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Role of 3.0 Tesla Magnetic Resonance Cholangiopancreatography in Obstructive Jaundice with Cyto/Histopathological or Surgical Correlation

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Abstract

Background: The expanding spectrum of therapeutic options for patients with surgical jaundice makes it necessary for the radiologist to precisely assess the etiology, location, level and extent of disease. Magnetic resonance cholangiopancreatography (MRCP) at 3.0 Tesla provides improved image quality due to high signal to noise ratio.

Aim: To study the role of 3.0 Tesla MRCP as one of the better modality in obstructive jaundice.

Settings and Design: This cross-sectional study included 107 patients who were referred to the Radiology Department of Shri Ram Murti Smarak Institute of Medical Sciences, Bareilly, Uttar Pradesh, India with clinical features of biliary obstructive disease.

Materials and Methods: 3.0 Tesla MRCP was done in patients with biliary obstruction and obstructive jaundice. Pineapple juice or diluted gadolinium was given to all the patients before MRI scan as oral contrast and Intravenous contrast was used in patients wherever necessary. The characteristic MRCP features with histopathological/cytological diagnosis or surgical findings (as applicable) were considered as final.

Results: The most common malignant lesion causing obstructive jaundice detected was gall bladder (GB) carcinoma, and most common benign condition was choledocholithiasis. MRCP was able to detect early wall thickening, direct liver infiltration and lymph nodal involvement in the case of GB carcinoma. It was able to detect mirrizi’s syndrome, choledochal cysts, bile duct injury and the site and likely cause of stricture.

Conclusion: MRCP at 3.0 Tesla provides improved image quality due to increased signal to noise ratio. Thin sections of 3-4 mm can be acquired in less time, helping reduce motion artifacts. Combination of magnetic resonance imaging with MRCP allows safe surgical management decisions as it is potentially useful in knowing the level and cause of obstruction.

Key words: Jaundice, Obstructive, 3.0 Tesla magnetic resonance imaging, Magnetic resonance cholangiopancreatography

INTRODUCTION

Obstructive jaundice is a clinical terminology used for a condition associated with significant morbidity and mortality. Obstructive jaundice is caused by the blockage of any duct that carries bile from the liver to gall bladder (GB) or from GB to the small intestine. It can be due to intrahepatic or extrahepatic causes. Extrahepatic causes are further sub-divided into intra-ductal and extra-ductal. Neoplasm, choledocholithiasis, biliary stricture, parasites and primary sclerosing cholangitis lead to intra-ductal obstruction. External compression of biliary channels by neoplasm, pancreatitis or cystic duct stones with subsequent GB distention lead to extra-ductal obstruction.¹ Early and accurate diagnosis is important in obstructive jaundice so that its outcome is needed to be controlled as early as possible.

Ultrasonography (USG) is usually done as the initial investigation in patients of obstructive jaundice and can be used for follow-up imaging after treatment. USG has limitations especially in the evaluation of the distal
common bile duct (CBD) where bowel gas, debris, fluid in the duodenum and obesity can degrade the image quality.1

Endoscopic retrograde cholangiopancreatography (ERCP) is a very operator dependent and invasive procedure, and it is associated with 1-7% related morbidity and 0.2-1% mortality.2

Computed tomography scan also has its store of limitations, especially in demonstrating two important pathologies, biliary stones and biliary strictures.3,4

MRCP, which combines the advantages of projectional imaging with those of cross-sectional imaging, is an established diagnostic technique that can be substituted for ERCP in most clinical settings and is now considered the imaging test of choice. It also helpful for presurgical planning and postsurgical follow-up.5,6

Recent innovations in whole – body magnetic resonance imaging (MRI), including fast imaging sequences, phased – array coils, parallel imaging techniques, and 3.0 Tesla magnets, allow the acquisition of higher – quality diagnostic images in less time. MRCP at 3.0 Tesla provides improved image quality over that at 1.5 Tesla. The signal to noise ratio at 3.0 Tesla is twice that at 1.5 Tesla, producing higher – resolution image data sets with reduced acquisition times. The depiction of intrahepatic ducts is significantly better at 3.0 Tesla. Delineation of the pancreatic duct, particularly the side branches, is improved at 3.0 Tesla. When oral contrast material is used, the fluid signal in the gastrointestinal tract is more effectively suppressed at 3.0 Tesla, an improvement that leads to better visualization of the hepatobiliary and pancreatic ducts. In addition, thin sections of 3-4 mm can be acquired in less time at 3.0 Tesla than at 1.5 Tesla, helping reduce motion artifacts.7

Aims and Objectives
Role of 3.0 Tesla magnetic resonance cholangiopancreatography (MRCP) in obstructive jaundice with cyto/histopathological or surgical correlation.

MATERIALS AND METHODS

The Ethical Committee of our Institute approved this cross-sectional study. Informed consent was taken from all patients undergoing this study. We prospectively studied 107 patients (64 females and 43 males) in the age range 5-76 years over a period from November 2012 to December 2013 at Shri Ram Murti Smarak Institute of Medical Sciences, Bareilly, Uttar Pradesh, India. MRCP with MRI cross-sectional study was done in all patients on 3.0 Tesla MRI, MAGNETOM VERIO of Siemens. Protocols used for 3.0 Tesla MR Cholangiography were Coronal T2W SPAIR Acquisitions, Radial single shot Acquisition, Axial T2W acquisition. Diffusion and contrast were done where it was required. Serum bilirubin and alkaline phosphatase were done in all cases.

The position of the patient was kept supine and body surface coil (16 channel flex coil large) was used. All patients were instructed to fast for 4-6 h prior to examination to help reduce peristalsis and gastrointestinal fluid before imaging. Pineapple juice or 4-5 ml of gadolinium contrast material diluted with 400 ml of distilled water was given to the patients before MRI scan as an oral contrast to suppress the signal from fluid in the gastrointestinal tract. In a few critically ill and unco-operative patients, respiratory triggering was used.

As a gold standard, we used correlation with histo/cytopathological study and surgical findings (wherever applicable). All patients with clinical features of the biliary obstructive disease were included in the study. Following patients were excluded, patients having cardiac pacemakers, prosthetic heart valves, cochlear implants or any metallic orthopedic spinal implants.

OBSERVATIONS

MRCP study was done for a total of 107 patients who were clinically diagnosed as having obstructive jaundice. In this study there is female predominance, female: male ratio being 1.4:1. The majority of patients with obstructive jaundice were in age group of >41 years (Table 1).

In the present study, the most common malignant cause is GB carcinoma, and the most common benign cause is choledocholithiasis causing obstructive jaundice. The spectrum of diseases is given (Graph 1).

In the total of 27 of carcinoma GB, there is female predominance (20/27) than males (7/27). Youngest age being 32 years and eldest being of 76 years of age. In our study, GB carcinoma was associated with calculi in 22 patients (81%). Only five patients were not associated with GB calculi (19%). 20 patients presented with GB neck

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<td>0-19</td>
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<td>20-30</td>
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<td>31-40</td>
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Table 1: Age wise distribution of patients with obstructive jaundice
mass. Mass completely replacing GB was noted in two patients. Four patients presented with a mass in the fundus wall. Wall thickening noted in one patient. All the 20 patients in which mass was noted in neck region shows infiltration into the porta hepatis/adjacent liver parenchyma and cause blockage of common hepatic or bile duct. Lymph nodes were commonly noted in pre/paraaortic region, aorto caval, periportal and peripancreatic region showing restriction in diffusion with low apparent diffusion coefficient (ADC). Anteroposterior diameter being 10-25 mm (Graph 2).

In cholangiocarcinoma, there is male predominance (6/8) than female (2/8). Male:female ratio 3:1. Six patients presented above the 41 years age group, eldest being 65 years age and youngest being 32 years. Cholangiocarcinoma were noted equally in both proximal and distal CBD. Two patients of distal cholangiocarcinoma showed exophytic infiltration. Three out of four patients in proximal cholangiocarcinoma showed infiltration into the biliary confluence and hepatic ducts. Total of four patients showed lymph nodes involvement, which were more common in distal cholangiocarcinoma (3/4) than proximal (1/4). Lymph nodes were noted in porta hepatis, peripancreatic, aorto caval region with the maximum anteroposterior diameter being 9-15 mm showing restriction in diffusion with low ADC (Graph 3).

A total of 10 patients were diagnosed as periampullary/ampullary carcinoma. Main pancreatic duct was dilated in 6 of 10 patients (60%) (ranging from 5.8 to 11.1 mm). The contrast was done in a total of eight patients. Soft tissue mass was noted in eight patients, which were <3 cm. Lymph nodes involvement was present in six patients mainly peripancreatic, pre paraaortic with maximum anteroposterior diameter of 10 mm. There is equal distribution between males and females ratio being 1:1. Eight patients were in the age group of more than 41 years, eldest being 70 years of age and youngest being 31 years of age.
Only one 60 years female patient of carcinoma head was noted. There was associated CBD infiltration with subcentimetric peripancreatic, aorto caval involvement of lymph nodes and dilatation of extrahepatic and intrahepatic bile ducts.

Five cases were diagnosed as Mirrizi’s syndrome on MRCP with an impacted stone in GB neck or cystic duct. The cystic duct was elongated in two cases. Female predominance (4/5) was noted.

A total of forty cases of choledocholithiasis were evaluated. In 20 patients, choledocholithiasis is associated with GB calculi. 14 patients of choledocholithiasis had previous cholecystectomy. Six patients presented with mixed calculi i.e., calculi in CBD along with calculi in main hepatic ducts (Graph 4). There is slight male predominance than females (1.1:1). Four patients were in the age group of 0-30 years. 16 were in age group of 31-40 years. 20 patients were in the age group of >41 years. Youngest of 25 years of age and eldest being 75 years of age.

All the four cases of malignant strictures were noted in female patients with abrupt termination, shouldering, and asymmetrical wall thickening and on surgical correlation proved to be Cholangiocarcinoma. All the strictures were commonly noted in the distal CBD. Most common age group of malignant stricture is 45-74 years, eldest being 74 years. The youngest age of benign stricture is 25 years and eldest is 58 years.

Five cases of benign strictures were not operated and were on regular follow-up study and showed no significant change.

Most CBD injury type according to Bismuth classification is Type II (Graph 5).

All patients with choledochal cysts were females. All were in pediatric age group, youngest being 5 years except for one being of 62 years who had a type IVA choledochal cyst with calculi in distal CBD. Two patients were of type I and other two were of type IV choledochal cyst.

**DISCUSSION**

A total of 107 cases of obstructive jaundice and pancreatobiliary diseases were evaluated in our study.

Biochemical criteria for obstructive jaundice were direct bilirubin more than 3 mg/dl. All the patients with obstructive jaundice had raised direct serum bilirubin, maximum up to 24.0 mg/dl. Serum alkaline phosphatase was markedly increased in all cases of malignancies and was normal or mildly increased in cases of benign conditions such as choledocholithiasis/choledochal cysts.

Presenting complaints included yellowish discoloration, abdominal lump, pruritus/itching, mild fever, vomiting, and anorexia. There is overall female predominance in our study, female: male being 1.4:1.

In our study, a total of 46 patients were of malignancy, out of which GB carcinoma was the most common cause of biliary obstruction, followed by perampullary/ampullary carcinoma, cholangiocarcinoma, and pancreatic head carcinoma. Most common benign cause was choledocholithiasis.

Upadhyay in 2004, in their study on comparative assessment of imaging modalities in biliary obstruction in 100 patients also concluded the most common malignant cause of obstructive jaundice as GB carcinoma (19%) followed by perampullary carcinoma (10%), pancreatic head carcinoma (1%) and cholangiocarcinoma (9%). The most common benign cause of obstructive jaundice in his study was choledocholithiasis (31%), which was similar to our study (37%).

In our study, out of 27 cases of GB carcinoma, there was female predominance and peak age group was fifth to seventh decade. In 2012, the study done by Vijayakumar et al. showed the peak incidence of GB carcinoma in the sixth and seventh decade of life and is 3-5 times more predominant in females. 22 of 27 (81%) patients of carcinoma GB were associated with GB calculi. Vijayakumar et al. showed the most common risk factor for GB neoplasm includes gall stones and history of chronic cholecystitis.

Twenty-four out of 27 patients of carcinoma GB showed biliary obstruction either by direct infiltration into the liver, porta hepatis, and CHD/CBD region (Figure 1) or by metastatic lesions with intrahepatic bile ducts dilatation. Two cases with mass located in the fundus region and one case with focal fundal wall thickening did not present with biliary obstruction. Soto et al., also showed the primary tumor as well as its spread beyond the GB. They also showed the primary tumor as well as its spread beyond the GB was hyperintense on T2 weighted image (T2WI) and hypointense on T1 weighted image (T1WI) when compared to the liver parenchyma. In our study also GB mass showed hyperintensity on T2WI with iso to hypointense on T1WI as compared to the liver parenchyma. Most were irregular in outline. Diffusion shows restriction in GB mass with low ADC (1.05 × 10⁻³ mm²/s – 1.16 × 10⁻³ mm²/s). Kim et al. in his study of the role of diffusion-weighted MRI in the diagnosis of GB carcinoma also showed ADC value of GB Carcinoma was 1.46 ±0.45 × 10⁻³ mm²/s. Thus concluding that the addition of diffusion weighted imaging to the standard biliary MRI protocol may improve sensitivity for distinguishing GB carcinomas from benign diseases.
Post contrast study showed minimal to mild heterogeneous enhancement and was not much contributory.

Lymph nodes were noted in 17 patients (67%) involving pre/paraaortic region, aorto caval, periportal and peripancreatic region showing restriction in diffusion with low ADC. The liver metastasis was noted in nine patients. Duodenal invasion was noted in one patient with GB neck mass infiltrating the porta hepatis and duodenum. Peritoneal metastases were not noted in any of the cases. In 2006, Kaza and Gulati done a study in 15 patients with GB carcinoma with MRCP and reported that sensitivity and specificity of MRI with MRCP in detecting hepatic invasion, lymph node metastasis and bile duct invasion was 86%, 90%, and 100%, respectively. MRI correctly diagnosed duodenal invasion in only 50% and none of the patients had peritoneal metastasis. In our study, the sensitivity was almost same for hepatic invasion, lymph nodes metastases and bile duct invasion as that of 90%, 95% and 100%, respectively.

In our study, a total of 10 cases of ampullary/periampullary carcinoma were diagnosed and confirmed by surgical correlation (Figure 2). MRCP was able to delineate the extent, level and local infiltration and helped in staging of the lesions. Sugita et al. in his study of 25 cases of periampullary tumors reported a sensitivity 88%, specificity 100% and diagnostic accuracy of 96%. Wu et al. in September 2012, also done the study on 71 cases of periampullary carcinomas and showed the percentage of dilated CBD was 100% for ampullary carcinoma and that for the dilated MPD was 42.9% respectively. Amandeep Singh in his study showed 100% sensitive, specificity and diagnostic accuracy in detecting periampullary carcinoma. Our study also concluded the same results showing sensitivity, specificity and diagnostic accuracy of 100% to diagnose ampullary/periampullary carcinomas. Guibaud et al., and Pavone et al., who concluded their studies suggesting that sensitivities ranging from 80% to 86% and specificities of 96-98% and diagnostic accuracies of 91-100% for the level of obstruction.

In our study, one case was diagnosed as carcinoma head pancreas in a female of 60 years. Tam et al. reported sensitivity of 80% and specificity of 95% and that concluded by Haminem et al. who in a study of 66 patients of suspected pancreatic cancers reported a diagnostic accuracy, sensitivity and specificity of 91%, 95% and 96% respectively.

In ours study, MRCP clearly depicted caliber of CBD and the site of the calculus, especially in the distal CBD, which is difficult to visualize on ultrasound. In one case, small intrahepatic duct stones were missed on MRCP because of lack of contrast between the stones and the surrounding liver, with no high signal bile outlining the stones. MRCP findings in cholelithiasis were proximally dilated CBD with T1/T2 hypointense filling defects with meniscus sign in its distal end causing dilatation of intrahepatic bile ducts (Figure 3).

Varghese et al. reported 91% sensitivity, specificity of 98% and diagnostic accuracy of 97%. Sugiyma et al. reported 91% sensitivity, specificity of 100% and diagnostic accuracy of 97%. Reinhold et al. showed a sensitivity of 90%, specificity of 100% and accuracy of 97% on MRCP. Mandela has also showed the same results in his study concluding that MRCP is a non-invasive investigation without complications and it has high sensitivity, specificity values in detection of CBD stones and should be done in all cases with a suspicion of CBD stones, where facilities...
and expertise are available. In our study, the results match as the sensitivity of 95% and specificity of 97%.

Sensitivity and specificity in detecting Mirrizi’s syndrome in our study are 100%. Sanal has also reported a case on MRI and MRCP findings of Mirrizi’s syndrome in an icteric patient and concluded that MRCP puts forward a non-invasive alternative to ERCP in the diagnosis of Mirrizi’s syndrome and is proved to be useful.

In our study, total of nine cases of biliary strictures were evaluated on MRCP on the basis of their imaging appearance (irregular or smooth margins, symmetric or asymmetric narrowing, abrupt or gradual tapering and presence or absence of double – duct sign). All the strictures were commonly noted in the distal CBD. Malignant strictures were noted in four patients and on surgical correlation proved to be cholangiocarcinoma (Figure 4). The most common cause of benign stricture was post-operative and pancreatitis.

Park et al. done a MRCP versus ERCP comparison study in 50 patients (27 with malignant stricture and 23 with benign stricture). Sensitivity, specificity, and accuracy of the two methods for differentiation of malignant from benign causes of biliary stricture were 81%, 70% and 76% respectively, for MRCP and 74%, 70%, and 72% respectively for ERCP. Singh in his study concluded the diagnostic accuracy, sensitivity, specificity of 93.13%, 90%, 94% of MRCP respectively in detecting malignant and benign strictures. Our study concluded the sensitivity of 98% and specificity of 100% in detecting the malignant strictures.

In four patients of choledochal cysts MRCP yielded diagnostic information by providing an exact anatomic map in pre-surgical evaluation (Figure 5). Kim et al. in his study of 20 patients concluded that MRCP helps in providing the exact anatomic map of the choledochal cyst and helps in pre-surgical evaluation. Atkinson in year 2003, also concluded the same.

In the present study, a total of three patients presented with bile duct injury. All the three patients presented with Type II bile duct injury (according to bismuth classification) due to accidental iatrogenic bile duct ligation (Figure 6). MRCP imaging showed discontinuity with hypointense ligation and dilatation of proximal biliary ducts. Bujanda and Calvo also done the study on 10 patients of iatrogenic bile duct injury evaluation on the basis of MRCP and concluded the presence of biliary dilatation, excision injury, stricture, fluid collection and free fluid and findings were confirmed with surgery and ERCP. They also concluded that MRCP correctly diagnosed all the patients and is effective in diagnosing postoperative biliary tract lesions and can help decide the best therapeutic approach.

Two patients of biloma were also evaluated in our study for bile duct injury. MRCP was not able to show direct

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**Figure 2:** Periampullary carcinoma causing blockage of common bile duct and pancreatic duct

**Figure 3:** Cholelithiasis in common bile duct and main hepatic ducts

**Figure 4:** Malignant stricture (cholangiocarcinoma)

**Figure 5:** Choledochal cyst
biliary leak due to increased signal intensity from biloma collection. Bile duct injury was confirmed with surgery.

Khalid et al. in 2001, also done a study using MRCP to detect iatrogenic bile duct injury and also showed that MRCP is not a functional study, and it does not directly show leaks. Presence of free fluid on the right side of the abdomen, with or without fluid collection adjacent to the injured bile duct, should suggest the diagnosis of bile leak.  

**CONCLUSION**

MRCP at 3.0 Tesla provides improved image quality due to high Signal to noise Ratio, producing higher – resolution image data sets with 3-4 mm sections in reduced acquisition times. Potentially useful in knowing the level and cause of obstruction, hence has excellent diagnostic capabilities in the non-invasive evaluation of the patient with obstructive jaundice and influence clinician management plans.

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Comparison between Minimally Invasive Endoscopic Hydrocoelectomy and Open Subtotal Excision

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INTRODUCTION

Hydrocele
Hydrocele is an accumulation of fluid in between tunica vaginalis.¹ hydrocele fluid is amber coloured,² specific gravity 1.022-1.024. It contains water,³ salts,⁴ albumin,⁵ fibrinogen.⁶

Types
• Congenital
• Acquired-primary,⁷ secondary

Etiology
A hydrocele can be produced in four ways:
• By excessive production of fluid within the sac,⁸ e.g. secondary hydrocele
• Through defective absorption of fluid
• By interference with lymphatic drainage of scrotal structures as in case of elephantiasis
• By connection with a hernia of the peritoneal cavity in the congenital variety,⁹ which presents as hydrocele of the cord

Clinical features
Swelling in scrotum which is cross fluctuant,¹⁰ transilluminant,¹¹ non palpable testes and can get above the swelling.¹²

Treatment
Under general or spinal anesthesia scrotum is cleaned and draped a vertical incision of about 6 to 8 cm given 1cm lateral to median raphe skin, dartos, external spermatic fascia, internal spermatic fascia are incised sac identified and fluid evacuated following procedures are carried out as per type of hydrocele.
• If sac is thin and contains clear fluid-lords placation done.¹³
• If sac is thick and large hydrocele-subtotal excision of sac.¹⁴
• Eversion and suturing of sac-jaboulays procedure.¹⁵
• Sac with testis placed in dartos pouch of scrotum - Sharma and Jhawars technique.¹⁶

Abstract

Background: To assess whether minimally invasive endoscopic hydrocoelectomy is superior to open subtotal excision of sac for hydrocele repair.

Materials and Methods: A prospective study is conducted in 30 patients of uncomplicated hydrocele, under spinal anesthesia participants undergone either minimally invasive endoscopic hydrocoelectomy or open subtotal excision of sac for hydrocele. Visual analog pain scores, time of the procedure, post-operative edema, hematoma and infection rates are compared.

Results: There is a significant difference in postoperative pain, edema, hematoma and infection rates. participants who undergone minimally invasive endoscopic hydrocoelectomy had less pain, minimal edema, no hematoma and a lower rate of infection compared with open subtotal excision.

Conclusion: Minimally invasive endoscopic hydrocoelectomy is preferred approach over open subtotal excision of the sac.

Key words: Hydrocele, minimally invasive endoscopic hydrocoelectomy, open subtotal excision
After carrying out respective procedure and securing hemostasis, a drain is placed, and wound closed in layers, scrotal support given.\(^{16}\)

**Complications of surgery**
- Reactionary hemorrhage
- Infection
- Pyocoele
- Sinus formation
- Recurrent hydrocele

**Complications of hydrocele**
- Rupture usually occurs as a result of trauma but may be spontaneous.\(^{17}\) Herniation of the hydrocele sac through the dartos muscle sometimes occurs in long-standing cases.\(^{18}\)
- Transformation into an hematocoele occurs if there is spontaneous bleeding into the sac or as a result of trauma.\(^{19}\) The sac may calcify.\(^{20}\)
- Postherniorrhaphy hydrocele is a relatively rare complication of inguinal hernia repair.\(^{21}\) It is possibly due to interruption to the lymphatics draining the scrotal contents.\(^{22}\)
- Infection which may lead to pyocele.\(^{23}\)
- Atrophy of testis in long standing cases.\(^{24}\)

Here, we try to introduce a novel, two port minimally invasive endoscopic technique for treatment of hydrocele,\(^{25}\) which allows subtotal excision of sac through inguinal approach to subdartos space.\(^{26}\) Main aim is to compare rate of complications associated with open subtotal excision and endoscopic technique.\(^{11}\)

**MATERIALS AND METHODS**

The protocol was approved by the Local Ethics Committee and written informed consent was obtained from each patient. 30 participants of age 20-40 years are selected with uncomplicated hydrocele and with no other comorbidities. 15 patients who have given consent for minimally invasive endoscopic hydrocoelectomy are subjected to the procedure, and other 15 are operated by open subtotal excision.

Patients are preoperatively investigated for routine blood counts, blood sugar and viral markers preanesthetic evaluation was done by anesthetist and procedure was carried out after obtaining fitness.

Minimally invasive endoscopic hydrocoelectomy: Under spinal anesthesia with patient in supine position, after abdomen and scrotum are cleaned and drapped, a 10 mm port is placed in inguinal canal facing testis through root of scrotum, sac is visualized in subdartos space and scrotum is inflated. A 5 mm port is placed just lateral to 10 mm port and subdartos space is reached operative manipulation is carried out through 5 mm port. Sac is dissected all around, punctured and fluid evacuated subtotal excision of sac done. A tube drain is placed through 5 mm port site after securing hemostasis and 10 mm port site closed. Figure 1 shows intraoperative photographs. Figure 2 is a postoperative photograph.

Open subtotal excision: Under spinal anesthesia scrotum is cleaned and draped a vertical incision of about 6-8 cm given 1 cm lateral to median raphe, skin, dartos, external spermatic fascia, internal spermatic fascia are incised sac identified and fluid evacuated. Subtotal excision of sac done hemostasis secured, and the wound closed in layers. Figure 3 shows intraoperative photograph.

Time of procedure is recorded post operatively patients are monitored for visual analogue pain scores, post-operative recovery, wound site edema, and rate of infection.

**RESULTS**

In our study, endoscopic hydrocoelectomy is carried out in a time period of 25-30 min and open procedure in 20-25 min. Visual analog scores are 4-6/10 for the open procedure and 2-3/10 for the endoscopic procedure with the same analgesic. 10 out of 15 participants had postoperative edema with open procedure, whereas the number is only 2 out of 15 with endoscopic procedure.
Seven out of 15 patients had post-operative hematoma in open procedure, which is nil with endoscopic procedure. Open procedure had a higher rate of infection where 4 out of 15 patients had their wound infected, only a single patient had port site infection in endoscopic procedure with the same antibiotic. Table 1 shows the results.

DISCUSSION

Minimally invasive endoscopic hydrocoelectomy is safe and effective procedure for hydrocoele with minimal complications. Complications associated with open procedure like intense postoperative pain, infection, edema, recurrence are minimal with laparoscopic technique. It also permits immediate recovery; patient satisfaction is also maximum due to low complications; it is more cosmetic compared to open technique. As there is no suture material used it is cost-effective too.

CONCLUSION

Due to advantages of endoscopic hydrocoelectomy over other technique as discussed, minimally invasive endoscopic hydrocoelectomy is preferred approach over open technique.

REFERENCES


### Table 1: Results

<table>
<thead>
<tr>
<th>Complications</th>
<th>Open</th>
<th>Endoscopic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain (visual analogue scale)</td>
<td>4-6/10</td>
<td>2-3/10</td>
</tr>
<tr>
<td>Oedema</td>
<td>10/15</td>
<td>2/15</td>
</tr>
<tr>
<td>Haematoma</td>
<td>7/15</td>
<td>0/15</td>
</tr>
<tr>
<td>Infection</td>
<td>4/15</td>
<td>1/15</td>
</tr>
<tr>
<td>Time</td>
<td>20-25 min</td>
<td>25-30 min</td>
</tr>
</tbody>
</table>

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Review of Programmatic Management of Drug Resistant Tuberculosis Guidelines for Treatment of Multi Drug Resistant Tuberculosis and Difficulties in its Implementation in Government Medical Colleges of Madhya Pradesh and Role of Pulmonary Medicine Departments: An Overview

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Abstract

Background: Programmatic management of drug-resistant tuberculosis (DR-TB) (PMDT) provides for the diagnosis, management and treatment of multi-DR TB (MDR-TB). PMDT aims to cover 100% population by the year 2015, and we thought to assess its possibility.

Methodology: This study has been done by reviewing the relevant data containing PMDT guidelines and scheme of patient care delivery contained therein downloaded from Government of India official website vis-à-vis relevant Medical Council of India (MCI) regulations that were also downloaded from MCI official website.

Results: Madhya Pradesh has 6 Government Medical Colleges (GMC) and except Indore none is equipped to run the MDR-TB ward as per the MCI for running the same. PMDT services have not been started in 3 of the 6 GMC. Deficiency of teaching faculty and senior/junior residents have been observed in 5 out of 6 colleges.

Conclusion: Central TB division, Ministry of Health and Family Welfare of India, State governments as major stakeholders for coordination and implementation of the program but has not included MCI. The main problem is human resource related.

Key words: Extensively drug-resistant tuberculosis, Multi-drug resistant, Mycobacterium tuberculosis

INTRODUCTION

Multi-drug resistant tuberculosis (MDR-TB) is defined as Mycobacterium TB (MTB) resistant to isoniazid and rifampicin with or without resistance to other drugs.¹ The data from various studies conducted in India MDR-TB levels of 1-3% in new cases and around 12% in re-treatment cases has been found.²³ 2% resistance to rifampicin and 18% resistance to isoniazid either alone or in combination
with other anti-TB drugs was found in a retrospective analysis of various randomized clinical trials conducted by the TB Research Center Chennai. The prevalence of MDR-TB is found to be about 3% in new cases and 12-17% in re-treatment cases.

What is Programmatic Management of Drug Resistant Tuberculosis (PMDT)?
The term PMDT refers to programme based MDR-TB diagnosis, management and treatment. These guidelines also integrate the identification and treatment of more severe forms of drug resistance, such as extensively DR-TB.

Revised National Tuberculosis Control Programme (RNTCP) introduced the PMDT services in the year 2007 after successfully establishing the DOTS services across the country in year 2006, to address the needs of MDR-TB patients which is considered as very complex. Internationally, the first WHO endorsed PMDT services were started in year 2000.

PMDT has aimed to follow international standards to treat MDR-TB patients. PMDT guidelines have stressed on efficient and timely identification of patients who require drug susceptibility testing (DST), quality-assured laboratory capacity (smear, culture-DST, rapid molecular test), efficient drug procurement and supply chain management, adherence to difficult-to-take regimens for long periods, prompt identification and management of side-effects, recording and reporting; and human and financial resources. The five components are: (1) Sustained political and administrative commitment, (2) diagnosis of MDR-TB through quality-assured culture and DST, (3) appropriate treatment strategies that utilize second-line drugs under proper management conditions, (4) uninterrupted supply of quality assured second line anti-TB drugs, (5) recording and reporting system designed for PMDT services that enable performance monitoring and evaluation of treatment outcome.

Government of India (GOI) has issued guidelines for running PMDT in India in the form of “guidelines on PMDT in India May 2012”. As per the objectives defined in the guidelines, it was aimed that by 2015, nationwide access to MDR-TB diagnosis and treatment for all smear positive cases was achieved. However, the aim to cover all population for MDR treatment has not been achieved till the point of study in year 2015 so it was considered to look into the “difficulties in Initiation of PMDT treatment in GMC of Madhya Pradesh and role of Pulmonary Medicine Departments” since under the PMDT ultimate patient care is to be provided by the of Pulmonary Medicine Departments of respective GMC.

PMDT delivers patient care through state level state PMDT Committee and district level DR-TB Centers which as per guidelines preferably be established in tertiary care hospitals and medical colleges. State PMDT Committee are responsible for developing a plan of action for implementation, expansion, maintenance, supervision, monitoring and quality enhancement of PMDT services in the respective state.

Composition of DR-TB Centers as per PMDT at GMC under RNTCP
Provisions to be made by institute selected as DR-TB center
PMDT guidelines suggest that the treatment is decentralized, but the complicated clinical care that is required to manage a case of MDR-TB case needs services of experts from various clinical disciplines. Ensuring availability of this clinical expert resource group is the essentially DR-TB center. The job of DR-TB centers is to initiate treatment, follow-up case management, and manage complications. One DR-TB center is expected per 10 million populations roughly. PMDT plans to scale up DR-TB centers nationwide in a phased manner. The selected DR-TB center in addition to being (1) a tertiary care center, has to provide, (2) separate Ward for males and females, (3) all routine services required under PMDT like beds, investigations and ancillary drugs for management of adverse drug reactions (ADRs) to be provided free of cost to the patient, (4) availability of relevant specialties like Pulmonologist, Physician, Psychiatrist, Dermatologist and Gynecologist etc. (5) formation of DR-TB Centre Committee, (6) National Training of All Doctors Included in DR-TB Centre Committee including Chairperson, (7) compliance of National Air Borne Infection Control Guidelines, (8) routine clinical laboratory investigation facility to be made available for pretreatment evaluation and monitoring of all patients, (9) provision of ancillary drugs as per DR-TB Centre Committee’s advice, (10) management of ADRs as per PMDT guidelines, (11) doctors and Nursing staff should be available from the Institute, (12) records and reports to be maintained for PMDT, (13) quarterly reports to be submitted electronically.
**Provision to be made by PMDT under RNTCP**

1. Remuneration of Senior Medical Officer and statistical assistant - DR-TB Centre
2. Training, formats and registers for PMDT
3. Second line anti TB drugs

**Funds**

Funds for up-gradation of chosen DR-TB center site as per PMDT guidelines: An amount up-to INR 1.5 million may be availed to renovate and incorporate airborne infection control measures.

**Locations**

All proposed DR-TB Centre must be established in a GMC Hospital under PNDT.

**Coordination**

To run a national program, coordination of activities at all levels from all perspectives is critical. Central TB Division (CTD), Ministry of Health and Family Welfare (MOHFW), GOI are the principal stakeholders. The CTD is considered the central coordinating body. PMDT under RNTCP is flexible to build partnerships with all relevant health care providers as per the need. PMDT activities if required, may be tailored to fit into the respective state and district levels infrastructure. Depending upon the existing infrastructure, the exact organizational structure of the RNTCP PMDT services may vary between the different settings.

**METHODOLOGY**

**Patients’ Consent and Ethical Clearance**

The article is theoretical and did not require contact with the patient at any point in time hence no question of patients consent or ethical clearance from the Institute was not required.

The relevant data for this study have been downloaded from GOI official website regarding PMDT guidelines and scheme of patient care delivery contained therein and review of the same has been made and relevant MCI regulations that were also downloaded from MCI official website have also been reviewed *vis-à-vis*. Faculty members or district TB officers from each GMC of MP or district where DR-TB centers are proposed or have been started were consulted to know about the facilities as per GOI guidelines for running DR-TB centers at their chosen site in their respective GMC.

**Scope of the Present Study**

Scope of the present study is kept limited to assess the difficulty in starting DRTB centers in GMC on account of status of Pulmonary Medicine Departments in respective GMC and their role in delivering PMDT services and does not include the assessment of other State, District, Field and DST lab related aspects as envisaged in PMDT guidelines.

**Observations**

Model of PMDT care includes services to be delivered at state, district, DR-TB center, field and culture and DST lab levels where coordination is required for integration and smooth functioning. Relevant observations made are given below in the form of tables. Table 1 depicts the status of PMDT and the corresponding levels for coordination and completion. Table 2 depicts the present status of MD TBRD seats and PMDT facilities in GMC of MP. Table 3 shows status of MD TBRD seats and MD general medicine seats in private and GMC of MP. Table 4 shows human resource (HR) status about staff requirement and deficiency as per MCI norms to run Medical College Department and PMDT Ward.

**DISCUSSIONS**

**Status of Pulmonary Medicine Departments**

The National PMDT guidelines state that it can be started in either Department of Pulmonary Medicine or Department of Medicine where the Department of Pulmonary Medicine does not exists. The Department of Public Health and Family Welfare (PHFW) of state Government of MP which controls the PMDT services in the state, has stressed to choose the former. The shortage of faculty in the TBRD specialty is known to all. The principal reason for the shortage is non-availability of MD TBRD courses in the government colleges. Despite being more than 50 years having passed since the inception of the colleges all medical colleges (except the one at Sagar, which was started in year 2008) none of the 6 GMC offer MD TBRD course. All GMC except Indore all have HR shortage. GMC at Indore offers DTCD course for 2 seats. Department of Pulmonary Medicine from the functional point is still non-existent as it is evolving in all the colleges except Indore and does not have adequate number of faculty at all medical colleges as per MCI norms. Similarly, there is a shortage of any junior resident (JR)/senior resident (SR) at all medical colleges except Indore. Due to this reason local residents do not have the opportunity to study the specialty and it is natural that faculty and SR seats will remain vacant. No MD TBRD teaching facility, no MD pass outs forms a vicious cycle that is difficult to break. The reason for the shortage of SR remains the same as the qualification to be appointed as SR is the same, i.e., MD in the concerned specialty. The shortage of JR is again mostly due to the same reason, i.e., no post-graduate teaching facility because students pursuing MD course are
Table 1: Various tasks under PMDT and the corresponding levels for coordination and completion

<table>
<thead>
<tr>
<th>Level</th>
<th>Sub-level</th>
<th>Task</th>
<th>Required HR to be made available by state or GMC</th>
</tr>
</thead>
<tbody>
<tr>
<td>State drug store</td>
<td>State TB society</td>
<td>Prepare and ship drug boxes to districts</td>
<td>State</td>
</tr>
<tr>
<td>District</td>
<td>District TB society</td>
<td>Identify suspects, refer specimens</td>
<td>State</td>
</tr>
<tr>
<td></td>
<td>District TB society</td>
<td>Coordinate diagnostic results</td>
<td>State</td>
</tr>
<tr>
<td></td>
<td>District TB society</td>
<td>Refer new/difficult cases to DR-TB center</td>
<td>State</td>
</tr>
<tr>
<td></td>
<td>District TB society</td>
<td>Coordinate care and drug flow to field</td>
<td>State</td>
</tr>
<tr>
<td></td>
<td>State TB society</td>
<td>Maintain records, monitor and supervise</td>
<td>State</td>
</tr>
<tr>
<td>DR-TB Center</td>
<td>Dean/Medical Superintendent</td>
<td>Maintain ward and AIC measures</td>
<td>GMC</td>
</tr>
<tr>
<td></td>
<td>Department of Pulmonary Medicine</td>
<td>Pre-treatment evaluation</td>
<td>GMC</td>
</tr>
<tr>
<td></td>
<td>Department of Pulmonary Medicine</td>
<td>Start M/XDR TB treatment</td>
<td>GMC</td>
</tr>
<tr>
<td></td>
<td>Department of Pulmonary Medicine</td>
<td>Consult for complications</td>
<td>GMC</td>
</tr>
<tr>
<td></td>
<td>Department of Pulmonary Medicine</td>
<td>Maintain records</td>
<td>State</td>
</tr>
<tr>
<td>Field</td>
<td>PHC, CHC government Dispensaries clinics etc.</td>
<td>Identify suspects, refer specimens</td>
<td>State</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Communicate results to patients</td>
<td>State</td>
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<tr>
<td></td>
<td></td>
<td>Support, supervise, manage MDR cases</td>
<td>State</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Manage minor adverse effects</td>
<td>State</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Collect and refer follow-up specimens</td>
<td>State</td>
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<tr>
<td>Culture and DST lab</td>
<td>Accredited labs for DST under PMDT</td>
<td>Receive diagnostic/ follow-up specimens</td>
<td>State</td>
</tr>
<tr>
<td></td>
<td>Accredited labs for DST under PMDT</td>
<td>Provide rapid results to district Field, and DR-TB Center</td>
<td>State</td>
</tr>
<tr>
<td></td>
<td>Accredited labs for DST under PMDT</td>
<td>Maintain records</td>
<td>State</td>
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<td></td>
<td>Accredited labs for DST under PMDT</td>
<td>Quality assurance of results</td>
<td>State</td>
</tr>
<tr>
<td></td>
<td>Accredited labs for DST under PMDT</td>
<td>Prepare and ship drug boxes to district</td>
<td>State</td>
</tr>
</tbody>
</table>


Table 2: Status of PMDT facilities in government medical colleges of MP

<table>
<thead>
<tr>
<th>GMC</th>
<th>MD TBRD/ DTCDC</th>
<th>PMDT started (yes/no)</th>
<th>PMDT running organization- PHFW or GMC</th>
<th>Pretreatment Evaluation facility</th>
<th>Emergency Management of TBRD</th>
<th>Expert Clinical Resource</th>
<th>Manpower HR-Doctors available at MC as per MCI norms</th>
<th>Manpower HR-SR available at GMC as per MCI norms</th>
<th>Manpower HR-JR available at GMC as per MCI norms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indore</td>
<td>DTCD Yes</td>
<td>PHFW Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Gwalior</td>
<td>No</td>
<td>NA No</td>
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<td>No</td>
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</tr>
<tr>
<td>Bhopal</td>
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<td>Yes</td>
<td>PHFW No</td>
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<tr>
<td>Jabalpur</td>
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<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Rewa</td>
<td>No</td>
<td>No</td>
<td>NA No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Sagar</td>
<td>No</td>
<td>Yes</td>
<td>PHFW No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

PMDT: Programmatic management of drug resistant tuberculosis, MD TBRD: Doctor of medicine in tuberculosis and respiratory diseases, DTCD: Diploma in chest diseases, PHFW: Public Health and Family Welfare Department, HR: Human resource, SR: Senior resident, JR: Junior resident, GMC: Government Medical College, MCI: Medical Council of India

Table 3: Status of MD TBRD and MD General Medicine seat in Private/Trust and GMC of MP

<table>
<thead>
<tr>
<th>College</th>
<th>Private/ trust/ government</th>
<th>Place</th>
<th>Year of inception</th>
<th>Number of TBRD seats per year</th>
<th>Number of MCI recognized MD general medicine seats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Index Medical College Indore</td>
<td>Trust</td>
<td>Indore</td>
<td>2007</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Peoples College of Medical Sciences and Research Centre</td>
<td>Trust</td>
<td>Bhopal</td>
<td>2005</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Ruxmaniben Deepchand Gardi Medical College</td>
<td>Trust</td>
<td>Ujjain</td>
<td>2001</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Sri Aurobindo Medical College and Post Graduate Institute</td>
<td>Trust</td>
<td>Indore</td>
<td>2003</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>MG Medical College</td>
<td>Government</td>
<td>Indore</td>
<td>1948</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>NSCB Medical College</td>
<td>Government</td>
<td>Jabalpur</td>
<td>1955</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Gaj Raja Medical College</td>
<td>Government</td>
<td>Gwalior</td>
<td>1946</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>S S Medical College</td>
<td>Government</td>
<td>Rewa</td>
<td>1963</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>Government Medical College</td>
<td>Government</td>
<td>Sagar</td>
<td>2008</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Gandhi Medical College</td>
<td>Government</td>
<td>Bhopal</td>
<td>1956</td>
<td>0</td>
<td>14</td>
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</table>

MD: Doctor of Medicine, TBRD: Tuberculosis and respiratory diseases, MCI: Medical Council of India, GMC: Government Medical Colleges
considered as JR by MCI. The four private medical college of MP, which have been started after the year 2001 are able to meet MCI norms and offer 10 MD TBRD seats per year. They also absorb most of their product as SR or faculty immediately after passing out as the demand of a MD TBRD is pretty high due to MCI regulations and which are same for both private and medical colleges. A few of the products return to their native states who do not hail from MP. This difference in status of Private and GMC in TBRD specialty is staggering and calls for better understanding of the issue, coordination and implementation at all levels especially the Department of Health and Medical Education of State Governments, MCI, MOHFW, GOI and better planning should be done to decide desirability and feasibility for opening of a particular MD course keeping in view the health needs of the respective state and country. JRs can be appointed on the basis of MBBS qualification but such seats are temporarily filled by those aspirants who either have to serve a rural area service bond. The rural area service bond candidates get an exemption from going to the rural area if they are employed as JR in a GMC. After completion of 1-year tenure, which is equal to the bond period they leave. Most of such JR aspirants join the posts just to avoid going into the rural area and keep preparing for the postgraduate entrance examination. As per government policy if they are selected for PG courses, they again get an exemption from the rural area service bond. Long procedural delay at various levels of administration is an important issue. For example, faculty posts are filled at the state level, and principal secretary and director medical education are the appointing authorities. Publishing wants, calling for applications, interviews and selection take a lot of time, and suitable candidates who have freshly passed MD TBRD find better employment somewhere else.

### The Interdepartmental and Intradepartmental Coordination

As per the scheme of PMDT ward the facility provided by program through national health mission via Department of PHFW is includes provision of drugs to treat MDR TB, Indian national rupees 1.5 million for renovation work of PMDT ward at the chosen site to adhere to Air Borne Infection Control Guidelines and provision of one medical officer one statistical assistant and one counselor. Other facilities are to be provided by the medical college. Permission to renovate, provision of man power of doctors falls in the domain of principal secretary and director of medical education. PMDT under RNTCP requires a ward to be opened in a GMC. Pulmonary Medicine related tasks under PMDT requires a vice chairperson of DR-TB Committee (Head of the Department of Pulmonary is considered fit for it) and a senior doctor from the department to function as nodal officer for DR-TB Centre. Provision of JR and SR falls in the domain of dean and provision of nursing and ancillary drugs and pathological and radiological services in the domain of medical superintendent, so to ensure smooth delivery of all services required under PMDT, coordination

<table>
<thead>
<tr>
<th>Staff required</th>
<th>For Pulmonary Medicine (First unit as Per MCI Norms)</th>
<th>For PMDT ward (Second unit as Per MCI Norms)</th>
<th>Total staff required for both Pulmonary Medicine and PMDT wards</th>
<th>Available/ Sanctioned posts</th>
<th>Filled posts</th>
<th>Vacant posts</th>
<th>Deficiency</th>
<th>Level at which Action is required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>State Government's Medical Education Department -do-</td>
</tr>
<tr>
<td>Associate Professor</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-do-</td>
</tr>
<tr>
<td>Assistant Professor</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>-do-</td>
</tr>
<tr>
<td>Senior Resident</td>
<td>3</td>
<td>3</td>
<td>6</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>6</td>
<td>Dean of the medical college can.</td>
</tr>
<tr>
<td>Junior Resident</td>
<td>3</td>
<td>3</td>
<td>6</td>
<td>3</td>
<td>0</td>
<td>6</td>
<td></td>
<td>Dean of the medical college can.</td>
</tr>
<tr>
<td>TBHV</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>State Govt. College through PEB -do-</td>
</tr>
<tr>
<td>Social worker TB</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>State government through its Department of PHFW/District TB Society -do-</td>
</tr>
<tr>
<td>LT</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>-do-</td>
</tr>
<tr>
<td>Senior Medical Officer</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>Provision to be made by State Govt. as per PMDT norms</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>-do-</td>
</tr>
<tr>
<td>Statistical Assistant Counselor</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>-do-</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>-do-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

HR: Human resource, PEB: Professional Examination Board (a body of state government entrusted to make recruitments), PHFW: Public Health and Family Welfare, PMDT: Programmatic management of drug resistant tuberculosis, MCI: Medical Council of India

| Table 4: HR status about Staff Requirement and deficiency as per MCI norms to run Medical College Department and PMDT ward | |

<table>
<thead>
<tr>
<th>Staff required</th>
<th>For Pulmonary Medicine (First unit as Per MCI Norms)</th>
<th>For PMDT ward (Second unit as Per MCI Norms)</th>
<th>Total staff required for both Pulmonary Medicine and PMDT wards</th>
<th>Available/ Sanctioned posts</th>
<th>Filled posts</th>
<th>Vacant posts</th>
<th>Deficiency</th>
<th>Level at which Action is required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>State Government's Medical Education Department -do-</td>
</tr>
<tr>
<td>Associate Professor</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-do-</td>
</tr>
<tr>
<td>Assistant Professor</td>
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<td>2</td>
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<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>-do-</td>
</tr>
<tr>
<td>Senior Resident</td>
<td>3</td>
<td>3</td>
<td>6</td>
<td>1</td>
<td>0</td>
<td>1</td>
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<td>Dean of the medical college can.</td>
</tr>
<tr>
<td>Junior Resident</td>
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<td>3</td>
<td>6</td>
<td>3</td>
<td>0</td>
<td>6</td>
<td></td>
<td>Dean of the medical college can.</td>
</tr>
<tr>
<td>TBHV</td>
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<td>2</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>State Govt. College through PEB -do-</td>
</tr>
<tr>
<td>Social worker TB</td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>State government through its Department of PHFW/District TB Society -do-</td>
</tr>
<tr>
<td>LT</td>
<td>1</td>
<td>0</td>
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<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>-do-</td>
</tr>
<tr>
<td>Senior Medical Officer</td>
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<td>1</td>
<td>1</td>
<td>Provision to be made by State Govt. as per PMDT norms</td>
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<td>1</td>
<td>1</td>
<td>-do-</td>
</tr>
<tr>
<td>Statistical Assistant Counselor</td>
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<td>1</td>
<td>-do-</td>
<td>0</td>
<td>1</td>
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</tr>
</tbody>
</table>

HR: Human resource, PEB: Professional Examination Board (a body of state government entrusted to make recruitments), PHFW: Public Health and Family Welfare, PMDT: Programmatic management of drug resistant tuberculosis, MCI: Medical Council of India
becomes indispensable. MCI is the body which governs the medical education and running of affiliated hospitals and has prescribed standard norms for opening a clinical wards and compliance of the same is mandatory for all medical colleges in India. In order to get a Department of Pulmonary Medicine recognized for the purpose of running MD TBRD course MCI, in its regulation has made it mandatory for PMDT services to treat MDR TB to be available in a medical college. MCI provides relaxation for appointing faculty for super-specialty courses like DM and MCH where they are to be inducted for the first time but does not provide any for broad specialty course like MD TBRD. This comes across as an anomaly in states like MP where none of GMC offers the MD course in TBRD specialty. PMDT has identified CTD, MOHFW GOI and State governments as major stake holders for coordination and implementation of the program but has not included MCI so the efforts must be made to include MCI as the stake holder. Including MCI as stake holder and developing a comprehensive view may be helpful as ultimately PMDT under RNTCP depend upon the GMC and their Pulmonary Medicine/TBRD Departments to serve as the clinical expert resource and if the same is not strengthened then the success of the program will remain questionable.

CONCLUSION

PMDT under RNTCP requires a ward to be opened in a GMC. MCI is the body which governs the medical education and running of affiliated hospitals and has prescribed standard norms for opening a clinical wards and compliance of the same is mandatory for all medical colleges in India. PMDT has identified CTD, MOHFW GOI and State governments as major stake holders for coordination and implementation of the program but has not included MCI. The main problem is HR related as it is difficult to meet MCI norms in making recruitment on relevant posts. None of the six GMC offers MD in TBRD which is the root cause of non-availability of teaching faculty and SRs. Opening MD courses in TBRD in every GMC is the only long-term solution to deal with the HR problem. All key decision makers from the Government Departments of PHFW/National Health Mission and Department of Medical Education starting from Principal Secretaries Directors, Dean Medical Superintendents of Medical College Hospitals and Head of the Departments of Medicine and Pulmonary Medicine should form a team and sit together and develop a time-bound action plan. Until the time Pulmonary Medicine Specialty and its Departments in GMC do not grow sufficiently the Department of Medicine should be made responsible to deliver PMDT services and run indoor MDR TB ward with the help of available clinical resource of its own and also the Department of Pulmonary Medicine. The role playing of each stake holder should be clearly defined and made accountable. MCI and GOI must be involved in the meetings and action plan development. Coordination needs to be improved between Department of PHFW/National Health Mission and Department of Medical Education and between district health authorities and medical college bodies. A clear cut guideline about the method and modus of coordination between two agencies may be developed. Decision making and implementation should be time bound and made accountable.

TB in India. RNTCP, TB care and DR-TB [Internet] 2014 [cited 2014 December 14].

REFERENCES


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Dyslipidemia as a Risk Factor in Ischemic Heart Disease: A Prospective Study

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²Resident, Department of Medicine, Sri Adichunchanagiri Institute of Medical Sciences, Mandya, Karnataka, India

Abstract

Background: Dyslipidemia has been clearly associated with increased risk of ischemic heart disease (IHD) particularly the cholesterol carried in low-density lipoprotein (LDL). Risk factors can be divided into lipid factors and non-lipid factors. The lipid factors are total cholesterol (TC), triglyceride (TGL), increased LDL, decreased high-density lipoprotein (HDL). Non-lipid risk factors include diabetes mellitus, hypertension, smoking, obesity, and lifestyle.

Aim: To study dyslipidemia as a risk factor in IHD. Age and sex distribution in IHD. Incidence and type of hyperlipidemia in patients with IHD. Comparison of lipid levels in IHD patients with that of healthy individuals. Comparison of lipid levels between angina pectoris and myocardial infarction (MI) group. Comparison of lipid levels between men and women with IHD.

Materials and Methods: This study involved 100 cases (30 patients with MI and 70 patients with angina pectoris) admitted at Sri Adichunchanagiri Institute of Medical Science Hospital and Research Centre, BG. Nagar during a period of 1-year. Detail history, examination, routine biochemical investigations, electrocardiogram, lipid profile (TC, HDL cholesterol, LDL cholesterol, very low-density lipoprotein [VLDL] cholesterol, TGL) were done in all the patients and cardiac isoenzymes, chest X-ray, echo were done in relevant cases.

Results: About 52% of patients had hyperlipidemia with Type IIa pattern predominating. Serum TC, TGL, VLDL, LDL, TC/HDL, LDL/HDL were significantly elevated in IHD group as compared to healthy controls. Serum HDL was low in patients with IHD as compared with healthy controls and which was statistically significant. No significant alteration in the lipid fraction was seen between MI and angina pectoris group. No significant alteration in the lipid fraction was seen between men and women with IHD.

Conclusion: The present study shows significant association of dyslipidemia with IHD, TC, LDL cholesterol, TGL, VLDL, TC/HDL, and LDL/HDL ratios were significantly elevated in patients with IHD. HDL was significantly reduced in IHD patients.

Keywords: Acute myocardial infarction, Angina pectoris, Dyslipidemia, Lipid profile

INTRODUCTION

Ischemia refers to a lack of oxygen due to inadequate perfusion of the myocardium, which causes an imbalance between oxygen supply and demand. Ischemic heart disease (IHD) is a condition of diverse etiologies, and the most common cause of myocardial ischemia is an atherosclerotic disease of epicardial coronary arteries.¹

In rare cases, IHD may be due to coronary artery occlusion, secondary to coronary emboli, congenital abnormalities, coronary spasm and a wide variety of systemic particularly inflammatory diseases.¹²

Epicardial coronary arteries are the major site of atherosclerotic disease.³ Among the many risk factors identified for the acceleration of the atherosclerotic process and thus predisposition to IHD, hyperlipidemias and hyperlipoproteinemias are the most potent.³⁴ It has been observed in several well documented studies that there is an inverse relation between high-density lipoprotein cholesterol (HDL) and incidence of coronary artery disease.³⁵ The evaluation of different fraction of lipoprotein as a risk factor for the development of coronary disease has been possible only recently when
methods to fractionate lipoprotein were made available. However, cholesterol was incriminated as an etiological factor for atherosclerosis in the beginning of this century when cholesterol was found in atheromatous plaques. Various studies around the world have well established that low-density lipoprotein (LDL) cholesterol and very low-density lipoprotein cholesterol (VLDL) are atherogenic and HDL is a protective factor against coronary atherosclerosis and coronary artery disease. Serum lipid and lipoprotein concentration are commonly used to identify individuals who may have the significant atherosclerotic disease.

**MATERIALS AND METHODS**

This study was carried out in AIMS B.G. Nagar for a period of 1-year. A total of 100 patients (30 with myocardial infarction [MI] and 70 patients with angina pectoris) were taken up for the study. The diagnosis in each case was established by history, clinical examination, electrocardiogram (ECG) with or without echocardiography and appropriate enzyme studies if required. The subjects were in the age group of 33-75 years. 20% of the patients were smokers, and 10% were hypertensives. Both known IHD patients who were on treatment for varying period of time and newly diagnosed IHD patients were included in the study.

**Inclusion Criteria**

1. Biochemical markers plus one or more of the following:
   a. Typical symptoms of myocardial ischemia.
   b. Q wave in the ECG.
   c. ST elevation or ST depression in ECG.
2. Typical symptoms of acute MI (AMI) plus one of the following:
   a. ST elevation in ECG.
   b. Increase cardiac biomarkers.

**Biochemical Markers of AMI**

1. Creatinine kinase-MB more than two times upper limit of normal.
2. Troponin T > 0.2 ng/ml
3. Troponin I > 1-1.5 ng/ml

**Exclusion Criteria**

1. Patients suffering from diabetes mellitus, hypothyroidism.
2. Patients on lipid-altering drugs like (β-blockers, oral contraceptive pills, diuretics, glucocorticoids, lipid-lowering drugs).
4. Patients who were obese (body mass index >30 kg/m²).

The purpose of elimination of cases with exclusion criteria was to obtain a pure picture of the relationship between IHD and serum lipids as the condition mentioned in the exclusion criteria may alter the lipid levels. Even in patients with AMI, samples for analysis were taken within 24 h of AMI.

No other limitations were imposed. After having been selected for the study each patient was subjected to the following procedure. Detail history, careful physical examination, laboratory investigations such as complete blood count, routine urine examination, fasting blood sugar, ECG, Lipid profile (total cholesterol [TC], HDL cholesterol, LDL cholesterol, VLDL, triglycerides [TGL]) and echocardiography, cardiac isoenzymes, thyroid function test, chest X-ray were done in relevant cases. Estimation of serum cholesterol, TGL, HDL cholesterol, LDL cholesterol, VLDL cholesterol were done by using enzymatic colorimetric method. Written informed consent was taken from the patient or guardian. The Institutional Ethics Committee approved the study.

**Statistical Analysis**

Relevant statistical methods were applied like Z-test and Student's t-test to see the significance of the difference in mean values between groups and to know the correlation between inter- and intra-group variations.

**RESULTS**

During this study period, 175 cases of IHD patients were admitted at Sri Adichunchanagiri Institute of Medical Science Hospital and Research Centre, BG. Nagar. 100 patients were included in the study after exclusion criteria. Moreover, all 100 cases of IHD were studied with respect to various lipid fraction.

A total of 100 cases were studied, among them 86 were male and 14 were female. The youngest patient was 33 years, and oldest was 75 years old (Table 1).

The incidence of hyperlipidemia and its sex distribution among 100 cases of IHD. 52% were hyperlipidemic, among which 47 were male and 5 were female (Table 2).

About 50% belongs to Type IIa, 23.1% belongs to Type IIb and 26.9% belongs to Type IV hyperlipidemia (Table 2.1).

Serum cholesterol is increased in the age group of 40-49 years among males and between age group 30-39 years in females. TGL values are increased in the age group 30-39 years in males as well as in females. We can infer from Table 3 that HDL values are low between ages 30 and 39 years in males and almost similar in case of females in the
Table 1: Age and sex distribution of IHD subjects studied

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Male (%)</th>
<th>Female (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
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<td>30-39</td>
<td>15 (15)</td>
<td>02 (14.3)</td>
<td>17 (15)</td>
</tr>
<tr>
<td>40-49</td>
<td>22 (25.6)</td>
<td>10 (71.4)</td>
<td>32 (32)</td>
</tr>
<tr>
<td>50-59</td>
<td>24 (27.9)</td>
<td>02 (14.3)</td>
<td>26 (26)</td>
</tr>
<tr>
<td>60-69</td>
<td>22 (25.6)</td>
<td>-</td>
<td>22 (25)</td>
</tr>
<tr>
<td>&gt;70</td>
<td>05 (6.1)</td>
<td>-</td>
<td>05 (6)</td>
</tr>
<tr>
<td>Total</td>
<td>86</td>
<td>14</td>
<td>100</td>
</tr>
</tbody>
</table>

IHD: Ischemic heart diseases

Table 2: Incidence of hyperlipidemia

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients studied</td>
<td>86</td>
<td>14</td>
<td>100</td>
</tr>
<tr>
<td>Patients with hyperlipidemia</td>
<td>47</td>
<td>05</td>
<td>52</td>
</tr>
<tr>
<td>Percentage</td>
<td>54.65</td>
<td>35.6</td>
<td>52</td>
</tr>
</tbody>
</table>

Table 2.1: Type of hyperlipidemia

<table>
<thead>
<tr>
<th>Type</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>IIa</td>
<td>25</td>
<td>1</td>
<td>26</td>
<td>50.0</td>
</tr>
<tr>
<td>IIb</td>
<td>12</td>
<td>-</td>
<td>12</td>
<td>23.1</td>
</tr>
<tr>
<td>IV</td>
<td>10</td>
<td>4</td>
<td>14</td>
<td>26.9</td>
</tr>
</tbody>
</table>

Table 3: Lipid levels in relation to age and sex in IHD patients (mean±SD)

<table>
<thead>
<tr>
<th>Age</th>
<th>Sex</th>
<th>Number of cases</th>
<th>TC (mg/dl)</th>
<th>TGL (mg/dl)</th>
<th>HDL (mg/dl)</th>
<th>LDL (mg/dl)</th>
<th>VLDL (mg/dl)</th>
<th>TC/HDL</th>
<th>LDL/HDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-39</td>
<td>M</td>
<td>13</td>
<td>187.2±33.3</td>
<td>183.1±94.0</td>
<td>32.9±3.4</td>
<td>121.0±28.7</td>
<td>38.2±17.4</td>
<td>5.6±1.1</td>
<td>3.5±0.9</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>02</td>
<td>198.0±4.0</td>
<td>173.0±8.0</td>
<td>41.5±0.5</td>
<td>122.0±5.0</td>
<td>34.6±1.2</td>
<td>4.8±0.1</td>
<td>2.9±0.2</td>
</tr>
<tr>
<td>40-49</td>
<td>M</td>
<td>22</td>
<td>200.7±40.5</td>
<td>151.5±53.5</td>
<td>40.7±6.5</td>
<td>129.8±41.9</td>
<td>30.3±10.7</td>
<td>5.1±1.5</td>
<td>3.4±1.3</td>
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<tr>
<td></td>
<td>F</td>
<td>10</td>
<td>186.6±6.5</td>
<td>174.4±44.5</td>
<td>42.0±6.7</td>
<td>108.9±8.2</td>
<td>34.9±8.9</td>
<td>4.7±0.7</td>
<td>2.7±0.5</td>
</tr>
<tr>
<td>50-59</td>
<td>M</td>
<td>24</td>
<td>171.2±42.8</td>
<td>139.1±51.6</td>
<td>40.6±6.5</td>
<td>103.4±40.8</td>
<td>27.8±10.3</td>
<td>4.8±1.1</td>
<td>2.6±1.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>02</td>
<td>180.0±8.0</td>
<td>156.0±10.0</td>
<td>44.0±2.0</td>
<td>104.5±7.5</td>
<td>31.5±1.5</td>
<td>4.3±0.0</td>
<td>2.3±0.1</td>
</tr>
<tr>
<td>60-69</td>
<td>M</td>
<td>22</td>
<td>190.2±36.9</td>
<td>168.2±59.9</td>
<td>40.3±5.6</td>
<td>118.7±37.5</td>
<td>33.6±11.9</td>
<td>4.9±0.9</td>
<td>2.9±0.9</td>
</tr>
<tr>
<td>&gt;70</td>
<td>M</td>
<td>05</td>
<td>187.6±40.5</td>
<td>158.1±64.1</td>
<td>39.3±6.4</td>
<td>117.9±38.6</td>
<td>31.8±12.6</td>
<td>4.9±1.2</td>
<td>3.1±1.1</td>
</tr>
</tbody>
</table>

TC: Serum total cholesterol, TGL: Triglyceride, HDL: High-density lipoprotein cholesterol, LDL: Low-density lipoprotein cholesterol, VLDL: Very low-density lipoprotein cholesterol, TC/HDL: Ratio of TC to HDL cholesterol, LDL/HDL: Ratio of LDL cholesterol to HDL cholesterol, IHD: Ischemic heart disease, SD: Standard deviation

Table 4: Comparison of lipid levels in IHD patients with healthy subjects

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Number of cases</th>
<th>TC (mg/dl)</th>
<th>TGL (mg/dl)</th>
<th>HDL (mg/dl)</th>
<th>LDL (mg/dl)</th>
<th>VLDL (mg/dl)</th>
<th>TC/HDL</th>
<th>LDL/HDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>IHD</td>
<td>100</td>
<td>187.2±37.7</td>
<td>159.8±61.5</td>
<td>40.2±6.2</td>
<td>116.1±37.0</td>
<td>32.2±12.1</td>
<td>4.7±1.2</td>
<td>2.8±0.9</td>
</tr>
<tr>
<td>Healthy</td>
<td>50</td>
<td>155.6±15.4</td>
<td>125.5±22.7</td>
<td>54.5±4.2</td>
<td>70.1±11.4</td>
<td>25.3±4.5</td>
<td>2.8±0.2</td>
<td>1.4±0.2</td>
</tr>
</tbody>
</table>

P<0.05: Significant, P<0.01: Very significant, P<0.001: Highly significant, TC: Serum total cholesterol, TGL: Triglyceride, HDL: High-density lipoprotein cholesterol, LDL: Low-density lipoprotein cholesterol, VLDL: Very low-density lipoprotein cholesterol, TC/HDL: Ratio of TC to HDL cholesterol, LDL/HDL: Ratio of LDL cholesterol to HDL cholesterol, IHD: Ischemic heart disease

This shows a definite increase in TC level (mean 187.2) when compared to 155.6 among healthy which is very significant. TGL level in IHD patients was 159.8 compared to 125.5 among healthy controls which are very significant. A mean HDL level of 40.2 in IHD when compared to 54.5 among healthy controls which are highly significant. There is a significant increase in LDL level (mean 116.1) when compared to 76.1 among healthy controls which are statistically significant. VLDL values of 32.2 in IHD subjects as compared to 25.3 among healthy which is very significant. The ratio of TC/HDL shows a definite increase with a mean of 4.7 in IHD subjects when compared to 2.8 in healthy controls, which are highly significant. The ratio of LDL/HDL shows a definite increase with a mean of 2.8 in IHD when compared to 1.4 in healthy control, which is statistically significant (Table 4).

Table 5 shows a comparison of mean values with a standard deviation of various lipid fraction between MI and angina pectoris among the IHD patients studied. There was no statistically significant difference seen between MI and Angina pectoris in values of any lipid fraction.

Table 6 shows comparison of a various lipid fraction with mean and standard deviation between men and women with IHD. There was no statistically significant difference between men and women studies.

**DISCUSSION**

**Age and Sex Distribution of IHD**

In the present study group age range was from 33 to 75 years, and the mean age was 50.9 years. A higher number of patients of IHD were seen between age group 40-70 years.
accounting for 80%. The bezafibrate infarction prevention (BIP) study has showed 89% in the age group of 50-70 years. Rubins *et al.* study included 96% in the age group 45-75 years. Chadha *et al.* study showed, 87% in the age group 45-65 years. This suggests that a sizable fraction of IHD occur in the middle age and elderly patients.

**Sex Distribution of IHD**

There were 86% of male and 14% of female in the present study. This difference in sex distribution may be because of exclusion of post-menopausal women from the present study. The BIP study included 81% of male and 19% female. Misra *et al.* study included 76% males and 24% females (Table 7). National Cholesterol Education Program (NCEP) has considered male sex as a risk factor because the rates of IHD are 3-4 times higher in men than in women in the middle decade of life. Stamper *et al.* concluded that estrogen is associated with a reduction in the incidence of IHD as well as in mortality from cardiovascular disease. It is known from various studies that women of childbearing age are protected against IHD and this fact has been attributed to estrogen, which is found to be protective against IHD.

**Incidence and Type of Hyperlipidemia**

The present study shows the incidence of hyperlipidemia being 52% of which Type II was predominant in 73% of cases, with Type IIA pattern in 50%. Vasantha *et al.* found incidence of hyperlipidemia in 59% of IHD patients studied with Type II predominating.

**Blood Lipid in Relation to Age and Sex**

In the present study, TC and LDL cholesterol are increased mainly in the age group 40-49 years in male and 30-39 years in female. TGL values were increased in the age group 30-39 years in both males and females. HDL values were low between the age group 30-39 years in males and fairly stable across the age group studied in the case of females. TC/HDL ratio was increased in the age group 30-49 years in males. Rubins *et al.* observed that TC and HDL and LDL remained fairly stable across the adult age range, TGL increased in 35-44 years age group. BIP study also observed that TC, HDL and LDL remained stable across the adult age group in both males and females, and TGL increased in patients less than 50 years of age. NCEP reports that a sizable fraction of all coronary artery diseases in men occurs in middle age.

**Comparison of Lipid Levels in IHD Patients with Healthy Subjects**

The present study shows that all lipid fraction are higher in IHD group as compared to healthy controls except HDL, which is lower in IHD group than in healthy controls. Misra *et al.* as observed that LDL, TC/HDL and LDL/HDL ratio were significantly raised in IHD group than in healthy. HDL values were significantly lower in IHD group compared to healthy. But TC and VLDL were not significantly elevated. Millet *et al.* observed that TC, TGL, HDL, LDL, VLDL, LDL/HDL and TC/HDL ratios were significantly increased in patients with IHD as compared to healthy. This suggest that cholesterol content of various plasma lipoproteins are important lipid risk factors for IHD (Table 8). HDL cholesterol is inversely associated with the occurrence of IHD. Whereas TC, TGL, LDL, VLDL, TC/HDL, and LDL/HDL are directly related to the disease.

**Lipid Levels Compared between MI and Angina Pectoris Group**

According to the present study, no significant difference was observed between these two groups of IHD which...
is compatible with Misra et al. study.\textsuperscript{14} It also found no significant difference between these two subgroup of IHD. Angina and MI are considered as two stages of clinical manifestations in the evolution of coronary atherosclerosis, so no such difference can be anticipated.\textsuperscript{18,19} Lipid levels between men and women with IHD: In the present study there was no statistically significant difference of various lipid fraction between men and women with IHD. Misra et al. also did not find any such difference between two sexes.\textsuperscript{14,17}

**CONCLUSION**

There is a significant alteration of lipid profile in IHD as compared to controls. Ischemic heart disease is more common in middle-aged and elderly subjects and males are more commonly affected than females. TC, LDL cholesterol, TGL, VLDL, TC/HDL and LDL/HDL ratio is significantly elevated in patients with IHD. HDL is significantly reduced in IHD group. Hyperlipidemia is seen in the majority of cases of ischemic heart disease with Type IIa pattern being the most frequent. There is no significant alteration in lipid fraction between patients with MI and angina pectoris also between men and women with ischemic heart disease.

**REFERENCES**


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Evaluation of Axial Length and Corneal Curvature of an Eyeball in Operated Paediatric Cataract Eyes: A Two Years’ Follow-up Study

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Abstract

Purpose: To assess changes in axial length (AL) and corneal curvature in pediatric cataract operated children and comparison of these parameters with the control group.

Background: The congenital or infantile cataract is opacity of the crystalline lens visible within the 1st year of life. Congenital cataract is responsible for 5-20% childhood blindness worldwide. The present study aimed to find changes in AL and keratometry in children operated for pediatric cataract over a period of 2 years.

Materials and Methods: A prospective and retrospective study in 30 eyes of operated pediatric cataract patients done. Where patients were divided into Group 1 (3-6 years, n = 11), Group 2 (7-10 years, n = 13) and Group 3 (11-13 years, n = 6). The AL and corneal curvature of an eyeball measured during surgery and at 6 monthly follow-up over a period of 2 years. The comparison was done with matched control groups.

Results: All three groups showed the borderline statistically significant difference in AL no significant difference in corneal curvature for 2 years postoperatively.

Conclusion: After the age of 3 years, there is no much growth of an eyeball occurs in relation to AL and corneal curvature, and hence need of secondary surgical intervention has been reduced.

Keywords: Axial length, Cataract, Corneal curvature, Pediatric, Surgery

INTRODUCTION

Congenital or infantile cataract is opacity of the crystalline lens, visible within the 1st year of life. Juvenile or developmental cataract occurs within the first decade of life. It is estimated that congenital cataracts are responsible for 5-20% childhood blindness worldwide. Globally there are 2,00,000 children having a bilateral cataract in Asia.¹² Incidence varies from country to country. In developing countries like India, 7.4-15.3% of childhood blindness is due to cataract.¹³

Pre-operative assessment of three important parameters deciding refractive status of human eye: The curvature of cornea, power of lens, axial length (AL) of eyeball.

Eyes with congenital and developmental cataracts clearly show abnormal ocular development in at least one respect (that is, abnormal crystalline lens formation) and, therefore, may display different patterns of postnatal growth when compared with normal eyes. Therefore, it is important to determine whether the presence of a cataract obstructing the visual axis in the immature eye and then surgical intervention with cataract removal and intraocular lens (IOL) implantation will affect the expected pattern of axial eye growth.

Predicting axial growth of an eyeball and the refractive change that accompanies, it is one of the major challenges for the long-term visual care of children after surgery. Children’s eyes normally undergo myopic shift as they

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grow. Understanding pediatric eye growth considering AL and corneal curvature after cataract surgery and comparing this with normal eyes will help in IOL power calculation and the prediction of refractive changes after Intraocular lens implantation.

The present study aims to find changes in AL and keratometry in children operated for pediatric cataract over a period of 2 years. Young children especially preschool age groups are not very cooperative for visual testing and detailed eye examination also they do not complain about a visual problem, and we have to diagnose their disability only by routine follow-up examination.

Furthermore, we can assess changes in these parameters in the early post-operative period, to avoid or treat amblyopia and study eyeball growth in relation with the increase in age. This helps in making strategies to prescribe corrective glasses if needed, therapy for amblyopia and revision of IOL in future if needed.

MATERIALS AND METHODS

The protocol was approved by Local Ethics committee and written informed consent was obtained from each patient. An outdoor patient based comparative study between operated pediatric cataract patients with normal age-sex matched children was conducted at Department of Ophthalmology for a period of 2 years. Prospective and retrospective design is used for the study. The study population was selected by non-probability convenient sampling method. Thirty pediatric patients with age >3 years and <13 years operated for congenital and developmental cataract were selected. Children not having any type of refractive error were selected for the comparative group. Study group and control group were divided into 3 groups according to age. First Group 1: 3-6 years, the second was Group 2: 7-10 years, third was Group 3: 11-13 years. Children with congenital anomaly, squint and traumatic cataract and children having associated co morbidities like glaucoma, persistent fetal vasculature, retinal or optic nerve anomalies and microphthalmos were not considered during the study.

All patients postoperatively and control were evaluated for assessment of AL performed using 10 MHz transducer of Echorule 2 Biomedix A-scan contact machine, keratometry readings were done by using Bausch and Lomb manual keratometry. Moreover, visual outcome with best corrected visual acuity, 6 monthly intervals over a period of 2 years. Corneal curvature also obtained in relation to IOL used as surgery with poly methyl-meth acrylate (PMMA) and foldable IOLs had different size of the wound.

Visual assessment of children 3-5 years done by using Allen pictorial chart at 3 m distance. For children above 5 years visual acuity assessment done by using snellen acuity chart and those children who was not able to read letters or numbers assessed by using the tumbling E test or Landolt rings at 6 m distance.

Retinoscopy performed by instillation of 1% tropicamide and 2.5% phenylephrine drops. After this, best corrected visual acuity calculated with subjective refinements.

We calculated the rate of axial growth (RAG). The RA was calculated by first dividing the axial growth in mm by the pre-operative (initial) AL in mm and then multiplying this with 100.

\[
RAG = \frac{\text{Axial growth}}{\text{Initial AL}} \times 100
\]

Change in corneal curvature readings were calculated as mean corneal curvature (D) at last follow-up visit minus the mean corneal curvature (D) preoperatively in patients and at first visit in controls.

We calculated the myopic shift as the spherical equivalent (SE) refraction at last follow-up visit minus SE refraction at initial visit.

\[
\text{Spherical equivalent} = \text{Dioptric spherical + Dioptric cylinder}
\]

All outcome data of the operated eyes were compared with outcome data of control eyes by using an independent \(t\)-test. Comparison of variables like AL (L), Keratometry (K), SE in association with age and sex in individual two groups done by using analysis of variance (ANOVA).

RESULTS

The results of comparing variables like keratometry, AL and refractive correction in operated pediatric cataract eyes and age-sex-matched control group between ages 3-13 years in a period of 2 years are summarized as follows (Table 1).

AL

In Group 1 (3-6), mean AL preoperatively in patients was 21.24 ± 1.03 and in control was 22.22 ± 0.55, at 6 months 21.49 ± 1.06 and 22.54 ± 0.5, at 12 months 21.73 ± 1.07 and 22.67 ± 0.54, and at 18 months 21.97 ± 1.09 and 22.92 ± 0.56. Difference between two groups was statistically significant at all follow-ups (\(P = 0.011, P = 0.007, P = 0.017, P = 0.016\)). Mean RAG in patient was 3.41 ± 0.17 and in control was 3.15 ± 0.12. Difference between two groups was statistically significant (\(P = 0.0007\)). In Group 2 (7-10), mean AL preoperatively in patients was 22.09 ± 2.16 and
in control was 23.51 ± 1.21, at 6 months 22.31 ± 2.18 and 23.75 ± 1.23, at 12 months 22.48 ± 2.18 and 23.92 ± 1.25, at 18 months 22.69 ± 2.21 and 24.14 ± 1.23. Difference between two groups was statistically significant at all follow-ups. (P = 0.049, P = 0.007, P = 0.049, P = 0.049). Mean RAG in patient was 2.67 ± 0.17 and in control was 2.71 ± 0.12. Difference between two groups was statistically significant (P = 0.044). In Group 3 (11-13), mean AL preoperatively in patients was 22.04 ± 0.64 and in control was 23.3 ± 0.39, at 6 months 22.29 ± 0.39 and 23.46 ± 0.65, at 12 months 22.44 ± 0.41 and 23.61 ± 0.66, at 18 months 22.56 ± 0.4 and 23.79 ± 0.67. Difference between two groups was statistically significant at all follow-ups (P = 0.002, P = 0.003, P = 0.004, P = 0.003). Mean RAG in patients was 2.36 ± 0.08 and in control was 2.08 ± 0.16. Difference between two groups was statistically significant (P = 0.033) (Graph 1).

### Corneal Curvature

In Group 1, mean corneal curvature preoperatively in patients was 44.44 ± 3.46 and in control was 44.77 ± 2.06, at 6 months 44.01 ± 3.54 and 44.31 ± 2.08, at 12 months 43.65 ± 3.53 and 44 ± 2.14, at 18 months 43.15 ± 3.47 and 43.59 ± 2.17. Difference between two groups was not statistically significant at all follow-ups (P = 0.725, P = 0.781, P = 0.811, P = 0.788). Mean change in corneal curvature in patients was 1.28 ± 0.13 and in control was 1.81 ± 0.24. Difference between two groups was not statistically significant (P = 0.23). In Group 2, mean corneal curvature preoperatively in patients was 42.96 ± 0.78 and in control was 43.51 ± 0.78, at 6 months 42.65 ± 0.83 and 43.51 ± 0.78, at 12 months 42.5 ± 0.87 and 42.92 ± 0.0, at 18 months 42.1 ± 0.81 and 42.75 ± 0.88. Difference between two groups was not statistically significant at all follow-ups (P = 0.061, P = 0.187, P = 0.09, P = 0.084). Mean change in corneal curvature in patients was 0.85 ± 0.11 and in control was 0.8 ± 0.13. Difference between two groups was not statistically significant (P = 0.31). In Group 3, mean corneal curvature preoperatively in patient was 42.95 ± 1.08 and in control was 42.49 ± 0.91, at 6 months 42.91 ± 1.02 and 42.16 ± 0.94, at 12 months 42.74 ± 1.13 and 41.95 ± 0.87, at 18 months 42.22 ± 0.07 and 42.14 ± 0.9. Difference between two groups was not statistically significant at all follow-ups (P = 0.706, P = 0.207, P = 0.215, P = 0.456). Mean change in corneal curvature in patient was 0.52 ± 0.096 and in control was 0.54 ± 0.06. Difference between two groups was not statistically significant (P = 0.66) (Graph 2).

The difference in a change in corneal curvature in relation to PMMA and foldable IOL over a period of 2 years in all age groups was not statistically significant (Table 2).

### DISCUSSION

It was observed in all age groups in 3-13 years, at the time of the surgery the AL of the eyes were significantly shorter.
Bhamare and Kapadia-Gupta: Axial Length and Corneal Curvature of an Eyeball in Operated Pediatric Cataract Eyes

than in the control eyes in all age groups. Cataractous changes in the crystalline lens, present since birth or developmental, both may hamper the normal growth of an eyeball. Hence patients have shorter AL than the control group. Over the period of 2 years follow-up for each eye the observed RAG of operated eyes was statistically significant in 3-6 years age group and borderline significant in 7-13 years age group from that control eyes in all age groups. This significant growth may be contributed by surgical intervention in which there is the implantation of IOL in place of the natural crystalline lens, decrease in lens thickness and increase in anterior chamber depth postoperatively. Also, there may be a change in vitreous volume change postoperatively which may be a contributory factor.

It was observed in all age groups in 3-6 years, the difference between the 2 groups in corneal curvature at every follow-up was not statistically significant and follows the same pattern. Surgical intervention in patients did not cause much alteration in corneal curvature postoperatively in comparison with control eyes. This may be in compensation to the higher axial growth occurring in both the groups. In study group, progressive corneal flattening was seen in the post-operative period, which is similar to that normally occurring in the control group in a period of 2 years. This corneal flattening may be in compensation to the axial growth which occurs due to myopic shift in this age group.

Comparison of AL among different age groups was done and ANOVA test was applied, which showed that different AL at various follow-ups were not statistically significant in both patients and control group. Difference of RAG was found statistically significant ($P = 0.00$) in both groups individually. This change is because of axial growth of an eyeball occurring with age in both the groups. Comparison of corneal curvature among different age groups was done and ANOVA test was applied, which showed that different readings of corneal curvature at various follow-ups were not statistically significant in both patients and control group. The difference in a change of corneal curvature was found statistically significant ($P = 0.00$) in both groups. As the age advances, there are some changes in corneal curvature expected to occur in an eyeball.

**CONCLUSION**

After the age of 3 years, there is no much growth of an eyeball occurs in relation to AL and corneal curvature, and hence need of secondary surgical intervention has been reduced.

**REFERENCES**

Evaluation of Results of Pronator Quadratus Repair Following Volar Plate Fixation of Distal Radius Fracture: A Prospective Study

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Abstract

Background: Volar plating is increasingly used in distal radius fracture as it helps in the fixation of radial and intermediate column. Now volar locking plate, polyaxial volar locking plate, which are low profile are increasingly used. During operation, pronator quadratus is incised. This has led to the question, whether pronator quadratus repair is necessary for better wrist function.

Purpose: The objective of this study was to evaluate the efficacy of pronator quadratus repair after volar plating of distal radius fracture.

