rehabil* 1987;14:475-80.
5. Könönen M, Kilpinen E. Comparison of three radiographic methods in screening of temporomandibular joint involvement in patients with psoriatic arthritis. *Acta Odontol Scand* 1990;48:271-7.
6. Larheim TA, Johannessen S, Tveito L. Abnormalities of the temporomandibular joint in adults with rheumatic disease. A comparison of panoramic, transcranial and transpharyngeal radiography with tomography. *Dentomaxillofac Radiol* 1988;17:109-13.
7. Könönen M. Subjective symptoms from the stomatognathic system in patients with psoriatic arthritis. *Acta Odontol Scand* 1986;44:377-83.
8. Bush FM, Harrington WG, Harkins SW. Interexaminer comparison of bone scintigraphy and panoramic radiography of temporomandibular joints: correlation with signs and symptoms. *J Prosthet Dent* 1992;67:246-51.
9. Ruf S, Panerz H. Is orthopantomography reliable for TMJ diagnosis? An experimental study on a dry skull. *J Orofac Pain* 1995;9:365-74.
10. Muir CB, Goss AN. The radiologic morphology of painful temporomandibular joints. *Oral Surg Oral Med Oral Pathol* 1990;70:355-9.
11. Scarfe WC, Eraso FE, Farman AG. Characteristics of the Orthopantomograph OP 100. *Dentomaxillofac Radiol* 1998;27:51-7.
12. Farman TT, Kelly MS, Farman AG. The OP 100 Digipan: evaluation of the image layer, magnification factors, and dosimetry. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1997;83:281-7.
13. Thanyakarn C, Hansen K, Rohlin M, Akesson L. Measurements of tooth length in panoramic radiographs 1. The use of indicators. *Dentomaxillofac Radiol* 1992;21:26-30.
14. Türp JC, Vach W, Harbich K, Alt KW, Strub JR. Determining mandibular condyle and ramus height with the help of an Orthopantomogram – a valid method? *J Oral Rehabil* 1996;23:395-400.
15. Piedra I. The Levandoski Panoramic Analysis in the diagnosis of facial and dental asymmetries. *J Clin Pediatr Dent* 1995;20:15-21.
16. Kubota Y, Takenoshita Y, Takamori K, Kanamoto M, Shirasuna K. Levandoski panoramic analysis in the diagnosis of hyperplasia of the coronoid process. *Br J Oral Maxillofac Surg* 1999;37:409-11.
17. Crow HC, Parks E, Campbell JH, Stucki DS, Daggy J. The utility of panoramic radiography in temporomandibular joint assessment. *Dentomaxillofac Radiol* 2005;34:91-5.
18. Hollender L. Imaging of the TMJ: the value of conventional radiography and standard views and tomograms. In: Worthington R, Evans JR, editors. *Controversies in Oral and Maxillofacial Surgery*. Philadelphia: W. B. Saunders; 1994.
19. Oberg T, Carlsson GE, Fajers CM. The temporomandibular joint. A morphologic study on a human autopsy material. *Acta Odontol Scand* 1971;29:349-84.
20. Ramstad T, Hensten-Pettersen O, Mohn E, Ibrahim SI. A methodological study of errors in vertical measurements of edentulous ridge height on orthopantomographic radiograms. *J Oral Rehabil* 1978;5:403-12.
21. Kurita H, Ohtsuka A, Kobayashi H, Kurashina K. Resorption of the lateral pole of the mandibular condyle in temporomandibular disc displacement. *Dentomaxillofac Radiol* 2001;30:88-91.
22. Kurita H, Ohtsuka A, Kobayashi H, Kurashina K. Relationship between increased horizontal condylar angle and resorption of the posterosuperior region of the lateral pole of the mandibular condyle in temporomandibular joint internal derangement. *Dentomaxillofac Radiol* 2003;32:26-9.

**How to cite this article:** Chaudhary S, Srivastava D, Jaetli V, Tirth A. Evaluation of Condylar Morphology using Panoramic Radiography in Normal Adult Population. *Int J Sci Stud* 2015;2(11):164-168.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Single File Systems: A Review

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## Abstract

In past, the shaping of root canals was done by using stainless steel (SS) hand files. But, it was not found so much effective as SS hand files a number of drawbacks because they lead to using of numerous hand files and drills for preparing the canals effectively. As well, hand instrumentation among SS files Take more time. These file also include an increased incidence of canal. Carrying lastly, from a clinical perspective, utilize of hand instruments in thin canals can be very annoying particularly in teeth with complex access. Hence, a single file technique has been developed for shaping the immense bulk of canals, regardless of their diameter, length or curvature. They have made the root canal procedures simple and less time consuming.

**Key words:** Canal transportation, Drills, Stainless steel, Single file

## INTRODUCTION

Endodontics is not uncomplicated term. The reality is, the further we know about the innovation and curvatures of the root canal systems, the more that we are attentive of nature's anatomic complications.<sup>1</sup> From the starting of modern era endodontics, there have been many notions, techniques and strategies for preparing canals. The clinical endodontic step forward was succeeding from utilizing a long series of stainless steel (SS) hand files and numerous rotary Gates Glidden drills to combined nickel titanium (NiTi) files for negotiating or shaping the canals. Irrespective of the ways used for root canal preparation, the mechanical objectives for canal preparation were radiantly outlined nearly 40 years ago. While properly performed, these mechanical objectives endorse the biological objectives for shaping canals, filling root canal systems, and three-dimensional disinfection. Over the decades, an astounding display of files has emerged for negotiating and shaping canals. On the other hand, in spite of the numerous brand names, the number of techniques advocated and number of instruments required endodontic treatment has

been classically approached with sanguinity for possible success. Every new age group of files has more developed canal preparation techniques through novelty in design, movement and material.<sup>2</sup> Our profession has visualized preparing canals utilizing a single-file technique. The actuality is that practically all canals can now be optimally prepared using a single-file technique.<sup>3</sup> Newly the focus is on the idea "less is more" for endodontic canal preparation. Consequently, a single-file technique has developed for shaping the immense majority of canals, irrespective of their diameter, length, or curvature.<sup>4</sup>

## HISTORY OF FILE SYTEMS

In 1988, Walia projected Nitinol, a NiTi alloy that is 2-3 times more stretchy, in the same file sizes, as contrasted to SS. The first commercially offered NiTi rotary files had come to sell in mid 1990s. All these files (first-generation) NiTi rotary files have inert cutting radial lands, fixed tapers over the length of their blades, and need a significant number of files to accomplish the preparation objectives.

The subsequently generation of NiTi rotary files introduced into existence in 2001. This generation of NiTi files contains the ProTaper® (Dentsply-Tulsa) rotary files which, dissimilar all further passive or active NiTi cutting instruments, have manifold increasing or decreasing proportion tapers on a single file.

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**Month of Submission :** 12-2014  
**Month of Peer Review :** 01-2015  
**Month of Acceptance :** 01-2015  
**Month of Publishing :** 02-2015

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The third generation of NiTi instruments was introduced in 2007 to the market, which apparently provided better flexibility and resistance to repeated fatigue. Sybron dental specialties initiated R-phase heat treatment, a non-grinding method, and a so-called special surface conditioning. Dentsply Tulsa dentals introduced a new proprietary thermal procedure, which resulted in an original metallurgical technology termed M-wire™.<sup>5</sup>

They insist on for something new and immense is still on and single file systems are not left untouched. Thus, this review talks about the single file systems, which are available there in market *viz.*: Reciproc Wave One, One Shape and T-files.

### One Shape File

One Shape file has introduced by Micro-Mega. Directed down the glide path by three cutting edges, its flexibility assures admiration to the new canal path and curvature. The file is accessible in size 21 mm, 25 mm and 29 mm with a taper of 0.6% (Figure 1).

One Shape's disparity of cross-sections provides a finest cutting action in three zones of the canal. The uneven pitch of this file reduces instrument screwing effects. The anti-breakage organize of One Shape file is a protection bonus i.e. the instrument will slow down to avoid division.

The principle following the efficient cutting is that the file has three unusual cross-section zones.

- The first zone has a variable 3 cutting-edge design
- The second, prior to the change, has a cross-section that increasingly changes from 3 to 2 cutting edges
- The final (coronal) is provided with 2 cutting edges.<sup>6</sup>

One Shape file is delivered in a germ-free blister, and it is recommended to use one file per tooth and then surplus.



Figure 1: One Shape file size 25 taper 0.6 taper<sup>6</sup>

The file be supposed to not sterilized, as the cutting effectiveness decreases severely, so the file should be utilized for maximum of 3-4 canals.<sup>7</sup>

### Wave One File

It is known as a single-use, single-file organization from Dentsply Maillefer that is used to shape the root canal totally from start to end. The working of these NiTi files generally run in an alike but repeat "balanced force" action by using a pre-programmed motor to run these files in a "reciprocating motion" (back and forth).

The number of files is three, which are in the Wave One single-file reciprocating system, and they are obtainable in lengths of 21,25 and 31 mm shown in Figure 2.

- In fine canals, the Wave One small file is used. This file is available in tip size of ISO 21 with a constant taper of 6%
- In the majority of canals, the Wave One primary file takes place. This file is obtainable in tip size of ISO 25 with an apical taper of 8% that decreases toward the coronal end
- In large canals, the Wave One large file is applied. This is available in tip size of ISO 40 with an apical taper of 8% that declined toward the coronal end.

The design of these files is competent to work with a reverse cutting action. All these instruments are having a modified convex triangular cross-section at the tip of end. As the reciprocating cycles complete its one complete reverse rotation, the instrument steadily moves towards with required little apical pressure into the canal.

With a possibility of cross-contamination, all instruments should be used single time inside root canals because it is a tough job to completely clean and sterilize endodontic instruments. Hence, there is a possibility of the presence of human dental pulp tissue. The plastic color coding in the handle also malformed once clean, which restraint it from being properly placed back into its handpiece.<sup>8</sup>



Figure 2: Wave One small (yellow), primary (red) and large (black) files<sup>8</sup>

### Reciproc

Dr. Yared and VDW Germany were the first who introduced this system at the 8<sup>th</sup> World Endodontic Congress in Athens.<sup>9</sup> Reciproc® instruments are designed with diameters and tapers, which are efficient in an optimal apical preparation in the large number of cases by using just one instrument according to the canal anatomy.<sup>7</sup>

The numerous cases of all canal anatomies can be primed using only one reciprocating file at 1 time and with the absence of the glide path or initial instrumentation. The Reciproc file is firstly moved toward in a cutting direction and after that reverse to liberate the instrument in the process of reciprocation. It takes several reciprocating movements to complete just one rotation of 360°. This procedure of root-canal preparation, which lacks the step of creating a glide path, opposes the current teaching standard for rotary instrumentation, which includes the preparation of initial glide path to minimize the risk of fracture which can be caused by an instrument binding in the canal.<sup>9</sup>

However, the angles of alternating right and left rotations are considerably lesser than the angles at which a Reciproc instrument can cause fracture in the process of reciprocation. These angles are preserved in the Reciproc endodontic motor, which prevents these instruments from rotating past its particular angle of fracture. The centering ability of this reciprocation technique also permits the instrument to pursue the natural path of least confrontation, which is the root canal. Reciproc instruments are made up of M-wire NiTi under the process of an innovative thermal-treatment. This alloy is having both the features of amplified resistance to cyclic exhaustion and superior flexibility than common NiTi material. One more advantage of this specific design is a huge capacity of the removal of debris from the canal because of deep flutes. Further, the flexible S-shaped cross-section having two cutting edges gives fine cutting ability at decrease friction.

From the three file sizes shown in Figure 3 - R25, R40 or R50 - It is required to select the one that matches the canal size best. The initial taper of every file is bigger over the first 3 mm from the tip, thus allowing #30 irrigation syringes to be positioned near to the apex. The canal shape designed in all the three instruments is best for all modern obturation techniques.

The Reciproc system is mainly designed for convenience and protection. With the single use specification of instruments, makes the work more efficient, and it declines the risk of contamination. One Reciproc instrument is sufficient for doing the job of several hand and rotary

instruments. Single use of these instruments also decreases the risk of material weariness due to over-use.<sup>9</sup>

### T-Files

In the year 2014, this file was introduced by miraculous dental solution in India. The file is obtainable in tip size of 21, 25, 30 and 40 with a taper of 8%. It is also offered in length 21, 25 and 31 mm shown in Figure 4.

This file has been made in a convex triangular design which is efficient in better rotation and proficient cutting; it is also notable that the file has no screw in effect and is capable in debris removal efficiently. T-Files has nano coating, which makes them supple and resists them to wear and tiredness breakage.<sup>10</sup>

### SINGLE FILES SYSTEM ADVANTAGES

1. Just one NiTi instrument for single root canal and in the majority cases per tooth
2. Reasonably priced



Figure 3: Reciproc file size no. 25<sup>9</sup>



Figure 4: T-Files<sup>10</sup>

3. Decrease global shaping time; let the clinician to spend more time cleaning the root canal system with superior irrigation techniques
4. Eliminates practical errors by using a single Instrument quite than using several files
5. A new level of care, eliminating the possibility of prior contamination due to single use
6. Simple to learn.<sup>11</sup>

## CONCLUSION

It is concluded to facilitate One Shape and Wave One, are the new asset in endodontic instruments. Only single rotary file is there for your endodontic treatments. A root canal treatment is approximately 3-4 times quicker than a conventional treatment. Thus, the generally period of treatment is shortened, and it's easy for patients to accept the treatment due to less follow-ups.

## REFERENCES

1. Kuttler S, West J. A Single File System: The Science of Simplicity. Dentistry Today, March 2012.
2. Ruddle CJ, Machtou P, West JD. The Shaping Movement 5<sup>th</sup> Generation Technology. Dentistry Today; 2013. p. 1-8.
3. Available from: <http://www.endoexperience.com/documents/NiTiHistory.pdf>. [Last accessed on 2015 Jan 09].
4. Ruddle CJ. Endodontic Canal Preparation: Wave One Single-File Technique. Dentistry Today, January; 2012.
5. Webber J, Machtou P, Pertot W, Kuttler S, Ruddle C, West J. The wave one single-file reciprocating system. Roots 2011;1:28-33.
6. Available from: [http://www.micro-mega.com/en/wp-content/brochure\\_OneShapeNG\\_EN1\\_v1.pdf](http://www.micro-mega.com/en/wp-content/brochure_OneShapeNG_EN1_v1.pdf). [Last accessed on 2015 Jan 23].
7. Kaur A, Kukreja N, Bansal A, Bansal J, Kukreja U, Chaudhary. D The battle in endodontics: A review. Dent J Adv Stud 2014;2:59-63.
8. Department of Health (UK). Advice for dentists on the re-use of endodontic instruments and variant Creutzfeldt-Jacob disease (vCJD). April, 2007.
9. Available from: <http://www.reciproc.com>. [Last accessed on 2014 Dec 25].
10. Available from: <http://www.msindia.co.in>. [Last accessed on 2015 Jan 10].
11. Yared G. Ontario, Canada; Reciproc. Available from: <http://www.vdw-dental.com>. [Last accessed on 2014 Dec 25].

**How to cite this article:** Dhingra A, Ruhail N, Bhardwaj N, Rohilla S. Single File Systems: A Review. Int J Sci Stud 2015;2(11):169-172.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# A Mysterious Lump in Abdomen a Case Report

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## Abstract

Leiomyoma is a benign soft tissue tumor arising from the smooth muscle cells. Leiomyomas usually arise in the uterine muscle. Extra uterine leiomyomas is a rare entity of which abdominal leiomyomas are still rarer. Here, we report an extremely rare case of extra uterine leiomyoma arising from the parietal layer of the peritoneum in a perimenopausal lady. The history and clinical examination did not provide us with enough clues to diagnose the condition making us rely on the imaging techniques. This pushed us into even more confusing state with varying reports that could not provide us with a precise result. It was until we opened the abdomen that we could identify to our surprise that the lesion was actually arising from the parietal layer of the peritoneum requiring a simple excision as against our anticipation.

**Key words:** Extra uterine leiomyoma, Parietal peritoneum, Rare, Smooth muscle

## INTRODUCTION

Leiomyomas are common benign uterine tumors occurring in about 20-30% of premenopausal women.<sup>1</sup> Extra uterine leiomyomas are rarer, and they present a greater diagnostic challenge. These histological benign tumors, which originate from smooth muscle cells, usually arise in the genitourinary tract (in the vulva, ovaries, urethra, and urinary bladder) but may arise in nearly any anatomic site.<sup>2</sup> Leiomyomas arising from the anterior abdominal wall, intestinal wall and even lungs have been described.<sup>3,4</sup> A primary peritoneal leiomyoma was reported by Sang *et al.* in a 51-year-old woman.<sup>5</sup> The difficulty in diagnosing such entity both clinically and with imaging poses a great challenge for the surgeon. We came across this patient complaining of a lump in her abdomen, which eventually turned out to be a peritoneal leiomyoma. The rarity of a Leiomyoma arising from the parietal layer of peritoneum prompted us to report the case.

## CASE REPORT

A 43-year-old female patient presented with a complaint of swelling in the right side of her upper abdomen since 2 years. Swelling was small to start with and gradually progressed to present size. There was no history of trauma. Swelling was not associated with pain or vomiting. There was no history of jaundice. Her bowel and bladder habits were normal. She was not a known hypertensive or diabetic. She had regular menstrual cycles with increased flow for 10 days; gave birth to two children, alive and healthy.

On general physical examination, she had pallor. Examination of the abdomen proper; upon inspection showed fullness in the right hypochondria better appreciated in a tangential plane with patient lying supine on the bed (Figure 1a and b). The size and borders could not be defined on inspection. Swelling was not moving

Access this article online	
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	Month of Peer Review : 01-2015
	Month of Acceptance : 02-2015
	Month of Publishing : 02-2015



Figure 2: (a-b) On bed photographs of the patient

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up with respiration. There were no visible pulsations or engorged veins over the swelling. Skin above the swelling was normal with no signs of inflammation. On palpation, it was a single globular swelling of size 10 cm × 10 cm in the right hypochondriac region. There was no local rise of temperature and tenderness over the swelling. The skin over the swelling was pinchable. The surface was smooth with well-defined borders and firm in consistency. Swelling was mobile in all directions. The examining fingers could be insinuated beneath the right costal margin.

On percussion, a dull note was elicited over the swelling. There was a resonant note over rest of the abdomen. There was no bruit upon auscultation. Rest of the systemic examination including per rectal and per vaginal examination were normal.

At this stage, a provisional diagnosis could not be reached except for it being a lump in the abdomen. On further enquiry patient showed us an ultrasound report done at outpatient department dated 2 months back, which read as “hypo echoic mass of 12 cm × 10 cm below the anterior abdominal wall to the right side of umbilical skin.” Patient was admitted for further evaluation and management. Routine blood investigations were done, which showed the hemoglobin at 64%.

Meanwhile a repeat ultrasound of the abdomen was done, which reported it as an irregular heterogeneous mass lesion predominantly hyper echoic noted in the retro peritoneum extending up to right lumbar region; the lesion measuring 16 cm × 14 cm causing mass effect on the greater vessels. Here again there was no hint toward the origin of the tumor. Also reported was the presence of bulky uterus with small focal hypo echoic lesions noted in the uterocervical junction. Liver, gallbladder, spleen, pancreas and both the kidneys were reported to be normal.

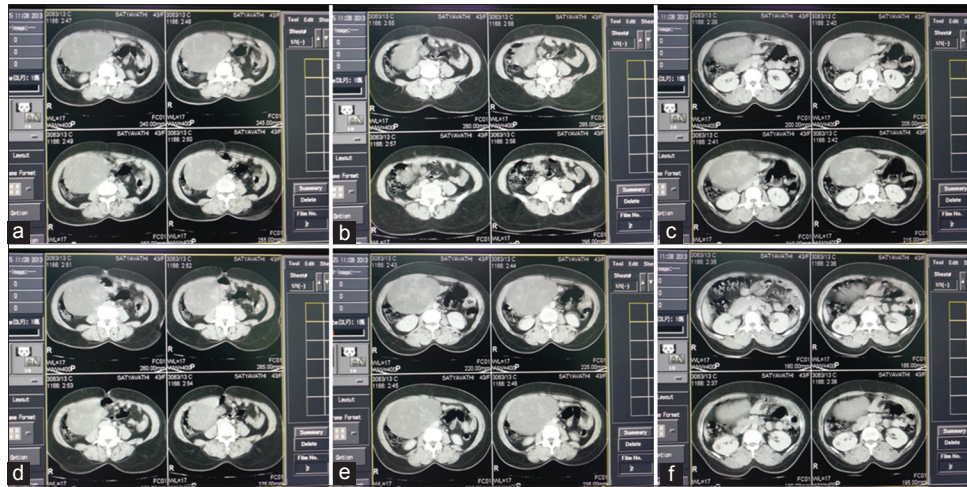
An abdominal computerized tomography with contrast (3063 and 3063c dated May 16, 2013 and May 17, 2013) was resorted to, which reported it to be a well-defined hypo dense lesion of size 13.7 cm × 12.9 cm × 11.2 cm arising from the ileal wall, displacing the adjacent loops of the bowel laterally, noted in the paramedian lumbar region. Lesion showing minimal heterogeneous enhancement and to be extra luminal in origin and there being no evidence of lymphadenopathy or free fluid in the peritoneal cavity. Aorta and inferior vena cava were reported normal. No signs of obstruction were reported, and liver, spleen, gallbladder, pancreas, and both kidneys were reported normal. However, a bulky uterus with small adenexal cyst on the right side was reported. Here they offered to suggest it to be either a duplication cyst or a benign small bowel tumor probably leiomyoma (Figure 2a-f).

Patient was explained of the situation and after discussing with her and the family it was decided to go for surgery with consent for on table decision making by the surgical team because the diagnosis was still inconclusive as far as the origin and nature of the lesion were concerned. However, a consensus regarding surgical options for the case was discussed, and we were prepared for resection and anastomosis of the involved segment of the bowel if required which we thought was the most probable outcome. Meanwhile, the hemoglobin status of the patient was improved with transfusion of two units of compatible whole blood of patient's blood group. Patient also underwent cardiac evaluation, which was normal. Patient was taken to the operation theatre and under general anesthesia the abdomen was opened. It took us all by surprise to find a 20 cm × 15 cm single solid tumor arising from the parietal wall of the peritoneum in the right hypochondriac region (Figure 3a and b).

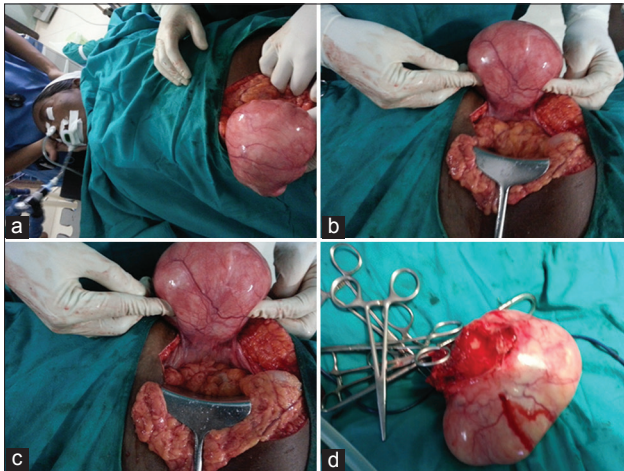
A simple excision securing hemostasis was all that was required for the tumor to be removed as the tumor was free from all the surrounding structures in the vicinity except its attachment to the peritoneum (Figure 3c and d). It was sent for histopathological examination after excision. The rest of the abdominal viscera were found normal. Abdomen was closed in layers and the patient recovered from anesthesia well. Patient was discharged on the 7<sup>th</sup> post-operative day with a good level of satisfaction. A week later the histopathological report (882/13) read the lesion having features of leiomyoma with degenerative changes.

## DISCUSSION

Leiomyomas are rare, benign, mesenchymal tissue tumors originating from smooth muscle cells. They were described first time by Virchow in 1854.<sup>6</sup> Uterine leiomyoma is the most common benign gynecological tumor affecting as many as 25% of women in the reproductive age group,<sup>7</sup> and is present in about 80% of all hysterectomy specimens.<sup>8</sup> They are symptomatic in only about one-third of cases. The tumors are most common in the fourth and fifth decades. Postmenopausal regression occurs in some cases.<sup>9</sup> They are one of the most common reasons for hysterectomies in women. These tumors enlarge during reproductive years and regress later after menopause indicating a role played by estrogen in their genesis and growth. These have been thought to be clonal tumors arising from a single myometrial cell.<sup>10,11</sup> Leiomyomas originate from smooth muscle cells of the uterus and rarely from intestine or vessel wall. The alteration of such cells to leiomyoma involves somatic mutation and unknown synergistic action of hormones, deranged lipid metabolism and local growth factors.<sup>1,10,11</sup> It is very rarely (0.1%) premalignant. Majority of such tumors are benign.



**Figure 2: (a-f) The computed tomography scan images of patient's abdomen**



**Figure 3: (a-d) Intra operative images of the patient showing the gross structure of the tumor with its origin from the parietal layer of the peritoneum and the resected tumor**

Malignant transformation of smooth muscle tumors has been reported especially in the disseminated variety.<sup>12</sup> They appear commonly in the uterus and skin, but very rarely in the soft tissue. Among all benign tumors of the soft tissue, leiomyomas account for only 3.8%.<sup>13</sup> In general, soft tissue leiomyomas cause little morbidity. Leiomyomas can be classified under three categories: (i) Cutaneous leiomyoma (leiomyoma cutis), (ii) angiomyomas (vascular leiomyomas), and (iii) leiomyomas of deep soft tissue.<sup>14</sup> Soft tissue leiomyomas are subdivided into two groups, depending on the site of origin: Superficial leiomyoma and deep soft tissue leiomyoma.<sup>15</sup>

The latter types, deep soft tissue leiomyomas, are further divided into two subtypes: Somatic soft tissue leiomyomas and retroperitoneal/abdominal leiomyomas.<sup>16,17</sup>

These histological benign tumors, which originate from smooth muscle cells usually arise in the genitourinary tract (in the vulva, ovaries, urethra, and urinary bladder) but may arise in nearly any anatomical site.<sup>2</sup>

The rare exceptions to the usually localized growth pattern of leiomyomas are: Disseminated peritoneal leiomyomatosis, benign metastasizing leiomyomatosis, intravenous leiomyomatosis, parasitic leiomyoma and retroperitoneal leiomyomatosis. Uterine leiomyomas affect 20-30% of women older than 35 years.<sup>2</sup> The radiological diagnosis of classical uterine leiomyomas is straightforward, given their typical imaging features and their common clinical manifestations.