Materials and Methods: During the period of 2011-2014, 50 distal radius fractures treated operatively with volar plate are assigned to receive a repair of pronator quadratus versus no repair. Surgical exposure, reduction, and postoperative rehabilitation are equivalent in both groups. Patients are followed up for a period of 12 months. Results are assessed via wrist motion, grip strength, disabilities of the arm, shoulder and hand (DASH) score, and visual analog scale (VAS).

Results: A total of 50 distal radius fractures were treated operatively. Full follow-up data are available for 27 patients repair group versus 20 patients in the control group. At 12 months, there is no significant statistical difference between two groups regarding wrist motion, DASH scores, and VAS scores. In addition, we found no significant differences in any of the parameters at the 2 weeks, 6 weeks, 3 months, and 12 months intervals. Reoperation was not required in any of the patient.

Conclusion: Pronator quadratus repair after volar plating of a distal radius fracture does not significantly improve postoperative results.

Keywords: Distal radius fractures, Pronator quadratus, Volar plating

INTRODUCTION

Distal radius fractures represents 16% of all fracture treated in the emergency department and 21% of all fractures treated in young adults.1 It is the most common fracture in the upper extremity. The most common cause of such a fracture is due to fall on the outstretched hand. Distal radius fractures often result in long-term functional impairment, pain, and deformity. The three-column model (Figure 1) of distal forearm helps in understanding the fractures and assists in planning for internal fixation.1 The volar locking plate has become the technique of choice in recent years for fixation of these fractures2 as it exhibits the potential for decreased functional disability and lower complication rate than the alternative such as external fixator, dorsal plating, and percutaneous pinning. By volar plating, we can stabilize both the radial column and intermediate column.

The modified Henry approach was preferred by us,1 it utilizes the plane between flexor carpi radialis and radial artery. The radial artery is retracted radially and flexor carpi radialis tendon medially retracted. The bone is exposed by complete division of pronator quadratus muscle.
It is believed that pronator quadratus muscle repair is necessary for better wrist movement, grip strength, and most important in preventing flexor tendon injury from friction of the plate. Some surgeons do not believe that.

This is a prospective study to evaluate whether pronator quadratus muscle repair is necessary after volar plating for better function.

MATERIALS AND METHODS

This is a prospective study performed on 50 patients with 50 distal radius fractures in our institution from January 2011 to December 2014. All the fractures are intra-articular ([Arbeitsgemeinschaft für Osteosynthesefragen] AO classification 23-B3 to 23-C3) (Figure 2). Patients with open fracture, bilateral wrist fracture, and with other fractures in the same upper limb were excluded. A clearance was obtained from the Ethical Committee of IPGMER and SSKMH and a detailed consent was taken from each of the patients explaining pros and cons of the surgical procedure involved along with pros and cons of other treatment modalities for similar fracture patterns. Among these 50 patients, 3 patients were lost during follow-up. The rest of the patients were followed up for a period of one year. All the operations were performed by the same surgeon. Computerized tomography (CT) full forms should be used. All the words that are to be expanded are highlighted in red scan has been done in Type C fractures for better understanding of fracture configurations.

All the patients were operated in the supine position with forearm placed on hand table. The modified Henry approach was found to be suitable for most fractures. Radial artery was palpated and marked. Tourniquet was applied. Incision was given between flexor carpi radialis muscle and radial artery. Flexor carpi radialis with deep flexor was retracted radially and radial artery medially. Exposure of the bone was completed by the division of pronator quadratus. Fracture was reduced by hyperextension of the wrist. In some cases, dorsal approach became necessary for a dorsal fragment or impacted intermediate fragment reduction. In some cases, radial lateral plate and dorsal plate were needed for proper fixation. Reduction was confirmed under image intensifier. Pronator quadratus was repaired with 3-0 bio-absorbable braided suture in 20 patients. Wound was closed in layers. Stich off was done after 12 days.

Immediately after surgery, patients were encouraged to elevate the limb, and mobilize the digits, elbow, and shoulder. Patients were followed up on 2 weeks, 6 weeks, 3 months, 12 months interval. Wrist movements, (disabilities of the arm, shoulder and hand) DASH score, (visual analog scale) VAS scale, and grip strength ratio were used to compare the operated side with the normal side.

RESULTS

During this 3 year period, 50 distal radius fractures were treated operatively. Complete follow-ups are available in 47 patients. Among them in 27 patients pronator quadratus was repaired. The average age group was 50 years (range 19-70 years) in the repair group and 60 years (range 25-70 years) in the non-repair group. The repair group consisted of 12 male and 15 female, the non-repair group consisted of 13 female and 7 male. Among the 47 fractures 15 fractures were Type B3 group, 13 in Type C1, 12 in Type C2, and 7 in Type C3 group (Figures 2 and 3).

In the pronator quadratus not repaired group, the average wrist motion at the end of 12 months: Flexion 82° (78-85), extension 80° (75-85), supination 86° (75-88), pronation
86° (73-87), ulnar deviation 36° (32-35), radial deviation 20° (15-25). DASH score 6 (4-8), VAS scale 1 (0-2), jammer grip strength ratio to contralateral limb 0.65 (0.55-0.68) (Figure 4).

In the pronator quadratus repaired group, the average wrist motion at the end of 12 months: Flexion 84° (80-86), extension 82° (75-85), pronation 80° (83-87), supination 80° (82-87), ulnar deviation 36° (30-37), radial deviation 20° (17-23), DASH score 8 (6-10), jammer grip strength to contralateral limb ratio 0.61 (0.57-0.68) (Figures 5 and Table 1).

Complications included 2 cases of superficial infection, which was treated with antibiotics. No deep infections were found. Reoperation was not required for any fracture.

No statistical difference in the range of motion, DASH score, and grip strength was found between pronator quadratus repaired and not repaired group (Figures 6-9 and Table 1).

**DISCUSSION**

During volar plating pronator, quadratus muscle is incised and it is damaged during reduction and plate fixation. Surgeons face difficulty in repairing the damaged muscle. Sometimes it is not possible to repair it or only partial repair is feasible. Even after hardware removal it is found that the average length of pronator quadratus is 68%. The length of healed Pronator quadratus muscle does not affect the isokinetic forearm rotation. It suggests that tight repair of Pronator quadratus is not necessary for achieving improved forearm function. Volar plating is now the most common procedure done in distal radius fracture. A variety of complications pertaining to volar plate fixation for the management of distal radius fracture has been reported. Incidence of flexor pollicis longus tendon rupture has been reported from 2% to 12%. In most of the cases, it is due to plate prominence, faulty plate positioning, high profile locking plate. Positioning of the plate proximal to the watershed line and early removal of plate in cases with plate prominence or warning symptoms can reduce the risk of this complication. Plate prominence at the watershed line predisposes individual to flexor pollicis longus (FPL) rupture and may be avoided by thorough fluoroscopic examination from multiple angles. In our study, there were no cases of FPL rupture. Other complication like reflex sympathetic dystrophy was not found in our study.

No statistical difference was found in the range of motion and grip strength between repair and non-repair group. The range of motion and grip strength is not significantly different at 95% confidence interval. These findings suggest functional equivalence between repair and not repair group.

**CONCLUSION**

During the surgical procedure, surgeons are usually very cautious regarding pronator quadratus repair after
Table 1: Follow-up grand chart

<table>
<thead>
<tr>
<th></th>
<th>2 weeks</th>
<th></th>
<th>3 months</th>
<th></th>
<th>6 months</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reaired</td>
<td>Not repaired</td>
<td>Reaired</td>
<td>Not repaired</td>
<td>Reaired</td>
<td>Not repaired</td>
</tr>
<tr>
<td>Extension</td>
<td>30°</td>
<td>30°</td>
<td>58°</td>
<td>50°</td>
<td>75°</td>
<td>71°</td>
</tr>
<tr>
<td>Flexion</td>
<td>35°</td>
<td>38°</td>
<td>55°</td>
<td>57°</td>
<td>75°</td>
<td>68°</td>
</tr>
<tr>
<td>Pronation</td>
<td>77°</td>
<td>77°</td>
<td>82°</td>
<td>80°</td>
<td>86°</td>
<td>84°</td>
</tr>
<tr>
<td>Supination</td>
<td>65°</td>
<td>55°</td>
<td>75°</td>
<td>70°</td>
<td>85°</td>
<td>85°</td>
</tr>
<tr>
<td>Ulnar deviation</td>
<td>31°</td>
<td>27°</td>
<td>31°</td>
<td>30°</td>
<td>35°</td>
<td>38°</td>
</tr>
<tr>
<td>Radial deviation</td>
<td>7°</td>
<td>8°</td>
<td>16°</td>
<td>12°</td>
<td>19°</td>
<td>18°</td>
</tr>
<tr>
<td>DASH score</td>
<td>58</td>
<td>54</td>
<td>32</td>
<td>26</td>
<td>14</td>
<td>16</td>
</tr>
<tr>
<td>VAS scale</td>
<td>7</td>
<td>7</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Grip strength to normal limb</td>
<td>0.04</td>
<td>0.06</td>
<td>0.12</td>
<td>0.15</td>
<td>0.32</td>
<td>0.35</td>
</tr>
</tbody>
</table>

DASH: Disabilities of the arm, shoulder and hand, VAS: Visual analog scale

Figure 6: Range of wrist motion is both groups

Figure 7: Comparison of wrist motion improvement in both groups
the plate has been fixed to the bone. Our comparative study suggests that there is no differences in terms of function or clinical outcomes between two groups. It appears that repair of pronator quadratus does have no significant impact on the outcome for these fractures, therefore, the additional step may be avoided. However, further studies with a larger and more varied ethnic and occupations group may be warranted to bring certainty in this dilemma.

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How to cite this article: Saha PK, Ray S, Behera S. Evaluation of Results of Pronator Quadratus Repair Following Volar Plate Fixation of Distal Radius Fracture: A Prospective Study. Int J Sci Stud 2015;3(2):26-31.

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Comparison of Child-Turcotte-Pugh Score and Renal Dysfunction in Predicting In-hospital Mortality In-patients with Decompensated Cirrhosis: An Observational Study

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Myriad of scoring systems have been designed and are being used to predict mortality in patients with cirrhosis. However, most of these scoring systems are used for predicting short-term (3 month) and long-term mortality. Very few are used to predict in-hospital mortality. Child-Turcotte-Pugh score (CTP score) has rarely been used to predict in-hospital mortality in cirrhosis. Furthermore, renal dysfunction is a common complication in patients with decompensated cirrhosis accelerating the mortality rate. Since renal indices are not included in the CTP score, this study was conducted to study the in-hospital mortality prediction power of CTP score and renal indices in decompensated cirrhosis.

INTRODUCTION

Decompensated cirrhosis is one of the major serious illnesses requiring admission to intensive care units.
mortality prediction power of CTP score and renal indices in decompensated cirrhosis. Serum albumin (g/dl), serum bilirubin (mg/dL), ascites, encephalopathy, nutritional status were used by Child and Turcotte in 1964 to assess the prognosis in chronic liver disease and the score was known as Child-Turcotte (CT) score.\(^1\) In 1973, Pugh modified the score by replacing nutritional status with prothrombin time and this modified score is known as Child-Turcotte-Pugh score.\(^2\) CTP score is classified as: A (5-6), B (7-9), C (10-15). A score of 1-3 is allotted for each of the five parameters; the higher the score (5-15), the greater the severity of CLD.\(^3\) The limitations of CTP score are: (i) assessment of ascites and encephalopathy is subjective; (ii) prothrombin time measurement depends on the sensitivity of the thromboplastin reagent used;\(^5\) (iii) any level of serum bilirubin more than 3 or any level of prothrombin time more than 6 will not affect CTP score;\(^4\) (iv) CTP score has a narrow range of 7-15 (Child B or C) in patients waiting for liver transplantation, and some patients may have identical CTP score which requires the use of the time on the waiting list as a tie breaker.\(^5\)

It is common to see a substantial degree of variability in renal function in patients with end-stage liver disease especially in those undergoing large-volume paracentesis and receiving diuretics. More importantly, diminished renal function is an important predictor of survival in those patients.\(^6\)-\(^9\)

The value of serum creatinine depends on the laboratory methods. To measure serum creatinine level, O’Leary modified Jaffe, compensated kinetic Jaffe, enzymatic and standard kinetic Jaffe methods have been used and compared in the calculation of the MELD score. There is a poor agreement among different creatinine assays, especially as serum bilirubin rises.\(^10\) Accordingly, the new standard is an enzymatic method for measuring serum creatinine.

And, accuracy of non-invasive measurement of renal function, including serum creatinine, has been shown to be suboptimal among cirrhotic patients.\(^11\)-\(^13\)

**METHODOLOGY**

**Source of Data**

The study was conducted on 50 patients with decompensated cirrhosis of liver admitted to KIMS Hospital, Bangalore during the study period from October 2013 to August 2014.

Type of study: An observational study

**Method of Collection of Data**

Informed consent was obtained from all patients/caretakers of the patients enrolled for the study. All the patients with end stage liver disease were screened for exclusion criteria and those who met the inclusion criteria were enrolled for the study. The patients’ demographics, presenting complaints, past medical history, and detailed examination findings were recorded soon after admission.

The patients are selected based on clinical examinations, biochemical tests, and ultrasound abdomen. The severity of cirrhosis of the liver was assessed based on Child-Turcotte-Pugh score and patients were grouped into Class A, B, and C according to the total score of 5-6, 7-9, and 10-15. Renal dysfunction was assessed by considering elevated serum creatinine at admission and screening all patients for hepatorenal syndrome using recommended diagnostic criteria. The patients are followed until discharge or death in the hospital and were observed for any cirrhosis related complications.

Inclusion criteria were patients more than 18 years of age with cirrhosis of the liver (diagnosed by clinical,

<table>
<thead>
<tr>
<th>Outcome</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Median</th>
<th>Minimum</th>
<th>Maximum</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum creatinine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discharged</td>
<td>30</td>
<td>1.10</td>
<td>0.833</td>
<td>0.70</td>
<td>0.30</td>
<td>4.20</td>
<td>0.002</td>
</tr>
<tr>
<td>Death</td>
<td>20</td>
<td>3.18</td>
<td>3.387</td>
<td>1.65</td>
<td>0.30</td>
<td>11.60</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>1.93</td>
<td>2.432</td>
<td>1.00</td>
<td>0.30</td>
<td>11.60</td>
<td></td>
</tr>
</tbody>
</table>

SD: Standard deviation

\[\text{Figure 1: Distribution of child class}\]
biochemical, and imaging study) with decompensation. Patient on diuretic therapy and patients on anticoagulation therapy at admission were excluded from the study.

### Statistical Methods

The following methods of statistical analysis have been used in this study. Data were entered in Microsoft Excel and analyzed using SPSS (Statistical Package for Social Science, Ver.10.0.5) package.

The results were averaged (mean + standard deviation) for continuous data and number and percentage for dichotomous data are presented in Table 1-7 and Figure 1. Normality of data was tested using Shapiro-Wilk test. The proportions were compared using Chi-square ($\chi^2$) test of significance. Proportion of cases belonging to a specific group of the parameter or having a particular problem was expressed in absolute number and percentage. The Student’s $t$-test was used to determine whether there was a statistical difference between groups in the parameters measured if the data is normal. A non-parametric test (distribution-free) used to compare two independent groups of sampled data. The test $P < 0.05$ was accepted as indicating statistical significance.

### RESULTS

This study was conducted in KIMS hospital Bangalore from October 2013 to August 2014. Total of 50 patients of decompensated cirrhosis admitted to KIMS were studied. Out of 50 patients with the end-stage liver disease, 20 (40%) died in the hospital due to cirrhosis related complications. For the purpose of analysis, the study population was divided into death group, and discharge group and the parameters were compared between each group.

The average age was 44.7 ± 12.040 years in discharge group and 54.1 ± 9.910 years in death group. The age span was 26-80 years in discharge group and 35-73 years in death group. There was male preponderance in both the study groups at a ratio of 4:1 in discharge group and 5.6:1 in death group. Gender difference with respect to in-hospital mortality was not statistically significant.

Hepatorenal syndrome was observed in 13 (26%) patients the incidence of which was found to be higher in death group (30%) compared to the discharge group (23.3%). However, there was no statistical significance difference between the two groups.

Mean serum creatinine value was higher in the death group (3.18 mg/dl) compared to discharge group (1.1 mg/dl) which was statistically significant (Table 1).

Total bilirubin level was also higher in death group (11.7 mg/dl) compared to discharge group (8.2 mg/dl) but with little statistical significance (Table 2).

The distribution of laboratory values is given in the Table 3. Serum creatinine level was relatively higher in the non-survivor group (55%) compared to survivor group (26.7%) but the difference was statistically not significant (Table 3).
CTP score was slightly higher in discharge group and there was no statistically significant difference between two groups (Tables 4 and 5).

Totally, 18 (90%) patients in the death group belonged to child Class C compared to 20 (66.67%) patients in the discharge group. Overall, 38 (76%) patients in the study population belonged to child Class C.

**DISCUSSION**

In the present study, out of 50 patients with end-stage liver disease, 20 patients died within the hospital accounting for 40% in-hospital mortality. In a study conducted by Cholangitas et al., mortality was seen up to 65%.

High mortality in their study was probably due to the higher incidence of life-threatening upper GI bleed (172 out of 312 patients). Of these 172 patients, 115 patients already had complications such as aspiration pneumonia, severe infection or organ failure.

In present study, mean age of patients was 48.5 ± 12.056 years as compared to 49.3 ± 11 years in a study conducted by Cholangitas et al.

Male patients contributed to 82% of cases in our study unlike 65% in the study conducted by Cholangitas et al. This difference is probably because of regional difference in social habits of female patients.

Even though P-value for renal failure is not statistically significant in the present study, it was observed that the mean serum creatinine was higher in death group. When serum creatinine alone was compared with the mortality, P-value was found to be significant.

The development of renal failure in cirrhotic patients indicates a catastrophic reduction in survival probability, such that it is the predominant factor in end-stage cirrhosis. The CTP score does not contain variables of the renal function, and this may be why it has poor performance.

CTP score was slightly higher in discharge group, and there was no statistically significant difference between two groups (Table 6).

Totally, 18 (90%) patients in the death group belonged to child Class C compared to 20 (66.67%) patients in the discharge group. Overall, 38 (76%) patients in the study population belonged to child class C.

The renal dysfunction in cirrhosis has been divided into two types. The Type I HRS occurs over 2-3 weeks and has high mortality and the Type 2 HRS occurs over a much longer period of time and has a relatively better outcome. Urinary biomarkers are now considered to be more sensitive than serum creatinine for renal failure in cirrhosis. Fagundes et al. have reported that urinary neutrophil gelatinase-associated lipocalin is significantly higher in patients with ATN than HRS. These evidences support the functional nature of HRS compared to ATN in cirrhotic patients.

The RIFLE or AKIN criteria has several limitations when used for renal insufficiency in cirrhosis. Hence, these criteria are not used routinely. Cirrhotic patients have less of muscle mass that affects the affects the level of serum creatinine. Therefore “normal” serum creatinine (<1.5 mg/dL) may still indicate significant renal dysfunction.

<table>
<thead>
<tr>
<th>Table 4: CTP score among the study groups</th>
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</thead>
<tbody>
<tr>
<td>Mean CTP score</td>
</tr>
<tr>
<td>Discharge group</td>
</tr>
<tr>
<td>10.33</td>
</tr>
</tbody>
</table>

CTP: Child-Turcotte-Pugh

<table>
<thead>
<tr>
<th>Table 5: Distribution of child class among the study population</th>
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</thead>
<tbody>
<tr>
<td>Child</td>
</tr>
<tr>
<td>Class A</td>
</tr>
<tr>
<td>Class B</td>
</tr>
<tr>
<td>Class C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 6: Comparison of complications with other studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>H. Encephalopathy</td>
</tr>
<tr>
<td>Survivors</td>
</tr>
<tr>
<td>Non-survivors</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>P value</td>
</tr>
<tr>
<td>Renal failure</td>
</tr>
<tr>
<td>Survivors</td>
</tr>
<tr>
<td>Non-survivors</td>
</tr>
<tr>
<td>Total</td>
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<tr>
<td>P value</td>
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</table>

<table>
<thead>
<tr>
<th>Table 7: Comparison of serum creatinine with other studies</th>
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</thead>
<tbody>
<tr>
<td>Serum creatinine</td>
</tr>
<tr>
<td>Survivors</td>
</tr>
<tr>
<td>Non-survivors</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>P value</td>
</tr>
</tbody>
</table>
In conclusion, the renal dysfunction in cirrhosis is mainly functional which occurs secondary to renal vasoconstriction in response to systemic arterial vasodilatation. Because of this renal vasoconstriction, cirrhotic patients have tendency to develop ATN when faced with complications such as gastrointestinal hemorrhage, diarrhea or sepsis.\textsuperscript{15}

**CONCLUSION**

Although Child-Pugh score was higher in death group than the discharge group, it was a poor predictor of in-hospital mortality. Indices of renal dysfunction (i.e., serum creatinine used in this study) was found to be a better predictor of in-hospital mortality. Hence, CTP score may require further modification to include renal parameters or it may be suggested to use CTP score in combination with renal parameters, to improve the in-hospital mortality prediction power.

**REFERENCES**

Study of Microalbuminuria in Hypertension

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Abstract

Background: Hypertension is the single most important risk factor in both coronary heart disease and cerebrovascular accidents. The onset of microalbuminuria correlates with duration and severity of hypertension, and its occurrence also heralds the onset of microvascular damage in other organs as kidney, retina, and heart. Microalbuminuria has recently emerged as an early marker of hypertension induced target organ damage.

Objectives: The objective was to study incidence and severity of microalbuminuria among hypertensive population.

Materials and Methods: This study was performed in Medical College, Jabalpur. 50 patients of mild, moderate, and severe hypertension were studied. After complete medical history and physical examination, routine biochemical analysis of blood and urine were obtained from every patient. Hypertension was defined according to Joint National Committee 6 criteria as an average blood pressure (BP) > 140-90 mmHg on at least three different occasions. Albumin excretion rate was determined by immunoturbidimetric test (Miral test).

Results: The incidence of microalbuminuria was 28% (14 out of 50) and was more prevalent in males. Maximum incidence of microalbuminuria was seen in higher age group (60-79 years). Microalbuminuria positive cases had significantly higher systolic BP (SBP) (171.86 ± 7.70 vs. 163.72 ± 7.35) and pulse pressure (75.86 ± 8.75 vs. 68.28 ± 10.04). Chances of microalbuminuria are higher in smokers. Microalbuminuria positive hypertensives had significantly higher level of serum creatinine (1.37 ± 0.46 vs. 1.09 ± 0.33). Microalbuminuria positive hypertensives had significantly lower creatinine clearance and a higher uric acid and cholesterol. Coronary artery disease and retinopathy were more prevalent in microalbuminuria positive patients. Electrocardiography (ECG) and echocardiography (Echo) changes of hypertension were more in microalbuminuria positive patients.

Conclusions: Microalbuminuria was significantly associated with higher SBP and pulse pressure higher creatinine, uric acid, cholesterol. ECG and Echo changes of hypertension were more in microalbuminuria positive patients. A risk coronary artery disease and retinopathy were more prevalent in microalbuminuria positive patients.

Key words: Blood pressure, Hypertension, Microalbuminuria

INTRODUCTION

Hypertension is the single most important risk factor in both coronary heart disease and cerebrovascular accidents. It is common, asymptomatic, readily detectable, and easily treatable, and is the leading cause of morbidity and mortality if left untreated. It may lead to congestive cardiac failure (hypertensive heart disease), renal failure, ocular damage, and aortic dissection.

Hypertension is an iceberg disease. In a developing country like India, only a small proportion of actual hypertensive’s are aware of their condition and very few among them are taking regular medications for its control. When defined as systolic blood pressure (SBP) > 140 mmHg and diastolic BP (DBP) > 90 mmHg, prevalence of hypertension is approximately:

i. 59.9/1000 population in males, 69.9/1000 population in females
ii. 19-25% in rest of world according to various studies.

About 90% of hypertension is primary or essential, remainder is secondary mostly related to renal disease,
endocrine abnormalities, vascular malformations, neurogenic, and psychogenic disorders.

Hypertension affects principally small muscular arteries and arterioles. Hypertension accelerates atherogenesis and causes two types of arteriosclerosis:

i. Hyaline arteriosclerosis.
ii. Hyperplastic arteriosclerosis or necrotizing arteritis.

Both of which are characterized by diffuse arteriolar wall thickening and luminal narrowing resulting in ischemia, necrosis, and fibrosis of tissues.

Hypertension principally affects organs with rich microvascular circulation as kidneys, brain, retina, and heart. One of the earliest biochemical markers of hypertensive microvascular angiopathy is filtration of small amount of albumin from glomerular capillaries due to intraglomerular hypertension. The onset of microalbuminuria correlates with duration and severity of hypertension, and its occurrence also heralds the onset of microvascular damage in other organs as kidney, retina, and heart. It is considered to be present when urinary albumin excretion is more than 20 µg/min, but less than 200 µg/min. This corresponds to approximately 30-300 mg/24 h.

Since this disease is associated with multisystem damage, very high morbidity and mortality, there was a long felt need of a marker that could predict multisystem changes at very early stage. Microalbuminuria has recently emerged as an early marker of hypertension induced target organ damage. A large number of studies all over the world have found a strong correlation between onset of microalbuminuria and biochemical markers of atherosclerosis (high and low-density lipoprotein [HDL and LDL] triglycerides, very LDL, cholesterol, apolipoprotein B, reduced HDL, and smoking) and have found a strong association between microalbuminuria and severity and duration of hypertension; microvascular changes in kidneys, retina, and heart.

The present study was conducted to find whether there exists any correlation between microalbuminuria, biochemical changes, and target organ damage in hypertension.

**AIMS AND OBJECTIVES**

1. To detect incidence of microalbuminuria among the hypertensive population.
2. To correlate incidence and severity of microalbuminuria with:
   a. Detailed physical examination to detect any physical finding significantly correlating with microalbuminuria.
   b. Various hematologic and biochemical parameters.
   c. Microvascular changes in the fundus detected through detailed fundus examination.
   d. Electrocardiography (ECG) findings of changes in coronary circulation, rhythm, and size of cardiac chambers.
   e. Any radiologically evident change in chest X-rays.
   f. Echo changes of systolic and diastolic dysfunction, ischemic heart disease (IHD).

**MATERIALS AND METHODS**

This study was performed in Medical College, Jabalpur. Permission from Ethical Committee was taken. 50 patients of mild, moderate, and severe hypertension were studied. Informed consent was obtained from each patient. The statistical analysis was carried out with SAS data analysis system. For statistical significance, the \( P < 0.05 \) was considered.

Inclusion criteria: Patients of mild, moderate, and severe hypertension.

Exclusion criteria:
1. Age <18 or >85 years.
2. Presence of neoplastic, hepatic or renal disease.
3. Diabetes mellitus (fasting plasma glucose > 140 mg/dl).
5. Females consuming oral contraceptives.

The attending physician made a diagnosis of essential hypertension. After complete medical history and physical examination, routine biochemical analysis of blood and urine were obtained from every patient. Hypertension was defined according to Joint National Committee 6 criteria as an average BP > 140-90 mmHg on at least three different occasions.

BP measurements: SBP and DBP were read to the nearest 2 mmHg. The lowest of the three consecutive readings was recorded. Pulse pressure (SBP − DBP) and mean BP (DBP + 1/3 pulse pressure) were recorded.

Body mass index (BMI) was calculated.

24 h urinary collections were obtained from each patient starting from second morning sample of the previous day to first morning sample of the test day.

Smoking was graded with a five point scale: Non-smoker, ex-smoker, smoking 1-14 g/day, smoking 15-25 g/day smoking > 25 g/day (1 cigarette = 1 g).

Retinopathy: The presence, type, and extent of hypertensive retinopathy were investigated.
ECG: It was used to detect signs of cardiac involvement, left ventricular hypertrophy, left atrial enlargement, left axis deviation, ventricular extrasystoles, atrial fibrillation, and myocardial infarction. Sokolow Lyon voltage criteria were used for detection of left ventricular hypertrophy as recommended by WHO. A criterion for IHD was based on the presence of Q-waves.

Chest X-rays: PA view of the chest was taken to note cardiomegaly, pulmonary venous congestion, and prominence or calcification of aortic knuckle. Cardiomegaly ratio > 0.5 was considered as evidence of cardiomegaly.

Echo: In this study, M mode and 2D Echo were done on BPL US9101 machine.

Urine: Albumin, sugar, and ketone bodies were detected.

Blood: Fasting and postprandial blood sugar, urea, serum uric acid, and serum cholesterol were estimated.

Serum and urinary creatinine estimation were done with measurement of creatinine clearance.

**Observations**

Of these 50 hypertension subjects, 28% (14 out of 50) were taken as study group being microalbuminuria positive and remaining 72% (36) being normoalbuminuric. Microalbuminuria positive cases were subdivided on the basis of microalbuminuria range into three groups for comparative study of microalbuminuria with some clinical and biochemical parameters. Findings of current study are as follows:

1. The incidence of microalbuminuria is 28% (14 out of 50). The distribution of cases according to albumin excretion rate is shown in Figure 1.

2. The peak incidence of microalbuminuria was found in the age group 60-79 years being 64% (9 out of 14 cases). The next maximum microalbuminuria cases were found in 40-59 years age range being 35% (5 out of 14 cases) (Table 1).

3. Male sex is associated with higher incidence of microalbuminuria (71.4% [n = 10] were males and 28.6% [n = 4] were females).

4. Microalbuminuria is significantly associated with higher SBP. Mean SBP (171 ± 7.70 mmHg) of microalbuminuria positive patients was significantly higher than mean SBP (163.72 ± 7.35 mmHg) of microalbuminuria negative patients (Table 2).

5. DBP was comparable in microalbuminuria positive (96 ± 10.32 mmHg) and microalbuminuria negative patients (95.75 ± 9.64 mmHg) and no significant association could be drawn.

6. Mean BP (120.21 ± 8.16 mmHg) of microalbuminuria positive patients was not significantly higher than mean BP (118.75 ± 7.35 mmHg) of microalbuminuria negative cases.

7. Mean pulse pressure (75.86 ± 8.75 mmHg) in microalbuminuria positive cases was significantly higher than mean pulse pressure (68.28 ± 10.04 mmHg) in microalbuminuria negative cases.

8. Prevalence of smoking was 20% (50) in the study. Among the smokers, 60% were microalbuminuria positive and 40% (n = 4) were microalbuminuria negative.

9. Increased BMI (BMI > 30 for males and > 28 for females) was observed in 24% cases (n = 12) in the study. No significant association was found with microalbuminuria.

**Figure 1: Distribution of cases according to albumin excretion rate**

**Table 1: Age and sex distribution of cases in the study**

<table>
<thead>
<tr>
<th>Age groups (years)</th>
<th>Positive (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>&lt;19</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>20-39</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>40-59</td>
<td>5 (35.71)</td>
<td>-</td>
</tr>
<tr>
<td>60-79</td>
<td>5 (35.71)</td>
<td>4 (28.57)</td>
</tr>
<tr>
<td>80 years and above</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td>4</td>
</tr>
</tbody>
</table>

*Statistically significant test value. Results: Z_m+,− = 2.09*, P<0.05; Z_f+,− = 4.13*, P<0.001. Maximum incidence of microalbuminuria was seen in the higher age group (60-79 years). SD: Standard deviation.
10. The mean hematocrit (40.95 ± 30.30 [male]; 34.53 ± 1.83 [female]; 39.11 ± 4.50 [total]) was very close to the mean hematocrit (40.54 ± 3.02 [male]; 33.6 ± 3.43 [female]; 36.49 ± 4.73 [total]) in microalbuminuria negative cases. No significant difference was observed.

11. The mean serum urea levels for the three different (20-50, 50-100 and > 100 mg/24 h) ranges of microalbuminuria were 29.28 ± 11.69; 28.5 ± 17.21; 30.75 ± 12.12 mg/dl, respectively. No significant association was found on correlating mean serum urea (29.47 ± 12.62 mg/dl) of total microalbuminuria positive cases (n = 14) and mean serum urea (22.68 ± 8.44 mg/dl) of total microalbuminuria negative cases (n = 36).

12. Mean serum creatinine levels among the three grades (20-50, 50-100 and > 100 mg/24 h) of microalbuminuria were 1.37 ± 0.46, 1.375 ± 0.56, and 1.375 ± 0.49 mg/dl, respectively. The mean value of serum creatinine (1.37 ± 0.46 mg/dl) of total microalbuminuria positive cases was significantly higher than the mean serum creatinine (1.09 ± 0.33 mg/dl) of microalbuminuria negative subjects (Table 3).

13. The mean urinary creatinine (19 ± 2.98 mg/dl) in microalbuminuria positive males was lower than the mean urinary creatinine (20.73 ± 2.02 mg/dl) in microalbuminuria negative males. It was statistically not significant.

14. The mean creatinine clearance (97.14 ± 6.75 ml/min) of total microalbuminuria positive cases was significantly lower than mean creatinine clearance (111.64 ± 13.98 ml/min) of total microalbuminuria negative cases.

15. The mean serum uric acid (8.58 ± 1.52 mg/dl) in total microalbuminuria positive cases was significantly higher than the mean serum uric acid (6.81 ± 1.14 mg/dl) of total microalbuminuria negative cases.

16. The mean serum cholesterol in total microalbuminuria positive cases (245.14 ± 35.40 mg/dl) was significantly higher than the mean serum cholesterol of total microalbuminuria negative cases (220.75 ± 27.08 mg/dl).

17. IHD was detected in 12% (n = 6) cases on the basis of ECG and Echo criteria, while 88% (n = 4) were normal (Figure 2). Among the IHD cases, 50% (n = 3) cases were microalbuminuria positive. In all microalbuminuria positive cases 21.4% (n = 3) had IHD whereas in all microalbuminuria negative cases (n = 36), only 8.3% (n = 3) had IHD. The correlation between microalbuminuria and coronary artery disease was insignificant, but a higher prevalence of coronary artery disease was seen in microalbuminuria positive cases (Table 4).

18. The prevalence of hypertensive retinopathy was 58% in the study. Among microalbuminuria positive cases 85.7% (n = 12) had retinopathy, whereas only 47.2% (n = 17) cases had retinopathy in microalbuminuria negative cases.

19. Changes in X-rays were seen in 22% cases (n = 11) in the study, among microalbuminuria positive cases (n = 14) changes were seen in 28% whereas in microalbuminuria negative cases (n = 36) changes were seen in 19% cases.

20. ECG changes were seen in 40% cases in the study 85.7% of microalbuminuria positive cases had ECG...
changes of hypertension whereas only 22.2% of microalbuminuria negative cases had changes in ECG. A significant correlation was seen between microalbuminuria and ECG changes (Table 5).

21. Echocardiographic features of systolic or diastolic dysfunction were seen in 60% or thirty cases (Figure 3). 85.7% of microalbuminuria positive cases had Echo changes of systolic or diastolic dysfunction whereas only 50% of microalbuminuria negative cases had Echo features of hypertension. Chi-square test shows significant correlation (Table 6).

**DISCUSSION**

**Prevalence of Microalbuminuria**

Of 50 hypertension patients in this study, 28% (n = 14) were found to be microalbuminuria positive. Of these 20% (n = 10) were males and 8% (n = 4) were females.

Similar prevalence rate was also found in the studies of Wu et al., 1998 (28%); Spangler et al., 1997 (25%).

**Correlation between Microalbuminuria and Age**

The age of the patients ranged from 18 to 80 years in the study. Of the total 14 microalbuminuria positive cases in the study, 35.71% (n = 5) male microalbuminuria positive cases were found in 40-59 years age range. 35.71% (n = 5) males and 28.57% (n = 4) females were in 60-79 years.

The mean age (59.79 ± 10.00 years) of microalbuminuria positive males was significantly higher than the mean age (52.30 ± 14.28 years) of microalbuminuria negative males (Z = 2.09*; P < 0.05). The mean age (61.75 ± 12.05 years) of microalbuminuria positive females was significantly higher than the mean age (49.13 ± 13.20 years) of microalbuminuria negative females (Z = 4.13*; P < 0.001).

The above findings correlate with the studies of Luft, 1997; Bonet et al., 2000.

**Correlation between Microalbuminuria and Sex**

A male predominance was seen in microalbuminuria positive cases.

These findings correlate with studies of Hillege et al., 2000; Gould et al., 1993; Bonet et al., 2000.

**Correlation of Microalbuminuria and SBP**

The mean SBP (171.86 ± 7.70 mmHg) of microalbuminuria positive cases was significantly higher than mean SBP (163.72 ± 7.35 mmHg) of microalbuminuria negative cases (Z = 3.40*; P < 0.05). The study results were very close to the findings of Mimran et al., 1994; Bonet et al., 2000. These studies have emphasized that microalbuminuria was very much associated with higher SBP.

**Table 4: Correlation between microalbuminuria and coronary artery disease**

<table>
<thead>
<tr>
<th>Coronary artery disease</th>
<th>Microalbuminuria (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Present</td>
<td>3 (50)</td>
<td>3 (50)</td>
</tr>
<tr>
<td>Absent</td>
<td>11 (25)</td>
<td>33 (75)</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>36</td>
</tr>
</tbody>
</table>

*Statistically significant test value. χ² = 6.164; P < 0.05 at 1 df. Coronary artery disease was more prevalent in microalbuminuria positive patients

**Table 5: Correlation between microalbuminuria and ECG changes**

<table>
<thead>
<tr>
<th>Changes in ECG</th>
<th>Microalbuminuria (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Present</td>
<td>12 (60)</td>
<td>8 (40)</td>
</tr>
<tr>
<td></td>
<td>(85.7)</td>
<td>(22.2)</td>
</tr>
<tr>
<td>Absent</td>
<td>2 (6.6)</td>
<td>28 (93.3)</td>
</tr>
<tr>
<td></td>
<td>(14.3)</td>
<td>(77.8)</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>36</td>
</tr>
</tbody>
</table>

*Statistically significant test value. Results χ² = 6.934; P < 0.001 (Significant at 1 df). Higher incidence of ECG changes of hypertension were seen in microalbuminuria positive patients. ECG: Electrocardiography

**Table 6: Correlation between microalbuminuria and echocardiographic changes**

<table>
<thead>
<tr>
<th>Echocardiographic changes</th>
<th>Microalbuminuria (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Present</td>
<td>12 (40)</td>
<td>18 (60)</td>
</tr>
<tr>
<td></td>
<td>(85.7)</td>
<td>(50)</td>
</tr>
<tr>
<td>Absent</td>
<td>2 (10)</td>
<td>18 (90)</td>
</tr>
<tr>
<td></td>
<td>(14.3)</td>
<td>(50)</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>36</td>
</tr>
</tbody>
</table>

*Statistically significant test value. Results χ² = 9.364; P < 0.005 (Significant at 1 df). Higher incidence of echocardiographic changes was seen in microalbuminuria positive patients
Correlation between DBP and Microalbuminuria
The findings of mean DBP correlate with the studies of Pedrinelli et al., 1999 who did not find any correlation between DBP and microalbuminuria. Only SBP was associated with microalbuminuria in their studies.

The results of this study do not match with study results of Redon et al., 1996 who found microalbuminuria to be more closely associated with DBP.

Correlation between Microalbuminuria and Mean BP
In the study, the mean BP did not correlate with microalbuminuria.

The opinion of Mimran et al., 1999 and Wu et al., 1998 was different from our findings who found the mean BP to be significantly higher in microalbuminuria positive cases.

Correlation between Microalbuminuria and Pulse Pressure
The mean pulse pressure (75.86 ± 8.75 mmHg) of microalbuminuria positive cases was significantly higher than the mean pulse pressure (68.28 ± 10.04 mmHg) of microalbuminuria negative cases (Z = 2.63*, P < 0.05).

The above relationship have been confirmed by the studies of Pedrinelli et al., 2000 and Bonet et al., 2000 who found a significant correlation between microalbuminuria and widened pulse pressure.

Correlation between Microalbuminuria and Smoking
Our findings closely match with studies of Mimran et al. who in their study found the prevalence of microalbuminuria to be two fold higher in hypertensive smokers. The similar findings studied by Spangler et al., 1997; Luft 1997 and Hillege et al., 2001 advocate that smoking was significantly associated with more microalbuminuria positivity in hypertension.

Correlation between Microalbuminuria and BMI
No significant association could be drawn from the results of chi square test $\chi^2 = 0.20$, $P > 0.05$; $\chi^2 = 0.09$; $P > 0.05$.

The above findings were different from those of Agrawal et al., 1996; Ruilope, 2001; and Bonet et al., 2000.

Correlation between Microalbuminuria and Creatinine Clearance
The levels of creatinine clearance in the study ranged from 76 to 118 ml/min among microalbuminuria positive subjects and 96-136 ml/min among microalbuminuria negative subjects.

These observations are in agreement with those of Ruilope et al., 2001.

Correlation between Microalbuminuria and Serum Uric Acid
Serum uric acid was found to be elevated in 36% (n = 18) cases in the study group. Of these 18 patients, 72% (n = 13) were microalbuminuria positive and 28% (n = 5) were microalbuminuria negative. The levels of serum uric acid ranged from 3.6 to 11.2 mg/dl in the study population.

The mean serum uric acid (8.58 ± 1.52 mg/dl) in total microalbuminuria positive cases was significantly higher than mean serum uric acid (6.81 ± 1.14 mg/dl) of total microalbuminuria negative cases (Z = 3.95*, P < 0.05).

These findings corroborate with the works of Mattel et al., 1997 (r = 0.43, P < 0.005*); Bigazzi et al., 1998; and Bianchi et al., 1999.

Correlation between Microalbuminuria and Serum Cholesterol
The mean serum cholesterol (240.5 ± 34.63 mg/dl) in microalbuminuria positive males is significantly higher than the mean serum cholesterol (212.8 ± 23.55 mg/dl) in microalbuminuria negative males (Z = 2.21*, P < 0.05).

The above findings closely match with studies of Bigazzi, Bianchi et al., 1999; Mimran et al., 1994; Bonet et al., 2001; Mettal (P < 0.005*), Agrawal et al., 1996. Their studies showed a very strong correlation between microalbuminuria and elevated serum cholesterol, elevated LDL, reduced HDL, high LDL: HDL ratio, elevated triglycerides, elevated serum levels of apolipoprotein A and B, thus increasing the atherogenic risk profile.

Correlation between Microalbuminuria and Coronary Artery Disease
Of the total 50 hypertension cases of study group, 12% (n = 6) were found to suffer from IHD whereas 88% (n = 44) had no Echo/ECG evidence of IHD.

Though the results of Chi-square test as stated above did not show significant correlation between microalbuminuria and coronary artery disease, yet the prevalence of coronary artery disease was higher (21%) in microalbuminuria
positive cases than (8%) in microalbuminuria negative cases in the present study.

Bianchi et al., 1997, found a very strong correlation \((P < 0.0002^*)\) between microalbuminuria and IHD. Olinic et al., 1994\(^{16}\) \((P < 0.001^*)\), Redon et al., 1991; Wu et al., 1998; Agrawal et al., 1996 \((P < 0.05)\); Biesenbach\(^{17}\) found the prevalence of coronary artery disease to be 11% in normoalbuminuric hypertensives and 29% in microalbuminuric hypertensives and the results of present study were very near to the above study.

**Correlation between Microalbuminuria and Retinopathy**

Out of the total 50 hypertension patients in the study; 58\% \((n = 29)\) cases had evidence of hypertensive retinopathy, whereas in 42\% \((n = 21)\) cases fundus was normal.

The findings of the present study were strongly supported by the similar results found in the studies conducted by Pontremolli et al., 1997.

**Correlation between Microalbuminuria and ECG Changes**

The results show a highly significant correlation between microalbuminuria and ECG changes in hypertension.

The above findings match with study of Pontremolli et al., 1998.\(^{18}\)

**Correlation between Microalbuminuria and Echo Changes**

There is a significant correlation between microalbuminuria and presence of Echo findings in hypertension.

These results are powered by similar finding in studies of Pontremolli et al., 1997;\(^{19}\) Cerasola et al. 1996;\(^{20}\) Agewall et al., 1993.

**CONCLUSION**

1. The incidence of microalbuminuria in hypertension was 28% with a peak incidence of in 60-79 years age group.
2. Male sex was associated with higher incidence of microalbuminuria.
3. Microalbuminuria was significantly associated with higher SBP and mean pulse pressure.
4. Microalbuminuria was strongly associated with smoking.
5. Microalbuminuria positive patients have significantly elevated levels of serum creatinine and significantly lower levels of urinary creatinine. Creatinine clearance was significantly reduced in microalbuminuria positive hypertensive patients.
6. Microalbuminuria positive hypertensives have significantly elevated uric acid and serum cholesterol.
7. Microalbuminuria was significantly associated with retinopathy, ECG and Echo changes.

**LIMITATIONS OF STUDY**

Analysis of 100 hospitalized patients may not reflect the pattern of disease in the community and requires a large population study. Cases were selected from a tertiary care center, so reference bias may be present.

**REFERENCES**


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Effect of Examination Stress on Heart Rate Variability

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Abstract

Background: Examination stress is known among all students, greater among those pursuing professional studies. The variation in autonomic response to examination stress is reported in same sex as well as gender difference. There is conflict in research work about such changes.

Aim: The aim was to study the heart rate variability (HRV) in medical students of either sex and to find any difference between them, if any.

Materials and Methods: A total of 49 medical students (25 boys and 24 girls) voluntarily participated for HRV analysis performed at three occasions, relaxed period, terminal, and professional examination. HRV was assessed by biomed polygraph.

Statistical Analysis: It was done by using SPSS 16.0 version. Nonparametric tests were used.

Results: There was a significant decrease in parasympathetic parameters at the time of terminal examination in both sexes with a greater reduction in girls. Between terminal and professional examination there changes in HRV parameters were little in both sexes.

Conclusion: The decrease in parasympathetic activity are found most at the time of terminal examination shifting the autonomic balance in favor of sympathetic in both sexes. After that, there is little change till professional examination suggesting of some adaptive mechanism. The girl medical students are under greater stress than boys.

Key words: Examination stress, Heart rate variability, Medical students

INTRODUCTION

Stress is a common feature of modern society. A stressor is a demand, situation or circumstances that disrupts person’s equilibrium and initiates the stress response of increased autonomic arousal.\textsuperscript{1} Prolonged stress is associated with chronic anxiety, psychosomatic illness, and a variety of other problems.\textsuperscript{1,2} When people are faced with demands from others or demands from the physical or psychosocial environment to which they feel unable to adequately respond, a reaction of the organism is activated to cope with the situation.\textsuperscript{3,4} The nature of this response depends on a combination of different elements, including the extent of the demand, the personal characteristics and coping resources of the person, the constraints on the person in trying to cope and the support received from others.\textsuperscript{1} The word, pressure, and stress are often used interchangeably, but in fact they are quite different. Pressure may be positive to achieve a goal. Prolonged pressure becomes negative and leads to stress, mental strain, and disturbance in homeostasis.\textsuperscript{5}

Pre-examination stress is a common condition faced by students prior to exams and is more predominant among professional students. The study of medicine is extensive, time-consuming, and very stressful. During their 5 years tenure, the students are subjected to endless working hours, and periodic examinations add an extra stress quotient. In order to maintain a remarkable grade-point-average, students often have to work beyond their mental threshold and physical strength.\textsuperscript{6}
It often causes changes in autonomic balance leading to altered behavior, acute anxiety, and depression. There are conflicting reports about the autonomic variability during mental stress. Therefore, the present study is planned to observe the autonomic variations due to self-perceived examination stress in medical students.

MATERIALS AND METHODS

The present study was conducted in the autonomic function lab of Department of Physiology at Lala Lajpat Rai Memorial Medical College Meerut, over a period of 18 months following approval from Institutional Ethical Committee. 49 first year MBBS students, of either sex, aged between 18 and 25 years voluntarily participated as subjects for the study. The exclusion criteria for the study were the factors or diseases, which might affect the autonomic activity. The Stanford stress Questionnaire was distributed among students to evaluate stress level and behavioral personality.

The heart rate variability (HRV) analysis, of each student was done on three occasions: The first record was performed during college cultural week when the students were in relaxed atmosphere and it was used as control. The second observation was recorded during their second terminal viva voce examination about 30 min prior to viva. The final HRV recording was done during their professional examination, 30 min prior viva voce. As examination is a known real life stressor for the students, the last two observations were taken as records of stressful period.

Each test was performed under thermoneutral condition. The subjects were abstained from coffee, tea or cola for 6 h before HRV analysis. Each subject was given 15 min relaxation before applying the limb lead electrodes. Finally, a short-term 5 min Lead II electrocardiography (ECG) recording was taken using the biomed polygraph. Before doing the final HRV analysis artifacts like ectopic beats were removed.

Following parameters are calculated from ECG recording.

**Time Domain Parameters**

Time domain analysis measures the changes in HR over time or the intervals between successive normal cardiac cycles. Time domain parameters are driven mainly via parasympathetic innervations of the heart.

1. Root mean square of the successive differences (RMSSD) (ms): Square root of the mean of the sum of the squares of differences between adjacent NN intervals
2. NN50 (count): Number of successive difference of interval which differ by more than 50 ms as proportion by total beat cycle
3. PNN50 (%): Percent of difference between adjacent NN intervals that are <50 ms.

**Frequency Domain Parameters**

Frequency domain (power spectral density) analysis describes the periodic oscillations of the HR signal decomposed at different frequencies.

1. Very low frequency (VLF) band: VLF (0.003-0.04 Hz) is driven mainly by various slow mechanism of sympathetic activity
2. LF band: LF (0.04-0.15 Hz) is driven mainly by sympathetic innervations of heart
3. High frequency (HF) band: HF (0.15-0.4 Hz) is driven mainly by parasympathetic innervations of heart
4. LF/HF ratio: This is a ratio between the power of LF and HF band. This measure indicates an overall balance between sympathetic and parasympathetic system.

**Statistical Analysis**

The demographic data were analyzed by using unpaired Student’s t-test. Since the data were not normally distributed, statistical tests were performed using nonparametric techniques. The Wilcoxon Signed-Rank test was used to compare the various variables in either boys or girls. However, Mann–Whitney U-test was used to compare the values between boys and girls. \( P \leq 0.05 \) were considered statistically significant. All calculations were done by using SPSS software.

RESULTS

Table 1 illustrates the demographic data of boys and girls. It is evident that the age, height, weight, and body mass index (BMI) are significantly lower in girls than boys as expected.

Table 2 shows that all the time domain parameters were decreased in boys from a relaxed state to terminal examination. However, the significant fall \( (P < 0.05) \) was seen only in NN50 and PNN50. Similar observation was seen when the comparison was made between relaxed period to professional examination with significant fall \( (P < 0.05) \) in NN50 only. Since time domain parameters depict the parasympathetic response, it can be concluded that there is a significant decrease in parasympathetic response up to terminal examination but thereafter the fall is not much.

Table 3 shows the decrease in LF and HF bands during terminal and professional examination when compared with the relaxed period in frequency domain parameters similar to time domain parameters. The overall effect of sympathetic to parasympathetic response which is reflected by LF:HF depicts the increased sympathetic response at
the time of terminal examination, but no further increase in its response thereafter till professional examination.

Table 4 shows that the time domain parameters in girls decreased from a relaxed state to terminal and professional examinations with significant fall in some of them. It also shows that the parasympathetic response continued to decrease significantly till professional examination in girls.

Table 5 shows that HF band in the frequency domain parameters in girls decreased from relaxed period to terminal and professional examination suggestive of altering the autonomic balance in favor of the sympathetic system. The LF:HF ratio is variable with a decrease during the professional examination.

### DISCUSSION

It is a known fact that any stressor, be it physical or psychological, tries to derail the homeostatic mechanisms of the body. In turn, body’s ability to respond to these stressors depends on perceived demand and ability to cope by altering the activity of autonomic nervous system (ANS) and thereby reestablishing the homeostasis. The response to the stressor is subject dependent. How does the response differs is not known till date. The possible role of increased activity of sympathetic nervous system (SNS) and hypothalamo-pituitary-adrenal axis may be the cause of adaptive mechanisms. It is documented that human body responds to stress by alterations in different biological functions especially autonomic functions such as HR and blood pressure.

The study of medical science, associated with clinical knowledge and experience, is stressful for medical students. Hence, this work was planned to observe the response of ANS activity to self-perceived examination stress in medical students of both sexes at the time of internal examination (second terminal examination) and university examination the latter seems to be more stressful.

Table 1 compare the demographic data of participants of both sexes and show a significant difference in age, height, weight, and BMI between boys and girls. It is expected to find such significance as the girls are admitted to a medical course at an early age as compared with boys. There is
known physiological differences in weight and height between two sexes.

The frequency domain parameters during relaxed state exhibit higher LF but low HF in females than the males. Since former is a measure of gradual sympathetic activity and the latter gives about the assessment of parasympathetic activity, it appears that even in resting state, the females have greater sympathetic activity. It is also reflected by higher LF:HF in females as compared to males. In a study by Ramaekers et al., it was observed that there is a gender difference in cardiac autonomic activity. The HRV was found to be significantly lower in healthy women compared to healthy men as also observed in the present study.

In males, the fall in LF was less than HF and a higher LF:HF, indicating a low parasympathetic activity as the stress level increases. However, in females, the reduction in LF was greater than males along with an increase in LF:HF, indicating a stressful state similar to males. However, the LF:HF ratio was greater in females indicating greater stress level in them as compared to males. At the time of professional examination, there was greater decrease in LF but only slight decrease in HF in both sexes with decrement in LF:HF as well, indicating the balance of ANS activity toward parasympathetic nervous system. It might be due to some adaptive mechanisms operating to cope up the perceived stress.

The time domain parameters in both sexes were showing a decreasing trend from a relaxed state to either at the time of terminal or professional examination with significant changes in some of them. When the same parameters are compared between terminal to professional examination, the changes in time domain parameters were little decrement. The fall in time domain parameters is an indication of increased sympathetic activity. It seems that the male students feel greater stress prior to either terminal or professional examination compared to relaxed period but between the two examinations, the stress is not much. It appears that the stress level is maximum at the time of terminal examination and after that a plateau is reached. It suggests that some coping mechanisms might occur in body to prevent the detrimental effect on homeostatic mechanisms. The frequency domain parameters in boys reveal a decrease in all parameters from relaxed state to both examinations. However, this fall was not significant. The LF:HF is same at the relaxed state and terminal examination time but a little lower at the time of professional examination. It indicates that the change in sympathetic activity is counterbalanced by similar change in parasympathetic activity at the time of terminal examination.

The time domain parameters in girls are decreased significantly from relaxed state to terminal examination or professional examination. However between terminal to professional examination, the decrease in these parameters was not significant. The fall in these parameters signifies increased sympathetic activity as indicated above. Hence, in girls the examination stress causes a maximum increase in sympathetic activity at the time of terminal examination but after that this activity does not rise much as also observed in boys.

The frequency domain parameters in girls show a significant fall in LF only though other parameters also exhibit a decreasing trend. It seems that there is slow and gradual increase in sympathetic activity in girls as LF is a measure of such change in sympathetic activity. Since the LF:HF is increased; it appears that increased sympathetic activity is counterbalanced by an increase in parasympathetic activity. From terminal to professional examination, the sympathetic activity is significantly increased as evident from increase in VLF which is a marker of acute increase in sympathetic activity but the HF does not change leading to decreased LF:HF ratio. It appears that the girls are at greater stress at the time of professional examination than boys. The slow, gradual increase in sympathetic activity in girls is changed to acute increase near professional examination when stress is expected to be maximum.

Delaney and Brodie, observed the effect of short-term psychological stress on HRV analysis and observed a decrease in HF and increase in LF and LF:HF signifying the increased sympathetic and decrease in parasympathetic activity. The findings of the present study did not match with this work as the psychological stress in our study developed gradually over a period of time which is variable in different individuals and there was increase in sympathetic activity with little or no change in PNS activity. There is also gender variability with greater SNS activity in females. It is observed that there is a rise in cortisol levels in any type of examination, more during oral than written examination. It appears that cognitive function face more challenge during oral examination as there is associated with performance pressure and evaluation by the audience. It seems that the increase in cortisol level helps in coping the stressful situation by altering homeostatic mechanisms. Changes in the ANS activity may be one of such mechanisms.

Limitations

• Our study is a cross-sectional one
• The number of subjects studied is less in both sexes. This is due to voluntary participation of the subjects
• The quantification of stress was not done due to some practical difficulties.
CONCLUSION

It is evident that there is a significant increase in HRV parameters in both sexes at the time of terminal examination due to increased sympathetic or decreased parasympathetic activity. Thereafter, such changes rise insignificantly up to professional examination suggesting some adaptation. The changes in HRV are greater in females suggesting more stress than males. However, the underlying mechanisms are still elucidated.

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Image Guided Fine-needle Aspiration Cytology of Adrenal Masses

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Abstract

Context: Fine-needle aspiration cytology (FNAC) of adrenal mass lesions is safe and helpful for diagnosis and management but not commonly used technique.

Aims: This study was done to evaluate the usefulness and drawbacks of image-guided FNAC of adrenal masses in a period of 3-year with an intention to note the safety, adequacy, to render the cytodiagnosis, to illustrate the cytological features, to histologically correlate them, to identify the problems and suggest a practical approach especially for institute with limited facilities.

Subjects and Methods: FNAC was done under radiological guidance in all cases using long spinal needle fitted with 20 ml disposable syringe. Appropriate staining was done and cyto-morphological features were studied and compared with histology wherever possible.

Results: Ten patients who presented with adrenal masses were studied. According to radiological and cytologic findings, we diagnosed four cases as benign (one myelolipoma and three pheochromocytoma) and six as malignant (three adrenocortical carcinoma, one metastatic carcinoma, one neuroblastoma and one ganglioneuroblastoma). FNAC was found to be safe in all (100%) cases. Adequacy was 100% and with some problems we were able to render cytodiagnosis in all (100%) cases. Histological correlation was available in nine cases which matched with the cytodiagnosis (100% correlation). In one case treatment and follow up was available.

Conclusions: Image-guided FNAC is an inexpensive, safe, simple and quiet reliable method of diagnosis and management of adrenal masses in most of the cases.

Keywords: Adrenal glands, Cytodiagnosis, Fine-needle aspiration

INTRODUCTION

The adrenal glands are paired retroperitoneal organs situated within the confines of the perirenal fat inside Gerota's fascia.¹

The lesions of adrenal gland can be hormonally functional or non-functional and presenting only with intra-abdominal mass. Functional lesions can present with paroxysmal hypertension, sweating and palpitation due to increased secretion of catecholamines, or by symptoms of hypercortisolemia or by virilizing symptoms or combination of both.¹

For the diagnosis of adrenal masses it is prime requirement that the patient should undergo thorough clinical, radiological, biochemical and endocrine evaluation.² Radiological guidance is practically always needed to ensure a representative sample, to avoid areas of necrosis and hemorrhage and to show the relation to major vessels and other structures.³ Fine-needle aspiration cytology (FNAC) is definitely advantageous, as it is easy-to-perform, cost-effective and time-saving procedure with lesser complications than biopsy.⁴⁵ FNAC of adrenal gland is less frequently performed technique in cytology services.⁶⁷ Many investigators in past have reported their experience with percutaneous image guided (computed tomography [CT] or ultrasound [USG]) FNA of adrenal
and have underscored the value of FNA in adrenal glands. However, there are studies which have demonstrated that FNA biopsy of adrenal glands is a specific and sensitive procedure in the workup of patients with adrenal gland lesions. FNA not only allows the confirmation of surgical conditions like primary and metastatic malignancies, benign neoplasms, and cystic lesions, but also help to diagnose the medical disorders which can be cured without surgery, like infections, e.g., tuberculosis and histoplasmosis.

Our aim was to establish the effectiveness of guided FNAC for diagnosis of adrenal masses and to discuss the pitfalls.

**SUBJECTS AND METHODS**

This study was a collaborative effort of the Departments of Pathology, Radiodiagnosis and Surgery of a tertiary care government hospital covering a period of 3 years (November 2011 to October 2014). An initial approval was obtained from the ethical committee of the hospital which conforms to the norms of the Helsinki Declaration on human experimentation (institutional or regional).

USG-guided and/or CT - guided FNAC was done for all adrenal lesions using lumbar-puncture needle fitted to 20 mL disposable syringe. Two needle passes were performed. Smears were prepared with gentle pressure, air-dried and then stained with May-Grunwald Giemsa stain. Cytomorphological features were studied and cytodiagnosis done and correlated with histology, for diagnostic accuracy.

**RESULTS**

This is a retrospective study. A total of ten patients with adrenal masses were aspirated under USG and/or CT guidance during the 3-year study period. Youngest patient was of 6 months and oldest was of 70 years, with most patients aged between 30 and 40 years (30%). 5 (50%) patients were male and 5 (50%) were female. Out of 10 cases, 4 (40%) were benign and 6 (60%) were malignant. The youngest patient had neuroblastoma and the oldest had metastatic poorly differentiated carcinoma. Table 1 contains age, sex, clinical, radiological, biochemical and endocrine evaluation, cytological diagnosis and histological diagnosis of all ten cases.

FNAC was safe in all 10 (100%) cases. The smears were also adequate in all 10 (100%) cases. Cytodiagnosis was problematic in some cases but with the help of clinical, radiological, biochemical and endocrine findings we were able to render the cytodiagnosis in all 10 (100%) cases. Histological correlation was available in 9 (90%) cases, which matched with the cytodiagnosis (100% correlation). In one case treatment and follow-up was available.

**Cytological Features**

In myelolipoma (Figure 1), there was predominance of myeloid precursors. Fair number of erythroid precursors, megakaryocytes and fat vacuoles were seen. Few adipocytes and benign cortical cells were also noted. The diagnosis was quiet easy. Histology confirmed the cytodiagnosis.

Three of ten cases were of pheochromocytoma (Figure 2) and were benign as no capsular invasion or metastasis was identified.

The smears were of variable cellularity. Cells were mainly loosely clustered with some single cells. Vague alveolar arrangement was seen at places. Cells were round to oval, occasionally spindled, with moderate pleomorphism and loose cohesion. Cytoplasm was abundant to moderate, eosinophilic to amphophilic, fine granular with illdefined borders. Vacuoles morphologically consistent with glycogen were seen in one of three cases. Nuclei were medium to large, round to oval, showing mild to moderate pleomorphism and fine granular chromatin. In one case some nuclei showed binucleation and eccentricity. Histology (Figure 3) of all three cases of pheochromocytoma was available and supported the cytodiagnosis.

Three of ten cases were of adrenocortical carcinoma. Cells were (Figure 4) round to oval, mainly singly arranged with moderate amount of basophilic cytoplasm and medium sized round nucleus with fine to coarse chromatin with moderate pleomorphism and few multinucleated and multilobated nuclei.

In one case of adrenocortical carcinoma (Figure 5) there was bubbly background and fair number of naked nuclei, therefore adrenocortical adenoma was also in consideration but wide areas of necrosis and size of 7 cm of the lesion favoured carcinoma over adenoma.

In another case (Figure 6) cells were also showing occasional vague alveolar arrangement, light eosinophilic cytoplasm. Therefore, pheochromocytoma was also considered but single round to oval nuclei showing abrupt transition in size at intervals in an otherwise uniform pattern and few bi/multi-nucleated and multilobated nuclei were helpful in favoring adrenocortical carcinoma. Histology of all three adrenocortical carcinoma confirmed the cytodiagnosis.

One of the malignant cases was a metastatic poorly differentiated carcinoma. Patient had multiple lung lesions, mediastinal lymphadenopathy, multiple liver deposits and bilateral adrenal masses (9 and 6 cm). Smears
Table 1: Age, sex, clinical, radiological, biochemical and endocrine findings, cytological diagnosis and histological diagnosis of adrenal lesions

<table>
<thead>
<tr>
<th>Case number</th>
<th>Age/sex</th>
<th>Clinical/biochemical/radiological/endocrine findings</th>
<th>Cytological diagnosis</th>
<th>Histological diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>32 years/F</td>
<td>Abdominal lump</td>
<td>Myelolipoma</td>
<td>Myelolipoma</td>
</tr>
<tr>
<td>2</td>
<td>18 years/F</td>
<td>Paroxysmal hypertension, sweating and palpitation, increased urinary and plasma VMA and catecholamines</td>
<td>Pheochromocytoma</td>
<td>Pheochromocytoma</td>
</tr>
<tr>
<td>3</td>
<td>28 years/M</td>
<td>Paroxysmal hypertension, sweating and palpitation, increased urinary and plasma VMA and catecholamines</td>
<td>Pheochromocytoma</td>
<td>Pheochromocytoma</td>
</tr>
<tr>
<td>4</td>
<td>45 years/F</td>
<td>Paroxysmal hypertension, sweating and palpitation, increased urinary and plasma VMA and catecholamines</td>
<td>Pheochromocytoma</td>
<td>Pheochromocytoma</td>
</tr>
<tr>
<td>5</td>
<td>32 years/F</td>
<td>Symptoms of hypercortisolemia</td>
<td>Adrenocortical carcinoma</td>
<td>Adrenocortical carcinoma</td>
</tr>
<tr>
<td>6</td>
<td>40 years/F</td>
<td>Symptoms of hypercortisolemia</td>
<td>Adrenocortical carcinoma</td>
<td>Adrenocortical carcinoma</td>
</tr>
<tr>
<td>7</td>
<td>42 years/M</td>
<td>Symptoms of virilization</td>
<td>Adrenocortical carcinoma</td>
<td>Adrenocortical carcinoma</td>
</tr>
<tr>
<td>8</td>
<td>70 years/M</td>
<td>Multiple lung lesions, mediastinal lymphadenopathy, multiple liver deposits, bilateral adrenal masses (9 cm and 6 cm)</td>
<td>Metastatic poorly differentiated carcinoma</td>
<td>Not available</td>
</tr>
<tr>
<td>9</td>
<td>6 months/M</td>
<td>Increased urinary and plasma catecholamines</td>
<td>Neuroblastoma</td>
<td>Neuroblastoma</td>
</tr>
<tr>
<td>10</td>
<td>10 years/M</td>
<td>Increased urinary and plasma catecholamines and metabolites</td>
<td>Ganglioneuroblastoma</td>
<td>Ganglioneuroblastoma</td>
</tr>
</tbody>
</table>

VMA: Vanillylmandelic acid

(Figure 7) were hypercellular with cells singly as well as in small aggregates. Cells were large round to oval with abundant amphophilic cytoplasm. Nuclei were markedly pleomorphic, mitotically active, hyperchromatic with high N:C ratio. Occasional multinucleation and multilobation


One case in our series was diagnosed as neuroblastoma. Smears were hypercellular showing single monomorphic cells, small clusters and rosette formation with neuropil in centre (Figure 8). Small to medium size, round cells with scant cytoplasm, at places forming cytoplasmic processes, were seen. Nuclei were round to oval, small to medium, hyperchromatic, with irregular membranes, coarse chromatin showing occasional moulding. Calcification (Figure 9) and wide areas of necrosis were also noted. Histology correlated with the cytodiagnosis.

We found one case consistent with ganglioneuroblastoma. Smears were cellular with cells predominantly dispersed, with few clusters. Predominant cell population was medium sized, round to oval with scant cytoplasm forming cytoplasmic tails. Moderately pleomorphic nuclei were round to oval, occupying almost whole cell, hyperchromatic with irregular membrane and coarse chromatin. Nucleoli were seen in some cells. Occasional large, uni- or bi-nucleated or even multinucleated ganglion cells with eccentric nuclei, prominent nucleoli and abundant cytoplasm were also seen. Cytodiagnosis was confirmed on histopathological examination.

Problem encountered were differentiation between:
1. Adrenocortical adenoma and carcinoma;
2. Adrenocortical carcinoma and metastatic carcinoma;
3. Adrenocortical carcinoma and pheochromocytoma.

**DISCUSSION**

Patients with adrenal masses were aged 6 months to 70 years, a finding similar to Wadih et al. Sex distribution was 50% male and 50% female. Ratio of benign versus malignant lesions was 40% and 60% respectively. Adequacy was 100% in our series, similar to Jhala et al. and Montali et al. However, Rana et al. have reported inadequacy rate of 11.4%. Good radiological localization, multiple passes (2-3), and awareness of cytomorphological features of the different entities of adrenal gland can help to arrive at a diagnosis in majority of cases.

Percutaneous FNA of adrenal mass is an invasive procedure and is known for significant morbidity with reported complications like pneumothorax, septicemia and hemorrhage in 8-13% cases. Complications can be reduced with correct technique. No such complication was reported in any of the ten cases in the present study, a finding similar to Rana et al.
FNA of adrenal gland is performed under three situations: (1) Incidentally detected mass on abdominal imaging, (2) symptomatic mass lesions, and (3) staging workup or follow-up of cancer patient. Whatever may be the situation, the primary aim is always to distinguish between the primary adrenal neoplasm and a metastatic disease. The overall sensitivity of adrenal FNA in detecting the presence of the malignancy has been reported to be up to 85%. In our series, the FNA was 100% specific for malignant lesions. There were no false-positive or false-negative cases for these malignant lesions, similar to Rana et al.

Myelolipoma showed a characteristic mixture of hematopoietic cells and adipocytes, a finding similar to Pinto and Settakorn et al.

Cytomorphological features of pheochromocytoma were consistent with those given by Rupp et al. and Nguyen et al. Nuclear chromatin was fine granular and evenly distributed as discussed by Rupp et al. while Nguyen et al. reported unevenly distributed chromatin with small clumps.

Vacuoles, morphologically consistent with glycogen vacuoles, were noticed in cytoplasm of one of three cases of pheochromocytoma, which is not reported in literature.

Difficulty was encountered in reporting cases of adrenocortical carcinoma. In differentiating adrenocortical carcinoma from adenoma and pheochromocytoma study of Wu et al. was most helpful, still it was a problem area. Cytological features of both adrenocortical adenoma and carcinoma are close to each other. As discussed by Saboorian et al., Wu et al. and Fassina et al., lipidic background, loosely cohesive cells and naked nuclei are features which can be seen in both adenoma and well to moderately differentiated carcinoma. Enlarged, hyperchromatic, multilobed and multinucleated nuclei favour adrenocortical carcinoma, while large cohesive tissue fragments favour adenocortical carcinoma.

Weiss have reported many features to differentiate adrenocortical carcinoma from adenoma. All were architectural features except for high nuclear grade, tumor necrosis and atypical mitosis which are features of carcinoma.

In some cases of adrenocortical carcinoma it is difficult to differentiate it from pheochromocytoma even on histology. On cytology, dispersed cell as well as loose cluster, prominent anisokaryosis and lipid depleted background is present in both as discussed by Nguyen et al. and Wu et al. and Fassina et al. In such cases clinical and endocrinologic data especially of catecholamines are helpful.

In poorly differentiated carcinoma of adrenal it was difficult to differentiate metastasis and primary as reported by Heaston et al. Clinical history helped and favored metastatic lesion. This metastatic poorly differentiated carcinoma did not reveal 3 dimensional cluster with smooth borders as was described by Wu et al.

Cytomorphology of neuroblastoma was consistent with Silverman et al. and Akhtar et al. except for no large cell or ganglion cell was seen. Here radiological features and characteristic rosettes with pink staining fibrillary centre helped them as neuroblastoma. It was later confirmed histologically. This is in agreement to Miller et al.

Features of ganglioneuroblastoma were similar to that reported by Kumar.

**CONCLUSION**

Image guided FNAC of adrenal lesion is inexpensive, safe, simple and quiet reliable method of diagnosis and
management in most of the adrenal lesions. Its use appears to be especially justified in those patients with primary neoplasms of nonadrenal sites, in whom silent adrenal lesions are detected during radiologic surveys for metastatic disease. Differentiation of primary tumours from metastatic depositions remaining the most difficult task. A diagnosis of metastatic malignancy obviates the need for surgical intervention and is essential for staging and therapeutic planning. Primary adrenal cortical masses with benign cytology and under 5 cm in size can be managed conservatively with follow-up scans; those with atypical cytology or greater than 5 cm in size warrant surgical exploration. Adrenalectomy is the treatment of choice for any adrenal tumor associated with endocrine abnormality, irrespective of tumor size and cytology.

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Pulmonary and Anthropometric Parameters in Young Healthy Adults of Haryana Region: A Cross-Sectional Study

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Abstract

Introduction: Swimming is always considered as a very good exercise for maintaining proper body health and also it has a profound effect on the respiratory system functions. Present study was carried out to investigate anthropometric parameters and pulmonary functions of swimmers of the study population and compare the parameters with young healthy controls of same age group not routinely engaged in any specific exercise or sport activities.

Materials and Methods: The present study was conducted on 60 male swimmers who were regularly swimming for at least 4 days in a week for a period of 1 year and above and 30 male controls in the age groups of 18-30 years. The 30 controls were healthy subjects not engaged in any exercises routinely. Several lung function parameters were studied.

Results and Conclusions: Swimming involves both the total body muscular activity and excessive use of respiratory muscles; thereby O₂ utilization for the muscles is higher in swimmers. Regular swimming exercise produces a facilitating effect on the lung function reflected in pulmonary lung function values.

Key words: Anthropometric, Lung, Pulmonary

INTRODUCTION

Swimming is always considered as a very good exercise for maintaining proper body health and also it has profound effect on the respiratory system functions.¹

During swimming, the diaphragm has to develop greater pressures as a consequence of immersion during the respiratory cycle, this causes functional improvement and ability of these muscles. Alterations in elasticity of lung tissue and chest wall or of respiratory muscles lead to further improvement in lung functions of swimmers.²

Unlike other weight training exercises, swimming improves in whole body strength as well as it improves lung functions and cardiovascular fitness. It is an aerobic exercise that helps the lungs to use oxygen efficiently.¹,³,⁵

Number of factors are implicated on which pulmonary functions depends on the balance between recoil capacity of lung and chest elasticity and coordinated neuro-muscular function of maintenance of effort; the respiratory muscles strength plays a vital role in pulmonary functions. Swimming involves both the total body muscular activity and excessive use of respiratory muscles following period of breath holding which is a part of training for competitive swimmers.⁶

In general, pulmonary functions are determined by elastic recoil of the lungs, respiratory muscle strength, compliance of the thoracic cavity, and airway resistance.⁷ It is well-known fact that respiratory functions vary according to the anthropometric parameters including age, height, body weight, etc.⁸ Instead of any other sports person, swimmers were chosen for present study because some previous studies have found that swimming exercise produces maximum effect on the respiratory functions compared to any other exercise activity or sport.
Present study was carried out to investigate anthropometric parameters and pulmonary functions of swimmers of the study population and compare the parameters with young healthy controls of same age group not routinely engaged in any specific exercise or sport activities.

MATERIALS AND METHODS

The present study was conducted on 60 male swimmers who were regularly swimming for at least 4 days in a week for a period of 1 year and above and 30 male controls in the age groups of 18-30 years. The 30 controls were healthy subjects not engaged in any exercises routinely. Persons who had a history of the chronic respiratory disease, hypertension, and any congenital cardio-respiratory disease were excluded from studying their history and thorough clinical examination. Swimmers involved in other athletic activities were excluded. Modern computerized pulmonary function test machine manufactured by Ganshorn Medizin Electronic (Gmbh) Germany was used to take observations of pulmonary functions.

Following parameters were taken:
1. Forced vital capacity (FVC)
2. Tidal volume (TV)
3. Inspiratory vital capacity (IVC)
4. Inspiratory reserve volume (IRV)
5. Expiratory reserve volume (ERV)
6. Forced expiratory volume in first second (FEV1)
7. FEV1/FVC %
8. Maximum expiratory flow rate at 25% of VC (MEF 25%)
9. Maximum expiratory flow rate at 50% of VC (MEF 50%)
10. Maximum expiratory flow rate between 75 and 85% of VC (MEF 75-85%)
11. Peak expiratory flow rate (PEFR)

For measuring body height and weight, stadiometer, and the electronic weighing machine was used respectively. SPSS software was used for statistical analysis by the application of independent sample t-test. P < 0.05 was considered significant.

RESULTS

The measured anthropometric factors (height 172.59 ± 4.78 cm, weight 63.42 ± 7.42 kg, and body surface area 1.75 ± 0.32 m²) were higher and statistically significant in the swimmers than the control groups (164.9 ± 5.32 cm, 57.62 ± 8.07 kg, 1.63 ± 0.24 m²), respectively (P < 0.05, Table 1).

The FVC (4.23 ± 0.52 L), IVC (4.23 ± 0.65 L), IRV (2.14 ± 0.33 L), ERV (1.56 ± 0.44 L), FEV1 (3.97 ± 0.65 L/s), MEF 25% (2.86 ± 0.68 L/s), MEF 50% (5.13 ± 0.8 L/s) were higher and statistically significant in the swimmer than the control groups (FVC: 3.47 ± 0.72 L, IVC: 3.42 ± 0.43 L, IRV: 1.62 ± 0.64 L, ERV: 1.29 ± 0.64 L, FEV1: 3.18 ± 0.63 L/s), (MEF 25%, 2.37 ± 0.07 L/s, and MEF 50%: 4.32 ± 1.32 L/s), respectively (P < 0.05, Table 2).

TV (0.74 ± 0.75 L), MEF 75-85% (7.37 ± 1.25 L/s), and PEFR (7.86 ± 1.33 L/s) were higher but statistically not significant in swimmer as compared to in control group (TV: 0.68 ± 0.12 L, MEF 75-85%: 7.01 ± 1.49 L/s, and PEFR 7.32 ± 1.77 L/s), respectively (P > 0.05, Table 2).

DISCUSSION

Several studies have been conducted to compare the lung functions normal healthy people and persons involved in different sports activities. There is a paucity of studies conducted on pulmonary functions in swimmers. Therefore, this study was conducted to find out the changes in lung functions by swimming.

The study group comprised of 60 swimmers in the age group of 18-30 years who were swimming regularly for at least 4 days in a week for a period of 1 year and above and 30 subjects (medical students) who were non-swimmers were selected as controls. Both groups were of similar age, sex, height, and weight. No significant difference was found between the two study groups with respect to resting pulse rate and blood pressure.

In the present study, we observed an increase in value of VC in swimmer group as compared to control population, which was highly significant. These observations may be

<table>
<thead>
<tr>
<th>Table 1: Anthropometric parameters in study and control group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthropometric factors</td>
</tr>
<tr>
<td>------------------------</td>
</tr>
<tr>
<td>Study group (n=60)</td>
</tr>
<tr>
<td>Age (years)</td>
</tr>
<tr>
<td>Height (cm)</td>
</tr>
<tr>
<td>BSA* (m²)</td>
</tr>
<tr>
<td>Weight (kg)</td>
</tr>
<tr>
<td>BMI** (wt/ht²)</td>
</tr>
<tr>
<td>Pulse rate (beats/min)</td>
</tr>
<tr>
<td>BP*** systolic (mmHg)</td>
</tr>
<tr>
<td>BP diastolic (mmHg)</td>
</tr>
</tbody>
</table>

BSA: Body surface area, BMI: Body mass index, BP: Blood pressure, SD: Standard deviation
Table 2: Comparison of lung function parameters among study and control group

<table>
<thead>
<tr>
<th>Lung function parameters</th>
<th>Mean±SD Study group (n=30)</th>
<th>Mean±SD Control group (n=30)</th>
<th>P value</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>IVC (L)</td>
<td>4.23±0.65</td>
<td>3.42±0.43</td>
<td>&lt;0.05</td>
<td>Significant</td>
</tr>
<tr>
<td>IRV (L)</td>
<td>2.14±0.33</td>
<td>1.62±0.64</td>
<td>&lt;0.05</td>
<td>Significant</td>
</tr>
<tr>
<td>TV (L)</td>
<td>1.56±0.44</td>
<td>1.29±0.64</td>
<td>&lt;0.05</td>
<td>Non-significant</td>
</tr>
<tr>
<td>FVC (L)</td>
<td>4.23±0.52</td>
<td>3.47±0.72</td>
<td>&lt;0.05</td>
<td>Significant</td>
</tr>
<tr>
<td>FEV1 (L)</td>
<td>3.97±0.65</td>
<td>3.18±0.63</td>
<td>&lt;0.05</td>
<td>Significant</td>
</tr>
<tr>
<td>FEV1/FVC%</td>
<td>89.45±6.62</td>
<td>94.67±4.93</td>
<td>&gt;0.05</td>
<td>Non-significant</td>
</tr>
<tr>
<td>MEF 25%</td>
<td>2.66±0.68</td>
<td>2.37±0.07</td>
<td>&lt;0.05</td>
<td>Significant</td>
</tr>
<tr>
<td>MEF 50%</td>
<td>5.13±0.8</td>
<td>4.32±1.32</td>
<td>&lt;0.05</td>
<td>Significant</td>
</tr>
<tr>
<td>MEF 75-85%</td>
<td>7.37±1.25</td>
<td>7.01±1.49</td>
<td>&gt;0.05</td>
<td>Non-significant</td>
</tr>
<tr>
<td>PEFR</td>
<td>7.86±1.33</td>
<td>7.32±1.77</td>
<td>&gt;0.05</td>
<td>Non-significant</td>
</tr>
</tbody>
</table>

IVC: Inspiratory vital capacity, IRV: Inspiratory reserve volume, ERV: Expiratory reserve volume, TV: Tidal volume, PVC: Forced vital capacity, FEV1: Forced expiratory volume in first second, MEF 25%: Maximum expiratory flow rate at 25% of VC, MEF 50%: Maximum expiratory flow rate at 50% of VC, MEF 75-85%: Maximum expiratory flow rate between 75 and 85% of VC, PEER: Peak expiratory flow rate, SD: Standard deviation.

due to changes in the inspiratory muscles strength induced by swimming, water pressure against the chest wall and elevated airway resistance could comprise conditioning stimulus for elevating inspiratory muscle strength.9

Bjurström and Schoene stated that the increase in VC was due to increased inspiratory muscle strength since swimmers experience negative pressure breathing during immersion in water.10

The results presented in Table 2 clearly indicates that swimmers had higher values of lung functions as compared to the control population, thereby these observations confirms that regular swimming produces facilitating effect on the respiratory activities.11,12

An efficient oxygen transport system from the atmosphere to the active tissues is required to fulfill large metabolic demand during strenuous exercise. From observations of the present study, we can conclude that physical training has a facilitative effect on respiratory function and physically active persons like swimmers have higher lung function values in comparison to sedentary controls.

CONCLUSION

Swimming involves both the total body muscular activity and excessive use of respiratory muscles; thereby O\(_2\) utilization for the muscles is higher in swimmers. Regular swimming exercise produces a facilitating effect on the lung function reflected in pulmonary lung function values.

REFERENCES

Ocular Morbidity in School Children in Mysore District: An Observational Study

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Abstract

Background: Refractive errors, strabismus, vitamin A deficiency, and infections of the eye are the various disorders, which affect school children. Most children may not be aware of the defective vision. Uncorrected refractive errors can lead to amblyopia and are the primary cause of visual impairment. Early detection of these problems and prompt treatment can prevent blindness in future.

Aim of the Study: The aim was to study of ocular morbidity in school children in Mysore district.

Method: This was an observational study of school children in 295 schools in Mysore district over a period of 5 years from 2010 to 2014. Screening was done for eye disorders by visual acuity testing, anterior segment torch light examination, and fundus examination with undilated the pupil. A detailed examination at the tertiary care hospital was done for all children who were identified with ocular disorders.

Results: A total of 20039 children were examined. Among this ocular morbidity was seen in 1044 (5.4%) children. Among the ocular morbidity, uncorrected refractive errors were the most common condition is seen in 518 (49.6%) children.

Conclusion: Ocular disorders among school going children can be easily identified by regular eye screening programs and if treated promptly reduces the visual disabilities. The present study shows uncorrected refractive errors as the main cause of visual disability in school children. The eye health awareness among school children and school teachers help in reducing ocular morbidity.

Key words: Eye screening, Ocular disorders, Refractive errors, Rural area, School children

INTRODUCTION

School eye checkup is an important aspect of any community health program. The school age is a formative period, transforming the child into a promising adult. Visual impairment in childhood is a worldwide problem that has a significant socioeconomic impact.¹ Childhood blindness is a priority because of the number of years of blindness that ensues. For planning and evaluating preventive and curative services for children, data on the prevalence and causes of blindness and severe visual impairment in children are needed. This includes planning special education and low vision services.² The causes and magnitude of refractive errors differ in various parts of the country.³ Refractive eye services are to be modified according to the situation in developing countries considering the fact that 30% of India's blind lose their sight before the age of 20 years, and 80% of the blindness is avoidable. The earliest signs of refractive errors are eye strain with or without redness by evening, with watering and headache. These complaints of the child go unnoticed to the parents due to lack of awareness among them. Early detection and treatment of ocular problems prevent future blindness. Vision screening in school children are useful in detecting correctable causes of decreased vision, especially refractive errors.⁴ The study was conducted with the primary objective of assessing the prevalence of ocular problems among school going children.

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MATERIALS AND METHODS

A team of an ophthalmologist, optometrists, an ophthalmic assistant, and a nurse from the mobile unit of KR Hospital visited the schools. All the schools were pre-informed and the children willing to have an eye examination were pre-registered. Camps were conducted in all the schools under NPCB program. Those not willing were excluded from the study. Structured questionnaire was used to obtain general data regarding the name, age, sex, and address. Local language was used to obtain information from the children and entered the English language in the questionnaire. The screening of the students was done for eye disorders by visual acuity testing, anterior segment torch light examination, and fundus examination with the undilated pupil. Visual acuity was assessed using Snellen’s chart; colorblindness was checked by using Ishihara’s chart. Diagnosis of Vitamin A deficiency was done, if there was a history of night blindness or on examination there were signs of conjunctival xerosis, Bitot’s spots, corneal xerosis or keratomalacia. Children present at the time of the visit were examined.

RESULTS

Over a period of 5 years, a total of 295 schools were visited. Among 23830 of total students, only 20039 children were examined for ocular morbidity. Males (44.2%) and females (55.7%) had almost equal representation (Table 1). Overall prevalence of ocular morbidity among the school children was 5.4% (Table 2). Among these majority (49.6%) had refractive errors (49.6%), followed by others (49.9%) which included squint, blepharitis, external hordeolum, red eye, followed by corneal blindness (0.19%), cataract (0.19%), and vitamin A deficiency (0.095%) (Table 3).

DISCUSSION

Poor vision in childhood affects performance in school or at work and also the future of a child. Planning of the youth’s career is very much dependent on visual acuity, especially in jobs for the navy, military, railways, and aviation.

Of the total of 20039 study subjects, 1044 (5.4%) had ocular morbidity. Another study reported a prevalence of 26.5% among school children in New Delhi. However, a school-based study in rural Delhi with the similar age structure reported that more than 40% of the children had one or more eye diseases. Survey of Blindness India estimated a prevalence of ocular morbidity 27.99 per cent for all India. In spite of the economic development and technical advancement in health, the prevalence of ocular morbidity had remained more or less the same.

Refractive errors are the most common reasons for the outpatient visit to an ophthalmic surgeon or an ophthalmic assistant. The present study showed a prevalence of refractive errors of 49.6%. Previous reports have shown an overall incidence between 21% and 25% of patients attending eye outpatient departments in India. Among children of 12-17 years in Ahmedabad city similar prevalence of refractive errors has been observed. From South India, high (32%) prevalence rate of refractive errors among school going children of age 3-18 years similar to the present study was observed. However, low prevalence of refractive errors of 2% has been reported from Eastern India by Datta et al. and 5.4% from Delhi by Rajesh et al among primary school children, which could not be explained. As compared to the present study lower prevalence of refractive errors (2.7-5.8%) has been reported among children of age 5-15 years from Africa.

Table 1: No. of school children screened for ocular morbidity

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of schools</th>
<th>Number of students in school</th>
<th>Number of students examined</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010-11</td>
<td>77</td>
<td>2936</td>
<td>2604</td>
</tr>
<tr>
<td>2011-12</td>
<td>55</td>
<td>2315</td>
<td>2168</td>
</tr>
<tr>
<td>2012-13</td>
<td>55</td>
<td>1990</td>
<td>1830</td>
</tr>
<tr>
<td>2013-14</td>
<td>55</td>
<td>2121</td>
<td>1888</td>
</tr>
<tr>
<td>2014-15</td>
<td>53</td>
<td>1773</td>
<td>1668</td>
</tr>
<tr>
<td>Total (%)</td>
<td>295</td>
<td>11135</td>
<td>9860</td>
</tr>
</tbody>
</table>

Table 2: Prevalence of refractive errors and other ocular morbidity in school children

<table>
<thead>
<tr>
<th>Year</th>
<th>Refractive error detected and corrected</th>
<th>Others</th>
<th>Ocular morbidity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>F</td>
<td>Total</td>
</tr>
<tr>
<td>2010-11</td>
<td>114</td>
<td>44</td>
<td>158</td>
</tr>
<tr>
<td>2011-12</td>
<td>44</td>
<td>55</td>
<td>100</td>
</tr>
<tr>
<td>2012-13</td>
<td>42</td>
<td>47</td>
<td>89</td>
</tr>
<tr>
<td>2013-14</td>
<td>22</td>
<td>42</td>
<td>64</td>
</tr>
<tr>
<td>2014-15</td>
<td>7</td>
<td>10</td>
<td>17</td>
</tr>
<tr>
<td>Total (%)</td>
<td>(46.8)</td>
<td>(54.11)</td>
<td>(100)</td>
</tr>
</tbody>
</table>

Table 3: Ocular morbidity and sex distribution among school children.

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Male</th>
<th>Female</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refractive error</td>
<td>229</td>
<td>289</td>
<td>518 (49.6)</td>
</tr>
<tr>
<td>Vitamin A deficiency</td>
<td>0</td>
<td>1</td>
<td>1 (0.095)</td>
</tr>
<tr>
<td>Corneal blindness</td>
<td>1</td>
<td>1</td>
<td>2 (0.19)</td>
</tr>
<tr>
<td>Cataract</td>
<td>1</td>
<td>1</td>
<td>2 (0.19)</td>
</tr>
<tr>
<td>Others</td>
<td>247</td>
<td>274</td>
<td>521 (49.9)</td>
</tr>
<tr>
<td>Total</td>
<td>479</td>
<td>565</td>
<td>1044 (100)</td>
</tr>
</tbody>
</table>
The different diagnostic criteria used by various authors, racial or ethnic variations, different lifestyles or living conditions or medical care may explain the differences among the studies.

The present study showed a high prevalence of infective diseases such as blepharitis, conjunctivitis, and external hordeolum. Reports have shown higher (3-17.5%) prevalence of conjunctivitis in other parts of India.10 According to a study by Robinson et al., 1.5% prevalence of conjunctivitis was found among children of 1-17 years in North America. These can be explained by the difference in socioeconomic status, personal hygiene of children, and seasonal variations.

Reports from Rajasthan and Kolkata show the prevalence of vitamin A deficiency up to an extent of 5.4-9% in 4-16 years as compared to 0.095% in the present study. Lower socioeconomic status associated with an unhealthy dietary pattern of children may explain this. According to study by Wedner et al. in Tanzania reported the prevalence of night blindness as 5.3% and Bitot's spots as 0.6% among school children of age 7-19 years.11

Minimal difference in the prevalence of ocular diseases among males and females in the present study is similar to results of the study by Sehgal et al., in Delhi (males 45.88% and females 54.11%).12 However, Khurana et al., reported higher prevalence in females (73.5%) as compared to males (49.4%) in Haryana.13 Prevalence of infectious diseases such as trachoma, conjunctivitis, and blepharitis was high among females probably due to increased use of the common ocular cosmetic material. Prevalence of vitamin A deficiency was found to be more among males as compared to females contrary to the results of other studies.

CONCLUSION

Ocular disorders among school going children can be easily identified by regular eye screening programs and if treated promptly reduces the visual disabilities. More awareness programs are required for children and school teachers regarding eye health.

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3. Danish Assistance to the National Programme for Control of Blindness. New Delhi, India: Vision Screening in School Children. Training Module.
A Study of Clinical Profile and Visual Outcome in Ocular Trauma

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Abstract

Introduction: Ocular trauma is a recognized leading cause of visual disability. The effects of injuries on the eye are devastating. Early intervention, health education and protective measures at work place are important aspects of reducing the morbidity.

Aims: To study the clinical profile and visual outcome in ocular trauma.

Materials and Methods: Retrospective study of patients with ocular trauma admitted to the Department of Ophthalmology, K.R. Hospital between November 2013 and November 2014. A total of 60 cases were taken up for the study.

Results: 37 (62%) patients were in the age group between 10 and 30 years. Males outnumbered females in this study. A total of 48 were males and the male to female ratio being 3:1. Majority of the injuries was found among the industrial workers (33%). The next commonly encountered injuries were in students (25%). Injuries to the anterior segment alone were seen in 50%. Closed globe injuries were found to be more common accounting for 40 patients (66.6%) than open globe injuries, which accounted for 16 patients (26.6%).

Conclusion: Young males are particularly vulnerable to ocular trauma. Industries remain the most common place for ocular injuries. Early intervention in patients with ocular trauma gives satisfactory visual results. This study emphasizes the need for health education regarding ocular trauma and protective measures at work place.

Key words: Closed globe injuries, Ocular trauma, Open globe injuries, Visual acuity

INTRODUCTION

The recognized leading cause of unilateral blindness is ocular trauma. It is an important cause of visual loss across the globe.¹

The eyes by nature are protected anatomically by the bony orbits and also the elastic and fatty tissue within the orbital cavity. Physiologically, the eyes are protected by the blink reflex and menace reflex on the approach of objects. In addition, copious lacrimation helps in dilution of and flushing out of the irritant material.² Compared with any other organ in the body, the effect of injuries is far more devastating in the eye considering the delicate structures it is made of. Unusual social and economic loss results following ocular injuries.³

Since 90% of all impressions a person receives are carried out by eye, its injury leads to difficulty at work and daily life and also causes a serious health burden.

Though ocular trauma has been described as a neglected issue, it was highlighted as an important cause of visual morbidity recently. A loss of more than 1 day/year, from about 55 million eye injuries across the globe has been reported by the World Health Organisation.⁴ The accumulation of defined epidemiological data and varied approaches to ocular trauma analysis would be helpful to plan health and clinical strategies for prevention and management of the injuries.

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Month of Acceptance : 04-2015
Month of Publishing : 05-2015

DOI: 10.17354/ijss/2015/213
This study was conducted in our department to analyse the clinical profile and visual outcome in ocular trauma cases. This study was conducted to check the clinical profile and visual outcome in ocular trauma.

MATERIALS AND METHODS

All patients with ocular trauma admitted to the Department of Ophthalmology, K.R Hospital, Mysore.

Methods of Collection of Data

- Sample size: 60 patients
- Sampling method: Convenience sampling method.

Inclusion Criteria

Patients with ocular injuries who were admitted to the Department of Ophthalmology, K.R Hospital, Mysore, during the period between November 2013 and November 2014 (1 year).

Exclusion Criteria

Ocular trauma cases:

1. Who had intra-ocular surgeries in the recent past
2. Who had pre-existing ocular pathologies causing severe visual impairment.

Method of Study

A piloted proforma was used to collect the data. An informed consent was obtained in every case. A comprehensive ocular examination was done using slit-lamp. The visual acuity was recorded using Snellen’s chart and the best corrected visual acuity (BCVA) was obtained.

Fundoscopic examination was done with the direct ophthalmoscope and indirect ophthalmoscope examination was done with slit-lamp bio-microscope using 78D lenses. In selected cases, the intra ocular pressure was recorded using applanation tonometer. B-scan ultrasonography was done wherever necessary. Patients were managed both medically and/or surgically. Patients with significant posterior segment injuries were referred to vitreoretinal surgeon.

Some of the salient terms included in this are:

Eye wall: Cornea and sclera

Closed globe injury: No full thickness wound of the eye wall
- Lamellar laceration: Partial thickness wound of the eye wall
- Contusions: Injuries occurring as a result of direct energy delivery or due to changes in the shape of the globe without full thickness wound of the eye wall.

Open globe injury: Full thickness wound of the eye wall
- Laceration: Full thickness wound of the eye wall caused by a sharp object
- Rupture: Full thickness wound of the eye wall caused by blunt object
- Penetrating: Entrance wound only
- Perforating: Both entrance and exit wound present.

Adnexal injuries: Eyelid and conjunctival injuries.

RESULTS

“A study of clinical profile and visual outcome in ocular trauma” was conducted over a period of 12 months from November 2013 to November 2014 in the Department of

<table>
<thead>
<tr>
<th>Table 1: Age distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in years</td>
</tr>
<tr>
<td>&lt;10</td>
</tr>
<tr>
<td>11-20</td>
</tr>
<tr>
<td>21-30</td>
</tr>
<tr>
<td>31-40</td>
</tr>
<tr>
<td>41-60</td>
</tr>
<tr>
<td>51-60</td>
</tr>
<tr>
<td>&gt;60</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2: Sex distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
</tr>
<tr>
<td>Males</td>
</tr>
<tr>
<td>Females</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 3: Distribution by occupation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupation</td>
</tr>
<tr>
<td>Student</td>
</tr>
<tr>
<td>Agriculturist</td>
</tr>
<tr>
<td>Industrial worker</td>
</tr>
<tr>
<td>Laborer</td>
</tr>
<tr>
<td>House wife</td>
</tr>
<tr>
<td>Miscellaneous</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>
Ophthalmology, K.R Hospital, Mysore. A total of 60 cases were included in the study after meeting the inclusion and exclusion criteria. The results were analyzed as below.

Of the 60 cases studied, 23 (38.33%) were in the age group of 11-20 years while 14 (23.33%) were in the 21-30 age group. Thus 37 (62%) of the patients were in the age group between 10 and 30 years. Only 2 patients (3.33%) were more than 60 years of age (Table 1).

Males outnumbered females in this study. A total of 48 were males and the male to female ratio being 3:1 (Table 2).

Majority of the injuries were found among the industrial workers (33%). The next commonly encountered injuries were students (25%). Agriculturists and other laborers were seen to have almost equal number of injuries (16.66% and 13.33% respectively) (Table 3).

Injuries to the anterior segment alone were seen in 30 patients (50%). 12 patients (20%) were found to have injuries of the posterior segment only. 14 patients (23.3%) were found to have involvement of both anterior and posterior segment. 4 patients (6.66%) had ocular adnexal injuries (Table 4).

Closed globe injuries were found to be more common accounting for 40 patients (66.6%) than open globe injuries which accounted for 16 patients (26.6%) (Table 5).

The BCVA at follow-up was 6/18 in 40% of patients followed by 12% of patients who had 6/18-6/60 and 8% of patients had BCVA <6/60 (Table 6).

### DISCUSSION

60 eyes were retrospectively analyzed. The common age group affected was younger age group i.e., <30 years, which constituted 62%. This was similar to the study done by Singh et al. where they found nearly 67% of patients under the age of 25 years. There were only 5 cases (8.33%) in the age group of more than 50 years. This is in total agreement to the study of Dhasmana et al. where they found no bimodal peak of age incidence.

The male:female ratio in the present study was 3:1 and according to the study of Dhasmana et al. it was 1.93:1. This fairly matches with world-wide ratio of 4:1. However, in the study by Titiyal and Prakash it was as high as 10:1.

Majority of the injuries were found among the industrial workers (33%). This was similar to the study done by Desai et al. However in the study of Singh et al. injuries among students were found to be the most common and only 11% of injuries were found in industrial workers.

In the present study closed globe injuries were seen in 40 patients (66.6%) while open globe injuries were seen in only 16 patients (26.6%) with a ratio of 2.5:1. This is in total concordance with the study of Karaman et al. where ratio was similar. However in the study by Oum et al. the incidence of closed globe injuries was nearly six times that of the open globe injuries. However, in the study of Titiyal and Prakash open globe injuries were more common than closed globe.

In our study 25% had very poor vision at the time of presentation. With treatment the number decreased to 8 (13.3%). However, in the study by Titiyal and Prakash the number of patients with severe visual handicap at follow-up was found to be higher at 30% and according to Judo study it was 21%. In the present study 40 subjects (66.6%) had follow-up BCVA better than 6/18. However, according to Singh et al. study only 20.2% of the patients had visual acuity better than or equal to 6/12 at follow-up.

### CONCLUSION

Young males are particularly vulnerable to ocular trauma. Industries remain the most common place for ocular

### Table 4: Distribution by ocular structure (segment) involved

<table>
<thead>
<tr>
<th>Structures</th>
<th>Number of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior segment</td>
<td>30 (50)</td>
</tr>
<tr>
<td>Posterior segment</td>
<td>12 (20)</td>
</tr>
<tr>
<td>Both anterior and posterior segment</td>
<td>14 (23.33)</td>
</tr>
<tr>
<td>Adnexal injury</td>
<td>04 (6.66)</td>
</tr>
<tr>
<td>Total</td>
<td>60 (100)</td>
</tr>
</tbody>
</table>

### Table 5: Type of injury

<table>
<thead>
<tr>
<th>Type of injury</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed globe injury</td>
<td>40 (66.6)</td>
</tr>
<tr>
<td>Lamellar laceration</td>
<td>5 (8.33)</td>
</tr>
<tr>
<td>Contusion</td>
<td>35 (58.33)</td>
</tr>
<tr>
<td>Open globe injury</td>
<td>16 (26.6)</td>
</tr>
<tr>
<td>Penetrating</td>
<td>12 (20)</td>
</tr>
<tr>
<td>Perforating</td>
<td>1 (1.66)</td>
</tr>
<tr>
<td>IOFB</td>
<td>1 (1.66)</td>
</tr>
<tr>
<td>Rupture</td>
<td>2 (3.33)</td>
</tr>
<tr>
<td>Adnexal</td>
<td>4 (6.66)</td>
</tr>
<tr>
<td>Total</td>
<td>60 (100)</td>
</tr>
</tbody>
</table>

IOFB: Intraocular foreign body

### Table 6: BCVA at presentation and at follow-up

<table>
<thead>
<tr>
<th>Visual acuity</th>
<th>At presentation (%)</th>
<th>At follow-up (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/6-6/18</td>
<td>20 (33.33)</td>
<td>40 (66.6)</td>
</tr>
<tr>
<td>&lt;6/18-6/60</td>
<td>25 (41.66)</td>
<td>12 (20)</td>
</tr>
<tr>
<td>&lt;6/60</td>
<td>15 (25)</td>
<td>8 (13.33)</td>
</tr>
<tr>
<td>Total</td>
<td>60 (100)</td>
<td>60 (100)</td>
</tr>
</tbody>
</table>

BCVA: Best corrected visual acuity
injuries. Early intervention in patients with ocular trauma gives satisfactory visual results. This study emphasizes the need for health education regarding ocular trauma and protective measures at work place.

REFERENCES


Source of Support: Nil, Conflict of Interest: None declared.
Demographic Profile and Visual Results of Cataract Surgery During Eye Camp Surgeries in Mysore District

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Abstract

Background: Avoidable blindness due to cataract in rural India remains a major health concern. Conducting quality cataract surgery in eye camps gives a good visual outcome. Cataract has been documented as the most significant cause of bilateral blindness 50-80% of bilateral blindness in India is reported to be due to cataract.

Aim: The aim was to evaluate the demographic profile and visual results of cataract surgery performed in eye camps by mobile ophthalmic unit.

Materials and Methods: A total of 2345 patients diagnosed as having significant cataract were selected from 163 eye camps. Study excluded subjects with ocular co-morbidities which may affect the visual outcome. 1486 patients underwent small incision cataract surgery (SICS) by experienced ophthalmic surgeons. The regular post-operative examination was done at day 1, day 7, and 1 month. Post-operative vision was recorded at 1 month.

Results: Of 2345 cases of senile cataracts, there were 633 (42.60%) males and 853 (57.40%) females with the mean age being 63.5 years. The maximum number of patients had a pre-operative visual acuity (VA) of ≤6/60 (74.3%). 1486 patients underwent SICS out of which posterior chamber intraocular lens (PCIOL) was implanted in 1437 (96.7%) of the patients and 39 (2.62%) of them were rendered aphakic. 1119 came for follow-up after 1 month whose vision was recorded. 723 (64.61%) patients had a post-operative best-corrected VA of 6/6-6/9, 296 (26.5%) of them had 6/12-6/18, 67 (5.6%) of them had 6/24-6/60 and 33 (2.3%) of them had a vision of ≤6/60.

Conclusion: Better correction of aphakia would improve the immediate visual results, which is important as a significant number of patients do not turn up for follow-up. The use of PCIOLs in the eye camp by experienced ophthalmologists appeared to give satisfactory results.

Key words: Blindness, Cataract, Visual

INTRODUCTION

Worldwide estimation shows that 285 million people are visually impaired, of which 39 million visually impaired people with a visual acuity (VA) <3/60 in the better eye. At least 90% of these people live in developing countries, and more than half are visually impaired as a result of the cataract. 82% of people living with visual disability are aged 50 and above,¹ globally, uncorrected refractive errors are the main cause of moderate and severe visual impairment; cataracts remain the leading cause of visual impairment in middle and low-income developing countries.² Avoidable blindness due to cataract in rural India remains a major health concern. Cataract has been documented as the most significant cause of bilateral blindness,³ 50-80% of bilateral blindness in India is reported to be due to cataract.⁴ Recent data from World Health Organisation show that there is a 25% decrease in the prevalence of blindness in

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India. Cataract blindness is particularly important in India where 62.6% of blindness and severe visual impairment is due to cataract. There are various strategies for increasing the number of cataract surgeries in developing countries. Surgical eye screening camps in rural areas and inexpensive surgery at a base hospital close to where the majority of people live give a good visual outcome. The results of surgery in eye camps are often not evaluated, and the role of intraocular lens (IOLs) implantation under camp conditions has been questioned. Cataract surgery aims to rehabilitate blind or visually impaired persons by restoring their eyesight so that their quality of life and ability to function are returned to normal or as near normal as possible. The outcome of cataract surgery for an individual or a defined population is therefore as important as measuring the quantity of surgical operations performed. The outcome can be measured simply as the VA in the operated eye or in the patient, and also in terms of ability to function, quality of life, and economic rehabilitation. The last three of these parameters can only be assessed through time-consuming studies and fall outside the scope of this study. This study, therefore, aims to evaluate the results of cataract surgery performed in a rural Indian eye camps.

**MATERIALS AND METHODS**

The study was carried out in the Department Of Ophthalmology, Mysore Medical College and Research Institute, Mysore over a period of 5 years from January 2010 to December 2014 in eye camps conducted by our mobile unit. A total of 2345 patients diagnosed as having significant cataract were selected from 163 eye camps. The study included patients aged above or equal to 40 years, who agreed to participate in the camp and gave their informed consent. All patients were screened at screening camps and transported to base hospital. All cases were subjected to thorough general, systemic and detailed ocular examination pre-operatively. The study excluded the patients who had been operated for complicated cataract, traumatic cataract, uveitic cataract, combined procedures, operated with secondary IOL implantation and other ocular co-morbidities which may affect the visual outcome. 1486 patients underwent small incision cataract surgery (SICS) by an experienced ophthalmic surgeon. Regular post-operative examination was done at day 1, day 7, and 1 month. Post-operative vision was recorded at 1 month.

**RESULTS**

A total of 163 camps were conducted over a period of 5 years. 2345 cases of senile cataracts were diagnosed. A total of 1486 patients with senile cataract, who were operated, were included in the study. There were 633 (42.6%) males and 853 (57.4%) females (Table 1). The age range was 40-87 years with the mean age being 63.5 years. The maximum number of patients was in the age group of 60-69 years (46.5%) (Table 2). The maximum number of patients had a pre-operative VA of ≤6/60 (74.3%). 1486 patients underwent SICS out of which posterior chamber IOLs (PCIOLs) was implanted in 1437 (96.70%) of the patients, and 39 (2.62%) of them were rendered aphakic (Table 3). Of the 1486 patients who were operated, only 1119 (78.3%) came for follow-up after 1 month whose vision was recorded. 723 (64.61%) patients had a post-operative best-corrected VA of 6/6-6/9, 296 (26.5%) of them had 6/12-6/18, 67 (5.6%) of them had 6/24-6/60 and 33 (2.3%) of them had a vision of ≤6/60 (Table 4).

**DISCUSSION**

Surgical technology for cataract surgery is growing rapidly and in developing countries the manual SICS (MSICS) is recommended as a procedure of choice, as it gives similar outcomes as phacoemulsification with low costs, less complications, and is less time-consuming. Accessibility and affordability are the major significant barriers for the uptake of surgical service in the developing countries. To overcome these barriers for the elimination of avoidable blindness due to cataract, outreach activities like surgical camps can be the most effective alternative where the latest MSICS is applicable. In this study, 74.3% (831) presented with VA <6/60 and 78.31% (1119) turned up for follow-up. Poor VA at presentation and missing the follow-up visit is due to the rural background of these patients. This was also due to the higher proportion of poor VA patients that were operated at camps accepting waiting time since they were unable to afford hospital based services. In the remote areas more patients with poor VA benefited from camps and achieved good sight restoration. Similar results were obtained in the study conducted by Kapoor et al.

**CONCLUSION**

This evaluation suggests that it is possible to obtain acceptable results from cataract extraction with experienced

<table>
<thead>
<tr>
<th>Year</th>
<th>Males</th>
<th>Females</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010-11</td>
<td>128</td>
<td>142</td>
<td>270</td>
</tr>
<tr>
<td>2011-12</td>
<td>94</td>
<td>154</td>
<td>248</td>
</tr>
<tr>
<td>2012-13</td>
<td>197</td>
<td>228</td>
<td>425</td>
</tr>
<tr>
<td>2013-14</td>
<td>156</td>
<td>252</td>
<td>408</td>
</tr>
<tr>
<td>2014-15</td>
<td>58</td>
<td>77</td>
<td>135</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>623 (42.60%)</strong></td>
<td><strong>853 (57.40%)</strong></td>
<td><strong>1486</strong></td>
</tr>
</tbody>
</table>
ophthalmologists in well-conducted Indian eye camps. Better correction of aphakia would improve the immediate visual results, which is important as a significant number of patients do not turn up for follow-up. The use of PCIOLs in the eye camp by experienced ophthalmologists appeared to give satisfactory results.

REFERENCES


How to cite this article: Satish K, Prakash DN, Chalekar R, Srilatha HS, UI Hak VE. Demographic Profile and Visual Results of Cataract Surgery during Eye Camp Surgeries in Mysore District. Int J Sci Stud 2015;3(2):66-68.

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Table 2: Age distribution

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>2010-11</th>
<th>2011-12</th>
<th>2012-13</th>
<th>2013-14</th>
<th>2014-15</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>40-49</td>
<td>28 (10.3)</td>
<td>18 (7.3)</td>
<td>48 (11.2)</td>
<td>41 (10.0)</td>
<td>16 (11.8)</td>
<td>151 (10.1)</td>
</tr>
<tr>
<td>50-59</td>
<td>18 (6.7)</td>
<td>36 (14.6)</td>
<td>52 (12.3)</td>
<td>52 (12.7)</td>
<td>17 (12.5)</td>
<td>175 (11.7)</td>
</tr>
<tr>
<td>60-69</td>
<td>121 (44.8)</td>
<td>113 (45.5)</td>
<td>195 (45.8)</td>
<td>205 (50.2)</td>
<td>58 (42.9)</td>
<td>692 (46.5)</td>
</tr>
<tr>
<td>≥70</td>
<td>103 (38.2)</td>
<td>81 (32.6)</td>
<td>130 (30.6)</td>
<td>110 (26.9)</td>
<td>44 (32.5)</td>
<td>468 (31.4)</td>
</tr>
<tr>
<td>Total</td>
<td>270 (100)</td>
<td>2480 (100)</td>
<td>425 (100)</td>
<td>408 (100)</td>
<td>135 (100)</td>
<td>1486 (100)</td>
</tr>
</tbody>
</table>

Table 3: Visual results of cataract surgery in base hospital eye camps

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of camps conducted</th>
<th>Number of cases diagnosed</th>
<th>Number of operated cases</th>
<th>IOL implanted</th>
<th>Rendered aphakic</th>
<th>Number of cases came for follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010-11</td>
<td>32</td>
<td>471</td>
<td>270</td>
<td>257</td>
<td>13</td>
<td>186</td>
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<tr>
<td>2011-12</td>
<td>27</td>
<td>415</td>
<td>248</td>
<td>240</td>
<td>8</td>
<td>212</td>
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<tr>
<td>2012-13</td>
<td>44</td>
<td>562</td>
<td>425</td>
<td>405</td>
<td>20</td>
<td>349</td>
</tr>
<tr>
<td>2013-14</td>
<td>45</td>
<td>665</td>
<td>408</td>
<td>400</td>
<td>8</td>
<td>268</td>
</tr>
<tr>
<td>2014-15</td>
<td>15</td>
<td>232</td>
<td>135</td>
<td>135</td>
<td>0</td>
<td>104</td>
</tr>
<tr>
<td>Total</td>
<td>163</td>
<td>2345</td>
<td>1486</td>
<td>1437 (96.70%)</td>
<td>39 (2.62%)</td>
<td>1119</td>
</tr>
</tbody>
</table>

IOL: Intraocular lens

Table 4: Pre and post-operative vision

<table>
<thead>
<tr>
<th>Vision</th>
<th>Pre-operative (%)</th>
<th>Post-operative (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/6-6/9</td>
<td>0</td>
<td>723 (64.61)</td>
</tr>
<tr>
<td>6/12-6/18</td>
<td>29 (2.6)</td>
<td>296 (26.5)</td>
</tr>
<tr>
<td>6/24-6/60</td>
<td>259 (23.15)</td>
<td>67 (5.6)</td>
</tr>
<tr>
<td>≤6/60</td>
<td>831 (74.3)</td>
<td>33 (2.3)</td>
</tr>
<tr>
<td>Total</td>
<td>1119</td>
<td>1119</td>
</tr>
</tbody>
</table>
Association of *Helicobacter pylori* Infection in Dental Plaque and Gastric Infections

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**Abstract**

**Introduction:** The oral cavity has been suggested as a reservoir for *Helicobacter pylori*. Dental plaque is actually a host associated biofilm, which provides a protective environment for colonizing organisms. The failure of triple or quadruple therapy to clear *H. pylori* infection from the dental plaque, despite its clearance from the gastric mucosa raised the possibility that dental plaque is the potential source of re-infection of the gastric mucosa.

**Materials and Methods:** A case-control study was conducted from February 2015 to April 2015 in Institute of Dental Sciences, Bareilly, Uttar Pradesh. All the 248 patients presenting with dyspeptic symptoms were included in our study. Those undergoing endoscopy and were found either having a histopathological examination or rapid urease test or both positive, were categorized as cases, and those who were having both negative were categorized as the controls. All the data were entered into SPSS package (version 17). Chi-square test and odd’s ratio were used to find the association between the dental plaque and *H. pylori* gastric infection. The statistical significance for the tests was set at <0.05.

**Results:** In our present study, greater positivity of *H. pylori* was observed in the stomach samples of males as compared to females. A positive association was found between the gastric infection and the presence of *H. pylori* in the dental plaque and it was found to be statistically significant.

**Conclusion:** *H. pylori* is a major etiologic factor in the development of gastritis and peptic ulcer diseases. There is sufficient evidence that the presence of *H. pylori* in the subgingival oral biofilm in the form of dental plaque may act as a reservoir for harboring *H. pylori*, leading to gastric re-infection.

**Key words:** Dental plaque, Gastric infections, *Helicobacter pylori*

**INTRODUCTION**

*Helicobacter pylori* is one of the most common bacterial infections in humans.¹ *H. pylori* is a gram-negative, curved or spiral, micro-aerophilic and urease producing an organism. It has been closely linked to chronic gastritis, peptic ulcer, gastric cancer, and Mucosa Associated Lymphoid Tissue lymphoma.²,³ It has been suggested that the micro-organism may be transmitted orally and has been detected in dental plaque and saliva.⁴ The oral cavity has been suggested as a reservoir for *H. pylori*, but the hypothesis that oral microflora may be a permanent reservoir is still controversial.⁵,⁶

Dental plaque is as a soft deposit forming the biofilm, which is primarily a collection of micro-organisms of about more than 600 distinct species. 1 g of wet dental plaque contains approximately $2 \times 10^{11}$ bacteria.⁷ It is actually a host associated biofilm, which provides a protective environment for colonizing organisms, and also acts as a barrier to antibiotic diffusion. Thus, it makes the micro-organisms resistant to antibiotics as compared to planktonic bacteria.⁸ Usually, the formation of dental plaque takes place in the absence of good oral hygiene. Many studies have reported the presence of *H. pylori* in dental plaque, saliva, and the dorsum of the tongue.⁹,¹⁰ About half of the world’s population is infected with *H. pylori¹¹ and the oral-oral and fecal-oral modes of transmission have been postulated.¹²

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**Month of Peer Review :** 04-2015  
**Month of Acceptance :** 04-2015  
**Month of Publishing :** 05-2015
The failure of triple or quadruple therapy to clear *H. pylori* infection from the dental plaque, despite its clearance from the gastric mucosa, raised the possibility that dental plaque is the potential source of re-infection of the gastric mucosa. Periodontal treatment in combination with systematic therapy has exhibited the successful eradication of *H. pylori*, as compared to systematic therapy alone, with the decreased risk of re-infection. For the complete prevention of gastric infection with *H. pylori*, eradication of the bacterium from the oral cavity is necessary.

The objective of our present study was to find out the association between the *H. pylori* infection in dental plaque and gastric infections in patients having dyspeptic symptoms.

**MATERIALS AND METHODS**

Study design: Case-control study.

Study place: Department of conservative dentistry and Endodontics, Institute of Dental Sciences, Bareilly, Uttar Pradesh.

Study period: 2 months (February-2015 to April-2015).

**Sampling Technique**

All the patients with dyspeptic symptoms of at least 6 months duration were included in our study.

**Sample Size**

A total of 248 patients who were having dyspeptic symptoms and subjected to as esophago - gastro-duodenoscopy during the study period were taken. Of these patients, 120 patients were categorized as the cases, and 128 were taken as the controls.

**Cases and Controls**

Patients with dyspeptic symptoms undergoing endoscopy who were either having histopathological examination or rapid urease test (RUT) or both positive, were categorized as the cases. Those who are both RUT and histopathological examination negative were categorized as the controls.

**Inclusion Criteria**

The patients who were included in this study were:

(i) Those having age more than 18 years.

(ii) Those not suffering from any systemic disease modifying periodontal disease manifestations (e.g., Diabetes, cellular immune disorders, osteoporosis), or requiring antibiotic prophylaxis.

(iii) Those not having a history of intake of antibiotics, proton pump inhibitors or bismuth compounds, \(H_2\)-receptor antagonists in the last 3 months.

(iv) Those not having a history of any dental treatment or oral prophylaxis in the past 6 months.

(v) Those not having vomiting to eliminate possible gastro-oral contamination by bacteria.

**Exclusion Criteria**

The patients having the following criteria were excluded from our study:

(i) Age \(\leq\) 18 years.

(ii) Suffering from any systemic disease, which affects periodontal disease manifestations like diabetes mellitus, osteoporosis, etc.

(iii) Having a history of intake of antibiotics, antacids, \(H_1\) receptor antagonists in the last 3 months.

(iv) Having a history of any dental treatment in the past 6 months.

(v) Having vomiting.

(vi) Not given consent for endoscopic procedures and histopathological examinations.

**Study Method**

A personal interview was carried out with the predesigned questionnaire for collecting data. Privacy and anonymity of the individuals were maintained, confidentiality was gained. Institutional Ethics Committee approval and consent were taken. Informed consent was also taken from all patients undergoing endoscopy procedure.

**Study Variables**

A standard proforma was prepared consisting of variables such as name, age, sex, religion, address, occupation, socio-demographic status, educational status, diet, source of water supply, habits (smoking/alcohol/pet handling), and oral hygiene practices. Along with these variables, GIT symptoms were also included.

**Statistical Analysis**

All the data were entered into the SPSS package (version-17). Chi-square test and the Odd’s ratio test were used to find the association between the dental plaque and *H. pylori* gastric infection in dyspeptic patients. The statistical significance for the tests was set at <0.05.

<table>
<thead>
<tr>
<th>Status</th>
<th>Number (%)</th>
<th>Chi-square test</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases</td>
<td></td>
<td>1.80</td>
<td>0.79</td>
</tr>
<tr>
<td>Male</td>
<td>78 (65)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>42 (35)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controls</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>34 (53)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>30 (47)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
RESULTS

In our present study, males are affected more than the females. Greater positivity of *H. pylori* was observed in the stomach samples of males as compared to females. The male to female ratio in the cases and controls was found to be approximately 2:1 (Table 1).

**Prevalence of Gastric *H. pylori* Infection and Oral Colonization of *H. pylori***

It was shown in our study that 86.66% of the cases (104 out of 120) showed positive RUT or *H. pylori* in the dental plaque. Among controls, 24 out of 128 (18.75%) showed the presence of *H. pylori* in the dental plaque. A positive association was found between the gastric infection and the presence of *H. pylori* in the dental plaque, and it was found to be statistically significant (Table 2).

**DISCUSSION**

In this study, the presence of *H. pylori* in the dental plaque was examined by the RUT and the results were found either as positive or negative. Of the 248 dyspeptic patients, 128 patients (51.6%) showed a positive RUT, thus indicating the presence of *H. pylori* in the dental plaque. Statistical analysis also showed that there was a positive association between the presence of *H. pylori* in the dental plaque and gastric infection. Our results were found to be similar with the results of study done by Gürbüz et al. In our present study, males are affected more than the females. Greater positivity of *H. pylori* was observed in the stomach samples of males as compared to females. The male to female ratio in the cases and controls was found to be approximately 2:1 (Table 1).

From all of the above studies, it is clear that there is a significant association between *H. pylori* associated gastric infection and dental morbidities like dental plaque, periodontitis, etc.

**CONCLUSION**

In our study, we found that there is a statistically significant association between *H. pylori* in the dental plaque and *H. pylori* associated gastric diseases. *H. pylori* is a major etiologic factor in the development of gastritis and peptic ulcer diseases. There is sufficient evidence on the presence of *H. pylori* in the subgingival oral biofilm or dental plaque, which could act as a reservoir for harboring *H. pylori* leading to gastric re-infection even after successful antibiotic therapy.

**RECOMMENDATIONS**

There should be a multidisciplinary clinical management protocol, merging the triple therapy to periodontal mechanical treatment and chemical disinfection. The maintenance of good oral hygiene along with plaque control measures and pocket eradication therapy should be undertaken for the effective and successful management of *Helicobacter pylori* associated gastric diseases. Further, researches that may be directed toward controlled randomized clinical trials are necessary for testing the efficacy of the multidisciplinary therapeutic regimen.

**REFERENCES**

Shahnawaz, et al.: Helicobacter pylori Infection in Dental Plaque and Gastric Infections


Source of Support: Nil, Conflict of Interest: None declared.
Computed Tomography: An Important Diagnostic Tool for Pulmonary Tuberculosis and its Patterns

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Abstract

Introduction: Pulmonary tuberculosis is caused by mycobacterium tuberculosis when droplet nuclei laden with bacilli is inhaled. Computed tomography (CT) scan, particularly high-resolution CT is one of the most useful imaging modality for tuberculous infection and its sequelae. CT scan can be used for detecting both acute and chronic changes in the lung parenchyma. Furthermore, it is much more sensitive in identifying complications of tuberculosis than any other imaging modality.

Materials and Methods: A total of 180 cases of pulmonary tuberculosis were included in the present study. Confirmation of tuberculosis in these cases was done by a detailed history, clinical examination, and routine laboratory investigations of all the cases. Chest radiography posteroanterior view in erect position using 1000 mA digital X-ray machine of Shimadzu and CT examination using Siemens Somatom ARSP - a third generation spiral scanner, were performed in all the cases within a week of starting anti-tuberculous therapy.

Result: The CT findings were divided into four groups based on the predominant pattern of involvement. These groups are predominant parenchymal excluding miliary (114 cases), predominant miliary parenchymal (30 cases), pleural effusion (18 cases), and mediastinal lymphadenopathy (18 cases). The predominant parenchymal lesions further classified into three major patterns. These are nodular opacities (114 cases), confluent consolidation (42 cases), and consolidation with associated loss of volume (72 cases).

Conclusion: Three major patterns of tuberculous parenchymal lesions were noted after CT scanning of all the cases. Cases of pleural effusion were associated with pleural thickening. All the cases were having a predominant picture of mediastinal mass lesions on chest radiograph, which on CT scan were seen to be enlarged lymph nodes.

Key words: Computed tomography, Diagnosis, Tuberculosis

INTRODUCTION

Pulmonary tuberculosis is caused by mycobacterium tuberculosis, when droplet nuclei laden with bacilli are inhaled. It is a major cause of morbidity and mortality, particularly in developing countries.¹⁻³ A variety of sequelae and complications can occur in the pulmonary and extrapulmonary portions of the thorax in treated or untreated patients. In the recent years, due to increase in the incidence of multi-drug resistant tuberculosis in HIV positive patients, tuberculosis is no longer a problem of third world only, rather it has become a global problem.⁴

Computed tomography (CT) is an imaging procedure that uses special X-ray equipment to create detailed pictures or scans of areas inside the body. It is also called CT and computerized axial tomography. Digital geometry processing is used to generate a three dimensional image of the inside of the object from a large series of two-dimensional radiographic images taken around a single axis of rotation.⁵ CT actually produces a volume of data that can be manipulated in order to demonstrate various bodily structures based on their ability to block the X-ray beam. Usage of CT has increased dramatically over the last two decades in many countries.⁶ It has more recently been used for preventive medicine or screening for diseases, for example, CT colonography for patients with a high risk of

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colon cancer, or full-motion heart scans for patients with high risk of heart disease.

CT scan can be used for detecting both acute and chronic changes in the lung parenchyma that is the internals of the lung. It is particularly relevant here because normal two-dimensional X-rays do not show such defects. A variety of special techniques are used, depending upon suspected abnormality. This special technique is called high-resolution CT (HRCT). In addition to increased sensitivity in detecting parenchymal lesions, pleural, pericardial diseases, and hilar/mediastinal lymphadenopathy can be well-documented and characterized by CT, particularly HRCT. Furthermore, it is much more sensitive in identifying complications of tuberculosis than any other imaging modality.\(^7\)

CT can also help in selecting an appropriate procedure and optimal site of biopsy in diagnostically problematic cases and mimicking lesions like bronchogenic carcinoma.

CT scan is specially required in patients:
1. Suspected of having occult tuberculosis
2. In whom the diagnosis of tuberculosis is indicated but the radiographs are equivocal, and clinical presentation and history are indeterminate
3. Known to have tuberculosis in whom tuberculosis may have developed and chest radiographs are equivocal
4. Known to have tuberculosis, when another disease like neoplasia is suspected, and routine chest radiography is unable to evaluate because of extensive disease.

This study was carried out with the following objectives:
1. To describe the spectrum of radiological changes seen in the chest by computed tomography in patients with pulmonary tuberculosis
2. To review previous literature in the same field and comparing the results.

**MATERIALS AND METHODS**

The present study was a cross-sectional study, conducted in MGM Medical College and LSK Hospital, Kishanganj, Bihar. It was approved from Institutional Ethical Committee. Study was conducted from September-2014 to February-2015 (6 months). Privacy and anonymity of the patients were maintained. A written consent was also taken from them. A total of 180 cases of pulmonary tuberculosis were selected for the study. After taking a detailed history, all patients were subjected to thorough clinical examination and routine laboratory investigations. Confirmation of tuberculosis was done by:

1. Presence of acid-fast bacilli in sputum or a significant skin reaction to purified protein derivative of tuberculo-protein (Mantoux-test) or both and/or radiographic evidence of current disease
2. Clinical and radiological improvement after starting antituberculous therapy
3. Diagnosis of tuberculous effusion was done by biochemical and cytological evaluation of aspirated pleural effusion.

Cases that could not be followed-up or no definite diagnosis could be obtained were excluded from our study.

All the cases had a chest radiography posteroanterior view in erect position using 1000 mA digital X-ray machine of Shimadzu. CT examination was performed using Siemens Somatom ARSP - a third generation spiral scanner with Somaris software or Somatom spirit dual slice CT scan, within a week of starting anti-tuberculous therapy. After the program, 10 mm contiguous slices were taken from apices to lung bases. Post contrast study with the same scanning parameters was performed, after administration of iopamidol or iohexol 1-2 mg/kg of body weight. In regions of special interest, HRCT was performed using 1 mm slice thickness and high Kernel B 80 for high spatial resolution. All the sections were viewed in soft tissue (mediastinal window), lung window, and in the special circumstances bone window.

**Statistical Analysis**

The radiological features were tabulated and expressed as percentage.

**RESULT**

One hundred and eighty patients with pulmonary tuberculosis, presented to MGM Medical College and LSK Hospital, Kishanganj were included in our study. The CT findings were divided into four groups based on the predominant pattern of involvement (Table 1).

The predominant parenchymal lesions consisted of 3 major patterns. The “nodular pattern” lesion were composed of multiple small nodules, usually of varying sizes ranging from <5 mm to 5-10 mm most often. The pattern of “confluent consolidation” appeared as homogenous or non-homogenous areas of consolidation while the

<table>
<thead>
<tr>
<th>Major groups</th>
<th>Number of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predominant parenchymal excluding military</td>
<td>114</td>
</tr>
<tr>
<td>Predominant miliary parenchymal</td>
<td>30</td>
</tr>
<tr>
<td>Pleural effusion</td>
<td>18</td>
</tr>
<tr>
<td>Mediastinal lymphadenopathy</td>
<td>18</td>
</tr>
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</table>
pattern of “consolidation with associated loss of volume” (CWALV) appeared as areas of consolidation with apparent focal loss of volume manifesting as bronchovascular distortion with or without associated fibrous bands in the adjacent parenchyma. Of the three parenchymal patterns, nodular opacities were seen in all the 114 cases. The pattern of CWALV was noted in 72 patients (63.16%). The “confluent consolidation” was seen in 42 cases (36.84%). 12 of these 42 patients also showed consolidation with associated loss of volume (Table 2).

In our study, all the 30 cases of miliary tuberculosis showed 1-3 mm nodules distributed in both the lungs and in all the segments. The nodules were distributed uniformly in 18 patients (60%). In 6 cases, lesions were seen more in peripheral areas of the lungs. In other 6 cases, lesions were predominant in the right lung (Table 3).

In the 18 cases of pleural effusion, 6 cases (33.33%) showed associated pleural thickening, while underlying parenchymal nodular opacities were noted in other 6 cases (33.33%) (Table 4).

In our study, there were 18 cases with a predominant picture of mediastinal lymphadenopathy. All the 18 cases showed enlarged right paratracheal, right tracheobronchial, and subcarinal lymphadenopathy (100%). The right intrapulmonary, anterior mediastinal, and paraesophageal nodes were enlarged in 12 cases each (66.7%). Aortopulmonary and left intrapulmonary nodes were enlarged in six cases (33.3%). 12 of the 18 patients (66.67%) showed lymph nodes to have low-density centers with enhancing periphery. Associated parenchymal findings were seen in six cases in the form of nodular opacities and confluent consolidation (Table 5).

**DISCUSSION**

Based on the findings of chest radiography and subsequent CT findings, 180 patients were segregated into four groups for the purpose of analysis and discussion.

1. Predominant parenchymal (excluding military) - 114 cases
2. Predominant military - 30 cases
3. Pleural effusion - 18 cases
4. Mediastinal lymphadenopathy - 18 cases.

All the important lesions could be categorized into one of the three parenchymal patterns earlier described by Ikezoe et al. and Aribandi et al. - namely the “nodular opacities,” “confluent consolidation,” and CWALV. In our present study, the most commonly occurred pattern was the “nodular opacity” pattern, being seen in 100% cases. The pattern of CWALV was seen in 63.16% while “confluent consolidation” was seen in 36.84% (Table 2).

Ikezoe et al. in 1993 retrospectively analyzed the spectrum of CT findings in 110 patients with active pulmonary tuberculosis. The authors compared the patterns and distribution of findings in diabetic/immunocompromised patients (39 cases) with those patients without underlying disease (71). The CT was classified into three main patterns. (1) Nodular opacities which included acinar, lobular or patchy lesions, (2) confluent consolidation, (3) consolidation with associated loss of volume. 44 (62%) of the 71 patients with no underlying disease had a nodular pattern, 11 (15%) had confluent consolidation, 13 (18%) had consolidation with associated loss of volume, and 3 (4%) patients had miliary pattern. Our present study is consistent with ==the study of Aribandi et al. They found that nodular opacity was seen in all, confluent consolidation was seen in 37% and CWALV was seen in 69%.

In the present study, all the 30 cases of miliary tuberculosis showed multiple 1-3 mm nodules distributed in both the

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**Table 2: Predominant parenchymal patterns: Frequency of occurrence (n=114)**

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Number of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nodular opacities</td>
<td>114</td>
<td>100</td>
</tr>
<tr>
<td>Confluent consolidation</td>
<td>42</td>
<td>36.84</td>
</tr>
<tr>
<td>CWALV</td>
<td>72</td>
<td>63.16</td>
</tr>
</tbody>
</table>

**Table 3: Distribution of nodules in miliary tuberculosis (n=30)**

<table>
<thead>
<tr>
<th>Distribution</th>
<th>Number of patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uniform</td>
<td>18</td>
<td>60</td>
</tr>
<tr>
<td>Peripheral&gt;central</td>
<td>06</td>
<td>20</td>
</tr>
<tr>
<td>Right&gt;left</td>
<td>06</td>
<td>20</td>
</tr>
</tbody>
</table>

**Table 4: Pleural effusion (n=18); associated features**

<table>
<thead>
<tr>
<th>Associated features</th>
<th>Number of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pleural thickening</td>
<td>06</td>
<td>33.33</td>
</tr>
<tr>
<td>Parenchymal nodular opacities</td>
<td>06</td>
<td>33.33</td>
</tr>
</tbody>
</table>

**Table 5: Mediastinal lymphadenopathy (n=18)**

<table>
<thead>
<tr>
<th>Group of lymph nodes</th>
<th>Number of patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right paratracheal</td>
<td>18</td>
<td>100</td>
</tr>
<tr>
<td>Right tracheobronchial</td>
<td>18</td>
<td>100</td>
</tr>
<tr>
<td>Subcarinal</td>
<td>18</td>
<td>100</td>
</tr>
<tr>
<td>Right intrapulmonary</td>
<td>12</td>
<td>66.7</td>
</tr>
<tr>
<td>Anterior mediastinal</td>
<td>12</td>
<td>66.7</td>
</tr>
<tr>
<td>Paraesophageal</td>
<td>12</td>
<td>66.7</td>
</tr>
<tr>
<td>Aortopulmonary</td>
<td>06</td>
<td>33.33</td>
</tr>
<tr>
<td>Left intrapulmonary</td>
<td>06</td>
<td>33.33</td>
</tr>
</tbody>
</table>
The growing burden of tuberculosis: Global
Radiation dose associated with common computed tomography showed three major patterns of parenchymal lesions: the occurrence of widespread nodularity of varying size, density, distribution, and number with associated interlobular thickening.

The present study shows that among 18 cases of pleural effusion, 6 cases (33.33%) showed associated pleural thickening, while underlying parenchymal nodular opacities were noted in other 6 cases (33.33%).

Our study also showed a total of 18 cases with a predominant picture on the chest radiograph of mediastinal mass lesions, which on CT scan were seen to be enlarged lymph nodes. All the 18 cases showed enlarged right paratracheal, right tracheobronchial, and subcarinal lymphadenopathy (100%). The right intrapulmonary, anterior mediastinal, and paraesophageal nodes were enlarged in 12 cases each (66.7%). Aortopulmonary and left intrapulmonary nodes were enlarged in 6 cases each (33.3%). The preponderance of right-sided involvement in our study was found to be consistent with other studies also.13-15 Moon et al.16 reported in their study of 49 cases of tuberculous mediastinal adenopathy, which included 37 cases of active and 12 cases of inactive tuberculosis that CT findings of node with central low attenuation and peripheral rim enhancement suggests active disease and finding of homogenous and calcified nodules suggested inactive disease.

Sahoo et al.17 concluded that HRCT may be helpful in the diagnosis of pulmonary tuberculosis and may be useful in the assessment of the efficacy of anti-tuberculous treatment. Jaiswal et al.18 concluded that even in sputum smear-negative setting, HRCT can predict the risk of pulmonary tuberculosis with good reproducibility and can select patients having a high probability of pulmonary tuberculosis.

CONCLUSION

Considering the magnitude of problem and burden of tuberculosis on health care services, this study was carried out. Tuberculosis is serious but treatable disease, nowadays, if it is timely diagnosed. To conclude, CT showed three major patterns of parenchymal lesions the nodular opacities, confluent consolidation, and CWALV. The nodular opacities pattern suggesting bronchogenic spread and initial stage of the pathological process were seen in all the cases with predominant parenchymal involvement and both lungs were equally involved. The patterns of confluent consolidation and CWALV lesions were seen more commonly in the apicoposterior segment and denote advanced stages of nodular opacity. Cases of pleural effusion showed pleural thickening with or without underlying nodular opacities. All the cases were having a predominant picture of mediastinal mass lesions on chest radiograph, which on CT scan was seen to be enlarged lymph nodes.

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Source of Support: Nil, Conflict of Interest: None declared.
Assessment of Effect of Gender on Learning Style Preferences among First Year Medical Students

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INTRODUCTION

Evolution wise males and females have differences in tastes and preferences though they are part of the same human race. There have been theories that claim difference in reasoning in males and females due to “innate differences” that they have been categorically endowed with.¹ Gender is among a number of factors that has been found to influence student learning style.² An emotional debate already exists regarding a gender gap in math and science. As suggested by former Harvard president Larry summers this gender gap might be due to “issues of intrinsic aptitude.” These are thereby important questions that must be addressed by the academic community if we are to provide quality education.³ It remains to be seen that if this sort of differences of “intrinsic attitude” can or does affect learning styles and preferences in the medical students.

We therefore, as researchers, have made an attempt to unravel this difference in learning styles amongst male and female medical students, if they so exist. Learning style preferences are the manner in which, and the conditions under which, learners most efficiently and effectively perceive, process, store and recall what they are attempting to learn.⁴ Knowing about the students learning style preferences might aid in the development of the most effective teaching approaches.⁵

Visual, aural, reading/writing, kinesthetic (VARK) is taken as an acronym that stands for four major sensory modes

Abstract

Introduction: Students have different learning styles and preferences as far as knowledge uptake is concerned. Visual, auditory, reading/writing and kinesthetic are among the known modes of information presentation. Understanding a students learning style preference is an important consideration while designing classroom instruction.

Purpose: This study is aimed at checking out the gender wise preference in learning styles among the 1st year medical students. This could be of help probably in providing tailor made instructive plans if required.

Materials and Methods: A total of 120 first year medical students from Grant Government medical college comprising of 68 male and 52 female students were included in this study. The standard questionnaire developed by Fleming was used in the study to assess the learning preference in both the genders.

Results: We found nearly equal multimodal preference likings for both the genders. i.e. males 66.17% and females 65.38%. The rest percentage being unimodal ones. Further breakdown into modality combinations, too, did not reveal any significant learning style difference.

Conclusion: As no significant difference in learning style preference amongst genders were revealed in this study, we would not advocate any customized teaching strategy differences among the male and female counterparts.

Key words: Gender, Learning style, Modal, VARK
of learning: VARK. Depending upon the mode by which a learner prefers to receive information one or more modes are often dominant and preferred by the learners. This study focuses on the chosen modes of learning that the medical students tend to adopt during their 1st year of medical career.

Talking about the different modes of learning, visual learners learn through seeing drawings, pictures and other image rich teaching tools. Auditory learners tend to learn by listening to lectures, exploring material through discussions, and talking through ideas. Reading/writing learners get to learn through interaction with textual materials, whereas kinesthetic learners learn through touching and experiences, which emphasize doing, physical involvement and manipulation of objects.8

Our interest to know about preferred learning modes and thereby develop teaching approaches to address the learning needs of both male and female medical students, led us to use the VARK inventory tool. The VARK questionnaire developed by Fleming was used as the required tool to better understand our learners as well as their learning style characteristics.7

MATERIALS AND METHODS

The study was conducted on 120 1st year medical students in the department of physiology at Grant Govt. Medical College and Jamshedjee Jeejeebhoy Group of Hospitals, Mumbai. Proper approval from the Institutional Ethical Committee was taken for the study. An e-mail confirmation and consent to use this questionnaire for the study was also taken from Fleming, the developer of the VARK questionnaire. Only those students who were interested and volunteered for the present study were taken into consideration after taking their written consent. Students also had the option open, of not participating for the study, if they so wished. Out of the 120 students, 68 were males and 52 were females. Students were allowed to choose multiple answers per item to adequately describe their preferred responses to the situation presented. The total number of student responses was tallied for each of the four sensory modalities (VARK) and for all possible combination of modalities. The scoring algorithm on the VARK website was then applied to identify each student’s modality preferences.8

Analysis

The number of students who preferred each mode of information presentation was divided by the total number of student responses to determine the percentage of students in each category.8,9 A χ² analysis was performed to determine if significant gender differences exist for each of the following situations:

- a) Multimodal and unimodal preferences between males and females
- b) Quadmodal, trimodal and bimodal preferences between males and females
- c) Specific multimodal preferences among male and female students.

Statistical analysis for the study was done using the popular software GraphPad Instat version 3.1

RESULTS

Three contingency tables, Tables 1-3 were designed and used to determine the relationship between gender and

1) Learning preferences (multimodal, unimodal VARK)
2) General multimodal learning preferences (quadmodal, trimodal and bimodal)
3) Specific multimodal preferences (VARK, VAR, VAK, VRK, ARK, VA, VR, VK, AR, AK, RK).

Using the individual contingency tables thus plotted, P value for each table was evaluated using χ² analysis.

<table>
<thead>
<tr>
<th>Table 1: The relationship between gender and learning preferences (multimodal, unimodal VARK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Female</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

The P value by χ² analysis comes to be 0.9486, VARK: Visual, aural, reading/writing, kinesthetic

<table>
<thead>
<tr>
<th>Table 2: The relationship between gender and general multimodal learning preferences (quadmodal, trimodal and bimodal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Female</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

The P value by χ² analysis comes to be 0.2642

<table>
<thead>
<tr>
<th>Table 3: The relationship between gender and specific multimodal learning preferences (VARK, VAR, VAK, VRK, ARK, VA, VR, VK, AR, AK, RK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
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<tr>
<td>---------</td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Female</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

The P value by χ² analysis comes to be 0.6377, VARK: Visual, aural, reading/writing, kinesthetic
Figures showing Pi-charts were also plotted using the respective contingency tables.

Figure 1a and b shows the percentages of male and female students who preferred multimodal and unimodal styles of information presentation. Males (66.17%) and quite a similar percentage of females (65.38%) preferred information to reach them by multiple sensory modalities (multimodal). Similarly unimodal presenters were also comparable in their percentages i.e., for males being (33.83%) and for females being (34.62%). Further breakdown of the unimodal presenters showed the following: (1) Students preferring single V (1.47% males vs. 1.92% females) (2) students preferring single A (5.88% males vs. 9.61% females) (3) students preferring single R (4.41% males vs. 3.84% females) (4) students preferring single K (22.05% males vs. 19.23% females). P-value turned out to be 0.9486, thereby ruling out any gender differences in the percentages of male and female students who preferred multimodal and unimodal styles of information presentation.

Figure 2a and b shows the percentages of male and female students who preferred two, three or four modes of information presentation. Some students preferred two modes (bimodal) 24.44% for males versus 29.41% females, some students preferred three modes (trimodal) 26.66% males versus 11.76% females and some students preferred four modes (quadmodal) 48.89% males versus 58.82% females. P value here was 0.2641, thereby again ruling out any gender differences in percentages of males and females who preferred bi-, tri- or quadmodal styles of information presentation.

Figure 3a and b shows the breakdown of bi-tri-and quadmodal preferences by gender. Of the male and female students who preferred two modes of information presentation, some preferred the combination of modes V and K (2.22% males vs. 8.82% females), some students preferred V and A (2.22% males vs. 2.94% females), some students preferred R and K (6.67% males vs. 5.89% females), some students preferred A and K (2.22% males vs. 2.94% females), some students preferred A and K (11.11% males vs. 8.82% females). None of the students either male or female in our study preferred the combination of V and R. Of the male and female students who preferred three modes of information processing some students preferred the combination of modes VR and K. (2.22% males vs. 0% females). Some students preferred the combination of modes VA and K. (6.67% males vs. 8.82% females). Some students preferred the combination of modes A, R and K. (17.78% males vs. 2.94% females). Some students preferred the combination of modes VR and K. (2.22% males vs. 0% females). Again none of the students either male or female in our study preferred...
the combination of VA and R. Students preferring all four modes of information presentation i.e. quadmodal were VA, R and K. (48.89% males vs. 58.82% females). P value here turned out to be 0.6377, thereby once more ruling out any gender differences in specific multimodal preferences between males and females.

Complementing the fact that statistically no gender differences could be established in any of the specific preferences tested, it was worth mentioning that, of the six possible bimodal combinations i.e., VA, VR, VK, AR, AK and RK, the combination VR, was neither represented in the male nor in the female student population. Likewise of the four possible trimodal combinations VAR, VAK, VRK, and ARK, again VAR failed to be represented in either of the student genders. Considering the trimodal combination VRK, it turned out to be poorly represented in males with only one expressing this preference, it failed to be represented at all in the female students.

** DISCUSSION **

The present study was conducted on the male and female 1st year medical students of Grant Government Medical College. This was done with an intention to assess gender differences in learning style preferences. Our motto of conducting this study was based on a recurrent reflection that, certain innate differences could probably exist in males and females as regards learning style preferences are concerned.

In this study, we administered the VARK questionnaire of sensory modality preferences to 1st year medical students to observe if above mentioned innate differences really had an impact on the learning styles. The VARK questionnaire is a standard 16-item, self-reported multiple choice questionnaire designed by Fleming used for the purpose of evaluating the students preferred modes of information presentation. A strong point about the VARK Questionnaire is that its questions and options are drawn from real life situations and respondents identify with the results that they receive-they affirm the face validity of the tool.

In our study, preferences being primarily classified as multimodal and unimodal, we come across results which show modality preference to be quite similar between both genders. Males come out to be 66.17% and females show up to be 65.38% amongst the multimodal learners. This preference for multimodal learning is consistent with studies done by Baykan and Naçar; and Lujan and DiCarlo, on students of 1st year medical and similar results obtained by Murphy and Gray on dental students. In contrast to our study we have Wehrwein et al. where males had preponderance for the multimodal preference while females preferred unimodal styles. Similarly in a study done in 2013 by Nuzhat et al. in medical students in Saudi Arabia it was seen that females had more diverse learning preferences than their male counterparts.

In our study, males and females quite similarly preferred multimodal learning to a same degree, and to such an extent that, in certain bimodal and trimodal learning preference, there existed an absence of akin preference in both bi and tri modal sets. For example, VAR in trimodal and the VR combination in bimodal failed to be represented in either of the genders.

In contrast to our study, the study which was done in 2007 by Slater et al. revealed variations between genders about distribution of combinations of sensory modality preferences. Female styles being more diverse, 10 out of 11 possible combinations were represented in the population, whereas only 6 of the 11 possible combinations were represented in the males. Combinations AK, AR, and ARK were entirely missing from the male multimodal profile in this study. Similarly in findings of Philibin et al. who used KOLB learning style inventory, males identified with a smaller subset of learning styles, whereas females distributed more broadly across the learning style spectrum.
Also, Jorge\textsuperscript{13} found that while male students primarily preferred to use tactile resources to learn new information, female students preferred to have more variety in their educational resources.

Considering the fact that the bimodal VR and trimodal VAR was not represented in either genders, an uncanny resemblance could probably be established or bumped upon in our studies, showing thereby a poor representation of combinations where V and R coexist. Probably in our case, had we gone for a larger study group the absence of students preferring bimodal VR or for that matter of fact trimodal VAR might also have been justifiably and uniformly represented in the results.

Amongst the male and female unimodal learners no gender differences in the percentages of students who preferred unimodal styles of information presentation existed (33.82\% of male students and 34.61\% of female students reported a preference for a single modality).

The VARK questionnaire thus used in our study could help as a two edged weapon by targeting both the students and the faculty alike. In case of students it could act as a process wherein by raising the awareness level of the students for their preferred learning modality, they could benefit by knowing their strengths and preferences and thus get empowered to adjust their learning behavior. Thinking from an alternate perspective this type of knowledge may increase students’ ability to actively cope with the rigorous academic demands of medical school. Use of active coping skills has been found to decrease anxiety and depression and to increase motivation among medical students.\textsuperscript{14}

Taking into consideration the instructors point of view the VARK results could help them become aware of the distribution of information intake preferences among each class and to adjust their method of information delivery to correspond with these preferences. Considering our study where male and female learners had quite comparable results these adjustments would both benefit male as well as female learners. Insight into the specific preferences of individual classes would help instructors tailor both their presentations and methods of assessment for each individual class.

Some students prefer one of the modalities over the other three so much that they find it difficult to understand the subject matter unless special care is taken to present it in their own preference mode. To make it so happen, teaching should be multisensory and filled with variety. Visual learners can thus be targeted by the presence of models and demonstrations. Auditory learners can be reached through discussion during peer instruction\textsuperscript{15,16} collaborative testing\textsuperscript{17,18} debate,\textsuperscript{19} games\textsuperscript{20-25} and answering questions.\textsuperscript{26} Manipulating models\textsuperscript{27,28} and role playing\textsuperscript{29} satisfies kinesthetic and tactile learners. Cooperative learning exercises, role playing, simulations, models, debates and games are amongst active learning strategies that can be used rampantly and efficiently in large classrooms. All these promote appreciable levels of motivation and involvement.

Though our and similar other studies proclaim the benefits of providing students with teaching strategies in their own preference mode, an opposing viewpoint too exists in literature, which suggests, mismatching as an occasional tool and teaching strategy to stimulate interest and thereby preventing boredom and averting the learner from disengaging.

**CONCLUSION**

Considering the educational background in India where the students in general have diverse backgrounds and vary widely in terms of culture, ethnicity, socioeconomic status, and medium of instruction a limitation of the VARK study can be traced wherein these confounding factors are not taken into account and might remain a drawback of the study. This study within its gambit failed to find any significant difference in learning style preference among genders. The results thus do not suggest the presence of an innate difference in aptitude and learning style attitude between genders.

**ACKNOWLEDGMENT**

We heartily acknowledge the zeal and the enthusiasm shown by the 1\textsuperscript{st} year medical students of Grant Government Medical College Mumbai. 2014-15 batch. Their contribution to the study was exemplary in terms of co-operation and sincerity. No source of funding was required in the present study as it did not involve any major expenditure. Similarly no conflict of interest whatsoever existed in our study.

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Source of Support: Nil, Conflict of Interest: None declared.
Spectrum of Breast Neoplasms in Females: A 10 Years Histopathological Review in a Tertiary Care Hospital

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Abstract

Introduction: Currently, the female breast is one of the most commonly biopsied tissues today because of the myriads of diseases and lesions that arise from it. These lesions constitute a source of morbidity and mortality among women globally.

Objective: To highlight the prevalence, spectrum and anatomopathological patterns of breast neoplasms in a tertiary care hospital.

Materials and Methods: A 10 years retrospective descriptive analysis of all histopathologically diagnosed breast neoplasms in women. In this study, the records of all the breast specimens received in the Department of Pathology, Mysore Medical College and Research Institute, Mysore, Karnataka were considered.

Results: Among 1285 cases of neoplastic lesions, 851 (66.2%) were benign and 434 (33.8%) cases were malignant. The majority of cases were fibroadenoma, i.e., 531 (41.3%). Invasive carcinoma of no special type was the most common malignant neoplasm, i.e., 371 (85.5%) cases, followed by invasive lobular carcinoma, which constituted 22 (5.1%) cases.

Conclusion: This study highlights the importance of histopathological examination in breast lumps not only in establishing the final diagnosis, but also in predicting the prognosis of breast neoplasms. These findings underscore the need for urgent public health intervention.

Key words: Benign, Breast, Malignant, Neoplasms

INTRODUCTION

Breast, an anatomical site which is constantly under the varying influence of sex hormones is one of the frequent sites of neoplasms in females.¹ Breast diseases are showing a rising trend worldwide. There is a wide variation in the spectrum of breast diseases and the epidemiology of breast cancer in various countries or ethnic groups.² Currently, the female breast is one of the most commonly biopsied tissues because of the myriad of diseases and lesions that arise from it.³ Among these lesions, benign breast diseases (BBDs) constitute the majority accounting for 90% of breast lesions worldwide. The BBDs spectrum range from developmental abnormalities, inflammatory, epithelial, fibro-epithelial, stromal proliferations and neoplastic tumors. Most of these lesions are seen in women of reproductive age and are associated with hormonal influences. However, studies have reported an increasing trend of these lesions in children and adolescents.⁴ Though benign breast neoplasms are more common and completely curable, they are overshadowed by the magnitude of the problems of malignant tumors of the breast.⁵ Breast carcinoma ranks first among the malignant tumors affecting females in many pails of the world.⁶ Breast cancer is a public health problem worldwide; therefore, it is critical that efforts in prevention and early diagnosis of breast cancer are implemented everywhere. One of the main problems concerning breast cancer relates to the lack of patients awareness about the disease. Breast awareness is a part of general body awareness. Learning how your breasts feel at

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different times will help you to know what is normal for you. The introduction of mammographic screening has led to an increased detection of breast cancers, at early stages. Fine-needle aspiration cytology is part of the triple assessment for the diagnosis of breast lesions. It is an established, highly accurate method for diagnosing breast cancer and has given rise to a reduction in the number of excision biopsies for BBDs. While most reports indicate that breast lumps are predominantly benign and mostly non-proliferative epithelial lesions, there has, however, been increasing recognition of the risk implications of the various forms of premalignant lesions. Researchers widely believe that cancer risk is increased in patients with atypical ductal and atypical lobular hyperplasia. The natural history of breast cancer continues to baffle both the surgeons and pathologists. However, there is no uniform pattern of study regarding the incidence and biology of the breast tumors in different parts of India. It is, therefore, pertinent for pathologists, oncologists, and radiologists not only to recognize and distinguish BBD from breast cancer but also to have in-depth knowledge of the pattern of occurrence of these disorders in their geographical locale.

We are presenting the findings of a retrospective analysis of various breast diseases in females from 2004 to 2013, which was carried out at the Mysore Medical College and Research Institute, Mysore, Karnataka.

Objectives
To highlight the prevalence, spectrum and anatomopathological patterns of breast neoplasms in a tertiary care hospital.

MATERIALS AND METHODS
A retrospective descriptive analysis of all histopathologically diagnosed breast neoplasms in women over a period of 10 years was done. Request forms were scrutinized for clinical data. In this study the records of all the breast specimens including mastectomy, lobectomy, and other open breast biopsy specimens received in the Department of Pathology, Mysore Medical College and Research Institute, Mysore, Karnataka were considered. A total of 1285 specimens were analyzed over a period of 10 years, i.e., from 2004 to 2013. Paraffin-embedded sections were stained with the routine hematoxylin and eosin method. Special stains and immunohistochemistry were performed wherever required.

RESULTS
During the period described, a total of 1285 breast specimens were received. Out of these there were 425 (33.07%) mastectomy and 860 (66.92%) lumpectomy specimens. Among 1285 cases of neoplastic lesions, 851 (66.2%) were benign, and 434 (33.8%) cases were malignant (Graph 1).

In this study, the majority of cases were fibroadenoma, i.e., 531 (41.3%) (Figure 1). Other entities encountered include 138 (16.2%) cases of fibrocystic change, 65 (7.6%)...
cases of benign phyllodes (Figure 2), 10 cases of borderline phyllodes, 8 cases of tubular adenoma (Figure 3) and one case each of nipple adenoma, apocrine adenoma, sclerosing adenosis, blunt duct adenosis and hamartoma.

6 (0.7%) cases of mesenchymal origin were encountered, among them 4 cases were lipoma and 2 cases were a hemangioma.

Invasive carcinoma of no special type was the most common malignant neoplasm i.e., 371 (85.5%) cases, followed by invasive lobular carcinoma (ILC), which constituted 22 (5.1%) cases (Figure 4). We encountered only 2 cases of papillary carcinoma breast in our study, which was the least common encountered malignant tumor (Figures 5 and 6). For histological grading, modified Scarff - Bloom - Richardson system has been used. In this study, the majority of the tumors showed Grade I (51.1%), followed by Grade II (41.1%) and Grade III (7.8%).

Table 1 depicts the frequency distribution of benign breast neoplasms. Table 2 depicts the frequency distribution of malignant breast neoplasms. Table 3 depicts the age group distribution of the various histological types of breast neoplasms.

**DISCUSSION**

Diseases of the breast have attracted medical interest as long ago as 3000 BC. The Edwin Smith surgical Papyrus of Egyptian Pyramids age (3000-2500 BC) described several cases of women with tumors of the breast. It is probable that malignant tumors of female breast were the first human cancers discovered and differentiated from other non-malignant diseases.

Breast lesions pose health and cosmetic hazards predominantly in females. The anxiety and fear associated with increased awareness of breast cancer have significantly improved the health seeking behavior of patients with breast lumps. This might partially explain the increasing incidence of benign breast neoplasms in this study. The importance of many benign lesions lies in their ability to mimic cancers, and not all benign lesions are completely free of risks.

Fibroadenoma was the most common benign breast neoplasm in this study accounting for 62.3% cases. This was also the finding in other studies such as Malik *et al.* (59%). However, in the reports from Pakistan and Jamaica, fibroadenoma was documented as the second commonest breast neoplasm that accounted for 29.4% and 33% respectively. In the current study, majority of patients with fibroadenoma were between 21 and 30 years (41.9%) of age followed by 11-20 years (30.5%) of age group, with the youngest 11 years and oldest being 58 years.

Fibrocystic change, the second most common benign breast neoplasm in this study, accounted for 16.2% of cases, a figure consistent with 19.6% documented
in Nigeria.\(^8\) Fibrocystic change seems relatively more common in Pakistanis as Memmon reported a high frequency of 66.3% and observed a changing trend of benign tumors from fibroadenoma to fibrocystic change.\(^9\)

This trend was however not observed in this study as fibroadenoma remained the commonest benign breast neoplasm throughout the 10 years study period. The fibrocystic change consists of a spectrum of morphologic changes comprising cysts, adenosis, epithelial hyperplasia, and fibrosis. The age range of patients with fibrocystic change in our study was 15-60 years with a mean age of 30 years, which is in consonance with 30, 32, 33 and 37 years documented in Nigeria, Ibadan, Kano and Ife respectively.\(^12\)-\(^14\)

In contrast to fibrocystic change which showed a relatively high prevalence up to the fifth decade, a sharp decline in the occurrence of fibroadenoma was observed after the third decade.

One case each of eccrine acrospiroma, chondroid syringoma and dermatofibrosarcoma protuberans was encountered.

In our study, only one case of atypical ductal hyperplasia was reported. It has 4-5 fold risk of progression to invasive breast carcinoma.

Carcinoma of the breast ranked second in this study. The vast majority of the cases (371 out of 434) were invasive ductal carcinoma. There were only 6 cases of ductal carcinoma in-situ. In addition, 22 cases of ILC, 21 cases of medullary carcinoma, 6 cases of metaplastic carcinoma (Figure 7), 5 cases of malignant phyllodes,

---

**Table 1: Benign breast neoplasms (851/1285)**

<table>
<thead>
<tr>
<th>Type of lesion</th>
<th>Number of patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apocrine adenoma</td>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td>Blunt duct adenosis</td>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td>Fibroadenoma</td>
<td>531</td>
<td>62.4</td>
</tr>
<tr>
<td>Fibrocystic change</td>
<td>138</td>
<td>16.2</td>
</tr>
<tr>
<td>Hamartoma</td>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td>Intraductal papilloma</td>
<td>8</td>
<td>0.9</td>
</tr>
<tr>
<td>Hemangioma</td>
<td>2</td>
<td>0.2</td>
</tr>
<tr>
<td>Lipoma</td>
<td>4</td>
<td>0.5</td>
</tr>
<tr>
<td>Nipple adenoma</td>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td>Sclerosingadenosis</td>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td>Tubular adenoma</td>
<td>8</td>
<td>0.9</td>
</tr>
<tr>
<td>Usual ductal hyperplasia</td>
<td>63</td>
<td>7.4</td>
</tr>
<tr>
<td>Phyllodes - benign</td>
<td>65</td>
<td>7.6</td>
</tr>
<tr>
<td>Borderline</td>
<td>10</td>
<td>1.2</td>
</tr>
<tr>
<td>Chondroidsyringoma</td>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td>Eccrine spiroma</td>
<td>1</td>
<td>0.1</td>
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<tr>
<td>DFSP</td>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td>ADH</td>
<td>1</td>
<td>0.1</td>
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</table>

**Table 2: Malignant breast neoplasms (434/1285)**

<table>
<thead>
<tr>
<th>Type of lesion</th>
<th>Number of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ductal carcinoma in-situ</td>
<td>6</td>
<td>1.4</td>
</tr>
<tr>
<td>Invasive ductal carcinoma</td>
<td>371</td>
<td>85.5</td>
</tr>
<tr>
<td>ILC</td>
<td>22</td>
<td>5.1</td>
</tr>
<tr>
<td>Medullary carcinoma</td>
<td>21</td>
<td>4.8</td>
</tr>
<tr>
<td>Metaplastic carcinoma</td>
<td>6</td>
<td>1.4</td>
</tr>
<tr>
<td>Mucinous carcinoma</td>
<td>3</td>
<td>0.7</td>
</tr>
<tr>
<td>Papillary carcinoma</td>
<td>2</td>
<td>0.5</td>
</tr>
<tr>
<td>Phyllodes-malignant</td>
<td>5</td>
<td>1.5</td>
</tr>
<tr>
<td>Non Hodgkin lymphoma</td>
<td>4</td>
<td>0.9</td>
</tr>
<tr>
<td>Pleomorphic MFH</td>
<td>1</td>
<td>0.2</td>
</tr>
<tr>
<td>Carcinosarcoma</td>
<td>1</td>
<td>0.2</td>
</tr>
<tr>
<td>Squamous cell carcinoma</td>
<td>1</td>
<td>0.2</td>
</tr>
<tr>
<td>Undifferentiated carcinoma</td>
<td>2</td>
<td>0.5</td>
</tr>
</tbody>
</table>

**Table 3: Age distribution in the breast neoplasms- no. (percentage %)**

<table>
<thead>
<tr>
<th>Age in years</th>
<th>10-20</th>
<th>21-30</th>
<th>31-40</th>
<th>41-50</th>
<th>51-60</th>
<th>61-70</th>
</tr>
</thead>
<tbody>
<tr>
<td>fibroadenoma</td>
<td>162 (30.5)</td>
<td>223 (41.9)</td>
<td>121 (22.7)</td>
<td>22 (4.1)</td>
<td>3 (0.5)</td>
<td></td>
</tr>
<tr>
<td>fibrocystic change</td>
<td>35 (25.3)</td>
<td>60 (43.4)</td>
<td>35 (25.3)</td>
<td>7 (5.1)</td>
<td>1 (0.7)</td>
<td></td>
</tr>
<tr>
<td>Usual Epithelial hyperplasia</td>
<td>20 (31.7)</td>
<td>20 (31.7)</td>
<td>18 (28.6)</td>
<td>5 (7.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DCIS</td>
<td>0</td>
<td>1 (16.7)</td>
<td>2 (33.3)</td>
<td>2 (33.3)</td>
<td>0</td>
<td>1 (16.7)</td>
</tr>
<tr>
<td>Invasive carcinoma</td>
<td>0</td>
<td>32 (7.5)</td>
<td>114 (26.8)</td>
<td>130 (30.6)</td>
<td>91 (21.4)</td>
<td>58 (13.6)</td>
</tr>
<tr>
<td>Benign phyllodes</td>
<td>10 (15.3)</td>
<td>17 (26.2)</td>
<td>18 (27.7)</td>
<td>15 (23.1)</td>
<td>5 (7.7)</td>
<td></td>
</tr>
<tr>
<td>Borderline phyllodes</td>
<td>0</td>
<td>1 (10)</td>
<td>5 (50)</td>
<td>3 (30)</td>
<td>1 (10)</td>
<td></td>
</tr>
<tr>
<td>Malignant phyllodes</td>
<td>2 (40)</td>
<td>0</td>
<td>1 (20)</td>
<td>1 (20)</td>
<td>1 (20)</td>
<td></td>
</tr>
<tr>
<td>Lymphoma</td>
<td>0</td>
<td>1 (25)</td>
<td>0</td>
<td>1 (25)</td>
<td>2 (50)</td>
<td></td>
</tr>
</tbody>
</table>

MFH: Malignant fibrous histiocytomas, ILC: Invasive lobular carcinoma

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**Figure 6: Papillary carcinoma, ×10 IHC P63**
3 cases of mucinous carcinoma (Figures 8 and 9) and 2 cases of papillary carcinoma were seen. However, in a fair number of the cases more than one pattern was found, and it was decided to consider all these cases as invasive ductal carcinoma. In our study, the majority of patients with invasive carcinoma were between 41 and 50 years (30.6%) of age, with youngest being 26 years and oldest being 70 years. The findings in our study were different from the literature of western countries such as the UK and US. In our study, the mean age at diagnosis was 45 years, which is less as compared to that in the western literature where the mean age is 54 years. Involvement of right breast was seen in 234 cases (53.9%), the left breast in 199 cases (45.9%) and both breasts in one case only.