However, leiomyomas occasionally occur with unusual growth patterns or in unusual locations that make their identification more challenging both clinically and radiologically.

Abdominal leiomyomas arise preferentially in perimenopausal females such as the present case. In instances like this whether smooth muscle cells in vessels of anterior abdominal wall and peritoneum react to the extraneous hormonal stimulation to form leiomyoma is yet to be explained. A leiomyoma arising from the parietal layer of peritoneum is so rare that even with modern advances in imaging techniques, its imaging features have seldom been described for preoperative characterization and diagnosis. Among the tumors that are completely resected, however, the rates of recurrence and metastasis are very rare.<sup>17</sup>

While the difficulty in diagnosing our patient compelled us to perform a small laparotomy, laparoscopic operations should be kept in mind in such cases.

## CONCLUSION

A leiomyoma, although commonly seen in the uterus or gastrointestinal tract, can develop *de novo* in areas devoid of myomatous tissues or obvious smooth muscle cells. Abdominal leiomyomas always pose a serious diagnostic dilemma and errors. Whether smooth muscle cells in vessels of peritoneum react to extraneous hormonal stimulation to form a *de novo* leiomyoma is yet to be established. Solitary peritoneal leiomyoma is a smooth muscle tumor that may arise in the peritoneum, in the absence of any uterine leiomyoma. This condition has to be kept in mind while completing the list of differential diagnosis of intra-abdominal tumors.

## REFERENCES

- Ostrzenski A. Uterine leiomyoma particle growing in an abdominal-wall incision after laparoscopic retrieval. *Obstet Gynecol* 1997;89:853-4.
- Fasih N, Prasad Shanbhogue AK, Macdonald DB, Fraser-Hill MA, Papadatos D, Kielar AZ, et al. Leiomyomas beyond the uterus: Unusual locations, rare manifestations. *Radiographics* 2008;28:1931-48.
- Rao LN, Babu SS, Prakash JA, Ram GS, Mohan N. Solitary anterior abdominal wall leiomyoma arising from tubectomy scar. *J Dent Med Sci (IOSR-JDMS)* 2014;13:4-6.
- Al-Wadaani HA. Anterior abdominal wall leiomyoma arising *de novo* in a perimenopausal woman. *Oman Med J* 2012;27:323-5.
- Singh N, Uma S, Bansal B. An isolated peritoneal leiomyoma: A rare entity. *J Gynecol Surg* 2013;29(5):271-3.
- Virchow R. Ueber makroglossie und pathologische neubildung quergestreifter Muskelfasern. *Virchows Arch (Pathol Anat)* 1854;7:126-38.
- Buttram VC Jr, Reiter RC. Uterine leiomyomata: Etiology, symptomatology, and management. *Fertil Steril* 1981;36:433-45.
- Cramer SF, Patel A. The frequency of uterine leiomyomas. *Am J Clin Pathol* 1990;94:435-8.
- Clement PB, Young RH. *Atlas of Gynaecologic Surgical Pathology*. Philadelphia, PA: Saunders Elsevier; 2008.
- Porter KB, Tsibris JC, Nicosia SV, Murphy JM, O'Brien WF, Rao PS, et al. Estrogen-induced guinea pig model for uterine leiomyomas: Do the ovaries protect? *Biol Reprod* 1995;52:824-32.
- Lalor PF, Uribe A, Daum GS. *De novo* growth of a large preperitoneal lipoleiomyoma of the abdominal wall. *Gynecol Oncol* 2005;97:719-21.
- Wada-Hiraike O, Yamamoto N, Osuga Y, Yano T, Kozuma S, Taketani Y. Aberrant implantation and growth of uterine leiomyoma in the abdominal wall after laparoscopically assisted myomectomy. *Fertil Steril* 2009;92:1747.e13-5.
- Myhre-Jensen O. A consecutive 7-year series of 1331 benign soft tissue tumours. Clinicopathologic data. Comparison with sarcomas. *Acta Orthop Scand* 1981;52:287-93.
- Rivière P, Bodin R, Bernard G, Deligne E, Peyromaure M, Ponties JE. [Leiomyoma of the female urethra]. *Prog Urol* 2004;14:1196-8; discussion 1198.
- Ivan D, James L. Leiomyoma. *Anderson's Pathology*. 10<sup>th</sup> ed. St. Louis: Mosby; 1996. p. 2502-3.
- Weiss SW. Smooth muscle tumors of soft tissue. *Adv Anat Pathol* 2002;9:351-9.
- Billings SD, Folpe AL, Weiss SW. Do leiomyomas of deep soft tissue exist? An analysis of highly differentiated smooth muscle tumors of deep soft tissue supporting two distinct subtypes. *Am J Surg Pathol* 2001;25:1134-42.

**How to cite this article:** Apparao K, Ramanachalam C, Kumar KA, Praveen S. A Mysterious Lump in Abdomen a Case Report. *Int J Sci Stud* 2015;2(11):173-176.

**Source of Support:** Nil, **Conflict of Interest:** None declared.



# Bilateral Tarsal Coalition: A Rare Case Report

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## Abstract

Tarsal coalition describes complete or partial union between two or more bones in the midfoot and hindfoot. The most commonly reported tarsal coalitions are calcaneonavicular and talocalcaneal and the remaining coalitions such as calcaneocuboid, talonavicular, cubonavicular being the rare presentations. One such case of tarsal coalition was reported in a 10-year-old boy who had presented with painful swelling of both feet on the medial aspect, anterior to the medial malleolus since 12 months without any history of trauma. On physical examination, a well defined bony swelling was observed on the anterior aspect of the medial malleolus on both feet with mild tenderness on palpation. No limitations to foot movements and absence of muscle stiffness in both feet. X-ray, computerized tomography scan and magnetic resonance imaging revealed fusion of talus and navicular bones suggesting a rare case of talonavicular coalition.

**Key words:** Congenital deformity, Coalition, Talonavicular, Tarsal coalition

## INTRODUCTION

A cluster of seven articulating bones constitutes “Tarsus.” The tarsus articulates with the metatarsus. The hindfoot is formed by talus and calcaneus while the midfoot is formed by cuboid, navicular and cuneiform bones (medial, lateral and intermediate).

### Tarsal Coalition

A tarsal coalition is an aberrant union between two or more tarsal bones and can be classified as osseous (synostosis) or non-osseous (cartilaginous [synchondrosis] or fibrous [syndesmosis]). This union may be complete or partial, and the joints in the hindfoot and midfoot are most commonly affected. The resulting abnormal articulation presents as a non-correctable flat foot, usually during adolescence, leading to accelerated degeneration within adjacent joints.<sup>1</sup> It is fairly common condition, which affects 1% of the population.<sup>2,3</sup> It occurs as isolated congenital anomaly or with other congenital disorders. The most common coalitions are

either talocalcaneal or calcaneonavicular<sup>4,5</sup> and can result in pain, flat foot, the peroneal tendon spasm and tarsal tunnel syndrome.<sup>6</sup> The onset of symptoms related to tarsal coalition normally happens at around 9-17 years old, with a crest frequency happening at 10-14 years old. Genetic cause plays the major role in the tarsal coalition leading to improper formation of the individual tarsal bones during fetal development. Other less common causes of tarsal coalition are infection, arthritis or trauma. Numerous cases of tarsal coalitions have gone unnoticed since this condition is found asymptomatic and also does not lead to any obvious deformities. The symptoms are noted during late childhood or adolescent period as the ossification of the tarsal bones occur during this period. The signs and symptoms vary depending upon the tarsal bones involved. We report a rare case of symptomatic talonavicular coalition not associated with any other congenital bony anomalies that have not been previously described.

## CASE REPORT

A 10-year-old boy was referred by a paediatrician to the Department of Orthopaedics who presented with swelling on the medial aspect, anterior to the medial malleolus since 12 months. The patient reported non-progressive dull aching pain on the swelling for past 1 month. No history of trauma, inflammation, infection or surgeries.

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**Month of Submission :** 12-2014  
**Month of Peer Review :** 01-2015  
**Month of Acceptance :** 01-2015  
**Month of Publishing :** 02-2015

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### Clinical Examination of the Foot and Ankle

On an inspection, there were no flat feet, and no high arched feet was observed, the foot shape was normal. No discoloration, scars or ulcers on both the feet of dorsal and plantar aspects. No callosities were observed. A localized bony prominence was noted on the medial aspect of both feet 1 inch below the medial malleolus anteriorly, and mild tenderness was present on palpation (Figures 1 and 2). The patient was examined while standing and walking. The patient was suggested for X-ray examination.

### Examination of the foot and ankle

Foot movements	Examination	Right side	Left side
Ankle joint	Dorsiflexion	Normal	Normal
	Plantar flexion	Normal	Normal
Subtalar joint	Eversion	Normal	Normal
	Inversion	Normal	Normal
Tibial rotation	Internal rotation	Normal	Normal
	External rotation	Normal	Normal
Inter phalangeal joint	All movements	Normal	Normal
Neurovascular assessment			
Sensations	Light touch	Normal	Normal
	Two point discrimination	Normal	Normal
	Vibrations	Normal	Normal
Reflexes	Ankle	Normal	Normal
Power	Motor strength	5/5	5/5
Arterial pulse	Posterior tibial	Pulsations felt	Pulsations felt
	Dorsalis pedis	Pulsations felt	Pulsations felt
Muscles	Tibialis anterior	Normal	Normal
	Extensor hallucis longus	Normal	Normal
	Extensor digitorum longus	Normal	Normal
Muscles	Posterior tibialis	Normal	Normal
	Flexor digitorum longus	Normal	Normal
	Flexor hallucis longus	Normal	Normal
Special test	Peroneus longus	Normal	Normal
	Thompson test (was performed to find the intactness of achilles tendon)	Normal	Normal
Gait	Swing phase	Normal	Normal
	Stance phase	Normal	Normal

### Investigations

The patient was subjected for X ray both feet antero-posterior and lateral views followed by computerized tomography (CT) scan and magnetic resonance imaging (MRI) both feet. The following findings were noted in X-ray, CT scan and MRI feet.

### On X-ray

Navicular bone is not visualised separately on both sides. Anterior and medial borders of the talus are seen at the site of the clinical swelling on both sides. No bony outgrowth or no focal lesions found. No evidence of fracture or periosteal thickening. Rest of the underlying bones including the tarsals, metatarsals, phalanges appears

normal. Distal end of the tibia and fibula appears normal. Medial and lateral malleolus appears normal. Joint space is normal. Anterior end of the talus is mildly widened

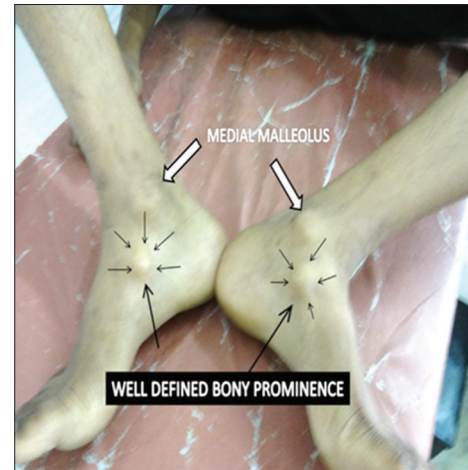


Figure 1: Image showing tender bony protuberance below the medial malleolus



Figure 2: Image showing tender bony protuberance below the medial malleolus (right leg)



Figure 3: X-ray images

and seen articulating with cuneiform bones on both sides (Figures 3 and 4). There is a failure of separation of the navicular bone during intrauterine development, which suggests the diagnosis as talonavicular coalition.

### CT Scan

64 slice of CT on both feet were studied, serial axial section of the foot with sagittal, coronal and three dimensional reconstruction shows fusion of the navicular bone with the talus bone. Anterior end of the talus is mildly widened and seen articulating with cuneiform. Normal trabecular continuity noted extending across the talus on both sides (Figure 5). Antero medial border of the talus is seen at the site of clinical swelling on both sides. No bony outgrowth/

focal lesions. No evidences of osteolytic/osteosclerotic lesion, soft tissue swelling. No evidence of any metallic foreign body.

### MRI Scan

Coronal, axial and sagittal 1.5 T MRI both feet revealed, no evidence of joint effusion, no soft tissue abnormalities, achilles tendon, peroneus longus and brevis, tibialis posterior, flexor digitorumlongus and flexor hallucislongus tendons appear normal. Anterior end of the talus is mildly widened and is seen articulating with cuneiform bones. Normal trabecular and marrow continuity extending across the talus was noted (Figures 6a and b). Antero medial border of the talus is seen at the site of clinical swelling.

## DISCUSSION

The first described congenital fusion of the talus and navicular with fibrous, cartilaginous or osseous tissue uniting the two bones by Anderson in 1879.<sup>7</sup> Earlier the aetiology of tarsal coalition was thought to be resulted from the incorporation of accessory ossicles into the neighbouring major tarsal bones<sup>8</sup> which led later to the discovery of the cause that the anomaly is due to the failure of differentiation of primitive mesenchyme.<sup>9</sup> The exact incidence of talonavicular coalition is not known, but the overall tarsal coalition has been estimated to be 1-2%.<sup>10</sup> The symptoms of these tarsal coalitions are



Figure 4: (a and b) X-ray right and left foot – Lateral view

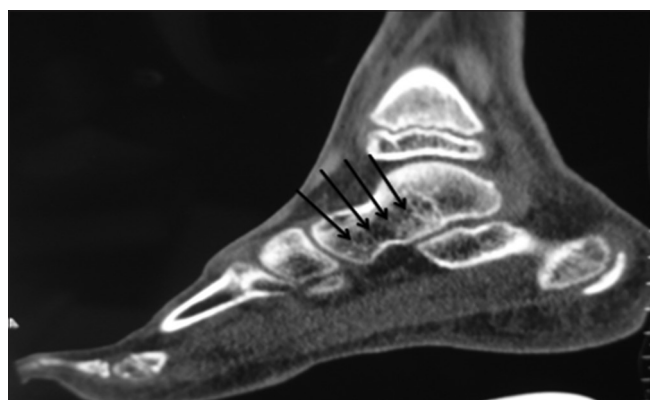


Figure 5: CT scan foot showing normal trabecular continuity

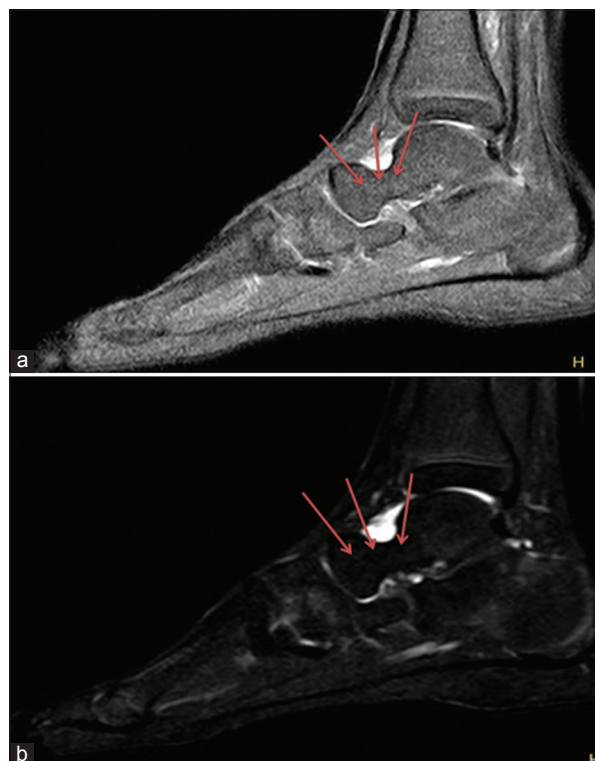


Figure 6: (a and b) Magnetic resonance imaging scan

covering a wide range of symptoms, but most of the tarsal coalitions were asymptomatic<sup>11</sup> and incidentally diagnosed by plain radiographs. Some of the studies David *et al.* proposed that most presentations were bony prominence with foot and ankle pain.<sup>12</sup> Similarly in this case report, the adolescent boy presented with a bony prominence and painful bony swelling since 1 year being the only symptom. Of course, the characteristic radiographic changes will be the absence of well circumscribed navicular or a decrease in talonavicular joint space or rounding of naviculocuneiform joint and beaking of the navicular bone. Similarly in this patient also there was an absence of the navicular bone with beaking which presented as bony prominence and absence of joint space between talus and navicular bone, which suggested the complete fusion of talus and navicular bone. Many studies reported that the coalitions were associated with several orthopaedic anomalies such as symphalangism, clinodactyly, shorter great toe and club foot.<sup>13</sup> In our patient, both the feet were painful with no other congenital bony anomalies and no history of any bony anomalies in the families and relatives. We found normal subtalar movements with X-ray findings showing broad and smooth anterior side of the fused navicular bone without any other restriction of movements like inversion and eversion. However, the CT and MRI finding shows clearly that there is a trabecular and marrow continuity exists across the talus, which is suggestive of talonavicular coalition rather than navicular agenesis. May be the patient will be showing severe signs and symptoms in the later age. We observed a case of talonavicular coalition associated with no other orthopedic anomalies. Though this condition is less likely important clinically than other tarsal coalitions, it sometimes is painful enough for undergoing surgery.

## CONCLUSION

The characteristic radiographic changes observed in a case of talonavicular coalition will be the absence of well circumscribed navicular or a decrease in talonavicular joint space or rounding of naviculocuneiform joint and beaking of the navicular bone. Similarly in this patient also there was an absence of the navicular bone with beaking, which presented as bony prominence and absence of joint space between talus and navicular bone, which suggested the complete fusion of talus and navicular bone. Investigations, including X-ray, CT scan and MRI revealed the fusion of talus and navicular bones suggesting a rare case of talonavicular coalition.

## REFERENCES

1. Zaw H, Calder JD. Tarsal coalitions. *Foot Ankle Clin* 2010;15:349-64.
2. Harris RI, Beath T. Etiology of peroneal spastic flat foot. *J Bone Joint Surg Br* 1948;30B:624-34.
3. Varner KE, Michelson JD. Tarsal coalition in adults. *Foot Ankle Int* 2000;21:669-72.
4. Bohne WH. Tarsal coalition. *Curr Opin Pediatr* 2001;13:29-35.
5. Lahey MD, Zindrick MR, Harris EJ. A comparative study of the clinical presentation of tarsal coalitions. *Clin Podiatr Med Surg* 1988;5:341-57.
6. Crim JR, Kjeldsberg KM. Radiographic diagnosis of tarsal coalition. *AJR Am J Roentgenol* 2004;182:323-8.
7. Challis J. Hereditary transmission of talonavicular coalition in association with anomaly of the little finger. *J Bone Joint Surg Am* 1974;56:1273-6.
8. Mosier KM, Asher M. Tarsal coalitions and peroneal spastic flat foot. A review. *J Bone Joint Surg Am* 1984;66:976-84.
9. Leonard MA. The inheritance of tarsal coalition and its relationship to spastic flat foot. *J Bone Joint Surg Br* 1974;56B:520-6.
10. Resnik CS, Aiken MW, Kenzora JE. Case report 780. Fracture of talar beaks in tarsal coalition. *Skeletal Radiol* 1993;22:214-7.
11. Frost RA, Fagan JP. Bilateral talonavicular and calcaneocuboid joint coalition. *J Am Podiatr Med Assoc* 1995;85:339-41.
12. David DR, Clark NE, Bier JA. Congenital talonavicular coalition. Review of the literature, case report, and orthotic management. *J Am Podiatr Med Assoc* 1998;88:223-7.
13. Doyle SM, Kumar SJ. Symptomatic talonavicular coalition. *J Pediatr Orthop*. 1999;19:508-10.

**How to cite this article:** Ganesan E, Arumugam B, Rathinavel MS. Bilateral Tarsal Coalition: A Rare Case Report. *Int J Sci Stud* 2015;2(11):177-180.

**Source of Support:** Nil, **Conflict of Interest:** None declared.



# Amyand's Hernia in 1 Month Old Child: A Rare Case Report

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## Abstract

Amyand's hernia is presence of the appendix inside the sac of the hernia with or without inflammation. This occurs mostly in inguinoscrotal hernia and rarely in femoral, umbilical and spigelian hernia. The symptoms can vary from acute abdominal pain incarceration, strangulation and perforation. Together Amyand's hernia constitute <1% cases encountered as obstructed hernia. Final diagnosis is made intraoperatively. A 1-month-old male child with inflamed right scrotal swelling was referred to us from a peripheral center. Intra operatively, the hernial sac contained inflamed appendix, caecum and terminal ileum. The appendectomy and herniotomy were done, and the patient showed uneventful recovery.

**Key words:** Amyand's, Appendix, Hernia, Infant

## INTRODUCTION

The presence of the vermiform appendix, whether inflamed or not inside a hernia sac, is called as Amyand's hernia.<sup>1</sup> This rare condition constitutes 1% of all inguinal hernia and inflamed appendix in <0.1% cases. In pediatric patients, it can be mistaken for incarcerated/strangulated hernia, torsion of the testis or scrotal abscess.<sup>2</sup> It is named after Claudus Amyand who did first appendectomy in an 11-year-old boy who presented with a discharging fecal fistula in right inguinoscrotal region.<sup>3</sup>

## CASE REPORT

A 1-month-old infant was brought by parents to emergency ward with complaints of swelling with reddish discoloration in right side of scrotum since 1 day, excessive crying since 1 day, poor feeding with vomiting since 1 day, fever since 1 day, low grade, constantly present.

Baby was full term born by normal vaginal delivery with a weight of 3 kg. On examination, baby was normal pink colored, eutermic and active with normal weight and developmental milestones. The general examination and routine blood investigations were within normal limits.

On abdominal examination, distention present and bowel sounds were absent. There was reddish discoloration of the skin with swelling present in the right side of the scrotum extending up to level of superficial ring. Rugosity of scrotal skin was present. Temperature of scrotum was raised. Left testis was normally palpable, but right testis was not separable from cord structures. Transillumination test was positive.

## Management

Baby was kept nil by mouth and was taken for emergency surgery. An inguinoscrotal incision was given of about 3 cm in length at the level of superficial ring, and parallel to the inguinal ligament and external ring was opened up. Dissection was extended to deep ring, and sac was lifted with cord structures. The sac was separated from cord structures by blunt dissection. The sac was then opened up which showed inflamed appendix of size around 5 cm with caecum and terminal ileum (Figure 1). The inflamed appendix was ligated at the base, and appendectomy was

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**Month of Submission :** 12-2014  
**Month of Peer Review :** 01-2015  
**Month of Acceptance :** 01-2015  
**Month of Publishing :** 02-2015

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done (Figure 2). The remaining contents of the sac were repositioned in the peritoneal cavity, and herniotomy was done. On 7<sup>th</sup> post-operative day, sutures were removed, and the patient was discharged with advice to attend follow-up in surgical outpatient department.

## DISCUSSION

Obstructed inguinal hernia is a surgical emergency. In this case of Amyand's hernia inflamed appendix was present in the inguinal hernia without abdominal sepsis, so this was Type 2 Amyand's hernia as per Lasanoff and Basson classification.<sup>4</sup>

### Classification of Amyand hernias, after Losanoff and Basson

Classification	Description	Surgical management
Type 1	Normal appendix within an inguinal hernia	Hernia reduction, mesh repair, appendicectomy in young patients
Type 2	Acute appendicitis within an inguinal hernia, no abdominal sepsis	Appendicectomy through hernia, primary repair of the hernia, no mesh
Type 3	Acute appendicitis within an inguinal hernia, abdominal wall, or peritoneal sepsis	Laparotomy, appendicectomy, primary repair of the hernia, no mesh
Type 4	Acute appendicitis within an inguinal hernia, related or unrelated abdominal pathology	Manage as types 1-3 hernia, investigate or treat second pathology as appropriate

For such cases, appendicectomy with herniotomy with inguinal canal repair is advised.<sup>4</sup>

Appendicectomy can be differed if there is no inflammation.<sup>5</sup> In pediatric and adolescent population in which high incidence of appendicitis, appendicectomy is recommended.<sup>6-9</sup> However, appendix can be spared in middle aged and elderly patients. For pediatric patients reduction of content and herniotomy and closure without mesh, repair is preferred.<sup>3,4,6,9,10</sup> Hernioplasty with mesh is avoided in cases with an inflamed appendix and also in cases of perforated appendix and sepsis because of increased chances of mesh rejection.<sup>4,8,9</sup> Post-operative follow-up is mandatory to prevent recurrence.

## CONCLUSION

Amyand's hernia should always be considered in the differential diagnosis of congenital inguinal hernia in infants. Whenever intra-operatively an appendix is found in the hernia sac, the decision of further appendicectomy

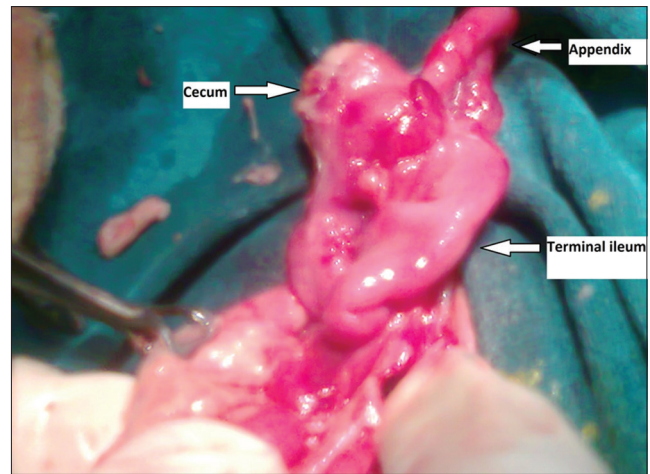


Figure 1: Hernial sac containing appendix cecum and terminal ileum

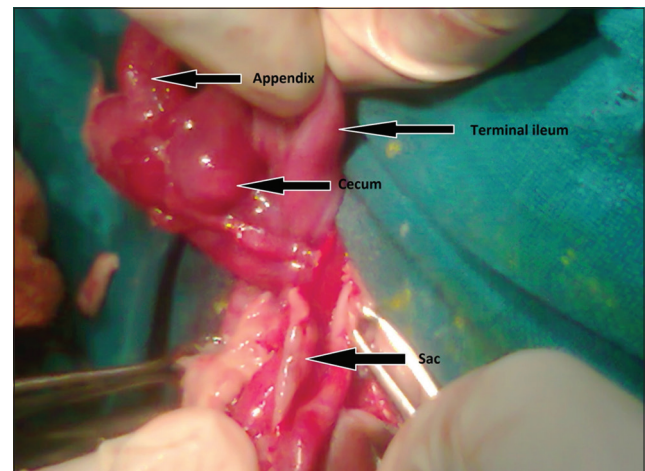


Figure 2: Intraoperative photograph showing Amyand's hernia

should be guided by presence or absence of inflammation of the appendix. Early intervention can lead to good results in patients of Amyand's hernia.