5 cases showed involvement of nipple by Paget disease associated with invasive ductal carcinoma (Figure 10).

422 patients underwent mastectomy with axillary clearance. 234 (55.4%) cases had positive lymph nodes for metastatic deposits, and 188 cases (44.6%) had negative lymph nodes.

Few rare malignant neoplasms were included. Among them, 4 cases were primary lymphoma of the breast. One more case was pleomorphic malignant fibrous histiocytoma in a 48-year-old. Another case was a 65-year-old female with carcinosarcoma. A case of malignant phyllodes with liposarcomatous differentiation was also observed (Figure 11).
CONCLUSION

This study highlights the importance of histopathological examination in breast lumps not only in establishing the final diagnosis, but also in predicting the prognosis of breast neoplasms. The pathologic features of breast cancer documented in this series, include the average age, degree of axillary lymph node involvement and the distribution of histologic types and grading are consistent with patient presentation at relatively advanced stages of disease. These findings underscore the need for urgent public health intervention, notably the development of national screening program for one of the most common cancer in women. Routine mammographic screening of high-risk groups aimed at early detection of these premalignant lesions is therefore highly indicated. A biopsy with histological diagnosis of all breast lumps is also recommended as this will aid in the detection of premalignant lesions particularly in low-resource settings.

REFERENCES


How to cite this article: Dayanand V, Shashidhar HB, Sandhyra M, Ashwini NS, Bharathi M. Spectrum of Breast Neoplasms in Females: A 10 Years Histopathological Review in a Tertiary Care Hospital. Int J Sci Stud 2015;3(2):84-89.

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Correlation of Clinico-Pathological Parameters of Epithelial Ovarian Carcinomas with Expression of p53

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Abstract

Introduction: Ovarian cancer is one of the most important causes of death from gynecologic malignancies. Better understanding of the molecular processes underlying this disease will certainly improve the prognosis.

Aim: The aim was to determine the frequency of expression of p53 in epithelial ovarian carcinomas (EOC) and to correlate the expression of p53 with the two-tier grading system of EOC and also other clinicopathological parameters.

Methodology: Immunohistochemical techniques were used to evaluate p53 expression in paraffin-embedded tissue specimens of 40 EOC cases, of which 24 cases were serous carcinoma, 14 were mucinous carcinoma, and 1 case each of endometroid carcinoma and malignant Brenner.

Results: Of the 40 EOC cases 22 (55%) cases were p53 positive. The p53 positivity increased with age (82%), however, was not statistically significant ($P = 0.415$). The p53 positivity was more in high-grade serous carcinoma (68.4%) compared to low-grade serous carcinoma and was statistically significant ($P = 0.05$). The p53 intensity scale (grade) was more in high-grade tumor compared to low-grade tumors and was statistically significant ($P = 0.027$). However, the correlation of p53 score with tumor grade was not statistically significant ($P = 0.421$).

Conclusion: The p53 expression increases with the age of the patient, a grade of tumor, and high-grade serous carcinoma.

Key words: Epithelial ovarian cancer, Immunohistochemistry, Two-tier grading

INTRODUCTION

Ovarian cancer is the 6th most common cancer among the women worldwide.¹ In India, ovarian cancer is third leading site of cancer trailing behind cervix and breast cancer.² Approximately 225,500 women are diagnosed with ovarian cancer annually, with an estimated 140,200 associated deaths in the world.³ Multiple studies have been performed for early diagnosis and to determine newer prognostic indicators of survival. The prognosis of epithelial ovarian carcinoma (EOC) is currently based on clinical and histopathological factors such as stage of disease, histologic grade, and residual tumor. Several prognostic factors such as serum CA-125 levels, DNA content, osteopontin, and others have been determined related to ovarian carcinoma.⁴ ⁵

Recently many molecular markers are being used as prognostic factors in EOC and include p53, mdm2, Bcl2, HER2/neu, BRCA1, and BRCA2. One of the extensively studied prognostic markers in ovarian cancer so far is expression of p53.⁶ Mutant p53 protein may be identified by immunohistochemical methods, related to the longer time required for the destruction of the mutant protein compared with the wild type. There is a highly significant correlation between the presence of mutations in the p53 gene detected by DNA sequence analysis and the over-expression of the p53 gene product detected by...
the immunohistochemical technique. The intranuclear accumulation of p53 are rare in benign (1%) and low malignant potential (5%) tumors, and common in invasive ovarian carcinomas (45-69%). The prevalence of mutation and expression increases with increasing tumor grade and stage and is more common in tumors of serous histology. Our study was conducted to evaluate the frequency of immunohistochemically detected p53 expression in a series of epithelial ovarian carcinoma and to correlate their association with the histological type and tumor grade.

METHODOLOGY

A total of 40 cases of EOC were evaluated which was received during the study period from January 2013 to June 2014 in the department of pathology, MIMS, Mandya. The study was approved by Institutional Ethical Committee. The representative tissue from the specimen was subjected to routine processing for paraffin embedding. 4-5 µ thick sections were taken from paraffin-embedded blocks, stained with hematoxylin and eosin stain and the histological type and grading using the two-tier system were done. The two-tier grading system was done based on the architectural pattern, nuclear atypia, and mitotic rate (Table 1).

The combined score of architecture, atypia, and mitotic figures/10 high power field (MF/10 HPF) is added to get a total score. Low-grade carcinoma includes 3-5 points, and high-grade carcinoma includes scores of 6-9 points. 3-5 µ thick sections on silane-coated slides were subjected to IHC study for p53 from all the cases. The polymer based IHC kit of BioGenex RTU (ready to use) was used. The nucleus stains either as coarse or fine granular brown dots when mutant p53 protein is present. The p53 positivity was assessed by a semi-quantitative method where the number of tumor cells showing positivity (score) and the staining intensity (grade) (Tables 2 and 3). A score of >1+ and grade of >2 was defined as an expression of p53 in a tumor.

Plan of Data Analysis
The collected data were entered in excel sheet and analyzed using Epi-info software. Descriptive statistics such as mean, standard deviation, and percentage along with Chi-square test were used to know the association. The P < 0.05 was considered as statistically significant.

RESULTS

The age of the 40 patients with EOC ranged from 25 to 60 years, and the mean age was 47 years. Majority (75%) of the patients were in 5th and 6th decade of life.

Of the 40 cases of EOC, 24 (60%) cases were serous carcinomas, 14 (35%) cases were mucinous carcinomas, 1 (2.5%) case each of endometrioid carcinoma, and malignant Brenner. In 40 cases of EOC, 20 cases (50%) were high grade and 20 (50%) were low grade.

Of the 24 cases of serous carcinoma, 19 cases (79.2%) were high grade and 5 cases (20.8%) were low grade. In 16 cases of non-serous carcinomas, all the 14 cases (100%) of mucinous carcinoma were low grade, one case of endometrioid carcinoma was of low grade and 1 case of malignant Brenner tumor was of high grade. Correlation of histologic type with a grade of the tumor was statistically significant (P < 0.001) (Table 4).

| Table 1: Histological grading using two-tier system |
|-----------------------------|-------------------------|-------------------------|
| Score | Architecture | Atypia | MF/10HPF |
| 1 | Glandular | Slight | 0-9 |
| 2 | Papillary | Moderate | 10-24 |
| 3 | Solid | Severe | >25 |

Table 2: Grading of staining intensity of p53 staining

<table>
<thead>
<tr>
<th>Intensity scale</th>
<th>Grade</th>
</tr>
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<tbody>
<tr>
<td>No staining</td>
<td>0</td>
</tr>
<tr>
<td>Weak staining</td>
<td>1</td>
</tr>
<tr>
<td>Moderate staining</td>
<td>2</td>
</tr>
<tr>
<td>Strong staining</td>
<td>3</td>
</tr>
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Table 3: Scoring of percentage of cells showing p53 positivity

<table>
<thead>
<tr>
<th>Percentage of cells showing positivity</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;10 of tumor cells</td>
<td>0</td>
</tr>
<tr>
<td>10-25 of tumor cells</td>
<td>1+</td>
</tr>
<tr>
<td>26-50 of tumor cells</td>
<td>2+</td>
</tr>
<tr>
<td>&gt;50 of tumor cells</td>
<td>3+</td>
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Table 4: Clinicopathologic characteristics of patients with EOC

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>25-60</td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>47</td>
<td></td>
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<tr>
<td>Histologic type of EOC</td>
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</tr>
<tr>
<td>Serous</td>
<td>24</td>
<td>60</td>
</tr>
<tr>
<td>Non serous</td>
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<td>40</td>
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<tr>
<td>Grade of EOC</td>
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<td></td>
</tr>
<tr>
<td>Low</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>High</td>
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<td>Grade of serous tumors</td>
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<td>20.8</td>
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<tr>
<td>High</td>
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<td>79.2</td>
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<td>15</td>
<td>93.8</td>
</tr>
<tr>
<td>High</td>
<td>01</td>
<td>06.2</td>
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</table>

EOC: Epithelial ovarian carcinomas
Immunohistochemistry of p53

Among the 40 cases of EOC, 82% of patients with p53 positivity were in 5th and 6th decade of life, and only 18% patients were in 4th decade of life. No p53 positivity cases were seen in patients of a 2nd decade of life. Correlation of age with p53 expression was not statistically significant ($P = 0.085$) (Table 5).

Of 40 cases of EOC, p53 was positive in 22 cases (55%) and negative in the other 18 cases (45%). While correlating the grade with p53 expression, 65% (13 of 20 cases) of high-grade carcinoma, and 45% (9 of 20 cases) of low-grade carcinoma were p53 positive, but the difference was not statistically significant ($P = 0.204$) (Table 5).

Of the 24 cases of serous carcinoma 14 cases (58.3%) were p53 positive (Figure 1) and of 14 cases of mucinous carcinoma 8 cases (57.1%) were p53 positive (Figure 2). The p53 expression was absent in both cases of endometrioid and malignant Brenner tumor. Expression of p53 was high in serous carcinoma compared to other histologic type but was not statistically significant ($P = 0.461$). 13 (68.4%) of the 19 cases of high-grade serous carcinoma and 1 (20%) of the 5 low-grade serous carcinoma were p53 positive which was statistically significant ($P = 0.05$). 8 (57%) of the 14 cases of low-grade mucinous carcinoma studied were p53 positive (Table 5).

When comparing the p53 score with histologic type of 24 cases of serous carcinoma, score 0+, 1+, 2+, and 3+ were seen in 4 (17%), 6 (25%), 6 (25%), and 9 (41%) cases, respectively. Of 12 cases of mucinous carcinoma, Grade 0, 1, 2, and 3 were seen 1 (7%), 5 (35%), 4 (29%), and 4 (29%) cases, respectively. Endometrioid carcinoma

---

Table 5: Correlation of p53 with clinicopathologic features of patients with EOC

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>p53 negative</th>
<th>p53 positive</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=18</td>
<td>%</td>
<td>N=22</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;5th decade</td>
<td>06</td>
<td>33.3</td>
<td>04</td>
</tr>
<tr>
<td>&gt;5th decade</td>
<td>12</td>
<td>66.7</td>
<td>18</td>
</tr>
<tr>
<td>Histologic type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serous</td>
<td>10</td>
<td>55.6</td>
<td>14</td>
</tr>
<tr>
<td>Non-serous</td>
<td>08</td>
<td>44.6</td>
<td>08</td>
</tr>
<tr>
<td>Histologic grade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>11</td>
<td>61.1</td>
<td>09</td>
</tr>
<tr>
<td>High</td>
<td>07</td>
<td>38.9</td>
<td>13</td>
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<tr>
<td>Grade of histologic subtype</td>
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<td></td>
<td></td>
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<tr>
<td>Low grade serous</td>
<td>04</td>
<td>22.1</td>
<td>01</td>
</tr>
<tr>
<td>High grade serous</td>
<td>06</td>
<td>33.3</td>
<td>13</td>
</tr>
<tr>
<td>Low grade mucinous</td>
<td>08</td>
<td>44.6</td>
<td>08</td>
</tr>
<tr>
<td>High grade mucinous</td>
<td>00</td>
<td>00.0</td>
<td>00</td>
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</table>

EOC: Epithelial ovarian carcinomas

Table 6: Correlation of p53 score with histologic type and tumor grade

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Score (N (%))</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0+</td>
<td>1+</td>
</tr>
<tr>
<td>Histologic type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serous</td>
<td>4 (17)</td>
<td>3 (13)</td>
</tr>
<tr>
<td>Mucinous</td>
<td>3 (21)</td>
<td>3 (21)</td>
</tr>
<tr>
<td>Endometrioid</td>
<td>0 (0)</td>
<td>1 (100)</td>
</tr>
<tr>
<td>Malignant Brenner tumor</td>
<td>1(100)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Tumor grade</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>3 (15)</td>
<td>5 (25)</td>
</tr>
<tr>
<td>High</td>
<td>5 (25)</td>
<td>2 (10)</td>
</tr>
</tbody>
</table>

---

Figure 1: Microphotograph showing strong and complete (grade 3) p53 staining in serous carcinoma (DAB, x10)

Figure 2: Microphotograph showing p53 positivity in mucinous carcinoma (DAB, x10)
was Grade 1, and malignant Brenner tumor was Grade 0 (Table 6).

When comparing the p53 score with tumor grade, of the 20 cases of high grade tumors, score 0+, 1+, 2+, and 3+ were seen in 5 (25%), 2 (10%), 3 (15%), and 10 (50%) cases, respectively. Of 20 cases of low grade ovarian tumors score 0+, 1+, 2+, and 3+ were seen in 3 (15%), 5 (25%), 5 (25%), and 7 (35%) cases, respectively. Correlation of p53 score with tumor grade was not statistically significant ($P = 0.421$) (Table 6).

When comparing the p53 intensity scale with tumor grade, of the 20 cases of high-grade tumors, Grade 0, 1, 2, and 3 were seen in 5 (25%), 2 (10%), 4 (20%), and 9 (45%) cases, respectively. Of 20 cases of low-grade tumors, Grade 0, 1, 2, and 3 were seen in 1 (5%), 10 (50%), 4 (20%), and 5 (25%) cases, respectively. The p53 intensity scale with tumor grade was statistically significant ($P = 0.027$) (Table 6).

**DISCUSSION**

Ovarian cancer is one of the most important causes of death from gynecologic malignancies. Better understanding of the molecular processes underlying this disease will certainly improve the prognosis. This study investigates correlations between the presence of p53 and various clinicopathological parameters in EOC with special emphasis on histological type and grade.

In our study, we found that 75% of the patients were in 5th and 6th decade of life similar to studies done by Zaman et al.,11 and Bodal et al.,12 A p53 expression rate of 64% was seen in patients of $>$55 years of age similar to studies done by Berker et al.,7 Sylvia et al.,13 Shi et al.,14 and Lee et al.,10 but the difference was not statistically significant ($P = 0.415$). This may be related to the accumulation of somatic mutations and is known that loss of heterozygosity on chromosome 17 increases with age (Table 4).15

The results of p53 positivity are relatively different in diverse studies. We found a p53 expression rate of 55% cases in our study. Literature reports positive results ranging from 44% to 66% (Table 5).1,4,6,7,10,15 Possible sources of this variation may be attributed to tissue fixation procedure, properties of different antibodies, scoring methods applied for p53 positivity, the different enzymes used for staining, and microwave procedure of the tissue during the staining process.15

Serous carcinoma (60%) was the most common EOC followed by mucinous carcinoma (35%) in our study similar to studies done by Tufan et al.,16 Lee et al.,10 Graeff et al.,6 and Geisler et al.17 Our study showed equal number of low and high grade cases in contrast to the studies by Berker et al.,7 Lee et al.,10 Hamdi et al.,15 Mary T. Sylvia et al.,13 and Dogan et al.4 where high-grade ovarian carcinomas was more than low-grade carcinomas. This discordance may be due to the low number of cases. Majority (79%) of the serous carcinoma were high grade than non-serous carcinomas as found by Köbel et al.18 and Arik et al. (Table 4).19

In studies done by Graeff et al.,6 Berker et al.,7 Renninson et al.,20 and Hamdi et al.15 the p53 expression were higher in serous carcinomas compared to non-serous carcinomas. In our study also, p53 expression was high (64%) in serous carcinomas compared to non-serous carcinomas (36%) which includes mucinous carcinoma, endometrioid carcinoma, and malignant Brenner tumor but statistical evaluation did not demonstrate the correlation (0.461) (Table 5).

An increasing prevalence of p53 positivity was seen in high-grade tumor in studies done by Berker et al.,7 Geisler et al.,17 and Lee et al.10 Similarly in our study, expression of p53 was seen in 60% of high-grade EOC and 40% of low grade EOC but was not statistically significant ($P = 0.204$) (Table 5).

Correlation of p53 expression with grade of serous carcinoma was statistically significant ($P = 0.05$) in our study as 68.4% of high-grade serous carcinoma was p53 positive while only 20% of low-grade serous carcinoma was p53 positive similar to study done by Giurgea et al.21 where 56.3% positivity was in high grade and 12.5% in low-grade carcinomas. These results are close to the dualistic model of carcinogenesis by Kurman et al.22 where they have reported p53 mutation in most of the high-grade serous carcinomas (Table 5).

In our study, 5 cases of high-grade tumors showed complete absence of immunostaining for p53, which includes 4 cases of high-grade serous carcinoma and 1 case of malignant Brenner tumor. Complete the absence of immunostaining for p53 was explained by Yemelyanova et al.23 in 2011 by analyzing for p53 mutations by nucleotide sequencing and p53 protein by IHC staining in ovarian carcinoma and showed that the missense mutation in p53 gene leads to the formation of a stable protein resulting in immunohistochemical expression and nucleotide deletions and nonsense mutation result in protein truncation and complete lack of immunostaining.

The results of p53 positivity in mucinous carcinoma were varied ranging from 8% to 100% in studies done by
### Table 7: Correlation of p53 intensity scale with histologic type and tumor grade

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>p53 intensity scale (N (%))</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><strong>Histologic type</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serous</td>
<td>4</td>
<td>17</td>
</tr>
<tr>
<td>Mucinous</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Endometroid</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Malignant brenner</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td><strong>Tumor grade</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>High</td>
<td>5</td>
<td>25</td>
</tr>
</tbody>
</table>

Renninson et al., Dogan et al., Hamdi et al., and Shi et al. and in our study it was 57.1% (Table 5). However, in the study by Ellenson et al. p53 expression was not associated with mucinous carcinoma.

In our study, p53 expression was determined by taking into account the combination of percentage of positive tumor cells (score), as well as staining intensity (grade) as in the studies by Lee et al. and Hamdi et al. Yemelyanova et al. in their study opine that determination of p53 expression by considering both score and grade is a complex process and all cases with 60-100% positive tumor cells demonstrate strong to moderate staining intensity and it is also difficult to reproduce, therefore, inclusion of staining intensity would not improve the performance of the test and suggested to score the p53 expression by percent of positive tumor cells.

While correlating p53 score with a grade of tumors, a score of 3+ was observed 50% of high-grade tumors and only 35% of low-grade tumors but was not statistically significant (P = 0.421). Similar to study done by Giurgeain et al. the prevalence of p53 immunostaining was 31% in low-grade carcinomas and 75% (score 3) in high-grade carcinomas (Table 6).

A statistically significant (P = 0.027) correlation was found while correlating p53 intensity scale with tumor grade, as most of the higher grade tumors (45%) showed intensity scale of Grade 3 compared to lower grade tumors (25%). Hamdi et al. also stated that strong p53 expression is seen in high grade than in low-grade tumors (Table 7).

**CONCLUSION**

The aim of this study was to determine the frequency of expression of p53 with various parameters in epithelial ovarian carcinoma has been aptly brought out in this study. The p53 positivity rate was high in patients of 5th and 6th decade, in serous carcinoma and in high grade in low-grade ovarian carcinoma. However, they did not show any statistically significant association may be due to the small number of cases in our study.

There was a statistically significant association with high-grade serous carcinoma and the p53 expression. The percentage of positive tumor cells for p53 and their staining intensity was more in high-grade tumors, and only the later feature was a statistically significant.

Therefore, the immunohistochemical study of p53 is a valuable aid to the prognostication of in epithelial ovarian carcinoma.

### REFERENCES

Shivakumar, et al.: Correlation of clinic-pathological parameters of EOC with p53 expression


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Fine Needle Aspiration Cytology: A Diagnostic Tool for Oral Lesions

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Abstract

Introduction: The oral cavity often shows a wide variety of lesions. In recent years fine needle aspiration cytology (FNAC) has been a tool for probable diagnosis because it is speedy, rapid, cost effective and less invasive procedure in comparison to biopsy. The simplicity of aspiration technique, however, does not mean that interpretation is less demanding than that of the surgical biopsy specimen.

Purpose: This study was carried out to assess the sensitivity, specificity, the diagnostic accuracy of FNAC in the oral lesions and to analyse the cyto-histopathology correlation.

Materials and Methods: This prospective study includes 82 patients with oral and oropharyngeal lesions who underwent FNAC. Both wet and dry smears were prepared. Final cytologic results were then compared with the definitive histopathological diagnoses, which were considered the gold standard.

Results: Out of 82 cases 75 (91.4%) were adequate for cytological study, in these 45 (60%) were neoplastic and 30 (40%) were non-neoplastic. 16 cases (35.5%) out of 45 neoplastic cases were diagnosed as benign and 29 (64.4%) as malignant. Chronic inflammation including chronic sialadenitis (n = 11, 36.6%) was the most common non-neoplastic lesion. The most common benign lesion was pleomorphic adenoma 3 (18.75% of total benign cases) while the most common malignant lesion was squamous cell carcinoma 23 (79.31% of total malignant cases). Cytological diagnoses were compared with the confirmatory histopathology diagnosis. There was one false negative case and one false positive case. The sensitivity was 94.44%; specificity was 85.71%; the positive predictive value was 94.44%; the negative predictive value was 85.71% with a diagnostic accuracy of 92.0%. P = 0.01. Kappa was 0.8.

Conclusion: FNAC was found to be highly accurate in the diagnosis of oral lesions. Detailed cytomorphologic examination coupled with clinical data, and appropriate use ancillary techniques can lead to an accurate diagnosis. Overlapping features of some tumors, especially in minor salivary glands, as well as limitations in accessibility of the lesions were probably responsible for the inaccurate diagnoses in few cases.

Key words: Cytology, Fine needle aspiration, Histopathology correlation, Oral cavity, Sialadenitis

INTRODUCTION

Fine-needle aspiration cytology (FNAC) is a procedure to obtain cells and tissue fragments through a needle introduced into abnormal tissue and its study.1 It is a simple, safe, speedy, cost-effective and rapid procedure. The simplicity of aspiration technique, however, does not mean that interpretation is less demanding than that of the surgical biopsy specimen. FNAC technique was first introduced in 1930 by Martin, Ellis, and Stewart.2,3

Oral cavity lesions are of unknown etiology, endemic in India and Indian subcontinent affecting mainly age group of 20-40 years.4 An allergic reaction has been suggested as a possible cause by some authors.5,6 It may be related to...
a peculiar dietary, component betel nut chewing, use of
tobacco and vitamin deficiency in Indians.4

The prevalence rate of oral cavity lesions varies from 0.2% to 0.5% in India with a higher percentage being found in southern areas of country.4 Sex ratio demonstrates male predominance.4 The incidence of oral cavity lesions is increasing now days probably due to increasing use of tobacco, pan masala and also because of better clinico histopathological diagnosis.

Pindborg et al. studied the disease submucous fibrosis and leukoplakia and defined it as “Insidious-chronic disease of unknown etiology” identified mainly in Indians and affecting all part of oral cavity and sometimes pharynx.7-9

Oral and oropharyngeal mass lesions are commonly diagnosed by biopsy. Traditional biopsy techniques in the oral cavity may require anesthesia and may have diagnostic difficulties particularly for transmucosal lesions. FNAC overcomes these shortcomings by providing a minimally invasive means to rapid diagnosis of intraoral lesions, and if necessary, a re-aspiration can be done quickly at the time of initial testing.4

There is a relatively large volume of literature documenting the effectiveness of FNA for diagnosis of head and neck and salivary gland lesions. Scant literature, however, explore the potential of FNA for the diagnosis of intraoral and lesions of the maxillofacial region.10 The diversity of lesion types, heterogeneity of cell population, difficulties in reaching and aspirating the lesion, and rarity of this type of lesion make the cytological diagnosis of oro-maxillofacial lesions difficult.

The fundamental indication for FNAC is a lesional mass that is palpable or visible by a radiological imaging method. This technique may also assist in establishing a specific diagnosis for radiolucent lesions of the jaw. The thinning or destruction of cortical bone permits the use of thin needles to aspirate such abnormalities.

This study was conducted to calculate the diagnostic accuracy, sensitivity, the specificity of needle aspiration of oral and oropharyngeal mass lesions and to study the cytological features in the aspirate so obtained.

MATERIALS AND METHODS

This study was conducted in the Department of Pathology and Department of ENT at a tertiary level teaching hospital in North India over a period of 2 years. A total of 82 cases were studied.

The procedure was well explained to patients in their language, and due consents were taken from all of them. Aspiration was performed with 22-23 gauge needle attached to a 20 ml disposable syringe. Visibility was enhanced by using a head mirror in a few cases. The needle was introduced into the target and suction was applied by retracting the syringe plunger to the 1-2 ml mark. The needle moved back and forth 4-5 times in same plane to ensure minimal bleeding. Aspiration was taken from proliferative or ulceroc-proliferative lesions. Both air dried, and wet fixed smears were prepared. Whenever needed, Ziehl-Neelsen staining was performed. The smears were then cytologically examined, and a diagnosis was made. The smears were reported as inadequate in cases when:

i. Only hemorrhagic material was aspirated
ii. Only benign squamous epithelial cells were seen, not directing towards any specific diagnosis.

In 28 cases, biopsies were taken, and histopathological diagnosis was given which were then correlated.

All the statistical parameters were calculated using Statistical Package for the Social Sciences version 20 software.

RESULTS

The results of twenty-eight patients, who had both FNAC and histopathological examination, were analyzed. Among the total patients (82) included in the study 57 (69.51%) were male and 25 (30.48%) were female. Age of the patients ranged from 10 to 82 years with a mean age of 40.74 years. The maximum number of patients were in the 31-40 years of age (n = 27) followed by 41-50 years of age (14 patients) (Table 1). A total of 12 sites were aspirated from oral and oropharyngeal regions. Maximum aspirates (n = 20) were from buccal mucosa followed by aspirates from the tongue (n = 11) (Table 2).

The FNAC results revealed 29 malignant and 16 benign cases. Among the malignant lesions squamous cell carcinoma was seen in 23 (79.3% out of all malignant lesions) patients (Figures 1 and 2). Among non-neoplastic

| Table 1: Distribution of cases according to age |
|---|---|---|
| Age group (in years) | Number of cases | Percentage |
| 0-10 | 01 | 1.21 |
| 11-20 | 09 | 10.97 |
| 21-30 | 11 | 13.41 |
| 31-40 | 27 | 32.92 |
| 41-50 | 14 | 17.07 |
| 51-60 | 13 | 15.85 |
| 61-70 | 06 | 7.31 |
| 71-80 | 00 | 00 |
| 81-90 | 01 | 1.21 |
| Total | 82 | 9 |
lesion, chronic inflammation was seen in 11 (36.6% of all non-neoplastic lesions) patients (Figures 3 and 4, Table 3).

Histopathology of subsequent punch biopsy specimens showed malignant lesions in 19 (67.85%) and benign in 9 (32.14%) patients (Table 4).

**Correlation of FNAC with Histopathology Reports**

It was found that most of the benign and malignant lesions reported in FNAC correlated with the histopathology results. There was one false positive result in the benign group where aspiration showed squamous cell carcinoma, but the histopathology showed keratosis only.

Similarly, there was one false negative where FNAC showed chronic inflammatory lesion and the histopathology report showed squamous cell carcinoma.

**Table 2: Distribution of different lesions according to site**

<table>
<thead>
<tr>
<th>Site</th>
<th>Lesions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buccal mucosa (20)</td>
<td>SCC (9), benign spindle cell lesion (1), NHL (1), carcinoma ex pleomorphic adenoma (1), hemangioma (1), Chronic sialadenitis (1), acrochordon (1), Acute inflammation (1), Chronic inflammation (1), inadequate (3)</td>
</tr>
<tr>
<td>Tongue (16)</td>
<td>SCC (7), metastatic SCC (1), squamous papilloma/acrochordon (1), acute inflammation (2), chronic inflammation (1), hemangioma (2), cystic lesion (1), Poorly diff ca/adenoid cystic ca/basal cell carcinoma (1)</td>
</tr>
<tr>
<td>Alveolus (11)</td>
<td>SCC (1), benign spindle cell lesion (1), chronic inflammation (1), infected epidermal cyst (1), acute inflammation (2), chronic sialadenitis (2), mucoepidermoid carcinoma (1), Tuberculosis (1), inadequate (1)</td>
</tr>
<tr>
<td>Palate (11)</td>
<td>SCC (1), pleomorphic adenoma (3), basal cell adenoma/myoepithelioma (1), inflammatory cystic lesion (1), benign spindle cell lesion (1), chronic inflammation (1), acrochordon (1), inadequate (2)</td>
</tr>
<tr>
<td>Floor of mouth (7)</td>
<td>Mucocoele (3), chronic sialadenitis (4)</td>
</tr>
<tr>
<td>Paratonsillar (6)</td>
<td>SCC (2), met. SCC (1), acute inflammation (1), acinic cell carcinoma (1), inadequate (1)</td>
</tr>
<tr>
<td>Lip (4)</td>
<td>Mucocoele (1), hemangioma (3)</td>
</tr>
<tr>
<td>Sublingual (2)</td>
<td>Mucocoele (2)</td>
</tr>
<tr>
<td>Oropharynx (2)</td>
<td>SCC (2)</td>
</tr>
<tr>
<td>Tonsil (1)</td>
<td>Acute inflammation (1)</td>
</tr>
<tr>
<td>Angle of mouth (1)</td>
<td>Giant cell granuloma (1)</td>
</tr>
<tr>
<td>Pharynx (1)</td>
<td>Cystic lesion (?atypical branchial cyst) (1)</td>
</tr>
</tbody>
</table>

SCC: Squamous cell carcinoma, NHL: Non-Hodgkin’s lymphoma

**Figure 1: Photomicrograph of poorly differentiated squamous cell carcinoma showing sheets of malignant squamous epithelial cells (H and E, ×400)**

**Figure 2: Section shows moderately differentiated malignant squamous epithelial cells. High N: C ratio is seen with hyperchromatic nuclei and pleomorphism (H and E, ×400)**

**Figure 3: Photomicrograph of smear shows ductal epithelial cells against a background of acute inflammatory cells. A diagnosis of obstructive sialadenitis was given (H and E, ×400)**

**Figure 4: Section shows abundant mucinous glands with mild chronic inflammatory infiltrate; (H and E, ×100)**
Data analysis showed sensitivity 94.44% and specificity 85.71% with positive predictive value (PPV) and negative predictive value (NPV) of 94.44% and 85.71% respectively. The diagnostic accuracy was found 92%. P < 0.05, which is significant and kappa was 0.81 (kappa value >0.75 shows excellent correlation between two studies).

**DISCUSSION**

A wide range of age was observed in the present study. The youngest case in the present study aged 12 years and the oldest case were of 82 years of age. Previous studies also yielded subjects with a wide range of age. Only a study was done by Saleh et al. had subjects from 30 to 87 years.

In a study conducted by Singh et al. the age of the patients was found to be 14 months to 84 years.

Similarly in the studies conducted by Deng et al., Singh et al., the patients fell in the age group of 3-91 years and 5-80 years respectively.

Aspirates were taken from various sites. This study had maximum aspirates from the buccal mucosa (Table 5).

**Malignant Lesions and Benign Lesions**

Squamous cell carcinoma was the most common oral and oropharyngeal lesion, which was aspirated in the current study. Results of other comparable studies reported in the literature are shown in Table 6.

The most common non-malignant lesions diagnosed on FNAC in the literature are given in Table 7.

**Table 3: Distribution of different cytological diagnosis of oral cavity and oropharynx**

<table>
<thead>
<tr>
<th>S. no.</th>
<th>Lesions</th>
<th>No. of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SCC</td>
<td>23</td>
<td>30.66</td>
</tr>
<tr>
<td>2</td>
<td>Chronic inflammatory lesion including</td>
<td>11</td>
<td>14.66</td>
</tr>
<tr>
<td></td>
<td>chronic sialadenitis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Acute/subacute inflammation</td>
<td>07</td>
<td>9.33</td>
</tr>
<tr>
<td>4</td>
<td>Mucocoele</td>
<td>06</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>Hematoma/hemangioma</td>
<td>06</td>
<td>8</td>
</tr>
<tr>
<td>6</td>
<td>Cystic lesion with/without inflammation</td>
<td>04</td>
<td>5.33</td>
</tr>
<tr>
<td>7</td>
<td>Pleomorphic adenoma</td>
<td>03</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>Squamous papilloma/acrochordon</td>
<td>03</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>Benign spindle cell lesion</td>
<td>03</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>Mucoepidermoid carcinoma</td>
<td>01</td>
<td>1.33</td>
</tr>
<tr>
<td>11</td>
<td>Metastatic SCC</td>
<td>01</td>
<td>1.33</td>
</tr>
<tr>
<td>12</td>
<td>Poorly diff ca adenoid cyst ca/basal cell carcinoma</td>
<td>01</td>
<td>1.33</td>
</tr>
<tr>
<td>13</td>
<td>Basal cell adenoma/myoepithelioma</td>
<td>01</td>
<td>1.33</td>
</tr>
<tr>
<td>14</td>
<td>Carcinoma ex pleomorphic adenoma</td>
<td>01</td>
<td>1.33</td>
</tr>
<tr>
<td>15</td>
<td>Acinic cell carcinoma</td>
<td>01</td>
<td>1.33</td>
</tr>
<tr>
<td>16</td>
<td>Large cell NHL</td>
<td>01</td>
<td>1.33</td>
</tr>
<tr>
<td>17</td>
<td>Giant cell granuloma</td>
<td>01</td>
<td>1.33</td>
</tr>
<tr>
<td>18</td>
<td>Tuberculosis</td>
<td>01</td>
<td>1.33</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>75</td>
<td>9</td>
</tr>
</tbody>
</table>

**Table 4: Cyto-histological correlation**

<table>
<thead>
<tr>
<th>Number of cases</th>
<th>Histologic diagnosis</th>
<th>Cytologic diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>SCC</td>
<td>17 SCC (TP)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 chronic inflammatory lesion (FN)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 non diagnostic</td>
</tr>
<tr>
<td>1</td>
<td>Mucocoele</td>
<td>1 mucocoele (TN)</td>
</tr>
<tr>
<td>1</td>
<td>Pyogenic granuloma</td>
<td>1 hemangioma (TN)</td>
</tr>
<tr>
<td>1</td>
<td>Chronic inflammation</td>
<td>1 chronic inflammation (TN)</td>
</tr>
<tr>
<td>1</td>
<td>Cellular fibrous</td>
<td>1 benign spindle cell lesion (TN)</td>
</tr>
<tr>
<td>1</td>
<td>Histiocytoma</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Acrochordon</td>
<td>Acrochordon (TN)</td>
</tr>
<tr>
<td>1</td>
<td>Moderate dysplasia</td>
<td>1 non diagnostic</td>
</tr>
<tr>
<td></td>
<td>(lichenoid type)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Pseudoepitheliomatous hyperplasia and</td>
<td>1 non diagnostic</td>
</tr>
<tr>
<td></td>
<td>?histoplasma</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Keratosis</td>
<td>SCC (FP)</td>
</tr>
<tr>
<td>1</td>
<td>Tongue cyst</td>
<td>1 Acute suppurative lesion (TN)</td>
</tr>
</tbody>
</table>

**Table 5: A comparison showing the most common site of aspiration in other studies with present study**

<table>
<thead>
<tr>
<th>Studies</th>
<th>Most common site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saleh et al. 2008</td>
<td>Pharynx/oropharynx</td>
</tr>
<tr>
<td>Deng et al. 2011</td>
<td>Palate</td>
</tr>
<tr>
<td>Singh et al. 2011</td>
<td>Mandible</td>
</tr>
<tr>
<td>Gillani et al. 2012</td>
<td>Alveolar ridge</td>
</tr>
<tr>
<td>Present study</td>
<td>Buccal mucosa</td>
</tr>
</tbody>
</table>

**Table 6: A comparison showing the most common malignant lesion in various studies with present study**

<table>
<thead>
<tr>
<th>Studies</th>
<th>Most common malignant lesion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saleh et al. 2008</td>
<td>SCC (22.2%)</td>
</tr>
<tr>
<td>Deng et al. 2011</td>
<td>SCC, basoloid neoplasm, metastatic (18.1%)</td>
</tr>
<tr>
<td>Singh et al. 2011</td>
<td>SCC (28.0%)</td>
</tr>
<tr>
<td>Gillani et al. 2012</td>
<td>SCC (60%)</td>
</tr>
<tr>
<td>Present study</td>
<td>SCC (79.31%)</td>
</tr>
</tbody>
</table>

**Table 7: A comparison showing the most common non-malignant lesion in other studies with present study**

<table>
<thead>
<tr>
<th>Studies</th>
<th>Most common non-malignant lesion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abrai et al. 2002</td>
<td>Pleomorphic adenoma (59.0%)</td>
</tr>
<tr>
<td>Singh et al. 2008</td>
<td>Chronic inflammatory lesions (35.3%)</td>
</tr>
<tr>
<td>Deng et al. 2011</td>
<td>Cystic lesions (23.5%)</td>
</tr>
<tr>
<td>Singh et al. 2011</td>
<td>Acute inflammatory lesions (34.6%)</td>
</tr>
<tr>
<td>Present study</td>
<td>Chronic inflammatory lesions- including chronic sialadenitis (36.66%)</td>
</tr>
</tbody>
</table>
The results of the current study are in accordance with those of Singh et al., i.e., chronic inflammatory lesions, including chronic sialadenitis. Even in the other studies, the frequency of pleomorphic adenoma ranged from 11.7% to 26.9%, which is roughly similar to the results in the current study.\textsuperscript{11,14}

**Sensitivity**

The present study which had a high sensitivity of 94.44\% showed concordance with Gandhi et al.\textsuperscript{18} and Singh et al.\textsuperscript{15} which had a sensitivity of 93.75\% and 97.87\%, respectively (Table 8).

**Specificity**

Our study which showed a specificity of 85.71\%, was in concordance with Singh et al.\textsuperscript{15} which had a specificity of 88.35\% (Table 8).

**Positive Predictive Value**

Our study had a PPV of 94.4\% that corresponds to PPV of Singh et al.\textsuperscript{15} which is 93.93\% (Table 9).

**Negative Predictive Value**

The NPV for our present study is 85.71\%, which is in concordance with Hafez et al.\textsuperscript{19} which was 89.3\% (Table 9).

**Diagnostic Accuracy**

The diagnostic accuracy of our present study is 92\%, which is similar to Singh et al.\textsuperscript{15} and Gandhi et al.\textsuperscript{18} which were 93.75\% and 90\% respectively (Table 8).

### Table 8: A comparison of sensitivity, specificity and diagnostic accuracy of various studies with present study

<table>
<thead>
<tr>
<th>Study</th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
<th>Diagnostic accuracy (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singh et al.\textsuperscript{15} 2008</td>
<td>97.87</td>
<td>88.35</td>
<td>93.75</td>
</tr>
<tr>
<td>Deng et al.\textsuperscript{11} 2011</td>
<td>9</td>
<td>95</td>
<td>97</td>
</tr>
<tr>
<td>Singh et al.\textsuperscript{18} 2011</td>
<td>77.70</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Gandhi et al.\textsuperscript{18} 2011</td>
<td>93.75</td>
<td>94.45</td>
<td>90</td>
</tr>
<tr>
<td>Present study</td>
<td>94.44</td>
<td>85.71</td>
<td>92</td>
</tr>
</tbody>
</table>

### Table 9: A comparison of NPV and PPV with present study

<table>
<thead>
<tr>
<th>Study</th>
<th>PPV (%)</th>
<th>NPV (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singh et al.\textsuperscript{15} 2008</td>
<td>93.93</td>
<td>93.75</td>
</tr>
<tr>
<td>Gillani et al.\textsuperscript{16} 2012</td>
<td>97.0</td>
<td>9</td>
</tr>
<tr>
<td>Hafez et al.\textsuperscript{19} 2014</td>
<td>97.7</td>
<td>89.3</td>
</tr>
<tr>
<td>Present study</td>
<td>94.4</td>
<td>85.71</td>
</tr>
</tbody>
</table>

PPV: Positive predictive value, NPV: Negative predictive value

### CONCLUSION

Cytological examination of the oral cavity is an accurate and reliable diagnostic tool in the pre-operative work-up of patients with intraoral lesions. Detailed cytomorphologic examination coupled with clinical data, and appropriate immunocytochemical study can lead to an accurate diagnosis. Although most cases are not problematic, there are few cases that can be challenging to the cytopathologists, especially minor salivary gland masses. These pitfalls, therefore, should always be kept in mind when faced with.

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**Source of Support:** Nil, **Conflict of Interest:** None declared.
Use and Accuracy of Fine Needle Aspiration Cytology in Thyroid Lesion: Our Experience in a Tertiary Teaching Hospital in North India

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Abstract

Background: Thyroid lesions are one of the common lesions encountered in clinical practice now days. Fine-needle aspiration cytology (FNAC) is considered a well-established diagnostic tool for the evaluation of clinically palpable thyroid lesions. It is a safe, non-invasive, cost-effective and efficient time-saving procedure that provides specific diagnosis rapidly with minimal complications.

Purpose: The aim of this study was to diagnose the spectrum of thyroid lesions by fine-needle aspiration cytology and to correlate these with histopathology findings of excised specimens.

Materials and Methods: FNAC was performed in total 252 patients with a thyroid swelling from December 2012 to December 2014, at a tertiary care teaching hospital. Cyto-histopathological correlation was done in 121 patients.

Results: Out of 252 patients, with thyroid swelling (M:F = 1:3) majority were in younger age group (n = 106 [42.06%] 21-40 years). In 240 adequate smears for cytological interpretations, colloid goiter was the most common diagnosis. Of these, 121 cases were surgically treated, and the tissue was submitted for a histopathological study, which showed 118 non-neoplastic lesions and 4 as neoplastic. In the present study, the cyto-histological concordance rate was 97.5%. The sensitivity, specificity, positive and negative predictive value and diagnostic accuracy are 50%, 99.14%, 66.6%, 98.3% and 97.5% respectively with significant \( P = 0.03 \) and kappa value = 0.6, which shows a good cyto-histological correlation.

Conclusion: FNAC is an excellent safe diagnostic procedure with a high degree of diagnostic accuracy and plays a crucial role in the selection of patients for surgery thus minimizing their expenditure and hospitalization.

Key words: Colloid goiter, Diagnostic accuracy, Fine needle aspiration cytology, Thyroid lesions

INTRODUCTION

Thyroid lesions are common lesions encountered in the outpatient department (OPD). Awareness and understanding of wide spectrum thyroid disorders are of great value because most lesions are treatable by medical or surgical management. Fine needle aspiration cytology (FNAC) is a safe, non-invasive, cost-effective and efficient time-saving OPD procedure, which provides specific, rapid diagnosis with minimal complications. FNAC is a well-established diagnostic tool for the evaluation of clinically palpable thyroid lesions. Although it is not a substitute for conventional histopathology, it should be considered as an essential component of preoperative/investigative procedure of pathological process.¹

The prevalence of thyroid lesions is higher in women (5%) than in men (1%).² However, most of the nodules are
benign and depending on age, gender, radiation exposure history, family history, and other factors, malignancy can be present in 5-10% of nodules only.\textsuperscript{2,3}

The routine use of this technique in the assessment of thyroid lesion has reduced the number of patients subjected to surgeries. Although FNAC is not a substitute for conventional histopathology, it is extremely valuable in categorizing the diseases. It bridges the gap between clinical evaluation and final surgical pathological diagnosis in the majority of cases and helps to reduce unwarranted surgeries. As a result, the incidence of malignancy at thyroidectomy has increased from 5-10% to 30-50%.\textsuperscript{4,5}

Different imaging techniques are now days used for preoperative diagnosis of clinically palpable thyroid lesions such as radio-nuclide scanning and high-resolution ultrasonography. However, FNAC is still regarded as the most accurate, time-saving and cost effective procedure, particularly if ultrasound is used as a guide for better sample collection especially in cystic lesions.

Today this procedure is practiced all over the world as an investigation of choice. Besides thyroid, it is used in other swellings as well like salivary glands, breast lesions, soft tissue and lymph nodes.\textsuperscript{6}

The aim of this study is to analyze the cytomorphology of clinically palpable thyroid lesions and correlate the findings with histopathological examination and to evaluate its sensitivity and specificity.

**MATERIALS AND METHODS**

This study was carried out in the Department of Pathology, of a tertiary teaching hospital, from December 2012 to December 2014. FNA was performed in 252 patients, presenting with the thyroid swelling referred from the various departments.

All the cases of thyroid swellings were included in the study and all the cases having neck swelling other than thyroid were excluded.

All the patients were carefully examined, and the procedure detail was explained to them in their language and a written consent was taken. Aspiration was done under aseptic precautions by 22-23 gauge needle, and both dry and wet smears were prepared. In cases of cystic and heterogeneous lesions or whenever cells were not retrieved by direct aspiration, guided aspiration was done. We categorized our results into inadequate/non-diagnostic, benign, follicular lesion of undetermined significance (FLUS)/ atypia of undetermined significance (AUS), suspicious for malignancy and malignant sampling according to the recent Bethesda classification.

The FNAC results were compared with the histological diagnosis which was considered as gold standard. Cases with cyto-histological disparity were re-evaluated for a probable reason. Statistical analysis of data was performed by using SPSS version 20 software. The sensitivity, specificity, positive and negative predictive value and diagnostic accuracy of FNAC in diagnosing thyroid lesions were calculated.

**OBSERVATION AND RESULTS**

Out of 252 cases with a thyroid swelling, 189 (75%) were females and 63 (25%) were males (M:F = 1:3). The age ranged from 10 years to 85 years with mean age of 37.86 years.

FNAC results were interpreted according to Bethesda classification and showed 200 benign cases (79.3%), 5 FLUS/AUS cases (1.9%), 13 cases (5.1%) of follicular neoplasm/suspicious for follicular neoplasm, 12 cases (4.5%) suspicious for malignancy, 10 cases (3.9%) malignant and 12 cases (4.7%) as Inadequate/non-diagnostic. Colloid goiter was the most common diagnosis in benign lesions. The malignant lesions showed papillary carcinoma (7 cases), medullary carcinoma (1 case) and anaplastic carcinoma (2 cases) (Table 1 and Figures 1-4).

The FNAC diagnosis was compared with the corresponding histopathological diagnosis. Out of 252 cases of FNAC, 121 thyroid specimens were subjected for histopathological evaluation. Cyto-histological concordance was found in 118 cases (97.5%), whereas 3 cases were discordant. Out of 2 cases reported as benign on cytology, one case was diagnosed as papillary carcinoma and other as follicular carcinoma thyroid on histopathology. 1 case reported as malignant on cytology was nodular goiter on histopathology (Table 2).

In the present study, the sensitivity, specificity, positive and negative predictive value and diagnostic accuracy of FNAC

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**Table 1: The cytological diagnosis distribution as per the bethesda classification**

<table>
<thead>
<tr>
<th>FNAC diagnosis</th>
<th>No. of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non diagnostic/inadequate</td>
<td>12</td>
<td>4.7</td>
</tr>
<tr>
<td>Benign</td>
<td>200</td>
<td>79.3</td>
</tr>
<tr>
<td>AUS/FLUS</td>
<td>5</td>
<td>1.9</td>
</tr>
<tr>
<td>FN/SFN</td>
<td>13</td>
<td>5.1</td>
</tr>
<tr>
<td>Suspicious for Malignancy</td>
<td>12</td>
<td>4.5</td>
</tr>
<tr>
<td>Malignant</td>
<td>10</td>
<td>3.9</td>
</tr>
</tbody>
</table>

Mittal, et al.: Cytological Study of Thyroid Lesions with its Histopathological Correlation

in diagnosing thyroid lesions were found 50%, 94.1%, 66.6%, 98.3% and 97.5%, respectively (Table 3).

**DISCUSSION**

Currently, FNAC of the thyroid nodule is a well-established and preferred diagnostic method for the initial evaluation of thyroid lesions as it has decreased the number of patient who underwent surgical treatment by 25-50%, thus increasing the percentage of malignant results in the operated group of patients.7

The present study was undertaken to evaluate, the type of thyroid lesion preoperatively with the help of FNAC and to correlate the observations with the histopathological examination in order to determine the usefulness and diagnostic accuracy of this technique.

The FNAC of the thyroid gland was performed in 252 cases, out of which histopathological specimen of 121 patients were received during the study period. Comparison of various parameters in our present study was done with previous studies.

In our study, the age of the patients ranged from 5 years to 85 years with most of the patients in the third and fourth decade (mean = 37.86) which is similar to the previous studies.5,8,9

Females were more affected than males in this study, which showed concordance with the previous studies.8,12

The inadequacy rate in the present study was 4.7%. Previous studies have shown the variable percentage of inadequate material ranging from 0% to 25%.5,13,14 Ali et al. suggested that the rate of non-diagnostic tests should be kept below 10%.15

Inadequate FNA specimen can occur as a result of sampling error, faulty technique and in highly vascular or
focal lesions. Ultra-sound guided sampling reduces the non-diagnostic test result.\textsuperscript{15,16}

The reason for lower percentage in the non-diagnostic and atypical follicular lesion of undetermined significance categories can be attributed to the fact that in our institutional setting, usually an ultrasound-guided FNAC is being performed by cytopathologist himself, for small nodules and nodules that appear heterogeneous on palpation, so the aspirate are procured from the exact site with a better quality and adequacy. This led to a reduction in the non-diagnostic cases thereby allowing more specific cytological diagnosis.

Being a tertiary care center, this institute caters a large population, representative of the general population, moreover this region comes under sub-Himalayan belt or “goiter belt”, therefore proportion of benign cases is more as compared to other entities.\textsuperscript{17}

The cytomorphicologic interpretation of AUS is subjective. Therefore the rate of AUS diagnosis is variable among institutions and pathologists. In some studies, the diagnosis of “AUS/FLUS,” “FN/SFN” and “suspicious for malignancy” are defined as intermediate category. We grouped these lesions as neoplastic lesions.

In the present study, the cyto-histological concordance rate was achieved in 118 (97.5\%) cases whereas 3 cases showed discordance ($n = 2$, 1.65\% false negative and $n = 1$, 0.80\% false positive [FP]).

Misinterpretation of aspirate from a non-neoplastic lesion of the thyroid as neoplastic (FP) occurred in 1 case in our study where a follicular neoplasm reported on FNAC was found to be colloid goiter on histopathology, as aspiration was probably done from the hypercellular areas of colloid nodules which led to over-diagnosis. A possible remedy is multiple aspirates from different parts of the swelling that could demonstrate colloid - rich areas and monolayered sheets of epithelial cells representing macrofollicles and degenerative changes, which would suggest the possibility of non-neoplastic lesions.\textsuperscript{18}

False negative cases (misinterpretation of aspirates from neoplastic lesions of thyroid as non-neoplastic) may also occur due to error in the sampling or misinterpretation of cytological material because of overlapping features of different lesions, these are of great concern because it indicates potential to miss malignant lesion.\textsuperscript{19} Since only a small percentage of patients with benign cytological findings undergo surgery, it is difficult to state the exact frequency of false negative results.\textsuperscript{20} In our study, a false negative diagnosis of colloid goiter was rendered in 2 cases, which turned out to be neoplasm on histopathological examination, one papillary carcinoma and other follicular carcinoma. False negative results in our series accords with the reports that suggest a range in literature from 1\% to 11\%.\textsuperscript{20,21} False negative cytology results delays in treatment and hence adversely affects the outcome in patients with malignancy.\textsuperscript{22}

Cytological examination in the first false negative case showed abundant colloid with low cellularity of follicular cells and cystic macrophages, which led to misinterpretation as a benign lesion. An accurate diagnosis could not render because of sampling from cystic areas and aspirating abundant colloid rather than cellular area. The occurrence

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**Table 2: Cyto-histo correlation of thyroid lesion**

<table>
<thead>
<tr>
<th>Bethesda category</th>
<th>FNAC diagnosis</th>
<th>Histopathological diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Benign</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>90 cases of Colloid goiter</td>
<td>88 cases of colloid goiter 1 case of MNG with lymphocytic thyroiditis 1 case of benign cystic lesion</td>
</tr>
<tr>
<td></td>
<td>15 cases of colloid goiter with cystic change</td>
<td>15 cases of colloid goiter</td>
</tr>
<tr>
<td></td>
<td>4 cases of colloid goiter with hurthle cell change</td>
<td>4 cases of colloid goiter</td>
</tr>
<tr>
<td></td>
<td>1 case of colloid nodule</td>
<td>1 case of colloid goiter</td>
</tr>
<tr>
<td></td>
<td>4 cases of multinodular goiter</td>
<td>3 case of colloid goiter 1 case of multinodular goiter</td>
</tr>
<tr>
<td></td>
<td>1 case of de-quivvains thyroiditis</td>
<td>1 case of colloid goiter</td>
</tr>
<tr>
<td></td>
<td>1 case of hyperplastic nodule</td>
<td>1 case of colloid goiter</td>
</tr>
<tr>
<td></td>
<td>1 case of colloid goiter</td>
<td>Papillary carcinoma thyroid</td>
</tr>
<tr>
<td></td>
<td>1 case of colloid goiter</td>
<td>Follicular carcinoma thyroid</td>
</tr>
<tr>
<td>4. Category</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 case of hurthle cell neoplasm</td>
<td>Hurthle cell adenoma with colloid nodule</td>
</tr>
<tr>
<td></td>
<td>1 case of FN</td>
<td>Follicular adenoma</td>
</tr>
<tr>
<td></td>
<td>1 case of FN</td>
<td>Nodular goiter</td>
</tr>
</tbody>
</table>

**Table 3: Diagnostic accuracy of FNAC in thyroid lesion**

<table>
<thead>
<tr>
<th>FNAC diagnosis</th>
<th>Total number of FNAC cases</th>
<th>number of cases with surgical biopsy</th>
<th>Correct FNAC diagnosis</th>
<th>FN</th>
<th>FP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benign</td>
<td>200</td>
<td>117</td>
<td>116</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Malignant</td>
<td>40</td>
<td>04</td>
<td>02</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Unsatisfactory</td>
<td>12</td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>252</td>
<td>121</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

FNAC: Fine needle aspiration cytology, FN: Follicular neoplasm
of cystic change in thyroid lesions is a common diagnostic pitfall in cytology. Most authors recommend preparation of 4-6 smears from different areas of the nodule. Strict criteria for specimen adequacy could help to reduce markedly the erroneous diagnosis in such cases. Ultrasound-guided FNAC results in better sample acquisition leading to low rate of non-diagnostic smears and high overall accuracy.

Cytological examination in the second case show moderate cellularity with small clumps of thyroid follicular cells arranged in poorly cohesive groups and a moderate amount of colloid favoring a diagnosis of colloid goiter. Histological features were consistent with follicular carcinoma showing vascular and capsular invasion. Cytological differentiation between follicular neoplasm and nodular goiter is often difficult. Aspiration, in this case, was probably done from colloid - a rich macrofollicular area of the neoplasm. As possible remedial measures, cytological features like increased cellularity with nuclear crowding and overlapping, repetitive uniform follicular cell patterns, syncytial clusters, microfollicular structure, scantly or no colloid may help in distinguishing follicular neoplasm from colloid goiter, although none of them is conclusive.

Sometimes marked cellularity is another problem in thyroid cytology. Increased cellularity of the smear and loss of cohesion may be present in the hyperplastic nodule, adenoma or in carcinoma. It is also, difficult to differentiate follicular adenoma from carcinoma on the cytological assessment because cytology cannot evaluate the criteria of vascular or capsular invasion or of intrathyroid spread.

So, it is concluded that proper sampling from representative sites is utmost importance for an accurate diagnosis. Most authors recommend preparation of 4-6 smears from different areas of the nodule. Strict criteria for specimen adequacy could help to reduce markedly the erroneous diagnosis in such cases. Ultrasound-guided FNAC results in better sample acquisition leading to a low rate of non-diagnostic smears, and high overall accuracy and pathologist should be aware of standard pitfalls thus facilitating the correct diagnosis. As reported earlier, the sensitivity of the thyroid FNAC ranges from 43% to 99% and its specificity was found 72-100% respectively. In our study, findings were comparable with the results in these series.

In our study, we find the diagnostic accuracy 97.5%, specificity 99.14%, sensitivity 50%, Positive predictive value 66.6% and negative predictive value 98.3%. Other statistical indices like Chi-square value = 4.7117E-12, P = 0.03 which is significant and kappa value = 0.6 (kappa value > 0.75 shows excellent correlation between two studies). The overall diagnostic accuracy in our series is also comparable with previous studies.

CONCLUSION

Thus, we conclude from this that FNAC is an excellent, safe diagnostic procedure with a high degree of accuracy and less invasive procedure than a tissue biopsy. The yield on FNAC can be increased by USG guided aspiration. It plays a crucial role in the selection of patients in surgical management thus minimizing the surgical burden.

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Maxillary Sinus Septation: A Radiological Study

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Abstract

Introduction: Bony septa in the maxillary sinus, which subdivide the antrum into recesses, were first described by Underwood in 1910. These septa are composed of cortical bone and may be partial or complete. They are located in either the anterior, premolar or molar region and are classified therein as anterior, middle, and posterior. They have also been classified as primary or secondary based on whether they are formed as a result of tooth eruption or following tooth loss, respectively. The importance of identifying these septae arises from the spate of sinus lift surgeries performed in the area to facilitate dental implant placement.

Objective: To study the presence of septation in maxillary sinuses by examining radiographic images obtained by computed tomography (CT).

Materials and Methods: This is a retrospective observational study. 157 coronal CT scans obtained were observed and analyzed for the presence of septae in the maxillary sinus.

Results: A total of 33 (21%) patient radiographs showed the presence of septae of which 16 were bilateral and 17 had unilateral septa.

Conclusion: The presence of septae in the maxillary sinus is a criterion to be considered when planning sinus lift and implantation procedures. The estimation of the probability of encountering such septae is vital in surgical planning and such studies from the Indian population will generate valuable data for the same.

Key words: Dental implants, Maxillary antrum, Maxillary sinus, Maxillary sinus floor augmentation

INTRODUCTION

The presence of bony septa in the maxillary sinus was first described by Underwood in 1910.1 The septa are composed of cortical bone and may be either complete or partial. They subdivide the maxillary sinus into recesses. The septae are classified by region of occurrence into anterior, middle and posterior if they are present up to the distal surface of II premolar, I and II molar and III molar, retromolar regions, respectively.1 Krennmair et al. further classified septae based on their mechanism of formation, as the primary following eruption of teeth and secondary if they were formed due to sinus pneumatization after tooth loss.2

The recent increase in the number of patients undergoing dental implant procedures has reciprocally increased the number of sinus floor elevation/augmentation surgeries in the case of patients who lack the required minimal bone width for placement of maxillary implants.3 The presence of sinus septae may necessitate modification of the surgical approach in order to prevent perforation of the Schneiderian membrane, which is the lining of the maxillary sinus.4-6 It was suggested that maxillary septae be classified as easy (E), moderate (M), and difficult (D) to enable the surgeon to tailor surgical management according to category.7

Comprehensive data on the prevalence of maxillary sinus septation from the Indian population is not available. We undertook this study to determine the presence of septation in maxillary sinuses in Trichy population by
examining radiographic images obtained by computed tomography (CT).

MATERIALS AND METHODS

Radiologic data were collected from 157 coronal CT scans obtained from the Department of Radiodiagnosis at our medical college hospital. Dual slice coronal CT images obtained by Wipro GE model 5114671/2 machine were analyzed by two independent observers. Images that showed pathologies that obscured maxillary sinus details were excluded from the study. A total of 314 sinuses from 157 patients were studied and analyzed for the presence of septae in the maxillary sinus. The unilateral and bilaterality of septae was made note of. Demographic details of age and gender were recorded. Institutional ethical committee clearance was obtained prior to the study.

RESULTS

Sample Characteristics

The age group of the sample ranged from 10 to 68 years with a mean age of 31 ± 1.2 years. The sample comprised of data from 78 females (50%) and 79 males (50%).

Prevalence of Maxillary Septae

The prevalence of septa was found to be 21% based on the number of patients ($n = 33$). Among the 33 patients in whom septae were observed, 17 were unilateral (51%) (Figure 1) and 16 were bilateral (49%) (Figure 2). 54.54% of septae were seen among males, whereas 45.46% of the observed septae were in females. The percentage of unilateral and bilateral septae seen in males and females respectively are represented in Graph 1. Septae were observed in different orientations, namely horizontal (Figure 3), vertical (Figure 4) and oblique (Figure 3). Of the 17 unilateral septae, 10 were on the right side maxilla (59%) and 7 were on the left side (41%). Among the studied sinuses, the prevalence was 15.6% ($n = 49$). All septae observed in our study were of primary type i.e., in dentulous areas. Septae were seen in anterior, middle and posterior regions (Figures 3, 5 and 6). 5 sinuses showed multiple septae (Figure 3).

DISCUSSION

Previous studies on maxillary septae estimate the prevalence to vary between 13% and 35.3% based on sinuses and between 21.6% and 66.7% based on patients. Prevalence rates based on patients as observed in our study falls within these limits. However, our prevalence rates based on sinuses are lower when compared to these. This may
be explained based on the dual slice imaging modality used in the study. Multislice CT has been used as the imaging tool in these studies. The sinus septae were studied after 3-D reconstruction of images. It has been demonstrated that identification of septae can be done by different study tools - whether cadaveric dissection, orthopantomograph, 3-D CT or during sinus surgery. 3-D CT is a more accurate tool to assess the presence and morphology of maxillary sinus septae, while orthopantomographs have been reported to give false results regarding the presence of septae. Hence, lower rates in our study may be attributed to the modality used (2-D CT), which due to the higher thickness of the imaging slice may account for missed septae. Alternatively the lower rates may reflect data from the Indian population.

Studies have measured the extent and area of occurrence of septae. This was not possible in our study due to the limitation caused by the imaging modality used.

Our data show the equal occurrence of unilateral and bilateral septa. Most studies report a preponderance of unilateral over bilateral septae. Our study shows more septae in the right than left sinuses. More number of septae were reported in the left sinuses. Previous studies show equal prevalence among right and left sides.

On the basis of the results obtained, we would suggest that (1) a comprehensive evaluation of the maxillary floor should be carried out prior to planning sinus-lift procedures, (2) large scale population studies should be undertaken for generating region-specific data, and (3) a comparison of the different modalities in sinus evaluation of the same sample population would define the best imaging modality to feasibly identify maxillary septa.

CONCLUSION

The prevalence of antral septae is 21% among patients as evaluated by dual slice CT. The presence of septae in the
maxillary sinus is a criterion to be considered when planning sinus lift and implantation procedures. An estimate of the prevalence rate of such septa in Tamil Nadu population and the methodology for the optimal visualization of such septa are of importance to surgeons operating in the area.

REFERENCES


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Comparative Evaluation of Reduction in Bacterial Load using Reciprocating Single File and Rotary Instrumentation Systems

Annil Dhingra¹, Vikrant Yadav², Neha Aggarwal²

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Abstract

Background: Bacterial products play an important role in the initiation and spread of periradicular periodontitis. Removal of bacteria by mechanical instrumentation is particularly effective in disrupting the Bacterial biofilm and reducing the presence of bacteria in the main root canal.

Aim: The aim was to compare the Bacterial reduction achieved with reciprocating and rotary systems during root canal preparation.

Materials and Methods: A total of 60 mandibular premolar were taken and divided into three groups of 20 teeth each. They were contaminated with Enterococcus faecalis. After an incubation period of 21 days, Bacterial colonies were counted both before and after instrumentation with three different rotary file systems wave one (Dentsply-Maillefer, Ballaigues, Switzerland), ProTaper Universal (Dentsply-Maillefer, Ballaigues, Switzerland), and the ProTaper Next (Dentsply-Maillefer, Ballaigues, Switzerland). Bacterial colonies were then again calculated 7 days after instrumentation. The difference in Bacterial colonies before and after instrumentation gave the reduction in bacteria. Result was statically analyzed.

Results: All the file systems significantly reduced bacteria after instrumentation. There was no significant difference in the reduction of bacteria by using both reciprocating and rotary file systems. There was an increase in bacteria 7 days after instrumentation with all the three systems.

Conclusion: Both reciprocating and rotary instruments removed the almost same amount of bacteria from the root canals.

Key words: Enterococcus faecalis, ProTaper next, ProTaper universal, Wave one

INTRODUCTION

Bacterial products play an important role in the initiation and spread of periradicular periodontitis. These microorganisms obtain their nutritional supply from the pulpal tissue, saliva, serum protein from the periradicular tissues, and the metabolites from other bacteria.¹ An infected root canal system may contain more microorganism from 100 to 110. Enterococcus faecalis is one of the most common Bacterial species found in endodontic infections. It stands out for its resistance and ability to survive in the nutritional deficient environment.² Although chemical agents are important in root canal disinfection, they do not remove all of the Bacterial species in biofilms. Moreover, mature biofilms are more resistant to the actions of chemicals.³

Removal of bacteria by mechanical instrumentation is particularly effective in disrupting the Bacterial biofilm and reducing the presence of bacteria in the main root canal. Rotary systems are associated with several advantages compared with manual techniques including more rapid procedures, more centered preparations, and less apical extrusion of debris.⁴ ⁷
Recently, instrumentation with a reciprocating single-file has been proposed, and it includes wave one (Dentsply-Maillefer, Ballaigues, Switzerland). The use of wave one (Dentsply-Maillefer, Ballaigues, Switzerland) was shown to reduce the morphological modification of the canal compared with the use of ProTaper. The newly introduced ProTaper next (Dentsply-Maillefer) has also been found to be useful in the cleaning of the root canals.

MATERIALS AND METHODS

Totally, 60 root canals of the mandibular premolars were standardized to a length of 12 mm they were instrumented to a working length of 11 mm up to a size 15 K-file (Dentsply-Maillefer, Ballaigues, Switzerland) under irrigation with distilled water. The root canals were filled with ethylenediaminetetraacetic acid, Glyde (Dentsply-Maillefer, Ballaigues, Switzerland) for 3 min to remove the smear layer and washed with 5 mL of distilled water. The apex was covered with composite resin (Dentsply-Maillefer, Ballaigues, Switzerland), and the external root surface was sealed with epoxy resin. A suspension of E. faecalis (ATCC 29212) in tryptic soy broth (TSB; Difco, Le Pont-de-Claix, RA, France) was prepared and the root canals were contaminated with E. faecalis suspension by an insulin syringe.

After the incubation period, the root canals were filled with distilled water. Samples (S1) were collected with size 15 paper points (Dentsply-Maillefer, Ballaigues, Switzerland) that were sterilized. The paper points were inserted into the root canals for 1 min each. The points were stored in tubes containing 500 µL of peptone water, and serial dilutions were prepared. Different dilutions were plated in triplicate on m-Enterococcus agar culture medium. The plates were incubated at 100% humidity, and the Bacterial count was measured (in CFU/mL).

The contaminated specimens were divided into three groups, as described below:

1. Group 1 was prepared with the wave one primary file (tip size 25, 0.08 taper) (Dentsply-Maillefer, Ballaigues, Switzerland). With the motor in reciprocating motion, X-smart plus (Dentsply-Maillefer, Ballaigues, Switzerland), the file was gently inserted into the cervical third and withdrawn. The file was then inserted into the middle third and last, the file was inserted into the apical third up to the working length with a brushing action performed against walls.

2. Group 2 was prepared with the ProTaper next system (Dentsply-Maillefer, Ballaigues, Switzerland). (X1 and X2) starting from the coronal third toward the apical third in a similar manner as Group 1.

3. Group 3 was prepared with the ProTaper Universal (Dentsply-Maillefer, Ballaigues, Switzerland). The cervical third was enlarged with Gates-Glidden drills 1, 2, and (Dentsply-Maillefer, Ballaigues, Switzerland) then with the instrument sequence SX and S2. The middle and apical thirds were instrumented with S1, S2, F1, and F2 (tip size 25, 0.08 taper).

Two teeth from each tooth were taken as controls (p control) were prepared by crown-down manual technique. These were the uncontaminated specimens that were instrumented according to each group. Irrigation during instrumentation was performed with a total of 10 mL of distilled water using a syringe.

Data Collection after Instrumentation

To determine the Bacterial count after instrumentation (S2), an additional 5 mL of distilled water was introduced after the final irrigation. Filing performed with a No. 25 Hedstrom file, introducing it into the canal up to the working length with circumferential filing strokes on all of the root canal surfaces. The file was sectioned below the handle and dropped into a tube containing 500 µL of peptone water. Three sterilized paper points (size 15) were inserted into the root canal for 1 min each and were stored in the same tube as the file. The root canals were filled with TSB and incubated at 37°C for 7 days. A third sampling was performed in the same manner as for S2 to determine the Bacterial count at 7 days after instrumentation (S3).

Statistical Analysis

Each Bacterial count was log-transformed for statistical analysis. The paired t-test was used for intragroup analysis, and Analysis of Variance (ANOVA) was used for intergroup analysis. The level of significance for all analyses was P < 0.05.

RESULTS

Table 1 shows the results for Bacterial reduction. Bacterial counts were decreased in S2 and S3 as compared to S1 for all groups (P < 0.0001 by t-test). This result demonstrated that all of the three instrument systems were effective in reducing the Bacterial count. ProTaper Universal (Dentsply-Maillefer, Ballaigues, Switzerland) reduced the maximum amount of bacteria, followed by ProTaper Next (Dentsply-Maillefer, Ballaigues, Switzerland) and minimum by wave one (Dentsply-Maillefer, Ballaigues, Switzerland) (Table1).

However, a comparison of the Bacterial counts at S2 and S3 revealed Bacterial growth in the 7 days after instrumentation (Table 2). The negative control did not show any Bacterial
growth, which indicated that aseptic conditions were maintained during the experiment. The reciprocating, rotary, and manual techniques had similar results immediately and 7 days after instrumentation (ANOVA).

DISCUSSION

Microbiological elimination is of utmost importance in endodontic therapy because the presence of bacteria is the main cause of failure. Chemo mechanical preparation promoted a highly significant reduction in intracanal bacterial counts. Chemo mechanical preparation can be considered as the main step in terms of controlling endodontic infections, it may not suffice to disinfect predictably root canals. To date, there is limited information about the effectiveness of current instrumentation techniques and instruments to reduce mechanically the bacterial population inside the root canal. In this study, we tested the ability of single and multiple file systems to reduce the bacterial load in the root canals.

In this study, a bacteriological marker used was *E. faecalis*. It grows easily in the aerobic environment and is non-fastidious in nature. Larger the root canal preparation, the higher the efficacy in reducing the infection level of the root canal. In clinical practice, the extent of instrumentation depends on the root dimension and the presence of curvatures. Large preparations can incorporate more anatomical irregularities and allow the removal of a substantial number of bacterial cells from the root canal. This may be the reason that ProTaper Universal (Dentsply-Maillefer, Ballaigues, Switzerland) removed more bacteria than the other systems.

In addition, instrumentation to larger file sizes can also result in better irrigant exchange in the apical third. Single-file techniques have become recently available for root canal preparation, but evidence as to their cleaning and disinfecting abilities is only incipient. One concern about the single-file instrumentation techniques refers to their ability to disinfect the root canal.

The third sampling at 7 days (S3) was used to verify bacterial growth in the root canal between appointments. Comparison between S2 and S3 revealed significant bacterial growth in the main canal. This finding contradicts the results found by Siqueira et al. (2007), who used intracanal medication between the appointments. The remaining bacteria within the dentinal tubules in the present study could have multiplied and entered the main canal. In the present report, none of the samples was totally free of bacteria. About 5-13% of bacteria were still present in the root canal after the instrumentation. Therefore, the single-file reciprocating systems resulted in almost similar bacterial reductions compared with those obtained with rotary systems or with the manual technique.

CONCLUSION

There was a significant reduction in the bacteria count in the canals prepared with a single file or multiple file system. ProTaper Universal (Dentsply-Maillefer, Ballaigues, Switzerland) removed the maximum amount of bacteria followed by ProTaper Next (Dentsply-Maillefer, Ballaigues, Switzerland) and then wave one (Dentsply-Maillefer, Ballaigues, Switzerland). However, no significant difference was observed among the three systems ($P < 0.05$).

REFERENCES


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Protein Energy Malnutrition among Preschool Children: A Cross-Sectional Study

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Protein-energy malnutrition (PEM) is a condition resulting from lack of sufficient energy or protein to meet the body's metabolic demands, as a result of either an inadequate intake of protein, intake of poor quality dietary protein, increased demands due to disease or increased nutrient losses. Pre-school children are most vulnerable to the effect of malnutrition because of rapid growth, and thus their nutritional status is considered to be a sensitive indicator of community health. The reasons for malnutrition are myriad and include poverty, lack of nutritious food, inadequate intake of food, improper infant and child feeding, among others. Malnutrition is a complex phenomenon, and it is both the cause and effect of poverty and ill-health and follows a cyclical, inter-generational pattern. It is not only an important cause of childhood morbidity and mortality, but also leads to permanent impairment of physical and possibly, of mental growth of those who survive.

INTRODUCTION

Nutrition has been recognized as a basic pillar for social and economic development. Adequate nutrition is essential in early childhood to ensure healthy growth, proper organ formation and function, a strong immune system, and neurological and cognitive development. Economic growth and human development require well-nourished populations who can learn new skills, think critically and contribute to their communities. Child malnutrition impacts cognitive function and contributes to poverty through impeding individual's ability to lead productive lives.¹

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children. The risk of death is directly correlated with the degree of malnutrition.\textsuperscript{4}

Malnutrition is identified as a major public health problem throughout the developing world, particularly in southern Asia and sub-Saharan Africa.\textsuperscript{4} Malnutrition in India can be termed as a burning social problem due to the impact of socio-cultural influence on nutrition.\textsuperscript{2} As per recent estimates 48% of children under 5 years of age are stunted, 20% are wasted and 43% are underweight in India.\textsuperscript{3} The pre-school age mortality in India is as high as 4% of all deaths. Malnutrition was shown to be an underlying cause in 3.4% of all deaths in young children and associated cause in no less than 46%.\textsuperscript{3}

Prevalence of underweight i.e., low weight for age among children under 5 years of age has been considered one of the indicators for tracking progress of the Millennium development goal 1: To eradicate extreme poverty and hunger, adopted by the United Nations in the year 2000.\textsuperscript{3} The target was to halve, between 1990 and 2015, the proportion of underweight children below 5 years, which comes approximately around 26% by this year 2015. However, many studies\textsuperscript{5-9} conducted recently in different parts of the country indicate that we are still far away from achieving the same. In light of the above considerations, the following study is undertaken to assess the nutritional status of pre-school children in the study area, for effective planning of interventions.

The objectives of the study were:
1) To study the prevalence of PEM in pre-school children (1-3 years) in the study area
2) To identify the various factors associated with malnutrition of the child.

**MATERIALS AND METHODS**

**Design of Study**
Community-based cross sectional study.

**Study Area**
The study was undertaken in Bhadravatitaluk of Shivamogga district, Karnataka state for a duration of 3 months from August 2013 to October 2013. Bhadravati taluk has a population of around 3,80,000 residing in 266 villages (rural) and 78 wards (urban).

**Study Population**
Preschool children in the age group of 1-3 years (12-36 months).

**Sample Size**
Minimum sample size calculated is 190 with absolute precision of 10% and significance level of 0.05 and design effect of 2, taking 43% prevalence of underweight in India as per recent estimates.\textsuperscript{5} We included 210 preschool children aged 1-3 years in the study.

**Sampling Technique**
Cluster sampling technique was used for sample selection. All the villages and wards of Bhadravati taluk were considered as clusters and the same constituted sampling units for our study. 30 clusters were selected by population proportional to size sampling. In each of the cluster, house to house visit was done and 7 children of either sex in the age group of 12-36 months were included, thus making a total of 210 children. Preschool children who were temporary visitors to the house and those residing in the study area for a period of <6 months were excluded from the study.

**Data Collection**
Data were collected from mothers/guardian using a pretested and semi-structured questionnaire after taking an informed consent. Body weight was measured without any footwear and with minimal clothing nearest to 0.1 kg using a standard digital weighing scale. For children aged 1-2 years supine length and for those aged 2-3 years standing height was measured to the nearest cm with the help of metallic tape.

**Statistical Analysis**
The data were analyzed using Epi Info version 3.5.4. WHO child growth standards, 2006 reference data for that particular age and sex were used to get the weight for age, height for age and weight for height indices. Children below two standard deviation of the reference median on any of these indices were considered as undernourished and termed as underweight, stunted and wasted respectively. Children below three standard deviation were considered as severely undernourished. Detection of PEM was done using WHO anthro software version 3.2.2. In addition to overall prevalence rate, the prevalence of PEM was also estimated in relation to certain important selected variables. To find out the association of PEM with these variables, Chi-square test was applied, and the statistical significance was evaluated at 5% level of significance.

**RESULTS**
Out of the 210 subjects in our study, there was almost equal distribution of both boys ($n = 104$) and girls ($n = 106$). According to age distribution, it was observed that maximum number of children were in the age group of 18-23 months i.e., 70 (33.3%), followed by 64 (30.4%) children in 12-17 months age group and least number of children were observed in the age group of 30-36 months i.e., 31 (14.7%).
The majority of the children, i.e., 132 (62.9%) were from the rural locality. The majority of children, i.e., 193 (91.9%) had only one sibling. The literacy rate of children’s fathers and mothers was 87.6% and 92.8% respectively. 168 (80%) of the children were Hindus, 37 (17.6%) were Muslims and remaining 5 (2.4%) were Christians. The majority of the children, i.e., 184 (87.6%) had received complete primary immunization while 26 (12.4%) children were partially immunized.

Figure 1 shows the prevalence of undernutrition among study subjects. According to WHO child growth standards 2006, the prevalence of underweight (low weight for age), stunting (low height for age) and wasting (low weight for height) was found to be 44 (21%), 47 (22.4%) and 28 (13.3%) respectively. The number of children having a severe degree of underweight, stunting and wasting was found to be 18 (8.6%), 26 (12.4%) and 6 (2.9%) respectively. No children were found to be overweight or obese in our study.

Table 1 illustrates that the prevalence of undernutrition, stunting and wasting with respect to certain socio-demographic variables. Findings revealed that the prevalence of all forms of undernutrition was randomly distributed among children of all age groups, and there was no significant association between the prevalence of undernutrition and age of the children. With respect to gender, the prevalence of undernutrition was more in male children in our study and it was found to be statistically significant for underweight ($P = 0.004$) and wasting ($P = 0.000$). The highest proportion of underweight, stunted as well as wasted children were found in illiterate mothers and the lowest in mothers with higher education and the differences were observed to be statistically significant ($P = 0.033$ for underweight, $P = 0.011$ for stunting and $P = 0.015$ for wasting). Father’s literacy was also found to be inversely related to nutritional status of children, with highest prevalence of undernutrition in children of illiterate fathers and lowest in those with fathers having education up to high school and above and it was statistically significant for underweight ($P = 0.004$) and stunting ($P = 0.002$) but not for wasting.
Table 2 shows that the prevalence of underweight, stunting and wasting was higher in children with birth order of two than other children, but we found no significant association between the birth order of children and the prevalence of undernutrition. Furthermore, neither there was a significant association between the prevalence of undernutrition and with the number of siblings that child had nor with the history of exclusive breastfeeding for first 6 months of life. With regard to immunization status, all forms of undernutrition (underweight, stunting and wasting) were found to be higher in children who were partially immunized, compared to those who were fully immunized. However, it was not statistically significant.

**DISCUSSION**

It was found that out of the 210 preschool children in our study, about 29.6% were underweight, 34.8% were stunted and 16.2% had wasting. According to National Family Health Survey-3 (NFHS-3), the total prevalence of underweight, stunting and wasting in Karnataka was found to be 36.7%, 43.7% and 17.6%. Our study findings are lower compared to NFHS-3 data, which means that we are witnessing a declining trend of undernutrition. A study by Sengupta et al. in urban slums of Ludhiana found the overall prevalence of underweight 29.5%, stunting 74.0% and wasting 42.0%. Prevalence of underweight was comparable to that found in our study but stunting and wasting were very high, the reason could be this study was done in urban slums. A higher prevalence of underweight was also seen in Koramudi tribal children underweight - 52.9%, stunting - 49.6% and wasting - 22.7%.

In the present study, there was no significant association between the prevalence of undernutrition and age of the children. Similar results were found in a study by Mathad et al. in Belgaum district of Karnataka. On the contrary, a study done in Jenu Kuruba tribes of Mysore district found a significant association of undernutrition with age. More male children in our study were undernourished compared to females and it was found to be statistically significant, which confirms to the findings of Bisai et al. though many others found under nutrition to be more in females. Findings revealed that there was significant inverse association between the prevalence of malnutrition among children and the level of education of their parents. Other investigators have also reported similar findings. Hence, higher parental education appears to be associated with better child nutrition.

We found no significant association between the birth order of children and the prevalence of undernutrition. On the contrary, increasing birth order has been noticed to be significantly associated with increasing prevalence of PEM by many authors. Also, there was no significant association between under-nutrition and the number of siblings, history of exclusive breastfeeding and also not with the immunization status. However, study by Sengupta et al. revealed that the prevalence of underweight and wasting was found to be significantly higher in those with more siblings. Many authors have also found a significant association between the prevalence of undernutrition and age of the child.

Table 2: Prevalence of under nutrition among study subjects according to certain other variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Classification</th>
<th>Children observed n</th>
<th>Underweight (%)</th>
<th>Stunting (%)</th>
<th>Wasting (%)</th>
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<td>3 (16.7)</td>
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<td>62 (29.6)</td>
<td>73 (34.8)</td>
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association between the prevalence of malnutrition among children and their immunization status, contrary to findings of our study.

**CONCLUSION**

The study findings revealed that the problem of undernutrition is critical in the study area with high rates of underweight (29.5%), stunting (34.8%) and wasting (16.2%). Underweight was found to be significantly associated with gender and literacy of both the parents, stunting with the literacy of both the parents and wasting with gender and literacy of the mother. So we conclude that, right for education and achieving 100% literacy will definitely go a long way in improving the nutritional status of preschool children.

**REFERENCES**


**Source of Support:** Nil, **Conflict of Interest:** None declared.
Isolation, Identification, and Antibacterial Sensitivity of the “STAR” Microorganisms of the Infected Root Canal: Enterococcus faecalis

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Abstract

Background: Endodontic infections are mixed in nature, but despite various pathogens. Dental infections and failure of root canal shows significant prevalence of Enterococcus faecalis.

Aim: The aim of this study was isolating and identifying E. faecalis microorganism from root canal of primary or secondarily infected tooth.

Methodology: This study was based on an experiment, which included 60 patients of age range of 15-45 years from July 2013 to September 2013 using random sampling. Sixty root canals were sampled for microbiological evaluation, by the use of sterile paper points. Microorganisms were isolated and identified by using simple conventional microbiological technique for aerobic species. The antibiotic sensitivity for these microorganisms was performed.

Results: E. faecalis was detected in 23% in our cases and out of them only 2% E. faecalis were resistant for ampicillin and vancomycin.

Conclusion: E. faecalis in infected and filled root canals indicate that its occurrence is higher than suggested by most studies.

Key words: Antimicrobial sensitivity, Endodontic failure, Enterococcus faecalis

INTRODUCTION

The role of microbiology in endodontic practice, although clearly important has remained controversial through most of the twentieth century. Now it is a fact that bacteria initiates pulpal and periapical infections. Endodontic infection is polymicrobial in nature. Despite the diversity in bacterial life in necrotic root canals the pathogens involved in failure of root therapy has been shown to a few species with significant prevalence of Enterococcus species. Enterococci are the most common inhabitants of gastrointestinal and genitourinary tracts.¹,² Recent years have witnessed their increased association with infective endocarditis and enterococcal bacteremia, but since last two decades, this is recognized as the leading cause of the hospital acquired infection.³,⁴ Enterococci also cause colonization in oral cavity and are seen associated with periodontitis⁵ and infected root canal infections.⁶-¹⁰ In necrotic pulp, it is a small percentage of microbial species. Enterococci are intrinsically resistant to many antimicrobial agents. A combination of penicillin and gentamycin are the mainstay for treating enterococcal infection until recently, but with the emergence of high level aminoglycosides resistance, vancomycin is the only alternative available. Thus, this study was aimed at isolating, identifying Enterococcus faecalis from the infected root canals and perform the antibiotic sensitivity testing for the same.

MATERIAL AND METHODS

Case Selection

A random search for 60 males and females patients in age group of 15-45 years was carried using a protocol approved by Institutional review board at the Department
of Conservative Dentistry and Endodontics at ITS Dental College Hospital and Research Centre, Greater Noida. Each patient included in this study had at least one intact non-vital tooth, presenting with one or more of the following symptoms:
1. Swelling
2. Pain on percussion
3. Spontaneous pain
4. Infected root canal.

The exclusion criteria are:
1. Un-cooperative behavior
2. Tooth with sinus and fistula
3. No debatable diagnosis
4. No recession
5. Tooth with abnormal anatomy and calcified canals
6. Any generalized disorders or antibiotic therapy within 2 months
7. Impracticibility of isolation with rubber dam.

All samples were taken by one practitioner using sterile instruments. The tooth under treatment was isolated by rubber dam (Figure 1). The operating area and the dental surface were disinfected by 3 successive applications of:
- Solution containing 30% hydrogen peroxide for 1-min
- Tincture of iodine (betadine, laboratoire sarget, meugriae) for 1-min
- 5% sodium thiosulfate for inactivation for 1-min.

Before opening the pulp cavity: 2 step access cavity preparations was accomplished using sterile burs under water spray. Access cavity was sampled with paper point as a sterility control (Figure 2). Paper points were immediately submerged in 1 ml of sterile nutrient agar. It was incubated for 4-5 h at 37°C in incubator (Figure 3).

Isolation of Species
In aerobic settings in the laboratory, the samples were inoculated on bile esculin agar, blood agar plate and Mac- Conky’s agar plate using streak method (Figure 4). To culture aerobes plates were incubated at 37°C Celsius for 24 h (Figures 5 and 6). Following incubation blood agar plate showed white colonies (Figure 7), Mac-Conky’s agar plate showed deep pink colored colonies (Figure 8) and black colonies were grown on bile esculin agar (Figure 9).

Identification of Species
Aerobes were identified using gram staining according to colony morphology and growth in specific media (Figure 10). Specific colonies were picked streaked on the sugar slant for mannitol and sucrose. Sugar fermentation test like mannitol (Figure 11) and sucrose test were than performed (Figure 12) and they came out to be positive. Catalase test was also positive (Figures 13 and 14). The colonies were picked and were incubated in nutrient agar for antibacterial susceptibility.
Antimicrobial Susceptibility

The susceptibility/resistance of *E. faecalis* stain for the following antimicrobial such as ampicillin, cotrimoxazole, cephalixin, tetracyclin, cefotaxime, ciprofloxacin, levofloxacin, linezolid, cloxacillin, ciprofloxacin, roxithromycin, lincomycin, gentamycin were performed (Figure 15). The antimicrobial susceptibility of isolates was investigated by means of axiom biodisk. This biodisk uses various antimicrobial at varying concentration in mcg on Muller-Hilton agar plate of 4 mm thick. It was incubated using a swab that has been submerged in a bacterial suspension. The surface of the plate was swabbed in three directions to ensure complete distribution of the inoculation, over the entire plate within 20 min of inoculation, the antimicrobial agent strips were applied and the plates were inverted for incubation at 37° for 24 h. After incubation, the plates were examined and an elliptical Zone of growth inhibition was seen around some specific antibiotics and were evaluated (Figure 16).

Figure 5: Streaking performed on the nutrient agar medium

Figure 6: Streaked culture plates are incubated at 37°C for 24 h

Figure 7: Growth of creamy-white colonies on the blood agar plate after the incubation for 24 h

Figure 8: Growth of deep pink colonies on the Mac-Conkys agar plate after the incubation for 24 h

Figure 9: Growth of Black colored colonies on the bile ausculin agar plate

Figure 10: Reagents used for Gram-staining
RESULTS AND DISCUSSION

There are many previous studies that have isolated and tested antibacterial activity in the root canals of various types of infected teeth. In general, Gram-positive cocci, Gram-negative rods and other bacterial species represent the predominant type of bacteria in infected root canals, these are generally of *Bacteroides* spp. like *Peptostreptococci*, *Prevotella* facultative anaerobes and obligate anaerobic streptococci. Our study aimed at isolating and identifying the most representative of endodontic microbiota that is *E. faecalis*, which is seen in various previous studies. The results obtained for the culture sample is depicted in Table 1.

60 root canals were microbiologically sampled from 60 different patients. Among them only 54 samples showed positive microbiological growth. Few cases did not show any microbiological growth, which goes in accordance with previous studies done by Schleifer et al. and Ryan et al.\textsuperscript{11-14} There were 35 primarily infected cases showing necrotic

Figure 11: Fermentation test for mannitol sugar which exhibits positive results by showing color change from red to yellow

Figure 12: Fermentation of sucrose exhibits positive result by changing color from red to yellow

Figure 13: Picking colonies from all the three different culture media for catalase test

Figure 14: Demonstration of catalase test, by mixing picked colonies with hydrogen peroxide. It is positive if bubble formation is seen

Figure 15: Exhibits antimicrobial sensitivity kit by axiom laboratories for Gram-positive bacteria

Figure 16: Antibacterial sensitivity test results shown as an elliptical zone of growth inhibition around specific antibiotics
pulp resulting from microorganism, which colonized the pulp chamber leading to pulp dysfunction. Various factors leading to pulpal infection are caries, trauma, bacteria. 25 cases were secondarily infected (unsuccessful endodontic treatment). These were already treated randomised controlled trial cases, which exhibited temporary sealing leading to micro-leakage. Various clinical characteristics of 60 cases were previous pain, acute pain, tender on percussion and few cases exhibited necrotic pulp tissue.

6 cases out of all the 54 cases exhibits *E. faecalis* growth. 5 cases were reported to be secondarily infected specially if the samples were taken during interappointment procedures. One primarily infected case was reported to show *E. faecalis* growth. Other most prevalent species were *Peptostreptococcus, Porphyromonas, Streptococcus* species, *Staphylococcus salivarius, Lactobacillus* specie, *Prevotella* spp. Few cases exhibited *Enterobacter* species, *Bacillus* spp. and *Escherichia coli*. All this goes in accordance with previously performed studies.15,20

Gram-positive bacteria was not the most prevalent species found in the primary root canal infections in our study. It goes in accordance to other previous studies by Schleifferk et al. and Ryan et al.30 In our study, only 6% cases exhibited *E. faecalis* in primary infected cases. The reason for this is based on the fact that the *E. faecalis* in the untreated cases are so low in number that the it is not easy to be recovered. *E. faecalis* is generally found in root canals in percentage which range from 29% to 77%.31-34 In untreated cases or the primary cases they are just 5% or less of the total microflora.35 But, our study showed a little increase in its number.

Out of all the positive cases of our study, 5 were secondarily infected and these are those root canals which are produced by bacterial invasion from coronal restorations or microorganisms resistant to any mechanical or chemical procedures. We found that the *E. faecalis* was the most prevalent organism. Our findings go in accordance with the study done by Murray et al. and Baron et al.36,37 The increased prevalence of *E. faecalis* in secondarily infected canals is suggested due to the changes in the root canal microbiota, which make it to grow to higher and more recoverable proportions. Another hypothesis is that it enters the canal in the process of treatment and during or between the treatment procedures.38 This statement goes totally in the favor of our study where 4 samples, which came positive were taken during inter-appointment procedures. It has already been proven that *E. faecalis* shows a lethal characteristic of growth in varying conditions like high salt concentration, wide temperature range, persistence in the presence of intra-canal medicament. It also have got many virulence factor like adhesions, surface structures, secreted factors, capsular polysaccharides which stabilize its growth in harsh environment.39,40 *E. faecalis* shows capabilities to invade dentinal tubules and stick to dentin surface. A long-term starvation assay lead to a result that this microorganism can survive in the environment with low nutrient supply. Various studies have shown that it is the serum derived fluid from the periapical tissue that makes *E. faecalis* specie to sustain.41

Endodontic procedures are the first choice of treatment in any case, but due to prolonged endodontic treatment procedures, antibiotics are prescribed. Few antibiotics are prescribed more often which are considered to prevent infection source from disseminating to the rest of the host. There is always a serious problem with microorganisms showing resistance to antibiotics. In general dental practice, antibiotics are bacteriostatic rather than bactericidal. Mostly normal immune response along with the antibiotic is sufficient, but unfortunately insufficient antibiotic dosage lead to resistance of microorganisms. To check for the antibacterial sensitivity in our study we have used axiom antibacterial kit, which contains various antibiotics in different quantity given in the Table 2.

Our results showed that the bacteria isolated from the root canals are commonly resistant to ampicillin, which is a conventional antibiotic. Erythromycin is traditionally a substitute of patients allergic to penicillins, but it is relatively unaffected according to our results. Our study confirms the statement of Wood42 who has done research for 20 years (1996-1986) on the patterns of antibiotic sensitivity against pathogenic microorganisms. He has commented that there is a continuous decline in bacterial sensitivities for the commonly subscribed antibiotics. Continuously and slowly, resistant strains are emerging for microorganisms encountered in the root canal. Penicillin, amoxicillin and erythromycin have been prescribed frequently in dentistry, thus the strains have evolved as is depicted in our study as well.

<table>
<thead>
<tr>
<th>Table 1: Summary of culture findings</th>
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<tr>
<td>Findings of culture</td>
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<tr>
<td>----------------------</td>
</tr>
<tr>
<td>Total number of samples</td>
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<tr>
<td>Total number of positive samples</td>
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<tr>
<td>Total number of negative samples</td>
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<tr>
<td>Total number of Primarily infected root canals</td>
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<tr>
<td>Total number of positive cases for primarily infected root canals</td>
</tr>
<tr>
<td>Total number of secondarily infected root canals</td>
</tr>
<tr>
<td>Total number of positive cases for secondarily infected root canals</td>
</tr>
<tr>
<td>Secondary cases which were inter-appointment samples</td>
</tr>
</tbody>
</table>
Clindamycin has shown to be effective against the pathogens of root canal in our study, thus it should be considered as a treatment modality for oral infections with less toxic antimicrobial drugs.

**CONCLUSION**

Presence of *E. faecalis* in the infected and filled root canal indicates that its occurrence is higher than suggested by most of the studies. It is evident that primary root canals exhibit good nutritional supply for its inhabitants, but well filled root canals also show *E. faecalis* growth that too in more recordable number. Retreatment cases are less predictable as the microorganism exhibits resistance to antimicrobial drugs. Thus, the present study has high lightened poly microbial nature of microorganisms and the antibiotic sensitivity pattern of them. As *Enterococcus* are a common cause of *Bacterial Endocarditis*, the antibiotic susceptibility of endodontic *Enterococcus* is of interest. Further studies with clinical correlation of effectiveness of these antibiotics and cultures taken after administration of these antibiotics as well as recording of disappearances of symptoms are recommended.

**REFERENCES**


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Routine Probiotic Supplementation (*Saccharomyces boulardii*) of Neonates with Birth Weight 1000-1999 g: A Cohort Study

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**Abstract**

**Background:** Probiotic supplementation in neonates has been found to confer beneficial effects by reducing the incidence of necrotizing enterocolitis (NEC) and all-cause mortality.

**Objective:** This study is designed to assess the impact of our policy of routine probiotic supplementation with *Saccharomyces boulardii* (Sb) in neonates with birth weight 1000-1999 g on their immediate neonatal outcome.

**Subjects and Methods:** From 2nd February 2011, we routinely supplement all low birth weight babies weighing from 1000 g to 1999 g with the probiotic Sb starting from within 4 h of age up to 7th day of life or the day of transfer out from nursery whichever is later. We compared the population characteristics and outcome of supplemented group over a period of 18 month (2.2.1011-1.8.2012) with that of a historical cohort over the immediate preceding 18 months.

**Results:** There were 46 babies in the supplemented group and 39 babies in the control group. There were no deaths in the probiotic group versus 4 deaths in the control group (0% vs. 10.3%, \(P = 0.04\)). There was an insignificant decrease in cases of NEC Stage 2 and above (0% vs. 7.7%, \(P = 0.09\)). Feed intolerance or NEC Stage 1 was significantly lower in the probiotic group (4.3% vs. 22.9%, \(P = 0.017\)). Sepsis (clinical + culture-proven) was significantly lower in the probiotic group (2.2% vs. 20.5%, \(P = 0.01\)). The time taken to full feeds was significantly shorter by 2.3 days in the probiotic group (\(P = 0.02\)).

**Conclusion:** Routine probiotic supplementation with Sb confers significant benefits in reducing all-cause mortality, feed intolerance and sepsis and can be recommended for similar neonatal units in India.

**Key words:** Necrotizing enterocolitis, Neonate, Probiotic, *Saccharomyces boulardii*

**INTRODUCTION**

Necrotizing enterocolitis (NEC) is a relatively common and serious gastrointestinal emergency and is a leading cause of morbidity and mortality in preterm neonates.¹,² It is characterized by intestinal injury, inflammation, and necrosis resulting from a multifactorial pathophysiology that includes host factors, inflammation of neonatal gut, intestinal ischemia, enteral feeding, and abnormal *Bacterial colonization*.³,⁵ Probiotics are viable microorganisms that have a beneficial effect *in vivo*. A cochrane review of 2008 and a meta-analysis by Deshpande *et al.* have shown the beneficial effects of probiotic supplementation of preterm babies in reducing the incidence of NEC and all-cause mortality.⁶,⁷ We offered routine probiotic supplementation with *Saccharomyces boulardii* (Sb) to our low birth weight population with birth weight from 1000 g to 1999 g from 2nd February 2011 onward to reduce the incidence of feed intolerance and NEC as well as the all-cause mortality which was almost always due to fulminant sepsis. There was no mortality in the 18 months period of routine probiotic supplementation. Hence, we decided to compare the outcome variables in this supplemented group against a cohort of historical controls in the 18 months immediately before the probiotic supplementation policy.

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MATERIALS AND METHODS

This study was conducted in the tertiary level neonatal intensive care unit of Women's Center Hospital, Coimbatore that predominantly caters to inborn babies.

From 2nd February 2011, routine probiotic supplementation with Sb (econorm sachets) was offered to low birth weight neonates with birth weight 1-1.999 kg. Each sachet contains 250 mg or 5 billion spores of Sb. One sachet was dissolved in 6 ml of milk or water for injection and administered in doses of 1/3rd sachet (2 ml) once a day for babies weighing 1-1.249 kg and ½ sachet (3 ml) for babies weighing 1.25-1.999 kg once day starting from within 4 h of life until the 7th day of life or the day of transfer out from neonatal intensive care unit (NICU) whichever is later. Babies with major congenital malformations, those who are transferred to other centers before 7 days and outborn babies who cannot reach our NICU before 3 h of age were excluded from the study. Informed verbal consent was obtained from the parents of each of the baby in the probiotic supplementation group.

Babies who received probiotic supplementation over an 18 months period from 2nd February 2011 to 1st August 2012 constitute the study group. All the low birth weight neonates of birth weight 1-1.999 kg admitted over the preceding 18 months before the implementation of the probiotic policy that is from 2nd August, 2009 to 1st February 2011 (who did not receive probiotic supplementation) constituted the historical control group. There were no changes in the patient care protocols including feeding policy during the pre-probiotic period and the probiotic study period.

These 2 groups are compared and evaluated using appropriate statistical techniques to assess the benefits of probiotic supplementation in the study group. The population characteristics like distribution of the babies according to different birth weight and gestational age strata as well as risk factors such as asphyxia, prolonged rupture of membranes, respiratory distress, and abnormal umbilical Doppler indices were compared between the two groups to look for significant difference if any. The main outcome measures are mortality and the incidence of NEC in these 2 groups. Other outcome measures that are studied are incidence of sepsis, time to establish full feeds, and the duration of NICU stay in the two groups.

The following case definitions were used:
1. NEC Stage 1 was defined as feed intolerance with abdominal distension without radiological features of NEC (pneumatosis intestinalis or portal vein gas) that warrants withholding of feeds for at least 24 h.
2. NEC Stage 2 was defined as feed intolerance and/or abdominal signs of NEC associated with characteristic radiological features like pneumatosis intestinalis or portal vein gas.
3. Clinical sepsis was defined as symptoms suggestive of sepsis-like poor feeding, lethargy, etc., with positive sepsis markers like neutropenia, thrombocytopenia, and/or positive C-reactive protein (CRP).
4. Culture proven sepsis was defined as isolation of pathogenic organisms from a normally sterile body fluid like blood and cerebrospinal fluid.

Statistical analysis was performed using computerized software program IBM SSPS version 20. Fischer’s exact test was used for comparing categorical variables. T-test was used for normally distributed continuous variables such as gestational age and birth weight. A non-parametric test Mann–Whitney U-test was used to analyze the time taken to full feeds and duration of NICU stay in the 2 groups as they did not have a normal distribution in a histogram. A $P = 0.05$ was considered to be significant.

The Institutional Ethics Committee approved the study proposal and gave permission to publish the study.

RESULTS

There were 46 babies included in the probiotic supplementation group (44 inborn and 2 outborn). One 34 weeks/1 kg/female baby with absent end-diastolic flow was not included as the baby was referred to another hospital on day 1 and hence did not receive probiotics. 39 babies were enrolled in the historical control group (36 inborn and 3 outborn). One 35 weeks/1.8 kg/female baby was not included in the control group as the baby had Down’s syndrome.

Baseline population characteristics like distribution according to different birth weights and different gestational ages and the co-morbidities in each group like respiratory distress syndrome, asphyxia, formula feeding, prolonged rupture of membranes, umbilical vessel Doppler abnormalities etc., were compared across the 2 groups. There was no significant difference in any of these parameters between the 2 groups (Table 1).

The main outcome measures are tabulated (Table 2). There were no cases of NEC Stage 2 and above in the probiotic group whereas there were 3 cases of NEC Stage 2 in the control group. But because of the small sample size this difference did not reach statistical significance. There were no cases of NEC Stage 3 neither in the probiotic nor the control group. The incidence of NEC Stage 1 (feed
intolerance) was significantly higher in the control group than the probiotic group (22.9% vs. 4.3%, P = 0.017)

All babies in the probiotic group had survived whereas 4 babies in the historical control group had died, and this was statistically significant (P = 0.04). All the 4 deaths were due to fulminant health care associated sepsis. Two of them culture positive (Klebsiella and Escherichia coli) and other two had multiorgan failure with severe thrombocytopenia and positive CRP (clinical sepsis). One neonate who died due to fulminant clinical sepsis also had NEC Stage 2.

The incidence of sepsis (clinical and cultural proven) was significantly higher in the control group than the probiotic group (20.5% vs. 2.2%, P = 0.01) whereas the culture proven sepsis rate was not different between the 2 groups. The mean number of days taken for the neonates to reach full feeds (discontinuation of intravenous fluids) differed significantly between the two groups. The neonates in the control group took an additional 2.3 days to reach full feed in comparison to the probiotic group (P = 0.02). The mean duration of NICU stay did not differ statistically between the groups (P = 0.18).

**DISCUSSION**

Randomized controlled trials involving more than 5000 neonates have attested to the beneficial effect of probiotics in prevention of NEC and reducing all-cause mortality.\(^6,7\)

The probiotics used in neonates are bifidobacterium, lactobacillus, and Sb. Administration of probiotics is a low cost, safe, and cost-effective intervention in reducing the risk of NEC in high-risk neonates.\(^6,8\) It has been argued by Deshpande et al. that given the totality of evidence, withholding probiotics in neonates at risk of NEC is now almost unethical, and further placebo-controlled trials are unwarranted.\(^3\) We chose Sb as a standard preparation is available (Econorm, Dr. Reddys Laboratories) in India, and it is resistant to anti- **Bacterial** antibiotics to which many of these neonates are exposed. In our NICU, NEC and deaths due to fulminant sepsis had occurred in preterm neonates weighing more than 1.5 kg as well and hence, it was decided to routinely supplement all neonates weighing from 1 kg up to 1.999 kg with probiotics.

Sb is a non-colonizing, non-systemic yeast that has been accepted for treating acute and antibiotic-associated diarrhea in children and adults.\(^8,11\) It achieves steady concentration in the colon within 3 days and is cleared from stools 2 to 5 days after discontinuation.\(^11\) The putative mechanisms of beneficial action include inhibition of activities of **Bacterial** pathogenic products, trophic effects on the intestinal mucosa and modification of host signaling pathways involved in inflammatory and non-inflammatory intestinal diseases.\(^9\) Sb also produces polyamines which promote intestinal maturation.

There have been three published articles on Sb supplementation in neonates. In a randomized placebo-controlled trial, Costalos et al. randomized 87 exclusively formula fed healthy neonates of 28-32 weeks gestation to receive either Sb or maltodextrin (placebo) for a median duration of 30 days starting from 1st week of life.\(^12\) Analysis of stool samples revealed that in the Sb supplemented group, there was a significant increase in intestinal

**Table 1: Baseline characteristics in the 2 groups**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gestational age (mean±SD weeks)</td>
<td>33±2.47</td>
<td>0.473*</td>
</tr>
<tr>
<td>Birth weight (mean±SD) kg</td>
<td>1.6±0.3</td>
<td>0.618*</td>
</tr>
<tr>
<td>Active resuscitation at birth n (%)</td>
<td>2 (5.1)</td>
<td>0.591**</td>
</tr>
<tr>
<td>Prom&gt;18 h n (%)</td>
<td>5 (12.8)</td>
<td>0.239**</td>
</tr>
<tr>
<td>Umbilical Doppler abnormalities n (%)</td>
<td>3 (7.7)</td>
<td>0.657**</td>
</tr>
<tr>
<td>O₂ therapy for respiratory distress n (%)</td>
<td>14 (35.9)</td>
<td>0.243**</td>
</tr>
<tr>
<td>Surfactant use n (%)</td>
<td>3 (7.7)</td>
<td>0.66**</td>
</tr>
<tr>
<td>Supplemental formula feeds in survivors n (%)</td>
<td>4 of 35 (11.4)</td>
<td>0.458**</td>
</tr>
</tbody>
</table>

*Fisher’s exact test (2 sided), SD: Standard deviation

**Table 2: Outcome measures in the two groups**

<table>
<thead>
<tr>
<th>Outcome measures</th>
<th>Value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>All-cause mortality n (%)</td>
<td>4 (10.3)</td>
<td>0.041*</td>
</tr>
<tr>
<td>NEC Stage 2 n (%)</td>
<td>3 (7.7)</td>
<td>0.093*</td>
</tr>
<tr>
<td>Feed intolerance (NEC Stage 1) n (%)</td>
<td>8 of 35 (22.9)</td>
<td>0.017*</td>
</tr>
<tr>
<td>Sepsis (clinical+culture proven) n (%)</td>
<td>8 (20.5)</td>
<td>0.01*</td>
</tr>
<tr>
<td>Culture proven sepsis n (%)</td>
<td>3 (7.7)</td>
<td>0.329*</td>
</tr>
<tr>
<td>Time to full feeds among survivors in days, mean±SD</td>
<td>6.5±4.67</td>
<td>0.021***</td>
</tr>
<tr>
<td>NICU stay among survivors in days, mean±SD</td>
<td>10.1±12.8</td>
<td>0.18***</td>
</tr>
</tbody>
</table>

*Fisher’s exact test (2 sided) ** Not available as incidence is 0 in probiotic group, *** Mann–Whitney U-test, SD: Standard deviation, OR: Odds ratio, CI: Confidence interval, NICU: Neonatal intensive care unit, NEC: necrotizing enterocolitis
colonization with beneficial bacteria like *bifidobacterium* and there was a significant decrease in colonization with harmful bacteria like *E. coli* and enterococci thus bringing intestinal microtome profile of Sb group closer to breastfed neonates. They also found an insignificant decrease in the incidence of NEC (9.8% vs. 16.6%) and culture proven sepsis (5.8% vs. 8.3%) in the Sb group. A randomized controlled trial in neonates of ≤32 weeks gestation and ≤1500 g birth weight, Demirel et al. report that Sb supplementation did not reduce the risk of definite NEC, culture-proven sepsis and all-cause mortality. But they found that Sb supplementation reduced the incidence of feed intolerance (48.1% vs. 22.9%) and clinical sepsis (47.8% vs. 34.8%). In another prospective double-blinded randomized controlled trial involving 208 (104 Sb supplemented and 104 placebo control) neonates of ≤32 weeks gestation and ≤1500 g birth weight, Serce et al. found no significant difference in the rates of NEC ≥ Stage 2 or death and NEC ≥ Stage 2 or culture-proven sepsis between the two groups.

In our study, Sb supplemented group had significantly lower rates of mortality, sepsis (clinical+culture proven) and feed intolerance (NEC Stage 1). Although the incidence of definite NEC (Stage II and above) was nil in the Sb supplemented group versus 7.7% (3 of 39) in the control group this was not statistically significant as the sample size was small. It has to be noted that Sb confers this benefit against NEC over and above the beneficial effects of human milk as our population is predominantly breastfed. The time to full feeds (stopping of IV nutrition) was significantly shorter in the Sb supplemented group by 2.3 days when compared with control group. Thus, Sb supplementation in our population confers a definite survival advantage (100% survival) by reducing the incidence of fulminant sepsis unlike the other neonatal studies on Sb. Our study shows a significant reduction in sepsis (clinical + culture-proven) and feed intolerance similar to the study by Demirel et al.

In a cohort study from North America (Canada) published recently Jennier et al. report that routine probiotic supplementation (0.5 g daily of a mixture of four *bifidobacteria* and *Lactobacillus rhamnosus GG*) resulted in significant decrease in the incidence of definite NEC (9.8-5.4%, *P* < 0.02) and a non-significant decrease in mortality (9.8-6.8%). In the accompanying editorial titled “Probiotic supplementation in preterm infants: It is time to change practice,” Tornow-Mordi and Soll. state that probiotic supplementation is a best-studied but least used intervention in neonatology with evidence base at least as strong as that for surfactant administration and antenatal corticosteroids and discuss the practical issues concerning its routine use especially in a North American set up.

No adverse effects from probiotic supplementation have been reported in the neonatal trials done till date, but there have been occasional reports of systemic bacteremia or fungemia reported outside the clinical trials. There have been only four young children reported of having nosocomial bacteremia with the probiotic lactobacillus, the majority of them being children with intestinal anomalies, and the illness had been relatively mild and easily treatable. Mild illness with bacteremia due to *bifidobacterium* used as a probiotic has been reported in an infant with omphalocele. Adverse events with Sb are very rare in normal individuals, but occasional cases of systemic fungemia have been described in immunocompromised individuals and those with indwelling central venous catheters. Unlike lactobacillus, Sb has not been associated with infection resulting from translocation from the gastrointestinal tract into the systemic circulation.

**CONCLUSIONS**

Routine probiotic supplementation can confer a definite survival advantage coupled with a significant reduction in the incidence of NEC in neonatal units with demographic and sepsis profile similar to our unit. Our study, although not a randomized controlled trial, provides a compelling reason to introduce probiotic supplementation in Indian neonatal units with similar population characteristics and morbidity and mortality patterns. In future studies, cross comparison between Sb and other *Bacterial* probiotics can be studied.

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Clinical and Laboratory Profile of Hepatitis E during an Outbreak in Nellore: A Tertiary Care Center Experience

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Background: Most of the studies about viral hepatitis E were from Northern India. Clinical spectrum of sporadic acute viral hepatitis E from southern India has not been well documented. A waterborne outbreak of viral hepatitis E occurred in Nellore during October-December 2008. We made an attempt to study the clinical and laboratory profile of patients with acute viral hepatitis E during this outbreak.

Objective: The objective was to determine the incidence of acute liver failure in acute viral hepatitis E, to know the prognosis of acute viral hepatitis E in pregnancy and to study the outcome of acute viral hepatitis E in patients with chronic liver disease (CLD).

Methods: We, in collaboration with a team from Christian Medical College, Vellore, studied clinical and laboratory profile of 75 cases of acute viral hepatitis E in a Tertiary Care Centre, Nellore.

Results: Our study supports that clinical and laboratory profile of viral hepatitis E is similar to previous outbreaks.

Conclusions: People who drank untreated municipal water were at high risk. Most common presenting symptom was jaundice. Cholestatic symptoms (pruritus) were also common presenting feature. Most of the patients had a spontaneous recovery without any treatment or hospitalization. Pregnancy and background of CLD are at high risk.

Key words: Jaundice, Liver diseases, Liver failure (acute), pregnancy

INTRODUCTION

Hepatitis E virus (HEV) is the causative agent of what previously has been referred to as enterically transmitted non-A, non-B hepatitis or “waterborne hepatitis.” HEV is the major cause of epidemic hepatitis and of acute, sporadic hepatitis in developing nations.¹⁻⁴

Hepatitis E was not recognized as a distinct human disease until 1980. The first experimental evidence for the existence of an additional waterborne hepatitis agent was reported in 1983.⁵,⁶

Hepatitis E is caused by infection with HEV, a non-enveloped, positive-sense, single-stranded ribonucleic acid (RNA) virus. HEV is the sole member of the genus Hepativirus in the family of Hepeviridae. HEV primarily affects young adults aged 15-40 and fewer cases are seen in children.¹

Just like hepatitis A virus, HEV is transmitted from person-to-person via the feco-oral route.⁵,⁷ Contaminated water or food supplies have been implicated in major outbreaks.⁷,⁹
Subbarayudu, et al.: Acute Viral Hepatitis E

There is a possibility of zoonotic spread of the virus, since several non-human primates, pigs, cows, sheep, goats, and rodents are susceptible to infection. Other modes of transmission are through person to person, blood transfusions, vertical transmission, and food-borne.

Hepatitis E has a restricted distribution: Epidemics of hepatitis E have been found in much of Central and South-East Asia, North and West Africa, and in Mexico. However, the application of recently developed serologic tests has revealed anti-HEV in every country in which it has been sought, including developed countries like United States, in which the disease virtually does not occur.

Possible reservoirs of HEV in the mentioned regions could be found in animals like monkeys, pigs, cows, rodents, sheep or goats.

The clinical presentation of hepatitis E is comparable to hepatitis A. The incubation period following exposure to HEV ranges from 3 to 8 weeks, with a mean of 40 days. Typical signs and symptoms of hepatitis include jaundice, anorexia, hepatomegaly, abdominal pain and tenderness, nausea, vomiting, and fever, although the disease may range in severity from subclinical to fulminant.

Serological and nucleic acid testing (qualitative and quantitative HEV RNA) have been developed for epidemiologic and diagnostic purposes. As no specific therapy is capable of altering the course of acute hepatitis E infection, prevention is the most effective approach against the disease. Hepatitis E is a mild to moderate disease in severity (mortality rate of 0.5-4%) except in pregnancy, where the mortality rate is progressively higher in each succeeding trimester and may reach 20%.

We studied 75 patients with icteric hepatitis with IgM anti-HEV positive by asking semi-structured questionnaire which includes prodromal symptoms, dark urine, clay-colored stools, jaundice, pruritus, right upper quadrant (RUQ) pain/discomfort, pregnancy status, altered sensorium, hematemesis/melena, and source of drinking water. Laboratory investigations include complete blood picture, serum bilirubin (total and direct), liver function tests, prothrombin time, international normalized ratio (INR), screening for hepatitis B surface antigen (HBsAg), hepatitis C virus, HIV, IgM anti-HEV, complete urine examination, renal function tests, and ultrasound abdomen.

RESULTS

We studied 75 patients with acute viral hepatitis E; include 52 males, 23 females in the mean age group of 43.1 ± 31.34 years. Most of the affected patients were in the age group of 15-45 years. The clinical presentation of 75 patients with acute viral hepatitis E is represented in Table 1. Most common presenting symptom was jaundice (96%); The most common prodromal symptoms presented to us were anorexia (84%) followed by fever (82.6) and malaise (81.3). All the 75 patients had abnormal liver function tests suggestive of acute hepatitis (Table 2a). There was a moderate rise in serum alkaline phosphatase levels and 40% had cholestatic symptoms. We observed coagulopathy (16%), upper gastrointestinal bleed (hematemesis/melena) (5.3%), acute liver failure (ALF)

MATERIALS AND METHODS

Pilot Survey

In Nellore during October 2008, we observed a sudden surge in number of patients with acute viral hepatitis and on a pilot study of 20 patients of acute viral hepatitis, Immunoglobulin M (IgM) anti-HEV was positive in 17 patients.

To identify further cases and to determine the incidence of acute viral hepatitis in the city, we in collaboration with a team from CMC, Vellore, did an epidemiological survey.

The 75 hospital patients’ samples contributed to the determination of the cause of the outbreak but were excluded from the epidemiological survey. Clinical and laboratory profile of these 75 patients with acute viral hepatitis E was studied. The inclusion criteria and exclusion criteria for studying these 75 patients is as follows.

Inclusion Criteria
1) Age more than 15 years
2) Patients with icteric hepatitis with IgM anti-HEV positive.

Exclusion Criteria
1) Drug-induced hepatitis
2) Acute viral hepatitis other than HEV.

We studied 75 patients with icteric hepatitis with IgM anti-HEV positive by asking semi-structured questionnaire which includes prodromal symptoms, dark urine, clay-colored stools, jaundice, pruritus, right upper quadrant (RUQ) pain/discomfort, pregnancy status, altered sensorium, hematemesis/melena, and source of drinking water. Laboratory investigations include complete blood picture, serum bilirubin (total and direct), liver function tests, prothrombin time, international normalized ratio (INR), screening for hepatitis B surface antigen (HBsAg), hepatitis C virus, HIV, IgM anti-HEV, complete urine examination, renal function tests, and ultrasound abdomen.

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(2.6%), acute on chronic liver failure (ACLF) (8%), and severe sepsis (1.3%) (Table 3). Ultrasonography of the abdomen revealed gall bladder (GB) wall edema in 45% (34/75) of patients. Most of the patients had spontaneous recovery. Out of 75 patients, 4 patients died with a mortality rate of 5.3%. The causes of death include ALF (2), ACLF (1) and severe sepsis (1).

DISCUSSION

Demographic features of 75 patients with acute viral hepatitis E were similar to previous outbreaks. The most affected age group was between 15 and 45 years (Figure 1). Our study included 52 males, 23 females in the mean age group of 43.1 ± 31.3 years (Figure 2), in contrast to mean age group of 22.5 years in Nandi et al. 2009. This major difference in mean age group might be due to inclusion of only patients with age >15 years.

The duration of initial prodromal phase was 1-10 days in majority of patients, prolonged prodromal phase ≥30 days noted in 12% of patients, characterized by varying combination of fever, anorexia, nausea, vomiting, arthralgias, myalgias, malaise, headache, and pain/discomfort in RUQ of abdomen. In our study, the most common prodromal symptoms (Table 1 and Figure 3) presented to us were anorexia (84%) followed by fever.

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<th>Table 1: Clinical profile in acute viral hepatitis E (n=75)</th>
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<th>Table 2: Liver function tests in acute viral hepatitis E (n=75)</th>
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<td><strong>Investigation</strong></td>
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<td>Serum bilirubin</td>
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<td>Serum ALT</td>
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<td>Serum ALP</td>
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<td>Prothrombin time</td>
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<td>INR</td>
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ALT: ???, ALP: ???, INR: ???

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<th>Table 2a: ALT levels in acute viral hepatitis E (n=75)</th>
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<td>2.</td>
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<td>3.</td>
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ALT: ???
(82.6) and malaise (81.3). These prodromal symptoms disappeared with the onset of jaundice (icteric phase).

Most common presenting symptom was jaundice (96%); Sailaja et al. 2009\cite{16} reported jaundice (100%) as the most common presenting symptom in their study. The duration of icteric phase was between 15 and 40 days. Cholestatic symptoms (pruritus) were the presenting feature in about 40% of patients, in which moderate rise of serum alkaline phosphatase was observed, which was almost similar to Nandi et al. 2009,\cite{18} but it was 59.4% of patients in Sarguna et al. 2007.\cite{18} The duration of cholestatic symptoms was variable and all patients had recovery from these symptoms. Physical examination revealed jaundice (96%), mild hepatomegaly (40%), pedal edema/ascites (16%), and splenomegaly (4%).

Patients with ACLF were followed up for a period of 2 years in liver clinic, and the rest of the patients were followed up until they became asymptomatic clinically and their liver function tests were normal. Most of the patients had spontaneous recovery without any treatment/hospitalization except a few patients who developed complications. Complications (Table 3) included coagulopathy (16%), upper GI bleed (hematemesis/melena) (5.3%), ALF (2.6%), ACLF (8%), and severe sepsis (1.3%).

We had 6 patients with chronic liver disease (CLD) admitted in our hospital, the etiology of CLD was due to alcohol (3/6), HBV-related (2/6), and cryptogenic (1/6). ACLF is defined as acute hepatic insult manifesting as jaundice and coagulopathy, complicated within 4 weeks by ascites and/or encephalopathy in a patient with previously diagnosed or undiagnosed CLD (The Asian Pacific Association for the Study of Liver Recommendations, 2008). ACLF occurred in 8% (6/75) of patients in our study while it was 21.7% in Mahtab et al. 2009\cite{19} and 70% in Ramachandran et al. 2004;\cite{20} both of these were retrospective studies. Out of 6 patients with ACLF, one patient with alcohol-related CLD developed hepatic encephalopathy (Grade 4) and had fatal outcome (16.6%), in contrast to mortality rate of 28% in Kc et al. 2009\cite{21} and 44% at 4 weeks and 70% at 12 months in Acharya et al. 2007.\cite{18} Rest of the 5 patients with ACLF had recovered.

Acute HEV in patients with CLD has a grave prognosis. Wilson’s disease was the most common cause of CLD complicated by acute HEV in Ramachandran et al. 2004.\cite{22} In contrast, in our study, alcohol-related CLD was complicated by HEV and there were no cases of Wilson's disease in this study. Seroprevalence studies showed that 44% of patients with CLD were at risk of developing hepatitis E.\cite{23}

The ACLF reported with superinfection with HEV in previous studies,\cite{24,26,27,28} but the mechanisms responsible for this increased mortality are not known. There is a little data available to determine the degree by which HEV infection accelerates or worsens liver damage in people with CLD. The presumed mechanisms are, hepatitis E might exacerbate conditions in which the liver is physiologically stressed and has marginal reserve as in the case of CLD; another hypothesis by Sallie et al. 1991\cite{29} could be due to cholestasis which leads to defective viral excretion with failure to clear the virus and consequent severe hepatocellular damage. This hypothesis could be strengthened by estrogen-induced cholestasis in pregnancy, immature bile apparatus in neonates\cite{30} leading to increased mortality. Hence, it is concluded that bile stasis could be ultimate common pathway\cite{31} that may lead to increased mortality in these conditions; however further large studies are needed to confirm this hypothesis. Liver biopsy is useful to differentiate from HEV superinfection on underlying CLD. Poor prognostic factors were female sex, younger age, encephalopathy, and persistent renal failure.\cite{32} These patients should be considered for liver transplantation.

In our study, dual infection of HEV and HBV was observed in 5.3% (4/75) of acute hepatitis, in contrast to 0.91% in Sarguna et al. 2007.\cite{18} Among these, 2 patients with CLD (HBV related) developed ACLF and the rest two were inactive HBsAg carriers. Tandon et al. 1982\cite{33} have found a higher attack rate of HEV in subjects who are HBsAg carriers.

There were 4 pregnant women in our study; all of them were in third trimester at the time of infection. Three out of them had no untoward effects during pregnancy and after delivery during their follow-up. While it is well-known fact that increased incidence of mortality ranging from 5% to 25% observed in HEV infection in pregnancy,\cite{28} the case fatality rate increases with the length of the pregnancy, as is evident in the present study (25%). In our study, one pregnant woman, who was in third trimester, with isolated HEV infection, without any co-morbidities and without pregnancy induced complications such as pregnancy-induced hypertension, eclampsia. She developed fulminant hepatic failure within 4 weeks of the onset of symptoms of liver disease and had a fatal outcome within 3 days of onset of hepatic encephalopathy.

Table 3: Complications of acute viral hepatitis E (n=75)

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<th>S. no</th>
<th>Complication</th>
<th>No. (%)</th>
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<tr>
<td>1.</td>
<td>Coagulopathy</td>
<td>12 (18)</td>
</tr>
<tr>
<td>2.</td>
<td>Upper GI bleeding</td>
<td>4 (5.3)</td>
</tr>
<tr>
<td>3.</td>
<td>Acute liver failure</td>
<td>2/75 (2.6)</td>
</tr>
<tr>
<td>4.</td>
<td>Acute on chronic liver failure</td>
<td>6/75 (8)</td>
</tr>
<tr>
<td>5.</td>
<td>Severe sepsis</td>
<td>1/75 (1.3)</td>
</tr>
<tr>
<td>6.</td>
<td>Progression to chronicity</td>
<td>Nil (0)</td>
</tr>
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Termination of pregnancy has no beneficial outcomes for pregnant woman with HEV. The exact mechanisms responsible for this increased mortality are not known; however there are certain plausible concepts such as endotoxin-mediated hepatocellular damage, a shift in the T-helper 1/T-helper 2 balance toward T-helper 2, selective suppression of nuclear factor kappaB (NFκB) p65, increased viral replication, an extreme low immune status of Indian/Asian pregnant women, and estrogen-induced cholestasis as discussed earlier. ALF in pregnant women, probably indicates that the outcome of this infection is determined by the host factors rather than by the dose or the virulence of the virus.

The most widely accepted definition of ALF includes evidence of coagulation abnormality, usually an international normalized ratio ≥1.5 and any degree of mental alteration (encephalopathy) in a patient without pre-existing cirrhosis and with an illness of <26 weeks duration (American Association for the Study of Liver Diseases Position Paper: The Management of ALF; Julie Polson and William M. Lee). The incidence of ALF was 2.6% (2/75) in our study while it was 0.9% in Nandi et al. 2009 and 40% in Acharya et al. 1996, Khuroo et al. 2003 in which only patients with ALF were included. Both cases with ALF had a fatal outcome, one among them was pregnant (3rd trimester).

INR >1.5 was considered an essential criterion for the diagnosis of coagulopathy or prothrombin activity of <40% can be used to define coagulopathy (The Asian Pacific Association for the Study of Liver Diseases Position Paper: The Management of ALF; Julie Polson and William M. Lee). The incidence of ALF was 2.6% (2/75) in our study while it was 0.9% in Nandi et al. 2009 and 40% in Acharya et al. 1996, Khuroo et al. 2003 in which only patients with ALF were included. Both cases with ALF had a fatal outcome, one among them was pregnant (3rd trimester).

Overall 4 deaths occurred with a mortality rate of 5.3% (4/75) which was higher than mortality rates reported previously. This high mortality rate in clinical study, in contrast to 1.3% case fatality rate in epidemiological survey, was may be due to limited study involving only 75 patients, patients who were severely ill got admitted in hospital, and among 4 deaths, one among had background of CLD, one was pregnant (third trimester) who were high risk for increased mortality. Among the other two deaths, one is due to severe sepsis with lung abscess in a non-pregnant woman, and the other is due to hepatic encephalopathy. Previous reported case fatality rates have ranged from 0.5% to 4%; however, these rates seem to be overestimated because they are based on data from hospitals. Population surveys during outbreaks have reported lower mortality rates of 0.07-0.6% in Aggarwal et al. 2000.

HEV chronicity is observed in immunocompromised persons such as organ transplant recipients. We did not observe any sequelae suggestive of chronicity. No post-transplant patients were included in our study.

People who drank untreated municipal water were at high risk (Figure 4).

Laboratory test abnormalities were similar to previous studies which include leukopenia with relative lymphocytosis, and abnormal liver function tests (Table 2) in almost all patients, characterized by elevated serum bilirubin (94.6%) predominantly conjugated bilirubin (values ranging from 1 to 31 mg/dl), elevated transaminases (100%) predominantly ALT (values ranging from 120 to 4500 U/L) (Table 2a). In our study, 80% of patients had cholestatic picture with elevation of serum alkaline phosphatase, in contrast to 97% in Sarguna et al. 2007.

The elevation of serum ALT levels as a single peak preceded or coincided with the onset of jaundice, which is similar to Balayan et al. 1983; Khuroo et al. 1983; Dienstag et al. 1983.

During follow-up, liver function tests were repeated, as illness subsided, serum transaminases and bilirubin abnormalities started declining, reached normal values by 4 weeks in most patients.

IgM anti-HEV detected by enzyme-linked immunosorbent assay with gene lab diagnostic kits was used to confirm the etiology of icteric hepatitis, and those who were positive for IgM anti-HEV were included in the study. IgM anti-HEV appears in the early phase of clinical illness, lasts 4-5 months and can be detected in 80-100% of cases during outbreaks of acute hepatitis E. The time of appearance of IgM anti-HEV was similar to previous studies, but after how many days it disappeared from the blood was not known since we did not repeat the test during follow-up.

Ultrasonography of the abdomen revealed GB wall edema in majority of patients. GB wall edema/thickening, mild hepatomegaly were common findings. We observed GB wall edema/thickening in 45% of patients, in contrast...
to 84% in Sudhamsu et al. 2006. Several hypotheses have been proposed to explain the mechanism of GB wall thickening in patients with acute hepatitis, such as decrease in gallbladder volume, a temporary decrease in bile production and excretion or may be due to a direct injury to and inflammation of the mucosal and muscular layers of the gallbladder by hepatitis virus contained in bile juice. Other findings include chronic liver parenchymal changes with portal hypertension, splenomegaly, and ascites in few patients. The main advantage of ultrasonography is to exclude biliary obstruction as a cause of jaundice and cholestatic symptoms. No evidence of biliary obstruction in imaging was observed in this study.

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Correlation of Fetal Heart Rate Tracings and Scalp Stimulation Test in Labor with Cord Blood pH and Perinatal Outcome

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INTRODUCTION

Late first stage and second stage of labor is the time of greatest physical strain often for the mother and always for the fetus. With early and precise detection of fetal distress by different methods and its more definitive management, perinatal morbidity and mortality can be reduced.

During the late 1960’s continuous electronic fetal monitoring was introduced into obstetrical practice to diagnose fetal hypoxia, It has been found that cardiotocographic (CTG) monitoring assures the attending obstetrician of fetal well-being but even with the worst form of tracing only 50-60% of fetuses get acidotic. Therefore, there has been an ongoing search for better methods to predict the fetal condition. Now the trend is moving toward doubly checking the pathological traces by a second more objective method such as vibroacoustic test, scalp blood pH, fetal pulse oximetry, and instant lactate assay.

Abstract

Background: Late first stage and second stage of labor is the time of greatest physical strain often for the mother and always for the fetus. With early and precise detection of fetal distress by different methods and its more definitive management, perinatal morbidity and mortality can be reduced.

Aims and Objectives: (1). To diagnose fetal hypoxia during labor by electronic fetal monitoring especially using scalp stimulating test. (2). To correlate the findings with cord blood pH, Apgar score, perinatal outcome and thus reducing perinatal morbidity and mortality.

Materials and Methods: A prospective study was carried out with 65 patients in labor with cephalic presentation in the Department of Obstetrics and Gynecology, Jawaharlal Nehru Medical College, AMU, Aligarh, in the year 2006-2007 for a period of 15 months.

Observation: In this study out of 57 scalp stimulation reactive patients 50 (88%) had a good neonatal outcome. 7 (12%) were admitted to the neonatal intensive care unit (NICU), 1 (2.5%) expired on day 2 of NICU admission admitted for depressed Apgar score due to cord prolapse.

Conclusion: It was seen that when there is acceleration on scalp stimulation 88% had good neonatal outcome while in non-reactive group 50% had a good neonatal outcome. The incidence of NICU admission was less in the reactive group as compared to the non-reactive group as compared to non-reactive group (50%). Also, more babies did in high-risk non-reactive group.

Key words: Apgar score, Cord blood pH, Scalp stimulation test
might be depressed in an acidotic fetus. This test came into existence as an accidental observation by Clark et al. in 1983 when they observed presence or absence of accelerations at the time of fetal scalp blood sampling for the assessment of fetal scalp pH.

Aims and Objectives
1. To diagnose fetal hypoxia during labor by electronic fetal monitoring especially using scalp stimulating test.
2. To correlate the findings with cord blood pH, Apgar score, perinatal outcome and thus reducing perinatal morbidity and mortality.

MATERIALS AND METHODS

The present study of, “Correlation of FHR tracings and scalp stimulation test in labor with cord blood pH and perinatal outcome,” carried out in the Department of Obstetrics and Gynecology, Jawaharlal Nehru Medical College, AMU, Aligarh, in the year 2006-2007.

Selection of Cases
Patients in labor, with the cephalic presentation, were selected and their consent was taken for study. Total 65 patients were studied. 42 were low-risk patients and 23 were of the high risk group. The age of patient ranged from 18 to 35 years. Ethical clearance from the Ethical Committee of Jawaharlal Nehru Medical College, AMU, Aligarh was taken for the study. A detail statistical analysis was done.

Evaluation of Patient
The patients were evaluated under the following headings:
• History of present pregnancy and complaints if any
• Bleeding per vaginum
• Fetal movement
• Pedal edema
• Blurring of vision.

Menstrual history: Complete menstrual history taken and expected date of delivery was calculated.

Obstetric history
• Number of full term live births
• Number of stillbirths/neonatal deaths
• Mode of delivery
• Number of abortions
• History of any congenital anomalies in babies.

Past history: No history of tuberculosis, diabetes, and hypertension.

Family history: History of diabetes hypertension, tuberculosis, etc. in family was noted.

Examinations
General examination
• Pulse rate
• Blood pressure
• Pedal edema
• Jaundice
• Lymphadenopathy
• Pallor.

Systemic examination
• Respiratory system
• Cardiovascular system
• Per abdomen examination
• Fundal height
• Presentation
• Number of fetuses
• Auscultation of fetal heart sound.

Investigation
• Routine investigation
• Urine for albumen, sugar
• Renal function test with blood sugar.

Special investigations
• CTG
• Scalp stimulation test
• Cord blood pH analysis.

CTG and scalp stimulation was done, when the patient was in advanced labor. Cord blood pH analysis was done after delivery of the baby.

Equipment for CTG Monitoring
The instrument used for fetal monitoring was Agilant fetal monitor series 50-IP monitor which gave continuous recording of FHR and uterine contractions simultaneously on a thermal graph paper. CTG paper gives a permanent recording of FHR pattern and its relationship to uterine contractions. Only external method of monitoring FHR was used. Along with it fetal movement event marker was also available which the patient has to press whenever she perceives fetal movement.

Measurement of Uterine Contractions
Uterine contractions are measured using the external method of monitoring. Pressure sensitive to co transducer was placed on a fundal area of maternal abdomen and frequency, and duration of contraction was noticed.

Measurement of FHR
The transducer was placed on the maternal abdomen where FHR of maximum intensity was heard. It catches ultrasound signals and convert them into an electrical signal and records it on thermal graph paper. Cardiotocometer
uses the time interval between two audible signals and measures beat to beat instantaneous FHR.

**Equipment Used for Cord Blood pH Analysis**

The equipment used is Eschweiler combisys II blood gas electrolyte analysis. It is a microprocessor controlled automatic analysis system for quantitative measurement and calculation of pH electrolyte and blood gas parameters of a single sample of whole blood or serum. The samples are suctioned directly into the sample port from capillary tubes, syringes, vacuumers or other sample intake-systems. The materials to be measured are automatically positioned in the analysis system. The sample quantity needed to fill completely the analysis system is controlled by a light barrier. The sample volume is approximately 50-80 µl.

**Conduction of CTG and Scalp Stimulation Test**

Prior to performing the test, patients were explained about the test. The proper abdominal examination was done to find out the fundal height, presenting part, position and to auscultate the point of maximum intensity of FHR. Then the patient was made to lie in a lateral recumbent position to avoid compression of inferior vena cava, which would impair uterine blood flow and thus leading to the appearance of decelerations. Tocodynamemeter was placed over abdomen just below the fundus. Area of maximum intensity of FHR was auscultated, and ultrasound transducer put after applying a liberal amount of aqua sonic jelly which improves conduction of signals. Both transducers were held in position using stretch belt. The speed of the paper is 1 cm/min. CTG tracings were taken in a patient in late labor and then scalp stimulation was given when FHR was at its baseline. Stimulation was not given during acceleration or deceleration as it would lead to difficulty in interpretation of response to scalp stimulation. The method used for scalp stimulation was as described by Clark et al. (1984). Each fetus was subjected to 15 s of gentle digital pressure on the scalp through the dilated cervix. The amount of pressure required to stimulate is that much pressure that is required in exploring the surface of the head to locate various sutures and fonatenelles. The presence or absence of immediate FHR acceleration was noted; an acceleration of fetal heart of at least 15 beats above the baseline for at least 15 s duration was regarded as positive response. The digital stimulus induces an immediate decrease in vagal tone with increase sympathetic response resulting in fetal heart acceleration. Such a response from fetus indicates an intact autonomic nervous system which might be depressed in an acidotic fetus. Interpretation of CTG trace (Arulkumaran et al., 1987).

Normal trace is defined as one with:

- **a)** Baseline FHR of 120-160 beats/min
- **b)** Variability of 10-25 beats/min
- **c)** Haring accelerations.

A suspicious trace was defined as one which had no acceleration and reduced baseline variability (5-10 beats/min) or abnormal baseline rate or flat baseline (<5 beats/min) or variable decelerations without ominous features.

An ominous trace was defined as one that had flat baseline and abnormal baseline rate or repeated late decelerations or repeated variable decelerations with ominous features that is:
- Duration of >60 s
- Beat loss>60 beats
- Slow recovery
- Rebound tachycardia
- Late deceleration component.

The FHR changes were so classified if it persisted after corrective measures of alteration of position of the mother, hydration, oxygen inhalation and omission of oxytocin infusion.

The response to scalp stimulation was interpreted as reactive or non-reactive.

Reactive/positive response is defined as the acceleration of 15 bpm lasting for at least 15 s. It implies no acidosis.

Non-reactive/negative response means no acceleration in response to the stimulus given.

**Determination of Cord Blood pH**

Method used for collection was according to “Bruce E. Josten et al. (1987).” Blood taken from the umbilical artery was used for acid-base studies to assess the metabolic status of the fetus. Blood collection was performed following delivery by immediately isolating 10-20 cm of a segment of cord. The cord was clamped by three clamps to isolate the segment within 20-30 s of delivery. Sample from the placental side was taken. Arterial blood was drawn in preheparinized (that is flushed with heparin) other anticoagulants like citrate, oxalate, ethylen diamine tetra acetate cannot be used because they shift pH values and distort acid base parameters.

The needle was capped, and capped syringe was transported to the laboratory as soon as possible and analysis was done within 15-20 min laboratory facilities were available round the clock. The blood was put in auto analyzer port provided for blood. Blood is pushed directly by syringe after removing the needle. The reading was displayed immediately on screen, and tracing was obtained for permanent record.
Criteria used for interpretation was as described by Arulkumaran et al.(1987)\(^1\). The pH values were grouped into ranges of:
- \( \text{pH} < 7.20 \): Acidotic
- \( \text{pH} = 7.21 \) to \( 7.25 \): Preacidotic/hypoxemic
- \( \text{pH} > 7.25 \): Non acidotic

After delivery following measures of outcome were noted:
1. Mode of delivery
2. Umbilical cord blood pH
3. Apgar score at one and 5 min
4. Presence or absence of meconium in liquor
5. Neonatal morbidity and mortality

**Statistical Analysis**
For testing the significance of incidence rate of each measure of outcome the following formulae were used

\[
Z = \frac{\text{test for proportion} - \text{expected proportion}}{\sqrt{\frac{\text{expected proportion} \times \text{expected proportion}}{\text{number of cases}}}}
\]

**Table 1: Distribution of patients**

<table>
<thead>
<tr>
<th>Type</th>
<th>Number of patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low risk</td>
<td>42</td>
<td>64.6</td>
</tr>
<tr>
<td>High risk</td>
<td>23</td>
<td>35.4</td>
</tr>
<tr>
<td>Total</td>
<td>65</td>
<td>100</td>
</tr>
</tbody>
</table>

**Table 2: Associated risk factors**

<table>
<thead>
<tr>
<th>Risk factors</th>
<th>Number of patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post term</td>
<td>2</td>
<td>8.0</td>
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<tr>
<td>PIH</td>
<td>3</td>
<td>12.6</td>
</tr>
<tr>
<td>BOH</td>
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<td>0</td>
</tr>
<tr>
<td>Heart disease</td>
<td>1</td>
<td>4.2</td>
</tr>
<tr>
<td>Rh negative pregnancy</td>
<td>1</td>
<td>4.2</td>
</tr>
<tr>
<td>IUGR</td>
<td>1</td>
<td>4.2</td>
</tr>
<tr>
<td>Severe anemia</td>
<td>1</td>
<td>4.2</td>
</tr>
<tr>
<td>Twin pregnancy</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Polyhydramnios</td>
<td>1</td>
<td>4.2</td>
</tr>
<tr>
<td>Severe preeclampsia</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Renal disease</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Previous caesarean section</td>
<td>7</td>
<td>29</td>
</tr>
<tr>
<td>Obstructed</td>
<td>3</td>
<td>12.6</td>
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<td>Icterus gravidarum</td>
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<td>12.6</td>
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<tr>
<td>Fibroid in pregnancy</td>
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</tr>
<tr>
<td>Total</td>
<td>24</td>
<td>100</td>
</tr>
</tbody>
</table>

PIH: Pregnancy induced hypertension, IUGR: Intrauterine growth restriction, BOH: Bad obstetric history

**Table 3: Interpretation of CTG tracings**

<table>
<thead>
<tr>
<th>CTG</th>
<th>Number of patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal trace</td>
<td>25</td>
<td>(41.5)</td>
</tr>
<tr>
<td>Suspicious trace</td>
<td>36</td>
<td>(56)</td>
</tr>
<tr>
<td>Ominous trace</td>
<td>4</td>
<td>(1.5)</td>
</tr>
<tr>
<td>Total</td>
<td>65</td>
<td>(100)</td>
</tr>
</tbody>
</table>

CTG: Cardiotocography

**Table 4: Interpretation of SST**

<table>
<thead>
<tr>
<th>SST</th>
<th>Number of patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reactive</td>
<td>57</td>
<td>(66.7)</td>
</tr>
<tr>
<td>Non-reactive</td>
<td>8</td>
<td>(37.5)</td>
</tr>
<tr>
<td>Total</td>
<td>65</td>
<td>(100)</td>
</tr>
</tbody>
</table>

SST: Scalp stimulation test

These results show that 23 (92%) having cord blood pH > 7.25 i.e. normal pH, with only 2 (8%) in preacidotic range. 24 (96%) out of 25 normal reactive traces patients had good Apgar score. 29% were delivered healthy and alive, with 2 babies (8%) admitted to neonatal intensive care unit (NICU) and 1 (4%) expired due to sudden cord prolapse in labor. Out 31 suspicious traces, 32 (89%) responded with accelerations on scalp stimulation 28 (87.5%) had normal pH i.e. >7.25. 4 (12.5%) were still in preacidotic range.

**OBSERVATIONS AND RESULTS**
This study includes 65 patients 42 patients were in low-risk group, and 23 were in the high risk group (Tables 1 and 2).

Out of 24 high-risk patients, maximum were a previous caesarean section (29%). Next high risk factor in the study is icterus gravid arum PIH, obstructed Labor (Figure 1).

Out of 65 patients studied in our study maximum patients were seen between 21 and 25 years of age in both low and high-risk groups (Figure 2).

Maximum patients lying in low-risk group were primigravida (56%) and those belonging to high-risk group were second gravida (38%) (Tables 3 and 4).

Correlation of scalp stimulation test with the mode of delivery. Out of 57 patients reactive to scalp stimulation, 39 (68.5%) had full term normal delivery. 10 (17.5%) had caesarean section due to fetal distress 8 (14%) also. Underwent operative interference due to other indications 36 belonged to low risk group with 26 (72%) normal vaginal deliveries (Table 5). Of 25 normal traces, all 25 were reactive to scalp stimulation test with 23 (92%) having cord blood pH > 7.25 i.e. normal pH, with only 2 (8%) in preacidotic range. 24 (96%) out of 25 normal reactive traces patients had good Apgar score. at 1 and 5 min while only 1 (4%) patients had low Apgar score.

23 (92%) delivered healthy and alive baby, with 2 babies (8%) admitted to neonatal intensive care unit (NICU) and 1 (4%) expired due to sudden cord prolapse in labor. Out 31 suspicious traces, 32 (89%) responded with accelerations on scalp stimulation 28 (87.5%) had normal pH i.e. >7.25. 4 (12.5%) were still in preacidotic range.
Table 5: Correlation of CTG, scalp stimulation test with cord blood pH, Apgar score and neonatal outcome

<table>
<thead>
<tr>
<th>CTG</th>
<th>SST</th>
<th>No.</th>
<th>&lt;7.20</th>
<th>7.20-25</th>
<th>&gt;7.25</th>
<th>1-6</th>
<th>%</th>
<th>1 min.</th>
<th>5 min</th>
<th>%</th>
<th>1 min.</th>
<th>5 min</th>
<th>%</th>
<th>7-10</th>
<th>%</th>
<th>Alive</th>
<th>%</th>
<th>Admission of NICU</th>
<th>%</th>
<th>Expired</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>Reactive</td>
<td>25</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>8</td>
<td></td>
<td>23</td>
<td>92</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>24</td>
<td>96</td>
<td>24</td>
<td>96</td>
<td>23</td>
<td>92</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Non reactive</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td>0</td>
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<tr>
<td>Total</td>
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<td>25</td>
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<tr>
<td>Suspicious</td>
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<td>34</td>
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<td>86</td>
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<td>0</td>
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<tr>
<td></td>
<td>Non reactive</td>
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<td>25</td>
<td>1</td>
<td>25</td>
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<td>2</td>
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<td>50</td>
<td>2</td>
<td>50</td>
<td>1</td>
<td>25</td>
</tr>
</tbody>
</table>

CTG: Cardiotocographic, SST: Scalp stimulation test, NICU: Neonatal intensive care unit

Figure 1: Age distribution

Figure 2: Parity distribution

i.e. 7.20-7.25. 31 (97%) out of 32 reactive suspicious traces had good Apgar score at 1 and 5 min but 1 (3%) had low Apgar score i.e. between 1 and 6. out of 36 suspicious traces, 4 (11%) non-reactive scalp stimulation, 3 (75%) out 4 had normal pH with 1 (25%) having preacidotic pH.

However, in non-reactive suspicious traces patients, 25% 1 patients had low Apgar score at 1 min and 3 patients (75%) had good Apgar score at 1 min. However, all (100%) had good Apgar score at 5 min.

Out of 4 ominous traces, none of them reacted with the acceleration of scalp stimulation all (100%) were non-reactive on scalp stimulation.

2 (50%) patients had normal pH despite abnormal CTG and non-reactive scalp stimulation test:
- 1 (25%) in preacidotics range.
- 1 (25%) in acidoctic range.
- 2 (50%) baby had low Apgar score at 1 min and 5 min.
- 2 (50%) had good Apgar score.
- 2 (50%) expired with such findings.
- 2 was admitted to neonatal intensive care unit.
- 1 (25%) baby was alive.

DISCUSSIONS

A number of well-defined FHR patterns have been shown to have a significant correlation with intra-partum fetal pH; this association. Forms the basis for electronic FHR monitoring. However such an association is far from perfect for, while a normal tracing with acceleration, no periodic decelerations, and good variability is an excellent indicator of fetal well-being, ominous patterns of late decelerations have been associated with at most, a 50% incidence of significant fetal acidosis.

Thus, when we get FHR tracings suggestive of acidosis we want to confirm the presence or absence of acidosis. Fetal blood sampling is of great value in separating acidotic cases from normal ones but cannot be performed in all cases even if equipment and expertise are available as in patients in early labor particularly if the cervix is not effaced Zalar et al. found that capillary blood pH approaches that of umbilical arterial blood pH. An alternative to fetal scalp blood sampling could, therefore, be helpful. Scalp stimulation test is non-invasive and simple to perform. The American Academy of Pediatrics and American college of Obstetricians and Gynecologists (2002) recommend that cord blood gas distinguish
metabolic acidemia from hypoxia or other causes that might result in low Apgar score.

In the present study, 65 patients were studied with 41 low risk and 24 high-risk patients. Maximum high-risk patients were those having a previous caesarean section and next were icterus gravid arum, pregnancy induced hypertension obstructed labor. Most of the cases were in age group of 21-25 years. Maximum patients were primigravida (56%). According to Roger et al.\(^7\) most frequently seen FHR deceleration in labor is variable deceleration.

**Interpretation of CTG Tracing**

In our study, maximum traces are suspicious traces. According to Arulkumaran et al. (1987)\(^3\) they found 64% patients had a suspicious trace. FHR changes are common in labor in fact only 40% of all traces are without any changes in routinely monitored patients.

**Interpretation of Scalp Stimulation Test**

This study indicates that in patients with reactive trace 66.7% belonged to low risk group while in patients with nonreactive trace only 37.5% were in low-risk group that is more number of high-risk patients in non-reactive group.

According to Clark et al. (1984)\(^6\) 63% of patients with heart rate tracings suggestive of acidosis were reactive to digital pressure.

Results of our study are comparable to that of study by Arulkumaran et al.\(^3\)

**Correlation of CTG Trace with Scalp Stimulation Test**

In our study, all patients with normal CTG trace showed acceleration on scalp stimulation.

While 88% patients with suspicious trace were reactive and 11% had no response on scalp stimulation.

In 4 ominous traces all were non-reactive on scalp stimulation. According to Arulkumaran et al. (1987)\(^6\) out of 32 suspicious traces 90.6% had a positive response with acceleration and 9.4% were negative but in those with ominous trace 61% were reactive and 39% were -reactive.

**Correlation of CTG with Meconium in Liquor**

Krebs et al. (1980)\(^8\) found reduced oscillatory amplitude, decreased the incidence of acceleration and late deceleration to be significantly more common when there is thick meconium.

Dasari et al. (2003)\(^9\) 5 fetuses out of 8 with acidosis did not show any ominous FHR pattern despite their presence of acidosis; they only exhibited hypoxia in the form of thick meconium.

In our study of 65 patients, 80% patients with normal CTG trace had clear liquor.

36% with suspicious trace had meconium while 75% with ominous trace had meconium. Meconium staining was statistically more in high-risk patients.

A normal cardiotocogram was highly predictive of normal pH in clear liquor and thin meconium, but not in fetuses with thick meconium.

**Correlation of CTG Trace with Mode of Delivery**

According to our study – 8% patients with normal CTG trace underwent caesarean section for fetal distress.

While cesarean section rate was high (75%) in patients with ominous trace and 25% with suspicious trace.

According to Arulkumaran et al. (1987)\(^3\) 50% with ominous trace were terminated by caesarean section for fetal distress.

**Correlation of CTG, scalp stimulation test with cord blood pH Apgar score and neonatal outcome**

According to Thorp et al. (1986)\(^10\) – trend for decreased acceleration and decreased fetal movements is associated with a low Apgar score 1 min after delivery.

In 25 patients with normal trace all were reactive to scalp stimulation 92% had normal pH with 8% in preacidosis. 96% had good Apgar score at 1 min and 5 min. 92% delivered live and healthy baby. Low\(^11\) found no increase in newborn complications after respiratory acidosis.

In patients with suspicious trace, 89% were reactive to scalp stimulation. 87.5% had normal pH, 12.5% were in preacidotic range and none had acidosis. 3% patients had low Apgar score at 1 and 5 min while 97% had good Apgar score at 1 and 5 min 87.5% patients had live and healthy baby, 12.5% were admitted to NICU and no mortality occurred in this group.

11% patients with suspicious trace were non-reactive on scalp stimulation, 75% had normal pH, 25% were preacidotic and none had acidosis. 25% had low Apgar score at 1 min. 75% had good Apgar score at 1 min and 100% had good Apgar score at 5 min. 75% had live and healthy baby, 25% were admitted to NICU and no mortality was seen in this group also.

Incidence of normal pH is also most equal is suspicious group with reactive and non-reactive test but the incidence of preacidosis is more in the non-reactive group although statistically insignificant. Chances of low Apgar score in reactive and non-reactive are also
not statistically significant in patients with suspicious trace. Both groups have an almost equal incidence of live and healthy babies. The correlation is statistically insignificant in this study. Large studies are required to prove the significance.

Out of 4 ominous traces all were non-reactive with 25% in acidosis, 25% in preacidosis and rest 50% had normal pH 50% had low Apgar with 2 (50%) mortalities out of 3 NICU admissions. Although in our studies, there was no ominous trace, which was reactive on scalp stimulation. However, studies done before shows ominous traces reactive to scalp stimulation where reactive traces had better outcome than non-reactive trace. That is reactive scalp stimulation test does give assurance in ominous traces also.

Elimian et al.11 (1997) reported that of 58 cases in which FHR accelerated 10 beats/min or more after 15 s of gentle digital stroking of the scalp, 100% had scalp pH of 7.20 or greater. Without acceleration, however only 30% had a scalp pH<7.20.

In study of Arulkumaran et al.1985): 80% responded to scalp stimulation in which 15% were in pre-acidotic range and 7% developed acidosis later on 20% fetuses had a negative test on scalp stimulation - 20% were acidotic and 50% were preacidotic.

The study indicates the importance of scalp stimulation test in suspicious and ominous traces rather than normal traces. Normal trace is itself associated with good neonatal outcome. While in patients with suspicious trace, if they are reactive to scalp stimulation it reassures the obstetrician of well-being of the fetus and thus avoiding unnecessary caesarean sections for fetal distress. In this study all ominous traces were non-reactive to scalp stimulation test. Larger studies are required to comment on the significance of reactive scalp stimulation in cases with ominous trace.

In the present study, it is concluded that the scalp stimulation which was discovered by Clark et al. accidentally in 1983 is an excellent predictor of fetal well-being but less consistent predictor of fetal compromise. It is non-invasive, cheap and simple to perform. It can be used as diagnostic method of choice in cases suggestive of fetal acidosis in institutions where the facility for fetal blood sampling is not available, especially in developing countries.

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Dental Fear Perceptions in Children - Do Dental Chairs have a Role in it?: A Pilot Study

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Abstract

Purpose: The study was conducted to assess the acceptance of pediatric dental chair over an adult dental chair and to assess the impact of pediatric dental chair in inducing change in behavior as compared to adult dental chair.

Materials and Methods: A total of 28 children between 4 and 6 years (18 boys and 10 girls) were randomly chosen for this pilot study. The children were categorized according to Frankl behavior rating scale, and 6 children were further excluded from the study who showed definitely positive behavior. These children were asked to rate both the chairs in a similar environmental set up and again the children having a greater liking for pediatric dental chair were examined in the pediatric dental chair to find the behavior change if occurred.

Results: Data were analyzed using SPSS for Windows release 20.0 (SPSS, Chicago, IL, USA). The acceptance level of pediatric fancy dental chair (mean score = 7.77, standard deviation [SD] = 1.54) was higher than normal adult dental chair (mean score 3.0, SD = 1.66) and it was statistically significant \( P = 0.0001 \). The study also showed the change in behavior was significant after sitting on pediatric dental chair than before sitting (mean score before = 2.22 and after sitting on pediatric chair = 2.59, \( P = 0.002 \)). No significant change was found in behavior according to age and gender.

Conclusions: Children have a liking for novelty and animations which was established by this study. Pediatric fancy looking dental chairs can have a beneficial effect on the behavior of children in the dental office.

Key words: Behavior, Comparison, Dental fear, Pediatric dental chair

INTRODUCTION

Dental fear in children is an important factor for managing patients and their treatment. Information about its origin in unco-operative child patient prior to the treatment procedures may help the pediatric dentist plan the treatment strategy in a better way.\(^1\) Dental fear and child behavior are usually of multifactorial origins which can be divided into social, environmental, and personal factors.\(^2\) Although personality is said to influence dental fear and behavior most, they are also strongly affected by social and family environments.\(^3\) Personality factors such as temperament, general fearfulness, and behavioral problems have been studied extensively, but the effect of environmental and situational factors has been comparatively less looked into.\(^4\) Among environmental factors, it has been well-documented that parental dental fear strongly correlates with that of the child.\(^5\) Factors such as socioeconomic status, family situation, frequent exposure to invasive medical care, and past experience of operative dental care have been explored as potential causes of dental fear and behavior problems, but the results have been inconsistent.\(^6\) Studies considering environmental and situational factors for fear are few, and most of them have been carried out in European and southeast Asian countries with less data available for India.\(^7,10\)

Aims and Objectives

- To assess the acceptance level of the pediatric dental chair by children over a normal dental chair.
- To assess the impact of the specially designed pediatric dental chair in inducing a change in behavior as compared to the normal dental chair.
MATERIALS AND METHODS

This study was carried out in a dental hospital involving 28 children aged between 4 and 6 years who were visiting the pediatric dentistry department for routine dental treatment for the 1st time. Informed consent was taken from the parents whose children participated in the study. Ethical Committee was also approached for clearance of this study and got the clearance without much delay as it was a non invasive study. Children with mental retardation, psychotic disorders, and severe sensory-motor impairment (cerebral palsy, blindness, deafness, etc.) were excluded. Children who were rated as having definitely positive behavior according to Frankl behavior rating scale were also excluded from the study. Hence, the sample size after exclusion became 22 children after exclusion of 6 children.

Study Designed in Two Steps

• First step to show the acceptance level of the pediatric dental chair over a normal dental chair.
• Second step conducted to know whether specially designed pediatric dental chair can have a positive role on the behavior of children in the dental clinic.
• Informed consent was taken from the parents of the 28 children who participate in this pilot study.

Group distribution was as follows:
Group 1: Specially designed pediatric dental chair (Figure 1).
Group 2: Normal adult dental chair (Figure 2).

All the treatment procedures were carried out by a single trained pediatric dentist. The behavior of the children was rated by an independent trained pediatric dentist using Frankl’s behavior rating scale. The Frankl’s scale is noted to have good reliability consisting of 4 behavior categories: (1) definitely negative; (2) negative; (3) positive; and (4) definitely positive.

• The selected children were randomly allocated a dental chair (which was done by statistician) without their knowledge of which chair they are going to. Each chair was kept in a separate room with similar environmental settings. Each child was asked to rate the particular chair to which they first went on a visual analog scale of 1-10. Similarly, they were asked to rate the other chair also. The results were analyzed for each chair.
• Step 2 was performed. The children were now asked to sit on the pediatric dental chair for an oral examination with a mouth mirror and explorer. The behavior and also any change in the same were noted after sitting on the pediatric dental chair. The parents were not allowed in the operatory, and the examiner did not resort to any other behavior modification techniques.

RESULTS AND OBSERVATION

Data obtained were analyzed using SPSS for Windows release 20.0 (SPSS, Chicago, IL, USA). Association of fear and behavior with age and gender was determined using chi-square test.

RESULTS

The mean age of the sample was 4.86 years (Table 1) (standard deviation 1.084) with 18 boys and 10 girls \( n = 28 \) (Table 2 and Graph 1). This sample size was reduced to 22 after 6 children reported to be definitely positive \( (n = 22) \) according to Frankl behavior rating scale. There was no statistically significant difference between boys and girls \( (P > 0.001) \). The mean scores for Chair 1 (pediatric chair) was found to be 7.77 (SD 1.54) (Table 3 and Graph 2) and Chair 2 was found to be 3.0 (Table 4 and Graph 3) (SD 1.66). Paired \( t \)-test gave a \( P = 0.0001 \) which was...
Acharya: Association of Dental Fear with Dental Chairs

statistically significant (Graph 4). Similarly, the mean scores before sitting on a pediatric dental chair was 2.22 and after sitting was 2.59 (Graph 5). Paired $t$-test gave a value of 0.02 which showed a significant change in behavior (Table 4). The study did not show any significant change in behavior due to gender (Graph 6) ($P = 0.642$, Chi-square = 0.007) and age ($P = 0.416$, $t = 0.831$) (Table 5 and Graph 7).

The results in this study showed that there is a greater acceptance of pediatric dental chair over adult chair in children and there is also a significant change in behavior after sitting on the pediatric dental chair if it is used for dental examination.

DISCUSSION

The origins of dental fear and anxiety have a complex and multifactorial psychological and physiological etiology. Though the use of pharmacologic measures to curb pain is a common approach, the use of measures to treat patient fear and anxiety lacks. Negative experiences in childhood or
Direct conditioning are the most common causes of dental fear and anxiety. Pain during treatment or an unpleasant attitude of the care provider establishes the initial stimulus that triggers patterns of fear and anxiety.11 The unfamiliar dental environment leads to fear in children and as pediatric health care professionals, it’s our duty to ensure children friendly environment. This can be done by many ways like having toys in the play area, use of attractive paintings in operatory and reception area, friendly ancillary personnel, etc. The one area which has been least studied is whether the use of a less threatening, attractively designed dental chair for children can have a positive effect on the behavior. An ideal pediatric dental chair should satisfy not only the criteria of the pediatric dentist, but also that of the dental staff, parents, and patients. From the perspective of the parent and patient, the pediatric dental chair should be comfortable, stable, clean, and pleasant in appearance. To this, the pediatric dentist must include favorable economics with regard to the purchase price, anticipated maintenance, and repair costs of the chair.12 Furthermore, the form and function of the chair should hasten all steps of patient care before, during, and after treatment, optimize the health of the dental team, internal marketing, and risk management. There are only a few manufacturers that construct dental chairs specifically for children. Unfortunately, when compared to an adult dental chair, the only difference is that the pediatric chair is smaller in size.13 There have been many studies suggesting the role of environmental factors on fear and anxiety in children and the effect on the behavior of children.14-16 Thus, we tried to assess whether the use of an attractive pediatric dental chair can bring about changes in the behavior of children and we were successful to a certain extent. The pediatric dental chair can have a positive role as an effective behavior modification tool. In this study, we could not get any relation between the age and gender and the behavior change while using a pediatric dental chair as compared to the normal dental chair. The drawbacks of our study were that this was a study conducted on a small sample size. Although conducted on a smaller group, the glaring differences in acceptance and behavior changes with the use of specially designed pediatric dental chair made the study effective. This study may not be effective for older children who are not so much attracted to fancy things and so this can be another drawback. Fear in a child and behavior is controlled by many factors so it might not be just the dental chair which can bring about changes in behavior. Other confounding factors like age, gender, etc., have to be taken into account which also plays a major role. Furthermore, in this study, the behavior modification which occurred was only for dental examination, and no treatment was given for the children.

**Table 1: Age**

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<tr>
<td>SE of mean</td>
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**Table 2: Gender**

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<td>Total</td>
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**Table 3: Scores for Chair 1**

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<th>Cumulative percent</th>
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<td>9.1</td>
<td>9.1</td>
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**Table 4: Scores for Chair 2**

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<td>Total</td>
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**Table 5: Mean scores**

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<tr>
<td>Chair 2</td>
<td>3.0000</td>
<td>22</td>
<td>1.66190</td>
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SD: Standard deviation, SE: Standard error
CONCLUSIONS

Dental fear and behavior in children go hand in hand. There are many behavior management techniques for children to reduce fear. This study was conducted to know whether specially designed pediatric dental chair can be added as another method to reduce fear in children and modify their behavior to accept dental care and it did show that use of pediatric dental chair can have a positive impact on the behavior of children. Further studies with larger sample size are required to establish the pediatric dental chair as one of the tools in behavior modification in children. The fancy pediatric dental chair is definitely beneficial for children, and it will also aid in communication with the child properly as it is less threatening and children treat it as a toy.