## REFERENCES

1. Amyand C. Of an inguinal rupture, with a pin in the appendix coeci, incrusted with stone; and some observations on wounds in the guts. *Phil Trans R Soc* 1736;39:329. *J Paediatr Surg* 1991;265-83.
2. Hutchinson R. Amyand's hernia. *J R Soc Med* 1993;86:104-5.
3. Meinke AK. Review article: Appendicitis in groin hernias. *J Gastrointest Surg* 2007;11:1368-72.
4. Losanoff JE, Basson MD. Amyand hernia: A classification to improve management. *Hernia* 2008;12:325-6.
5. Tycast JF, Kumpf AL, Schwartz TL, Coln CE. Amyand's hernia: A case report describing laparoscopic repair in a pediatric patient. *J Pediatr Surg* 2008;43:2112-4.
6. Upadhyaya VD, Kumar V, Srivastava P, Gangopadhyaya AN. Amyand's hernia in infant: A rare entity. *Kathmandu Univ Med J (KUMJ)* 2009;7:143-4.
7. Psarras K, Lalountas M, Baltatzis M, Pavlidis E, Tsitlakidis A, Symeonidis N, et al. Amyand's hernia - A vermiform appendix presenting

- in an inguinal hernia: A case series. J Med Case Rep 2011;5:463.
8. Pandey V, Gangopadhyay AN, Gupta DK, Sharma SP. Gangrenous Amyand's hernia in neonate: A great clinical Masquerader. Open J Pediatr 2013;3:364-5.
  9. Murugesan MS, Rajasekaran MS. Amyand hernia. IOSR J Dent Med Sci 2013;6:20-4.
  10. Sandhu A, Liaqat N, Nayyar SI, Faryal R, Shafique S. Amyand's hernia with perforated appendix in neonate. APSP J Case Rep 2014;5:34.

**How to cite this article:** Sharma P, Dixit S, Batra R, Vadher R, Sharma S. Amyand's Hernia in 1 Month Old Child: A Rare Case Report. Int J Sci Stud 2015;2(11):181-183.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Gorham's Disease in Distal Femur: A Rare Case Report

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## Abstract

Gorham's disease is a rare musculoskeletal disorder which causes progressive osteolysis and is characterized by massive bone destruction due to non-malignant proliferation of vascular elements along with a great number of osteoclasts. Only about 200 cases have been reported ever since Gorham first described it. Precise etiology of the disease is unknown. It can involve male or female of any age, but usually diagnosed before 40 years of age. Bones formed by intramembranous ossifications are commonly involved. Femur involvement was seen in 24 cases only. Our case was a 31 year male who presented as supracondylar fracture of the femur. Diagnosis is by exclusion. Radiological and histological findings confirm the diagnosis. Spontaneous regression has been reported. No standard therapy is available. Surgery and radiotherapy are the standard modalities of treatment. Recently, chemotherapy with anti-osteoclastic and angiogenesis inhibitors are used.

**Key words:** Gorham's disease, Musculoskeletal disorder, Osteolysis

## INTRODUCTION

Gorham's disease is a rare osteolytic musculoskeletal disorder reported in only 200 cases. It was first described by Gorham *et al.*<sup>1</sup> Occurs at any age, but comm only <40 years with no sex predilection.<sup>2</sup> Exact etiology is unknown. Usually presents as progressively painful swelling or as a pathological fracture.<sup>3</sup> Any bone, but usually of pelvic and shoulder girdle are involved. Exclusive femur involvement is rare and was seen in 24 cases.<sup>4</sup> Diagnosis is usually difficult and is by clinical correlation, X-ray findings, exclusion of other causes and confirmed by histopathology. We are reporting a middle aged male, who presented with pathological fracture of the distal femur.

and swelling in the lower part of right thigh and was not able to stand up after injury. On physical examination, there was swelling, tenderness and deformity in the lower third of right thigh. No distal neuro-vascular deficit was found.

X-ray right femur with knee showed displaced supracondylar fracture of right femur with intra-articular extension (Figure 1). Serum calcium, phosphorus, alkaline phosphatase, prostrate specific antigen, abdomino-pelvis



**Figure 1:** X-ray right knee - AP/lateral view of the patient showed displaced supracondylar fracture of the right femur

## CASE REPORT

A 31-year-old male was admitted to our hospital with a history of trivial injury following which he developed pain

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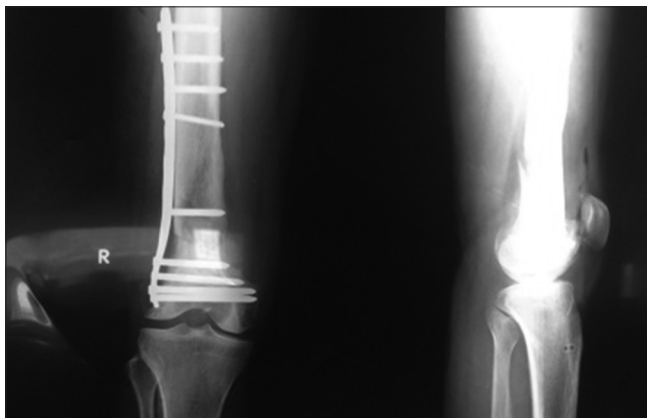
Month of Submission : 12-2014  
Month of Peer Review : 01-2015  
Month of Acceptance : 01-2015  
Month of Publishing : 02-2015

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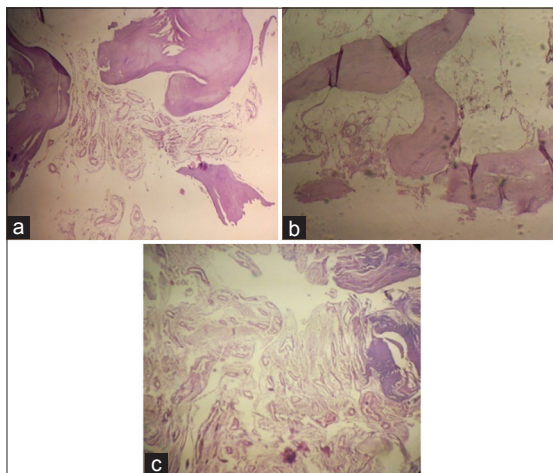
sonography and other basic parameters were within normal limits.

Probable diagnosis was displaced supracondylar fracture of right femur with intra-articular extension and open reduction, and internal fixation (ORIF) was planned. Under spinal anesthesia, the fracture site was exposed and an intra-operative finding of excavated, soft, friable bone with lytic lesion, with an excess amount of oozing from bone ends led to the suspicion of a pathological lesion. Hence, biopsy was taken from the diseased location and sent for histopathology. ORIF was done, and the fracture was fixed with dynamic condylar plate osteosynthesis (Figure 2). Post-operative period was uneventful.

Histopathologic examination showed spicules of bone (Figure 3a) with fatty marrow extending into fibrous connective tissue (Figure 3b). Many blood vessels were seen amidst the fibrous tissue. There was no intervening osteoclastic activity (Figure 3c). The picture was consistent with the diagnosis of Gorham's disease.



**Figure 2: Fracture fixed with dynamic condylar plate osteosynthesis**



**Figure 3: (a) Histological appearance of the specimen from the patient showed bony spicules, (b) with fatty marrow, (c) and angiogenesis amidst fibrous tissue**

## DISCUSSION

Gorham's disease was first reported in 1838 by Jackson.<sup>5</sup> In 1955, Gorham and stout described the clinical and pathological manifestations of the disease as an osteolytic process. It is characterized by a vascular and sometimes lymphatic proliferation along with osteoclasts leading to bone resorption and replacement by fibrous and non-neoplastic vascular tissue. It is a rare disease, and only about 200 cases are reported.

Any appendicular or axial skeletal bone can be involved, but preference is for those formed by intramembranous ossifications such as the pelvic and the shoulder girdle. The disease process is usually monostotic, but polyostotic involvement occasionally occurs. Approximately, 40 cases have been reported with involvement of the upper extremity, with only about 24 cases affecting the femur exclusively. Richard in 1937, first reported a case with exclusive femur involvement.

Clinical manifestations vary with the site of the lesion. Some cases present with an abrupt and some with insidious onset of pain, swelling, restriction of movements and weakness of the affected limb. In our case, acute pain and limitation of movements due to pathologic fracture was the presenting feature.

The eponyms are vanishing bone disease, phantom bone disease, disappearing bone disease, idiopathic massive osteolysis, massive osteolysis, progressive massive osteolysis or morbus Gorham-Stout disease.<sup>6</sup>

Etiopathogenesis is unknown. There is no evidence of genetic transmission. Gorham suggested that trauma could initiate angiogenesis which leads to the local increase in blood flow with resultant stasis and increased pH, thus stimulating bone resorption. Devlin *et al.* concluded that increased osteoclastic activity (interleukin 6 [IL-6] increased up to 7 times) to be the causative factor.<sup>7</sup> Hirayama related cellular and humoral mechanism for osteoclastic activity as he observed elevated thyroid T-cell activity and calcitonin.<sup>8</sup> Moller *et al.* showed evidence that increased number of stimulated osteoclasts to be the cause for osteolysis. Dickson *et al.* on acid phosphatase cytochemistry suggested involvement of mononuclear phagocytes, multi-nucleated osteoclasts and vascular endothelium (macrophage colony stimulating factor and receptor activated nuclear factor KB ligand) in bone resorption.<sup>9</sup>

Histopathology of the involved bone shows a non-malignant proliferation of thin-walled vessels; may be capillary, sinusoidal or cavernous. In late stages, massive osteolysis with replacement of the osseous tissue by fibrous tissue is seen.



The disease can spread from one location to another and is not restricted by joints. This results in regional osseous destruction. Complications include chylothorax, pericardial and pleural effusions due to the extension from the scapula, ribs or vertebral involvement.<sup>10</sup> This can lead to respiratory failure and death. Rarely, infection of bone and septic shock can occur. Paraplegia can occur in patients with vertebral involvement.

Diagnosis is usually by exclusion. All other causes of osteolysis like metabolic, infections, endocrine, immunologic or malignant conditions should be ruled out. The standard laboratory blood tests are usually within normal limits. Serum alkaline phosphatase may be elevated slightly. In the study of radiographic findings in patients with Gorham's disease by Resnick, found radiolucent foci in the intramedullary or subcortical regions in the initial stages. Later stages showed progressive atrophy, dissolution, fracture, fragmentation, disappearance of portion of bone with tapering of the remaining bone and soft tissue atrophy.<sup>11</sup> Radio-isotope bone scan and magnetic resonance imaging (MRI) results are variable. Radioisotope bone scan may show increased vascularity initially, and later decreased uptake. T1-weighted-spin echo MRI may show uniformly low signal intensity while T2-weighted-spin echo images show increased signal intensity in the affected bones.

No specific treatment is available. Natural history and prognosis are unpredictable. Spontaneous regression is observed in some patients. In general, patients with visceral and spinal involvement have a poor prognosis.

Aim of the treatment is to prevent osteoclastic activity. Currently, chemotherapy with angiogenesis inhibitors like alpha-2b interferon, which also prevents IL-6 production and anti-osteoclastic agents like bisphosphonates are available. Both have shown only limited success. Surgery and radiotherapy remain the main stay of treatment.

Surgical management includes resection of the lesion and reconstruction with bone grafts or prosthesis in those with monostotic lesion. Bone grafts may also be affected by the disease. For those with multiple bone involvement, radiation therapy has been used successfully.

## CONCLUSION

Though varied treatment modalities are put forth, no specific treatment is enforced, due to the rarity of the disease. In our case of monostotic involvement, fracture fixation was done and was advised regular follow-up.

## REFERENCES

1. Gorham LW, Wright AW, Shultz HH, Mazon FC Jr. Disappearing bones: A rare form of massive osteolysis; report of two cases, one with autopsy findings. *Am J Med* 1954;17:674-82.
2. Patel DV. Gorham's disease or massive osteolysis. *Clin Med Res* 2005;3:65-74.
3. Gorham LW, Stout AP. Massive osteolysis (acute spontaneous absorption of bone, phantom bone, disappearing bone); its relation to hemangiomatosis. *J Bone Joint Surg Am* 1955;37-A:985-1004.
4. Baba AN, Bhat YJ, Paljor SD, Nazir A, Khan NA. Gorham's disease of femur. *Indian J Orthop* 2011;45:565-8.
5. Jackson JB. A boneless arm. *Boston Med Surg J* 1838;18:368-9.
6. Campbell J, Almond HG, Johnson R. Massive osteolysis of the humerus with spontaneous recovery. *J Bone Joint Surg Br* 1975;57:238-40.
7. Devlin RD, Bone HG 3<sup>rd</sup>, Roodman GD. Interleukin-6: A potential mediator of the massive osteolysis in patients with Gorham-Stout disease. *J Clin Endocrinol Metab* 1996;81:1893-7.
8. Hirayama T, Sabokbar A, Itonaga I, Watt-Smith S, Athanasou NA. Cellular and humoral mechanisms of osteoclast formation and bone resorption in Gorham-Stout disease. *J Pathol* 2001;195:624-30.
9. Dickson GR, Mollan RA, Carr KE. Cytochemical localization of alkaline and acid phosphatase in human vanishing bone disease. *Histochemistry* 1987;87:569-72.
10. Tie ML, Poland GA, Rosenow EC 3<sup>rd</sup>. Chylothorax in Gorham's syndrome. A common complication of a rare disease. *Chest* 1994;105:208-13.
11. Resnick D. Osteolysis and chondrolysis. In: Resnick D, editor. *Diagnosis of Bone and Joint Disorders*. 4<sup>th</sup> ed., Vol. 5, Ch. 89. Philadelphia, Pennsylvania, U.S.A.: W.B. Saunders Company; 2002. p. 4920-44.

**How to cite this article:** Mohapatra A, Mallaya PU, Poulouse PJ, Raj KK. Gorham's Disease in Distal Femur: A Rare Case Report. *Int J Sci Stud* 2015;2(11):184-186.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Haim–Munk Syndrome: A Rare Genodermatosis

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## Abstract

Haim–Munk syndrome (HMS) is rare autosomal recessive disorder, clinically characterized by severe early periodontitis, palmoplantar hyperkeratosis, arachnodactyly, acro osteolysis, pes planus and onychogryphosis. These patients have severe, unresponsive periodontal disease and become edentulous at early age of life. Papillon–Lefevre syndrome (PLS), which looks similar to the HMS should be differentiated from the latter since treatment approach is different for both. This case report details about the cardinal features of HMS and explains how it differs from PLS. The case report aims to increase awareness of this condition among the health care professionals, and hence that early recognition and referral to periodontologist paves way to preserve the teeth.

**Key words:** Arachnodactyly, Genodermatosis, Haim–Munk syndrome, Keratoderma, Periodontitis

## INTRODUCTION

Palmoplantarkeratoderma, a rare genodermatosis and early onset periodontal disease are common to both Haim–Munk syndrome (HMS) and Papillon–Lefevre syndrome (PLS).<sup>1</sup> The presence of additional important features such as arachnodactyly, acroosteolysis, pesplanus (flat foot) and onychogryphosis (abnormal curvature of nails) suggests HMS.<sup>2</sup> These additional features go unnoticed until a thorough general physical examination is done and HMS were commonly mistaken for PLS or pre pubertal periodontitis.<sup>3</sup> Since the treatment modality for these additional features differ for aforesaid conditions, accurate diagnosis of the condition remains vital.

## CASE REPORT

A 12-year-old boy, first born of 3<sup>rd</sup> degree consanguineous parentage, was brought to pediatric outpatient department with complaints of thick, dry skin in palms and soles with

recurrent skin infections since 5 years of age. He also had bleeding gums on and off with multiple tooth loss since 5 years of age.

History revealed that he had normal deciduous teeth eruption by 8 months of age then followed by early shedding at 4 years of age. Eruption of permanent teeth was unaffected with premature shedding of the same, which started at 11 years of age. Till then he had recurrent bleeding of gums during brushing and tooth loss. He took native treatment for both of his dental and dermatological problems. He is a mediocre school going student and tallest among his peer groups. His younger sibling is 9 years old and he was apparently normal. No similar illness in the family. Drug history was not contributory.

On general physical examination, he is thin built boy weighing 36 kg (expected is 39 kg), height of 160 cm (expected is 150 cm), upper segment to lower segment ratio is 0.94, arm span is 152 cm, mid parental height is 168 cm, tanner staging suggests Stage 2 sexual maturity rates. He had well demarcated, erythematous, hyperkeratotic, scaly plaques and fissures in both palms and soles. The lesions on the soles of the foot extend to the lateral malleolus and similar lesion on the interphalangeal joints of the hand (Figure 1). He had signs of arachnodactyly (Figure 2) - Walkers and Steinberg sign (Figure 3) and bilateral flexible pesplanus. He had normal appearing hair and finger/toe nails.

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www.ijss-sn.com

**Month of Submission :** 12-2014  
**Month of Peer Review :** 01-2015  
**Month of Acceptance :** 01-2015  
**Month of Publishing :** 02-2015

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On intra oral examination his oral hygiene was poor, gingiva was inflamed, soft and receding. The gum readily bleeds on probing. He had loss of central

lower incisor, and other teeth were extremely mobile (Figure 4). His other system examinations were normal, particularly searched for cardiac murmur/clicks and hepatosplenomegaly/generalised lymphadenopathy.

On further investigations, his complete blood count and peripheral smear suggested nutritional anemia. His erythrocyte sedimentation rate, bleeding time, clotting time, serum calcium was within normal limits. X-ray of both hands with wrist suggested bone age (Greulich and Pyle atlas) of 12 years, metacarpal index of 9.4 and acroosteolysis (Figure 5).

Thus, severe periodontal disease in a boy coming from 3<sup>rd</sup> degree consanguineous family with the background of these dermato-skeletal features, the diagnosis of HMS was made. The boy was referred to periodontologist, where he was treated with tooth extraction, (0.2%) chlorhexidine mouth rinse and detailed advice on oral hygiene methods.



**Figure 1:** Scaly, hyperkeratotic lesions on the hand and foot



**Figure 2:** Arachnodactyly (elongation of fingers and toes)



**Figure 3:** Signs of arachnodactyly Walkers and Steinberg sign



**Figure 4:** Loss of central lower incisors and receding gums



**Figure 5:** X-ray both hand with wrist – showing elongated metacarpals with metacarpal index of 9.4 (black arrow) and acroosteolysis (white arrow)



Temporary removable prosthodontia was also suggested to him. The dermatologists started him on oral acetretin.

## DISCUSSION

In 1965, Dr. Haim (dermatologist) and Dr. Munk (Radiologist) described a rare genodermatosis in four siblings of cochin from India.<sup>4</sup> It is a rare autosomal recessive condition caused due to missense mutation in lysosomal protease cathepsin C gene on chromosome 11q14.1-q143, which is expressed in epithelial regions like soles, palms and oral gingiva. The enzyme lysosomal protease maintains a delicate balance between the commensals of the oral cavity and immune system by protein degradation. Similar mutation is also seen in PLS and pre pubertal periodontitis.<sup>5</sup> The HMS is characterized by Type IV palmoplantar keratoderma, unresponsive severe early periodontitis, arachnodactyly, acroosteolysis, pesplanus and onychogryphosis.<sup>6</sup>

The first major feature of HMS is palmoplantar keratoderma. It is a group of keratinization disorder, clinically described by abnormal thickening and erythematous keratotic scales on the skin of palms and soles. They usually begin at 3-5 years of age and worsen in winter. Similar lesions can also be found in eyelid, cheeks, axilla and thighs. The nails show fissuring and the hair remain normal.<sup>7</sup> The second feature is severe periodontitis, classically characterized by a cycle of gingivitis (inflamed, edematous, bleeding gingiva) followed by periodontitis (deepening of perialveolar pockets and loss of alveolar bones), occurring during eruption of temporary teeth and also subsequently permanent teeth eruption. This inflammation subsides only on complete exfoliation of the teeth.

The other minor features are, arachnodactyly (long pointed finger and toes) clinically identified with positive wrist/walkers sign, thumb/Steinberg sign and radiologically by metacarpal index value of more than 8.4 in men and 9.2 in women.<sup>8</sup> Acro-osteolysis (resorption of the terminal bone of fingers and toes) are also seen in hyperparathyroidism, dermatomyositis, scleroderma and psoriatic arthritis.<sup>9</sup> Pesplanus or flat foot, occurs due to loss of medial longitudinal arch of foot, they are distinguished as rigid and flexible based on alignment of plantar arch on non-weight bearing views.<sup>10</sup> Onychogryphosis (Ram's horn nail) is hypertrophy of nails producing claw like appearance.

At history level, this reported case resembled PLS, but after general physical examination the presence of arachnodactyly, flexible pesplanus and X-ray feature of acro-osteolysis pointed us toward the diagnosis of HMS. Though onychogryphosis is not present in our case, and it will take time for them to appear.

It is important to differentiate between these two syndromes since the approach for the treatment differs in both. For instance, the periodontium is less severely affected in HMS than compared with PLS.<sup>11</sup> Thus, early intervention can retain teeth for longer in HMS and other skeletal deformities may need intervention when they become symptomatic e.g., pesplanus.

## CONCLUSION

The syndrome comprises of features common to both dermatology and dentistry, but they usually present to pediatricians, as in our case. Hence, awareness about this condition is necessary for the members of these fields to initiate early multi-disciplinary treatment modalities thus preventing the precocious loss of dentition. Also to press more on the importance of meticulous general physical examination in differentiating between HMS and PLS, both of which may look similar.

## REFERENCES

1. Hart TC, Stabholz A, Meyle J, Shapira L, Van Dyke TE, Cutler CW, *et al.* Genetic studies of syndromes with severe periodontitis and palmoplantar hyperkeratosis. *J Periodontol Res* 1997;32:81-9.
2. Erciyas K, Inaloz S, Erciyas AF. Periodontal manifestations in a patient with haim-munk syndrome. *Eur J Dent* 2010;4:338-40.
3. Pahwa P, Lamba AK, Faraz F, Tandon S. Haim-Munk syndrome. *J Indian Soc Periodontol* 2010;14:201-3.
4. Haim S, Munk J. Keratosis palmo-plantaris congenita, with periodontosis, arachnodactyly and a peculiar deformity of the terminal phalanges. *Br J Dermatol* 1965;77:42-54.
5. Toomes C, James J, Wood AJ, Wu CL, McCormick D, Lench N, *et al.* Loss-of-function mutations in the cathepsin C gene result in periodontal disease and palmoplantar keratosis. *Nat Genet* 1999;23:421-4.
6. Puliyl JM, Sridharan Iyer KS. A syndrome of keratosis palmo-plantaris congenita, pes planus, onychogryphosis, periodontosis, arachnodactyly and a peculiar acro-osteolysis. *Br J Dermatol* 1986;115:243-8.
7. Sybert VP, Dale BA, Holbrook KA. Palmar-plantar keratoderma. A clinical, ultrastructural, and biochemical study. *J Am Acad Dermatol* 1988;18:75-86.
8. Walker TM. The normal metacarpal index. *Br J Radiol* 1979;52:787-91.
9. Miller TT. Bone tumors and tumorlike conditions: Analysis with conventional radiography. *Radiology* 2008;246:662-74.
10. Staheli LT, Chew DE, Corbett M. The longitudinal arch. A survey of eight hundred and eighty-two feet in normal children and adults. *J Bone Joint Surg Am* 1987;69:426-8.
11. Hart TC, Hart PS, Michalec MD, Zhang Y, Firatli E, Van Dyke TE, *et al.* Haim-Munk syndrome and Papillon-Lefèvre syndrome are allelic mutations in cathepsin C. *J Med Genet* 2000;37:88-94.

**How to cite this article:** Kumar ND, Balaji S, Revathy K, Kumaran AA, Ragavendiran VD. Haim–Munk Syndrome: A Rare Genodermatosis. *Int J Sci Stud* 2015;2(11):187-189.

**Source of Support:** Nil, **Conflict of Interest:** None declared.



# Scrub Typhus Pneumonia – A Forgotten Entity in Children: Case Report

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## Abstract

Scrub typhus fever is widely reported in various parts of India. Rickettsial infections including scrub typhus are often missed due to non-specific presentation of its illness, limited knowledge, and awareness among clinicians and poor diagnosis facilities. It should be suspected in any child with fever more than 5 days with rash, edema, hepatosplenomegaly, lymphadenopathy, eschar, and tick bite or tick exposure. Pulmonary involvement of scrub typhus includes atypical pneumonia to serious cases showing dense airspace consolidation, pleural effusion, and acute respiratory distress syndrome. Only a few cases of scrub typhus pneumonia are reported in children. We report a 5-year-old child who presented with pneumonia involving both lungs and unilateral effusion who promptly responded with azithromycin and doxycycline.

**Keywords:** Child, Leukopenia, Pneumonia, Rickettsial, Scrub typhus

## INTRODUCTION

Scrub typhus caused by *Orientia tsutsugamushi* transmitted to the humans by the larval mite of the family Trombiculidae.<sup>1</sup> Scrub typhus may cause serious complications in several organs which include septic shock, myocarditis, pneumonia, acute respiratory distress syndrome, renal failure, meningoencephalitis, and hepatitis.<sup>2</sup> Among chest manifestation of scrub typhus presence of pneumonia indicates severe disease.<sup>3</sup> We present a child with bilateral pneumonia and unilateral effusion who was diagnosed to have scrub typhus infection and had a favorable outcome with appropriate antibiotics.