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Clinical Presentation of Infratentorial Hemorrhage Cases of Stroke in a Tertiary Care Hospital, Chennai

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Abstract

**Purpose:** It is estimated that every year, 15 million people suffer from stroke in the world out of which six million die and another five million are permanently disabled. There are limited studies on the infratentorial hemorrhage cases of stroke especially in India. In this context, this present study was conducted to throw light on the clinical presentation of infratentorial hemorrhage cases admitted in a tertiary care hospital in Chennai, India.

**Materials and Methods:** This is a prospective observational study conducted on the stroke cases admitted to the Neurology Department of Sri Ramachandra Medical College Hospital, Chennai during August 2010 to February 2013.

**Results:** It was found that a total of 1,809 cases of stroke were admitted during this period out of which 43 were infratentorial hemorrhage cases (2.4%). A majority of the patients belonged to 61 and above years age group (44.2%) followed by 41-60 years age group (41.9%) with a higher proportion of cases among males (67.4%) compared to that in females (32.6%). The most common co-morbid conditions were found to be diabetes mellitus (37.2%), chronic kidney disease (25.6%), and dyslipidemia (20.9%). Systemic hypertension was found as a risk factor in as much as 81.4% cases. The most common clinical presentation of the patients was found to be giddiness (39.5%) followed by unconsciousness, vomiting, and dysarthria (25.6% each) motor deficit was found in 44.2% while sensory deficit was found in 27.9% of patients.

**Conclusions:** The clinical presentation of infratentorial cases of hemorrhagic stroke differs qualitatively from other cases of hemorrhagic stroke and ischemic type of cerebral stroke.

**Key words:** Chennai, Clinical manifestations, Eye signs, Infratentorial hemorrhage, Intracerebral hemorrhage, Stroke

INTRODUCTION

It is estimated that every year, 15 million people suffer from stroke in the world, out of which six million die and another five million are permanently disabled. Globally, stroke is the second leading cause of death after 60 years and fifth leading cause of death in people aged 15-60 years.¹ Several studies around the world revealed that the global burden of stroke is high especially in low and middle-income countries.²

During 1990-2010, the age-standardized incidence of stroke significantly decreased by 12% in high-income countries while it increased by 12% in low- and middle-income countries. The mortality due to stroke, however, has decreased in all countries especially in high-income countries.³

The estimated age-adjusted prevalence rate of stroke in India ranges from 84 to 262 per 1-lakh population in rural areas and 334-424 per 1-lakh population in urban areas.⁴ Uncontrolled hypertension is considered as the most common etiological factor for both ischemic and hemorrhagic strokes. Intracerebral hemorrhage (ICH) accounts for 10-15% of all strokes with increased mortality and morbidity compared to that of ischemic strokes.⁵ It has been reported that primary ICH due to chronic hypertension or amyloid angiopathy accounted for 78-88% of all cases.⁶ Other risk factors for ICH include diabetes mellitus,
smoking, cardiac disease, hyperlipidemias, alcoholism, anti-coagulant use, hematological disorders, and aneurysms.  

The ICH can be supratentorial (which is more common of the two) than infratentorial. There are limited studies on the infratentorial hemorrhage cases of stroke especially in India. In this context, this present study was conducted to throw light on the age and gender distribution, co-morbid conditions, risk factors, clinical presentation, and radiological classification of infratentorial hemorrhage cases admitted in a tertiary care hospital in Chennai, India.

MATERIALS AND METHODS

This is a prospective observational study conducted on the stroke cases admitted electively or in an emergency to the Neurology Department of Sri Ramachandra Medical College Hospital, Chennai during August 2010 to February 2013. This hospital is one of the prestigious private tertiary care hospitals in India with facilities for medial as well as postgraduate and super specialist courses. Ethical Clearance was obtained from the Institutional Ethics Committee for carrying out the study. It was found that a total of 1,809 cases of stroke were admitted during this period out of which 255 were cases of ICH with a proportional prevalence of 14.1%. Of a total of 255 cases of ICH, there were 43 cases of infratentorial hemorrhage cases with a proportion of 16.9%. Overall, the proportion of infratentorial hemorrhage stroke in the study was found to be 2.4% out of all stroke cases admitted in the hospital.

A pretested questionnaire was used for collecting information about age, gender, clinical symptoms, ocular signs, motor and sensory deficits, and radiological findings. Written consent was taken from the study subjects or their relatives (in cases of unconscious patients) for conducting this observational study. Information about the risk factors such as hypertension, aneurysms, arteriovenous malformations, tumors, and hemostatic factors were also collected. The data analysis was done using Epi-info software 7.0 version (Centres for Disease Control, Atlanta, USA). The descriptive data were analyzed using usual methods like proportions or percentages.

RESULTS

It was found in the study that a majority of the patients belonged to 61 and above years age group (44.2%) followed by 41-60 years age group (41.9%) while around 13.9% cases occurred below 40 years of age. A higher proportion of cases occurred among males (67.4%) compared to females (32.6%). The most common co-morbid conditions were found to be diabetes mellitus (37.2%), chronic kidney disease (25.6%), and dyslipidemia (20.9%) (Table 1). Systemic hypertension was found as a risk factor in as much as 81.4% cases. None of the patients was found to have any other risk factors like aneurysms, arteriovenous malformations, tumors or hemostatic factors while in 18.6% cases, no cause could be identified.

The most common clinical presentation among the patients was found to be giddiness (39.5%) followed by unconsciousness, vomiting, and dysarthria (25.6% each) (Table 2). The most common ocular sign was found to be nystagmus (18.6%), pinpoint pupils (18.6%) followed by absent corneal reflex (11.6%) (Table 3). Motor deficits were found in 44.2% while the sensory deficit was found in 27.9% of patients (Table 4). Radiologically, the site of hemorrhage was found to be pons (51.2%) and cerebellum (48.8%). Among the pontine hemorrhage cases, Type 1 (massive) was found to be common (27.9%) while among cerebellar hemorrhage cases, majority of the cases were more than 5 cm size (25.6%) (Table 5).

DISCUSSION

The present study has found that the majority of the cases were found among 40 years and above patients (86.1%).

<table>
<thead>
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<th>Parameter</th>
<th>Number of patients (%)</th>
</tr>
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<td>Age group (years)</td>
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</tr>
<tr>
<td>Below 40</td>
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<tr>
<td>41-60</td>
<td>18 (41.9)</td>
</tr>
<tr>
<td>61 and above</td>
<td>19 (44.1)</td>
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<tr>
<td>Gender</td>
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<tr>
<td>Male</td>
<td>29 (67.4)</td>
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<tr>
<td>Female</td>
<td>14 (32.6)</td>
</tr>
<tr>
<td>Co-morbid conditions</td>
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<tr>
<td>Diabetes mellitus</td>
<td>16 (37.2)</td>
</tr>
<tr>
<td>Chronic kidney disease</td>
<td>11 (25.6)</td>
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<tr>
<td>Dyslipidemia</td>
<td>9 (20.9)</td>
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<tr>
<td>Old cerebrovascular accident</td>
<td>8 (18.6)</td>
</tr>
<tr>
<td>Alcoholism</td>
<td>7 (16.3)</td>
</tr>
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<td>Smoking</td>
<td>6 (13.9)</td>
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<table>
<thead>
<tr>
<th>Clinical feature</th>
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</thead>
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<tr>
<td>Giddiness</td>
<td>17 (39.5)</td>
</tr>
<tr>
<td>Unconsciousness</td>
<td>11 (25.6)</td>
</tr>
<tr>
<td>Vomiting</td>
<td>11 (25.6)</td>
</tr>
<tr>
<td>Dysarthria</td>
<td>11 (25.6)</td>
</tr>
<tr>
<td>Unsteadiness</td>
<td>7 (16.3)</td>
</tr>
<tr>
<td>Headache</td>
<td>5 (11.6)</td>
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<tr>
<td>Hemiparesis</td>
<td>5 (11.6)</td>
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<tr>
<td>Hemiplegia</td>
<td>5 (11.6)</td>
</tr>
<tr>
<td>Others</td>
<td>11 (25.6)</td>
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Vomiting is another common symptom reported in cases of hemorrhagic stroke compared to ischemic stroke. The clinical presentation of the patients was found to be different in infratentorial type compared to supratentorial type. The infratentorial type of hemorrhage is comparatively less common type than supratentorial type and ischemic type of cerebral stroke. The clinical presentation of infratentorial cases of hemorrhagic stroke differs qualitatively from other cases of hemorrhagic stroke and ischemic type of cerebral stroke. There is a need for further studies on infratentorial hemorrhage.

**CONCLUSION**

Advancing age is considered to be a recognized risk factor for ICH and in general for all types of strokes. A slightly higher incidence was reported in males and this present study also found a higher prevalence in males (67.4%) than in females (32.6%). In the current study, the most common clinical presentation of the patients was found to be giddiness (39.5%) followed by unconsciousness, vomiting, and dysarthria (25.6% each). It was reported that 50% patients report a decrease in the level of consciousness. The infratentorial type of hemorrhage is comparatively less common type than supratentorial type and ischemic type of cerebral stroke. The clinical presentation of infratentorial cases of hemorrhagic stroke differs qualitatively from other cases of hemorrhagic stroke and ischemic type of cerebral stroke. There is a need for further studies on infratentorial hemorrhage.

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Excision versus Arthroplasty in Mason’s Type 3 Fractures of Radial Head: A Comparative Study

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Abstract

Background: Comminuted radial head fractures are treated either by radial head excision or prosthetic replacement. To our knowledge, this is the first Indian study reporting the comparative results of excision versus arthroplasty in radial head fractures.

Objectives: Our objective was to study and compare the results of two procedures, namely excision and arthroplasty, in comminuted radial head fractures.

Materials and Methods: This is a comparative prospective study comprising 22 patients, aged 20 years and more (average 33.55 years), with comminuted Mason’s Type 3 radial head fractures. They were randomized placing 12 patients in the excision group and 10 patients in the arthroplasty group. The patients were followed up for a period of 7-17 months (average 14 months) postoperatively. Results were analyzed by the Mayo’s elbow performance score and were statistically evaluated by Chi-square test (with Yate’s modification) and Fisher’s test.

Results: As per Mayo’s score, results in excision group were graded as excellent, good, fair, and poor in 7, 4, 1, and 0 cases, respectively, as compared to 0, 7, 3, and 0 cases, respectively, in arthroplasty group. The difference between the results was statistically not significant for Chi-square test (with Yate’s modification) (P = 0.4491) and for Fisher’s test (P = 0.2932). Moderate pain occurred in 1 case (8.3%) of excision and 3 cases (30%) of arthroplasty group. There was elbow stiffness in one arthroplasty patient (10%) and none in the excision group. Moderate elbow instability resulted in 5 patients (41.6%) of the excision group and none in the other. Posterior interosseous nerve palsy occurred in one arthroplasty patient, which recovered after 7 months.

Conclusion: Our study shows that short-term results are similar to radial head excision and arthroplasty in comminuted radial head fractures. Long-term follow-up studies are required to determine the outcome of both in these fractures.

Key words: Arthroplasty, Excision, Radial head fractures

INTRODUCTION

Radial head fractures are not uncommon with an overall incidence of 1.5-4% of all adult fractures.¹⁻³ Though the treatment option in children is straightforward, the matter is still unsettled in adults. Multiple studies have shown that the radial head is responsible for approximately 30% of the valgus stability of the elbow.⁴⁻⁶ Radial head excision has been advocated by many surgeons throughout the years for comminuted fractures. Prosthetic replacement of the radial head was first proposed by Speed in 1941 using a ferrule cup over the neck of radius.¹ Since that time, the use of acrylic, silicone, vitallium, and other metallic radial head prostheses has been reported each with varying results.

Comminuted radial head fractures are treated by radial head excision or by radial head arthroplasty. There has been contrasting results of the treatment outcome of both modalities of treatment in literature.⁷⁻⁹ There are many studies which highlight the advantages of radial head arthroplasty in these fractures.⁹,¹⁰ The aim of our study was to prospectively compare the results obtained by radial head excision and arthroplasty, in comminuted fractures of the radial head.
MATERIALS AND METHODS

The study was conducted in the Department of Orthopaedics, Medical College and Hospital, Kolkata on a prospective basis from February 2007 to December 2008 after obtaining ethical clearance. The inclusion criteria were as follows: (1) Mason's Type 3 radial head fractures (2) closed fractures (3) age of patient 20 years and more (4) delay at presentation of not more than 2 weeks. Patients with age <20 years and open fractures were excluded from the study. 22 patients who fitted the criteria were included in the study after obtaining a written informed consent. Clinical and radiological evaluation was done in each of them. Following prospective randomization, 12 patients were included in the excision group and 10 patients in the arthroplasty group.

Technique of Radial Head Excision

For radial head excision, the upper arm was slightly abducted, the elbow extended, and the forearm pronated on a hand table. A short lateral approach beginning at the lateral epicondyle and ending a few centimeters distal to the radial neck was used.7 The interval between the anconeus and extensor carpi ulnaris was entered, and the radial collateral ligament complex was exposed. A longitudinal incision was made in the anterior part of the lateral collateral ligament along its fibers extending from the lateral condyle to just distal to the radial neck through the annular ligament and capsule. The fractured radial head was excised with great care taken not to leave any fragment in the elbow joint. The radial head was reconstructed on the operation table to make sure that no fragments were left behind. The wound was closed in layers, and no drain was used.

Medial collateral ligament stability was assessed by placing a valgus force on the elbow with the forearm in pronation and elbow at 30° of flexion and assessing the distance between the radial neck and the capitellum. A change in the distance between the radial neck and capitellum of >2 mm was taken as an indication for a disruption of the anterior band of the medial collateral ligament. Instability of the elbow in the extended position indicated that the anterior and posterior parts of the capsule were also torn.8,9

Technique of Radial Head Arthroplasty

For implant arthroplasty, the prosthesis used was a monoblock radial head implant made of stainless steel 316 XL in four different head sizes with diameters of 14, 16, 18, and 20 mm with a stem size of 5 mm. The radial neck was reamed with reamers starting with size 3 mm with 1 mm increment until size 5 mm. The correct diameter of the radial head prosthesis was selected by comparing the excised radial head fragments and the prosthesis. The height of the prosthesis was best selected to ensure that it would have a normal articulation with the proximal radioulnar joint so that it was at the same height as the trochlear notch.10 The implants were press-fit into the proximal part of the radius, and no cement was used. Annular ligament repair was not done. The wound was closed in layers and drain was not used routinely. Suture removal was done on the 12th post-operative day.

Active range-of-motion exercises of the elbow were started 2 weeks after the surgery. The cases were followed up on a weekly basis in the first month, fortnightly thereafter till the acceptable uncomplicated range of motion was regained. After that, the patient was followed up every 3 months. The results were analyzed by Mayo elbow performance score.11,12 Statistical analysis was done using Chi-square test (with Yate's modification) and Fisher's test utilizing the software Epi – Info; Version 3.5.

RESULTS

The patients ranged from 26 years to 48 years (average 33.55 years) and the most frequent age group affected was 31-40 years. 14 fractures were on the right side. None of the cases had a medial collateral ligament injury on clinical examination and by intraoperative assessment. The mode of injury in all cases was a fall on the outstretched hand. The average interval between the injury and surgery was 5 days. Patients were followed up for a period ranging from 7 to 17 months (average 14 months).

Of the 12 patients who had undergone head excision, 7 (58%) had excellent results whereas none of the 10 cases who had undergone radial head arthroplasty had excellent results (Graphs 1 and 2, Figures 1 and 2). Good results were obtained in 4 (33%) cases of radial head excision and in 7 (70%) cases of radial head arthroplasty. There was 1 case (9%) of radial head excision, which fell into the fair group. 3 patients (30%) of the arthroplasty group had fair results. None of the cases of both groups had poor results. Pain, which was moderate, was present in 1 out of 12 cases (8.3%) of radial head excision and 3 out of 10 cases (30%) of arthroplasty. Severe pain was not present in any patient of either group. There was no nerve palsy in any of the patients pre-operatively. Posterior interosseous nerve palsy occurred in one patient who had undergone a radial head arthroplasty which recovered after 7 months of follow-up. Elbow stiffness did not occur in any patient of the excision group whereas it occurred in 1 patient of the arthroplasty group (10%). Moderate elbow instability occurred in 5 patients of the excision group (41.6%) while no instability was found in any patient belonging to the arthroplasty group. None of the patients in the excision group had an ulna plus deformity on follow-up.
The difference between the results by the two methods (excision and arthroplasty) of treatment was statistically not significant ($P = 0.4491$ for Chi-square test and $P = 0.2932$ for Fisher’s test).

**DISCUSSION**

In 1954, Mason classified radial head fractures into three types namely Type 1 (undisplaced segmental or marginal fractures), Type 2 (displaced fractures involving part of the head), and Type 3 (comminuted fractures of the entire head). In 1985, Morrey modified Mason’s classification to incorporate fractures of the radial head associated with posterior dislocation of the elbow as suggested by Johnston as a Mason Type 4 fracture.

A review of the literature reveals a number of articles concerning fractures of the radial head and neck. In discussing the treatment of severely comminuted fractures, most authors until the 1950s considered excision as the only modality of treatment. Local formation of new bone and proximal displacement of the radial shaft were cited as the two factors, which would impair the function of the elbow besides persistent pain of elbow and wrist. Acrylic radial head prostheses were introduced but were discarded soon due to fractures of the prosthesis itself. Silastic prosthesis was introduced in the 1970s. It was found to act as a spacer only without giving any biomechanical advantage in weight transmission, besides causing synovitis, resulting in them being pushed out of favor.

The search for a stiffer material for prosthesis manufacture resulted in the use of various metals such as vitallium, stainless steel, and most recently titanium. Literature agrees that metallic radial head replacement restores the axial stiffness of the forearm to normal whereas excision allows abnormal proximal migration especially under load.

According to Ikeda et al., although radial head excision is associated with wrist and forearm pain, and elbow instability, these complications are not considered to be serious if they do not hamper joint mobility. According to Herbertsson et al., radial head excision leads to a good or fair result. Ashwood et al. treated Mason Type 3 radial head fractures using a monoblock titanium prosthesis with satisfactory outcomes. 50% of their patients had an excellent result, and 31% had a good result. Of the 25 cases of radial head arthroplasty performed by Moro et al., good or excellent results were obtained in 17 cases (68%). According to these authors, there is a mild to moderate physical impairment of elbow and wrist in short-term follow-up after arthroplasty with a metal radial head implant.
Our current experience shows that radial head excision apparently gives better short-term results than radial head arthroplasty, but it was statistically not significant. Excellent or good results were obtained in 91% of excision cases and 70% of arthroplasty cases though the arthroplasty group did not have any excellent short-term results. This was mainly due to the moderate pain which was experienced by 30% cases of the arthroplasty group whereas moderate pain was experienced only by 8.3% of the excision group. Moderate elbow instability occurred in 41.6% patients of the excision group whereas no instability was found in any patient belonging to the arthroplasty group. Though literature does not mention the time period after which proximal radial migration usually develops, it could adversely affect the results of head excision in the long term. Moreover, further follow-up is required as many authors report of pain in the initial period after arthroplasty, which improves with time. Hence, we consider the shorter follow-up and small sample size to be limitations of our study.

In conclusion, both radial head excision and arthroplasty give good short-term results in comminuted radial head fractures. Further studies with longer follow-up are required to determine the long-term effects of both these treatment methods. In the present Indian scenario, radial head arthroplasty seems difficult due to the unavailability of accurate sized implants and the affordability issues of imported radial head implants available abroad.

REFERENCES


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INTRODUCTION

The accurate diagnosis of a renal mass is dependent on many factors including the clinical history, nature of the imaging findings, the experience of the radiologist, and the quality of the examination. Incidental discovery of asymptomatic solid renal masses has meant smaller, more difficult to characterize lesions are now routinely identified on cross-sectional imaging studies and, for renal cell carcinoma (RCC), a decrease in the stage at presentation. Coincidently, as the tumors discovered have become smaller (<4 cm in diameter), the number of benign lesions encountered has also increased, and opportunities to use less radical therapies for those lesions requiring treatment are evolving. Detection of malignant renal masses and their differentiation from their benign counterparts is extremely important, especially when these masses are small. Computed tomography (CT) is the most sensitive imaging modality for detection of renal masses, additionally it has been suggested that CT can play an effective role in characterizing renal masses as solid lesions, simple cysts or complex cysts, further differentiating the last group into six categories based on the likelihood of a complex cyst being malignant. Accordingly, CT is used in deciding whether to recommend that a renal mass be surgically removed or followed with additional imaging or ignored.

MATERIALS AND METHODS

The study was carried out in the Department of Radio-diagnosis in hospitals attached to Bengaluru Medical College and Research Institute, Bengaluru (Victoria
In our study, the maximum percentage of patients was in the age range of 60-69 years. The most common renal mass was RCC accounting for 62% of all the renal masses and 71% were in the age range of 60-69 years. Our findings are similar to the findings of Gudbjarston et al., who have described the incidence and distribution of renal cell cancer in a large population and have found that RCC peaks in 6th through the 8th decade.

Regarding the differentiation of benign from malignant renal masses included in our study (Table 4). The benign renal masses had a mean attenuation value of ~16.8 HU on pre-contrast scans whereas the malignant renal masses showed a higher mean attenuation value of ~28 HU.

The mean attenuation value of benign renal masses in corticomedullary phase (CMP) phase was ~25.29 HU, and that of malignant masses was ~56.02 HU.

The mean attenuation value of benign renal masses in nephrographic phase (NP) was ~35.57 HU, and that of malignant masses was ~73.70 HU. Malignant masses showed a more heterogeneous type of contrast enhancement due to the presence of necrosis.

Benign renal masses showed a mean increase of ~8.5 HU in the CMP, whereas malignant renal masses showed a significant increase of ~28.02 HU.

Malignant renal masses showed a larger difference between NP and unenhanced scan with a mean value of ~54.6 HU whereas benign masses showed a difference of ~16.9 HU.

Of the two false positive cases in our study, oncocytoma was misdiagnosed as RCC due to its heterogeneous pattern with increased density on unenhanced scan and significant enhancement in the corticomedullary and NP. The other case was complex renal cyst, which was again mistaken for a malignant lesion due to its higher attenuation value of ~29 HU on unenhanced scan and significant contrast enhancement, the diagnosis of high attenuation complex renal cyst was confirmed on histological examination postoperatively.

Regarding the imaging characteristics of renal masses:

The most common calcified renal mass in our study was RCC, with calcification was seen in 11 out of 31 cases.

Malignant renal masses showed more amount of necrosis when compared to the benign renal masses (58% of RCC and 100% of Wilms tumor).

Table 1: Age distribution of patients studied

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
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<tr>
<td>&lt;10 years</td>
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<tr>
<td>30-39 years</td>
<td>3</td>
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<td>50-59 years</td>
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<td>60-69 years</td>
<td>27</td>
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<tr>
<td>Total</td>
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Table 2: Gender distribution of patients studied

<table>
<thead>
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</tr>
</thead>
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<td>64</td>
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<tr>
<td>Female</td>
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<td>36</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>

In our study, the maximum percentage of patients was in the age range of 60-69 years. The most common renal mass was RCC accounting for 62% of all the renal masses and 71% were in the age range of 60-69 years. Our findings are similar to the findings of Gudbjarston et al., who have described the incidence and distribution of renal cell cancer in a large population and have found that RCC peaks in 6th through the 8th decade.

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The mean attenuation value of benign renal masses in nephrographic phase (NP) was ~35.57 HU, and that of malignant masses was ~73.70 HU. Malignant masses showed a more heterogeneous type of contrast enhancement due to the presence of necrosis.

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Of the two false positive cases in our study, oncocytoma was misdiagnosed as RCC due to its heterogeneous pattern with increased density on unenhanced scan and significant enhancement in the corticomedullary and NP. The other case was complex renal cyst, which was again mistaken for a malignant lesion due to its higher attenuation value of ~29 HU on unenhanced scan and significant contrast enhancement, the diagnosis of high attenuation complex renal cyst was confirmed on histological examination postoperatively.

Regarding the imaging characteristics of renal masses:

The most common calcified renal mass in our study was RCC, with calcification was seen in 11 out of 31 cases.

Malignant renal masses showed more amount of necrosis when compared to the benign renal masses (58% of RCC and 100% of Wilms tumor).
Renal vein invasion was seen in 19.5\% cases of RCC and 14\% cases of Wilm’s tumor, whereas none of the benign masses showed renal vein invasion.

Our findings were similar to study by Zagoria et al. who reviewed the CT appearances of 78 pathologically proven RCCs. Of 61 RCCs, there was imaging evidence of extrarenal spread (87\%), intratumoral necrosis (61\%), and differential growth rates in the tumor (64\%). The author found that the vascular solid renal neoplasm’s showed mean attenuation value of 104 ± 46 and 90 ± 37 in CMP and NP, respectively, whereas benign lesions showed 19±8 and 20± in CMP and NP, respectively. The mean attenuation of benign lesions was low as they had included only the simple cysts in their study, and the spectrum of benign cases included in our study were abscess, MLCN, complex cyst, and oncocytoma.

Using the region of interest technique for differentiating benign from malignant renal masses on pre and post contrast studies, sensitivity = 100\%, specificity = 71\%, positive predictive value (PPV) = 95\%, negative predictive value (NPV) = 100\%, and accuracy = 96\% was achieved (Table 5 & 6). The results of our study are very much similar to the Kopka et al. who evaluated the combination of UE, CMP ad NP in detection, and characterization of

| Table 3: CT features of renal masses
<table>
<thead>
<tr>
<th>Malignant lesions</th>
<th>Calcification</th>
<th>Hydronephrosis</th>
<th>Necrosis</th>
<th>Ureter</th>
<th>Renal vein</th>
<th>IVC</th>
<th>Adrenal</th>
<th>Lymph nodes</th>
<th>Distant metastases</th>
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<td>02</td>
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<td>9</td>
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<td>00</td>
<td>07</td>
<td>00</td>
<td>01</td>
<td>00</td>
<td>00</td>
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<td>01</td>
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<td>Renal TCC (2)</td>
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<td>00</td>
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<td>00</td>
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<td>00</td>
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</tr>
<tr>
<td>Abscess (2)</td>
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<td>00</td>
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</tbody>
</table>

CT: Computed tomography, TCC: Transitional cell carcinoma, MLCN: Multilocular cystic nephroma

| Table 4: Characteristics of renal masses on MDCT with respect to attenuation values on pre and post contrast scan, a comparison
<table>
<thead>
<tr>
<th>N</th>
<th>Mean HU</th>
<th>SD</th>
<th>Minimum</th>
<th>Maximum</th>
<th>F value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unenhanced</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>Benign</td>
<td>7</td>
<td>16.71</td>
<td>10.388</td>
<td>8</td>
<td>29</td>
<td>14.696</td>
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<tr>
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<td>28.00</td>
<td>4.761</td>
<td>20</td>
<td>39</td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benign</td>
<td>7</td>
<td>25.29</td>
<td>16.750</td>
<td>10</td>
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<td>21.190</td>
</tr>
<tr>
<td>Malignant</td>
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<td>56.02</td>
<td>13.296</td>
<td>30</td>
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</tr>
<tr>
<td>Nephrographic</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benign</td>
<td>7</td>
<td>33.27</td>
<td>25.079</td>
<td>10</td>
<td>85</td>
<td>16.348</td>
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<tr>
<td>Malignant</td>
<td>43</td>
<td>73.70</td>
<td>22.513</td>
<td>38</td>
<td>102</td>
<td></td>
</tr>
</tbody>
</table>

MDCT: Multi detector computed tomography, SD: Standard deviation

| Table 5: True or False Positive and Negative cases for renal masses
<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>True positive</th>
<th>False positive</th>
<th>False negative</th>
<th>True negative</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>RCC</td>
<td>31</td>
<td>2</td>
<td>0</td>
<td>17</td>
<td>50</td>
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<tr>
<td>Wilms tumor</td>
<td>7</td>
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<td>0</td>
<td>43</td>
<td>50</td>
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<tr>
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<td>48</td>
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<td>0</td>
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<tr>
<td>Cyst</td>
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<td>0</td>
<td>49</td>
<td>50</td>
</tr>
<tr>
<td>Renal pelvic TCC</td>
<td>3</td>
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<td>46</td>
<td>50</td>
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<td>MLCN</td>
<td>1</td>
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<td>0</td>
<td>49</td>
<td>50</td>
</tr>
<tr>
<td>Oncocytoma</td>
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<td>0</td>
<td>0</td>
<td>49</td>
<td>50</td>
</tr>
</tbody>
</table>

MDCT: Multi detector computed tomography, RCC: Renal cell carcinoma, TCC: Transitional cell carcinoma, MLCN: Multilocular cystic nephroma

| Table 6: Sensitivity and specificity of MDCT for renal masses
<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>PPV</th>
<th>NPV</th>
<th>Accuracy</th>
<th>P value</th>
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<tbody>
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<td>93.9</td>
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<tr>
<td>Wilms tumor</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Abscess</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Metastases</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Cyst</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>&lt;0.001</td>
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</tr>
<tr>
<td>Oncocytoma</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

RCC: Renal cell carcinoma, TCC: Transitional cell carcinoma, PPV: Positive predictive value, NPV: Negative predictive value, MLCN: Multilocular cystic nephroma, MDCT: Multi detector computed tomography

The author showed a sensitivity of 100%, a specificity of 95%, PPV of 96%, NPV of 100%, and accuracy of 96%.

**DISCUSSION**

The detection rate of renal masses has increased in the last decades owing to the widespread use of CT and magnetic resonance imaging (MRI). Therefore, an accurate characterization of renal masses is essential to ensure appropriate case management. Renal masses can be divided into cystic and solid lesions. The most common are cysts in up to 27% of patients over 50 years. CT- or MRI-enhancing masses are classified as solid or complex cystic. 85% of expansive solid masses are malignant. Therefore, a solid, enhancing mass must be considered malignant unless proven otherwise. RCC (Figure 1) is the most common malignant tumor; other malignant masses include Wilms tumor (Figure 2), TCC (Figure 3), renal oncocytoma (Figure 4), MLCN (Figure 5), lymphoma (primary and more frequent secondary), metastases from carcinoma, and primary/secondary sarcoma. Primary tumors of the lung, breast, and gastrointestinal tract are the most common sources of renal metastases.

Benign tumors account for approximately 20% of all solid renal cortical tumors, and renal oncocytoma is the most common solid tumor type.

Non-neoplastic renal masses include inflammatory pseudotumors with and without abscess formation (Figure 6), renal infarct, hematoma, and replacement lipomatosis with coexistent xanthogranulomatous pyelonephritis.

About 90% of clear cell RCCs are hypervascular with a heterogeneous enhancing pattern of mixed enhancing solid soft-tissue components and low-attenuation necrotic or cystic areas.

Seventy-five percent of papillary RCCs are hypovascular, and 90% of all papillary tumors demonstrate a homogeneous...
or peripheral enhancement pattern. Chromophobe tumors often demonstrate a moderate degree of enhancement.\textsuperscript{17,18}

TCC is frequently multifocal and may involve any part of the collecting system. CT urography allows assessment of a non-functioning kidney that is superior to excretion urography and nodal and distant metastases. The shape of the kidney is usually preserved even in the presence of large tumors. Hydroureteronephrosis proximal to the lesion is usually present. If the renal sinus is obliterated by tumor, the appearance may mimic the so-called faceless kidney.\textsuperscript{19}

Oncocytoma remains a diagnostic challenge. Zhang \textit{et al.} found that oncocytoma tended to show a homogeneous and hypervascular pattern. A central scar can be seen in large oncocytoma.\textsuperscript{17}

## CONCLUSION

The technical developments in CT and MRI in the last decade enable an excellent detection rate of renal masses. Contrast-enhanced images allow differentiation between cystic and solid renal lesions. Complex cystic and solid lesions can be characterized further. Pre-treatment percutaneous biopsy can significantly decrease the number of unnecessary surgeries for benign disease and assist the urologist in clinical decision-making, especially for elderly and unfit patients who are possible candidates for active surveillance and/or minimally invasive ablative therapies.\textsuperscript{20}

Multidetector computed tomography (MDCT) was able to differentiate a benign from malignant lesion with a sensitivity of 100%, the specificity of 71%, and accuracy of 96%. The difference in the density was maximum in the unenhanced and nephrographic group, compared to unenhanced and corticomedullary group, indicating that malignant renal masses would show significant enhancement in the corticomedullary and the NP.

Thus, MDCT with good reformating techniques has excellent accuracy in the detection and characterization of renal masses.

## REFERENCES

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Evaluation of the Interaction between Sodium Hypochlorite and Chlorhexidine used as Root Canal Irrigants: An In-Vitro Stereomicroscopic Study

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Abstract

Introduction: The combination of sodium hypochlorite (NaOCl) and the chlorhexidine (CHX) results into formation of an insoluble precipitate. The aim of this in-vitro study was: (1) To evaluate the amount of precipitate formed and chemical composition of this precipitate which is formed due to interaction between NaOCl and CHX and, (2) to prevent the formation of precipitate by using absolute alcohol as an intermediate flush.

Methodology: Totally, 20 extracted single-rooted human teeth were selected, cleaning and shaping has been done with all root canals. After instrumentation, all teeth were decorated at the cemento-enamel junction. All teeth were randomly divided into two groups containing 10 teeth each. In the test group (Group A), canals were irrigated with 15% ethylenediaminetetraacetic acid and 5.25% NaOCl followed by 2% CHX. In the Group B, absolute alcohol was used as intermediate flush between 5.25% NaOCl and 2% CHX. All teeth were sectioned longitudinally and subjected to stereomicroscopic examination.

Results: Test group (Group A) samples showed orange-brown precipitate, concentrated more in the coronal and middle thirds, whereas the Group B showed no evidence of precipitate. The thickness of the precipitate was measured using the ProgRes computer software (Olympus, Hamburg, Germany). Bonferroni test was implicated for statistical analysis to compare the significant difference of precipitate formation at three different levels in Group A.

Conclusion: An insoluble orange - brown precipitate formed due to the interaction between NaOCl and CHX. This precipitate can be prevented by using absolute alcohol flushing between 5.25% NaOCl and 2% CHX. Dentinal tubules are blocked and occluded due to this NaOCl/CHX precipitate. Utmost care has been taken while irrigating with NaOCl and CHX.

Key words: Chlorhexidine, Interaction of irrigants, Parachloroaniline, Precipitate, Sodium hypochlorite

INTRODUCTION

Bacteria are the etiological agents of pulp necrosis and apical periodontitis and bacteria in the root canal system can initiate and cause periapical inflammatory lesions.¹ He aims of endodontic treatment is to eliminate bacteria from the infected root canal and to prevent reinfection. Due to the complexity of the root canal system, bacteria, and tissue from root canal surfaces cannot be removed by mechanical instrumentation.² Mechanical instrumentation results into the formation of a smear layer on the canal surface.³ Irrigation along with the mechanical instrumentation is required to remove debris, tissue remnants, microbes, and the smear layer from root canal surfaces.

A combination of sodium hypochlorite (NaOCl) and ethylenediaminetetraacetic acid (EDTA) is an effective combination of removal of both tissue and smear layer.⁴ NaOCl is known for its tissue dissolving property and is antimicrobial.⁵ However, disadvantage of NaOCl if
extruded out of the root canal apex and into the periapical tissues is destructive tissue damage. NaOCl has a disagreeable odor also corrodes and weakens endodontic instruments. Thus, 2% chlorhexidine (CHX) gluconate have been considered as an alternative irrigant.

CHX is a broad-spectrum antimicrobial agent that disrupts the membranes of microbes. CHX has lower toxicity as compared with NaOCl so, it has been suggested for use as an irrigant and intracanal medicament. CHX has comparable antibacterial efficacy to NaOCl and has the advantage of having substantivity. However, CHX does not show the tissue dissolution capabilities that of NaOCl. Hence, it has been suggested that CHX cannot be used as a replacement to NaOCl as a main irrigant but used as supplemental in final irrigation step after NaOCl and EDTA irrigation. The suggested protocol for irrigation is NaOCl (which dissolves the organic components during instrumentation), followed by EDTA (which used as final flush of canals to remove the smear layer), then NaOCl and finally CHX (which imparts substantive antibacterial activity). Although combination of NaOCl and CHX may enhance their antimicrobial properties, a major concern about this irrigation regimen is that irrigation with CHX in the presence of NaOCl in the root canal produces an orange-brown precipitate known as parachloroaniline (PCA).

Basrani et al used X-ray photoelectron spectroscopy and time of flight secondary ion mass spectrometry to identify this precipitate. The precipitate contains a significant amount of PCA; a hydrolysis product of CHX. Even without the presence of NaOCl, CHX might spontaneously hydrolyze into PCA in the presence of heat and light. PCA has industrial uses in pesticides and dyes and has been demonstrated to be carcinogenic in animals. Its degradation product, 1-chloro-4-nitrobenzene, is also a carcinogen.

In the root canal system, a major concern is that this formed precipitate might attach to the root surface and leaches slowly into the periapical tissues. It could also compromise the seal of an obturated root canal. Therefore, the main objective of this study was to evaluate the maximum thickness of precipitate formed along the canal wall caused by the interaction between NaOCl and CHX and to prevent the formation of precipitate by using an intermediate flush of absolute alcohol.

**METHODOLOGY**

A total of 20 single-rooted, extracted human teeth were selected for this study. Calculus, bone, residual soft tissues were removed from the teeth. Storage of selected teeth were done in refrigerated 0.9% saline and used within 1 month (Baxter Health Care Corp, Round Lake, IL). Access cavity was prepared by using a high-speed #2 round bur. Pulp extirpation done with each tooth, coronal flaring was achieved by using #2, 3, and 4 Gates Glidden drills. Working length determination has been done with the help of surgical operating microscope by using #10 K-file, which was introduced into the canal until the tip of the file was visible at the apical foramen. A glide path was established by using #15 and #20 K-files.

A fresh mix of aquasil vinyl polysiloxane impression material (Dentsply/Caulk, Milford, DE) was used to fill a small glass vial (WVR Scientific, West Chester, PA). The root end of the prepared tooth was inserted into the impression material and allowed to set. This resulted in the prevention of extrusion of irrigant solution out of the apex and allowed ease of handling during instrumentation. All root canals were instrumented by using the rotary engine (Aseptico Inc, Dentsply, Woodinville, WA) with a 1:8 gear reduction handpiece. The hand piece was set at 300 rpm and torque level two, which is within the range recommended by the rotary file manufacturer (Tulsa Dental, Dentsply, Tulsa, OK). Canal enlarged with Profile NiTi rotary files (Tulsa Dental, Dentsply) to a size 40/0.06 in a crown-down manner. The apical matrix was further enlarged to a 60/0.04 by using Profile NiTi hand files (Tulsa Dental, Dentsply). Needle irrigation 1 mm short of the working length was delivered with a Monojet syringe (Sherwood Medical Co., St. Louis, MO) and a 27-gauge needle. Irrigation was done with a total of 5 ml of 5.25% NaOCl between instrument changes. A #15 K-file was intermittently used to maintain working length. After instrumentation, the teeth were irrigated with 5 ml of buffered (pH 7.4) 15% EDTA (Sigma - Aldrich Inc., St. Louis, MO).

All teeth were decoronated at the cemento-enamel junction and then randomly divided into two groups containing 10 teeth each. In the test group (Group A), canals were irrigated with 15% EDTA and 5.25% NaOCl followed by 2% CHX. In the Group B, absolute alcohol was used as intermediate flush between 5.25% NaOCl and 2% CHX.

Group A: In this test group 5 ml of 5.25% NaOCl was used to irrigate, and the canal was left filled with NaOCl. Then 5 ml 2% CHX was used as a final irrigant followed by immediately drying of the canal with paper points.

Group B: In this group absolute alcohol was used as an intermediate flush between 5.25% NaOCl and 2% CHX.

Teeth in Group A and Group B were sectioned longitudinally and subjected to stereomicroscopic examination. The
sections were then examined under stereomicroscope for the precipitate formed. At ×100 magnification, representative areas for each third of the root canals were chosen for analysis. The maximum thickness of precipitate from its surface to the dentinal wall in each chosen area was measured using “ProgRes” computer software program at the uniplanar level. The measurements obtained were subjected to statistical analysis.

RESULTS

Figures 1a and b and 2a-c represents the variable thickness of precipitations formed due to the interaction between NaOCl and CHX in Group A. Precipitation thickness was measured by using ProgRess computer software program. Figure 3a and b represents no evidence of precipitation formation in Group B. Intermediate flushing with absolute alcohol was done in between 5.25% NaOCl and 2% CHX throughout the root surface area and showing no evidence of precipitation formation also dentinal tubules appears to be patent with no obliteration. Table 1 summarizes precipitation thickness at coronal, middle, and apical third of root canal walls in Group A (test group). There was no significant difference in precipitate thickness between coronal and middle levels. There was a significant difference seen between coronal and apical levels. Similarly, there was a significant difference between middle and apical levels. Graph 1 represents mean precipitation thickness recorded at coronal, middle, and apical aspect of root canal walls in Group A.

Table 1: Comparison of the precipitation thickness at three levels on root surfaces

<table>
<thead>
<tr>
<th>Level</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev</th>
<th>Min</th>
<th>Max</th>
<th>F</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coronal</td>
<td>10</td>
<td>646.7</td>
<td>133.51</td>
<td>437.04</td>
<td>790.38</td>
<td>25.877</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Middle</td>
<td>10</td>
<td>511.3</td>
<td>127.13</td>
<td>389.67</td>
<td>715.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apical</td>
<td>10</td>
<td>167.2</td>
<td>37.92</td>
<td>115.78</td>
<td>197.79</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Bonferroni test was implicated to find out significant differences between pair of levels.

No significant difference between coronal and middle levels ($P > 0.05$).
A significant difference between coronal and apical levels ($P < 0.001$).
A significant difference between middle and apical levels ($P < 0.01$).

DISCUSSION

Biomechanical cleaning and shaping, using files and antibacterial irrigants reduces the bacterial count in the root

Figure 1: Thick brownish precipitate which was observed immediately on interaction of NaOCl and CHX, concentrated at the middle and coronal third in group A (test group). (a) ×40 (b) ×100

Graph 1: Mean precipitation thickness recorded at three levels

Figure 2: Thickness of precipitate measured using progress software at ×100 magnification. (a-c) ×100

Figure 3: No evidence of precipitate formation in group B which received an intermediate flush of absolute alcohol in between 5.25% NaOCl and 2% CHX. (a) ×40 (b) ×100
To prevent the formation of a precipitate, 90% alcohol was used which completely removed any residual NaOCl. This deprived CHX of a reactant to form the precipitate with NaOCl. On stereomicroscopic examination, clear canals were observed with no evidence of precipitate formed (Figure 3). In addition, to eliminating the formation of PCA, alcohol being volatile evaporates completely, thus paving the way for the better penetration of CHX.

**CONCLUSION**

The interaction between NaOCl and CHX resulted in an insoluble orange - brown precipitate. This precipitate can be prevented by using absolute alcohol flushing between 5.25% NaOCl and 2% CHX. Dentinal tubules are blocked and occluded due to this NaOCl/CHX precipitate. Utmost care and precaution have been taken while irrigating with NaOCl and CHX.

Hence, the suggested protocol while using NaOCl and CHX would be:

NaOCl→17% EDTA→NaOCl→Ab Alcohol→CHX.

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Thoracoscopy Guided Pleural Biopsy versus Ultrasound Guided Abram’s Needle Pleural Biopsy in a Tertiary Care Centre at Mahbubnagar, Telangana, India

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Abstract

Background: In cases of pleural effusion tissue samples can be obtained through Abram’s needle pleural biopsy (ANPB); thoracocopy or cutting needle pleural biopsy (CNPB) for histopathological analysis. This study was aimed to compare the diagnostic efficiency and reliability of ANPB under ultrasound (USG) guidance with that of medical thoracoscopy in patients with pleural effusion.

Methods: Between August 2013 and February 2015, 84 patients with exudative pleural effusion that cannot be diagnosed by the cytological analysis were included in the study. All patients were randomized after the USG scan to perform ANPB and CNPB. These two groups were compared in terms of diagnostic sensitivity and complications associated with the methods used.

Results: Of the 84 patients, tuberculosis (TB) was diagnosed in 40, metastatic pleural diseases in 38, benign pleural diseases in 2 and 2 were undetermined. In the USG; ANPB group, the diagnostic sensitivity was 87.5% as compared with 94.1% in the thoracoscopic group, the report statistically significant (P = 0.252). No difference was identified between the sensitivity of the two methods. The USG findings and the degree of pleural thickening, complications were low and acceptable.

Conclusion: Although we recommend the use of ANPB as the primary method of diagnosis in patients with pleural thickening or lesions. Pleural effusion observed by USG or chest X-ray (CXR) or computed tomography (CT) scan. In patients with only pleural fluid appearance on USG or CXR or CT scan and in those who have benign pleural pathologies other than TB, one can still consider USG-ANPB, but primary method and diagnosis should be medical thoracoscopy, where we can observe the pleural cavity.

Key words: Abram’s needle, Medical thoracorscopy pleural biopsy, Pleural effusion

INTRODUCTION

There are approximately 3200 new cases of pleural effusions per million people each year and their investigation and management provide a significant workload for respiratory departments.¹ ² The cause of a pleural effusion is usually determined by thoracocentesis with biochemical and microbiological analysis of the pleural fluid. These initial analysis has low sensitivity to detect tuberculosis (TB) and malignancies, the two most important causes of pleural effusions in India.

The diagnostic yield of thoracocentesis alone varies from approximately 25% to 75% for pleural fluid cultures in TB,³ ⁴ and generally from 40% to 87% for malignancies.⁶ ⁸ Pleural biopsy is indicated to improve the diagnostic yield
of unexplained pleural effusion, particularly when pleural carcinomatosis or TB is suspected.9

Thoracoscopy can be performed by a pulmonologist under local anesthesia and mild sedation. Several studies suggest that medical thoracoscopy increases the diagnostic yield in patients with non-diagnosed pleural effusion when thoracocentesis and closed pleural biopsy are non-diagnostic.10,11

Blind percutaneous pleural biopsy has traditionally been performed to investigate the etiology of exudative pleural effusion in which the initial thoracocentesis has been non-diagnostic. In view of the increasing use of image-guided and thoracoscopic pleural biopsies, the role of ultrasound (USG) guided pleural biopsy in the investigation of pleural effusion is increasing.12

Aim of the Study
This study was aimed to compare the diagnostic efficiency and reliability of Abram's needle pleural biopsy (ANPB) under USG guidance with that of medical thoracoscopic pleural biopsy in patients with undiagnosed pleural effusion.

METHODS
This study was conducted from August 2013 to February 2015 on patients admitted under Department of Pulmonary Medicine, S.V.S Medical College, Mahaboobnagar, Andhra Pradesh. Patients aged 20-60 years were only included in the study, with moderate to massive pleural effusions, in whom the exudative effusion remained undiagnosed. Patients with minimal to mild effusion, with underlying liver, kidney or cardiac diseases, with bleeding diathesis and skin infections were excluded from the study.

All the patients were subjected prior to the following a full history, thorough clinical examination, lab investigations prothrombin time, activated partial thromboplastin time, international normalized ratio, pleural fluid investigations: Biochemical, pathological, microbiological, chest X-ray (CXR) posterior-anterior view, computed tomography (CT) chest and an informed consent was taken.

Patients were divided randomly into two groups:

Group 1
Patients are undergoing USG guided ANPB. The preferred position for the procedure was the sitting position, with the subject's arms folded across the chest and supported by a bedside table. The site of the biopsy and the procedure was done under full USG guidance. Percutaneous USG-guided pleural biopsy was done with a 14 gauge Abrams needle. The puncture site was disinfected and anesthetized by infiltration with 2% lidocaine. The patient was asked to hold his breath, and the needle was inserted into the lesion under USG guidance. Under the sterile technique and local anesthesia, at least four needle biopsies (transported in 4% formalin and at least one specimen for microbiological investigations (transported in 0.9% saline) were obtained.

If any complications were noted a CXR was done after the procedure, and an intercostal tube drainage was inserted if needed and CXR taken.

Group 2
This group included thoracoscopy guided biopsy. The thoracoscopic examination was done using rigid thoracoscopy. The patient was positioned lying down in a lateral decubitus position with the involved side facing upwards. The patient's blood pressure, pulse rate, intravenous line and oxygen saturation were monitored continuously using a portable monitor. Supplemental oxygen was given to the patient to maintain oxygen saturation. The entire lateral chest wall was scrubbed with iodopovidone. The patient was then subjected to local anesthesia and sedation; lidocaine 2% for local anesthesia, sedation was achieved by midazolam. After raising a 2 cm subcutaneous wheal and anesthetizing the skin, subcutaneous tissues, muscle planes, rib periosteum and parietal pleura by about 20 cc of 2% lidocaine, a 2 cm transverse skin incision was made by a scalpel parallel to the rib along the intercostal space.

Blunt dissection of the intercostal tissues was performed by spreading straight Kelly clamp both parallel and perpendicular to the underlying muscles which were separated and the parietal pleura was gently palpated by the index finger and was penetrated by the Kelly clamp. The rigid trocar and obturator of the medical rigid thoracoscope were inserted through the incision, down the preformed tract, penetrating the pleural membrane into the pleural cavity.

After drainage of the fluid, medical rigid thoracoscope was introduced through the trocar into the pleural space. The parietal pleura including the costal, diaphragmatic sometimes mediastinal pleura, as well as the visceral pleura, was thoroughly examined for any lesions such as nodules, plaques, adhesions, thickening, mottling or anthracosis. Multiple forceps biopsies were taken from any suspicious gross pathological lesion in the parietal pleura. The visceral pleura was not biopsied. The biopsies were then kept in a sterile bottle filled with formalin and then these bottles were sent to pathology laboratory for histopathological examination and diagnosis of at least one specimen for microbiological investigations (transported in 0.9% saline). After the procedure, the trocar and thoracoscope were
removed and then thoracostomy tube was inserted and fixed in position to the skin of the chest wall. Plain CXR was done just after the procedure to make sure that the chest tube was in place.

RESULTS

The total number of patients included in the study was 84, 42 patients in each group. The mean age in-Group I was 45.0 ± 13.05 years and in-Group II was 40.60 ± 17.77 years. In-Group I, 20 out of 42 patients (47.6%) were males whereas in-Group II, 24 out of 42 patients (57.1%) were males.

As regards smokers, in-Group I 20 patients (47.6%) were smokers while in-Group II 20 patients (47.6%) were smokers. The mean pack-years for smokers in-Group I was 32.78 ± 10.78, whereas, it was 33.71 ± 9.27 in-Group II.

Total number of patients diagnosed as having TB was 42 (50%) out of which from Group I was 17 patients and Group II were 24 cases and 1 undiagnosed cases from Group I.

Total number of patients diagnosed having malignancy were 38 (45%) of which in Group I was 17 cases and in Group II was 16 cases and 5 undiagnosed cases from Group I.

Total number of patients having the benign disease were 2 cases both were from Group I while total undiagnosed cases were 6 from Group I and 2 from Group II. The result is summarized in Table 1.

DISCUSSION

In the current study, we preferred to use local anesthesia only in-Group I patients and local anesthesia with conscious sedation in-Group II. One or two therapeutic thoracenteses before thoracoscopy, with the drainage of at least 1500 ml at each procedure for patients with large pleural effusions were done to prevent re-expansion pulmonary edema.

Some of our patients experienced sharp transient pain while the biopsies were taken. The administration of local intrapleural lidocaine resolved this nuisance. Other patients experienced little or no discomfort when the parietal pleura was touched. This could be due to decreased pleural sensation in most patients with chronic pleurisy (malignant or benign).

In the present study, sonographic appearances of Group I were mostly confirmed histologically, as the presence of nodules mostly indicates malignancy, while diffuse thickening suggests tuberculous or other inflammatory pleural infections.

Similarly, we found that thoracoscopic appearances were mostly confirmed histologically, as the presence of nodules mostly indicates malignancy while diffuse thickening, adhesions, and plaques suggest tuberculous or other inflammatory pleural infections.

The total number of undiagnosed cases in Group I was 6. The diagnostic sensitivity was 87%. Thoracoscopy was done on those undiagnosed 6 cases, and 5 proved to be malignant and 1 was tubercular. The total number of undiagnosed cases in Group II was 2 with a sensitivity of 94%. The complication rates were also similar. Only one case in Group I developed pneumothorax.

The present study was a randomized, controlled study which compared the diagnostic yields of the closed pleural biopsy and medical thoracoscopic pleural biopsy in undiagnosed exudative pleural effusions.

The diagnostic sensitivity from Group I 87% in our study which when compared to a study by Mohammed et al. who reported a 91% diagnostic sensitivity,13 and a study by Adams and Gleeson,14 who reported image-guided biopsy was about 91%, which is almost similar to that of our study although ours comparatively is much lower.

Taking the diagnostic sensitivity of Group II patients, which was 94% when comparing with diagnostic sensitivity in previous thoracoscopic studies varied from 90% to 100%, which is comparable to ours. In a study by Mohammed et al., Diacon et al., Walzl et al. who reported a 100% diagnostic sensitivity.13,15,16

The British Thoracic Society recommends either thoracoscopy or image-guided biopsy (using CT or USG) as the next line of investigation in the event of a non-diagnostic, blind pleural aspirate.17

### Table 1: Results

<table>
<thead>
<tr>
<th>Classification and diagnosis of patients</th>
<th>Group 1</th>
<th>Group 2</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of case</td>
<td>42</td>
<td>42</td>
<td>84</td>
</tr>
<tr>
<td>Males</td>
<td>20</td>
<td>24</td>
<td>44</td>
</tr>
<tr>
<td>Females</td>
<td>22</td>
<td>18</td>
<td>40</td>
</tr>
<tr>
<td>Smokers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>17</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Number of TB cases</td>
<td>17</td>
<td>24+1</td>
<td>42</td>
</tr>
<tr>
<td>Number of malignant cases</td>
<td>17</td>
<td>16+5</td>
<td>38</td>
</tr>
<tr>
<td>Number of benign cases</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Undetermined cases</td>
<td>6</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

TB: Tuberculosis
CONCLUSION

Blind closed pleural biopsy has a modest yield. However, under image guidance improves the yield, particularly for malignancy. An image-assisted pleural biopsy with Abrams needle may, therefore, be an acceptable alternative to thoracoscopy, particularly when there is a high probability of malignancy. Cases that remain undiagnosed warrant thoracoscopy.

Thoracoscopy has a superior diagnostic yield for pleural malignancy and TB and is, therefore, to be the investigation of choice in exudative pleural effusions where a thoracocentesis was non-diagnostic and particularly when malignancy is suspected.

Furthermore, it allows for the direct inspection of the pleura and for the potential direct application of talc pleurodesis when required. Access to thoracoscopy is, however, limited in many parts of the world, mainly in India as significant resources and expertise are required.

REFERENCES


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Evaluation of Chest Pain in Premenopausal Indian Women

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Abstract

Introduction: Premenopausal women are protected from heart disease. Women with proven coronary artery disease, (CAD) are more likely to present with atypical symptoms. Quite often, young females present with symptoms of atypical chest pain and require repeated consultations.

Purpose: To study the clinical profile, assessment of risk factors and incidence of CAD in premenopausal females presenting with chest pain.

Materials and Methods: A total of 50 premenopausal females with chest pain of all etiologies for the chest pain were included and categorized into two groups: (1) Those having chest pain considered typical for CAD, and (2) those having atypical chest pain; and were subjected to various cardiological investigations, upper gastrointestinal (GI) endoscopies and psychiatric evaluation.

Results: About 72% patients had atypical chest pain. There were no statistically significant difference with regards to the rapidity of onset, duration, intensity and aggravating or relieving factors. Apprehension was more commonly associated with atypical and palpitation with typical chest pain. Body mass index ≥23 kg/m² was significantly more common with atypical chest pain. Diagnosis of CAD was made in overall 10% females; most common etiologies observed were painful musculoskeletal conditions (34%), functional (30%) and GI pain (16%). Barring one who had rheumatic heart disease, all patients had normal investigations. Treadmill test was suggestive of CAD in one female. Thus, only 2.7% females having atypical non-cardiac chest pain (NCCP) had CAD and 28.5% females having typical cardiac chest pain had CAD. Atypical chest pain was associated with musculoskeletal pain, psychiatric disorder and GI disease in the majority of females.

Conclusion: Atypical chest pain is common in premenopausal females, common causes being non-cardiac ones; yet CAD still remains a remote possibility. Characteristics of chest pain and absence of risk factors cannot reliably predict NCCP and a detailed evaluation is warranted.

Key words: Aged, Chest pain, India, Women

INTRODUCTION

Chest pain is a major source of concern for patients and physicians alike as it may harbinger acute life-threatening cardiac events, yet many patients who describe chest pain typical of significant cardiac disease can actually be free of such disease. Chest pain is the chief complaint in about 1% of outpatient practice and in 20-30% of all emergency medical admissions, surprisingly <50% patients are given a final diagnosis of acute myocardial infarction and an organic etiology is demonstrable in only about 16% of such patients.1-3 Studies have shown that 50% of patients with non-cardiac chest pain (NCCP) and normal coronary anatomy had esophageal reflux or motility disorders,4 and 60% had evidence of breathing disorders.5
Patients with NCCP and no upper gastrointestinal (GI) disease had a higher proportion of panic disorder (15%), obsessive-compulsive disorder (21%) and major depressive episodes (28%).

Premenopausal women are largely protected from heart disease. These women are more likely to have non-specific chest pain symptoms than men and only half of women who had typical chest pain suggesting ischemia had stenotic coronary lesions (50% lumen diameter narrowing). The probability of having coronary artery disease (CAD) in a cohort of young patients (2/3rd of them being females) with atypical chest pain is low; patients with no typical features had only 2% chance of an abnormal coronary angiogram if aged <55 years. On the other hand, even women with proven CAD are more likely to present with atypical symptoms and have worse prognosis than men.

In patients of NCCP, both peripheral stimuli (as from the esophagus) and psychological factors interact in producing the final report of pain. In clinical practice, the presentation determines the order of cardiac and non-cardiac investigations. Only recently, American Heart Association had given a consensus on non-invasive testing in symptomatic females. It states that young women with low pretest probability of CAD should not be subjected to non-invasive tests including exercise treadmill testing (TMT).

A more meticulous approach is needed for the assessment and management of female patients with chest pain. This can be done in many cases by the general practitioner, sometimes with the help of emergency chest pain clinics and easy referrals to a rheumatologist, a gastroenterologist or a psychiatrist. In our clinical experience, number of young premenopausal female patients present with symptoms of atypical chest pain, which brings a lot of apprehension, repeated consultations and expenses leading to poor quality of lives for the patients and family, nevertheless long-term prognosis seems to be relatively good.

Thus, we thought that it would be prudent to analyze chest pain in premenopausal females in a resource constrained setting. We aimed to study the clinical profile, assessment of risk factors and incidence of CAD in such population presenting with typical and atypical chest pain.

MATERIALS AND METHODS

This cross-sectional study included 56 premenopausal female patients aged 15-55 years attending the medicine outpatient department (OPD), cardiology OPD and the emergency department of Netaji Subhashchandra Bose Medical College and Hospital (NSBMCH), Jabalpur, India with complaints of chest pain. The spectrum of chest pain included all descriptions; including typical angina or chest pain characteristics considered atypical for ischemic heart disease. All etiologies for the chest pain were considered. Of these, 6 patients were excluded due to non-compliance and lack of follow-up; thus a total of 50 subjects were studied. Patients with known CAD diagnosed structural heart disease, acute coronary event, and pregnant women were not included. The ethics committee of the institute approved the study. Each subject gave written informed consent before being included in this study. The guidelines lay down by the Indian council of Medical Research (1994) and Helsinki declarations (modified 1989) were adhered to in all patients included in the study.

The details of chest pain: Type, onset, duration, site, nature, intensity, radiation to other sites, aggravating and relieving factors, associated symptoms; and other coexisting diseases were analyzed. Patients were mainly categorized into those having chest pain considered typical for CAD and those having atypical chest pain. “Typical chest pain” was defined as the pain felt under the sternum and characterized by a heavy or squeezing feeling often caused by exertion or emotions. It included pain experienced as discomfort or tightness, or pressure in the chest or in the back, neck, jaw, shoulders and arms (especially the left arm). Other types of chest pain were considered as “atypical chest pain.” Atypical pain included those at sites other than substernal location, and with other characters like pricking, shooting, piercing, burning, etc.

The character of chest pain was recorded in the patient's own language. It was found to fit into the burning, compression, crushing, dull aching, heaviness, pricking, sharp and stabbing varieties. The intensity of chest pain was graded into mild (pain not interfering with daily activities), moderate (pain interrupting the daily activities) and severe (pain needing urgent medical attention). The site of pain was categorized into central, left sided, right-sided, bilateral and diffuse. The onset was divided into sudden (pain appearing and progressing over a period of <1 week) and insidious (slow onset pain progressing over a period of >1 week). The precipitating and relieving factors, if any were noted. The associated symptoms of apprehension (nervousness and anxiety), palpitation, sweating, syncope, dyspnea, regurgitation, belching, nausea, vomiting, loss of consciousness and abnormal behavior were noted. The family history and personal history, including lifestyle, addictions and oral contraceptive (OCP) usage were assessed. The detailed clinical examination, which included vital signs, general and systemic examination was done.

Each patient was subjected to routine investigations including complete blood counts, fasting blood sugar,
blood urea, serum creatinine, fasting lipid profile, electrocardiogram (Magic-R, MR-12, Solan, India), creatine phosphokinase-myocardial band (CPK-MB) and chest X-ray. According to the history and relevant investigations, the patients were categorized into high risk and low-risk groups for CAD. These patients were further investigated with echocardiography/Doppler study (Philips, HD-7 Ultrasound System, Shenyang, China), cardiac enzymes, TMT (Schillers, Cardiovit CS200, Puducherry, India), upper GI endoscopy (Pentax Medical, EG-290Kp, Japan) and pulmonary function test (COSMED, QuarkPFT, Rome, Italy). The subjects were also subjected to a psychiatric and orthopedic evaluation. After detailed investigation the subjects were prescribed with multidisciplinary measures based on the diagnosis ascertained; risk factors for CAD were also assessed.

Data were expressed as mean (95% confidence interval [CI]). Categorical variables were compared using Chi-square test. The probability level of <0.05 was set for statistical significance.

RESULTS

Between June, 2013, and May, 2014, premenopausal female patients aged 15-55 years attending the medicine OPD, cardiology OPD and the emergency departments of Netaji Subhaschandra Bose Medical College and Hospital NSBMCH, Jabalpur, India with new onset of chest pain were screened. Patients were excluded if they had a history of CAD, structural heart disease, bronchial asthma, chronic obstructive airway disease, trauma and inability to perform TMT. Pregnant women were also excluded from the study. 56 patients thus screened were included in the study. Six patients were non-compliant and/or did not follow; thus the data from 50 subjects was analyzed.

Results showed that the majority of females presented with atypical chest pain, accounting for 72% of the patients. The mean age of patients with atypical chest pain and atypical chest pain was 26.64 ± 6.49 and 29.10 ± 7.6 years; this difference was not statistically different. 68% of patients had chest pain for <1-month duration, 22% had chest pain of more than 6 months duration. Half of the patients had a sudden onset of pain, another half had an insidious onset. The majority of patients had dull aching (28%) and stabbing (24%) type of chest pain which predominantly was in a central location (60%). Chest pain was most commonly associated with apprehension (74%) and palpitations (42%); patients commonly had more than one associated symptoms. In 56% of patients there were no aggravating factors; in 30% exertion was the precipitating cause. In 54% patients, the pain was relieved spontaneously.

When characteristics of atypical and typical pain were compared, there was no statistically significant difference in regards to the rapidity of onset, duration and intensity of chest pain. 75% of patients with atypical chest pain had the duration of <1 month, only 5.6% patients had duration more than 6 months; majority (69.5%) had chest pain of mild to moderate intensity. Apprehension was more commonly associated with atypical (P = 0.015); palpitation was more commonly associated with typical chest pain (P = 0.008). There was no significant difference between atypical and typical chest pain in terms of other accompaniments of chest pain and aggravating or relieving factors.

When risk factors namely advanced age, diabetes mellitus, hypertension, high body mass index (BMI), low serum high-density lipoproteins, high serum triglycerides, cigarette smoking, family history of premature CAD and OCP use were assessed in patients with atypical and typical chest pain; only BMI ≥23 kg/m² was statistically more common with atypical chest pain (P = 0.030).

Overall only in 5 (10%) females having chest pain, diagnosis of CAD was made; most common etiologies were painful musculo-skeletal conditions (34%), functional (30%), GI pain (reflux esophagitis 10%; gastritis 6%), pneumonia (6%) and mitral stenosis (4%). When the patients were subjected to resting electrocardiogram and cardiac enzymes estimation (CPK-MB and/or Troponin-I), none of the patients having atypical chest pain had a positive results; however 2 (14.30%) patients of typical chest pain had both abnormal electrocardiogram and elevated cardiac enzymes to suggest acute coronary syndrome (ACS). ACS patients were then hospitalized and treated as per protocol. On resting echocardiography, among 14 patients with typical chest pain, 2 (14.3%) had regional wall motion abnormalities (those with ACS), 2 (14.3%) had left ventricular hypertrophy and 1 (7.1%) had evidence of rheumatic heart disease (RHD). In total among them, 5 (35.7%) had abnormal echocardiography findings. This was in contrast to patients with atypical chest pain in whom only 1 (2.8%) had abnormal echocardiography finding of RHD; the difference being statistically significant. On subjecting the patients to TMT, two females having typical chest pain had evidence of CAD when compared to those with atypical chest pain in whom only one patient had evidence of CAD. When an overall diagnosis of CAD was entertained, 2.8% females having atypical NCCP had CAD; on the other hand, 28.5% females having typical cardiac chest had CAD (P = 0.006). When other diagnoses were compared between the two groups, atypical chest pain was more associated with a psychiatric diagnosis and musculoskeletal pain (Table 1).
The frequency of chest pain was less than once per month to moderate chest pain over the central chest area (50%). The frequency of chest pain was less than once per month in three-quarters of the subjects. Cooke et al. studied 65 consecutive patients with chest pain and completely normal coronary angiograms recruited over a period of 1-year, and 65 sex-matched patients with significant stenoses at angiography. Females constituted 2/3 of the patient population. The median duration of symptoms was 24 months (range 2-216) in patients with normal coronary angiography and 18 months (range 2-720) in patients with abnormal coronary angiography. They showed that there were no important differences in the site, quality, radiation of pain and associated symptoms, but three symptoms were considered to be typical and had discriminatory value in differentiating CAD from non-CAD; (1) The consistency with which pain was reproduced by exercise, (2) the duration of pain episodes (typical, 5 min), and (3) the frequency of pain at rest (typical, up to 10% of all pain episodes). All three symptoms were atypical in 21 (32%) patients with normal coronary angiograms, but in only one patient with an abnormal coronary angiogram. Patients with no typical features had a 2% chance of an abnormal coronary angiogram if aged <55 years or 12% if aged 55 years or more. In a recent meta-analysis of 18 studies, pooled prevalence of NCCP was 13% (95% CI 9-16). The prevalence of NCCP was higher in Australian studies and in studies using a questionnaire to define its presence, compared with those using Rome I or II criteria. Prevalence was no different in women versus men (odds ratio 0.99; 95% CI 0.82-1.20).

Even in patients who have CAD, atypical chest pain is not so uncommon. Summers et al. conducted a retrospective study of patients presenting to the emergency department of a southern United States urban hospital with enzyme-documented myocardial infarction to determine the prevalence of atypical chest pain descriptions. A multivariate analysis of those patients with atypical pain descriptions was conducted to determine the independent demographic factors associated with these descriptions. In a total of 77 subjects (56% black; 44% white, 49% male and 51% female) meeting the study criteria, 43% were found to have atypical elements in the character of their chest pain descriptions. African Americans and women had the highest rates of atypical pain (56% and 46%, respectively); the use of the descriptive term “sharp” accounted for nearly half of the atypical presentations.

None of the risk factors for CAD were more commonly associated with females having typical chest pain; on the contrary, a BMI value of ≥23 kg/m² was significantly more commonly with atypical chest pain patients. This finding is seemingly odd, needs to be validated in larger population-based studies. When other risk factors for CAD were

### Table 1: Final diagnosis in premenopausal females presenting with typical and atypical chest pain (n=50)

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Atypical chest pain n=36 (%)</th>
<th>Typical chest pain n=14 (%)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAD</td>
<td>1 (2.8)</td>
<td>4 (28.5)</td>
<td>0.006</td>
</tr>
<tr>
<td>Functional</td>
<td>14 (38.8)</td>
<td>1 (7.1)</td>
<td>0.027</td>
</tr>
<tr>
<td>Gastritis/reflux esophagitis</td>
<td>4 (10.8)</td>
<td>4 (28.5)</td>
<td>0.130</td>
</tr>
<tr>
<td>Mitral stenosis</td>
<td>1 (2.8)</td>
<td>1 (7.1)</td>
<td>0.479</td>
</tr>
<tr>
<td>Musculoskeletal pain</td>
<td>15 (41.6)</td>
<td>2 (14.3)</td>
<td>0.066</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>1 (2.8)</td>
<td>2 (14.3)</td>
<td>0.123</td>
</tr>
</tbody>
</table>

CAD: Coronary artery disease

**DISCUSSION**

This study is unique in the sense that evaluation of atypical chest pain in premenstrual females <55 years is seldom studied, although it is known than young females with ACS are less likely to present with pain when compared to men. Our study has shown that most of the females in this age group had atypical NCCP. In those having atypical chest pain, the probability of an underlying CAD is remote, yet possible. To categorize a chest pain of a non-cardiac origin, characteristics of pain like onset, duration, intensity and pain accompaniments; and the presence of risk factors are not helpful.

Our study showed that 72% of pre-menstrual females presented with atypical chest pain; 50% of them had a sudden onset, and 66% of them had chest pain of <1-month duration. The mean age of patients with atypical and typical chest pain groups was similar (26.64 ± 6.49 and 29.10 ± 7.6 years respectively). The majority in each group had centrally located pain (60%). When both group was compared, patients with atypical chest pain had significantly more apprehension, on the other hand, those with typical chest pain complained more of palpitations. Otherwise, there was no difference in both groups in terms of aggravating and relieving factors. Cormier et al. estimated the relationship of chest pain with negative cardiac diagnostic studies to psychiatric illness. A total of 98 patients with chest pain and no prior history of organic heart disease underwent a structured psychiatric interview at the time of cardiac diagnostic testing, either coronary arteriography or TMT. Patients with negative cardiac test results were significantly younger and more likely to be females, endorsed a greater number of autonomic symptoms with their chest pain, and were more likely to report atypical chest pain. In another study on 307 patients with NCCP from China, the prevalence of NCCP was 13.9% (95% CI 13-15) and was higher in men than in women (16.6% vs. 11.9%, P = 0.002). The median duration of NCCP was 24 months (range 0.1-360 months). Most (96%) subjects with NCCP had mild
evaluated by Sullivan et al., only diabetes was significantly more common in females with chest pain and abnormal coronary angiography when compared with those having chest pain and normal coronary angiography. The rest of the risk factors like history of premature CAD in family members, hypertension, dyslipidemia and smoking did not differ in females with or without obstructive coronary arteries. In patients of CAD, females when compared with males, the risk factors usually do not differ from those in males; diabetes and dyslipidemia were probably an exception. Sullivan et al. demonstrated that diabetes imposes a greater risk of heart disease in women than in men; in another study high triglycerides level was an important risk factor in women. Overall only in 5 (10%) females having chest pain, diagnosis of CAD was made; most common etiologies were painful musculo-skeletal conditions (34%), functional (30%), GI pain (reflux esophagitis 10%; gastritis 8%), pneumonia (4%) and mitral stenosis (4%). Ortiz-Olvera et al. assessed 31 patients (22 females) with NCCP after excluding CAD using upper GI endoscopy, ambulatory pH monitoring, stationary esophageal manometry and psychiatric evaluation. They showed that 64% and 36% females had gastro-esophageal reflux disease (GERD) and functional pain disorder respectively. In United States and Europe; musculoskeletal pain, GERD and non-specific or functional pain disorders were among the commonest causes of chest pain in patients visiting primary health care centers; however in patients visiting emergency care centers, cardiac chest pain was the most common diagnosis entertained. In a study of 250 patients presenting in emergency department in an UK center, on non-invasive testing 142 had cardiac pain (mean age 79 years, 58% male) and 108 had atypical chest pain (mean age 60 years, 55% male). Of those with atypical pain, 40 patients were discharged without a diagnosis; and in remaining 68 the pain was of musculoskeletal (25 patients), cardiac (21 patients), GI (12 patients) or respiratory nature (10 patients). On 1-year follow-up, half of the patients with atypical pain had undergone further investigations, and 14% had been readmitted. As a result the proportion of positive diagnoses had increased in each of the subgroups, with the commonest categories being musculoskeletal (27 patients), cardiac (25 patients), GI (14 patients) and respiratory (12 patients). The yield of investigative procedures was generally low (20%) but at the end of the year only 27 patients remained undiagnosed. The mortality rate was 2.9% (3 patients) compared with 18.3% in those with an original cardiac event; none of the patients who had a non-cardiac diagnosis died.

In our study, when an overall diagnosis of CAD was entertained, only 2.7% females having atypical NCCP had CAD. This was in contrast to females having typical cardiac chest pain in whom 28.5% had CAD. This suggests that in young females presenting with atypical chest pain, the chances of CAD is remote. Bhardwaj studied patients with typical and atypical chest pain with dynamic electrocardiogram changes who were then subjected to coronary angiography. 33 patients had atypical chest pain out of which 22 were females, and 11 were males. The mean age of the patients was 45.15 ± 10.18 years. Only 6% of these patients had CAD. This was in contrast to 39 patients who had typical chest pain, among them 92% had CAD. Studies in late 19th century suggested that the prognosis of angina or angina-like pain was good, with mortality rates close to zero. Recent studies have shown that the prognosis of patients with NCCP is not benign as it was previously thought. Jespersen et al. conducted a retrospective study of a cohort of 11,223 patients with stable chest pain in 10 years referred for coronary angiography. They compared the results with 5705 participants from the Copenhagen City Heart Study. Results showed that significantly more women (65%) than men (32%) had the normal coronary angiography. In the pooled analysis, the risk of major adverse cardiovascular event was higher with multivariable-adjusted hazard ratios (HRs) of 1.52 (95% CI 1.27-1.83) for patients with normal coronary arteries; and 1.85 (95% CI 1.51-2.28) for patients with diffuse non-obstructive CAD when compared with the reference population. For all-cause mortality, normal coronary arteries and diffuse non-obstructive CAD were associated with HRs of 1.29 (95% CI 1.07-1.56) and 1.52 (95% CI 1.24-1.88), respectively. Women’s Ischemia Syndrome Evaluation (WISE) study group included 936 women with chest pain referred for coronary angiography and followed them up for a mean 5.2 years. The results were compared with the St James Women Take Heart (WTH) Project, which had recruited 1000 asymptomatic, community-based women with no history of heart disease followed up for 10 years. Compared with the WISE women, asymptomatic WTH women significantly had a lower prevalence of obesity, family history of CAD, hypertension, and diabetes mellitus. The cardiovascular events were most frequent in women with 4 or more cardiac risk factors, with the 5-year annualized cardiovascular event rate being 25.3% in women with non-obstructive CAD, 13.9% in WISE women with normal coronary arteries, and 6.5% in asymptomatic women.

Being conducted in a resource constrained settings and unavailability of coronary angiography; we could not subject our patients for coronary angiography for confirmation of CAD. We think premenopausal women with low risk of CAD should not be subjected to invasive tests, neither is...
it indicated. However in patients with intermediate and high risks, it is warranted according of American Heart Association guidelines. The sample size was small; moreover ours was not a follow-up study to ascertain long-term prognosis of chest pain in premenopausal Indian females as well as to come up with some strategy for management of this selected subgroup. Despite these shortcomings, we could draw some conclusion from this study. However, we suggest a long-term study with larger sample size to answer these questions in Indian scenario.

CONCLUSION

Atypical chest pain is common in premenopausal females, common causes being musculoskeletal, psychiatric and GI disorders; the incidence of CAD in them is very low. As characteristics of chest pain and absence of risk factors cannot reliably predict NCCP and there is a remote possibility of CAD in these females, a cautious approach and detailed evaluation which may include a coronary angiography is warranted.

REFERENCES

Clinical Profile and Outcome of Dengue Fever Cases in Children by Adopting Revised WHO Guidelines: A Hospital Based Study

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Abstract

Objectives: To analyze the clinical profile of dengue fever cases and to interpret the outcome of these children by adopting the revised classification and management protocol by World Health Organization (WHO).

Materials and Methods: A prospective study of all children in the age group of 0-14 years who were serologically confirmed to have dengue admitted at Sri Manakula Vinayagar Medical College and Hospital between January 2014 and December 2014 were included in the study. A detailed symptomatology, clinical findings, relevant investigations were analyzed. They were classified, monitored, and managed according to revised WHO guidelines.

Results: Out of 50 cases, males were 52% and females were 48% with maximum number of cases seen in the age group of 5-15 years (58%) and the highest peak were seen in October - December season (74%). In our study, we identified children with dengue without warning signs (38%), dengue with warning signs (52%), and severe dengue (10%) of cases. Fever was seen (100%) and among children with warning signs the predominant features noted were lethargy and restlessness (73%), abdominal pain and persistent vomiting (61%) each, clinical fluid accumulation (15%), and mucosal bleed (23%), hepatomegaly were observed in 84% cases. In severe dengue category out of five children, one had severe hematuria, two had respiratory distress following severe plasma leakage, two others had central nervous system involvement. Lab parameters include raised hematocrit (50%), leucopenia (38%), thrombocytopenia (74%). Crystalloids were used in (66%). No colloids were used. Blood products were required in 2. No mortality was observed in our study.

Conclusion: Children in the age group of 5-15 years were most commonly affected with the majority of them residing in rural areas. Persistent vomiting, abdominal pain, and lethargy mentioned in the revised guidelines as warning signs helped us in identifying sick dengue cases early and better monitoring of the children and have yielded a fruitful outcome.

Keywords: Child, Dengue, Revised classification, Warning signs, World Health Organization

INTRODUCTION

Globally, dengue is considered to be the most important mosquito-borne disease, which is found to be endemic in more than 100 countries.¹ In Southeast Asian countries, dengue constitutes a major cause of pediatric morbidity and mortality.² The epidemiology of dengue fever is changing dramatically over the last few decades with respect to the prevalent strains, affected geographic population, and severity of the disease. It is no longer confined to an urban area with frequent outbreaks now occurring more in rural areas.³ There are certain salient clinical features, which help in the detection of dengue fever cases but they can also present with varied clinical manifestations.⁴ There were many controversies with
regard to World Health Organization (WHO) 1997 dengue classification guidelines in its failure to detect patients who developed shock and severe form of dengue.\textsuperscript{5,6} Therefore, following positive results from large multicenter study which was conducted in South East Asia and in Latin America, WHO revised their guidelines in 2009\textsuperscript{7} and accordingly the clinical classification was revised as dengue without warning signs, dengue with warning signs, and severe dengue which was more applicable and much easier to understand.\textsuperscript{8,9}

It also helped in identifying sick dengue patients more easier for the clinicians than the traditional guidelines.\textsuperscript{10} The warning signs in the revised classification were put forth to identify the severe dengue cases by health care professionals early during endemic and facilitated them for the need of detailed laboratory workup.\textsuperscript{9} Hence, the present study was undertaken to analyze, classify and manage the dengue fever cases, and interpret the outcome of the children by adopting the revised WHO guidelines 2009.

**MATERIALS AND METHODS**

This prospective observational study was conducted at Sri Manakula Vinayagar Medical College and Hospital, Puducherry from January 2014 to December 2014. All children in the age group of 0-14 years who had clinical features suggestive of dengue illness and confirmed either by rapid dengue test and or dengue IgM, IgG antibody test by ELISA method were included in the study and those who had dengue along with other coexisting illness such as malaria, scrub typhus, and typhoid, which was confirmed by laboratory tests were excluded. Parents or the guardians of all the subjects provided written informed consent and the study is approved by Institutional Ethical Committee.

A detailed symptomology, vitals, general, and systemic examination findings were recorded in a predesigned proforma at the time of admission and were monitored periodically. Hematological parameters such as total count, packed cell volume, platelet count was done in all patients. In the sick patients, liver function test, coagulation profile, blood sugar with electrolytes, ultrasound abdomen, and chest radiography were taken. The patients were classified according to revised WHO criteria and managed appropriately. The treatment details of usage of crystalloids or colloids and the use of blood products in severe dengue patients were also entered.

The data was entered and analyzed using Epi Info version 3.5.4. The clinical features, laboratory parameters and outcome of these children were taken for analysis.

**RESULTS**

A total of 50 children were diagnosed to have dengue fever in the study period; 26 (52%) were boys and 24 (48%) were girls with an equal ratio of 1:1. Majority of the children (74%) were from nearby rural areas of Villupuram district, Tamil Nadu, India.

The common age group was between 5 and 15 years (58%). 10% of the affected population were infants and the youngest one was 5 months old. Table 1 shows the age-wise distribution of dengue fever cases as per revised WHO classification.

Fever was noted in all dengue patients with mean duration of illness of 5.2 days. The common presentation by these children includes vomiting (44%), lethargy (40%), pain abdomen (36%), facial puffiness (18%), abdominal distention, and decreased urine output (14%) each. Myalgia and headache were seen in 10% and 14% of the cases, respectively. Bleeding manifestations were observed in 7 (14%) of the cases of which epistaxis and melena were the common bleeding manifestations noted. Hematuria, hematemesis, and bleeding per vagina were observed in 1 case each. Figure 1 shows an infant with gross hematuria.