## CASE REPORT

A 5-year-old male child was brought to the outpatient department with the complaints of fever, cough of 1-week

duration and rapid breathing of 1 day. The mother gives a history of mild periorbital puffiness of 1-day duration. His urine output was normal. On examination, the child was sick looking, febrile, vitals: Heart rate – 122/min, respiratory rate – 42/min with minimal intercostal and subcostal retraction with oxygen saturation in room air – 92% (Figure 1). Blood pressure and capillary filling time were within normal limits. Chest examination revealed bilateral crepitations in both lung fields. Child also had firm liver 3 cm below right costal margin. A provisional diagnosis of acute bacterial pneumonia was made; investigations were sent and were started on injection ceftriaxone. His blood investigations showed low total count (4200 cells/mm<sup>3</sup>) with 60% lymphocyte and low platelet count (1.28 lakh), hematocrit was 33%, urine albumin was 2 plus, serum glutamic-oxaloacetic transaminase 189 IU, serum glutamic-pyruvic transaminase – 58 IU, serum sodium – 132 mEq/L, and serum albumin – 2.8 mg %. X-Ray chest showed ill-defined opacities in the right middle and lower zone and left lower zone with obliteration of costophrenic angle on the left side (Figure 2). In view of both leukopenia and thrombocytopenia with raised liver enzymes, a possibility of co-infection with dengue was thought, but non-structural protein 1, Immunoglobulin G (IgG) and IgM were negative. Ultrasonography abdomen showed hepatomegaly with no gall bladder wall edema or ascites. Child continued

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Month of Submission : 12-2014

Month of Peer Review : 01-2015

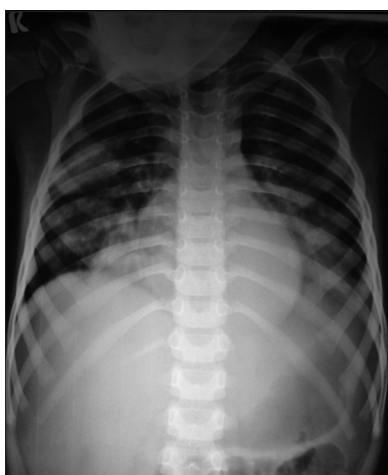
Month of Acceptance : 01-2015

Month of Publishing : 02-2015

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**Figure 1: The sick child receiving oxygen**

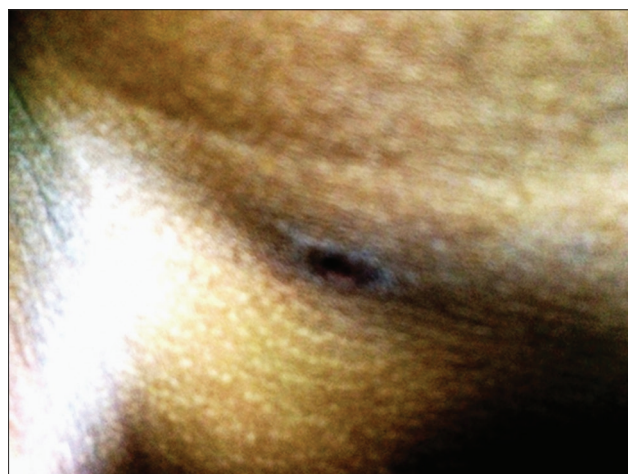


**Figure 2: X-ray chest showing ill-defined opacities in bilateral lung fields with minimal left-sided pleural effusion**

to have fever spikes with increasing tachypnea and lung findings. His repeat counts showed a further drop in the total count to 2800 cells/mm<sup>3</sup> and platelet to 83,000. Blood culture showed no growth. A possibility of scrub typhus pneumonia was thought and on careful examination a small eschar of <5 mm was noted in right inguinal region (Figure 3). Weil–Felix was strongly positive to OXK strain of *Proteus mirabilis* and enzyme-linked immunosorbent assay (ELISA) test for IgM scrub typhus was also positive. Child was started with injection azithromycin despite which fever was persistent so T. doxycycline was added for which child responded promptly. Doxycycline was continued for 5 days, and thereby child became afebrile and respiratory distress settled.

## DISCUSSION

The clinical features of scrub typhus are often vague, and common symptoms include fever, body pains, headache, cough mostly non-productive and gastrointestinal disturbances. In children, affected symptoms may vary and can include two or more systems.<sup>4</sup> The



**Figure 3: Eschar buried in the right inguinal region**

chigger bite at the site of attachment may result in an eschar which looks like a cigarette burn and the lesion is most commonly noted in the children in lower limbs as they tend to play in bushy areas.<sup>5</sup> Similar to our case where eschar was noted in the inguinal region. The other important findings include generalized lymphadenopathy, (80-90%) of patients prominent in axillae, then in the neck and inguinal areas, maculopapular rashes more in non-exposed areas, hepatomegaly, splenomegaly and conjunctival congestion.<sup>6</sup> Scrub typhus causes lung and pleural involvement which includes pneumonia, interstitial pneumonitis, pleural effusion pulmonary edema, and life-threatening pulmonary hemorrhage.<sup>7</sup> The present case had bilateral pneumonia with minimal effusion on the left side. No single, specific laboratory parameter is available for early diagnosis of Rickettsial disease but some positive laboratory clues include normal to low leukocyte count with increase in immature to mature cell ratio, hyponatremia, thrombocytopenia and mildly elevated transaminases.<sup>8</sup> Serological methods are the mainstay for diagnosis of scrub typhus.<sup>9</sup> However, it is positive only after 5-7 days and hence cannot be diagnosed early. Due to the non-availability of other serological tests in India. Weil–Felix test is widely used despite its low sensitivity and specificity.<sup>10</sup> Immunofluorescent assay is the gold standard for diagnosis but due to its non-availability, IgM ELISA if available has better sensitivity and specificity.<sup>11</sup> In this case, Weil–Felix test is strongly positive for OXK along with IgM ELISA test positive for scrub typhus. The common chest radiographic abnormalities noted include non-specific lung infiltrates with predilection to lower zone, diffuse bilateral areas of reticulonodular opacity to Hilar lymph node enlargement.<sup>12</sup> Early administration of anti-Rickettsial antimicrobials is the key to prevent complications and reduces the mortality associated with this disease. Doxycycline is the drug of choice; it is continued for 3 days subsiding of fever or minimum of 5-7 days.

Other antibiotics which are effective includes rifampin, chloramphenicol, macrolides, and fluoroquinolones.<sup>11</sup>

## CONCLUSION

Apart from viral and bacterial causes of pneumonia in children, Rickettsial pneumonia in children should be considered as a differential diagnosis especially when the child is having low to normal count with thrombocytopenia and living in an endemic area.

## REFERENCES

1. Saah AJ. *Orientia tsutsugamushi* (scrub typhus). In: Mandell GL, Bennett JE, Dolin R, editors. Mandell, Douglas, and Bennett's Principles and Practice of Infectious Disease. 5<sup>th</sup> ed. Philadelphia: Churchill Livingstone; 2000. p. 2056-7.
2. Mahajan SK. Scrub typhus. J Assoc Physicians India 2005;53:954-8.
3. Song SW, Kim KT, Ku YM, Park SH, Kim YS, Lee DG, *et al.* Clinical role of interstitial pneumonia in patients with scrub typhus: A possible marker of disease severity. J Korean Med Sci 2004;19:668-73.
4. Mathai E, Rolain JM, Verghese GM, Abraham OC, Mathai D, Mathai M, *et al.* Outbreak of scrub typhus in southern India during the cooler months. Ann N Y Acad Sci 2003;990:359-64.
5. Shah V, Vaidya V, Bang V, Shah I. Spotted fever in a child in Mumbai, India. J Vector Borne Dis 2009;46:310-2.
6. Sirisanthana V, Puthanakit T, Sirisanthana T. Epidemiologic, clinical and laboratory features of scrub typhus in thirty Thai children. Pediatr Infect Dis J 2003;22:341-5.
7. Jeong YJ, Kim S, Wook YD, Lee JW, Kim KI, Lee SH. Scrub typhus: Clinical, pathologic, and imaging findings. Radiographics 2007;27:161-72.
8. Chirstopher DP, James EC. Rickettsia rickettsii. In: Sarah SL, Larry KP, Charles GP, editors. Principles and Practice of Pediatric Infectious Diseases. 2<sup>nd</sup> ed. Philadelphia: Churchill Livingstone; 2003. p. 942-5.
9. Kováčová E, Kazár J. Rickettsial diseases and their serological diagnosis. Clin Lab 2000;46:239-45.
10. Mahajan SK, Kashyap R, Kanga A, Sharma V, Prasher BS, Pal LS. Relevance of Weil-Felix test in diagnosis of scrub typhus in India. J Assoc Physicians India 2006;54:619-21.
11. Rath N, Rath A. Rickettsial diseases in Indian context. Pediatr Infect Dis 2013;5:64-8.
12. Choi YH, Kim SJ, Lee JY, Pai HJ, Lee KY, Lee YS. Scrub typhus: Radiological and clinical findings. Clin Radiol 2000;55:140-4.

**How to cite this article:** Arunagirinathan A, Raghavan A, Narayanaswamy DK, Sangili S. Scrub Typhus Pneumonia – A Forgotten Entity in Children: Case Report. Int J Sci Stud 2015;2(11):190-192.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# An Unusual Case of Huge Cervical Fibroid: A Case Report

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## Abstract

Leiomyomas are the most common uterine and pelvic tumors. The usual anatomical location is the body of the uterus. Cervical leiomyomas are uncommon and present as a huge abdominal mass is rare. We report a case of a 42-year-old female who presented with abdominal distension, pain in abdomen, and pressure symptoms like frequency of urination. Abdominal examination revealed a huge mass of 24 weeks size pregnant uterus filling the abdominal cavity with restricted mobility, non-tender and solid in consistency. Magnetic resonance imaging showed a sub-serous fibroid arising from the left lateral wall of the uterus and extending exophytically into pelvis. On laparotomy, uterus was pushed upward up to umbilicus and uterus sitting on the top of the fibroid. Fibroid was anterior to cervix and lower uterine segment. Cervix was elongated. Lower margin of mass was covering the superior and posterior surface of the bladder. Mass was going laterally and posterior into the left lumbar and iliac region compressing the sigmoid colon. Cervical fibroid removed by enucleation and total abdominal hysterectomy with bilateral salpingo-oophorectomy. Histopathological examination showed a cervical fibroid with hyaline and cystic degeneration. Patient had an uneventful post-operative recovery.

**Key words:** Cervical, Fibroid, Huge

## INTRODUCTION

Leiomyoma is the most common of all uterine and pelvic tumors. The incidence of leiomyoma is 20% in the reproductive age group, and only 1-2% are confined to the cervix.<sup>1</sup> Cervical fibroid develops in the wall of the cervix,<sup>2</sup> usually in its supra vaginal portion. They can change the shape of the cervix or may lengthen it. Huge cervical fibroid may push the uterus upwards. Mostly cervical leiomyoma is single and is either interstitial or sub serous and rarely it is submucous and polypoidal.<sup>1</sup> These tumors can frequently present with retention of urine, menstrual abnormalities, constipation, and sometimes can present only as an abdominal mass without any other symptoms and may mimic an ovarian tumour.<sup>3,4</sup> Large cervical fibroids

are difficult to handle and need an expert hand to operate these cases.<sup>5</sup> Large cervical fibroids are rare, and only handful of cases has been reported in literature.<sup>6,7</sup>

## CASE REPORT

A 42-year-old P<sub>1+0</sub> patient presented with the history of off and on the frequency of urine and burning micturition for the last 7 years. Gradual distension of abdomen and pain in the abdomen for the last 7 months. She had no history of menstrual disturbances or constipation, and bowel habits were regular. She had a normal vaginal delivery 22 years back. Patient general and systemic examination was normal except for pallor. Abdominal examination revealed a mass of about 24 weeks size gravid uterus, which was non-tender, solid in consistency with restricted mobility and lower margin of mass is not reachable. There were no ascites clinically. On per speculum examination, cervix was pulled high up and visualized with difficulty. On bimanual examination, there was a large solid mass which was filling the pelvic cavity and extending into the abdomen up to the umbilicus. On

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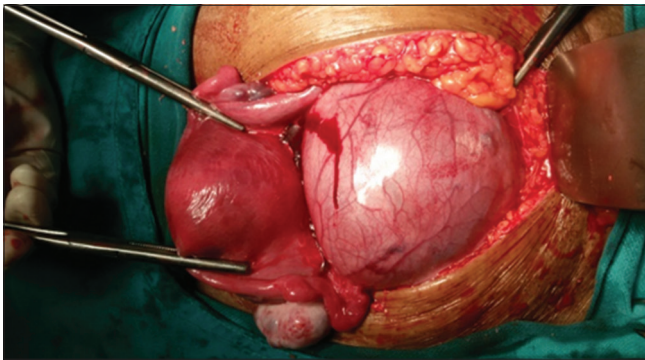


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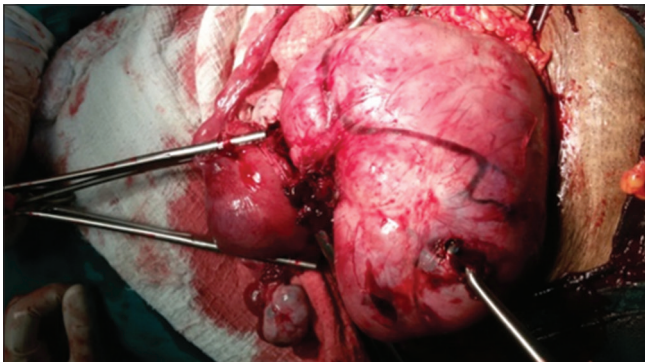
Month of Submission : 12-2014  
Month of Peer Review : 01-2015  
Month of Acceptance : 01-2015  
Month of Publishing : 02-2015

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**Figure 1: Uterus with the cervical fibroid, uterus sitting on top of the fibroid**



**Figure 2: Whole of cervical fibroid enucleated but still attached to its bed**



**Figure 3: Bulky uterus with bilateral tubes and ovaries with an elongated cervix and a cervical fibroid**

investigation/hemoglobin was 9.7 g/dl, liver and renal function tests were normal. Ultrasound report showed that uterus is enlarged and a large echogenic SOL in fundus and body and extending up to cervix measuring 11.2 cm × 10.3 cm × 8.1 cm, echo texture is heterogeneous (leiomyoma uterus).

Magnetic resonance imaging (MRI) report showed a large size 137 mm × 96 mm × 141 mm lobulated T1 and T2 hypo intense mass lesion arising from the left lateral wall of the uterus and extending exophytic ally into pelvis. Uterus is compressed and deviated to the left side. Posteriorly, the

lesion is compressing the anterior wall of sigmoid colon. It is also indenting the posterior and superior wall of the urinary bladder. It is predominantly exophytic/sub serosal myometrial fibroid. Kidneys and ureters were standard.

Exploratory laparotomy under general anesthesia revealed large cervical fibroid 20 cm × 15 cm × 15 cm in size. Uterus was bulky with thickened and edematous tubes. Round ligament was thickened. Bilateral ovaries were slightly enlarged and cystic. Uterus was sitting on the top of the fibroid and was pushed upward. Fibroid was anterior to cervix and lower uterine segment. Cervix was elongated. Lower margin of mass was covering the superior and posterior surface of the bladder. Mass - going posteriorly into the left lumbar and iliac region compressing the sigmoid colon. A transverse incision made anteriorly in the capsule of fibroid and pushed the bladder down. Cervical fibroid was removed by enucleation of the capsule by blunt dissection with finger and homeostasis of fibroid bed achieved. Total abdominal hysterectomy with bilateral salpingo-oophorectomy was done. Patient received two units of blood intra-operatively. Her post-operative period was uneventful. Histopathological examination confirmed a cervical fibroid (Figures 1-3).

## DISCUSSION

Huge cervical fibroids are rare. They are histopathologically identical to those found in the body of the uterus. The index case of huge cervical fibroid presented with complaints of a gradual distension of abdomen, pain in abdomen, frequency of urine, and burning micturition. These fibroids pose a significant risk to ureters and bladder during surgery.<sup>8</sup> Enlargement of cervical fibroid pushes the uterus upward, and fibroid may become impacted in the pelvis leading to urinary retention and ureteric obstruction.

Sharma *et al.* from Sri Lanka reported a case of cervical fibroid that clinically resembles an ovarian tumor.<sup>9</sup> Patient presented with abdominal distention and loss of weight. During surgery, left ureter was injured, and ureteric anastomosis was done. Basnet *et al.* in Nepal also reported a case of huge cervical fibroid<sup>10</sup> with an unusual presentation. In their case patient had gradual abdominal distention, scanty and irregular menstruation and no bowel and bladder complaints. During surgery bladder injury occurred that was repaired and to achieve hemostasis bilateral internal iliac arteries were ligated on both sides.

In our patient, cervical fibroid grew to occupy not only the pelvic cavity, but became abdominal mass pushing the uterus up to the umbilicus. Lower margin of mass was compressing the posterior and superior surface of the bladder and laterally compressing the sigmoid colon.

## CONCLUSION

In our patient, MRI report showed exophytic/subserosal myometrial fibroid arising from left lateral wall of uterus and extending exophytic ally into the pelvis and ultrasound report showed that uterus is enlarged and a large echogenic SOL in fundus and body and extending up to cervix measuring 11.2 cm × 10.3 cm × 8.1 cm. But despite the MRI and ultrasound report, on laparotomy, it was found to be cervical fibroid. This shows that though the new diagnostic modalities such as ultrasound and MRI scan have improved the accuracy of pre-operative diagnosis, the final diagnosis can only be made at laparotomy.

## REFERENCES

1. Bhatla N. Tumours of the corpus uteri. In: Jeffcoates Principles of Gynaecology. 5<sup>th</sup> ed. London: Arnold Publisher; 2001. p. 470.
2. Tiltman AJ. Leiomyoma of uterine cervix: A study of frequency. *Int J Gynaecol* 1998;17:231-4.
3. Suneja A, Taneja A, Guleria K, Yadav P, Agarwal N. Incarcerated procidentia due to cervical fibroid: An unusual presentation. *Aust N Z J Obstet Gynaecol* 2003;43:252-3.
4. Dutta DC. Benign lesions of the uterus. In: Textbook of Gynaecology Including Contraception. 3<sup>rd</sup> ed. India: New Central Book Agency (p) Ltd.; 2004. p. 264.
5. Kshirsagar SN, Laddad MM. Unusual presentation of cervical fibroid: Two case reports. *Int J Gynaecol Plastic Surg* 2011;3:38-9.
6. Bucella D, Frédéric B, Noël JC. Giant cervical polyp: A case report and review of a rare entity. *Arch Gynecol Obstet* 2008;278:295-8.
7. Massinde AN, Mpogoro F, Rumanyika RN, Magoma M. Uterine prolapse complicated with a giant cervical polyp. *J Low Genit Tract Dis* 2012;16:64-5.
8. Kaur AP, Saini AS, Kaur D, Madhulika Dhillon SP. Huge cervical fibroid: An unusual presentation. *J Obstets Gynaecol India* 2002;52:164-5.
9. Sharma S, Pathak N, Goraya SP, Singh A, Mohan P. Large cervical fibroid mimicking an ovarian tumour. *Sri Lanka J Obstet Gynaecol* 2001;33:26-7.
10. Basnet N, Banerjee B, Badani U, Tiwari A, Raina A, Pokharel H, *et al.* An unusual presentation of huge cervical fibroid. *Kathmandu Univ Med J (KUMJ)* 2005;3:173-4.

**How to cite this article:** Srivastava M, Agarwal M, Bhatnagar P, Gupta M. An Unusual Case of Huge Cervical Fibroid: A Case Report. *Int J Sci Stud* 2015;2(11):193-195.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Non-surgical Endodontic Management of Extra-oral Cutaneous Sinus Tract: A Case Report

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## Abstract

A common manifestation of pulpal necrosis is draining sinus tract or fistula, which could be intra-oral or extra-oral. The microbiologically induced inflammation spreads along the path of least resistance by penetrating the alveolar bone. Ultimately, to form a path of drainage, the inflammatory process can reach the surrounding tissues. These conditions are often misdiagnosed as other non-pulpal pathologies, which may lead to unnecessary invasive treatment of skin lesions. Such patients are usually healthy and are unaware of the underlying asymptomatic dental problem. Removal of all etiological factors would lead to complete healing and repair. The present case reports the successful root canal treatment and closure of the tract by relying on evidence-based endodontics.

**Key words:** Calcium hydroxide, Cutaneous sinus tract, Large periapical lesion, Non-surgical treatment

## INTRODUCTION

Extra-oral cutaneous odontogenic sinus tracts are often most misdiagnosed. Patients with extra-oral cutaneous sinus tracts often undergo dermatological and other surgical interventions before being referred to the dental surgeon.<sup>1</sup> Thorough dental evaluation is needed for all chronic draining sinus tracts of the face and neck.

Microorganisms and their by-products, which are present in the periradicular area, might perforate the cortical plate with the infection draining onto the mucosal or cutaneous surface following the path of least resistance, after exiting from the necrotic pulp canal system.<sup>2</sup>

This article presents a case of extra-oral cutaneous sinus tracts in the chin region, managed conservatively by nonsurgical endodontic treatment of the offending teeth.

## CASE REPORT

A 22-year-old male presented to Department of Conservative Dentistry and Endodontics, with a chief complaint of extra-oral nodular growth with intermittent pus discharge on his chin region since 4 months. The medical history was non-contributory. Clinical examination showed draining lesion approximately 6 mm × 13 mm in diameter in the sub mental area (Figure 1). Palpation elicited an exudate discharge from it. Intraorally, no vestibular swelling was present, and fractured incisal edge of mandibular right central incisor was noticed. Pulp vitality showed a negative response with 41. An intraoral periapical radiograph showed diffuse radiolucency surrounding mandibular central incisors (Figure 2). A diagnosis of suppurative apical periodontitis was made.

After local anesthesia and rubber dam placement, root canal treatment was initiated with pulp chamber access and chemo-mechanical preparation of the root canals for the tooth.

One oval root canal was located and working length was measured with Root ZX electronic apex locator (J Morita, Kyoto, Japan) and size 10 K-File (Mani Dental mart, INC, Japan) and confirmed with a periapical radiograph, in the

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**Month of Submission :** 12-2014

**Month of Peer Review :** 01-2015

**Month of Acceptance :** 01-2015

**Month of Publishing :** 02-2015

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root canal of the tooth. As the canal was identified as oval-shaped, the hand instrumentation was performed via step back technique.

Irrigation was administered for 4 min with 3% sodium hypochlorite (NaOCl) (Prime Dental Private Ltd., India) solution at a 3 mL/min flow rate. The final preparation was performed with a size 35# 2% hand K-File (Mani Dental mart, INC, Japan).

Next, the smear layer was removed with 3 mL 17% ethylenediaminetetraacetic acid (EDTA) (Sybron Endo, USA) for 3 min, and a final rinse with 3 mL of normal saline was performed. Pure calcium hydroxide was mixed with anesthetic solution and placed as intracanal medicament with a size 35 Lentulo spiral (Mani Dental Mart, INC, Japan) into the root canal. Tooth was then temporarily sealed with glass-ionomer cement (Fuji 9 Gold Label, GC Europe, Belgium), and the patient was scheduled to return in 1 week.

At the following appointment, patient was symptom-free, and the sinus tract mark was showing slight improvement, so Metapex (Meta Biomed, Korea) was given as medicament for 20 days.

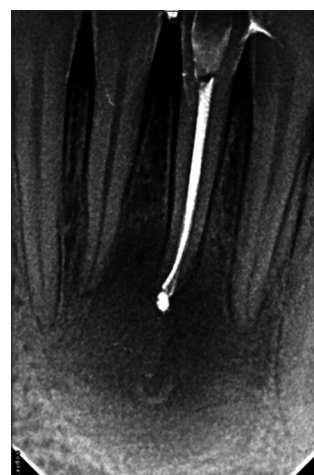
At the following appointment, rubber dam was placed, and 3% NaOCl solution was administered for 4 min at 3 mL/min to remove the calcium hydroxide paste.

Final obturation was performed using cold lateral condensation technique and AH-26 root canal sealer (Dentsply DeTrey GmbH, Konstanz Germany). The opening access was restored with a composite resin for tooth 41 (Figure 3).

3 months recall periapical radiograph showed signs of healing of periapical lesion and shown in Figure 4. At the 7-month follow-up, the clinical appearance of the skin had returned to a healthy status, and the periapical lesions had resolved significantly (Figures 5 and 6).



**Figure 1: Cutaneous sinus tract on the chin region before treatment**



**Figure 3: Periapical radiograph of final obturation, following restoration. Radiopacity present in the apical region of tooth 41 is extruded sealer**



**Figure 2: The periapical radiograph of the lesion before treatment**



**Figure 4: The periapical radiograph after 3 months**





**Figure 5: The periapical radiograph after 7 months. Significant healing is noted in periapical lesions**



**Figure 6: Healed cutaneous lesion after 7 month of the treatment showing healing without scar**

## DISCUSSION

Patients with cutaneous facial sinuses are difficult to diagnose as they may not always have dental symptoms, and the cutaneous sinus may develop at a distance from the origin of infection.<sup>3</sup>

The differential diagnosis of an extra-oral cutaneous sinus includes endodontic lesion, suppurative apical periodontitis, salivary gland fistula, osteomyelitis, congenital fistula, pyogenic granuloma, infected cyst, and deep mycotic infection.<sup>4</sup>

The most common site of suppurative sinus tracts of endodontic origin is intraoral region. Mandibular teeth cause 80% of extra-oral sinus tracts with purulent drainage in the chin or submental area.<sup>5</sup>

However, definitive diagnosis is complicated, as such cutaneous lesions do not always reveal the origin of the infection, some patients report toothaches and other

symptoms. Sheehan *et al.*, observed an extra-oral fistula in the nasofacial sulcus, which was first diagnosed as a facial furunculosis.<sup>6</sup>

Periapical radiography is necessary to demonstrate bone loss in the apex of the infected tooth because a tooth with a necrotic pulp can appear normal or have slightly altered color.<sup>7</sup> But the clinical examination, dental radiography, and sometimes cone beam-computed tomography can help identify the location of the teeth that are involved. The treatment option for extra-oral sinus tracts of endodontic origin is non-surgical endodontic therapy, sometimes complemented by surgery, or dental extraction.<sup>3</sup>

Throughout instrumentation with NaOCl is considered the ideal for use because it has both proteolytic and anti-microbial activity, and it also has the unique ability to dissolve necrotic tissue, hence in this case, sodium hypochlorite is used throughout instrumentation.<sup>8</sup>

About 17% EDTA is a chelating agent that removes calcium ions to demineralize the inorganic component of dentine. Irrigation with EDTA has been advocated to remove the smear layer which was created by root canal instrumentation.<sup>9</sup>

Calcium hydroxide is used as an intra-canal medicament because it disinfects the root canal system. Its biological properties are achieved by the dissociation in  $\text{Ca}^{2+}$  and  $\text{OH}^-$  ions. The antimicrobial effect of calcium hydroxide is due to its high pH - 12.5. It also exhibits a destructive effect on cell membranes and protein structures. Calcium hydroxide-based pastes were used as an antibacterial dressing in this case because it plays a major role as inter - appointments dressing in the disinfection of the root canal system.<sup>10</sup>

Ah Plus sealer is used as root canal sealer in the present case because of it has anti-microbial activity, which is due to the presence of bisphenol - A- diglycidylether.<sup>11</sup> AH Plus also sealer has a good flow, thereby it diffuses into the dentinal tubules and creates microbial inhibition by means of entombment.<sup>12</sup>

Endodontic therapy was performed because the tooth in this report was restorable. The source of the infection should be eradicated through root canal for definitive treatment of the draining sinus tract. Spontaneous closure of the tract should be expected in 5-14 days after root canal therapy.<sup>13</sup>

## CONCLUSION

A dental etiology must always be considered for any cutaneous sinus tract in the head or neck. Elimination of

the dental source of infection results in resolution of the sinus tract without the need for surgical excision.

## REFERENCES

1. Cantatore JL, Klein PA, Lieblisch LM. Cutaneous dental sinus tract, a common misdiagnosis: A case report and review of the literature. *Cutis* 2002;70:264-7.
2. Kotecha M, Browne MK. Mandibular sinuses of dental origin. *Practitioner* 1981;225:910-5.
3. Pasternak-Júnior B, Teixeira CS, Silva-Sousa YT, Sousa-Neto MD. Diagnosis and treatment of odontogenic cutaneous sinus tracts of endodontic origin: Three case studies. *Int Endod J* 2009;42:271-6.
4. Wilson SW, Ward DJ, Burns A. Dental infections masquerading as skin lesions. *Br J Plast Surg* 2001;54:358-60.
5. Foster KH, Primack PD, Kulild JC. Odontogenic cutaneous sinus tract. *J Endod* 1992;18:304-6.
6. Sheehan DJ, Potter BJ, Davis LS. Cutaneous draining sinus tract of odontogenic origin: Unusual presentation of a challenging diagnosis. *South Med J* 2005;98:250-2.
7. Witherow H, Washan P, Blenkinsopp P. Midline odontogenic infections: A continuing diagnostic problem. *Br J Plast Surg* 2003;56:173-5.
8. Naenni N, Thoma K, Zehnder M. Soft tissue dissolution capacity of currently used and potential endodontic irrigants. *J Endod* 2004;30:785-7.
9. Young GR, Parashos P, Messer HH. The principles of techniques for cleaning root canals. *Aust Dent J* 2007;52:S52-63.
10. Pour PP, Ashraf H, Darmiani S. Diagnosis and treatment of odontogenic cutaneous sinus tracts of endodontic origin: A case report. *Int J Dent Res* 2013;2:8-10.
11. Kayaoglu G, Erten H, Alaçam T, Ørstavik D. Short-term antibacterial activity of root canal sealers towards *Enterococcus faecalis*. *Int Endod J* 2005;38:483-8.
12. Nawal RR, Parande M, Sehgal R, Naik A, Rao NR. A comparative evaluation of antimicrobial efficacy and flow properties for Epiphany, Guttaflow and AH-Plus sealer. *Int Endod J* 2011;44:307-13.
13. Spear KL, Sheridan PJ, Perry HO. Sinus tracts to the chin and jaw of dental origin. *J Am Acad Dermatol* 1983;8:486-92.

**How to cite this article:** Patel N, Shetty R, Katkade A, Agrawalla A, Somani S, Jagtap P. Non-surgical Endodontic Management of Extra-Oral Cutaneous Sinus Tract: A Case Report. *Int J Sci Stud* 2015;2(11):196-199.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Silicone Auricular Prosthesis for a Patient with Unilateral Congenital Microtia: A Case Report

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## Abstract

Maxillofacial prosthodontics gains utmost significance as the process not only tries to develop acceptable esthetics but also tries to enhance the psychological comfort of the patient by restoring the defective or missing craniofacial structures. This article presents an outlined procedure for the fabrication of a prosthetic ear by three piece die technique. The technique has provided good results from patient's esthetics, comfort and satisfaction point of view. Although the patient cannot improve hearing capacity using this prosthesis, it will definitely increase the self-confidence of the patient. In patients with poor economic status, implant placement seems difficult. Method mentioned here gives good results in less amount of time.

**Key words:** Case report, Microtia, Prosthesis

## INTRODUCTION

The fabrication of ear prosthesis is considered by many prosthodontists to be one of the most difficult replacements in maxillofacial reconstruction. The severe undercuts and pronounced convolutions of the ear's surface present a challenge in simulating a naturally proportioned prosthesis.<sup>1</sup>

Loss of an auricle results from trauma, congenital disease or surgical ablation of benign or malignant tumors.<sup>2</sup> Loss of facial tissue regardless of its cause leads to serious functional and psychological problems.<sup>3</sup> Repairs using autogenous tissue are the gold standard in the rehabilitation of these defects; however, rehabilitation with aesthetic prostheses may be a suitable treatment alternative in patients for whom a repair with autogenous tissue is not possible.<sup>4</sup> Because of the limited number of maxillofacial materials available in the past, esthetics has been a secondary consideration to form and function.

However, esthetics may be the most important factor in patient acceptance of the prosthesis. Chalian *et al.* stated that the emotional aspects of gross defects of body integrity, especially of the head and neck regions, play a key role in the rehabilitation of the patient. Even though a clinically acceptable prosthesis may have been constructed, the patient's rehabilitation is not complete until he or she accepts the deformity and the prosthesis.<sup>5</sup>

Two major problems in making prosthetic ear are reconstructing a mirror-image prosthetic ear and correctly orienting the prosthesis to the surrounding tissues. In 1980, Nusinov and Gay<sup>6</sup> described a method for obtaining the reverse image of an ear using parallel lines transferred to casts, a vertical camera capable of reproducing three-dimensional objects, and tracing paper. Shimodaira *et al.*<sup>7</sup> proposed superimposing a color slide onto a facial cast to sculpt a facial prosthesis. Both methods are relatively complex and require special and costly equipment. However, these problems can be overcome by simply making a free hand carved pattern of the ear in a modeling wax and resembling it to the natural one in form and texture and orienting it correctly to the surrounding tissues.

This article will present a case report of fabrication of conventional ear prosthesis for a 16-year-old girl having congenital microtia.

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**Month of Submission :** 12-2014

**Month of Peer Review :** 01-2015

**Month of Acceptance :** 02-2015

**Month of Publishing :** 02-2015

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## CASE REPORT

A 16-year-old female patient was referred to Department of Prosthodontics, HP Government Dental College and Hospital, Shimla, with the chief complaint of congenitally missing right external ear (Figure 1a). Small soft tissue elevations were present behind the external auditory meatus and one above it (Figure 1b). Patient's left ear was normal with normal hearing pattern. As per the medical examination report from the Department of Otorhinolaryngology, right middle ear was found to be hypoplastic and with limited hearing capacity associated with microtia.

A prosthetic reconstruction by conventional way was decided to satisfy patient's desire of cosmetic correction and social rehabilitation due to financial constraints.

### Impression Procedure

Impression was obtained with the patient lying on her side in a supine position. Horizontal and vertical lines were marked through the external auditory meatus on both defect and non-defect side.

These markings were transferred with the impression and showed on the working cast. These coordinates are of value in obtaining the proper orientation over the defect while making a new ear form.

The patient's skin of auricular region was boxed to the circumscribed outline with collar of boxing wax (Figure 2a and d). Adjacent hair was covered with petroleum jelly, and cotton was placed in the ear canal.

Irreversible hydrocolloid was used to make an impression. The addition of 50% more water improved its flow properties and facilitated the impression procedure. A backing of quick setting plaster provided suitable support for the impression (Figure 2b-e). Stone model was prepared from the impression (Figure 2g).



**Figure 1: (a and b) Pre-prosthetic photograph of the patient with right ear microtia**

### Sculpturing of the Wax Auricular Pattern

A transparent autopolymerizing acrylic resin base was made on the defect cast to prevent distortion of subsequent ear wax pattern by providing a stable base. On this base, ear wax pattern was made using red modeling wax and corrected without distortion.

The prosthesis sculpting was done from the beginning by dividing both the cast into equal sections with the use of pencil so that the contours are more easily verified.

When the position and basic contours of the wax pattern are acceptable, the surface details were applied. The surface texture of the restoration is important and was developed according to the normal ear texture. Contours, grooves, and wrinkles were reproduced (Figure 3a and b).

### Auricular Wax Pattern Trial

The sculpted wax pattern was then verified on the patient and compared it with the normal ear (Figure 4a and b). Corrections were done according to the visibility, height, width, and according to patient's expectations.

### Three Piece Die Fabrication

External notching for alignment of subsequent pours of the cast with auricular form was completed, and the surface was lubricated with the petroleum jelly. Then the sculpted ear form, while seated on the working cast, is boxed in wax along the greatest dimension of the helix and lobe enclosing all of the posterior aspects of the form. The complete posterior under surface of the sculptured ear is registered by pouring artificial stone into the boxed area.

The boxing was removed from the superior aspect of the completed posterior registration to facilitate flush registration of the two parts, and subsequent notching was completed as before.

Complete working cast was lubricated with petroleum jelly and then boxed with the sculptured form including the posterior stone cast registration and poured covering the external surface of the wax form and the outer surface of the posterior stone cast registration.

After setting of the stone, all artefacts and aberrations which might prevent the approximation of the die surfaces into a tightly fitting mold assembly were removed (Figure 5a-c).

### Intrinsic Coloration and Mold Packing

A generous amount of the base color of silicon was poured on a mixing slab, and different intrinsic silicone





Figure 2: (a-c) Impression procedure steps for right defective ear, (d-f) impression procedure for left normal ear, (g) stone models of the right and left ear



Figure 3: (a) Wax pattern of the right ear, (b) left normal ear

pigments were added to it to match the color to non-defect ear. For this color matching, patient was seated in a convenient position for evaluating the skin tones and color highlights.

Furthermore, different shades for different regions of the ear have been prepared separately. Mold was prepared by application of the separating medium to it, and different shades of silicone were applied in a



Figure 4: (a) Right ear wax pattern trial, (b) left normal ear

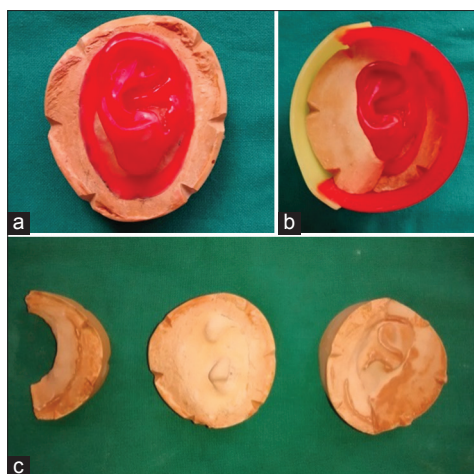
particular region, and overall mold was packed with the base color of silicone.

After 48 hours of curing at room temperature, mold was disassembled, and silicone form was retrieved (Figure 6).

#### Retention and Maintenance

After finishing of the ear prosthesis, it was retained over the defect surface with the use of cosmosil bioadhesive (Figure 7).

Patient was instructed to keep the skin surface clean and free of oil secretions to ensure proper adhesion of



**Figure 5: (a-c) Steps for three piece mould preparation**



**Figure 6: Silicone ear prosthesis just after retrieval from the mold**



**Figure 7: Final placement of right ear prosthesis using bio-adhesive**

prosthesis. Prosthesis should be removed at night to avoid excessive forces on the prosthesis while sleeping and reapplied in the morning.

## DISCUSSION

The fabrication of an extra-oral-facial prosthesis is as much an art as it is a science. Prosthesis form, coloration, and texture must be as discernible as possible from the surrounding natural tissues.<sup>8</sup>

Sculpture of patterns for auricular prosthesis can be a time-consuming and tedious process due to multiple convolutions and contours of the ear.<sup>9</sup> Silicone material is selected for ear prosthesis fabrication. In this case, RTV silicone (MP Sai Enterprise) was used. Intrinsic pigments were used for the prosthesis coloration as these are color stable and provided better esthetic results. According to Turner *et al.*<sup>5</sup> it is the color and the ability of the prosthesis to blend visually with the surrounding tissue that have the greatest influence on esthetics. It is by intrinsic coloration that a base shade of material is produced. Without the correct base shade, extrinsic coloring will never adequately match the adjoining tissue. Intrinsic earth pigments showed excellent color stability and are recommended for use in maxillofacial prostheses. Bioadhesive used for the retention of the prosthesis was cosmosil. The advantage of this adhesive being is insoluble in water, sweat and better retention for longer duration of time.<sup>8</sup>

Although this material has shortcomings of having esthetic limitations and slight hardening with time, it provided economic rehabilitation to the patient, improving the quality-of-life and reintegrating her back to society. But whenever feasible implant retained prosthesis should be given prime consideration, which has improved retention and stability of the prosthesis.<sup>10,11</sup>

## CONCLUSION

This article presents the procedure for ear prosthesis fabrication using three piece mold. The technique has provided good results from patient's esthetics, comfort and satisfaction point of view. Although the prosthesis is conventional adhesive retained, it will definitely increase the self-confidence of the patient.

## REFERENCES

1. Brown KE. Fabrication of ear prosthesis. *J Prosthet Dent* 1969;21:670-6.
2. Wang R. Preoperative auricular wax pattern duplication for surgical template fabrication. *J Prosthet Dent* 1999;81:634-7.
3. Singh A, Ghosh S, Kar S, Ahmed I. Silicone prosthesis for a patient with unilateral ear defect: A clinical case report. *Eur J Gen Dent* 2013;2:315-9.
4. Mohamed K, Mani UM, Seenivasan MK, Vaidhyanathan AK, Veeravalli PT. Comparison of two impression techniques for auricular prosthesis: Pilot study. *J Rehabil Res Dev* 2013;50:1079-88.
5. Turner GE, Fischer TE, Castleberry DJ, Lemons JE. Intrinsic color of

- isophorone polyurethane for maxillofacial prosthetics. Part II: Color stability. J Prosthet Dent 1984;51:673-5.
6. Nusinov NS, Gay WD. A method for obtaining the reverse image of an ear. J Prosthet Dent 1980;44:68-71.
  7. Shimodaira K, Fukuda H, Kanazawa T, Funakubo T. Technique for superimposing a color slide onto a facial cast to sculpt a facial prosthesis. J Prosthet Dent 1989;62:212-3.
  8. Taylor TD. Clinical Maxillofacial Prosthetics. Carol Stream, Illinois: Quintessence Publishing Co. Inc.; 2000.
  9. Butler DF, Gion GG, Rapini RP. Silicone auricular prosthesis. J Am Acad Dermatol 2000;43:687-90.
  10. Beumer J, Marunick MT, Esposito SJ. Maxillofacial Rehabilitation: Prosthodontics and Surgical Management of Cancer-related, Acquired and Congenital Defects of the Head and Neck. 3<sup>rd</sup> e Hanover Park, Illinois: Quintessence Publishing Co. Inc.; 2011.
  11. Goveas R, Shrestha B, Srithavaj ML, Thaworanunta S. Fabrication of a new silicone auricular prosthesis without removing the existing metallic framework. J Prosthet Dent 2014;112:1605-8.

**How to cite this article:** Ahirrao R, Gupta R, Luthra RP, Chadda AJ, Sharma V, Sarin S. Silicone Auricular Prosthesis for a Patient with Unilateral Congenital Microtia: A Case Report. Int J Sci Stud 2015;2(11):200-204.

**Source of Support:** Nil, **Conflict of Interest:** None declared.



# Flexible Denture: An Alternative to Repeatedly Fractured Acrylic Removable Partial Denture in a Patient with Collapsed Bite - A Case Report

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## Abstract

Acrylic better known as polymethyl methacrylate resin (PMMA) has been widely used in dentistry for many years as a denture base material due to its desirable properties like excellent esthetics, low water sorption, ease of repair, and simple processing techniques. Unfortunately, some disadvantages have also been seen associated with them like decreased flexibility, low impact strength, and allergic reaction to monomer. Flexible dentures also known as nylon and polyamide dentures are an excellent alternative to conventionally used PMMA dentures, which not only provide satisfactory esthetics and comfort, but also adapt to the constant movement and flexibility in edentulous patients. The case report presents a patient having collapsed bite with repeated fracture of her acrylic denture successfully treated with flexible removable partial denture.

**Key words:** Flexibility, Nylon, Polymethylmethacrylate, Removable partial denture

## INTRODUCTION

The fracture of removable partial denture bearing excessive stresses during mastication in a patient with collapsed bite constitutes a challenging and a difficult problem. Several factors have been attributed for the fracture including flexural fatigue resulting from cyclic deformation and those which exacerbate the deformation of the base or alter its stress distribution.<sup>1,2</sup> Denture bases should be made of materials which are strong and biocompatible in order to serve successfully for a reasonable length of time.<sup>3</sup> Acrylic better known as polymethyl methacrylate resin (PMMA) has been widely used in dentistry for many years as a denture base material due to its desirable properties like excellent esthetics, low water sorption, ease of repair, and simple processing techniques.<sup>4,5</sup> Unfortunately, some disadvantages have also been seen associated with them like

relatively low impact strength causing fracture of acrylic based dentures and allergic reactions to residual monomer although rare but have been reported.

Flexible denture base materials also known as the nylon denture were introduced to dentistry by the name of valplast and flexiplast in 1950's.<sup>6,7</sup> Nylon is a generic name used for certain types of thermoplastic polymers belonging to the class known as polyamides.<sup>8</sup> Ucar *et al.* in their study on nylon denture base material concluded that it can be a useful alternative to PMMA in special circumstances where higher flexibility, higher resistance to flexural fatigue, higher impact strength is required.<sup>9</sup> Nylon, suitably stiffened could be extremely useful in treatment of those patients for whom acrylic prosthesis are not suitable which include patients who demonstrate repeated fracture of dentures and those that show tissue reactions of a proven allergic nature.<sup>7</sup> The improved flexural properties of nylon denture base materials have promoted their usage in conditions like repeated fracture of denture, unyielding undercuts, pronounced tuberosities, tori, and bulging alveolar ridges. Thus, nowadays, polyamide denture base materials are used because of higher flexibility compared to the commonly used PMMA.<sup>10,11</sup>

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**Month of Submission :** 12-2014  
**Month of Peer Review :** 01-2015  
**Month of Acceptance :** 02-2015  
**Month of Publishing :** 02-2015

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## CASE REPORT

A 73-year-old female patient reported in the Department of Prosthodontics, H.P Government Dental College and Hospital, Shimla with a chief complaint of difficulty in mastication due to her repeated fractured denture since past 1 year. Patient also reported of difficulty in insertion and removal of the denture. The present denture which patient was wearing was made of conventional PMMA resin and had undergone frequent repairs for fractures. Patient had replaced two dentures in the past 1 year and was in a desperate search for a denture that could address her present problems.

On intraoral examination, teeth no. 12, 13, 15, 16, 17, 23, 24, 25, 27, 31, 32, 36, 37, 41, 42, 45, 46, and 47 were missing. The patient had a collapsed bite (Figure 1) due to her missing teeth in the maxillary and mandibular arch along with excessive wear of the remaining teeth. There was Grade 1 mobility associated with 22 and 44, and the periodontal condition of the remaining teeth was good with only slight gingival recession. The patient had difficulty in insertion and removal of her denture because of the undercuts associated with her remaining teeth due to gingival recession which was common to be seen in patient aged 73 years. The tissue underlying the denture bearing area was also traumatized.

### Treatment Plan

Diagnostic casts were prepared using alginate impressions. Thereafter, casts were mounted on a surveyor and analyzed for undercuts. The patient was provided with two treatment options, cast partial denture and flexible removable partial denture. The patient went for flexible denture because of reasons such as high costs and extensive mouth preparation associated with cast partial denture.

### Procedure

Standard clinical procedures with regard to impression making and maxilla mandibular jaw relation records were followed. Proper height of maxillary and mandibular bite rim was established so as to correct the collapsed bite of the patient (Figure 2). Once the maxillomandibular relations were recorded, mechanical undercuts (diatorics) were made in the center of each tooth before teeth arrangement so that the melted polyamide could easily flow into these diatorics for mechanical retention between acrylic teeth and flexible resin (Figure 3). Teeth setting was done followed by final carving and finishing of the trial dentures. Thereafter, patient was evaluated for esthetics, phonetics, and functional occlusion followed by fabrication of the denture.

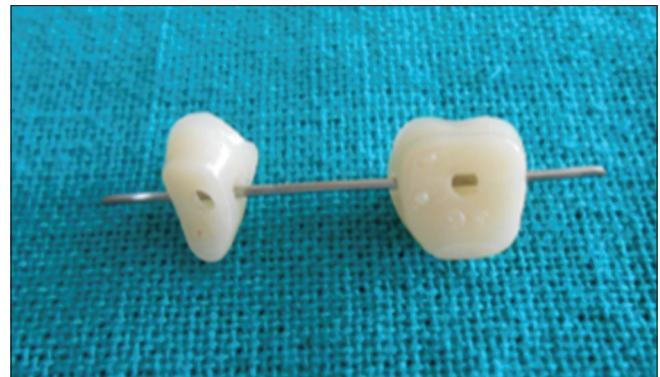
Lab procedures for the fabrication of flexible dentures - (injection cast technique) wax sprue former was then



**Figure 1: Patient with collapsed bite**



**Figure 2: Bite registration**



**Figure 3: Diatorics prepared in each tooth**

attached to the trial denture which served as an inlet for the flow of polyamide material followed by investing in dental stone (Type III). Thereafter, dewaxing was done in boiling water for 4-6 min, and residual wax was discarded. A thin coat of separating agent was applied to the model and allowed to dry completely. Cartridge furnace was heated to a temperature of 575°F (302°C) and maintained

so as to attain proper consistency to flow into the mould. Silicones spray (Dentsply, USA) was sprayed on cartridge (Lucitone FRS Dentsply Trubyte, USA) which was allowed to melt in the preheated furnace for 17 min as per the manufacturer's instruction. At the same time, the dewax flasks were maintained at a temperature of 70-80°C in a preheated oven.

Piston head was properly alignment with the cartridge sleeve and piston was engaged by depressing the activation switch at a pressure of 100 psi (5 bars) for 1 min and immediately thereafter the assembly was removed and disengaged. Dental flasks were then bench cooled for 5 min. The blanks were removed from the molds, and the sprue was removed with metal discs. The dentures were grossly trimmed using carbide burs followed by final finishing and polishing using sandpaper, rubber cones, and buff wheel (Figure 4). Finally, denture insertion was done, and post insertion instructions were given to the patient for proper maintenance of their denture (Figure 5).

Post insertion evaluation: Follow-up was done for post insertion evaluation of patient wearing removable partial flexible denture for comfort, denture fracture, mastication,

ease of insertion and removal, and overall tissue health underlying denture base at an interval of 1 month, 3 months, and 6 months on periodical recalls.

## DISCUSSION

The chief complaint of the patient was addressed with the removable flexible (nylon) partial denture as there was no fracture of the denture reported during 1 month, 3 months, and 6 months on periodical recalls. The physical properties of the nylon denture material such as high yield strength, flexural strength, tensile strength along with low flexural modulus as compared to PMMA denture makes nylon denture resistance to shock and repeated stressing, enabling it to resist the excessive forces caused by collapsed bite.<sup>12-15</sup> Hence, flexibility of nylon compiled with its strength enables it to resist fracture on constant stressing. The patient reported with marked improvement in mastication as she was able to chew her food properly without any pain. Due to the inherent flexibility of the nylon denture, the undercuts associated with the teeth did not pose any problem in insertion and removal of the prosthesis.<sup>16,17</sup>

The patient was satisfied with the esthetics of her denture as the pink-colored nylon clasps eliminate the use of metallic clasps which offered better esthetics to the patients.<sup>13,18</sup> The overall oral tissue health of the patient was improved which can be attributed to the fact that flexible denture appears to act as tissue conditioners and the slight movement over the tissue due to its flexibility stimulates the blood circulation under the denture base thereby contributing for the overall health of the underlying tissues.<sup>13,14,19</sup>

## CONCLUSION

Polyamide (nylon) denture base material has shown several advantages over the traditional rigid acrylic denture bases like strength, accuracy, management of undercuts, biocompatibility, management of fracture due to stress concentration and better comfort to patients. The strong, flexible nature of flexible denture material is perfectly suited to the variety of natural conditions in the mouth, simplifying design and enabling the flexible nylon resin to act as a built-in stress-breaker that provides superior functions and stress distribution. As the flexible removable partial denture was able to address all the problems of the patient, it may be concluded that nylon denture can act as a promising alternative where frequent fracture is encountered with acrylic denture in a patient with collapsed bite.



**Figure 4: Finished flexible denture**



**Figure 5: Patient wearing flexible removable partial denture**

## REFERENCES

1. Anusavice KJ. Phillips' Science of Dental Materials. 10<sup>th</sup> ed. Philadelphia: WB Saunders; 1996. p. 238.
2. Beyli MS, von Fraunhofer JA. An analysis of causes of fracture of acrylic resin dentures. J Prosthet Dent 1981;46:238-41.
3. Matthews E, Wain EA. Stress in denture base. Br Dent J 1956;100:167-71.
4. Abuzar MA, Bellur S, Duong N, Kim BB, Lu P, Palfreyman N, *et al.* Evaluating surface roughness of a polyamide denture base material in comparison with poly (methyl methacrylate). J Oral Sci 2010;52:577-81.
5. Yousef A, Hamd A, Dhuru VB. Physical and mechanical properties of pressure-molded and injection-molded denture base acrylics in different conditions. Saudi J Oral Sci 2014;1:65-70.
6. Singh K, Gupta N. Injection molding technique for fabrication of flexible prosthesis from flexible thermoplastic denture base materials. World J Dent 2012;3:303-7.
7. Stafford GD, Huggett R, MacGregor AR, Graham J. The use of nylon as a denture-base material. J Dent 1986;14:18-22.
8. Kohli S, Bhatia S. Polyamides in dentistry. Int J Sci Study 2013;1:20-5.
9. Ucar Y, Akova T, Aysan I. Mechanical properties of polyamide versus different PMMA denture base materials. J Prosthodont 2012;21:173-6.
10. Krishna VP, Premalatha A, Babu PJ, Raju DS, Kumar MP, Rao DB. Effect of various chemicals on the bond strength of acrylic tooth and denture base-An *In vitro* comparative study. J Int Oral Health 2014;6:100-5.
11. Katsumata Y, Hojo S, Hamano N, Watanabe T, Yamaguchi H, Okada S, *et al.* Bonding strength of autopolymerizing resin to nylon denture base polymer. Dent Mater J 2009;28:409-18.
12. Lowe LG. Flexible denture flanges for patients exhibiting undercut tuberosities and reduced width of the buccal vestibule: A clinical report. J Prosthet Dent 2004;92:128-31.
13. Thakral GK, Aeran H, Yadav B, Thakral R. Flexible partial dentures – A hope for the challenged mouth. People's J Sci Res 2012;5:55-9.
14. Phoenix RD, Mansueto MA, Ackerman NA, Jones RE. Evaluation of mechanical and thermal properties of commonly used denture base resins. J Prosthodont 2004;13:17-27.
15. Smith DC. Recent developments and prospects in dental polymers. J Prosthet Dent 1962;12:1066-78.
16. Singh JP, Dhiman RK, Bedi RP, Girish SH. Flexible denture base material: A viable alternative to conventional acrylic denture base material. Contemp Clin Dent 2011;2:313-7.
17. Dhiman RK, Chowdhury SK. Midline fractures in single maxillary complete acrylic vs. flexible dentures. Med J Armed Forces India 2009;65:141-5.
18. Ito M, Wee AG, Miyamoto T, Kawai Y. The combination of a nylon and traditional partial removable dental prosthesis for improved esthetics: A clinical report. J Prosthet Dent 2013;109:5-8.
19. Yavuz T, Aykent F. Temporary flexible removable partial denture: A clinical report. Clin Dent Res 2012;36:41-4.