**Table 1: Age-wise distribution of dengue fever cases as per revised WHO classification**

<table>
<thead>
<tr>
<th>Age group</th>
<th>Dengue without warning signs</th>
<th>Dengue with warning signs</th>
<th>Severe dengue</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 year</td>
<td>0 (0%)</td>
<td>2 (07%)</td>
<td>2 (40%)</td>
<td>4 (08%)</td>
</tr>
<tr>
<td>1-5 years</td>
<td>7 (36%)</td>
<td>9 (34%)</td>
<td>1 (20%)</td>
<td>17 (34%)</td>
</tr>
<tr>
<td>5-10 years</td>
<td>9 (47%)</td>
<td>10 (35%)</td>
<td>2 (40%)</td>
<td>21 (42%)</td>
</tr>
<tr>
<td>&gt;10 years</td>
<td>3 (15%)</td>
<td>5 (19%)</td>
<td>0</td>
<td>8 (16%)</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>26</td>
<td>5</td>
<td>50</td>
</tr>
</tbody>
</table>

Percentages as given in parenthesis, WHO: World Health Organisation

**Table 2: Frequency of clinical symptoms according to type of dengue fever cases in percentages**

<table>
<thead>
<tr>
<th>Clinical symptoms</th>
<th>Dengue without warning signs</th>
<th>Dengue with warning signs</th>
<th>Severe dengue</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persistent vomiting</td>
<td>21</td>
<td>61</td>
<td>40</td>
<td>44</td>
</tr>
<tr>
<td>Abdominal pain</td>
<td>5</td>
<td>61</td>
<td>20</td>
<td>36</td>
</tr>
<tr>
<td>Lethargy/restlessness</td>
<td>0</td>
<td>73</td>
<td>80</td>
<td>46</td>
</tr>
<tr>
<td>Myalgia</td>
<td>0</td>
<td>11</td>
<td>40</td>
<td>10</td>
</tr>
<tr>
<td>Facial puffiness</td>
<td>0</td>
<td>26</td>
<td>40</td>
<td>18</td>
</tr>
<tr>
<td>Abdominal distension</td>
<td>0</td>
<td>15</td>
<td>60</td>
<td>14</td>
</tr>
<tr>
<td>Fast breathing</td>
<td>0</td>
<td>3</td>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>Headache</td>
<td>5</td>
<td>23</td>
<td>0</td>
<td>14</td>
</tr>
<tr>
<td>Rash</td>
<td>5</td>
<td>7</td>
<td>20</td>
<td>8</td>
</tr>
<tr>
<td>Decreased urine output</td>
<td>5</td>
<td>23</td>
<td>0</td>
<td>14</td>
</tr>
<tr>
<td>CNS manifestation</td>
<td>0</td>
<td>0</td>
<td>40</td>
<td>4</td>
</tr>
<tr>
<td>Bleeding</td>
<td>0</td>
<td>23</td>
<td>20</td>
<td>14</td>
</tr>
</tbody>
</table>

CNS: Central nervous system
Table 2 elaborates the frequency of clinical symptoms according to the types of dengue fever patients during the study period.

Among the clinical findings, palmoplantar flushing was observed in 13 (26%) of cases. Rashes were observed in 2 cases. Figure 2 shows a child with palmoplantar flushing. Abdominal findings of hepatomegaly and splenomegaly were noted in 70% and 42% of the cases, respectively. Clinical fluid accumulation in the form of ascites and pleural effusion with reduced air entry were observed in (2%) of cases.

Figure 3 depicts an X-ray chest of a child with bilateral pleural effusion. Severe shock was observed in 2 cases at admission. Bradycardia was noted in 8% of children during recovery. Table 3 shows the frequency of common clinical signs noted according to the types of dengue fever cases.

On analyzing the warning signs, restlessness/lethargy, abdominal pain, persistent vomiting, and hepatomegaly >2 cm were the most important warning signs observed in dengue patients and was found to be statistically significant. Table 4 elaborates statistical values of different warning signs noted in dengue fever patients.

Based on the above symptoms and signs and relevant investigations; 38% were classified as dengue without warning signs, 52% as dengue with warning signs and 10% as severe dengue.

Evidence of raised hematocrit >35% were observed in 50% of cases with a mean hematocrit value of 39.1%; 3 patients had very high hematocrit above 45%.

Thrombocytopenia (<1-lakh) was observed in 74% of cases with 12% of patients having counts, which was <20,000/mm, but major proportion of the cases had platelet count between 50,000 and 1-lakh. Figure 4 shows the distribution of platelets with respect to severity of dengue cases.

Leukopenia (<5000) was observed in 38% of cases. Hyponatremia was observed in 28% and abnormal liver function tests (raised liver enzymes) were observed in 40% of patients. Prolonged prothrombin time and activated partial thromboplastin time were seen in 10.2% of cases.

Nonstructural protein 1 antigen test was positive in 74% of cases, IgM in 38% and dengue IgG (along with NS1 antigen or IgM) was positive in 16% of cases.

Ultrasound abdomen was done in 15 patients. The most common ultrasonogram findings were Gall bladder edema (93%), pleural effusion (79%), and ascites (73%).

<table>
<thead>
<tr>
<th>Table 3: Frequency of clinical signs noted according to types of dengue fever cases in percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signs</td>
</tr>
<tr>
<td>Bradycardia</td>
</tr>
<tr>
<td>Hypotension</td>
</tr>
<tr>
<td>Palmoplantar flushing</td>
</tr>
<tr>
<td>Hepatomegaly</td>
</tr>
<tr>
<td>Splenomegaly</td>
</tr>
<tr>
<td>Decreased air entry</td>
</tr>
<tr>
<td>Ascites</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Table 4: Analysis of significance of warning signs noted in dengue fever cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warning signs</td>
</tr>
<tr>
<td>------------------------</td>
</tr>
<tr>
<td>Persistent vomiting</td>
</tr>
<tr>
<td>Abdominal pain</td>
</tr>
<tr>
<td>Lethargy</td>
</tr>
<tr>
<td>Hepatomegaly</td>
</tr>
</tbody>
</table>

*p<0.05 significant
In our study, non-structural protein 1 antigen was positive in 74% of cases indicating it is a highly sensitive test for the detection of dengue early during the illness. Secondary dengue infection (dengue IgG positive) was noted in 8 patients and all were sick at admission indicating the need to do both IgM and IgG serology along with non-structural protein 1 antigen in all cases of dengue.

Though 66% of dengue children required crystalloids, colloids were not used in any patients and by adopting the revised WHO classification the need for blood products were limited only to two cases (4%) in contrast to study done by Sahana et al.12 were 24.7% required blood component therapy.

The limitations of this study was relatively small size sample, so further studies using revised WHO classification on a larger scale in children may be required to access the applicability of this classification during triage management in the community.

CONCLUSION

In summary, children in the age group of 5-15 years were commonly affected by dengue with the major proportion of patients affected from rural areas thus highlighting the need for epidemiological surveillance and implementation of effective vector control program at timely intervals in these areas to prevent future dengue outbreaks. Persistent vomiting, abdominal pain, and lethargy were useful warning signs which helped us in taking decisions on hospital treatment but however, further research may be required into the predictive value of these signs in different age groups and geographical areas.

REFERENCES

Arunagirinathan, et al.: Clinical Profile and Outcome of Dengue Fever Cases in Children by Adopting Revised WHO Guidelines: A Hospital Based Study


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Primary Intramedullary Nailing with Flap Cover in Gustilo Type III B Open Tibial Fractures: An Analysis of Outcomes

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INTRODUCTION

Open fractures of the tibia present the orthopedic surgeon with a difficult problem because of poor soft-tissue cover and blood supply of the tibial shaft. The subcutaneous location of the anteromedial surface of the tibia accounts for a high incidence of open fractures in tibia compared to other long bones, with severe bone and soft tissue injury frequently resulting in complications and poor outcomes.¹

In 1984, Gustilo et al. first quantified the importance of soft-tissue damage as an important predictor of infection and poor outcome, and ever since, this has been highlighted by many authors over the years.²⁻⁶ In particular, Grade-III B open tibial fractures are associated with high rates of infection, non-union, malunion, and amputation.⁶⁻⁹

It is universally accepted that the extent of soft tissue injury and its management are the most important factors in determining the outcome of open tibial fractures; but the...
best method of bone stabilization in these fractures is still unclear. The most widely used method of stabilization is by external fixation, but recently, small diameter locking intramedullary nails are gaining more popularity in the primary management of the Gustilo Type III B open tibial fractures. It is in this setting that we analyze the outcome of 28 cases of Gustilo Type III B open fractures of the tibia for which locked intramedullary nails were used primarily for bone fixation.

MATERIALS AND METHODS

This study was conducted in the Department of Orthopedics, along with the Department of Plastic Surgery, at Kannur Medical College on a prospective basis from January, 2011 to January, 2015. Ethical clearance was obtained from the Institutional Review Board and informed written consent was taken from all the patients. Fractures were classified according to AO classification and open fractures according to Gustilo and Anderson classification. The fractures were also classified according to the severity of bone loss as described by Winquist and Hansen. Fractures were Graded III B if there was significant soft-tissue injury or contamination, and periosteal stripping as described by Gustilo et al. All open fractures of tibia falling under Type III B of Gustilo—Anderson classification system were included in the study. Exclusion criteria were: (1) Fractures with known arterial injury (Gustilo Type III C fractures), (2) tibial fractures proximal to the tibial tubercle, and those with proximal or distal intra-articular extension, (3) fractures extending into the distal 4 cm of the tibia, (4) cases which presented more than 48 h after injury, (5) associated serious injuries or comorbid medical conditions, (6) pathological fractures.

Detailed clinical and radiologic evaluation was done in all the patients. Out of the 79 patients admitted with fractures of the tibia, 28 patients who fitted the criteria were included in our study. All 28 patients were treated immediately by debridement followed by the insertion of a reamed intramedullary nail as the primary fixation device. All fractures received soft tissue coverage during the procedure or within 3 days. The patients received tetanus toxoid and antibiotic prophylaxis consisting of cefuroxime 1.5 g twice daily and gentamycin 80 mg twice daily for 72 h.

The required nail length and diameter were determined preoperatively using a radiographic ruler held parallel to the uninjured tibia. Using a medial parapatellar or a patellar tendon splitting approach, the nail insertion point was kept slightly distal to the tibial plateau, below the lateral intercondylar tubercle and in line with the proximal anterior tibial margin. The medullary canal was opened with a curved awl and guide wire introduced. Serial reaming was done up to 1 mm more than the estimated nail diameter. Securing to the insertion handle, the selected nail was inserted by soft hammer blows and gentle rotary movements over the guide wire across the fracture site up to the distal epiphyseal scar, and until the proximal end had sunk 1-5 mm into the bone. Distal locking was generally carried out first, enabling the use of the back strike technique to prevent distraction at the fracture site, which was followed by proximal locking.

In axially stable, rotationally unstable fracture patterns, the dynamic locking option was used (primary dynamization). In fracture patterns that were axially and rotationally unstable, and where the judgment of stability was difficult, proximal and distal static locking was chosen. The appropriate sized end cap was inserted before the incisions were sutured. The plastic surgeon then decided the type of flap most appropriate depending on the anatomy of injury, as well as the soft tissue defect after debridement. The soft tissue reconstruction was done either immediately or within 72 h after bone fixation. Supervised by a physiotherapist, the joints were mobilized as early as tolerated, followed by toe-touch weight bearing and active-assisted motion. Progressive weight bearing was given depending on the stability and signs of the union. All patients had visits to the outpatient clinic until radiological union, thereafter the frequency of follow-up visits was tapered down. In those patients presenting with features suggestive of delayed union or non-union, secondary procedures like bone grafting, dynamization, exchange nailing and bone transport were done as early as 4 weeks, and carried out when deemed appropriate.

During follow-up, the patients were examined by a physiotherapist who recorded all parameters relevant to outcome status, which included pain, gait, use of walking aids, limb length discrepancy, range of motion of knee and ankle, and cosmetic appearance of the injured limb. The final functional outcome was assessed based on a grading system as described by Georgiadis et al. Range of movement was graded according to the restrictions of movement in the percentage of normal movements. The physiotherapist also employed short form 36 questionnaire for health-related quality of life measure. Responses to each of the SF-36 items were scored and summed according to a standardized scoring protocol and expressed as a score on a 0-100 scale for each of the eight health concepts.

RESULTS

The age of the patients ranged from 17 to 75 years. Out of the 28 cases, 21 were men and seven were women. The
pattern of the external wounds was as follows: Puncture wounds in two; wounds measuring 2-5 cm in five; between 5 and 10 cm in eight patients, and lacerations longer than 5 cm in 13. According to the AO system of classification, 17 (60.7%) were Type 42B and 11 (39.2%) were Type 42C. According to the Winquist and Hansen classification based on bone loss, there were 9 patients with minor, 9 with moderate and 10 with the major bone loss.

In 19 patients, there was comminution, with three having segmental fractures. 13 fractures were in the middle third of the tibia; 5 at the junction of the middle and distal thirds; and 10 in the distal third. 24 cases were managed with immediate soft tissue reconstruction, and 4 patients received flap coverage within 48-72 h after bone fixation. The mean follow-up at the time of final review was 36 months (range 15-50 months).

The time to union ranged from 11 weeks to 20 months (average - 32.7 weeks). In 24 cases in which union was achieved, 12 fractures (43%) united within 20 weeks, 10 cases (36%) between 21 weeks to 30 weeks and 2 (7%) fractures between 30 and 36 weeks. 4 (14%) fractures went into non-union, which subsequently united after 36 weeks with secondary procedures. The time to union was less in fractures with minor bone loss and delayed in cases with moderate and severe bone loss. Predictably, delayed union occurred in cases of fractures with gross soft tissue injury and extensive periosteal stripping.

Delayed union occurred in 12 (43%) of the 28 open fractures. Additional surgery for delayed bone union was carried out between the 5th and 6th months. In one patient solid bone-healing of the fibula had occurred, blocking the contact of the fracture surfaces of the tibia for which a high fibular osteotomy was performed, and the fractures healed after 2 months. In two cases, a rigid intramedullary nail was inserted after reaming. The tibia eventually united at 8 months after injury.

Four of the fractures in our series went into non-union (14%). Two of these belonged to the group with severe bone loss, one with moderate bone loss and one with the minor bone loss.

**Secondary Procedures**

Of the 28 open fractures, 17 (61%) showed the primary wound and bone healing and no additional surgical procedures were necessary. In the remaining 11 open fractures (39%), in which further surgical intervention was required, a direct relationship was found between the severity of the initial trauma and the ensuing complications. In seven patients of delayed union, dynamization was done along with secondary bone grafting. In one case of infection at the distal locking site, the distal screw was removed. Two cases of non-union required implant removal and exchange nailing with a larger diameter reamed nail. A case of infected non-union was managed by implant removal with sequestrectomy and bone transport with an Ilizarov fixator. In one case of non-union where the injury was located at the distal third of the tibia, Ilizarov fixator was applied.

Functional outcome based on the grading system is summarized in Table 1. 16 cases (57%) were evaluated as excellent, 10 cases (36%) as good/fair, and 2 cases (7%) as poor results.

Using the SF-36 system, the mean physical score was 55.4 (range 05-100), and the mean mental score 30.8 (range 08-100). The mean component scores for each of the eight dimensions of the quality of living were: General health, 60.07 (range 0-87); limitation of activities, 63.07; physical health, 49.14; emotional health, 71.07; social activities, 67.82; pain, 49.21; vitality, 62.92; mental health, 54.42. Individual SF-36 scores with age and sex norms are given in Table 2.

**Joint Stiffness**

There was no severe restriction of ankle or knee joint movement in any case. Results have been summarized in Tables 3 and 4.

### Table 1: Functional outcome based on the grading system as excellent (30-24 points), good/fair (23-18 points) and poor (17-10 points)

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Grade I (3 points)</th>
<th>Grade II (2 points)</th>
<th>Grade III (1 point)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>No pain</td>
<td>Mild</td>
<td>Moderate to severe</td>
</tr>
<tr>
<td>Knee stiffness</td>
<td>0-30%</td>
<td>30-60%</td>
<td>60-100%</td>
</tr>
<tr>
<td>Ankle stiffness</td>
<td>0-30</td>
<td>30-60</td>
<td>60-100</td>
</tr>
<tr>
<td>Infection</td>
<td>No</td>
<td>Superficial</td>
<td>Bone deep</td>
</tr>
<tr>
<td>Shortening</td>
<td>0-1 cm</td>
<td>Up to 2 cm</td>
<td>&gt;2 cm</td>
</tr>
<tr>
<td>Radiological union</td>
<td>&lt;20 weeks</td>
<td>21-30 weeks</td>
<td>&gt;30 weeks</td>
</tr>
<tr>
<td>Patient satisfaction</td>
<td>Highly satisfied</td>
<td>Satisfied</td>
<td>Dissatisfied</td>
</tr>
<tr>
<td>Squatting</td>
<td>Possible</td>
<td>With discomfort</td>
<td>Not possible</td>
</tr>
<tr>
<td>Cross legged sitting</td>
<td>Possible</td>
<td>With discomfort</td>
<td>Not possible</td>
</tr>
<tr>
<td>Ability to walk</td>
<td>Without aid</td>
<td>With one crutch</td>
<td>With two crutches</td>
</tr>
</tbody>
</table>

*Number of cases in each group is shown in italic numbers*
Examples of our cases are shown in Figures 1-3.

DISCUSSION

Tibial fractures with bone loss usually result from high energy trauma which produces severe injuries to both the soft tissues and the tibial fragments. Considerable delay in the union must be expected, with a prolonged period of treatment. In such cases, the indications for limb salvage have been questioned. Improvement in techniques of bone fixation and soft-tissue cover have given better results over the last two decades. Early stabilization of the fracture greatly facilitates the care of the soft-tissue wound and prevents pressure on devitalized areas of the skin caused by angulation of displaced bone ends. Early cover of the wound not only reduces infection, but also improves the blood supply to the healing bone.

The classification and prognosis of these severe injuries are difficult because of variation in the extent of skin degloving, muscle contusion, periosteal stripping and bone loss, which are not easy to quantify. The most widely accepted classification of soft-tissue injury in open fractures is that of Gustilo and Anderson, but this does not include assessment of bone loss. Gustilo Type III B injuries with bone loss have more delay in union and require more secondary reconstructive procedures than Type III B fractures without bone loss. The time to union for fractures with moderate and severe bone defects was longer than that which has been reported for Gustilo Types II and Type III open fractures without bone loss as has been observed by other authors too. Union was achieved, however, in all the fractures, but the time taken was directly related to the amount of bone loss.

It is generally agreed that the early management of soft tissues and bone includes thorough excision of all contaminated and devitalized tissue and “therapeutic” levels of antibiotics for 48 h to prevent infection, which is the major cause of failure. Although there is evidence in favor of the use of intramedullary nailing in the early treatment of uncomplicated open tibial fractures, its use in fractures with bone loss has not been much described.

Many authors favor the use of an external fixator for the stabilization of these injuries. But nailing offers many practical advantages over external fixation. The advantages include earlier weight-bearing, easier access for secondary soft-tissue and bony procedures, a reduced malunion rate and better patient tolerance. Furthermore, it avoids the risks of pin-tract infection and of late re-fracture. Direct comparison with previous reports of the use of external fixation for such cases is impossible, because fractures with bone loss are usually included in the whole spectrum of open fractures. In our series, the mean time taken for union was 32.7 weeks (ranging from 11 weeks to 20 months). The

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**Table 2: SF-36 health outcome scores**

<table>
<thead>
<tr>
<th>Age/sex</th>
<th>GH</th>
<th>LA</th>
<th>PH</th>
<th>EH</th>
<th>SA</th>
<th>P</th>
<th>V</th>
<th>MH</th>
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<tr>
<td>38/M</td>
<td>67</td>
<td>57</td>
<td>60</td>
<td>86</td>
<td>90</td>
<td>16</td>
<td>33</td>
<td>50</td>
</tr>
<tr>
<td>32/F</td>
<td>44</td>
<td>66</td>
<td>74</td>
<td>77</td>
<td>90</td>
<td>48</td>
<td>38</td>
<td>08</td>
</tr>
<tr>
<td>24/M</td>
<td>78</td>
<td>67</td>
<td>70</td>
<td>67</td>
<td>100</td>
<td>51</td>
<td>90</td>
<td>55</td>
</tr>
<tr>
<td>24/M</td>
<td>56</td>
<td>49</td>
<td>57</td>
<td>68</td>
<td>100</td>
<td>57</td>
<td>50</td>
<td>75</td>
</tr>
<tr>
<td>25/M</td>
<td>51</td>
<td>67</td>
<td>26</td>
<td>36</td>
<td>33</td>
<td>75</td>
<td>50</td>
<td>37</td>
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<td>34/M</td>
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<td>63</td>
<td>100</td>
<td>67</td>
<td>10</td>
<td>79</td>
<td>84</td>
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<td>45</td>
<td>50</td>
<td>100</td>
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<tr>
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<td>67</td>
<td>50</td>
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<td>84</td>
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</table>

**Table 3: Restriction of movement of knee joint**

<table>
<thead>
<tr>
<th>Stiffness</th>
<th>Number of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;30%</td>
<td>25</td>
<td>89</td>
</tr>
<tr>
<td>30-60%</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>&gt;60%</td>
<td>0</td>
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</table>

**Table 4: Restriction of movement of ankle joint**

<table>
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<tr>
<th>Stiffness</th>
<th>Number of cases</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>&lt;30%</td>
<td>18</td>
<td>64</td>
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<tr>
<td>30-60%</td>
<td>10</td>
<td>36</td>
</tr>
<tr>
<td>&gt;60%</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Shortening**

Shortening of the injured extremity exceeded 2 cm in 2 patients (7%). In 14 patients (50%), the shortening measured between 1 and 2 cm. 7 patients (25%) showed a leg-length difference of 0.5-1 cm. Shortening of the tibia was unrelated to the nail used, and seemed to depend mostly on the fracture pattern.

**Infection**

There were 5 cases (18%) of post-operative infection; two of which were superficial. Of the three deep-seated infections, 2 cases resulted in chronic osteomyelitis (7%).

Examples of our cases are shown in Figures 1-3.
average time of union and complications in series reported by other authors is summarized in Table 5.

The major concern with early internal fixation with rigid intramedullary nails in open tibial fractures is the high rate
of infection. In our series there were no early infections after early flap cover; all five infections appeared to be related to deficiencies in the early phase of soft-tissue management. Three cases with infection were controlled by further debridement and the application of fasciocutaneous flaps. The importance of the soft-tissue blood supply for both fracture healing and the survival of bone grafts has been shown experimentally. Flap cover has many advantages over local skin cover. We consider that flap cover should be the routine treatment for soft-tissue defects in open fractures with bone loss as has been recommended by many authors.

Theoretical arguments based on blood supply to the fracture favor external fixation. According to Rhinelander, intramedullary nails interrupt the blood supply temporarily and only when there is direct contact with the cortex. Small diameter nonreamed locking nails do not require a tight interference fit, and need very little cortical contact for stability. Reaming of the medullary canal increases periosteal blood flow and stimulates periosteal new-bone formation.

A large portion of the cortex loses perfusion immediately after reaming because the endosteal circulation is destroyed, and bone marrow blocks the intercortical canals. In response to these effects, periosteal blood flow increases in order to maintain circulation in the cortical bed. Blood flow in the cortex returns to normal or supranormal levels within days after medullary reaming. The periosteum reacts to the increased blood flow by forming new bone, which in turn aids in healing of the non-union. Furthermore, the products of reaming, which contain osteoblasts and multipotent stem cells, serve as a local bone graft that stimulates medullary healing at the non-union site.

It can also be assumed that early flap coverage will improve the blood supply to the fracture site regardless of the type of fixation. In our series, nailing provided excellent lasting alignment, making soft-tissue procedures and secondary reamed nailing easier and improving patient compliance. External fixation is bulky, requires meticulous pin care and has been reported to have an incidence of pin-track infections as high as 80%. High rates of infection have been reported with “secondary” intramedullary nailing. Based on our study, we recommend the use of interlocking nails (nonreamed or minimally reamed just enough to admit a small diameter nail) for the stabilization of Grade III B open tibial fractures.

The secondary bone procedures required during the course of treatment was determined by the extent of the initial bone loss. It is useful to make a careful clinical and radiological reassessment of fracture healing at between 16 and 20 weeks after injury. Lack of signs of the union at this stage was treated successfully by exchange nailing. Exchange nailing provides biological and mechanical effects that promote osseous healing. The biological effects result from reaming of the medullary canal, and the mechanical effects result from the use of a larger-diameter intramedullary nail.

Many authors recommend early bone grafting in fractures with circumferential bone loss of >2.5 cm. We also

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**Figure 3: Radiographs and clinical picture of a patient with joint stiffness and deep infection, (a) post-operative radiographs, (b) radiographs at 20 weeks, (c) radiographs at 26 weeks, (d) radiographs at 30 weeks, (e) union at 36 weeks, (f) ankle stiffness at 6 months, (g) chronic osteomyelitis - patient pointing toward a discharging sinus**

---

**Table 5: Average time of union and complications reported by other authors**

<table>
<thead>
<tr>
<th>Author</th>
<th>Number</th>
<th>Type</th>
<th>Union (weeks)</th>
<th>Infection</th>
<th>Non-union</th>
<th>Malunion</th>
<th>Stiffness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whittle <em>et al.</em></td>
<td>50</td>
<td>Gustilo Type I-III B</td>
<td>30.3</td>
<td>8</td>
<td>4</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Bone and Johnson</td>
<td>29</td>
<td>Gustilo Type I-III B</td>
<td>28.9</td>
<td>6.9</td>
<td>48.3</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Sanders <em>et al.</em></td>
<td>64</td>
<td>Gustilo Type I-III B</td>
<td>31.1</td>
<td>4</td>
<td>17.1</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Singer and Kellam</td>
<td>43</td>
<td>Gustilo Type I-III B</td>
<td>26.4</td>
<td>12</td>
<td>47</td>
<td>49</td>
<td>-</td>
</tr>
<tr>
<td>Keating <em>et al.</em></td>
<td>41</td>
<td>Gustilo Type I-III B</td>
<td>28.8</td>
<td>2.4</td>
<td>12</td>
<td>2.4</td>
<td>38</td>
</tr>
</tbody>
</table>
recommend the same for fractures with moderate or severe bone loss. The early elective use of bone grafting between 8 and 12 weeks for moderate bone loss appears to be justified; fractures with severe bone loss may require repeated grafting. This method of treatment is not as technically demanding as some of the more specialized alternatives such as vascularized or free segmental bone transfers, bone transport or segmental bone transport over an unreamed nail.

Infection rates in these fractures are reported to be much higher than those for Grade-I and Grade-II fractures. According to a study by Gustilo et al., infection rates for Grades I, II and III were 0-2%, 2-7%, and 10-50% respectively. The same authors also found a large difference between Grade III A and Grade III B fractures, with infection rates of 4% and 52% respectively, but these cases were not treated by early flap coverage. Osteomyelitis, a serious complication in open fractures, was not synonymous with non-union of the tibia in our series. Solid bone healing took place eventually in fractures in which the nails were left in the tibia, despite the presence of a draining sinus.

In conclusion, the paramount principle of treatment of open tibial fractures is the creation of a suitable environment for healing, for which reconstruction of the soft-tissue envelope and stabilization of the fracture are crucial. The factors which are critical to the union are the initial displacement, comminution, associated wounds, and infection. The relatively atraumatic insertion of a small diameter nail across the fracture site makes this a feasible procedure in open fractures. The use of intramedullary nailing as a method of primary bone stabilization in open tibial fractures offers considerable advantages over external fixation. In our series, the use of intramedullary nails for internal fixation did not lead to an increased incidence of infection. Based on our study, we recommend the use of intramedullary nails, after minimal reaming, with flap cover in Gustilo III B open tibial fractures.

REFERENCES

Muhammad, et al.: Primary Intramedullary Nailing in Open Tibial Fractures


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Comparative Evaluation of Early Ambulation with Delayed Ambulation on Postdural Puncture Headache

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The main limitation of intra-thecal blockade is chances of post dural puncture headache (PDPH), to prevent these following words are seen universally in post-operative advice: “Avoid pillow and head up position for 24 h.” The goal of this study is to find the relationship between early ambulation and PDPH.

INTRODUCTION

The aim of modern anesthesia is not only limited to diminish pain during surgery but to provide early ambulation too. Even today spinal anesthesia is the most common and sureshot technique of central neural blockade, with very low incidence of side-effect.
The use of non-cutting pencil point needles greatly reduces the incidence of PDPH. They have reduced the overall incidence of PDPH to an acceptable level of <3%.

Factors increasing the risk of PDPH are shown in Table 1.

First study to correlate ambulation and PDPH was conducted in 1988 on obstetric patients who have got the high risk of PDPH (Table 1), even than ambulation was not found to play any role in PDPH. In 2003, another study had shown increased risk of PDPH in rested patient when compared to early ambulation and they have recommended that patient with PDPH should also be promoted to ambulate. Headache usually occurs after 24 h and varies in severity (Table 2).

Most of the research work conducted so far had used three or more variable which increase confounding. In this study, we have excluded patients with high risk for PDPH like pregnant females, multiple puncture. The goal of this study is to find the exact relationship between ambulation and PDPH using a fine 25G pencil point needle.

**MATERIALS AND METHODS**

After approval from institutional ethical committee and written consent, 120 American Society of Anesthesiology (ASA) Status I and II patients of either sex, aged 20-50 years, undergoing minor elective infraumbilical surgeries of short duration were included. Thorough pre-anesthetic checkup of every patient was done. After which patient were subjected to routine and special investigations if required. The procedure along with possible risks and complications were explained. An informed and written consent was obtained.

Each patient received 10 mg diazepam orally a night before surgery. Injection diclofenac 75 mg/IM was given to all patient immediately after spinal block. No sedative, narcotics drug were given pre-, intra- or post-operatively.

Each patient was re-examined thoroughly before application of intra-thecal block. A 3-lead electrocardiogram monitor, pulse oximeter, and an automated non-invasive arterial blood pressure monitor were applied. Baseline systolic, diastolic, and mean arterial pressures were noted.

After preloading each patient with ringer lactate (500 ml), lumbar puncture was done in sitting position in interspace of 4th and 5th lumbar vertebrae under full aseptic condition, by 25 Gauze pencil point Whitacre spinal needle. With return of clear cerebrospinal fluid (CSF), hyperbaric bupivacaine 0.5%, 2 ml was injected. Patient turned supine and monitored continuously. After 5 min of injection, level of blockade checked. When there was no pain sensation surgeon was allowed to proceed with the surgery. Vitals were monitored at regular interval in whole perioperative

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**Table 1: Factors that may increase the incidence of post-spinal puncture headache**

<table>
<thead>
<tr>
<th>Age</th>
<th>Younger more frequent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Females&gt;males</td>
</tr>
<tr>
<td>Needle size</td>
<td>Larger&gt;smaller</td>
</tr>
<tr>
<td>Needle bevel</td>
<td>Less when the needle bevel is placed in the long axis of the neuraxis</td>
</tr>
<tr>
<td>Pregnancy</td>
<td>More when pregnant</td>
</tr>
<tr>
<td>Dural punctures (no.)</td>
<td>More with multiple punctures</td>
</tr>
</tbody>
</table>

**Table 2: Grading of PDPH severity**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>No treatment required</td>
</tr>
<tr>
<td>Moderate</td>
<td>Moderate limited activity</td>
</tr>
<tr>
<td>Regular analgesics required</td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td>Confined to bed</td>
</tr>
<tr>
<td>Anorexic</td>
<td>Unable to feed baby</td>
</tr>
</tbody>
</table>

PDPH: Post dural puncture headache

**Table 3: Post anesthesia discharge scoring system**

<table>
<thead>
<tr>
<th>Vital signs</th>
<th>Vital signs must be stable and consistent with age and pre-operative baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP and pulse within 20% of pre-operative baseline</td>
<td>2</td>
</tr>
<tr>
<td>BP and pulse 20-30% of pre-operative baseline</td>
<td>1</td>
</tr>
<tr>
<td>BP and pulse&gt;30% of pre-operative baseline</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity level</th>
<th>Patient must be able to ambulate at pre-operative level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steady gait, no dizziness, or meets pre-operative level</td>
<td>1</td>
</tr>
<tr>
<td>Unable to ambulate</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nausea and vomiting</th>
<th>The patient should have minimal nausea and vomiting prior to discharge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimal: Successfully treated with PO medication</td>
<td>2</td>
</tr>
<tr>
<td>Moderate: Successfully treated with IM medication</td>
<td>1</td>
</tr>
<tr>
<td>Severe: Continues after repeated treatment</td>
<td>0</td>
</tr>
</tbody>
</table>

| Pain | Acceptable | 2 |
| Not acceptable | 1 |

<table>
<thead>
<tr>
<th>Surgical bleeding</th>
<th>Minimal: Does not require dressing change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate: Up to two dressing changes required</td>
<td>1</td>
</tr>
<tr>
<td>Severe: More than three dressing changes required</td>
<td>0</td>
</tr>
</tbody>
</table>

BP: Blood pressure

**Table 4: Demography**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Group I</th>
<th>Group II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>38.62±3.64</td>
<td>37.57±2.30</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>54.22±4.88</td>
<td>55.2±3.93</td>
</tr>
<tr>
<td>Duration of surgery (min)</td>
<td>52.69±7.31</td>
<td>49.62±9.24</td>
</tr>
</tbody>
</table>
Jain, et al.: Effect of Early Ambulation on PDPH

Complications such as nausea, vomiting, drowsiness, respiratory depression, hypotension, and others were looked for, during the total perioperative period of observation, and were treated appropriately.

After completion of surgery patient were divided into randomly through lottery method:
- Group I: Patient were ambulated as soon as the effect of spinal weaned off
- Group II: Patient were ambulated after 24 h bed rest without pillow.

All patients were observed for 1 h in post-operative period. After which they were shifted to their respective wards. Patients of Group I were allowed to ambulate as soon as they can while Group II patient were ordered bed rest without pillow for 24 h.

Group I patients were allowed to discharge in the evening if they are able to planter flex the foot and urinate normally with a post anesthesia discharge scoring system (Table 3) of nine or more provided there is no surgical problem. Group II patient were discharged next day with same criteria. At the time of discharge all patient were accompanied by at least one responsible adult. All patient were advised to drink lot of water, avoid strenuous activity, driving, machine operation and if they experience any headache or other problem report immediately on phone, if severe report to hospital. On third post-operative day an active telephonic inquiry was made to all patient regarding any problem and Group I patient were specifically asked regarding the first post-operative night sleep as good or bad. In Group II patient, this was asked at the time of discharge.

Statistical analysis was performed using SPSS-11. Quantitative variables were expressed as mean ± standard deviation while qualitative variables were expressed as percentage. PDPH was analyzed using Pearson’s chi-square test. A $P < 0.05$ was considered significant.

**RESULTS**

This study includes 120 patients of ASA physical Status I-II aged 20-50 years, undergoing elective infraumbilical surgery. Patients were either ambulated early or after 24 h bed rest.

Demographic data are shown in Table 4. There was no significant difference between each Group.

Four patients out of 120 suffered PDPH giving an overall frequency of 3.3%. Frequency of PDPH in both Groups were equal i.e., 3.3% (Table 5). In Group I one patient had mild headache while one had moderate, severe PDPH was not observed in Group I. In Group II both patients had a moderate headache (Table 5).

There was no difference in overall incidence of PDPH. However if the frequency of moderate headache was compared, difference is significant ($P < 0.05$).

The frequency of nausea and vomiting was in 5% in Group I and in 10% Group II, the difference was significant statistically. One unique thing which we have studied is first post-operative night sleep. In Group I 6 (10%) patients reported bad sleep or inability to sleep, in Group II 14 (23.3%) patients were sleep deprived, the difference was significant ($P < 0.05$).

When we compared overall expenditure during peri-operative period it was Rs. 2146.3 ± 194.2 in Group I while 3152.2 ± 206.8 in Group II. We have not compared this statistically as the number of patient undergoing free surgery was different in both Groups.

**DISCUSSION**

PDPH, a common complication and the foremost factor limiting the use of spinal anesthesia in outpatient surgery.

**Table 5: Incidence of side-effect**

<table>
<thead>
<tr>
<th>Side-effect</th>
<th>Group I</th>
<th>Group II</th>
<th>$P$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of patients</td>
<td>Percentage</td>
<td>Number of patients</td>
</tr>
<tr>
<td>Headache</td>
<td>2</td>
<td>3.3</td>
<td>2</td>
</tr>
<tr>
<td>Mild</td>
<td>2</td>
<td>3.3</td>
<td>1</td>
</tr>
<tr>
<td>Moderate</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Severe</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nausea and vomiting</td>
<td>3</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Bad first post-operative night sleep</td>
<td>6</td>
<td>10</td>
<td>14</td>
</tr>
</tbody>
</table>

NS: Non-significant
It is due to loss of CSF as first described by Bier, thus lowering of CSF pressure. Though it is called as PDPH, it appears that arachnoid puncture is more linked to the resulting headache than the dural rent. However, whether the headache is due to traction on intracranial structures or due to compensatory cerebral venodilatation is yet unknown. Historically when thick 16G spinal needle were used incidence of PDPH was as high as 75%. The incidence is inversely related to needle gauge and frequency with 27G Whittacre needle was quoted as 0.5% in one study.

This headache is usually aggravated in head up position. Treatment of PDPH includes maintenance of hydration, oral analgesics. Epidural blood patch is definitive but only few cases require this.

It is usually taught that early resumption of head up position will increase CSF leak due to gravitation effect. In 1988 Thornberry and Thomas studied effect of posture on PDPH and reported early mobilization reduces PDPH. In that study patients were mobilized 6 h after spinal anesthesia and subject for study (obstetric patients) were at high risk for PDPH. Most other studies conducted so far had used two or more variable, in this study we have used only one variable so as to reduce confounding factors.

In the present study incidence of PDPH in both group is 3.3%. In Group I one patient reported moderate grade headache while second patient had reported mild headache. In both these patient headache responded to ibuprofen along with increased water intake. In Group II both patient suffered headache of moderate grade, which also responded to same treatment. Group II patient suffered more nausea and urine retention, and 23.3% patient reported difficulty in sleep compared to 10% of Group I. This highly significant difference in sleep is supposed to be due to hospital bed and environment with absence of pillow. A homely environment without any restriction results in good sleep. None of the literature published so far have commented on first post-operative night sleep. In long term Group I patient have resumed their activities 2 days prior to Group II patient and there is difference in hospital expenditure too.

**CONCLUSION**

This can be concluded that early ambulation does not increase the frequency of PDPH, rather it decrease the incidence of nausea and improves the quality of first post-operative night sleep. Patient should be ambulated as early as they can.

**REFERENCES**

The Influence of Maternal Variables on Availment of Antenatal Care Services and Perinatal Outcome

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²Professor, Department of Obstetrics & Gynaecology, Gandhi Medical College & Hospital, Secunderabad, Telangana, India

Abstract

Aim: Understanding the impact of maternal background on antenatal care (ANC) utilization, and to improve the maternal and child health care services.

Objectives: (1) Study association of four maternal background variables: Education, parity, age, residential status (urban or rural) with ANC utilization by assessing booked/unbooked status of delivered mothers, (2) effect of booked/unbooked status on perinatal outcome, (3) live births were further evaluated as neonatal birth weight <2 kg or more than 2 kg.

Methodology: Observational study was carried out on 9326 cases delivered during the period of 1-year at Gandhi Medical College, a tertiary care hospital located in Secunderabad, catering to both urban and rural population. The subjects were grouped as booked or unbooked cases as per antenatal visits. The age, parity, education, and residential status of each patient in booked and unbooked cases was noted. Further, its impact on perinatal outcome was studied.

Results: The incidence of booked cases was observed as 58.9%. Majority of booked cases (67%) were from the urban area and only 36.7% of rural population had prior antenatal visits. Of the total prim parous cases delivered 57% were booked cases, and multiparous booked cases delivered were 52.97%. On studying the education pattern of booked cases, only 11.85% were illiterate whereas in unbooked category illiteracy was 42.32%. The low birth weight babies were 26.30% in booked and 36.75% in unbooked cases. Incidence of weight <2 kg was 21.13% in booked low weight babies and 41.81% in unbooked low weight babies. Beneficiaries of Janani Suraksha Yojana were 40%.

Conclusion: The educational status of the patients came out as significantly important variable and the booked rural population was significantly less educated as compared to booked urban population. Hence, whole hearted efforts should be directed in educating women population and also improving health care facilities in rural areas to provide early referral of high risk cases.

Keywords: Booked, Perinatal outcome, Rural, Unbooked, Urban

INTRODUCTION

For centuries, care for the childbirth and young children was regarded as a domestic affair. In 20th century, the health of the mother and child had become the public health priority. In the beginning of the 21st century, the Millennium Development Goals (MDG)¹ places it at the core of the struggle against poverty and inequality as a matter of human right. In these MDGs the health and wellbeing of women, mothers, and children is given special priority. This shift in emphasis has far reaching consequences. Antenatal care (ANC) is the care of the woman during pregnancy. The primary aim of ANC is to achieve at the end of a pregnancy a healthy mother and healthy baby. Ideally this care should begin soon after conception and continue throughout pregnancy. The central purpose of ANC is to identify high risk cases as early as possible from a large group of antenatal mothers and arrange for them skilled care while continuing to provide appropriate care for all mothers.

In 2001, WHO published the conclusions of a randomized control trial of a new model of ANC.² The new WHO model of ANC separates pregnant women into two
groups: Those likely to need only routine ANC (some 75% of the total population of pregnant women), and those with specific health conditions or risk factors that necessitate special care (25% of pregnant women). For the first group, a standard program of four antenatal visits is recommended (with additional visits should conditions emerge which require special care). The WHO guidelines are also specific as regards to the timing and content of ANC visits according to gestational age. The guidelines stipulate that “only examinations and tests that serve an immediate purpose and that have been proven beneficial should be performed.”

In November 2004, in the report of Millennium Summit, the secretary general of United Nations, Kofi Annan called on “The international community at the highest level to lift more than one billion people out of poverty by 2015 and urged that no efforts be spared to reach the target by date in every region and every country.”

In millennium declaration, eight MDG’s were set out each with its numerical target and indicators for monitoring progress.

In these MDG’s the health and wellbeing of women, mother, and children is given special priority due to unacceptable high mortality and unequal access to health care.

The MDGs:
Goal 1: Eradicate extreme poverty and hunger.
Goal 2: Achieve universal primary education.
Goal 3: Promote gender equality and empower women.
Goal 4: Reduce child mortality.
Goal 5: Improve maternal health.
Goal 6: Combat HIV/AIDS, malaria, and other diseases.
Goal 7: Ensure environmental sustainability.
Goal 8: Develop a global partnership for development.

Aims and Objectives
To understand the impact of maternal background on ANC utilization and perinatal outcome. This will help in improving the maternal and child health care services.

1. Study four variables from maternal background-education profile, parity (as prim parous/multiparous), age, residential status as urban or rural, and impact of these variables on ANC by assessing booked/unbooked status of pregnant mothers
2. To study effect of booked/unbooked status on perinatal outcome in terms of live births and stillbirths
3. Live births were further evaluated in respect to neonatal birth weight <2 kg or more.

**METHODOLOGY**

The study population included the cases delivered during the period of 1-year from January 1st, 2013 to December 31st, 2013. Informed written consent was taken from all the patients and Ethical clearance was taken from the Ethics Clearance Committee of Gandhi Medical College, Secunderabad, which is affiliated to the N.T.R University of Health Science, Vijayawada. A retrospective observational study was carried out on 9326 cases who delivered at Department of Obstetrics and Gynecology, Gandhi Medical College, Secunderabad, Telangana, which is serving both urban and rural population.

The study population was categorized into two groups: Booked and unbooked cases. The booked cases were those cases that had come to our antenatal clinic. Unbooked cases were the cases who never attended the antenatal clinic. The age, parity, educational profile, and residential status of each patient in booked and unbooked cases was noted. With these four variables as background, the two subgroups of antenatal women (booked or unbooked) were evaluated. Further, the impact of booked/unbooked status on perinatal outcome was studied. The perinatal outcome was studied as a live baby or stillbirth. The weight of live newborn baby was taken into account. As per standard protocol baby weight <2.5 kg was taken as low birth weight. These low birth weight babies were further sub-classified into two groups:
1. Babies with weight <2 kg (these babies routinely required admission for intensive care)
2. Babies with weight between 2.1 kg and 2.5 kg (routine admission not required)
3. The data were analyzed statistically using Chi-square test.

**OBSERVATIONS AND RESULTS**

A total of 9326 cases delivered during the period of 1-year from January 1st, 2013 to December 31st, 2013. The incidence of booked cases was observed as 5502 (58.9%) and that of unbooked cases was 3824 (41.1%) (Table 1 and Figure 1).

As regard to the residential status of patients, majority of cases were from urban area 6533 (70.05%) and 2793 cases belonged to rural area (29.95%) (Table 2 and Figure 2).

Of these 6533 urban cases, majority of the cases, 4377 (67%) were booked and the rest 2156 (33%) were

<table>
<thead>
<tr>
<th>Table 1: Incidence of booked and unbooked cases</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Booked</strong></td>
</tr>
<tr>
<td>5502 (58.9%)</td>
</tr>
</tbody>
</table>

2. Babies with weight between 2.1 kg and 2.5 kg (routine admission not required)
3. The data were analyzed statistically using Chi-square test.

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As regard to the residential status of patients, majority of cases were from urban area 6533 (70.05%) and 2793 cases belonged to rural area (29.95%) (Table 2 and Figure 2).
unbooked. Among 2793 rural cases, 1026 (36.71%) were booked and 1767 (63.29%) were unbooked. Statistical analysis was done by applying Chi-square test, $P$ value was < 0.001 (Table 3 and Figure 3).

Upon analyzing parity status of cases, incidence of primiparous cases who were delivered during study period was 3772 out of 9326 cases (40.44%). Incidence of multiparous women delivered was 5554 (59.56%) (Table 4 and Figure 4). Of the total 3772 primiparous cases delivered, 2150 (57%) were booked cases and 1622 were unbooked (43%).

The incidence of multiparous cases delivered was 5554 of which 2942 were booked (52.97%), and 2612 cases were unbooked (47.03%) (Table 5 and Figure 5). On statistical analysis, results were significant (Table 5).

As age status of patients was concerned, maximum number of patients (8287) were between age group 20 and 30 years and only 320 (3.43%) cases were below 20 years of age while 719 (7.7%) cases were above 30 years of age (Table 6 and Figure 6).

On studying education pattern of booked cases, only 11.85% were illiterate, whereas in the unbooked category it was 42.32%. The graduates and postgraduates in booked class were 34.44% and in unbooked class it was only 6.68% (Table 7 and Figure 7a and b). Table 8 shows a significant difference between the education profiles of below 8th standard compared to that of above 8th standard ($P < 0.001$).

The perinatal outcome was also studied. The total stillbirths in 1-year was 264 (2.83%) of the total deliveries. Of these, only 57 (21.43%) cases were booked and the rest 207 cases (78.57%) were unbooked. The incidence of low birth
weight in babies of both groups (booked and unbooked) was analyzed. The standard protocol was followed.

1. Babies born with weight <2 kg routinely required more intensive care and admission in neonatal intensive-care unit (NICU)

2. Babies born with weight between 2.1 kg and 2.5 kg required less NICU admission.

The total number of booked cases with low birth weight babies was 1447 of 5502 (26.3%) of which incidence of babies weighing <2 kg was 306 of 1447 (21.13%) booked low weight babies. Incidence of babies with weight of >2 kg was 1141 of 1447 (78.87%) booked low weight babies. Total number of unbooked cases with low birth weight babies was 1405 of 3824 (36.75%) unbooked cases. Incidence of babies with weight of <2 kg was 587 of 1405 (41.81%) unbooked low weight babies. Incidence of babies with weight of >2 kg was 818 of 1405 (58.18%) unbooked low weight babies (Table 9 and Figure 8).

---

**Table 3: Residential status of cases with regard to booked/unbooked status (P<0.001)**

<table>
<thead>
<tr>
<th>Cases</th>
<th>Rural (%)</th>
<th>Urban (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Booked</td>
<td>1025 (36.70)</td>
<td>4477 (68.53)</td>
<td>5502</td>
</tr>
<tr>
<td>Unbooked</td>
<td>1768 (63.30)</td>
<td>2056 (31.47)</td>
<td>3824</td>
</tr>
<tr>
<td>Total</td>
<td>2793</td>
<td>6533</td>
<td>9326</td>
</tr>
</tbody>
</table>

**Table 4: Incidence of primiparous and multiparous cases**

<table>
<thead>
<tr>
<th>Cases</th>
<th>Primiparous cases</th>
<th>Multiparous cases</th>
<th>Total cases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3772 (40.44%)</td>
<td>5554 (59.56%)</td>
<td>9326</td>
</tr>
</tbody>
</table>

**Table 5: Parity status of the patients**

<table>
<thead>
<tr>
<th>Cases</th>
<th>Primiparous</th>
<th>Multiparous</th>
<th>Total</th>
<th>Significance test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Booked cases</td>
<td>2150</td>
<td>3352</td>
<td>5502</td>
<td>P&lt;0.05</td>
</tr>
<tr>
<td>Unbooked cases</td>
<td>1622</td>
<td>2202</td>
<td>3824</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3772</td>
<td>5554</td>
<td>9326</td>
<td></td>
</tr>
</tbody>
</table>

**Table 6: Age was statistically significant variable having P<0.05**

<table>
<thead>
<tr>
<th>Cases</th>
<th>&lt;20 years</th>
<th>20-30 years</th>
<th>&gt;30 years</th>
<th>Total</th>
<th>Significance test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Booked</td>
<td>259</td>
<td>4704</td>
<td>539</td>
<td>5502</td>
<td>P&lt;0.05</td>
</tr>
<tr>
<td>Unbooked</td>
<td>61</td>
<td>3583</td>
<td>180</td>
<td>3824</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>320</td>
<td>8287</td>
<td>719</td>
<td>9326</td>
<td></td>
</tr>
</tbody>
</table>

**Table 7: Educational profile of booked and unbooked cases**

<table>
<thead>
<tr>
<th>Educational profile</th>
<th>Booked cases (%)</th>
<th>Unbooked cases (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illiterate</td>
<td>652 (11.85)</td>
<td>1618 (42.32)</td>
</tr>
<tr>
<td>5th Standard</td>
<td>418 (7.59)</td>
<td>622 (16.26)</td>
</tr>
<tr>
<td>8th Standard</td>
<td>866 (15.74)</td>
<td>716 (18.71)</td>
</tr>
<tr>
<td>10th Standard</td>
<td>968 (17.59)</td>
<td>392 (10.24)</td>
</tr>
<tr>
<td>12th Standard</td>
<td>703 (12.78)</td>
<td>221 (5.79)</td>
</tr>
<tr>
<td>Graduates and post graduates</td>
<td>1895 (34.44)</td>
<td>255 (6.68)</td>
</tr>
<tr>
<td>Total</td>
<td>5502</td>
<td>3824</td>
</tr>
</tbody>
</table>

**Table 8: Study of educational profile**

<table>
<thead>
<tr>
<th>Cases</th>
<th>Till 8th standard</th>
<th>Above 8th standard</th>
<th>Total</th>
<th>Significance test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Booked cases</td>
<td>1936</td>
<td>3566</td>
<td>5502</td>
<td>P&lt;0.001</td>
</tr>
<tr>
<td>Unbooked cases</td>
<td>2956</td>
<td>868</td>
<td>3824</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4892</td>
<td>4434</td>
<td>9326</td>
<td></td>
</tr>
</tbody>
</table>

Figure 6: Age status of booked and unbooked cases

Figure 7: (a) Educational profile of booked cases, (b) Educational profile of unbooked cases, The difference was statistically significant (P < 0.0001)
The data in Table 10 clearly reveals the need for improving maternal and child health care in India. A good amount of work has been done till now by the government and various NGO’s but still a lot remains to be done. Tracking the ANC in India reveals two aspects of the problem.

1. Areas where ANC facility is absent or insufficient (rural areas)
2. Areas where ANC facility is available but poorly utilized.

The solution to the first problem is direct, that is to establish functional health centers where regular health checkups and uncomplicated deliveries can be conducted. High risk cases are timely identified and referred to the higher centers. The second aspect of the problem where ANC facility is available but poorly utilized is a complex one. The factors which play an indirect role in inadequate utilization are:

**Illiteracy or Ignorance**

The efforts put in to educate females will be a long-term definitive reward in improving the health as well as overall decision making in the family. The statistics shown in Table 11 state that a lot of efforts and will is needed to improve the female literacy rate which will yield long-term definitive results. Nordström and Cnattingius analyzed birth weight of 3451 infants in Sweden and recommended education as an important socioeconomic indicator. National Family Health Survey bulletin reports also reinforce the call for continued investment in female education.

The present study also affirms that obstetrics care was availed in a better way by educated women. Women attending regular antenatal clinics have better perinatal outcome. Pokharel et al., Ziyo et al., in their studies reported less mortality in booked cases. Anand and Garg emphasized the role of ANC in preventing low birth weight babies. Current study again states the importance of ANC in delivery of healthy neonates.

Educating women will indirectly improve utilization of health care services. This will have positive impact on the improvement of maternal and child health.

Thus:

1. Education of females (MDG 2) and reduced child mortality and improved maternal health (MDGs 4 and 5) are closely related
2. The present study also confirms that urban population utilized ANC more than rural population. The facilities in rural areas are too expensive or too far away. The affordability and accessibility of health care is the answer. Lopez and Choonara in Cuban study stated “free and universal health care system with emphasis on primary health care system.” Facilities to provide good emergency obstetric care in remote areas as well as an efficient facility of transport should be available. Janani Suraksha Yojana, a government funded scheme to promote hospital deliveries free of cost to all below poverty line mothers is a good effort by government of combined Andhra Pradesh and Telangana in this

### Table 9: Incidence of weight of babies in booked and unbooked cases

<table>
<thead>
<tr>
<th>Cases</th>
<th>Weight &lt;2 kg</th>
<th>Weight &gt; 2 kg</th>
<th>Total cases</th>
<th>Significance test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Booked cases</td>
<td>306</td>
<td>1141</td>
<td>1447</td>
<td>P&lt;0.05</td>
</tr>
<tr>
<td>Unbooked cases</td>
<td>587</td>
<td>818</td>
<td>1405</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>893</td>
<td>1959</td>
<td>2852</td>
<td></td>
</tr>
</tbody>
</table>

### Table 10: Demographic data of India to reduce maternal, newborn and child

| Total Indian population (in 1000s) | 1,236,687 |
| Infant mortality rate (per 1000 live birth) | 44* |
| Neonatal mortality rate | 31 deaths/1000 live births* |
| Under five mortality rate | 56 deaths/1000 live births* |
| Maternal mortality rate | 178 deaths/100,000 live births* |
| Lifetime risk of maternal death (1 in N) | 70* |
| Total maternal deaths | 56,000 |

UNICEF, 2010* and 2012* report

### Table 11: Census conducted by Government of India in year 2011

<table>
<thead>
<tr>
<th>Demographic variable</th>
<th>Andhra Pradesh (combined A.P. &amp; Telangana) (%)</th>
<th>India (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Literacy rate</td>
<td>67.66</td>
<td>74.04</td>
</tr>
<tr>
<td>Male literacy rate</td>
<td>75.56</td>
<td>82.14</td>
</tr>
<tr>
<td>Female literacy rate</td>
<td>59.74</td>
<td>65.46</td>
</tr>
</tbody>
</table>

* = UNICEF, 2010 and 2012 report

* = National Family Health Survey bulletin report.
3. Traditional and cultural beliefs and prejudices. Taking the help of “trained birth attendants”/Accredited Social Health Activist who are from the community and enjoy the confidence of the local population can help in improving ANC.

4. The role and responsibility of health care providers during pregnancy, labor, and later needs no emphasis. The health care provider includes skilled obstetricians and semi-skilled Auxiliary Nurse Midwives and trained birth attendants. Time to time upgradation of their knowledge, attitude, diagnostic and clinical skills are also recommended. In the present study, the efforts are made to know various factors which have their role in maternal care and indirectly affect the neonatal outcome.

**CONCLUSION**

Four maternal variables were studied in pregnant women who delivered at our hospital with the aim to understand effect of these on availing delivery services and perinatal outcome. These variables were age, parity, residential status in terms of rural or urban and educational status of the patient. The educational status of the patient came out as significantly important variable as far as booked/unbooked status was concerned. The booked cases had higher literacy than the unbooked cases. The residential status (urban/rural) also affected the booked/unbooked status. The booked rural population was less as compared to booked urban population. Age variable also had an impact on booked/unbooked status. In this study, parity status did not have a significant effect on booked/unbooked status of cases. The incidence of low birth weight babies in booked group was significantly less. This directly implies that those cases that availed the ANC facilities had better pregnancy outcome.

Hence, whole hearted efforts should be directed in educating women population and also improving health care facilities in rural areas by providing good health care facilities at affordable cost and establishing referrals and transport facility for obstetric emergencies to higher health care centers.

**REFERENCES**

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Laser Prescience in Pediatric Dentistry

M Shanthi
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Abstract
Pediatric laser dentistry is a promising field in modern minimally invasive dentistry, and it can be “child friendly” approach. Laser is the common acronym used for laser. The use of lasers in dentistry has been evolved since 1960’s by Maiman. Dental lasers offer many advantages like avoiding needles and high-speed hand pieces, which makes less traumatic experience and improves behavioral management of the child. Recent advances in laser technology and research have set the stage of revolution in pediatric dental practice to provide optimal, preventive, interceptive and restorative dental care in a stress free environment. The present article aims to revise some of the hard tissue and soft tissue laser applications in children.

Key words: Caries diagnosis, Caries prevention, Dental trauma, Frenectomy, Gingivectomy, Laser, Pediatric dentistry, Tooth eruption

INTRODUCTION
Pediatric dentistry is age defined specialty based not on a particular skill, but encompassing all aspects of child development in health and disease. Working with children is different from working with adults, it is essential to be familiar with age-appropriate skills and functioning, and development. This century has seen advent of advancements in pediatric dentistry also influenced by all such advancements. Such changing trends help us to raise the standards by incorporating child-friendly approaches into dental care.

Laser is an acronym for light amplification by stimulated emission radiation and it is the greatest invention of this century. Laser treatment represents a main source of remedy in some fields like medicine and surgery, whereas in dentistry it is used as adjunctive during hard and soft tissue management. The use of lasers in dentistry has been evolved since 1960’s by Maiman.1 Initially lasers like ruby were used to carious enamel and dentine. Rapid development of laser technology has introduced various types like argon,2 carbon dioxide,3 Neodymium-Aluminum-Garnet (Nd:YAG)4 or Erbium-Yttrium-Garnet (Er: YAG)5 and diode lasers6 with wide applications in dentistry. These laser applications can be divided into hard and soft tissue applications.

The use of different types of new lasers enables pediatric dentist to provide minimally invasive dentistry for hard and soft tissue procedures with minimal discomfort, and no pain during and after treatment. It minimized the use of injections, eliminated the vibrations, smell of conventional dentistry and was appreciated by parents and children. This makes dental visit stress free and install positive dental attitude in a child. Recent advances in laser technology and research have set the stage of revolution in pediatric dental practice to provide optimal, preventive, interceptive and restorative dental care in a stress free environment. This paper reviews some of the laser applications in pediatric dentistry.

CLASSIFICATION OF LASERS
1. Based on active material6 used
   • Gas lasers
   • Solid lasers
   • Liquid lasers
2. Based on the wavelength7
   • Invisible ionizing radiation
   • Visible
   • Invisible thermal radiation
3. Based on their operating mode8
   • Continuous
Shanthi: Pediatric Laser Dentistry

Laser Applications in Pediatric Dentistry
These are broadly divided into hard and soft tissue applications.

Hard tissue applications:
- Caries detection by laser induced fluorescence
- Prevention of enamel and dental caries
- Caries removal
- Cavity preparation
- Pit and fissure sealants
- Curing light activated resins
- Laser pediatric crowns
- Bleaching of vital and non-vital tooth
- Laser fusion of vertical root fracture
- Removal of old restorative materials
- Laser algesia
- Orthodontic tooth movement
- Dental traumatology.

Soft tissue applications:
- Exposure of teeth to aid in tooth eruption
- Frenectomy
- Ankyloglossia
- Aphthous ulcers
- Herpes labialis lesions
- Dentigerous cyst
- Leukoplakia
- Treatment of mucocele
- Pediatric endodontics
- Gingival remodeling and Gingivectomy.

HARD TISSUE APPLICATIONS

Caries Detection by Laser Induced Fluorescence
Conventional methods of diagnosing dental caries such as manual probing and radiographic evaluation are often ineffective in detecting enamel defects, as they may be too small or inaccessible to the diagnostic tool. In addition, manual probing has the potential of stimulating caries due to the iatrogenic damage caused by the explorer. Radiographs (e.g., bitewing X-rays), although effective in revealing advanced stages of decay, are unsuccessful in detecting early caries, especially in the complex anatomy of fissure areas.

A new era has been began with laser in regard to early caries detection methods such as diagnodent,\textsuperscript{9,10} quantitative laser fluorescence,\textsuperscript{11} optical coherence tomography. These diagnostic techniques results in non-invasive or minimally invasive approach to clinical management of dental caries. This detection can be outperforming very accurately, the application is easy and very safe and also avoid ionizing radiation.\textsuperscript{12}

Prevention of Enamel and Dentine Caries

The role of lasers in the prevention of caries has been explored since the 1960’s by using ruby, Nd: YAG, CO\textsubscript{2} and argon lasers.

Various mechanisms which suggest caries prevention by lasers are:
- Increased acid resistance\textsuperscript{13} in lased enamel by ultra-structural alterations of enamel, as a result of melting and resolidifying. Enamel micro hardness seems to be related to enamel mineral content, and plays a role in enamel demineralization, as well as in erosion inhibition.
- Organic blocking theory: Partial denaturation of organic matrix may block the diffusion pathway in enamel, resulting in retardation of enamel demineralization.
- Combination of reduced enamel permeability and enamel solubility as suggested by Stern et al.\textsuperscript{14} Diminution in the size of the apatite crystal, due to loss of water and CO\textsubscript{2}, and that the hydroxyapatite crystal could be made more compact after laser irradiation, thus increasing to enamel resistance.
- Laser can alter the chemical composition and morphology of the highly mineralized (96%) dental enamel. Frequencies <450 mJ/cm\textsuperscript{2}, resulted in an increased Ca/P ratio, decreased amount of carbonate and protein and the formation of tri calcium phosphate and tetra calcium phosphate, suggesting the involvement of photo thermal mechanism.\textsuperscript{15}

Combination of Laser and Fluoride in Caries Prevention\textsuperscript{16}

\textit{Laser activated fluoride therapy}

Laser irradiation reduces critical pH for enamel dissolution from 5.5 to 4.8. However, this critical pH is further reduced in the presence of fluoride in concentrations as...
low as 0.1 ppm. Reduction in critical pH may protect tooth structures from acid challenges. Lased enamel will not undergo dissolution until the critical pH of 4.3 is reached.\textsuperscript{17}

Caries Removal

The first documented use of Er: YAG laser to remove carious tissue was at 1980’s in a study by Hibst and Keller. Laser treatment possesses the requirements of minimal invasive dentistry. The possibility to ablate small area of infected layer guarantees maximum conservation of the tooth structure. Using the antibacterial property of the Er: YAG laser, decontaminate the affected layer that retains its remineralizing potential. The lack of smear layer after vaporization with laser assures a better retention of the composite resin to the dentine. Preparing the enamel surface with a laser before etching gives a better marginal seal of the composite restoration.\textsuperscript{18}

Caries removal biophysics\textsuperscript{19}

The biophysics of the hard tissue laser includes wavelength, energy density, and pulse duration of laser radiation and properties of the tissue, such as absorption, reflection, transmission and scattering. All dental hard tissues contain various amount of water. Water molecules in the target tooth are superheated, explode and in turn, ablate tooth structure and caries. A bactericidal effect, typical of laser-tissue interaction occurs as well. Water mediated explosive tissue removal has been shown to be the most efficient way of removing tissue while transferring minimal heat to the remaining tooth.

Instructions for handpiece application:

- Always gently touch target tissue with tip end
- Cutting radiation goes out only from the end of the fiber tip
- Direct water stream to the target tissue
- Always keep tip moving to provide effective ablation and better cooling
- For wide cut, constantly move tip over the surface
- For deep cut, constantly move tip up and down (pumping).

Structural morphology of the tooth after laser exposure shows no evidence of cracking, fissuring, or charring.

Cavity Preparation\textsuperscript{20}

The use of lasers for cavity preparation and caries removal is based on then ablation mechanism in which dental hard tissue can be removed by thermal and or mechanical effect during laser irradiation (Table 1).\textsuperscript{21}

Technique

A focused mode is used for fast cutting and defocused mode for slow cutting. For deep cutting, the tip is moved up and down as in pumping action. The operator can detect different tooth structures by hearing the sound of ablation (popping sound), which is differentiated by tissue type. Beginning of cavity preparation, focused beam of 6 W (67.9 J/cm\textsuperscript{2}) at maximum air pressure level and 32% water level. As enamel removal progressed to dentin, reduce the power to 3 W (33.9 J/cm\textsuperscript{2}) at 70% air level and 20% of water level. Line angles and point angles\textsuperscript{22} are placed in preparation for greater mechanical retention of the restoration.

Advantages of laser cavity preparation

a. Laser is capable of preparing the cavity in an irregular fashion which is ideal for placement of composite or GIC (Minimally invasive procedure).

b. Strength of tooth is maintained, and bond strength of restoration is enhanced.

c. Acid etch step can be easily avoided, and micro-leakage of composite resin restoration can be minimized.

Pit and Fissure Sealants

A promising approach to non-operative dentistry is scaling of enamel lesions with low viscous light curing resins such as pit and fissure sealants. One of the important requirements of a pit and fissure sealant is that it should prevent micro leakage at its periphery failing which, the carious process continue underneath the sealants. John\textsuperscript{23} (1997) found a delicate interlacing pattern of thin partitions and small knob like expansions in laser etched enamel and penetrations of micro fissures into the enamel estimated at 10 mm. These subsurface alterations may provide space for the infiltration and mechanical retention of dental resin. Brugnara\textsuperscript{24} in a study with CO\textsubscript{2} laser improves the retention of sealant. Another in vitro study by Hicks \textit{et al.}\textsuperscript{25} showed benefit of argon laser polymerization, fluoride release and mechanical retention of sealant.

Curing Light Activated Resins

Schein \textit{et al.}\textsuperscript{26} (2003) on SEM evaluation of the interaction pattern between dentin and resin found morphological characteristics of the acid-etched irradiated dentin and

<table>
<thead>
<tr>
<th>Wet composition (Wt %)</th>
<th>Enamel</th>
<th>Dentin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inorganic</td>
<td>96</td>
<td>70</td>
</tr>
<tr>
<td>Organic</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>Water</td>
<td>3</td>
<td>10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recommended settings for the Er: YAG</th>
<th>Energy (mJ)</th>
<th>Pulses per sec (Hz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caries</td>
<td>100-200</td>
<td>10</td>
</tr>
<tr>
<td>Enamel</td>
<td>200-250</td>
<td>15</td>
</tr>
<tr>
<td>Dentin</td>
<td>150-200</td>
<td>10</td>
</tr>
<tr>
<td>Etching</td>
<td>30-50</td>
<td>15</td>
</tr>
</tbody>
</table>
found favorable diffusion of monomers through the collagen network. After cavity preparation using Er:YAG laser at 250 mJ/pulse, 4 Hz, noncontact mode, focused beam and a fine water mist was used.

**Advantages**
1. Laser required less time to achieve polymerization
2. Exposure time is less
3. Reduce chair time and achieving patient satisfaction especially with restless children
4. Helpful in situations where dry field for long length is difficult to maintain
5. In inaccessible areas, laser beam offers the advantage of no loss of power over distance
6. Increased penetration depth makes it possible to cure thicker increments
7. Improved adhesion
8. Reduce micro leakage.

**Laser Pediatric Crowns**

**Tooth preparation**
Biolase is set to begin cutting the surface layer of enamel. Initial cuts are made at a setting of 5.5 watts, 65% air and 55% water. Crowns should be prepared with same specifications as in the conventional method. However, the tooth surface is left roughened not smooth. Buccal, lingual, mesial and distal walls do not require an occlusal taper. Undercuts are placed to improve the bond of the resin crown. This technique eliminates local anesthesia, thereby providing optimal patient comfort and compliance.

**Laser Bleaching**
The objective of laser bleaching is to achieve power bleaching process using the most efficient energy source, while avoiding adverse effects.

General protocols for laser bleaching:
- Review the patient's oral habit and health history, lifestyle and expectations
- Take a photographic record
- Discuss possible treatment sensitivity
- Discuss the combination of office bleaching and home bleaching
- First aid kit must contain antioxidants
- Assemble protection gear and safety eye goggles
- Rubber dam application is must.

Safety issues in laser bleaching:
- Special training for operating the equipment and use of special eye protection with orange colored lenses is mandatory.
- Handle hydrogen peroxide with extreme caution with well-protected isolation technique.

**Laser Fusion of Vertical Root Fracture**
Dederich (1999) using exposure parameters of 15 W, 0.2 s and spot diameter of 1.0 mm, in 15 single exposures with average of 5 s lapse time between exposures and radiographic analysis at 1-year, observed good bone fill of the defect and satisfactory healing at predetermined exposure parameters.

**Removal of Old Restorations**
Hibst and Keller showed removal of various restorative materials (composite, GIC) with Er:YAG laser. For pulpal safety lower pulse rates are indicated. Laser ablation of amalgam fillings should be avoided because of release of mercury vapor.

**Laser Analgesia**
Analgesic effect on nerves supplying oral cavity is by decreasing firing frequency of nociceptors with a threshold effect by maximal suppression. Duration of analgesic effect can persist for 15 min approving for usage on patients having phobia to needles.

**Orthodontic Tooth Movement**
Low level laser therapy (LLLT) at 8J/cm² energy density and at 100 mW was applied for retraction of maxillary canines into the first premolar extraction spaces along with fixed edgewise appliance. LLLT enhances rate of tooth movement and hence used as an adjunct to reduce treatment duration.

**Dental Traumatology**
Most frequently used lasers in dental traumatic injuries are Er:YAG, Er, Cr:YAG, diode and CO₂ lasers in uncomplicated and complicated fractures.

**SOFT TISSUE APPLICATIONS**
There are numerous soft tissue procedures, which can be performed with lasers. Two main features of these are reduced bleeding intra-operatively and less pain post-operatively when compared to conventional techniques.

**Exposure of Tooth to Aid in Tooth Eruption**
Lasers are used to expose the teeth and allow the eruption of teeth without any damage to tooth enamel. Lasers that have no absorption into enamel are ideal for locating and exposing the teeth with a retarded eruption or in need of operculum resection. Boj et al. (2006) treated eruption cyst with laser powered hydrokinetic system and suggested no suturing or antibiotic or medication is necessary. Suggested settings are Er: YAG 30 h, 45 mJ both in contact and non-contact mode are used. This makes behaviour management by the pediatric dentist easier.
Frenectomy
In newborn tight maxillary frenum may interfere with proper latching to breastfeeding. In older children, high frenal attachment may lead to mid-line diastema. Laser settings are Er:YAG 30 Hz, 50 mJ and laser energy is directed at the insertion of frenum and area between two front teeth. Sutures are not required. Post-operative period is uneventful.

Ankyloglossia
The abnormal attachment on the lingual frenum is one of the most misdiagnosed and overlooked congenital abnormalities observed in children. Treatment of tongue-tie, laser settings include Er:YAG 30 Hz, 50 mJ no water with the use of safety goggles. A suture is placed at the junction of the frenum and end of the cut to prevent reattachment.

Aphthous Ulcers
Are painful and cause problems during eating and speaking. Energy directed into the surface of these lesions with lasers in the focused mode remove exposed nerve endings. Lesions can be rendered insensitive at low wattages within 4 min with light contact mode.

Herpes Labialis Lesions
Lesions have been successfully treated with Nd:YAG laser in the free running pulse at an area of defocused non-contact mode. The infusion of laser energy disrupts the progress of the viral activity, arresting lesions progression. In the early stages, lasers may able to reverse the viral action and also prevent the lesions from recurrence.

Dentigerous Cyst
Benign odontogenic cysts are common in unerupted tooth in the mixed and permanent dentition. Lasers are used to vaporize bony cavity and curettage of the cystic cavity, deduction of the cystic lining.

Leukoplakia
Laser-assisted removal of the precancerous lesion by ablative Er:YAG laser with non-contact digitally controlled hand piece X-Runner in QSP mode (Light Walker AT, Fotona, Slovenia, 2013) was used. The laser settings were as follows: pulse energy 120 mJ, pulse mode QSP, frequency 20 Hz. Circle, rectangle or hexagon shape was selected according to the lesion size and shape. The hand piece was held at the distance of 15 mm from the lesion surface and water spray level was set to 10 ml/min.

Advantages
1. The operational field is very clear, especially because there was no bleeding
2. Time saving as the interventions was performed very quickly because of the automatic coverage of the area with the X-runner handpiece
3. Very safe and pleasant for the patient
4. Effective and comfortable for the operator
5. No post-operative swelling and pain reduction and accelerates wound healing.

Treatment of Mucocele
Laser excision (Picasso, AMD Laser Technologies, USA; wavelength of 810 nm) was used under local anesthesia (2% lignocaine with 1:80000 epinephrine), using 300 µm diameter tip at 1.3 W. Uneventful healing without recurrence was reported.

Lasers in Pediatric Endodontics

Diagnosis of dental pulp
The principle of vital and non-vital diagnosis of dental pulp by laser Doppler flowmetry is based on the changes in red blood cell flux in the pulp tissue. When normal pulp is stimulated by the pulsed laser at 2 W and 20 pulses per second at a distance of approximately 10 mm from the tooth surface, pain is produced within 20-30 s and disappears a couple of seconds after the laser stimulation is stopped. In acute pulpitis, pain is induced immediately after laser application and continues for more than 30 s after stopping the laser stimulation.

Indirect pulp capping
Pulp capping is superior with disinfection attained up to the depth of 300 µm. Local analgesia is not required with laser due to less heat generation in the pulp chamber.

Direct pulp capping
Laser tissues have advantages with respect to control of hemorrhage and sterilization and is thus beneficial for use in direct pulp capping. Er, Cr:YSGG laser at 1 W, 20 Hz with 20% air and 15% water is used.

Pulpotomy
Vital pulp amputation by laser therapy was one of the most successful treatments in Pedodontics as the amputation of the pulp tissue at satisfactory level is obtained. To achieve coagulation following amputation of coronal pulp reduced power setting of 30-40 mJ, with tip of hand piece held 3-4 mm away in defocused mode, devoid of water spray and only 30% air is used.

Access cavity preparation and canal preparation
New type of Er, Cr:YSGG lasers has been developed for access cavity preparation and enlargement of root canal orifices. The pulsed Nd:YAG laser with 2 W at 20 pps for 1 s is recommended for removing pulp remnants. It is effective tool for killing microorganisms because of the laser energy and wavelength characteristics. Infected root canals are indicated for this laser treatment, but application to extremely curved and narrow infected root canals may
be difficult. Rooney et al.\textsuperscript{32} reported sterilization rates of 80-90% depending on the conditions of root canals, type of laser device, application parameters.

**Laser treatment of periapical lesions with sinus tract**\textsuperscript{43}

Although sinus tracts close by standard endodontic treatment, a few cases require special treatment. Pulsed laser, 2 W and 20 pps are recommended parameters can accelerate wound healing.

**Gingival Remodeling and Gingivectomy**\textsuperscript{44}

Erbium laser with the energy of 55-80 Mj and frequency of 20-30 Hz without water spray is used.

**CONCLUSION**

Lasers in pediatric dentistry have benefits as well as limitations. Though American Academy of Pediatric Dentistry recognizes the use of lasers as an alternative method of providing soft and hard tissue dental procedures for infants, children, adolescents, and persons with special health care needs, dental professional requires additional training to use and apply on pediatric dental patients. In the present scenario, lasers can be a useful adjunct to our regular pediatric dental practice.

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Clinical and Therapeutic Implications of Cancer Stem Cells: A Review

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Abstract

Cancer is a disease of genes. Although a number of pathogenesis have been proposed for cancer, a unifying model of tumorigenesis is yet to be established. Furthermore, the mortality rate associated with cancer has not decreased in spite of the advances in therapy. Many questions still remain unanswered regarding the pathogenesis, therapy, and recurrence. Researchers have now proposed that cancer initiation and progression is driven by a small subpopulation of cancer cells called the cancer stem cells (CSCs). These cells have also been implicated in recurrence, metastasis and therapy of cancer. This review highlights the clinical and therapeutic implications of CSCs.

Key words: Cancer, Cancer stem cells, Cancer stem cell hypothesis, Head and neck squamous cell carcinoma

INTRODUCTION

Tumors were once thought to be composed of a homogeneous mass of proliferating cells. However, with increased understanding of tumor pathogenesis, it is accepted to be heterogeneous aberrant tissue arising from single cancer stem cell (CSC). Inherited and somatic mutations enable a normal cell to ignore all the growth-inhibitory signals, proliferate disproportionately, invade tissue and finally undergo metastasis. The mechanisms underlying these mutations is not completely understood and a unifying “model of tumorigenesis” is yet to be established. During the few years, many advances have been made in the diagnosis, early detection and management of such patients. Despite this, the increase in survival rate is just nominal and recurrence and treatment failures continue to occur in a large number of patients. A number of questions remain unanswered: Why the survival rate has not increased? Why tumors do not respond to treatment? Why tumors recur? Why cancer cells develop resistance to treatment? Researchers across the globe are working to find answers to all the above mentions questions and better understand the nature of cancer. One such concept that seems to partly answer some of the questions is the CSC hypothesis. The CSC hypothesis suggests that not all the cells in the tumor have the ability to proliferate and maintain growth of the tumor, but only a subpopulation of cells in the tumor called the CSCs are able to proliferate and self-renew.

The concept that cancer might arise from a rare cell population of cells with stem cell properties was proposed about 150 years ago. The first experimental evidence of transplantable hematopoietic stem cells was given in 1955. Cells with stem-like characteristics were described in bone marrow in 1961 by Till and McCulloch. CSC theory was first proposed by Hamburger and Salmon in 1977. Hematopoietic CSC was first described by Bonnet and Dick in 1997 and in breast cancer CSC was isolated by Clarke et al. in 2003.

American Academy of Cancer Research Workshop on CSC in 2006 defined the CSC as a cell within the tumor that possesses the capacity to self-renew and to cause the heterogeneous lineages of cancer cells that comprise the tumor. The CSC theory was first proposed by Hamburger and Salmon who demonstrated that only a small percentage of tumor cells were able to form colonies in soft agar.

The first conclusive evidence for CSCs was published...
in 1997 in Nature Medicine. Bonnet and Dick isolated a subpopulation of leukemic cells that expressed a specific surface marker of CD34, but lacked CD38 marker. They concluded that CD34+/CD38− subpopulation is capable of initiating tumors in immunodeficient mouse that is histologically similar to the donor.\textsuperscript{3,8,11-14}

CSC hypothesis gains support through two features:\textsuperscript{1}

1. Similarity between CSCs and normal stem cells in terms of self-renewal, differentiation, drug resistance and migration capacity
2. Genetic and epigenetic damages best accumulated in stem cells because of their long life span.

Current CSC research is focusing on the identification of CSC in solid tumors since stem cells in hematopoietic malignancies such as leukemia have been well characterized.\textsuperscript{15} However, many difficulties are encountered when exploring the existence of CSCs in solid tumors, due to the inaccessibility of tumor cells and the lack of appropriate functional assays. An important breakthrough in the study of solid tumor CSCs was the identification of breast cancer CSCs and their biomarkers by Clarke and his colleagues in 2003. They reported that cells expressing CD44+/CD24−cell surface phenotype were able to initiate tumors when they were transplanted into immune-deficient mice.\textsuperscript{4} Since then, CSCs have been reported in neoplasms of brain, prostate, lung, colon, pancreas, liver, melanoma and skin.

**ORIGIN OF CSC**

Depending on the tumor type and the phenotype the tumor presents, the sources of origin of CSCs is different. Four main hypotheses were suggested by Costea et al. regarding the origin of CSCs in oral squamous cell carcinoma.\textsuperscript{16}

1. CSC may originate from normal somatic stem cells.
2. Normal somatic stem cells are the only cells that reside long enough within the epithelium to acquire the number of genetic changes necessary for transformation and cancer development to occur. Multiple genetic changes transform normal stem cell into a CSC.
3. Fusion between hematopoietic stem cell and a mutated oral keratinocyte occasionally occurs producing a cell with stem-like properties, the CSC. Fusion may occur between a mutated hematopoietic stem cell and oral keratinocyte giving the same end result.
4. De-differentiation-oncogenic events could occur initially in an amplifying cell delaying its differentiation and permitting acquisition of additional oncogenic events leading to cancer.
5. Neosis: Exposure of cells to genotoxic agents can yield multinucleated giant cells. Their cell division by cytoplasmic cleavage (neosis) may result in the formation of multiple small CSCs. However, neosis has been described so far only for \textit{in vitro} settings.

**CLINICAL IMPLICATIONS OF CSC**

The clonogenicity and heterogeneity of tumors can be explained by CSC hypothesis. CSC model may also be involved in initiation and progression, metastasis, and relapse of tumors. CSC is also known to confer chemo and radioresistance to tumors.