**How to cite this article:** Sharma V, Gupta R, Luthra RP, Ahirrao R, Sarin S. Flexible Denture: An Alternative to Repeatedly Fractured Acrylic Removable Partial Denture in a Patient with Collapsed Bite - A Case Report. Int J Sci Stud 2015;2(11):205-208.

**Source of Support:** Nil, **Conflict of Interest:** None declared.



# Kleine–Levin Syndrome: Sleeping Beauty: A Rare Case Report on Sleep Disorder

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## Abstract

Kleine–Levin syndrome (KLS) also called sleeping beauty syndrome, is a rare sleep disorder with onset in early adolescence. Common symptoms are episodes of hypersomnolence, behavioral and cognitive disturbances (including specific feelings of derealization), hyperphagia and hypersexuality. The cause is not known and neither there are any definitive management guidelines. It remains a diagnosis of exclusion after ruling out other psychiatric and neurological disorder. Disturbed behavior may dominate the picture, suggesting that the essential problem is a personality disorder or even schizophrenia, and it is important for a psychiatrist to be well informed about the condition to avoid the erroneous diagnosis. KLS is an illness with devastating course, which disturbs socio-occupational activities. An early diagnosis and effective management can help patient escape from the morbidity caused by this disorder. Modafinil and lithium were found to be effective, in this case. The priority of this report is to add the existing clinical knowledge of psychiatrists, neurologists and physicians. In the near future, research is needed on neurobiology, genetic etiology and management of this disorder.

**Key words:** Hyperphagia, Hypersomnolence, Kleine–Levin syndrome, Lithium, Modafinil

## INTRODUCTION

Kleine–Levin syndrome (KLS) is a rare disorder with periodic hypersomnia, eating disturbance, cognitive and behavioral disturbances. The disease was named, “KLS” by Critchley in 1962 after Willi Kleine and Max Levin who studied multiple cases of hyper somnolence and emphasized the association of periodic somnolence with megaphagia to morbid hunger from 1925 to 1936.<sup>1</sup>

International Classification of Sleep Disorders-3 criteria (2013) states following five key points for diagnosis:

- A. At least two recurrent episodes of excessive sleepiness of 2 days to several weeks
- B. Episodes recur at least 1 per 18 months
- C. Normal alertness, cognitive function, behavior and mood between episodes

- D. At least one of these during an episode:
  - Cognitive dysfunction
  - Altered perception, derealization
  - Eating disorder (anorexia or hyperphagia)
  - Disinhibited behavior (such as hypersexuality).
- E. Symptoms not better explained by other disorders.<sup>2</sup>

This disorder because of its sporadic presentation has unknown prevalence. A systematic review of 186 cases showed incidence usually in adolescence with a course lasting for 8 years or more.<sup>3</sup>

## CASE REPORT

Mr. X 21-year-old male, Hindu nuclear family, studied up to 10<sup>th</sup> std., belonging to low socio economic group presented with complaints of excessive sleep episodes of abrupt onset lasting for 10-12 days 2-3 times a year for the past 3 years. He was found to be sleeping more than the usual with average sleeping time of 18-19 h a day. It was difficult to arouse him while he was sleeping, on waking up he was generally irritable extending at times to severe aggression, confused, disinhibited behavior, decreased speech output, marked decline in self-care. It was also associated with hyperphagia. He would eat unusually

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Month of Submission : 12-2014  
 Month of Peer Review : 01-2015  
 Month of Acceptance : 01-2015  
 Month of Publishing : 02-2015

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more quantities of food. Inter-episodic periods showed complete recovery. There was no positive past or family history of neurological or psychiatric disorder. History of meningitis, head injury, and substance abuse were ruled out. All biochemical, endocrine, radiological parameters and electroencephalography were found within normal range. A clinical diagnosis of KLS was made, and patient was put on modafinil 100 mg oral dose for 30 days and was switched to lithium 450 mg and he is maintaining well with no recurrence.

## DISCUSSION

Patient fulfilled the criteria for KLS, but due to the rarity of the disorder he was previously diagnosed as psychosis not otherwise specified. This disorder is commonly considered as a neuro-psychiatric disorder and psychotic symptom can be part of this disorder.<sup>4</sup> The disorder is rare in females.<sup>5</sup> The disease mimics and shares psychiatric conditions in many ways, and hence it is easily misdiagnosed as personality disorder or major mental illness. Furthermore, therefore, it is important to have a high index of suspicion in any case presenting with complaints of episodic hypersomnolence and after ruling out differentials like Kluver–Bucy syndrome, atypical depression, substance abuse and other differentials for hypersomnolence<sup>2</sup> and finally diagnosis of KLS should be made. Lithium, valproate, carbamazepine, amphetamine, L-dopa, modafinil, armodafinil have been tried for symptomatic treatment and for prevention of relapse with variable results as there are no definitive guidelines for treatment.<sup>3,6</sup> KLS is a neuro-psychiatric disorder therefore a case can present to neurologist or psychiatrist depending upon patients underlying symptoms, so it is important for clinicians to have high index of suspicion mainly for

atypical presentations to avoid delay in diagnosis or making erroneous diagnosis. Though most cases have an abrupt onset but precipitating events like neurological infection should not stop clinician to suspect KLS.<sup>7,8</sup>

In the above case report after a short course of modafinil, started on lithium and patient is maintaining well with no recurrence. Thus, modafinil and lithium was found to be effective in this case.<sup>9</sup>

## CONCLUSION

This case report aim to highlight that KLS though considered a rare disorder but not uncommon and lack of enough available research data is likely to be responsible for missed or erroneous diagnosis; thus we require more systematic studies regarding etiologies and treatment.

## REFERENCES

1. Pearce JM. Kleine-Levin syndrome: History and brief review. *Eur Neurol* 2008;60:212-4.
2. American Academy of Sleep Medicine. Diagnostic and Coding Manual. International Classification of Sleep Disorders. 3<sup>rd</sup> ed. Westchester, Illinois: American Academy of Sleep Medicine; 2013.
3. Arnulf I, Zeitzer JM, File J, Farber N, Mignot E. Kleine-Levin syndrome: A systematic review of 186 cases in the literature. *Brain* 2005;128:2763-76.
4. Murthy VS, Kelkar AD, Sonavane SS. Psychosis in a case of Kleine-Levin syndrome: A diagnostic challenge. *Indian J Psychol Med* 2014;36:192-4.
5. Aggarwal A, Garg A, Jiloha RC. Kleine-Levin syndrome in an adolescent female and response to modafinil. *Ann Indian Acad Neurol* 2011;14:50-2.
6. Bansode A, Shah N, Kukreja S, Sonavane S, Desousa A. Klein Levin syndrome – A case report. *Indian J Priv Psychiatry* 2012;6:52-4.
7. Merriam AE. Kleine-Levin syndrome following acute viral encephalitis. *Biol Psychiatry* 1986;21:1301-4.
8. Will RG, Young JP, Thomas DJ. Kleine-Levin syndrome: Report of two cases with onset of symptoms precipitated by head trauma. *Br J Psychiatry* 1988;152:410-2.
9. Mohapatra S, Sathpathy A, Deo SJ, Rath N. Kleine-Levin syndrome and its successful treatment with armodafinil. *Ger J Psychiatry* 2014;17:25-6.

**How to cite this article:** Dhage A, Mandaknalli R. Kleine-Levin Syndrome: Sleeping Beauty: A Rare Case Report on Sleep Disorder. *Int J Sci Stud* 2015;2(11):209-210.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Parapagus Dicephalus Tribrachus Tripus Conjoined Twin: A Case Report

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## Abstract

Dicephalus twins are very rare form of conjoined twins and are a subtype of parapagus conjoined twin. Dicephalus twins share a common body with two heads. They are subdivided into many groups depending on the number of upper limbs, lower limbs and number of torso. A stillborn dicephalus tribrachus tripus conjoined twin is reported here. There are presence of six fingers and three toes in extra limbs and external genitalia are ambiguous. Presence of third lower limb makes the case even more unusual among the rare type. There is a high incidence of mortality in conjoined twins. Early and accurate diagnosis is important in conjoined twins.

**Key words:** Conjoined twins, Dicephalus, Parapagus, Tripus

## INTRODUCTION

Conjoined twins have fascinated people for centuries.<sup>1</sup> Conjoined twinning is a rare phenomenon and in a recent epidemiological study, it was found that the total prevalence of conjoined twin was 1.47 per 100,000 births.<sup>2</sup>

Parapagus is the term used where there is extensive side-to-side fusion, and this is a rare form of conjoined twins.<sup>3</sup> Dicephalus is a subset of parapagus, in which the twins share a common body from the neck or upper chest downwards.<sup>4</sup> This anomaly represents <0.5% of all the reported cases of conjoined twins.<sup>5</sup>

They are subdivided into many groups depending upon the number of upper limbs, lower limbs and number of torso.<sup>6</sup> Accordingly they are dicephalus tetrabrachius dipus, dicephalus tribrachius dipus and dicephalus dibrachius dipus.

There is a high incidence of mortality in conjoined twins. In a study conducted by Mackenzie *et al.*, 28% of conjoined twins died during the intrauterine period, 54% during immediate postnatal period and 18% survived.<sup>7</sup>

Here, a parapagus dicephalus conjoined twin is reported with three upper and lower limbs. Thus, the present case is a parapagus dicephalus tribrachius tripus conjoined twin. In most of the literature bipus dicephalus conjoined twins were reported, but tripus dicephalus conjoined twins are unusual.

## CASE REPORT

A stillborn full-term two headed conjoined twin was brought to the Department of Anatomy from the department of obstetrics and gynecology with birth weight of 3.5 kg, and was delivered by caesarean section to a 30-year-old female who did not undergo any antenatal ultrasonography. There was no family history of twinning, but consanguinity was present. History of radiation exposure or intake of drugs was absent. Informed consent was taken from the guardians for examination.

On external examination, twin had two heads and necks with the right head had smaller neck than the left one (Figure 1). The two heads had fused trunk below the neck. Externally, there were normal trunk, abdomen and a single

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Month of Submission : 12-2014  
Month of Peer Review : 01-2015  
Month of Acceptance : 01-2015  
Month of Publishing : 02-2015

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umbilical cord. A single set of ambiguous genitalia and an imperforate anus were seen (Figure 2).

On dorsal examination of the twin, an upper limb was found to attach on the cervical region of the back of the twin (Figure 3). The hand of the limb was abnormally developed with six fingers of abnormal sizes (Figure 4).

The most unusual part of the present case report which makes the case a rare one is that there was a third lower limb attached on the lower lumbar region of the back of the twin (Figure 3). The foot of the limb was elongated with three toes (Figure 5).

## DISCUSSION

Conjoined twinning is one of the rare, most interesting and most challenging congenital malformations.<sup>8</sup> Conjoined

twinning arises when the twinning event occurs at about the primitive streak stage of development, i.e., at about 13-14 days after fertilization and it is always associated with the monoamniotic, monochorionic type of placentation.<sup>9</sup>

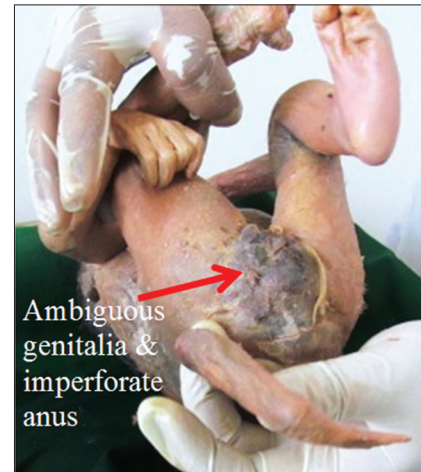


Figure 3: Ambiguous genitalia and imperforate anus in the conjoined twin



Figure 1: Two headed conjoined twin with right head having smaller neck than that of left one



Figure 4: Hand of third extra upper limb of the conjoined twin with abnormally developed six fingers

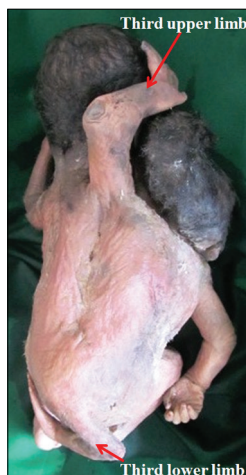


Figure 2: An extra upper limb and a lower limb are attached on cervical and lumbar region of back of the conjoined twin respectively



Figure 5: Elongated foot of the third extra lower limb with three toes

Dicephalus is considered an unusual variant of craniofacial duplication in conjoined twinning. The phenotype comprises a wide spectrum and ranges from partial duplication (diprosopus) of a few facial structures to complete dicephalus.<sup>10</sup>

A significant male predominance in parapagus type of conjoined twin has been detected.<sup>2</sup> In the present case, the external genitalia is ambiguous.

There are two theories of how conjoined twins are formed. The more widely accepted one is the “fission theory” which states that conjoined twins occur when a fertilized ovum begins to split into identical twins, but is somehow interrupted during the process and develops into two partially formed individuals who are stuck together.<sup>11</sup> It is argued that conjoined twinning cannot possibly result from a “fission event,” and can result from the fusion of mono amniotic twins.<sup>12</sup> He proposed that two mono-ovular embryonic discs may lie adjacently to one another at various angles and may become secondarily united dorsally, caudally, laterally or dorsally and symmetrically or asymmetrically, but always homologous.<sup>13</sup> It might seem logical to assume that dicephalus twins arise from two separate, nearly parallel notochords on one embryonic disc, very close together caudally, but with varying degrees of separation rostrally.<sup>14</sup>

## CONCLUSION

Early and accurate diagnosis is important in conjoined twins so that parents can be counseled for options of

termination of pregnancy. Ultrasound imaging is useful diagnostic tools in early pregnancy. Three-dimensional scan is superior to two-dimensional scan as it detects anomalies more precisely.

## REFERENCES

1. Hassani AA, Sandhu AK, Sundari MS. Dicephalus dibrachius with anencephaly. *Saudi Med J* 2005;26:1634-5.
2. Mutchinick OM, Luna-Muñoz L, Amar E, Bakker MK, Clementi M, Cocchi G, *et al.* Conjoined twins: A worldwide collaborative epidemiological study of the International Clearinghouse for Birth Defects Surveillance and Research. *Am J Med Genet C Semin Med Genet* 2011;157C:274-87.
3. Spitz L. Conjoined twins. *Prenat Diagn* 2005;25:814-9.
4. Bondeson J. Dicephalus conjoined twins: A historical review with emphasis on viability. *J Pediatr Surg* 2001;36:1435-44.
5. Singhal AK, Agarwal GS, Sharma S, Gupta AK, Gupta DK. Parapagus conjoined twins: Complicated anatomy precludes separation. *J Indian Assoc Pediatr Surg* 2006;11:145-7.
6. Athanasiadis AP, Tzannatos C, Mikos T, Zafrakas M, Bontis JN. A unique case of conjoined triplets. *Am J Obstet Gynecol* 2005;192:2084-7.
7. Mackenzie TC, Crombleholme TM, Johnson MP, Schnaufer L, Flake AW, Hedrick HL, *et al.* The natural history of prenatally diagnosed conjoined twins. *J Pediatr Surg* 2002;37:303-9.
8. Ghritlaharey RK. Ischiopagus tetrapus conjoined twins. *J Clin Diagn Res* 2008;2:800-1.
9. Kaufman MH. The embryology of conjoined twins. *Childs Nerv Syst* 2004;20:508-25.
10. Guttmacher AF, Nichols BC. Teratology of conjoined twins. *Birth Defects* 1967;3:3-9.
11. Harma M, Harma M, Mil Z, Oksuzler C. Vaginal delivery of dicephalic parapagus conjoined twins: Case report and literature review. *Tohoku J Exp Med* 2005;205:179-85.
12. Barth RA, Filly RA, Goldberg JD, Moore P, Silverman NH. Conjoined twins: Prenatal diagnosis and assessment of associated malformations. *Radiology* 1990;177:201-7.
13. Mabogunje OA, Lawrie JH. Conjoined twins in West Africa. *Arch Dis Child* 1980;55:626-30.
14. Spencer R. Theoretical and analytical embryology of conjoined twins: Part II: adjustments to union. *Clin Anat* 2000;13:97-120.

**How to cite this article:** Sahu SK, Choudhury PR, Saikia M, Das TK, Talukdar KL, Bayan H. Parapagus Dicephalus Tribachius Tripus Conjoined Twin: A Case Report. *Int J Sci Stud* 2015;2(11):211-213.

**Source of Support:** Nil, **Conflict of Interest:** None declared.



# Self-healing Lesion of Bisphosphonate Induced Osteonecrosis of Maxilla in an Osteoporotic Patient: A Case Report

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## Abstract

Bisphosphonates (BP) are used as anti-osteoclastic and anti-resorptive agents for the management of osteoporosis, multiple myeloma, Paget's disease and hypercalcemia of malignancy. Their function is to improve bone morphology, prevent bone destruction and pathologic fractures while decelerating bone resorption. However, BP-induced osteonecrosis of the jaw (BRONJ) is one of the complications of BP intake. The aim of this paper is to report a case of BRONJ in a patient on oral BP for osteoporosis, which healed spontaneously on cessation of offending drug.

**Key words:** Bisphosphonate, Osteonecrosis, Osteoporosis

## INTRODUCTION

Bisphosphonate (BP) related osteonecrosis of the jaw (BRONJ) is one of the complications of BP intake for management of osteoporosis, multiple myeloma, Paget's disease and hypercalcemia of malignancy.<sup>1</sup> The reported incidence is significantly higher with the Intravenous preparation while the risk appears to be minimal for patients receiving oral BPs, where the prevalence approximates 0.1%.<sup>2</sup> Based on retrospective studies, estimates of cumulative incidence range from 0.8% to 12%. The mandible is more commonly affected than the maxilla and 60-70% cases are preceded by a dental surgical procedure.<sup>2</sup> The association of long-term application of bisphosphonates and exposed bone has been first described by Marx in 2003. Since then, about 5000 cases have been documented.<sup>1,3</sup>

The American Society for Bone and Mineral Research defines BRONJ as "an area of exposed bone in the maxillofacial region that has not healed within 8 weeks after identification by a healthcare provider in a patient who is receiving or has been exposed to a BP and has not had radiation therapy to the craniofacial region."<sup>4,5</sup> The American Association of Oral and Maxillofacial Surgeons (AAOMS) suggested a staging system based on four stages of BRONJ.<sup>2,6,7</sup>

Although antibiotics and chlorhexidine mouth rinses have been advocated in the literature in order to manage lesions of BRONJ, but no case have been reported in the literature till date. Here, we are reporting a case of Stage I BP induced osteonecrosis of maxilla in a patient who was on a low dose oral BP for osteoporosis and the lesion healed spontaneously on stoppage of the offending drug.

## CASE REPORT

A 52-year-old male patient reported to the department of oral medicine and radiology at Maulana Azad Institute of Dental Sciences with the complaint of ulceration on the left side of the palate for past 3 months. The patient had a previous history of extraction of upper left maxillary first

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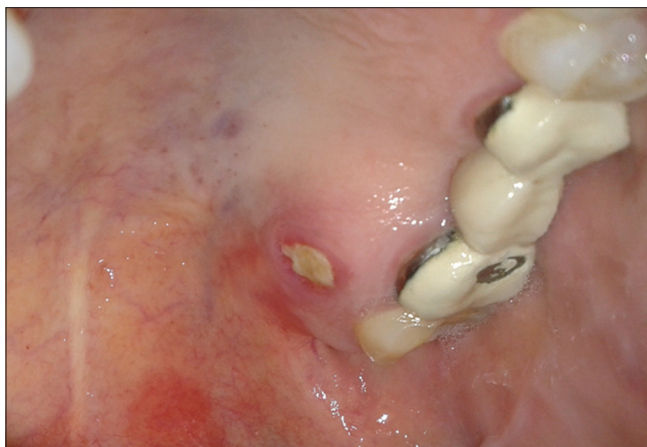
**Month of Submission :** 12-2014  
**Month of Peer Review :** 01-2015  
**Month of Acceptance :** 01-2015  
**Month of Publishing :** 02-2015

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molar followed by placement of fixed prosthesis in relation to upper left maxillary second premolar, first, second and third molar about 1 month before the appearance of lesion. There was no associated history of fever, trauma, and pus discharge, but there was mild, dull, intermittent pain, which relieved on taking analgesics. He was a diagnosed case of osteoporosis and was under treatment with oral BP alendronate 200 mg daily for the past 6 months. Personal history including habits was non-contributory.

On intraoral examination, there was sloughing of the alveolar mucosa of the palate with exposed bone in relation to upper left maxillary second and third molar approximately 1 cm away from the gingival margin. The surrounding mucosa was erythematous. Lesion was approximately 1 cm × 1 cm in size (Figure 1) and was bony hard and tender on palpation. The associated teeth were tender on percussion. Gingival and periodontal examination did not reveal any pathological finding. Orthopantomogram was advised, which did not reveal any pathological changes (Figure 2). Based on the positive history of intake of oral BP, previous history of dental treatment and clinical presentation, diagnosis of BRONJ was made.

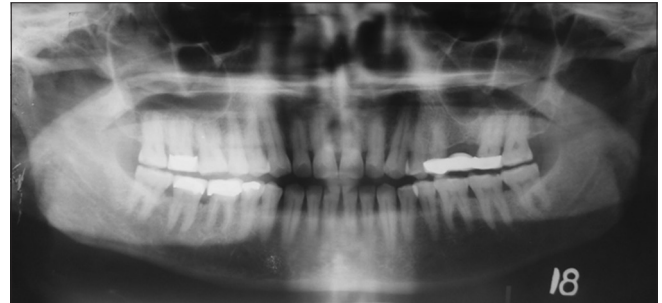
In consultation with the treating physician, the patient was asked to stop the drug and was advised chlorhexidine mouth rinses. The patient was kept on regular follow-up and on subsequent visits, it was seen that there was covering of exposed bone with normal mucosa and healing was evident in about 1 month (Figure 3). Complete healing of the site was evident on subsequent follow-ups (Figures 4 and 5).



**Figure 1:** Intraoral photograph of the patient at first visit showing exposed necrotic bone of left alveolar mucosa of palate in relation to 27, 28 diagnosed as bisphosphonate-induced osteonecrosis of the jaw

## DISCUSSION

Osteoporosis is a major public health problem because of its high cumulative fracture risk and the potentially disastrous consequences. Oral BPs are synthetic drugs used primarily in the treatment of osteoporosis. Being strong



**Figure 2:** Orthopantomograph of the same patient with no pathological finding with respect to the site of lesion (left posterior maxilla)



**Figure 3:** Intraoral photograph of the patient at follow-up visit after 1 month with the healing of lesion evident



**Figure 4:** Intraoral photograph of the patient at follow-up visit after 3 months



**Figure 5: Intraoral photograph of the patient at follow up visit after 6 months**

suppressors of osteoclasts, they slow down the remodeling process and thus increase bone mineral density. Despite the benefits of these drugs, BRONJ, which was first published in the literature in 2003, is a severe side-effect of BP therapy.<sup>3</sup>

A clear causal relationship between oral BP and osteonecrosis of the jaw has yet to be established. Two theories have been put forward. First, that BPs induce compromised vascularity of the jaws by decreasing vascular endothelial growth factor, inducing apoptosis of the endothelial cells and inhibiting capillary neoangiogenesis.<sup>2,3,8</sup> These events lead to avascular necrosis of the jaws.<sup>2,3</sup> The second hypothesis is that the ischemia is thought to be induced through dense, poorly formed bone via the anticlastic mechanism of BPs as they alter the cytoskeletal morphology of osteoclasts inducing integrin signaling, trafficking of endosomes and disruption of the ruffled border.<sup>2,9</sup> Microstress and microfractures of jaw bones signal the osteoclastic and osteoblastic resorption and mineralization of the damaged bone, respectively. As a result, there is no release of bone morphogenic protein with no induction of osteoblastic differentiation resulting in an avascular and acellular osteon.<sup>2,9</sup>

BRONJ may remain asymptomatic for many weeks or months and is usually identified by its unique clinical presentation of exposed bone in the oral cavity. These lesions typically become symptomatic when sites become secondarily infected or if there is trauma to adjacent or opposing healthy soft tissues.<sup>10</sup> Radiographic changes in early stages are very subtle and difficult to detect but over time, as the surface bone breaks down, changes such as osteolysis consistent with bone loss may be evident.<sup>10</sup> Preventive measures should always be taken to subvert the risk of developing this severe ailment. These include careful dental examination and extraction of candidate's

**Table 1: Treatment guidelines for BRONJ devised by AAOMS<sup>2</sup>**

Stages	Treatment guidelines
Stage zero or risk category	No treatment indicated Patient education
Stage I	Antibacterial mouth rinse Clinical follow up every 4 months
Stage II	Treatment with broad spectrum oral Antibiotics Antibacterial mouth rinse Superficial debridement to relieve soft tissue irritation
Stage III	Antibacterial mouth rinse Antibiotic therapy and pain control Surgical debridement or resection for larger palliation of infection and pain

BRONJ: Bisphosphonate related osteonecrosis of jaw, AAOMS: American Association of Oral and Maxillofacial Surgeons

teeth with enough time allowed for healing in advance of the start of BP treatment, control of dental caries and periodontal disease, avoiding implant placement.<sup>2,8,11</sup> Non-restorable teeth should be treated by removal of the crown and endodontic treatment of the root remnants.<sup>2</sup> Other risk factors including diabetes, smoking, alcohol abuse, poor oral hygiene and corticosteroid therapy should be taken care of. Patient should be adequately informed of the potential risk of defective bone healing.<sup>2,12</sup>

Currently, there is no effective treatment for BRONJ. The AAOMS has proposed a staging system and based on it, treatment strategy (Table 1) has been devised with the goal of preventing progression of lesions and limiting complications related to chronic infection.<sup>2</sup>

The literature, until date, does not document any case in which there was spontaneous healing of the lesion of BRONJ solely on cessation of the drug. Although the exact mechanism of this phenomenon is not known, but it can be hypothesized that the self-healing ability might be due to the fact that the bone renews itself and discontinuation of therapy might have a beneficial effect as the newly formed bone is unable to absorb BP.

## CONCLUSION

In view of the present case, it may be advised to stop the BP therapy for the management of osteoporosis in patients who manifest with BRONJ since alternative therapies for osteoporosis are available. However, the treatment should be based on individual's systemic conditions.

## REFERENCES

- Sharma D, Ivanovski S, Slevin M, Hamlet S, Pop TS, Brinzaniuc K, *et al.* Bisphosphonate-related osteonecrosis of jaw (BRONJ): Diagnostic criteria and possible pathogenic mechanisms of an unexpected anti-angiogenic side effect. *Vasc Cell* 2013;5:1.

2. Ficarra G, Beninati F. Bisphosphonate-related osteonecrosis of the jaws: An update on clinical, pathological and management aspects. *Head Neck Pathol* 2007;1:132-40.
3. Marx RE. Pamidronate (Aredia) and zoledronate (Zometa) induced avascular necrosis of the jaws: A growing epidemic. *J Oral Maxillofac Surg* 2003;61:1115-7.
4. Tong CK, Ho ST, Wong SL. Osteonecrosis of the jaw after oral bisphosphonate for osteoporosis. *Hong Kong Med J* 2010;16:145-8.
5. Khosla S, Burr D, Cauley J, Dempster DW, Ebeling PR, Felsenberg D, *et al.* Bisphosphonate-associated osteonecrosis of the jaw: Report of a task force of the American Society for Bone and Mineral Research. *J Bone Miner Res* 2007;22:1479-91.
6. Advisory Task Force on Bisphosphonate-Related Osteonecrosis of the Jaws, American Association of Oral and Maxillofacial Surgeons. American Association of Oral and Maxillofacial Surgeons position paper on bisphosphonate-related osteonecrosis of the jaws. *J Oral Maxillofac Surg* 2007;65:369-76.
7. McLeod NM, Brennan PA, Ruggiero SL. Bisphosphonate osteonecrosis of the jaw: A historical and contemporary review. *Surgeon* 2012;10:36-42.
8. Vannucchi AM, Ficarra G, Antonioli E, Bosi A. Osteonecrosis of the jaw associated with zoledronate therapy in a patient with multiple myeloma. *Br J Haematol* 2005;128:738.
9. Montazeri AH, Erskine JG, McQuaker IG. Oral sodium clodronate induced osteonecrosis of the jaw in a patient with myeloma. *Eur J Haematol* 2007;79:69-71.
10. Ruggiero S, Gralow J, Marx RE, Hoff AO, Schubert MM, Huryn JM, *et al.* Practical guidelines for the prevention, diagnosis, and treatment of osteonecrosis of the jaw in patients with cancer. *J Oncol Pract* 2006;2:7-14.
11. Hewitt C, Farah CS. Bisphosphonate-related osteonecrosis of the jaws: A comprehensive review. *J Oral Pathol Med* 2007;36:319-28.
12. Marx RE, Sawatari Y, Fortin M, Broumand V. Bisphosphonate-induced exposed bone (osteonecrosis/osteopetrosis) of the jaws: Risk factors, recognition, prevention, and treatment. *J Oral Maxillofac Surg* 2005;63:1567-75.

**How to cite this article:** Gupta S, Gupta S, Ghosh S. Self-healing Lesion of Bisphosphonate Induced Osteonecrosis of Maxilla in an Osteoporotic Patient: A Case Report. *Int J Sci Stud* 2015;2(11):214-217.

**Source of Support:** Nil, **Conflict of Interest:** None declared.



# Mineral Trioxide Aggregate as an Apical Plug Material in Tooth with Open Apex: A Case Report

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## Abstract

The conventional method of apexification with calcium hydroxide has certain disadvantages such as very long period of treatment, tooth fracture and an incomplete calcification of the bridge. Mineral trioxide aggregate (MTA) as an apical sealing material has gained importance as an alternative treatment for open apices. We report a case of complete healing of a periapical abscess after placement of MTA apical plug, after the root canals were debrided and rinsed with sodium hypochlorite. The remaining portion of the root canal was obturated using lateral condensation technique, and a crown was placed. After 6 months of follow-up complete healing of the periapical lesion was noticed this was evident radiologically. This case report suggests that use of MTA as an apical sealing material is a significant alternative to the conventional methods of apexification.

**Key words:** Apexification, Mineral trioxide aggregate cement, Periapical abscess, Tooth apex

## INTRODUCTION

Mineral trioxide aggregate (MTA) has few potential uses in endodontics as a root canal filling material. The other uses of MTA in dentistry are regeneration of periradicular tissues such as bone, cementum, and periodontal ligament.<sup>1</sup> MTA has an excellent sealing ability, the reason for this is the material is a hydraulic cement that sets even in the presence of moisture.<sup>1,2</sup>

The main goal of treatment of teeth with pulpal necrosis is achieving an apical seal. In the past, this apical seal was achieved by creating a barrier with hard tissue, a procedure known as apexification. The major disadvantages of apexification procedure using calcium hydroxide are the thin walls of the root, which may fracture and although the barrier is calcified it is actually porous and may contain a small amount of soft tissue.<sup>3</sup>

As an alternative to traditional apexification using calcium hydroxide, a number of materials have been proposed in the literature. Among these materials, MTA is most popular for this procedure. MTA is composed of fine hydrophilic particles of tricalcium silicate, silicate oxide, and tricalcium oxide. When mixed with sterile water it forms a colloidal gel and its setting time is 3-4 h in the presence of moisture.<sup>4</sup> MTA has less leakage, better antibacterial properties, high marginal adaptation and short setting time (4 h), a pH of 12.5 and is more biocompatible.<sup>4,5</sup>

Therefore, the present case report highlights the non-surgical management of a non-vital tooth with an open apex associated with a peripapillary lesion using MTA apical plug technique.

## CASE REPORT

A 16-year-old female patient was referred to the department of endodontics, Mamata Dental College and Hospital with a chief complaint of pain in the upper right front tooth region. The patient's dental history revealed that she had suffered a trauma to the right maxillary central incisor 5 years back, for which she did not undergo any treatment. The right maxillary central incisor was discolored and was tender

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Month of Submission : 12-2014  
Month of Peer Review : 01-2015  
Month of Acceptance : 00-0000  
Month of Publishing : 02-2015

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on percussion. On doing the pulp vitality test, there was a negative response to cold, heat and electric pulp testing. On radiographic examination of the associated tooth, a large canal with associated periapical lesion was noticed in relation to right maxillary central incisor (Figure 1).

Access opening was done, and working length was determined. Pus was extruded from the root canal immediately after the access opening was made. Working length was determined (Figure 2) and biomechanical preparation was then done and canal was debrided using 2.5% sodium hypochlorite and saline.

The canal was dried using paper points, and MTA was placed using MTA carrier in the apical portion of the canal (Figure 3).

Remaining portion of the canal was filled with gutta-percha using lateral condensation technique and crown was placed (Figure 4).

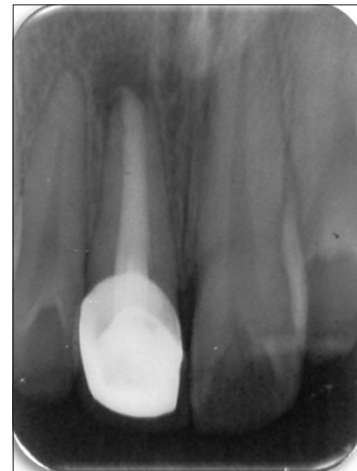
The patient was then followed up for a period of 6 months at an interval of 1 month. The periapical lesion healed slowly and after a period of 6 months complete healing of the lesion was noticed (Figure 5).



**Figure 3: Mineral trioxide aggregate placed in the tooth**



**Figure 1: Intra oral periapical radiograph showing periapical lesion in relation to right maxillary central incisor**



**Figure 4: Root canal is obturated and crown placed**



**Figure 2: Working length determination**



**Figure 5: Complete healing of lesion after 6 months**

## DISCUSSION

The tissues of the periodontium when traumatized due to intrusion, luxation or exfoliation external resorption may occur. Early necrosis of the pulp, incomplete root formation or external resorption of the root due to trauma may result in blunted or shortened root with open apex.<sup>6,7</sup>

Apexification is the process of creating a barrier with hard tissue at the root end. Although, calcium hydroxide was used most commonly for the process of apexification, the time duration is too long ranging from 12 to 24 months.<sup>8</sup> Moreover, the barrier formed by apexification using calcium hydroxide is considered to be incomplete having a swiss cheese appearance and can allow apical microleakage leading to reinfection.<sup>8</sup> To overcome these disadvantages of using calcium hydroxide as apical sealing material, a “one visit apexification” using MTA was introduced.<sup>9</sup>

MTA is one of the most effective materials for sealing both iatrogenic and pathological communication between endodontic and periodontal spaces.<sup>10-12</sup> when used in contact with periradicular tissue, MTA has the ability to induce cementum like hard tissue. The rationale for this is MTA stimulates the production of interleukins and cytokines, thereby promoting hard tissue formation.<sup>4</sup> MTA plug in the apical portion of the root promotes apical repair and prevents root canal overfilling and increases the fracture resistance of immature teeth.<sup>13</sup>

Holland *et al.*<sup>14</sup> have conducted a study on periapical tissue response in dogs after root canal filling with MTA. They noticed biological closure of the apical foramen as well as the absence of the inflammation in the peripapal tissues after placement of MTA. The rationale for this response is due to cell adhesion and differentiation with consequent deposition of hard tissue by periapical tissue, which is in contact with MTA. These results are consistent with the present case, where complete healing of the periapical lesion was noticed in the duration of 6 months with narrowing of the open apex, and no recurrence was noticed thereafter.

Günes and Aydinbelge<sup>4</sup> in their report of cases on MTA apical plug method for treatment of non-vital immature permanent maxillary incisors have noticed radiological and clinical successful healing of the peripapal lesion after 1 year duration. In the present case report, complete healing of the periapical lesion was noticed in the duration of 6 months.

Ajwani and Saini<sup>8</sup> have reported a case of successful treatment of mutilated maxillary central incisor with an

open apex using intracanal calcium hydroxide and MTA, followed by fiber post and core. In the present case after placing the MTA apical plug, the subsequent increments were obturated using lateral condensation technique. The present case also produced the similar results with no symptoms thereafter.

Ultrasonic instruments, a messing gun or amalgam carrier, manual pluggers, and K-files have been proposed for delivering the MTA apical plug.<sup>15,16</sup> As extrusion of the root filling material is a common problem in roots with an open apex, operator skills in delivering the material is a determining factor in the outcome of the treatment.

The present case report suggests that MTA apical plug technique permits suitable management of teeth with necrotic pulp, open apex, and periapical lesion.

## CONCLUSION

Placement of an apical barrier using MTA is an alternative to conventional long-term calcium hydroxide therapy, which reduces the treatment time. Moreover, MTA apical plug can be considered very effective in stimulating regeneration of apical tissue in immature permanent teeth with open apices.

## REFERENCES

1. Floratos SG, Tsatsoulis IN, Kontakiotis EG. Apical barrier formation after incomplete orthograde MTA apical plug placement in teeth with open apex – Report of two cases. *Braz Dent J* 2013;24:163-6.
2. Camilleri J, Pitt Ford TR. Mineral trioxide aggregate: A review of the constituents and biological properties of the material. *Int Endod J* 2006;39:747-54.
3. Ghaziani P, Aghasizadeh N, Sheikh-Nezami M. Endodontic treatment with MTA apical plugs: A case report. *J Oral Sci* 2007;49:325-9.
4. Günes B, Aydinbelge HA. Mineral trioxide aggregate apical plug method for the treatment of nonvital immature permanent maxillary incisors: Three case reports. *J Conserv Dent* 2012;15:73-6.
5. Kubasad GC, Ghivari SB. Apexification with apical plug of MTA-report of cases. *Arch Oral Sci Res* 2011;1:104-7.
6. Pace R, Giuliani V, Pagavino G. Mineral trioxide aggregate in the treatment of external invasive resorption: A case report. *Int Endod J* 2008;41:258-66.
7. Araújo RA, Silveira CF, Cunha RS, De Martin AS, Fontana CE, Bueno CE. Single-session use of mineral trioxide aggregate as an apical barrier in a case of external root resorption. *J Oral Sci* 2010;52:325-8.
8. Ajwani P, Saini N. Non-surgical management of a mutilated maxillary central incisor with open apex and large periapical lesion. *Indian J Dent Res* 2011;22:475-7.
9. Stefopoulos S, Tzanetakis GN, Kontakiotis EG. Non-surgical retreatment of a failed apicoectomy without retrofilling using white mineral trioxide aggregate as an apical barrier. *Braz Dent J* 2012;23:167-71.
10. Torabinejad M, Hong CU, McDonald F, Pitt Ford TR. Physical and chemical properties of a new root-end filling material. *J Endod* 1995;21:349-53.
11. Al-Hezaimi K, Naghshbandi J, Oglesby S, Simon JH, Rotstein I. Human saliva penetration of root canals obturated with two types of mineral trioxide aggregate cements. *J Endod* 2005;31:453-6.

12. Al-Kahtani A, Shostad S, Schifferle R, Bhambhani S. *In-vitro* evaluation of microleakage of an orthograde apical plug of mineral trioxide aggregate in permanent teeth with simulated immature apices. J Endod 2005;31:117-9.
13. Pace R, Giuliani V, Nieri M, Di Nasso L, Pagavino G. Mineral trioxide aggregate as apical plug in teeth with necrotic pulp and immature apices: A 10-year case series. J Endod 2014;40:1250-4.
14. Holland R, Mazuqueli L, de Souza V, Murata SS, Dezan Júnior E, Suzuki P. Influence of the type of vehicle and limit of obturation on apical and periapical tissue response in dogs' teeth after root canal filling with mineral trioxide aggregate. J Endod 2007;33:693-7.
15. Erdem AP, Sepet E. Mineral trioxide aggregate for obturation of maxillary central incisors with necrotic pulp and open apices. Dent Traumatol 2008;24:e38-41.
16. Aminoshariae A, Hartwell GR, Moon PC. Placement of mineral trioxide aggregate using two different techniques. J Endod 2003;29:679-82.

**How to cite this article:** Kakani AK, Chandrasekhar V, Muralidhar T, Chandrakanth M, Rakesh D. Mineral Trioxide Aggregate as an Apical Plug Material in Tooth with Open Apex: A Case Report. Int J Sci Stud 2015;2(11):218-221.

**Source of Support:** Nil, **Conflict of Interest:** None declared.



# Idiopathic Granulomatous Mastitis of Breast and its Management: A Case Report

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## Abstract

Idiopathic granulomatous mastitis is a rare inflammatory disease of the breast with unclear etiology. It commonly occurs in the child bearing age. It is a diagnosis of exclusion, and it is necessary to exclude all the infectious and non-infectious granulomatous conditions. There are no standard therapeutic guidelines due to the rarity of the disease. Here, we report a case of granulomatous mastitis of left side breast with history of bilateral multiple fibroadenomas in a 38-year-old women. The case was treated with oral corticosteroids for a period of 4 months with good response. Wide local excision was performed. The patient is on regular follow-up since 13 months after surgery without any recurrence.

**Key words:** Breast, Granulomatous mastitis, Idiopathic, Management

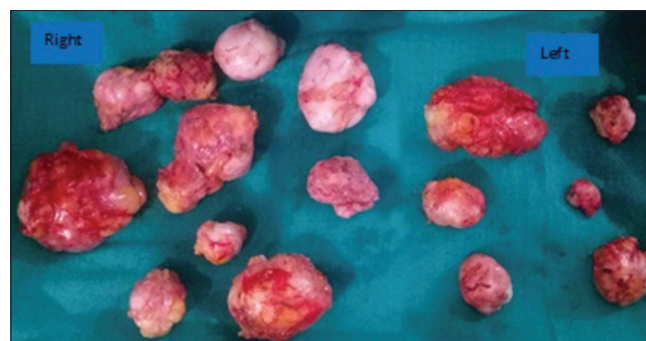
## INTRODUCTION

Idiopathic granulomatous mastitis (IGM) is a rare inflammatory disease of the breast with unclear histology.<sup>1</sup> It was first described by Kessler and Wollock in 1972.<sup>2</sup> IGM most commonly occurs in the child bearing age or with a history of oral contraceptive use.<sup>2</sup> It most commonly presents as a unilateral breast mass. Up to 25% of cases can involve both breasts.<sup>1</sup> IGM may be a self-limiting condition.<sup>1</sup> It may persist for a range of 2-24 months, but chronic conditions may last for several years.<sup>3</sup> We report a case of IGM in a 38-year-old women.

## CASE REPORT

A 38-year-old woman was presented with multiple bilateral breast nodules since 20 years back. There was no history of breast trauma, family history of cancer, oral contraceptive or estrogen use, tuberculosis or nipple discharge. The

medical and surgical history was unremarkable. She reported breast feeding to two of her children 3½ years back. Ultrasound revealed multiple nodules in the breast and all are radiologically suspected as fibroadenomas. Tru-cut biopsy from the larger one revealed fibroadenoma. Bilateral excision of the nodules was done. Gross examination showed multiple rounded to oval masses largest of size 4 × 5 cm and smooth in surface (Figure 1) cut section was solid, nodular with presence of clefts. Histopathological examination revealed fibroadenoma. She was on regular follow up since then, and found to have a lump in the upper outer quadrant of left breast after 2 years. Tru-cut biopsy of the lump was done and Histopathological examination revealed features of granulomatous mastitis. The case was treated with oral



**Figure 1:** Multiple rounded masses with glistening smooth outer surface

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Month of Submission : 12-2014  
Month of Peer Review : 01-2015  
Month of Acceptance : 01-2015  
Month of Publishing : 02-2015

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corticosteroids for 4 months, and the size of the lesion was reduced. Wide local excision was done and gross examination showed two inflammatory masses with red, granular surface, approximately one of size 4 cm × 4 cm and another of size 2 cm × 2 cm (Figure 2). Histopathological examination revealed granulomatous mastitis (Figures 3 and 4). She was now kept under regular follow-up, and there is no recurrence of the disease in a gap period of 13 months.

## DISCUSSION

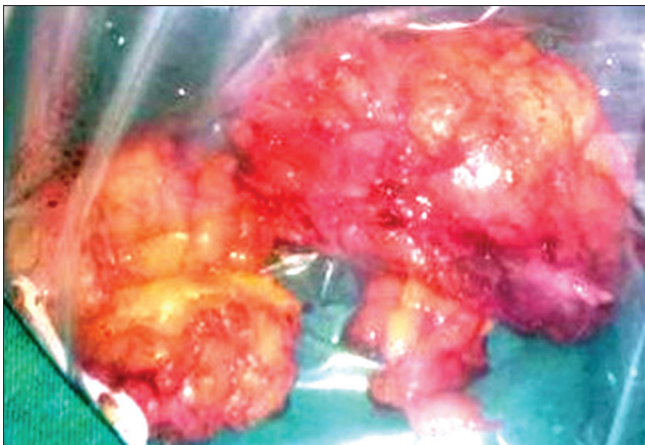
IGM is a diagnosis of exclusion and it is necessary to exclude all the infectious and non-infectious granulomatous conditions.<sup>4</sup> Presence of chronic granulomatous inflammation of lobules without necrosis is the pathological characterization of IGM.<sup>5</sup> Though it is a benign, clinico-radiologically it is confused with breast cancer.<sup>6</sup> For the diagnosis of GM, exclusion of breast cancer and other infective or non-infective causes of granulomatous inflammation such as, tuberculosis, sarcoidosis,

Wegener's granulomatosis, fungal and parasitic infections, polyarteritis nodosa, etc., should be done.<sup>3,7</sup> The present case ruled out other infectious conditions. Extravasations of protein and fat-rich secretions from damaged mammary ducts into the lobular connective tissue cause a localized immune response and it may be a proposed mechanism for granulomatous inflammation.<sup>7,8</sup> If initial presentation suggests infectious mastitis, different antibiotics are frequently used. After no response to antibiotics, different etiologies are suspected. Therefore, a high degree of suspicion in the early course of the disease is necessary for the proper diagnosis.

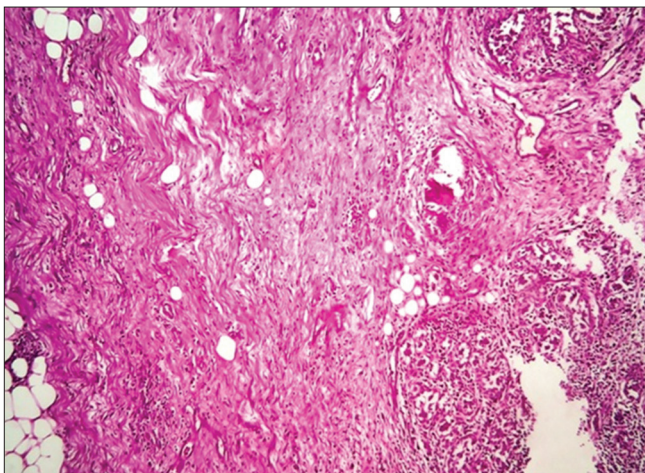
Ultrasound, mammogram, tru-cut biopsy, core needle aspiration biopsy and non-contrast MRI are helpful in diagnosis. Tru-cut biopsy is necessary for the diagnosis.<sup>9</sup> Histopathological examination needs for the diagnosis and presence of non-caseating granulomatous lobulitis ruled out other granulomatous diseases. Histopathological examination shows non-caseating granulomatous lobulitis, giant cells, leucocytes, epithelioid cells and macrophages.

The present case had a history of multiple fibroadenomas of bilateral breast since childhood. Relation between fibroadenomas and IGM is nowhere mentioned in the literature. The case was operated for multiple fibroadenomas 2 years back and develops a mass lesion in left side breast. There is no symptom or sign of infection between the gap periods. Whether there is any association between fibroadenoma and IGM needs further evaluation.

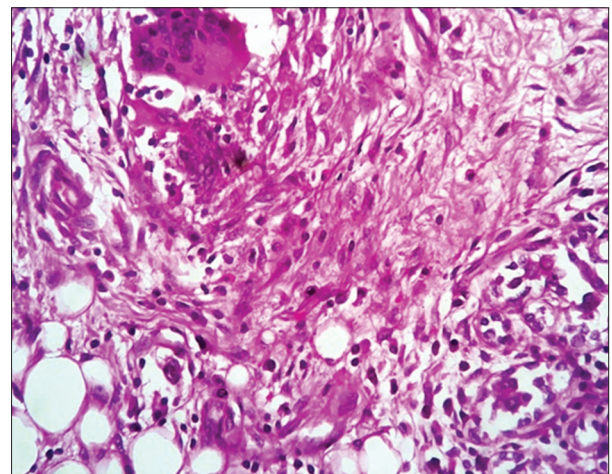
IGM is a diagnostic and therapeutic dilemma mimicking some other conditions. Clinical presentation usually mimics breast abscess or breast cancer.<sup>3</sup> The present case on histopathological examination shows features of granulomatous mastitis.



**Figure 2: Two reddish masses with high vascularity and granular surface**



**Figure 3: Wide and unevenly spaced lobules of breast acini separated by fibrofatty stroma along with many granulomas in the breast parenchyma (H and E, ×400)**



**Figure 4: Microsection showing breast lobule (right lower field) surrounded by numerous inflammatory cells. Upper field shows a granuloma containing many multinucleated giant cells, clusters of epithelioid cells and inflammatory cells (H and E, ×400)**

There is no definitive treatment till date. Initial treatment varies widely either surgical or non-surgical. Corticosteroids, immunosuppressant, antibiotics, abscess drainage and surgical excisions are treatment options in IGM. IGM is generally a self-limiting condition, and uncomplicated cases can be safely observed without any treatment.<sup>3</sup> Current data shows that initial treatment should be a course of corticosteroids when treatment is necessary. In persistent cases, more immunosuppressive is necessary like methotrexate or azathioprene. In unresponsive cases, recurrence or cases complicated by abscess formation requires surgical interventions.<sup>10</sup> Treatment with corticosteroids prior to surgery significantly reduces inflammation allowing more conservation surgery.<sup>8</sup> Once infectious etiology is ruled out, oral steroid therapy should be started.<sup>1</sup> The present case received 4 months course of oral corticosteroids with good response and followed by wide local excision.

## CONCLUSION

IGM is a rare inflammatory breast disease with high index of suspicious is necessary for the diagnosis. Association between fibroadenoma and IGM is not known and needs further evaluation. Before treatment biopsy should be done, and careful histopathological examination is necessary to rule out invasive breast cancer. Furthermore, it needs to

rule out infectious etiology. Due to the absence of clear understanding about the disease, treatment will remain challenging.

## REFERENCES

1. Erozgen F, Ersoy YE, Akaydin M, Memmi N, Celik AS, Celebi F, *et al.* Corticosteroid treatment and timing of surgery in idiopathic granulomatous mastitis confusing with breast carcinoma. *Breast Cancer Res Treat* 2010;123:447-52.
2. Kessler E, Wolloch Y. Granulomatous mastitis: A lesion clinically simulating carcinoma. *Am J Clin Pathol* 1972;58:642-6.
3. Al-Khaffaf B, Knox F, Bundred NJ. Idiopathic granulomatous mastitis: A 25-year experience. *J Am Coll Surg* 2008;206:269-73.
4. Patel RA, Strickland P, Sankara IR, Pinkston G, Many W Jr, Rodriguez M. Idiopathic granulomatous mastitis: Case reports and review of literature. *J Gen Intern Med* 2010;25:270-3.
5. Going JJ, Anderson TJ, Wilkinson S, Chetty U. Granulomatous lobular mastitis. *J Clin Pathol* 1987;40:535-40.
6. Hovanessian Larsen LJ, Peyvandi B, Klipfel N, Grant E, Iyengar G. Granulomatous lobular mastitis: Imaging, diagnosis, and treatment. *AJR Am J Roentgenol* 2009;193:574-81.
7. Ocal K, Dag A, Turkmenoglu O, Kara T, Seyit H, Konca K. Granulomatous mastitis: clinical, pathological features, and management. *Breast J* 2010;16:176-82.
8. Konan A, Kalyoncu U, Dogan I, Kiliç YA, Karakoç D, Akdogan A, *et al.* Combined long-term steroid and immunosuppressive treatment regimen in granulomatous mastitis. *Breast Care (Basel)* 2012;7:297-301.
9. Imoto S, Kitaya T, Kodama T, Hasebe T, Mukai K. Idiopathic granulomatous mastitis: Case report and review of the literature. *Jpn J Clin Oncol* 1997;27:274-7.
10. Mazlan L, Suhaimi SN, Jasmin SJ, Latar NH, Adzman S, Muhammad R. Breast carcinoma occurring from chronic granulomatous mastitis. *Malays J Med Sci* 2012;19:82-5.

**How to cite this article:** Dhal I, Nayak R, Sahoo TK, Samal S, Samantara S. Idiopathic Granulomatous Mastitis of Breast and its Management: A Case Report. *Int J Sci Stud* 2015;2(11):222-224.

**Source of Support:** Nil, **Conflict of Interest:** None declared.



# Pre Endodontic Build-up of a Grossly Destroyed Tooth: A Case Report

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## Abstract

Tooth structure loss due to caries or trauma often will hamper the required isolation with a rubber dam during root canal treatment. Improper isolation is one of the important reasons for compromised root canal therapy. The few minutes spent placing a build-up prior to the initiation of root canal therapy will help to achieve maximum positive result of treatment. The time investment will result in easy rubber dam placement, the adequate amount of achieved isolation, the reduced chance of losing the provisional restoration, and the superior quality of the endodontic treatment. Hence in this presentation, we will be reviewing the technique of restoring grossly decayed teeth prior to starting endodontic therapy. We are also showcasing cases of composite core build-up on grossly decayed teeth.

**Keywords:** Cariously destroyed teeth, Core build up, Pre endodontic build up

## INTRODUCTION

One of the main principles of endodontic therapy is disinfection of the root canal space. This disinfection is achieved by a three pronged approach, *viz.* cleaning and shaping, irrigation of the root canal space and usage of intra-canal medicaments. Achieving thorough debridement of the canal space is possible only when these modalities succeed. Having an access cavity that is four walled goes a long way in helping these goals to succeed. The dichotomy here is that very often the very teeth that need root canal therapy are also those that have lost a substantial amount of tooth structure.<sup>1</sup> These teeth almost never have intact crowns and at other times could also have old leaky restorations that need removal and hence we are faced with a further weakened tooth that does not lend itself to the application of a rubber dam clamp. These teeth that require root canal therapy thus need to be “pre-treated” before they can be subjected to root canal therapy. Doing this enables

not only efficient disinfection but also application of the rubber dam sturdily over the tooth being treated.<sup>2</sup>

The Pre-treatment Triad then consists of:

1. Removal of carious tooth structure.
2. Removal of old restorations.
3. Restoring contour of the tooth.

Completion of these steps fulfills the following objectives:

1. It prevents contamination of the root canal space by bacteria present in the carious lesions.
2. It prevents inter-appointment contamination of the canal space by oral fluids and saliva.
3. This also allows the intracanal medicaments to function to their optimum best. At the same time, the medicaments do not leach out into the oral cavity. This ensures that the root canal space remains in a medicated state in between appointments.
4. Having four good walls enables the tooth to sustain the forces exerted by a rubber dam clamp.
5. Reconstruct the pulp chamber so that there is an adequate space for the irrigating solutions and temporary medications. One must recall that, During the cleaning and shaping procedure, the pulp chamber must never be dry; on the contrary, it must contain as much irrigating solution as possible. The access cavity, therefore, must function as a basin, which is

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Month of Submission : 12-2014  
Month of Peer Review : 01-2015  
Month of Acceptance : 01-2015  
Month of Publishing : 02-2015

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possible only if there are four walls. The temporary medication must never be placed within the canal, but in the pulp chamber; For this reason, it requires space.

6. Re-establish a regular and stable contour of the tooth, to provide regular and easily locatable reference points by which one can determine, with the use of rubber stops, the working length of the instruments.
7. A meticulous pre-operative tooth build-up shall prevent a post-operative tooth fracture and improve the prognosis of the treatment.

This article presents clinical cases that have been restored pre-operatively.

## CASE REPORT

A 24-year-old male patient came to clinics with a chief complaint of incomplete treatment done with the tooth in lower right back region of the jaw.

Clinical examination revealed badly carious tooth with the distal pulp horn exposed and carious lesion present on the distal and lingual surface (Figure 1).

The pre-treatment radiograph revealed deep occlusal caries involving enamel, dentin and exposure of the pulp chamber with 46. It was seen that the pulp horn was involved and that there was a periapical lesion with the mesial root and a periodontal ligament widening with the distal root (Figure 2).

After the evaluation of the radiograph, it was decided to do the root canal treatment of 46.

Clinical evaluation showed destruction of more than 2 walls of the tooth structure and it was anticipated that there would be a problem in putting on the rubber dam clamp for isolation. So, pre-endodontic build-up of lost tooth structure was the preferred option.

As the tooth was non-vital and asymptomatic local anesthesia was not given to the patient.

An access opening of the tooth in question was completed. During the access opening all the remaining carious tooth structure was removed (Figure 3).

After the removal of the carious tooth structure, the tooth was deemed to have a tooth restorability index of >2.

During access opening four canal orifices were found. The orifices were enlarged using Sx ProTaper™. All the pulp tissue was extirpated from the pulp chamber and canals. 3%



Figure 1: Broken down mandibular molar



Figure 2: Pre-treatment IOPA of 46



Figure 3: Complete access opening with removal of caries

sodium hypochlorite and 17% ethylenediaminetetraacetic acid were used to irrigate the root canals.

The tooth structure was etched with 37% phosphoric acid for 15 s and it is rinsed with water and dried with blotting papers (Figure 4).

Later the tooth structure is coated with bonding agent (3M ESPE, single bond 2) in two layers and is cured for 20 s respectively (Figures 5 and 6).

After bonding to avoid destroying the canal entries with the restorative material during build-up the area of orifices are secured with the help of sterile cotton pellet (Figure 7).

After the cotton pellet is inserted, Tofflemire™ band is fitted around the tooth with the help of a retainer (Figure 8).

The stepwise core build up was done with the tooth using packable composite (3M ESPE, Filtek™ Z250 Universal) (Figures 9-11).

After the removal of band and retainer, all the ragged borders are made smooth with the help of composite polishing burs and stones (Figure 12).

The tooth structure, which was available after treatment was perfect for application of rubber dam (Figure 13).

It provided the maximum area for pooling of irrigating solution. Furthermore, it gave a four walled structure in which interappointment temporary restoration could be placed securely, which is very important for successful treatment outcome. It also helped to retain the intra canal medicament (R C Cal, Prime Dental). Temporization was done using Cavit™ (3M ESPM).

## DISCUSSION

The aim of endodontic therapy is to clean and shape the root canal in order to obtain a tridimensional sealing of the endodontic space.<sup>1</sup>

One of the most critical elements in endodontic treatment is proper tooth isolation.<sup>2</sup>

Rubber dam is the most comfortable means of isolation among all isolation procedures. It was developed in 19<sup>th</sup> century by S. C. Barnum and became one of



Figure 4: Etching enamel and dentin



Figure 6: Curing of bonding agent



Figure 5: Application of bonding agent to etched tooth structure



Figure 7: Cotton pallet is used to avoid the blockage of canal orifice





Figure 8: Application of Tofflemire™ band and retainer



Figure 11: Step wise composite build-up



Figure 9: Step wise composite build-up



Figure 12: Finished restoration



Figure 10: Step wise composite build-up

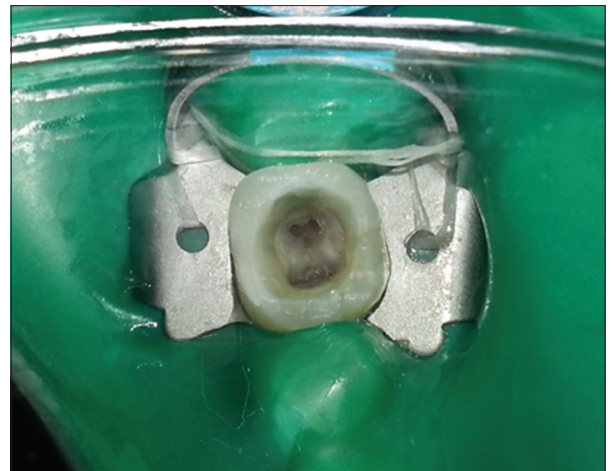


Figure 13: Built tooth with rubber dam and clamp

sophistication for the ultimate protection of both patient and clinician.

Properly placed rubber dam isolates the working area and avoid hindrance from obstacles like saliva and tongue.

Following are the advantages offered by a rubber dam:

1. Helps to achieve surgically clean operating field
2. Reduced chances of cross infection
3. Soft tissue is retracted and protected

4. Avoid aspiration of clamps or instrument by the patient
5. Increased access to working area.<sup>3</sup>

However all of this is possible if destructed tooth is built to secure the rubber dam clamp.

The working length of the tooth is defined as “the distance from a coronal reference point at which canal preparation and obturation should terminate.”<sup>4</sup>

Getting a proper and stable reference point is mandatory to have exact working length during complete root canal treatment. Build-up done on cariously destructed tooth helps to get the reference point during treatment.

Removal of the carious dentin and fractured over hanging restoration before build-up is necessary because it may hamper bond between tooth structure and composite and may also lead to secondary caries.<sup>5</sup>

Different materials are used to do pre-endodontic build up, e.g. Flowable composite, packable composite, self-cure or light-cure Glass-ionomer cement.<sup>6</sup>

If the tooth is going to be prepared for a crown, the build-up is ground from the inside. The purpose is to leave 0.5-0.7 mm to serve as a matrix for the final build-up. Then, during the crown preparation the build-up leftovers are removed.

The bonding procedure followed is always the total-etch procedure with selective enamel etching for 30 s. Then applying the bonding agent, which can be a two-bottle system or a self-priming single bottle system.<sup>6</sup>

In above case during build-up the obliteration of the canal orifice is protected by using a cotton pellet in the pulp

chamber. Thermoplasticized GP pellets, LC Block-Out resin (Ultradent Products, Inc.), paper points also can be used for the same.<sup>1</sup>

The contact points between adjacent teeth should be respected when possible. The pre-endodontic build-up on frontal teeth should be made using the appropriate shades for the tooth so that the build-up will be as aesthetic as possible.<sup>6</sup>

## CONCLUSION

In endodontic treatment, multiple variables can affect the outcome of a case. The use of this technique will enhance endodontic treatment by preventing marginal leakage before, during and after treatment that is provided before a final restoration is placed, facilitating treatment by increasing tooth surface area for clamp stability; and preventing further breakdown of the tooth by caries or fracture. By planning with a stable pre-endodontic restoration, the clinician is taking the first step toward a successful result.

## REFERENCES

1. Cohen S, Burns RC. Pathways of the Pulp. 6<sup>th</sup> ed. St Louis: Mosby; 1994. p. 179-84.
2. Heydrich RW. Pre-endodontic treatment restorations. A modification of the ‘donut’ technique. J Am Dent Assoc 2005;136:641-2.
3. Hargreaves KH, Cohen S. Pathways of the Pulp. 10<sup>th</sup> ed. St Louis: Mosby; 2010. p. 109.
4. Ingle JJ, Bakland LK, Baumgartner JC. Ingle’s Endodontics. 6<sup>th</sup> ed. Hamilton: BC Decker Inc.; 2008.
5. Omar H, El-Badrawy W, El-Mowafy O, Atta O, Saleem B. Microtensile bond strength of resin composite bonded to caries-affected dentin with three adhesives. Oper Dent 2007;32:24-30.
6. Kafelov B. Pre-endodontic Build-up: Methods and Applications; 2012.

**How to cite this article:** Kshirsagar S, Aggarwal S, Mukhtar A, Gupta P, Rai V, Chawla M. Pre Endodontic Build-up of a Grossly Destructed Tooth: A Case Report Int J Sci Stud 2015;2(11):225-229.

**Source of Support:** Nil, **Conflict of Interest:** None declared.



# An Ulcer in the Palate - A Diagnostic Dilemma

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Ulcer is a common oral lesion. Even though, ulcer is common it really poses a diagnostic challenge for a physician. A 46-year-old male patient reported with a complaint of pain in mouth of 2 months duration. He had associated difficulty in also swallowing. History of smoking since 30 years. His medical history revealed that he had tuberculous meningitis at the age of 13 years which resulted in slight mental incompetency as revealed by his father. Currently, he looked emaciated and had chronic cough. On examination, multiple, bilateral, firm, nodular and mobile cervical lymph nodes were palpable which felt like strings of rosary beads. Intra oral examination revealed a large ulcerative lesion on the palate interspersed with yellowish white areas extending to the oropharynx. Lesion was slightly elevated from the surface. Tongue also showed severe white coating interspersed with reddish pink areas (Figures 1 and 2).

Differential diagnosis: The diagnosis of the lesion was clinically difficult, and a differential diagnosis was given.

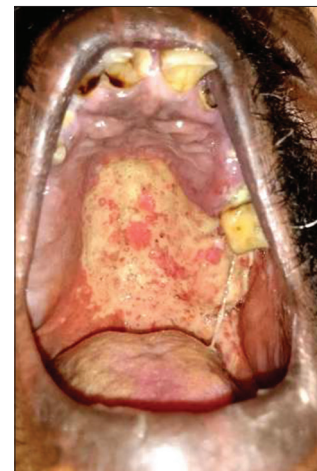
- Malignant lesion
- Tuberculous ulcer.

Reasons for giving diagnosis of malignant lesions

1. Patients history of smoking for past 30 years
2. Severe emaciation and the recent loss of weight
3. The patchy elevated appearance of the lesion and its extension
4. Patients difficulty in swallowing
5. Pain in the region
6. Multiple cervical nodes
7. Thick and ropy saliva.

Reasons why tuberculous lesion was suspected

1. History of tuberculous meningitis - It could be a reactivated lesion
2. Cough and sputum – Tuberculosis usually produces a dry cough
3. A similar appearance of the tongue.



**Figure 1: Clinical image showing a diffused ulcer on the palate extending into posterior aspect of oro pharynx, covered with slough**



**Figure 2: Zoomed image of lesion showing ulcer covered with yellowish slough and multiple erythematous areas**

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www.ijss-sn.com

Month of Submission : 12-2014  
 Month of Peer Review : 01-2015  
 Month of Acceptance : 01-2015  
 Month of Publishing : 02-2015

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There are cases where malignant transformation has occurred in tuberculous ulcer.<sup>1,2</sup> Considering the aggressiveness of the lesion this also could be envisioned.<sup>3,4</sup> Tuberculous lesions will heal by antituberculous therapy, but if malignant transformation is present other aggressive therapy may be needed. Hence, the case needs further investigations to rule out malignancy.

### Points to Ponder

- Tuberculosis may remain dormant for a long time and may exacerbate at a later rate. Even though the complete cure is expected by timely treatment, there may be cases, which may exacerbate on some stimulation

- The aggressiveness of the lesion also may be indicative of some underlying immune compromise. Hence early diagnosis is mandatory.

### REFERENCES

1. Gupta N, Nuwal P, Gupta ML, Gupta RC, Dixit RK. Primary tuberculosis of soft palate. *Indian J Chest Dis Allied Sci* 2001;43:119-21.
2. Haddad NM, Zaytoun GM, Hadi U. Tuberculosis of the soft palate: An unusual presentation of oral tuberculosis. *Otolaryngol Head Neck Surg* 1987;97:91-2.
3. Ray P, Halder A, Chowdhury J, Roy AK. Primary Tuberculosis in Soft Palate: Case Report of a Rare Entity. *Indian J Dermatol* 2014;59:423.
4. Kamala R, Sinha A, Srivastava A, Srivastava S. Primary tuberculosis of the oral cavity. *Indian J Dent Res* 2011;22:835-8.

**How to cite this article:** Mohamed A, Varma RB, Shanmughan AM, Valappila NJ. An Ulcer in the Palate - A Diagnostic Dilemma. *Int J Sci Stud* 2015;2(11):230-231.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Lewandowsky-Lutz Dysplasia in a Retropositive Individual: A Rare Case Report

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Lewandowsky-Lutz dysplasia also known as epidermodysplasia verruciformis is a rare genodermatosis, which characterized by wide spread and persistent infection with human papilloma viruses, clinically presenting with combination of pityriasis versicolor-like lesions, reddish verruca-like and seborrheic keratosis-like plaques having potential for malignant transformation.<sup>1</sup> It is usually transmitted as an autosomal recessive disorder with mutations in EVER1/TMC6 and EVER2/TMC8 genes located on chromosome 17q 25.<sup>2</sup> The most common serotypes of Human papillomavirus implicated are 3, 5, 8-10, 12, 14, 15, 17 and 19-25.<sup>3</sup>

A 38-year-old male patient, a truck driver by profession, born of a non-consanguineous marriage, presented to our outpatient department with multiple asymptomatic flat whitish skin lesions over the face, neck and abdomen and multiple elevated skin colored lesions over the dorsum of both hands and feet. These lesions first appeared at 9 years of age on the dorsum of the hands and feet and gradually progressed. The patient has been married for 12 years and has two children with apparently good health. He gave a history of frequent extramarital sexual contact and was diagnosed with retroviral infection 6 years back and was started on anti-retroviral therapy. Cutaneous examination revealed multiple well defined hypopigmented macules (Figures 1 and 2), few coalescing to form patches noted over the face, neck and trunk. There were multiple well defined skin colored to slightly brownish papules with a smooth surface (Figures 3 and 4) noted over the dorsum



Figure 1: Clinical picture showing hypopigmented macules over the front of the neck



Figure 2: Clinical picture showing hypopigmented macules over the back of the neck

Access this article online	
 www.ijss-sn.com	Month of Submission : 12-2014
	Month of Peer Review : 01-2015
	Month of Acceptance : 01-2015
	Month of Publishing : 02-2015

of both hands and feet. There was no involvement of any mucous membrane. A detailed systemic examination was done, which revealed no abnormalities. Routine blood investigations-within normal limits, CD4 cell

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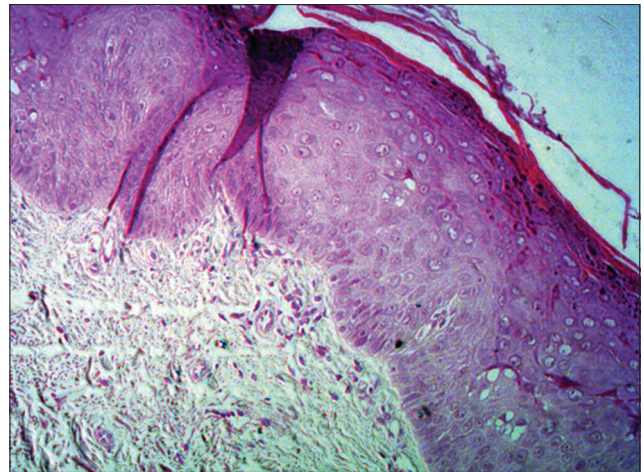
**Figure 3: Clinical picture showing brownish papular lesions over the dorsum of hand**



**Figure 4: Clinical picture showing brownish papular lesions over the dorsum of foot**

count-270 cells/mm<sup>3</sup>, potassium hydroxide mount showed neither spores nor hyphae.

Histopathology (Figure 5) showed basket weave hyperkeratosis, focally thickened granular layer, large



**Figure 5: Histopathological picture of Lewandowsky-Lutz dysplasia**

swollen pale keratinocytes (koilocytes), which were characteristic.

#### Points to Ponder

- Diagnosis of this condition is usually based on a combination of clinical features and histopathology.
- The presence of koilocytes on histopathology is characteristic.
- It is important always to rule out tinea versicolor infections by doing a potassium hydroxide mount.

#### REFERENCES

1. Vohra S, Sharma NL, Shanker V, Mahajan VK, Jindal N. Autosomal dominant epidermodysplasia verruciformis: A clinicotherapeutic experience in two cases. *Indian J Dermatol Venereol Leprol* 2010;76:557-61.
2. Aochi S, Nakanishi G, Suzuki N, Setsu N, Suzuki D, Aya K, *et al.* A novel homozygous mutation of the EVER1/TMC6 gene in a Japanese patient with epidermodysplasia verruciformis. *Br J Dermatol* 2007;157:1265-6.
3. Gul U, Soyulu S, Yavuzer R. Epidermodysplasia verruciformis associated with isolated IgM deficiency. *Indian J Dermatol Venereol Leprol* 2007;73:420-2.

**How to cite this article:** Vijayakumar S, Kumar VJ. Lewandowsky-Lutz Dysplasia in a Retropositive Individual: A Rare Case Report. *Int J Sci Stud* 2015;2(11):232-233.

**Source of Support:** Nil, **Conflict of Interest:** None declared.



# Epispadias with Diphallia: A Case Report

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Epispadias is a very rare congenital anomaly. Diphallia is much rarest anomaly. We describe a case of the male patient passing urine from the dorsal aspect of the penis without incontinence single stage surgical correction is an advantage, in this case.<sup>1</sup> A rare, first case of epispadias with diphallia is presented. In an extensive review of world literature, no case was reported like this. A 20-year-old boy presented with the passage of urine from the opening on the top of the penis he wants to get married. He has normal size penis with extra small penis attached on dorsum of the penis. He is got urinary continence physical examination was unremarkable. On examination of the external genitalia revealed midpenile epispadias with normal size penis and a 2 cm small penis at centre of the penis on dorsum (Figure 1) the remaining scotum and testes are normal. His investigations are with normal limits. Cystoscopy showed normal posterior urethra and bladder.

We have done excision of small phallus and epispadias closure as single stage repair (Figure 2). Post-operatively he is doing well after 2 years of follow. The surgical management of epispadias involves a single or two stage corrections. Excision of function less phallus as been done. After surgical correction he is voiding well, with good cosmetic out come.



**Figure 1: Epispadias – Before surgery**



**Figure 2: Post-operative – After surgery**

## Points to Ponder

- The incidence of epispadias 1 out of 117,000 in males and 1 out of 484,000 in females
- First case of epispadias with diphallia is presented and single stage correction was done.

## REFERENCE

1. Wein AJ. Text Book of Campbell-Walsh Urology. 9<sup>th</sup> ed. Philadelphia: Saunders; 2010.

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**Month of Submission :** 12-2014

**Month of Peer Review :** 01-2015

**Month of Acceptance :** 01-2015

**Month of Publishing :** 02-2015

**How to cite this article:** Babu BS, Haritha B, Dasaradhi B, Ramana BR. Epispadias with Diphallia: A Case Report. Int J Sci Stud 2015;2(11):234.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

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# Babu's Retractor

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## INTRODUCTION

A new innovation Babu's retractor made for retraction of bladder during ureteric reimplantation, retraction of vessels during arterio-venous fistula, retraction of the pelvis during pyeloplasty and pyelolithotomy.

Variety of retractors for various surgeries are available for various systems including urology. We have invented single stem double end retractor useful for retraction during open surgeries. Surgical retractors are abdominal retractors, eye retractors, gynecology retractors, handheld retractors, laminectomy retractors, pediatric and ribbon retractors, pelvic retractors, rectal retractors, rhinoplastic retractors, self-retaining retractors, skin retractors, surgical retractors, thoracic retractors, tissue retractors, trachea retractors, urological retractors, uvula retractors and vein and nerve retractors. There are totally 135 retractors.

## DESCRIPTION

Length: 25 cm. One side right angled non traumatic 5 mm round tip. Other side right angled non traumatic 10 mm round tip.

Material: Stainless steel



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www.ijss-sn.com

Month of Submission : 12-2014  
Month of Peer Review : 01-2015  
Month of Acceptance : 01-2015  
Month of Publishing : 02-2015

## Advantages and Utilisation in Urology

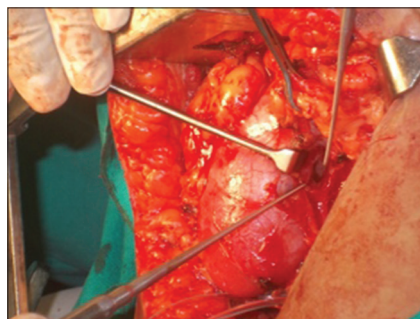
In ureteric reimplantation to retract the bladder



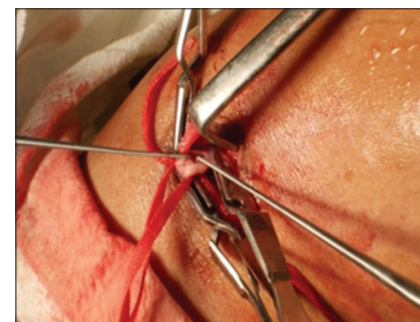
In pyelolithotomy - to retract renal pelvis



In pyeloplasty - to retract the renal pelvis



AV fistula to retract artery and vein



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## METHODS

This retractor is used in several open surgeries and found most useful in urology.

### Disadvantage

It is not malleable.

## RESULTS

Their results are excellent and matchless for surgeries

like ureteric implantation, A-V fistulas and during pyelolithotomy and other procedure. It is an excellent tool in retracting fine structures in urology and when surgical space is limited.

## CONCLUSIONS

We are using this retractor past 3 years and we found it to be much useful, during fine open surgeries in urology. In other specialities, we have to introduce. It is best neo innovation in urosurgical armentarium.

**How to cite this article:** Babu BS, Haritha B, Dasaradhi B, Ramana BR. Babu's Retractor. Int J Sci Stud 2015;2(11):235-236.

**Source of Support:** Nil, **Conflict of Interest:** None declared.