**Initiation and Progression of Tumors**

Tumorogenesis is a multistep process in which an accumulation of genetic and epigenetic alterations form the basis for the progression of a normal cell to a cancerous cell. Only long-time residents of the epithelium/mucosa, most likely stem cells, have the ability to accumulate the number of necessary genetic hits that will result in cancer development.\textsuperscript{17,18}

It has been proposed that a stem cell acquires one or more genetic alterations and forms a patch in the mucosal epithelium with genetically altered daughter cells. As a result of this process, CSCs are formed, which can escape the cytotoxic action of immune system killer cells.\textsuperscript{1} The patch starts to expand, and a tumor develops. Normal epithelium in certain areas then gets replaced by genetically aberrant cell population.\textsuperscript{17}

**METASTASIS**

It has been suggested that CSCs may be involved in metastasis of a tumor, but the exact mechanism still remains unclear. Several hypotheses have been put forth to explain the mechanism of metastasis by CSCs. The hypothesis proposed by is that the original CSCs that caused the primary tumor might do so, resulting in primary and metastatic tumor that evolve in parallel rather than sequentially.\textsuperscript{19} The mechanism suggested by Brabletz et al. states that there are two forms of CSCs in tumor progression namely stationary CSC (sCSC) and mobile or migrating CSC (mCSC). According to them, sCSCs are embedded in epithelial tissues or epithelial based tumors and cannot disseminate. mCSCs are derived from sCSC by acquiring transient epithelial-mesenchymal transition (EMT). They are located at the tumor-host interface and mediate metastasis. Finally, the authors hypothesized that sCSC was responsible for the formation of primary tumors while mCSC mediates metastasis.\textsuperscript{15,18}

It has also been noted that CSCs acquire the properties of invasion and metasis through EMT induction. Recently, EMT is also known to confer drug resistance property to CSCs.\textsuperscript{14}
Resistance to Chemotherapy
Normal stem cells are conferred with an ability to protect themselves from the toxic environment and, therefore, resistant to drugs used to treat cancer. Similarly, CSC may also have an ability to resist chemotherapy and radiotherapy. Several studies have confirmed that CSCs are indeed resistant to current cancer therapies. The mechanisms involved in making CSC resistant to chemotherapy are as follows:
1. Many CSCs are in G0 phase of cell cycle.
2. Resistant to DNA damaging agents and enhanced DNA repair mechanism.
3. Expression of higher levels of bcl-2, an anti-apoptotic protein.
4. Increased expression of ATP-binding cassette (ABC) transporter that can actively efflux cytotoxic drugs.5

Resistance to Radiotherapy
1. Enhanced DNA repair via ChK1 and ChK2 kinases (1)
2. Enhanced cell longevity via the histone deacetylase Sir T1(1)
3. Brain CSC can repair double-stranded DNA breaks caused by γ-radiation probably through increased activity of the ataxia telangiectasia mutated DNA repair pathway.8

CSC in Relapse
Relapse of a tumor may involve the tumorigenic properties of CSCs and their resistance to conventional therapies. A large number of studies indicate that CSC escape the traditional therapies, persist within the tumor mass and cause recurrence. CSC from breast, pancreas and colon are all resistant to chemotherapeutic drugs.18

IDENTIFICATION OF CSC
There are various methods employed for identification of CSC which include in vivo label retention, in vitro clonal assays, flow cytometry using cell surface markers and Hoechst dye exclusion.2,7,10 Nucleotide analogs such as bromodeoxyuridine and tritiated thymine are used to label slow dividing cells, which is a property of all stem cells. This label is incorporated into newly synthesized DNA and will remain within the cells. In vitro clonal assays provide a reliable method for the identification and isolation of cells with stem cell properties from both normal and neoplastic tissue.19

CSC populations are commonly defined by presence or absence of various combinations of cell-surface proteins, such as CD44+ /CD24− populations in breast cancer. By staining cells with antibodies against these markers, these cells can be identified and isolated by flow cytometry and/or fluorescence-activated cell sorting (FACS). These isolated CSCs are implanted in soft agar or immunodeficient mice.19 They form colonies in soft agar or produce tumors in the mice, which are histologically and phenotypically similar to that in the host. When used properly, FACS analysis is the most robust tool in the identification of CSCs. The surface markers employed for isolation are CD44, CD24 and CD133. CD44 molecule is a transmembrane glycoprotein and may play an important role in facilitating adhesion, migration and invasion.2,19 CD24 is a single chain protein bound to the extracellular membrane of the cells. This marker is expressed in pancreatic cancer but not in breast and prostate cancer.18 CD133 (Prominin-1) is also a transmembrane glycoprotein and is expressed in tumor cells of the brain. It is recently been found to be expressed in lung, pancreatic, liver, prostate, gastric and head and neck cancer. It is known to increase the survival of cells in vitro and confer chemoresistance to tumor cells.2,19

Aldehyde dehydrogenase (ALDH) activity in normal and malignant stem cells converts retinol to retinoic acid, which is crucial for differentiation pathways. ALDH expression is elevated in hematopoietic and leukemic stem cells. It enriches other markers such as CD44, CD133, etc. and also confers chemoresistance to the CSC.2,15,19 Hoechst 33342 is a DNA dye used for flow cytometric analysis of the DNA content of live cells. This dye can penetrate intact cell membranes but are rapidly expelled out of the cells by ATP-dependent ABC transporters. Lack of fluorescence by flow cytometry helps identify this population of cells.19

THERAPEUTIC IMPLICATIONS OF CSC
According to the CSC hypothesis, if only a subpopulation of cells drives tumor formation then therapies have to be developed to identify and target these cells.20 The current therapy targets the bulk of the tumor mass and is unlikely to target CSCs. There are many recent reports of drugs that specifically target CSCs.21 Until date, the most successful targeted therapy is the development of imatinib (Gleevec) that targets BCR-Abl in patients with chronic myeloid leukemia. It induced complete remission in the majority of the patients.1,3,20 Parthenolide and rapamycin appear to kill CSC of acute myeloid leukemia but not normal hematopoietic stem cells. Temozolomide preferentially eliminates CSC in glioblastomas.18

Therapies using properties of miRNA to inhibit CSC markers have shown promising results. For example miRNA -34a inhibits pancreatic CSCs and miRNA-128 inhibits BMI1 in breast cancer and gliomas.1
CSC MODEL IN HEAD AND NECK SQUAMOUS CELL CARCINOMA (HNSCC)

Only a few studies are reported of CSC in head and neck cancers. Prince et al. reported CD44 cells from HNSCC could produce tumors in immunodeficient mice. Few biomarkers such as Oct-4, Nanog, CD133, CD44 and ALDH have been identified in CSC of HNSCC. CD133+ cells display clonogenicity and tumorigenicity in xenograft models when compared to CD133-2 Chen showed that ALDH activity correlated with disease staging in HNSCC and that higher enzymatic activity correlated with expression of EMT genes and enriching cells with CSC properties. Also, ALDH+ HNSCC cells are less sensitive to radiation than ALDH- cells. Tumors of head and neck contain cancer cells lacking markers associated with non-tumor cell lineages present within the tumor (Lin+ cells) and express CD44 (Lin-CD44+ cells). Lin-CD44+ cells have the capacity to produce tumors in immunocompromised mice. These cells are associated with poor prognosis. CD44 has also been implicated in metastatic spread and disease progression in HNSCC. Nanog/Oct-4/CD133 triple positive status predicted a poor prognosis for patients with oral cancer. However, none are conclusive. Currently, there are no consistently well-defined biomarkers or matured technologies to identify CSC in HNSCC.

CONCLUSION

CSCs are proven to exist in hematopoietic tumors, and targeted therapies have also been developed. CSC theory satisfactorily answers some of the questions related to tumor biology. However, many researchers disagree with the concept of CSC as many things remain to be elucidated regarding their role in tumorigenesis. CSC concept had opened a new area of research. It is becoming increasingly clear that cancer is a stem-cell disorder. Studies have to be directed to further our knowledge regarding the new concept. The ability to prospectively identify, isolate and study CSCs will significantly alter the way we think about, study and treat cancer.

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Maxillary Plasma Cell Granuloma: A Rare Lesion at an Unusual Site

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CASE REPORT

A 28-year-old male presented to the dental department with complaints of pain in the left maxillary area of 2 months duration. He gave a history of previous injury to the upper left incisors 15 years ago with the loss of upper left central incisor tooth. There was no history of any previous medication.

General and systemic examination were within normal limits. Local examination revealed tenderness and swelling over left anterior maxillary region and absence of upper left central incisor tooth. There was no history of any previous medication.

Radiological findings in the left maxilla - A well-defined radiolucent lesion in the maxilla with a sclerotic margin measuring about 1 cm across in the periapical region of the upper left central and lateral incisors was noticed (Figure 1).

Provisional clinical diagnosis: Periapical cyst in the left anterior portion of the maxilla lateral to the anterior nasal spine.

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A complete curettage of the periapical cyst with enucleation of the cyst was done, and the biopsy submitted for histopathological examination.

Histopathological examination showed normal stratified squamous epithelial lining and sub-epithelial proliferation of fibrous connective tissue with large focal areas of dense mixed inflammatory cell infiltrates composed of predominantly mature plasma cells, neutrophils, and lymphocytes (Figure 2). There were also focal areas of spillover of inflammatory cells into the epithelium. Many plasma cells showed large intra-cytoplasmic hyaline globules (Russell bodies) (Figure 3).

A thorough screening of the skeletal system did not reveal the involvement of any other bone.

**DISCUSSION**

Plasma cell granuloma is a rare condition involving reactive non-neoplastic proliferation of mature plasma cells of polyclonal origin. Though lung is the most common site of involvement, almost any other organ may be involved including the head and neck region. Intra-oral location is more uncommon site for its occurrence. The documented cases of involvement of oral and nasopharyngeal region include plasma cell granuloma in the soft tissues of oral cavity such as tongue, lip, buccal mucosa, and gingiva. The lesion is often solitary and may be associated with chronic antigenic exposure. Other predisposing factors which have been mentioned include foreign bodies, periodontitis, and periradicular inflammation. A few drug-induced plasma cell granulomas have been reported. More than 20 prescription medications such as calcium channel blockers, phenytoin sodium, and cyclosporine have been implicated in their causation. Vishnudas *et al.* have reported amlodipine-induced plasma cell granuloma of the gingiva in a 54-year-old female patient with hypertension for the first time in medical literature.

The most important differential diagnosis to be ruled out is solitary plasmacytoma which is a malignant condition due to the monoclonal proliferation of neoplastic plasma cells. In the present case, it was ruled out on histopathology by the absence of atypical features in the plasma cells in addition to the absence of Bence-Jones proteinuria and absence of rouleaux formation and atypical plasma cells in peripheral blood smear.

**CONCLUSION**

Diagnosis of plasma cell granuloma, especially at a rare site like maxilla, may often pose a diagnostic challenge due to its close resemblance to plasmacytoma which is a malignant neoplastic condition. Being a benign inflammatory pseudotumor, it carries a favorable prognosis following complete resection. Hence, the importance of
awareness of this benign entity, more so at a rare site like maxilla can never be overemphasized, and it undoubtedly commands an extreme degree of caution in diagnosis and management.

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Fimbrial Prolapse after Abdominal Hysterectomy: A Case Report

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Abstract

Prolapse of the fallopian tube into the vaginal vault is a rarely reported complication and clinicians can miss the diagnosis when dealing with posthysterectomy vaginal bleeding and discharge. Condition can be confused with vault granulations and serious conditions like recurrent cancer in vaginal vault. We present a case of posthysterectomy fimbrial prolapse in a 40 years old patient as I encountered it for the first time in 20 years of practice. She was referred from different center outside Ranchi to our medical college and hospital in obstetrics and gynecology outpatient department. On naked eye examination, it appeared to be granulation tissue, but when traction test done along with sonography, diagnosis of fimbrial tube prolapse was confirmed and effectively managed.

Key words: Granulation tissue, Hysterectomy, Infection, Vagina vault

INTRODUCTION

Incidence is <1% of all hysterectomies and much lower in better centers. Though it is a benign condition, failure to diagnose it in time and treat appropriately may prove harmful to the patient. Hysterectomy is the most frequently performed surgical procedure.1 Post hysterectomy prolapse of fimbria is a rare event. Since the first description of this condition by Piozzi in 1902, fewer than reported so far, the majority following vaginal hysterectomy probably due to non-closure of the vault and the pelvic peritoneum.2 This condition is omitted from modern textbook of gynecology because of its rarity.3 Fallopian tube prolapsed should be considered in all cases of pelvic or abdominal pain accompanied by vaginal bleeding or discharge after hysterectomy with or without granulation tissue in the vaginal vault. The predisposing factor is the development of abscess at the vaginal apex, which later on leads to prolapse of fimbria through the vault. Total salpingectomy with closure of the vault defect is considered to be the optimal management because partial salpingectomy can result in recurrence of vaginal discharge and continuing traction on the tubal remnant can lead to persistent pain and dyspareunia.4

CASE REPORT

A 40-year-old female came in the outpatient department with a complaint of watery discharge per vaginum, which was excessive in amount. She had to apply sanitary pad. She had three living children, all full term normal deliveries. Her tubectomy was done 10 years back. She underwent abdominal hysterectomy 1 year back in some private hospital at Hazaribagh. Indication of hysterectomy was menorrhagia not responding to medical treatment. Just after the operation she started having vaginal watery discharge. She was in discomfort, so went to her doctor. She took medication for 3 months but no relief. Later on her doctor referred her to our institute in outpatient gynecology department. Details of operation were not available. Her post-operative period was uneventful. There was no history of fever, postcoital bleeding or dyspareunia except for watery discharge per vaginum. General and systemic examination revealed no abnormality. Speculum examination revealed pink fleshy mass near the right angle of the vaginal vault (Figures 1 and 2). This lesion did not bleed on touch during the process of obtaining a pap...
smear. Bimanual pelvic examination revealed no pelvic mass. Finding was further confirmed by traction test. The prolapsed tissue was held by sponge holder, and traction was given, the patient felt excruciating pain. Her routine investigations were normal. Vault smear was taken, which showed superficial and intermediate squamous cells with few clusters of endocervical cells against the normal background. No evidence of dysplasia seen. Sonography showed well defined soft tissue with a cyst of 3.9 mm × 1.9 mm on the right side of the vault. In view of above finding, she was subjected to laparotomy. The right angle of the vault was carefully dissected, pushing the bladder down, and the vault was opened, fimbria was pulled out, prolapsed part was cut and ligated and tissue sent for histopathological examination (HPE). Pankreatin antibodies can be used to detect fallopian tube epithelium immunohistochemically and this is a valuable approach. Vault closed with interrupted sutures and abdomen closed in layers. Stitches removed on 8th post-operative day. Perineal swabing with antiseptic was done and discharged with proper advice. HPE report showed acute on chronic endosalpingitis.

**DISCUSSION**

The incidence of fimbrial tube prolapse is 0.5% with a vaginal hysterectomy and 0.06% with abdominal hysterectomy and 0% with laparoscopic hysterectomies. Risk factors for development of this condition include low socio-economic status, post-operative formation of hematoma and/or infection of the vault and an open vaginal cuff.

The mean time interval between hysterectomy and development of fimbrial prolapse is about 4 months, and the longest interval is 32 years. Diagnosis is made by traction test. If it is vault granulation or a primary/recurrent cancer, the held portion get detached easily and painlessly. If it is fimbrial tube prolapse then patient experiences pain. However, histopathology leads to definitive treatment. Fimbrial tube prolapse needs to be differentiated from adenocarcinomas, primary and metastatic, endometriosis, cyst of the mesonephric and paramesonephric duct and vaginal adenosis, however, the appearance is distinct and should not be confused with fimbrial prolapse. Electrocauterizing the prolapsed fimbria thinking it to be granulation tissue may produce catastrophic result as bowel lies in close proximity to the tube.

**CONCLUSION**

Fixation of accessories onto the pelvic wall and complete peritonisation at the time of hysterectomy are the most important method to prevent fimbrial tube prolapse. Meticulous closure of pelvic peritoneum and vaginal vault separately, achieving haemostasis prior to closure, practice of not fixing the vault to cornual pedicles are the approaches to avoid this complication. Systematic salpingectomies during conservative hysterectomies may be an appropriate approach to prevent fallopian tube prolapse, it would prevent not only fallopian tube prolapse but also tubal and serous ovarian cancer. Most of the cases are misdiagnosed as granulation leading to delayed diagnosis and potentially catastrophic complications i.e., peritonitis. Potential implication of younger age to the occurrence of fallopian tube herniation. Earlier resumption of sexual intercourse before complete healing of vaginal cuff is suggested to be the precipitating event, other predisposing factors are malnutrition, poorly controlled diabetes mellitus, chronic cough and chronic constipation. Post-operative vault infection or haematoma formation, malignancy and tissue radiation are other causes.
Bharti and Kumari: Fimbrial Prolapse after Abdominal Hysterectomy

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Perioperative Management of a Case of Long QT Syndrome Posted for Laparoscopic Cholecystectomy

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ABSTRACT
Long QT syndrome (LQTS) is a cardiovascular arrhythmogenic disorder due to a mutation in cardiac ion channels; such patients are prone for stress triggered polymorphic ventricular lachyarrhythmias, Torsades-de-pointes during the perioperative period. We report case management of a 55-year-old female patient with asymptomatic LQTS, who underwent laparoscopic cholecystectomy. Perioperative anxiety and pain, certain anesthesia drugs and maneuvers, hemodynamic changes due to carbon dioxide pneumoperitoneum, tilting of the table, are all potential triggers for Torsades-de-pointes. The goal of anesthesia management is avoidance of factors that increase the risk of precipitating Torsades-de-pointes, immediate recognition and management of Torsades-de-pointes if it occurs. The appropriate measures that were adopted which resulted in the uneventful recovery of the case are discussed.

Key words: Anesthesia, Arrhythmia, Cholecystectomy, Ion channels, Mutations, Laparoscopic, Long QT syndrome, Torsades-de-pointes

INTRODUCTION
Long QT syndrome (LQTS) is a familial or acquired arrhythmogenic cardiovascular disorder due to mutation in cardiac ion channels characterized by prolonged ventricular repolarization manifesting as QT interval prolongation on an electrocardiogram (ECG). Symptoms are related to physical activities and emotional stress, presenting as recurrent syncope, seizure-like episodes, cardiac arrest.¹ These symptoms follow episodic ventricular tachyarrhythmias “Torsades-de-pointes.”²

We report a case management of 55-year-old female, asymptomatic and previously undiagnosed with LQTS, posted for laparoscopic cholecystectomy, these patients of LQTS whether treated or untreated carry high risk of perioperative ventricular arrhythmias. A laparoscopic procedure may itself trigger tachy and bradyarrhythmias, therefore, the goal of anesthesia management is avoidance of factors that increase the risk of precipitating Torsades-de-pointes, immediate recognition and management of Torsades-de-pointes if it occurs.³ The appropriate measures that were employed, which resulted in uneventful recovery is discussed here.

CASE REPORT
A 55-year-old female weighing 50 kg was admitted with cholelithiasis and scheduled to undergo laparoscopic cholecystectomy. There was no history of syncopal attacks, seizures or adverse cardiac events. She was not a known hypertensive or diabetic, and there were no other co-morbidities. There was no history suggestive of adverse cardiac events or sudden death in other family members. Baseline pulse rate was 60/min other vital parameters were normal, hearing was normal. Abdominal examination revealed tenderness in the right hypochondrium. Biochemical examination which included complete hemogram, blood sugar, liver function tests, renal function tests, and serum electrolytes were normal. Ultrasonography abdomen revealed cholelithiasis; chest X-ray was normal,

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Srinivas and Singh: Perioperative Management of Long QT Syndrome

ECG showed long corrected QT-interval (QTc) of 581 ms (Figure 1a and 1b), Echocardiography was normal. The diagnosis of cholelithiasis with Long QTc was made; cardiologist consultation was sought.

General anesthesia with endotracheal intubation and controlled ventilation was planned. Patient was given tablet diazepam 10 mg and tablet ranitidine 150 mg the night before surgery. The operation theater was equipped with a pacing device, defibrillator, and necessary monitors, magnesium sulfate to treat Torsades-de-pointes, and emergency cardiac drugs were procured. Patient was connected to monitors. Heart rate, non-invasive blood pressure, oxygen saturation, end-tidal carbon dioxide, ECG in 2 leads were monitored. She was pre-oxygenated and pre-medicated with injection midazolam 2 mg intravenous, injection ranitidine 50 mg intravenous, and injection buprenorphine 0.15 mg intravenous, anticholinergics and antiemetics, which are known to prolong QTc were avoided; stress response to laryngoscopy and intubation could prolong QTc, injection lignocaine 75 mg intravenous was used to attenuate it. Injection propofol 75 mg intravenous was given as induction agent, and tracheal intubation was facilitated by injection atracurium 25 mg intravenous. Occasional ventricular ectopics, without any hemodynamic changes appeared soon after and were self-limiting. While avoiding volatile inhalation agents and α2-agonists, anesthesia was maintained using nitrous oxide, oxygen, propofol infusion at the rate of 80-100 μg/kg/min, with top-up doses of Injection atracurium as required. Prior to the creation of carbon dioxide pneumoperitoneum and positioning of the patient, low dose nitroglycerine infusion was started at the rate of 0.5 μg/kg/min, to minimize the hemodynamic changes. Intra-abdominal pressure due to pneumoperitoneum was kept between 10-12 mmHg. Hypoxia, hypercarbia, excessive rise in airway pressure did not occur. Prior to deflation of pneumoperitoneum, nitroglycerine infusion was stopped. The surgery lasted for 1 h without any adverse events. Deflation of pneumoperitoneum was uneventful. Anticholinesterases-anticholinergics known to trigger Torsades-de-pointes were not used; the effect of non-depolarizing muscle relaxant was allowed to wear-off. The trachea was extubated after the recovery criteria were met. Prior to suctioning and extubation, injection lignocaine 75 mg intravenous was given to attenuate stress response. Following extubation, the patient was conscious, comfortable, and was managed in the post anesthesia care unit. She was closely monitored for any adverse cardiac events for the next 24 h; the recovery was uneventful.

**DISCUSSION**

LQTS is an arrhythmogenic disorder resulting from mutation in cardiac ion channels, may present as congenital or acquired forms. Congenital LQTS is gene specific; age at presentation is during childhood or adolescent. Two clinical phenotypes are known - Jervell and Lange Nielsen syndrome is heterozygous for mutation, autosomal recessive, associated with profound bilateral sensorineural deafness, runs a more malignant course associated with sudden infant death syndrome, sudden cardiac death. Romano-Ward syndrome is homozygous for the mutation, autosomal dominant, only has cardiac manifestations, 50% never show symptoms. Of many genotypes identified, LQTS (LQTS1, LQTS2, LQTS3) are most common, LQTS1 and 5 are associated with Jervell and Lange Nielsen syndrome, LQTS1-6 are associated with Romano-Ward syndrome. Acquired LQTS has sporadic genetic mutation or single nucleotide polymorphism, can develop QTc prolongation and Torsades-de-pointes in response to drugs that alter ventricular repolarization and also potentiated by hypokalemia, hypomagnesemia, hypocalcemia, bradycardia, pre-existing cardiac diseases (hypertension, ventricular hypertrophy, myocardial ischemia, myocarditis, myocardial fibrosis, sinus node dysfunction, conduction blocks), drug interactions that alter metabolism of offending drugs, associated hepatic, renal dysfunction, and endocrine disorders such as diabetes mellitus, hypo- and hyperthyroidism.

Ion channel defects enhance sodium or calcium inward currents, inhibit potassium outward current during plateau phase of action potential, lengthen action potential manifesting on ECG as QTc prolongation. β receptor stimulation in these cases will also prolong action potential by stimulating Na⁺/Ca²⁺ exchanger, increase in inward Na⁺ is unopposed by smaller increase in outward K⁺ current,
because of low density of potassium ion channels in myocytes. Normal QTc corrected for heart rate using Bazett’s formula is less than 440 ms; QTc > 500 ms has arrhythmia risk.

About 60% genotypically susceptible individuals may be symptomatic others may have normal QTc and may present for the first time intra-operatively with Torsade-de-pointes, some may have only ECG features, in some immediate family members may have definite LQTS, few may reveal history of sudden cardiac death in family members before the age of 30 years, such patients can be presumptively diagnosed on the basis of published probability criteria (Table 1). Those who have high probability require complete electrophysiological investigation and genotyping prior to surgery.

Symptoms are related to physical activity and stress manifesting as recurrent syncope, seizure-like episodes, cardiac arrest, resulting from episodic ventricular tachyarrhythmias called Torsades-de-pointes (sinusoidal twisting of QRS axis around the isoelectric line of ECG), which can cause abrupt decrease in cerebral blood flow, majority of the episodes are self-terminating, some may end up as sudden death due to ventricular fibrillation triggered by Torsades-de-pointes. Arrhythmias triggers being stress, exercise for LQTS1, emotional stress and auditory stimulus for LQTS2, pause induced arrhythmias which is common during sleep in LQTS3. QTc prolongation and arrhythmia in response to drugs that alter ventricular repolarization in susceptible individuals, along with potentiating factors as discussed earlier are triggers for acquired LQTS.

### Table 1: Diagnostic criteria for LQTS

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECG findings</td>
<td></td>
</tr>
<tr>
<td>QTc</td>
<td></td>
</tr>
<tr>
<td>≥480 ms</td>
<td>3</td>
</tr>
<tr>
<td>460-470 ms</td>
<td>2</td>
</tr>
<tr>
<td>450 ms (in males)</td>
<td>1</td>
</tr>
<tr>
<td>Torsades de pointes</td>
<td>2</td>
</tr>
<tr>
<td>T-wave alterations</td>
<td>1</td>
</tr>
<tr>
<td>Notched T wave in three leads</td>
<td>1</td>
</tr>
<tr>
<td>Low heart rate for age</td>
<td>0.5</td>
</tr>
<tr>
<td>Clinical history</td>
<td></td>
</tr>
<tr>
<td>Syncope</td>
<td></td>
</tr>
<tr>
<td>With stress</td>
<td>2</td>
</tr>
<tr>
<td>Without stress</td>
<td>1</td>
</tr>
<tr>
<td>Congenital deafness</td>
<td>0.5</td>
</tr>
<tr>
<td>Family history</td>
<td></td>
</tr>
<tr>
<td>Family members with definite LQTS</td>
<td>1</td>
</tr>
<tr>
<td>Unexplained sudden cardiac death</td>
<td>0.5</td>
</tr>
<tr>
<td>before 30 in immediate family members</td>
<td></td>
</tr>
</tbody>
</table>

If the total score is >4 points implies a high probability. ECG: Electrocardiogram, LQTS: Long QT syndrome

**Prevention and Treatment**

Avoid trigger, reverse metabolic - electrolyte abnormality, eliminate offending drugs. In LQTS1 and 2 prophylactic β blocker propranolol is used, for LQTS3, Na channel blocker flecaidine is used. Pacemaker and Cardioverter-Defibrillator are necessary in symptomatic patients despite β blockers. To prevent pause dependent arrhythmias temporary pacing or isoprenaline infusion can be used, for suppression of early after-depolarization (treatment of Torsades-de-pointes), magnesium sulfate is the first line of treatment, 2-4 g IV followed by infusion of 2-4 mg/min, the bolus can be repeated after 15 min if Torsades-de-pointes persists. Injection mexiletine can also be used to treat Torsades-de-pointes. Defibrillator is used to treat sustained arrhythmias.

Anesthesia management of a patient with LQTS is always a challenge; they carry a very high risk of perioperative malignant ventricular arrhythmias, which may be refractory to treatment. Anesthesia drugs and adjuvants may impair ventricular repolarization and increase the risk of Torsades-de-pointes. The effects of drugs, techniques, and combinations should be carefully considered.

The present case posted for laparoscopic cholecystectomy had intermediate risk probability of having LQTS (Table 1), therefore had a tendency of developing Torsades-de-pointes, while the stress of surgery, certain anesthesia drugs, carbon dioxide-pneumoperitoneum, raised intra-abdominal pressure, and positioning were potential triggers.

Perioperative β blockers though recommended in LQTS patients, C-Steikon et al., suggest cautious use of drugs causing bradycardia in bradyarrhythmic patients, hence was withheld in the present case (baseline pulse was 60/min).

Anesthesia premedication is usually performed using vagolytic and sedative/analgesic drugs. Atropine causes lengthening of QTc and hence was not used. Many studies demonstrate that injection midazolam does not modify either QTc or transmural dispersion of repolarization, hence it was used for premedication. Midazolam reduces sympathetic activity in unstimulated patients but it does not blunt the hemodynamic response to intubation. Owczuk et al. demonstrated that use of intravenous lignocaine 1.5 mg/kg before laryngoscopy and intubation prevented prolongation of QTc induced by this manoeuvre, hence was used in our case. Adequate sedo-analgesia reduces catecholamine release. Morphine and fentanyl are used in LQTS patients without any adverse effects, however, in the present case, Injection Buprenorphine was used as it also does not produce a
significant change in QTc. Therefore, was beneficial along with nitrous/oxygen, occasional venricular ectopics, which occurred following intubation were self-terminating and did not produce hemodynamic changes. Use of muscle relaxants facilitates intubation because succinylcholine prolongs QTc, causes vagal stimulation, it was avoided. Non-depolarizing muscle relaxants do not extend QTc, so can be used; except pancuronium, which has vagolytic properties. Injection Atracurium, as it avoids recovering agents was used in the present case. Carbon dioxide pneumoperitoneum required for the procedure produce increase in intra-abdominal pressure and systemic carbon dioxide absorption, leading to complex physiological changes affecting a number of homeostatic systems. Studies demonstrate fewer adverse hemodynamic effects with low intra-abdominal pressure. In the present case, intra-abdominal pressure of around 12 mmHg was maintained. Similar to the studies of Moon et al., low dose of Injection Nitroglycerine infusion was effective in reducing hemodynamic changes during pneumoperitoneum and positioning; while avoiding volatile inhalational agents, which are known to prolong QTc. Hypoxia, hypercarbia, excessive rise in intrathoracic pressure which could prolong QTc, was prevented by optimizing ventilation. As the combination of anticholinesterase and anticholinergics is known to prolong QTc, reversal of non-depolarizing muscle relaxant (injection atracurium) was withheld and since extubation could also trigger Torsades-de-pointes, Injection lignocaine bolus was used and patient was extubated after recovery criteria were met.

Pacing device and defibrillator were made available, and the patient's heart rate, blood pressure, oxygen saturation, ECG in 2 leads were monitored and pain was adequately controlled. Recovery was uneventful.

CONCLUSION

Anesthetic drugs and adjuvants, techniques, surgical stress may impair ventricular repolarization and increase the risk of Torsades-de-pointes. The effects of these should be carefully considered in the perioperative management of LQTS patients susceptible to arrhythmias.

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Laryngomalacia: An Anesthetic Challenge Successfully Managed

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Airway management of these patients is challenging with risk of total airway obstruction, aspiration, need of prolonged postoperative intubation, and mechanical ventilation. We report successful anesthetic management of a child with congenital laryngomalacia.

CASE REPORT

A 17-month-old male child with bilateral pelvic-uretero junction (PUJ) obstruction, weighing 12 kg, was posted for left pyeloplasty. During anti-natal checkup of the child, bilateral hydronephrosis was detected during antenatal check up on Level II ultrasonography. The child underwent reno-amniotic shunt in 6th gestational month. Now, the child was posted for left pyeloplasty.

Key words: Anesthetic management, Endotracheal intubation, Laryngomalacia, Pyeloplasty

INTRODUCTION

Laryngomalacia is the term most widely used to describe the “inward collapse of supraglottic structures of the larynx during inspiration”. It is the most common cause of stridor in newborn, affecting 45-75% of all infants with congenital stridor. The high pitched noise of inspiratory stridor is created by airflow through an area of obstruction due to collapsed supraglottic structures during inspiratory phase of respiration. Stridor in children appears few weeks to months after birth, more during inspiration, crying and supine position.

Pathogenesis of laryngomalacia is still unknown. The first proposed mechanism of pathogenesis was floppiness of the airway secondary to infantile cartilage abnormalities, but histologic study did not support this. Other investigators suggest that there is poor neuromuscular control with relative hypotonia of the supraglottic dilator muscles.

Congenital anomalies and genetic disorders occur with an estimated incidence of 8-20% with laryngomalacia.

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In pre-operative period, the child was screened for respiratory tract infection, signs of cor pulmonale and other congenital anomalies. Apart from bilateral PUJ obstruction leading to bilateral hydronephrosis, other systems were within normal limit. His biochemical parameters were normal (hemoglobin - 11.4, blood urea nitrogen - 14.0, serum creatinine - 0.55).

The child was fasted for 6 h. Difficult airway cart was kept ready with standby by the surgical team. Monitoring devices i.e., pulse oximeter probe, non-invasive blood pressure (NIBP), electrocardiograph, capnometer, and temperature monitor were placed. Intra-venous line was secured with a 22G cannula and premedicated with glycopyrrolate 4 μg/kg, midazolam 0.03 mg/kg and fentanyl 2 μg/kg. Inhalational induction was done with 100% O₂ and halothane. Continuous positive airway pressure (CPAP) was applied by using Jackson Rees Circuit, to prevent stridor. Mask ventilation was easy and stridor disappeared under anesthesia with CPAP. After achieving adequate depth of anesthesia, hypopharyngeal spray with 2 ml of 2% lidocaine was done to obtund hypopharyngeal reflexes. Then laryngoscopy was performed using Miller blade no. 1. Large floppy, omega-shaped epiglottis getting sucked in and slight vocal cord collapse during inspiration was seen. With external manipulation, normal arytenoids were visualized on laryngoscopy. We decided to go for endotracheal intubation for securing the airway. After administering propofol 30 mg (2.5 mg/kg), the child was intubated with uncuffed endotracheal tube 4.0 and bilateral air entry was confirmed. Then neuro-muscular blocking agent atracurium 6 mg was given and anesthesia was maintained with intermittent positive pressure ventilation with O₂, N₂O, and halothane. Analgesia was ensured with fentanyl, paracetamol, and local infiltration of the surgical incision site with 6 ml of 0.25% bupivacaine plain. The duration of surgery was 90 min and the child was extubated fully awake uneventfully. The child was shifted to the pediatric intensive care unit (PICU) for further vitals monitoring (NIBP, heart rate, oxygen saturation) with standby ventilator back-up. The PICU stay was uneventful, and then the child was discharged.

**DISCUSSION**

During managing this case, our anesthetic goals were: - (1) To screen for other congenital anomalies and optimize the child before surgery, (2) judicious premedication with mild sedative to prevent child from crying and hyperventilating, which would have worsened the stridor, (3) using an antisialagogue to prevent aspiration as well as for better action of laryngeal spray of local anesthetic agent, (4) under general anesthesia (GA) airway examination to assess severity of laryngomalacia, (5) ensuring good analgesia, and (6) intensive post-operative monitoring and preparedness for post-operative ventilation.

We had used midazolam for mild sedation and to overcome separation anxiety and glycopyrrolate as an antisialagogue. The inhalational induction was planned for under GA airway examination. This is the most commonly used technique and use maximal oxygen usage and a volatile agent having bronchodilatory effects. Halothane was chosen as inhalational agent, as halothane has higher blood-gas partition coefficient (2.46) and halothane vaporizer can deliver maximum possible minimum alveolar concentrations (MAC) multiples (5.75 MAC multiple vs. 2.42 MAC multiple for sevoflurane vaporizer), and allow us enough time for laryngoscopy and assessment of severity of laryngomalacia. The induction may be prolonged due to compromised airway, but with time and patience and modest amounts of CPAP, the airway can be maintained and the child deepened to a level, where the airway can be sprayed with topical local anesthetic, usually lidocaine (3-5 mg/kg). If the child is too light at this point, coughing, desaturation, and laryngospasm may complicate the induction. This can be avoided by ensuring the child is at a deep level of anesthesia. Any periods of apnea can be treated by gentle stimulation and CPAP. There are certain disadvantages of this technique such as: (a) CO₂ monitoring is difficult, (b) monitoring of respiration need to be done by direct vision, and (c) environmental pollution. Bronchoscopy would have been the technique of choice for assessment, but due to unavailability of pediatric fiberscope we had no other choice left than direct laryngoscopy.

Laryngeal mask airway (LMA) might be the better option, but we opted for endotracheal intubation because of favorable anatomy and for complete airway protection for prolonged duration in semi-lateral position during surgery. The use of LMA in case of laryngomalacia has a higher failure rate and it may not be able to protect airway against reflex, which is commonly seen in these patients.

Most infants with laryngomalacia will have mild symptoms and a benign disease course that resolves by the age of 12-24 months; however, it is important to recognize that not all cases of laryngomalacia have a benign course. Mild laryngomalacia is a benign and self-limiting condition, requiring re-assurance and follow-up. In our case, the child was 17 months old with decreased intensity of stridor, which might be the reason for getting favorable laryngeal anatomy. With careful pre-operative assessment, thought out a plan for airway management with available backup options and intensive postoperative monitoring, we had successfully managed this challenging case.
CONCLUSION

With careful pre-operative assessment, thought out a plan for airway management with available backup options and intensive postoperative monitoring, we had successfully managed this case.

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Brunnder Gland Cyst: A Case Report

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Patient was initially treated with proton pump inhibitors with dietary and lifestyle modifications. No imaging was done. Patient was subjected to gastroduodenoscopy for the persistence of symptoms.

In gastroduodenoscopy, while entering 2nd part of the duodenum a bilobed, sessile, polypoid structure noted arising from the lateral wall of the duodenum (Figure 1a and b). While trying to take a biopsy, it ruptured leaking mucinous material and completely disappeared. Bits of tissue sampled sent for histopathological examination.

Follow-up upper gastrointestinal endoscopy revealed no lesion in the duodenum.

Histopathological examination revealed a cystic structure lined by a single layer of tall columnar cells with clear cytoplasm with the nucleus at the base representing Brunner gland cyst in the submucosa. There is no evidence of Brunner gland hyperplasia or features of atypia or malignancy.

DISCUSSION

Brunner gland cysts are largely identified on upper gastrointestinal endoscopy done for other reasons. Exact cause of the Brunner gland cyst is not known.

Pathologically, these were referred in literature with different terms like Brunner gland cysts, Brunner gland cystadenomas, cysts of Brunner gland, cystic hamartoma.
of Brunner glands, mucocele of Brunner glands. Histologically, these are cystic dilation of ducts of glands without hyperplasia and are different from solid counterparts of Brunner gland lesions like hamartoma, adenoma or hyperplasia in which cystic spaces form little amount of volume of these lesions.

Even though presentation of majority of these lesions described as asymptomatic lesions found incidentally on upper gastrointestinal endoscopy, there are reports of presentations like upper gastrointestinal hemorrhage, intestinal obstruction, pancreatitis, obstructive jaundice because of their more common location in proximal duodenum; however, these presentations are more common with solid counterparts of these lesions.

These are benign usually with normal appearing tall columnar cells with clear cytoplasm and basal nuclei. Whereas in solid counterparts with hyperplasia of epithelium, even though, benign lesions are more common, chance of malignancy is present though rarely reported as adenocarcinoma.

Diagnosis of Brunner gland cysts on imaging before invasive procedure like endoscopy is largely limited by the availability of modalities like computed tomography, magnetic resonance imaging, endoscopic ultrasound especially in developing countries and the limited indications of these imaging modalities in asymptomatic individuals. However, gastroenterologists and radiologists should be aware of these rare lesions to consider as differential diagnosis whenever there are polypoid lesions or filling defects noted, especially in the proximal small intestine. Ultimately, the histopathological examination is the modality one has to resort to, to distinguish these lesions and presence of cystic component directs toward benign nature in these lesions.

In asymptomatic cases, Brunner gland cysts can be treated by endoscopic polypectomy and histopathological examination of resected polyp followed with endoscopy. In presentations like upper gastrointestinal hemorrhage, obstruction – excision either by endoscopy or surgical options may be required whenever necessary.

**CONCLUSION**

Brunner gland cysts are cystic dilations of Brunner glands, most of them are asymptomatic, usually identified on upper gastrointestinal endoscopy done for other symptoms. However, few cases of symptomatic Brunner gland cysts were reported as obstruction, hemorrhage. Most of these are benign, and one should suspect malignancy if solid component present in these lesions, which can be identified on histopathological examination. Gastroenterologists and radiologists should be aware of this condition to differentiate this from other polypoid lesions in the proximal gastrointestinal tract.

**REFERENCES**


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Ophthalmic Metastasis in Squamous Cell Carcinoma of Head and Neck: A Study on Two Patients

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Abstract

Primary squamous cell carcinoma of head and neck usually metastasizes to the regional lymph node, lung, and bone. Ophthalmic metastasis in squamous cell carcinoma of head and neck is uncommon. Most of the ophthalmic metastasis is due to the carcinoma of the breast and lung. Squamous cell carcinoma of the oral cavity with metastasis to the eye has not yet been documented. We are presenting herewith two cases of carcinoma buccal mucosa that had ophthalmic metastasis. One patient had carcinoma left buccal mucosa, which was treated with left marginal mandibulectomy with pectoralis major myocutaneous flap and neck dissection followed by radiotherapy. He was asymptomatic for 1½ year, subsequently he presented with choroid, lung and bone metastasis. The other patient was diagnosed as carcinoma right buccal mucosa, which was subsequently treated with segmental mandibulectomy with supraomohyoid neck dissection, followed by radiotherapy. He was asymptomatic for 6 months. Subsequently, he presented with metastasis to the left orbit. Both the patients were treated with radiation with palliative intent to the eye and were symptomatically improved. The clinical presentation, diagnosis and treatment of carcinoma buccal mucosa with ophthalmic metastasis are discussed here with the review of literature due to its rarity and for future documentation.

Key words: Choroid metastasis, Head and neck carcinoma, Orbital metastasis, Squamous cell carcinoma

INTRODUCTION

Ophthalmic metastasis from an extraocular primary malignancy is a rare event. Head and neck malignancy most commonly metastasize to the regional lymph node. Common sites of distant metastasis are lung, mediastinal lymph node, bone and liver.¹ Orbital metastasis is defined as one that occurs within the space between the eyeball and bony orbit. Orbital involvement usually occurs due to direct extension of nasopharyngeal and ethmoid sinus carcinoma or through perineural invasion. Similarly ocular metastasis mostly choroid metastasis occurs due to primary in carcinoma of lung and breast.² However, carcinoma buccal mucosa with ocular metastasis is also a rare event. The overall prognosis of the patient with this metastasis is generally poor.¹³ Once diagnosis has been established, treatment is mainly palliative and focuses on symptom relief and improvement of visual function. Ferry and Front reviewed a series of 227 cases of metastatic carcinoma to the eye and orbit, but none had primary head and neck malignancy.⁶ Here we present two cases of squamous cell carcinoma of buccal mucosa that metastasizes to orbit and eye due to its rarity and for documentation.

CASE REPORTS

Case 1

A 47-year-old male on December 2011 clinically presented with an ulceroproliferative lesion of size 4 cm × 2 cm × 3 cm at left buccal mucosa whose margin was raised and everted, surface irregular. There was no involvement
of regional draining lymph nodes. Histopathology of the primary was squamous cell carcinoma. He underwent left marginal mandibulectomy with pectoralis major myocutaneous flap with left modified neck dissection. Histopathology revealed squamous cell carcinoma of left buccal mucosa, tumor infiltration of the underlying soft tissue. All the mucosal and bony cut margins were free. There was no perineural invasion or lymphovascular space invasion, no involvement of the overlying skin. Out of 40 lymph nodes, no lymph node showed metastasis. Based on histopathology report he received adjuvant external beam radiotherapy of 60 Gy to locoregional site, which was completed on March 2012. He was asymptomatic till September 2013. Subsequently he presented with swelling followed by pain and diminished vision of the left eye. Left eye fundoscopy revealed choroid metastasis (Figure 1). Automated perimetry showed loss of temporal field of vision of left eye (Figure 2). Optical coherence tomography image of left eye presented with neurosensory detachment far nasal to the foveal center (Figure 3). Positron emission tomography-computed tomography evaluation showed metastatic disease in the left choroid, left acetabulum, 5th thoracic vertebra, and lung. He received palliative radiotherapy of 30 GY to left eye, 5th thoracic vertebra and left acetabulum after which he was asymptomatic. In view of the good response to radiotherapy, the patient was subjected to palliative chemotherapy with paclitaxel and carboplatin. After completion of three cycles of chemotherapy, he died due to the progression of his disease.

Case 2
A 48-year-old male presented with an ulceroproliferative lesion of size 4 cm × 5 cm × 4 cm with irregular margin at the right buccal mucosa of 9 months duration. He had clinically significant right Level I cervical lymph node of size 2 cm × 2 cm, which was mobile. Histopathology of the primary and fine needle aspiration and cytology of neck node showed squamous cell carcinoma. The patient underwent segmental mandibulectomy with supraomohyoid neck dissection. Post-operative biopsy revealed metastatic squamous cell carcinoma with deposits in right cervical node. He received adjuvant concurrent chemoradiation 60 GY in 30#, 2 GY/# with shrinking field technique, along with weekly cisplatin of 40 mg/m². Six months after the completion of treatment he developed swelling, pain, diminished vision and restricted movement of his left eye. Axial plain and contrast-enhanced computed tomography scan of brain and paranasal sinuses revealed a soft tissue enhancing mass lesion in intraconal compartment of left orbit, separable from the left optic nerve, suggesting retro orbital metastasis (Figure 4). No evidence of bone erosion or involvement of paranasal sinus and intracranial...
extension was seen. The right eye and orbit were normal. Chest X-ray and ultrasound of abdomen and pelvis were normal. Clinico radiological evaluation did not reveal any distant metastasis. He received radiotherapy to left orbit with palliative intent, but subsequently was lost for follow-up.

DISCUSSION

Orbital metastasis is relatively uncommon, occurs in 2-3% of patients with malignancy. The most common primary malignancy to metastasize to the eye includes breast (38-40%), lung (20-29%), and gastrointestinal tract (12%). The malignant lesion from other organs rarely metastasize to the eye. Isolated cases of thyroid cancer, malignant melanoma, hepatomas etc., metastasizing to the eye have been reported. In as many as 19% of cases, patients have no history of systemic cancer when presenting with ophthalmic symptoms. A possible explanation for this phenomenon is that the orbit's volume is restricted, so any expansion of a mass will result in a symptom much sooner than a similar mass located elsewhere in the body. This metastasis usually indicates extensive hematogenous spread of a primary cancer, which was observed in one of our case. The average age of the patient at the time of diagnosis is 61 years. Both the patients in our series were at 5th decade. Ocular involvement is more common than that of orbit. The ratio of ocular to orbital involvement ranges from 7:1 to 10:1. Unilateral metastasis is common than bilateral metastasis. Some studies have indicated that metastatic disease is more common in the left orbit. As the left common carotid ascends directly off the aorta tumor cells from the circulation could have a more direct path to left orbit. In this series both the patient had unilateral orbital and ocular involvement i.e., of the left side.

Primary carcinoma of head and neck producing ocular metastasis is also further rare. Day et al. reported two patients of head and neck cancer, Maheswari et al. reported one patient of head and neck cancer with ophthalmic metastasis. However, in our study both the patients, had primary carcinoma buccal mucosa that presented with the ocular and orbital metastasis which has not yet been reported in literature.

Treatment for orbital metastasis is mostly palliative. The aim of the treatment is to improve the patient's quality of life and restore or preserve visual function. Orbital surgery to remove the tumor mass is not usually recommended as this is not curative, offers no benefit in terms of prognosis or survival, and may be associated with significant ocular morbidity. It should be done only in cases of intractable ocular pain or unmanageable local hygiene due to rapid tumor growth. Both the patients in our series were treated with external beam radiotherapy with the palliative intent for which patients were symptoms free. Chemotherapy for systemic treatment can help to control orbital metastasis especially for chemosensitive tumor, such as small cell lung cancer and neuroblastoma, but the mainstay of treatment is orbital irradiation. In the present series, the first patient was treated with paclitaxel and carboplatin but there was no benefit. Radiotherapy may alleviate symptoms in 80% of cases and may be able to restore some vision. Patient's general health, life expectancy and side effect of treatment must be taken into consideration. Hormone therapy plays an important role in the treatment of metastasis from hormone sensitive tumors such as breast cancer and prostate cancer. Short-term improvement of vision after an individualized therapy of orbital metastases is beneficial. However, the systemic prognosis is poor. Mean survival time is about 10-20 months, which were also observed in the present series.

CONCLUSION

Although ophthalmic metastasis is rare, any patient with proptosis with a history of malignancy should be evaluated for ophthalmic metastasis. Ophthalmic metastasis may represent the initial manifestation of undiagnosed systemic neoplasia. Treatment approach for ophthalmic metastasis is mostly palliative, and there must be good communication between patient and patient's relative with the health care provider explaining the prognosis. Even though carcinoma of head and neck rarely metastasize to orbit or eye, here we report two patients of carcinoma buccal mucosa.
with ocular and orbital metastasis due to its rarity and documentation.

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Giant Cell Tumor of the Calcaneus: A Case Report

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Abstract

Giant cell tumor (GCT) is benign, locally aggressive tumor that has a tendency for local recurrence. It usually presents at the ends of long bones. Occurrences at atypical locations like bones of the feet are rare, seen in <1% of cases. The majority of cases with GCT present with 15-40 years of age, with <10% above a fifth decade. Treatment options for the same are also very ill-defined. Early diagnosis and aggressive intervention hold the key to successful treatment with less radical operative procedures. We report a case of GCT of the calcaneus in a 56-year male treated with curettage and bone grafting with no signs of recurrence on 1-year follow-up.

Key words: Calcaneus, Curettage, Giant cell tumor, Osteoclastoma

INTRODUCTION

Giant cell tumor (GCT) of bone is generally a benign tumor composed of mono-nuclear stromal cells and characteristic multinucleated giant cells. It usually develops in long bone, but can occur in unusual locations. The multinucleated giant cells appear similar to osteoclasts, which led to the other term osteoclastoma. A typical GCT is a lytic lesion with well-defined, non-sclerotic margins, eccentric in location. GCT is a locally aggressive tumor, which has the tendency for local recurrence. Atypical locations are rare, and tumor diagnosis in these circumstances is often confusing. Most of the multicentric GCTs occurs in the long bones of the lower extremity especially around the knee. Patients with GCTs occurring in the feet tend to present earlier as compared to those at more typical locations. There are very few cases in the medical literature where multiple foot bones are involved. The bones of the hands and feet are uncommon locations with a prevalence of <2%. Multicentric GCT has been reported in <1% of cases with lesions often located in the distal extremities particularly the hands and feet. When multiple bones are involved en bloc resection removing a wide margin through normal tissue planes often leading to amputation of the involved foot will ensure the lowest rate of recurrence.

Here, we present you a case of a 56-year-old male presenting to the orthopedic department with a GCT of the right calcaneus.

CASE REPORT

A 56-year-old male presented with right heel pain and swelling. The pain was present since 11 months. However, the swelling had appeared 6 months back. There was no history of trauma or fall. For this, he consulted a local medical practitioner, who managed the patient conservatively. On presentation to our hospital, a radiograph was taken which showed an osteolytic lesion in the right calcaneus (Figure 1). A computerized tomography scan was performed successively which showed a 5 cm × 3 cm × 3 cm well defined, multiloculated osteolytic lesion with intact cortical margins (Figures 2 and 3).

Excision and curettage of the lesion with bone grafting was performed. Intraoperatively the lesion was soft, greyish, well-defined lesion. Histopathology demonstrated characteristic multi nucleated giant cells in a background of mononuclear stromal cells suggestive of GCT.

The post-operative period was uneventful, and the patient was discharged on post-operative day 14. Patient was put on a below knee Plaster of Paris cast for 6 weeks.
monthly for 6 months, followed by every 3 monthly from next 6 months. In this 1-year follow-up the patient remained disease free and ambulatory, no recurrence of symptoms or no new growth from radiographs was observed.

DISCUSSION

GCT of bone was described by Cooper and Travers in 1818. The tumor is generally benign, locally aggressive with potency of recurrence as well as for malignant transformation, which occurs in 1.5-13% of cases and metastasis primarily to the lungs, however, this is rare occurring in <1% of cases. Malignant transformation to osteosarcoma has been reported in approximately 1% of cases. They occur predominantly in metaphysis and epiphysis of long bones, most common site being distal end femur, followed by proximal end tibia and distal end radius. It is usually seen in the skeletally mature patients, peak incidence in the third decade with a male:female ratio of 1:1.5.

GCT is very rare in the calcaneus. In a study performed by Campanacci et al. two cases were reported in the calcaneus out of the total of 327, whereas Dahlin reported 4 out of 411 cases in his study; overall incidence being approximately 1%.

Clinically GCT presents with non-specific symptoms like local swelling, pain, and warmth. On gross pathology, typical GCTs is a soft friable dark tissue with associated areas of cystic and necrotic changes. Histologically the tumor shows characteristic multinucleated osteoclastic type giant cells with round to oval/spindle-shaped nuclei and areas of mitotic activity. Radiologic features of GCT are usually distinctive, appearing as an expanding, eccentrically located radiolucent shadow typically toward the end of the long bone. The tumor has indistinct margins and at times it may be multilocular. Secondary aneurysmal bone cysts or malignant transformations to osteosarcoma may sometimes be encountered.

Treatment of GCT is surgical. Traditionally curettage with or without bone grafting/placement of bone cement is the first line of management. However, recurrence of the tumor is a known complication, most cases presenting within 3 years of primary surgery. Hence the addition of mechanical burr drilling of the tumor was, and/or cryoablation is recommended. This patient should, hence be regularly followed up not only for recurrence but also due to the small definitive risk of malignant transformation. Recently Denosumab, a monoclonal antibody that targets receptor activator of
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nuclear factor k-B has been used to treat GCT of bone. It has been shown to inhibit the osteoclastic activity of GCT, hence is been used preoperatively to facilitate the recession of tumor as well as primary treatment for patients unwilling/unfit for surgery. 

**CONCLUSION**

GCT presenting in the calcaneus is a very rare entity. It could present with pain or be asymptomatic and discovered accidentally on a radiograph. The characteristic appearance makes it an easy diagnosis on simple radiographs, however, presentation in an unusual age group must not rule out its likely diagnosis. Intervention in early stages can avoid radical procedures like calcanectomy or amputation. We recommend aggressive surgical approach with close follow-up to detect recurrence if any, at an early stage.

**REFERENCES**


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Russell Viper’s Cardiac Bite: A Case Report

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Abstract

Viper snake is common in South Asia. It produces a variety of clinical manifestation like hypotension, diarrhea, headache, renal failure, respiratory failure and other neurological manifestations. The toxicity depends on a combination of five different venom fractions, each of which is less toxic when tested separately. Venom toxicity and bite symptoms in humans vary within the different population and over time. Myocardial ischemia and infarction are a rare complication of Russell’s viper bite. Here we report a case of anterolateral ischemia and acute kidney injury following a Russell’s viper bite in a 20-year-old healthy male, without previous cardiac or renal complications. He recovered within 2 weeks following hemodialysis and anti-snake venom administration.

Key words: Acute kidney injury, Anti-snake venom, Hemodialysis, Myocardial ischemia, Snake bite, Russell viper

INTRODUCTION

In India, 50,000 people die from snake bite every year.¹ Though many types of snakes are prevalent the mortality and morbidity are more common with viper, cobra and krait.² Venom in many snakes affects virtually every organ system in the human body and can be a combination of many toxins including cytotoxins, hematotoxins, neurotoxins and myotoxins. Most snake bites, whether venomous or non-venomous will produce some local effects. There may be minor pain and redness in 90% of cases although this varies depending on the site of the bite. Viper bite is extremely painful and produces local cellulitis, tissue damage, neurological complications like ptosis, convulsions, loss of coordination, weakness, nephrological complications like renal failure and hematological complications like bleeding manifestations. Cardiotoxicity in a viper bite is an extremely rare complication, which is reported in <10% of the viper bites.³ We report a case of Russell’s viper bite in a 20 year male who presented with acute myocardial ischemia and acute kidney injury who recovered within 2 weeks following hemodialysis and administration of polyvalent snake venom and other supportive measures.

CASE REPORT

A 20-year-old male presented to our emergency department 4 h after an alleged history of snake bite in his right leg above the lateral malleolus. He complained of severe pain at the site of bite, giddiness, retrosternal chest pain and also had vomiting. Patient was not a diabetic, hypertensive and did not have any cardiac, renal and coagulation disorder in the past. No history of any previous surgeries. Patient was a non-alcoholic and non-smoker. No significant family history.

Patient was conscious and oriented. His blood pressure 90/60 mmHg, pulse - 112/min regular and was comfortable with room air. On examination, fang marks was seen with surrounding erythema at the site of the bite. He developed cellulitis involving up to 5 cm below the knee. Patient had congenital ptosis, decreased urine output, his single breath count test was normal, with no other neurological deficit, no bleeding manifestations, and other system examinations were normal.

Whole blood clotting time was prolonged >20 min. Electrocardiogram (ECG) showed sinus tachycardia,
ST flattening with T-wave inversion in lead II, III, aVF, V3-V6 suggestive of inferior and lateral wall ischemia and cardiac enzymes - Trop I was positive, creatine kinase MB - 116 U/L, echo: No regional wall motion abnormalities. Bleeding time was 3 min 35 s, clotting time was 5 min 45 s, white blood cell - 19,000 cu/mm, platelet - 123,000 cu/mm and he had normal electrolytes levels. Patients renal function test was normal initially, lactic acid dehydrogenase was 803 U/L which was suggestive of rhabdomyolysis. His repeated renal function test on the subsequent day was elevated which indicated acute kidney injury and urine for myoglobin was negative.

Patient was managed with intravenous fluids, intravenous broad spectrum antibiotics, and anti-snake venom. He was initiated on hemodialysis and was given medical management for myocardial ischemia. Patient recovered in 2 weeks with all the abnormal parameters returning back to normal. Repeat ECG was normal with no old ischemic changes. (Table 1, Figures 1 and 2)

**DISCUSSION**

The mechanism by which myocardial ischemia or infarction occurs is not known clearly. Possible mechanisms are, disseminated intravascular coagulation causing thrombus formation in coronaries and direct vasculitis by snake venom causing an infarction. Some snakes have sarafotoxins, which cause coronary vasoconstriction. Coronary spasm due to endothelins released by snake bite is also considered to be a possible mechanism.

Other mechanisms that suggested has causative for myocardial infarction (MI) for viper bite, are: (1) Hypovolemic shock due to bleeding, (2) anaphylactic shock, (3) hypercoagulability in consumption coagulopathy, (4) hyperviscosity secondary to hypovolemia induced hemoconcentration, (5) direct cardiotoxic effect on myocardium.

Tony and Bhat have reported a case of MI on day 2 following a snake bite and proposed vasospasm caused by sarafotoxins in snake venom as the possible mechanism.

**Table 1: Investigations**

<table>
<thead>
<tr>
<th>Test</th>
<th>Russels viper bite</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Day 1</td>
</tr>
<tr>
<td>WBC count</td>
<td>19,500 cells/cumm</td>
</tr>
<tr>
<td>Platelet</td>
<td>123,000 mm³</td>
</tr>
<tr>
<td>PT and INR</td>
<td>C-13, T-17</td>
</tr>
<tr>
<td></td>
<td>INR-1.34</td>
</tr>
<tr>
<td>CK-MB</td>
<td>116 U/L</td>
</tr>
<tr>
<td>CK total</td>
<td>713 U/L</td>
</tr>
<tr>
<td>Serum urea</td>
<td>35 mg/dl</td>
</tr>
<tr>
<td>Serum potassium</td>
<td>1.0 mg/dl</td>
</tr>
<tr>
<td>Serum sodium</td>
<td>139 mEq/dl</td>
</tr>
<tr>
<td>Serum potassium</td>
<td>3.9 mEq/dl</td>
</tr>
<tr>
<td>Serum LDH</td>
<td>803 U/L</td>
</tr>
</tbody>
</table>

*PT: Prothrombin time, INR: International normalized ratio, CK: Creatinine kinase, LDH: Lactate dehydrogenase*
Dissanayake and Sellahewa\textsuperscript{9} have described acute MI following Russell’s viper bite in a 47-year-old man and proposed a mechanism of predominant coagulant in venom resulting in coronary thrombosis – leading to MI.

Hoffman \textit{et al}\textsuperscript{10} have reported myocarditis with extensive myocardial necrosis at post mortem in two horses after the injection of \textit{Viperae palaestinae} venom for the commercial production of antibodies.

Rowlands \textit{et al}\textsuperscript{11} reported myocardial damage in a fatal case after snake bite by a species of the Australian elapid family in which small foci of myocardial damage and massive skeletal rhabdomyolysis were seen.

Sathyanathan and Mathew\textsuperscript{12} reported Raynauds phenomenon and gangrene occurring in opposite limb following envenomation with a snake bite.

In our case, the patient was a non-smoker, non-diabetic and normotensive individual with no family history of dyslipidemias or adverse cardiac events and hence pre-existing coronary stenosis was considered to be unlikely. So the mechanism could be direct cardiotoxicity or coronary thrombosis due to hypercoagulopathy. Myocardial ischemia with acute kidney injury in snake bite is very rare. The physician should have a high index of suspicion to look for cardiac complication too, hence reported.

**CONCLUSION**

Snake bite is common in India. Young people are affected more commonly.\textsuperscript{13} Even though myocardial involvement in a Russells viper bite is rare, recording an electrocardiogram in all snake bite patients may detect myocardial involvement earlier and devastating sequel of MI can be prevented in these cases if diagnosed earlier and managed with antin snake venom. The postulated mechanisms and its various complications should be kept in mind while treating a patient of Russel viper’s bite.

**ACKNOWLEDGMENT**

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Two Unrelated Families of Holt–Oram Syndrome: Delayed Bone Age, Patent Ductus Arteriosus and Complex CHD as Unreported Features

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INTRODUCTION

Holt–Oram syndrome is a known autosomal dominant hand heart syndrome first described by Mary Holt and Samuel Oram in 1960 and since then more than 350 case reported.¹ ² The most important findings includes atrial septal defects (ASDs), ventricular septal defect (VSD), atrioventricular conduction abnormalities, vascular hypoplasia and upper limb musculoskeletal deformities.³ ⁴ This syndrome caused by mutations on chromosome 12q24.1 that inactivate the TBX5 gene.³ ⁴ The criteria for diagnosing this syndrome includes abnormalities of thumb (triphalangia, hypoplasia or aplasia) and congenital heart disease.³

CASE REPORT

Family 1
Mother was the first affected person in the family. She was married to an unaffected male. She had three affected children and one abortion. The first female expired at the age of seven, cause of death was not known. Second issue spontaneously aborted. The third issue is a female child, and fourth is male child (Figure 1).

Case 1
This mother came with her 8-year-old male child that was 4th issue of unrelated 40-year-old female and 45-year-old male. Weight and height of child were 14.4 kg and 116 cm. Patient was admitted with complaints of fever, cough, cold, chest pain and breathing difficulty since last 7 days. There was a history of palpitation, repeated chest infection and not gaining weight, abnormal deformed upper limb since birth. On examination, he had pallor, chest in drawing, and pulse rate of 110/min, respiratory rate of 24/min, liver 2/7 cm below costal margin, pectus excavatum, and short clavicle, abnormalities of scapula were present (Figures 2a and b, 3a and b). He had...
bilateral dysgenesis of the forearm and of thenar area, limitation of supination and pronation movements on both side, but more on the left side, deformed thumb and arachnodactyly on the right side (Figures 4 and 5). Auscultation of the chest revealed bilateral crepitation, wheeze, and the pansystolic murmur of grade 4+/6+ all over the precordium. Blood investigation showed a moderate degree of microcytic hypochromic anemia. X-ray chest showed cardiomegaly with bilateral infiltration (Figure 6). X-ray forearm and wrist showed only two carpal bones, abnormal first metacarpal on the right side (Figure 7). Electrocardiography showed right axis deviation and echocardiography showed left ventricular hypertrophy (LVH), right ventricular hypertrophy (RVH), and moderate pulmonary stenosis (PS), moderate PR, apical VSD (11.2 mm) moderate mitral regurgitation (MR), membrane in left atrium, large CS opening in RA, one another channel opening in right atrium.

Case 2
A 13-year-old girl was the elder sister of the above child and 3rd child of their parents. She had complaints of palpitation. On examination, she had absent thumb and forearm on the left side. Cardiovascular examination showed precordial bulge, wide fixed splitting of second heart sound with an
ejection systolic murmur at the pulmonary area. X-ray chest showed cardiomegaly, and X-ray left forearm and hand showed absent forearm bones, 1st metacarpal and phalanges and only two carpal bones. ECG showed right bundle branch block with right axis deviation. Echocardiography showed ostium secundum ASD of 4 cm (Figure 8).

Case 3
A 38-year-old old patient was mother of above two children. She also had complaints of palpitation and history of repeated respiratory infection in childhood. On examination, she had short clavicle, on right side abnormal thumb while on left side absent thumb, increased gap between middle and ring finger, restricted movement at elbow and wrist on left side, difficulty in supination and pronation. Cardiac examination had grade 2nd murmur and echocardiography showed ostium primum ASD (Figure 9).

Family 2
The mother of the child was first affected in the family. She had a female child which was also affected (Figure 10).

Case 1
A 4-year-old female child was the daughter of 28 years old mother and 34 years old father and admitted with complaints of fever, cough, and breathing difficulty. She had bilateral abnormalities of thumb, thenar...
hypoplasia, on both sides there was increased gap between middle and ring finger and between the ring finger and little finger (Figures 11 and 12). There were restricted supination and pronation movements. There was mild precordial bulging. On cardiovascular examination the patient had no murmur. X-ray chest showed cardiomegaly and bilateral infiltration (Figure 13), X-ray forearm showed only two metacarpal bones (Figure 14). ECG showed right axis deviation and echocardiography showed large ASD and trivial patent ductus arteriosus (PDA).

Case 2
This 28-year-old female was the mother of the above child. She had no complaints but had right-hand thumb abnormalities and thenar hypoplasia while on left side thumb was absent. She had difficulty in supination and pronation movements. On cardiovascular examination, she had grade 2\textsuperscript{nd} systolic murmur and echocardiography confirms ostium primum ASD (Figure 15).

DISCUSSION
In 1960 Mary Holt and Samuel Oram described this syndrome for the 1\textsuperscript{st} time and since then different authors...
have reported on approximately 350 patients. This syndrome is also known as heart-hand, heart upper limb and upper limb cardiovascular syndrome. McKusick created the name Holt–Oram syndrome when describing a case in which a mother and her daughter were affected. The most frequent cardiac abnormalities are ASD of ostium secundum, VSD, ostium primum ASD and arrhythmias. Pulmonary arterial hypertension may occur in a significant number of patients and is generally a result of the excessive pulmonary blood flow caused by the ASD as in our case first in family one. Other rare cardiac abnormalities in this case are the presence of LVH, RVH, and moderate PS, moderate PR, apical VSD (11.2 mm) moderate MR, membrane in left atrium, large CS opening in RA, one another channel opening in right atrium which is not described in literature. In case one in family second, there was PDA along with ASD, a combination not yet described in literature.

Skeletal abnormalities spare the lower limbs. This occurs because the mutant gene interferes with the embryonic differentiation during the 4th and 5th week of pregnancy, when the lower limbs are not yet differentiated. Our patients also had delayed bone age that is yet not described in literature as our patient had only two carpal bones (Case 1 in family 1 and Case 1 in family 2). All other findings in our patients were as described by other author.

**CONCLUSION**

Many cases of Holt–Oram syndrome have now been reported from India but we would like to bring the attention toward the additional features that are to be looked in this syndrome viz delayed bone age, PDA, complex CHD and scapular abnormalities.

**REFERENCES**

Subarachnoid Hemorrhage with Cerebral Salt Wasting Leading to Cerebral Ischemia

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**Abstract**

Cerebral salt wasting (CSW) syndrome is defined by the development of extracellular volume depletion due to renal sodium transport abnormality in patients with an intracranial disease with normal adrenal and thyroid function. It was first described by Peters et al. in 1950. Various cerebral pathologies leading to this syndrome include head injury, brain tumor, intracranial surgery, stroke, tubercular meningitis, etc. It is an important under-recognized cause of hyponatremia in patients with subarachnoid hemorrhage (SAH) and aneurysm clipping. The clinician can misinterpret it as a syndrome of inappropriate secretion of antidiuretic hormone (SIADH) which has a totally different treatment protocol. We report a case of CSW syndrome presenting as delayed vasospasm and aphasia due to cerebral ischemia.

**INTRODUCTION**

Cerebral salt wasting (CSW) syndrome is defined by the development of extracellular volume depletion due to a renal sodium transport abnormality in patients with an intracranial disease with normal adrenal and thyroid function. It was first described by Peters et al. in 1950. Various cerebral pathologies leading to this syndrome include head injury, brain tumor, intracranial surgery, stroke, tubercular meningitis, etc. It is an important under-recognized cause of hyponatremia in patients with subarachnoid hemorrhage (SAH) and aneurysm clipping. The clinician can misinterpret it as a syndrome of inappropriate secretion of antidiuretic hormone (SIADH) which has a totally different treatment protocol. We report a case of CSW syndrome presenting as delayed vasospasm and aphasia due to cerebral ischemia.

**CASE REPORT**

A 53-year-old male came with a history of sudden onset of severe headache, vomiting, and transient loss of consciousness. On examination, he was conscious, alert and oriented and had neck stiffness. A cerebral computed tomogram (CT) revealed SAH (Fischer Grade 3) with blood in anterior interhemispheric fissure and basal cisterns. CT angiography revealed a medium sized anterior communicating artery aneurysm directed anteriorly, inferiorly, and to the right side. He underwent a left pterional craniotomy and clipping of aneurysm on 3rd day of ictus. There were no intraoperative complications, and the initial post-operative course was uneventful. Since the patient was accepting normal oral feeds and CT scan (on 3rd postoperative day) was normal (Figure 2a), he was shifted towards from the intensive care unit.

On the 7th postoperative morning, he became drowsy, aphasic, and developed a right hemiparesis (Grade 4/5). At this stage, the blood pressure was 100/60 mm Hg, the central venous pressure was 1-cm of water (5-10 cm H₂O), and plasma sodium was 118 mmol/L. The last 24 h, urinary output was 1200 ml with a measured
fluid intake of 1800 ml during the same period. He was shifted back to the intensive care unit and a further workup revealed a serum osmolality of 278 mosm/kg (normal 285-295 mosm/kg), blood urea nitrogen (BUN) of 54 (normal 22-46 mg/dl), creatinine 0.8 (normal 0.6-1.2 mg/dl), serum uric acid 2.3 mg/dl (normal 2.0-7.0 mg/dl), urinary sodium 108 mmol/L (normal value in dehydration <20 mmol/L), urine osmolality 308 mosm/kg (normal <100 mosm/kg), and urine specific gravity of 1.030 (normal <1.003 or less). The patient appeared hypovolemic and the entire clinical picture was suggestive of CSW. CT scan of the brain (7th postoperative day) was normal (Figure 2b).

The sodium deficit was calculated to be 714 meq. Half correction of sodium was done at the rate of 1-mmol/L/h in next 24 h. Over the next 24 h, his serum sodium levels improved to 128 mmol/L and he became less drowsy. Volume depletion was corrected with dextran 40 and normal saline to attain a central venous pressure between 8 and 10. Urine output between 80 and 150 ml/h was achieved and urinary sodium levels reduced to 52 mmol/L. The patient continued to improve neurologically, and his hemiparesis resolved. Another cerebral CT, on postoperative day 12, revealed patchy infarcts in left middle cerebral artery territory (Figure 2c).

The patient gradually improved in a week and became more alert. The biochemical investigations were normal, and he was shifted to the ward. Another CT scan (18th postoperative day) (Figure 2d) revealed the resolution of infarcts. His aphasia improved gradually over next 3 months.

DISCUSSION

CSW is a process of extracellular volume depletion and is characterized by extracellular volume depletion, low central venous pressure, increased urinary sodium (>40 meq/L), increased urinary osmolality, increased BUN/creatinine levels, and low to high serum osmolality. Two postulated mechanisms for CSW are the excess secretion of natriuretic peptides (atrial natriuretic peptide [ANP], brain natriuretic peptide [BNP], C-type ouabain-like peptide), and the loss of sympathetic stimulation to the kidney. After SAH, the reason for volume depletion and hyponatremia is natriuresis, which can be due to CSW, SIADH, hypothyroidism, adrenal insufficiency, osmotic diuresis, use of diuretics, and renal failure. Cerebral vasospasm remains one of the major threats to patients with aneurysmal SAH and natriuresis make them prone for delayed cerebral infarction.

CSW and SIADH have been reported to occur in cerebral pathologies, but the distinction between them is imperative because the treatment is just the opposite. A retrospective review of data for 316 patients who presented with SAH and hyponatremia found that the diagnosis was SIADH in 69% and CSW in 6.5%. SIADH is characterized by normal to high extracellular fluid volume, high urinary sodium levels (>40 mEq/L), high urine osmolality, low serum osmolality, low to normal BUN/creatinine ratio, normal to high CVP, and normal BNP levels. If CSW syndrome is misdiagnosed as SIADH and treated with fluid restriction, there is a risk of hemoconcentration and hypotension leading to decreased cerebral perfusion and vasospasm. Furthermore, if not corrected early, it may induce cerebral edema and increased intracranial pressure due to low osmolality.
Our patient had clinical features suggestive of CSW like hyponatremia associated with hypovolemia, elevated urea, increased urinary sodium, and increased urinary osmolality. He developed neurologic deficit simultaneously with hyponatremia and natriuresis. He rapidly responded to volume replacement with colloids and sodium rich fluids. Whether the cerebral ischemia led to the development of CSW or CSW preceeded the onset of the infarct is a matter of debate. However, our prompt exclusion of SIADH as the cause of hyponatremia prevented the patient from deterioration, and the infarcts were patchy and resolved quickly. Fluid restriction, which is the treatment for SIADH would have been disastrous.

The appropriate treatment for CSW syndrome includes maintaining the body fluid volume and electrolyte concentration. Corticosteroids (like fludrocortisone) are also recommended for the treatment of CSW syndrome but were not used in this case. Corticosteroids act on the distal tubule of the kidney, thereby directly increasing the sodium absorption. However, they should be used judiciously as there is a risk of fatal side effects such as hypertension, hypocalcemia, and pulmonary edema.

The patient had normal urine output at the onset of CSW, which was slightly awkward. Serum levels of ANP, BNP were not done, in this case, which could have further confirmed the diagnosis. Fractional excretion of uric acid, which improves after hyponatremia, correction in SIADH unlike CSW could have been done to substantiate the diagnosis.

**CONCLUSION**

We like to convey that: (1) Hyponatremia might herald or coincide with the onset of cerebral infarction after surgery for aneurysmal SAH and can manifest even a week later, and (2) CSW is an important cause of hyponatremia, which has to be differentiated from SIADH.

**REFERENCES**

A Case Report of a Perforated Postpartum Intrauterine Contraceptive Device and Review of Literature

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Abstract

Uterine perforation is the most serious complication associated with an intrauterine contraceptive device. Perforation of the uterus by an intrauterine contraceptive device inserted in the immediate postpartum period has rarely been reported. The thick uterine wall in the postpartum period is thought to prevent perforation. However, hypoestrogenemia in the postpartum period, uterine involution, the softness of the postpartum uterus, breastfeeding may predispose to uterine perforation in the postpartum period though the insertion is by skilled operators. Migration of intrauterine contraceptive device through a path of lesser resistance is an area for concern. We report a case of partial perforation of Cu T380A placed during cesarean delivery.

Key words: Intrauterine contraceptive device, Perforation, Postpartum

INTRODUCTION

Provision of intrauterine contraceptive device in the immediate postpartum period offers an effective and safe method for spacing and limiting births. The postpartum intrauterine contraceptive device can be placed immediately following delivery of the placenta, during cesarean section or within 48 h following childbirth. Expulsion rates for postpartum intrauterine contraceptive device vary from 3% to 37%. In general, the expulsion rates for postpartum intrauterine contraceptive device range 10-14%.

Perforation of the uterus with postpartum intrauterine contraceptive device has not been reported so far. The thickness of the uterine wall in the postpartum period is thought to prevent perforation. A review of 3029 cases of postpartum intrauterine contraceptive device in Paraguay from 2000 to 2009 showed 0.0% perforation rate and 1.4% spontaneous expulsion rate. The natural history of intrauterine device translocation following any type of uterine perforation is not well-understood and likely depends on a number of factors such as the type of intrauterine device, uterine morphology, the presence and location of leiomyomata, and the mechanics at the given insertion event. The risk of perforation is greatest during the 12 weeks after giving birth and while the patient is lactating. Caliskan et al. reported that post-placental insertion and insertion after 6 months postpartum were found not to increase the risk of uterine perforation. However, insertions 0-6 months postpartum increased the risk of uterine perforation. Kapp and Curtis concluded that post-placental placements during cesarean delivery are associated with lower expulsion rates than post-placental vaginal insertions without increasing rates of postoperative complications. Whether this relates to assurance of high fundal placement or to less cervical dilatation is unclear. Shukla et al. in a 5 year experience with postpartum intrauterine contraceptive device at a tertiary care center involving 1317 women reported no cases of perforation or misplaced intrauterine contraceptive device. The EURAS - intrauterine device study from 6 countries found that breastfeeding at the time of insertion was associated with a six-fold increase in uterine perforation and the risk was also more, if the women were up to 36 weeks postpartum at the time of insertion. Both Andersson and
Van Houdenhoven et al., have discussed the role of uterine involution and increased uterine contractility as potential contributing factors to intrauterine perforation occurring in the postpartum period. We report a case of partial perforation of Cu T380A placed during cesarean delivery.

CASE REPORT

A 20-year-old primigravida underwent an elective cesarean section in May 2014 for cephalopelvic disproportion with pregnancy induced hypertension. A term male child with birth weight 3.0 kg was delivered. CopperT 380A was inserted after delivery of the placenta after taking consent from the patient. She was discharged on the seventh postoperative day in good condition with advice to return after 6 weeks for review. She returned to her hometown and did not come for a follow-up visit. A total of 8 months following the cesarean section patient developed pain abdomen and went to a practicing gynecologist in her hometown. An ultrasonogram performed there showed the intrauterine contraceptive device perforating the myometrium up to the serosa and was referred to our tertiary care center for hysteroscopic removal. The patient attended our center 1½ months after being referred with persisting pain abdomen. On examination, there was tenderness in the suprapubic region. The threads of the CopperT were not visualized, and there was tenderness in the fornices. Repeat ultrasound showed intrauterine contraceptive device within the uterine cavity. The short limb of the CopperT was in alignment within the uterine cavity, and long limb of CopperT was oriented horizontally perpendicular to short limb and appeared to be coursing through myometrium up to the level of serosal lining. Possibilities included myometrial perforation and long limb at left cornu of the uterus (Figure 1).

After taking consent, the patient was posted for hysteroscopic removal of the intrauterine contraceptive device. On hysteroscopy, the CopperT was seen to be inverted with the short arms pointing downward, and the long limb deeply embedded in the myometrium at the fundus (Figure 2). The CopperT was removed and shown to the patient. The patient was discharged in good condition on the same day.

DISCUSSION

Insertion of an intrauterine device immediately after delivery is appealing for several reasons. The woman is known not to be pregnant, her motivation for contraception may be high, and the setting may be convenient for both the woman and her provider and does not affect breastfeeding. Uterine perforation is the most serious complication associated with the use of an intrauterine contraceptive device. Perforations may be partial with some portion of the device remaining within the endometrial cavity or complete with the device passing wholly into the peritoneal cavity (Figure 3). The frequency of uterine perforation with an intrauterine contraceptive device is estimated to be around 1.2 per 1000 insertions. Postpartum period <6 months, lactation, and amenorrhea may increase the risk of perforation. The World Health Organization (2009) recommends the intrauterine contraceptive device to be started after 4 weeks postpartum. Patients with the perforated intrauterine contraceptive device may be wholly asymptomatic or report with abdominal pain, abnormal vaginal bleeding or pregnancy. Most experts today advice removal of any perforated intrauterine contraceptive device. A missing intrauterine contraceptive device string should raise suspicion for this complication. Real-time transvaginal ultrasonography is the initial diagnostic modality. If the intrauterine contraceptive device is in the uterus and removal desired this may be done by using ultrasound guidance with the patient under paracervical anesthesia. If unsuccessful operative hysteroscopy should be undertaken. If no intrauterine contraceptive device is seen within the uterus on ultrasonography X-rays of the abdomen and pelvis should be obtained. Two to three different views should be used for optimal localization. Computerized tomography and magnetic resonance

Figure 1: (a-c) Ultra-sonogram pictures of the perforated misplaced intrauterine contraceptive device
imaging are other useful diagnostic modalities. If the intrauterine contraceptive device is deeply embedded into the myometrium or present within the peritoneal cavity operative laparoscopy is indicated for its removal. In certain cases, a combination of hysteroscopy and laparoscopy and rarely fluoroscopy will be required for localization and removal of the ectopic intrauterine contraceptive device. Efforts should be made to protect and confirm that all vital structures of the abdomen and pelvis are without injury following all but the most straightforward operative intrauterine contraceptive device retrievals.

CONCLUSION

Clinicians and patients should carefully weigh the benefits and risks of intrauterine contraceptive device insertions during the postpartum period. A follow-up examination 4-12 weeks after insertion is recommended to ensure correct positioning. Various outcomes associated with insertion of the intrauterine contraceptive device at the time of cesarean section can be another useful area for further research.

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Perforating Hydatidiform Mole at 8 Weeks of Gestation: A Surgical Emergency

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Abstract

Gestational trophoblastic neoplasms include the tumor spectrum of hydatidiform mole (complete and partial), invasive mole (chorioadenoma destruens), placental site trophoblastic tumor, and choriocarcinoma. Hydatidiform mole is the most common, and its incidence varies worldwide from 1 in 125 deliveries in Mexico and Taiwan to 1 in 1500 deliveries in the US. It is common in women under 20 and over 40 of age, belonging to low socio-economic status, and having nutritionally deficient diets. Invasive mole is reported in 10-15% of women who have had primary molar pregnancy. Although considered benign, invasive mole is locally invasive and may produce distant metastases. It may totally invade the myometrium and be associated with uterine rupture and hemoperitoneum. The microscopic findings are the same as in hydatidiform mole. It is common to see a perforating mole when a molar pregnancy has not been detected and evacuated early but perforating mole at 8 weeks of gestation is very rare. As perforating mole leads to rupture of uterus and hemoperitoneum, which is life-threatening to the patient, emergency laparotomy is mandatory as a therapeutic procedure. We report a case of molar pregnancy of 8 weeks gestation in a woman who presented with hemoperitoneum and shock requiring laparotomy.

Keywords: Hemoperitoneum, molar pregnancy, shock

INTRODUCTION

Abnormal uterine bleeding, usually during the first trimester, is the most common symptom, occurring in over 90% of patients with molar pregnancies. Three-fourths of patients with bleeding have this symptom before the end of the 3rd month of pregnancy. Only one third have profuse vaginal bleeding. Excessive nausea and vomiting is reported to occur in 14-32% patients, whereas 10% patients present with hyperemesis gravidarum. Pre eclampsia in the first trimester or early second trimester has been said to be pathognomonic of hydatidiform mole, although it occurs in only 10-12% of these patients. Hyperthyroidism occurs in 10% of patients, whereas almost half of them have an excessive uterine size for gestational date. Multiple theca lutein cysts causing enlargement of one or both ovaries occurs in 15-30% of women with molar pregnancies. These cysts regress once the mole is evacuated, and regression usually parallels the decline of beta-human chorionic gonadotropins (B-HCG) levels. Operation is indicated only if rupture and hemorrhage occur or if the enlarged ovaries get infected.

The clinical presentation as an acute abdomen in patients with molar pregnancy may be usually due to invasive mole or choriocarcinoma.¹ As uterine perforation leads to hemoperitoneum due to internal hemorrhage leading to irreversible shock and subsequent morbidity and mortality, prompt diagnosis and treatment is needed.¹,²

In the present case, the woman presented with acute abdomen, tense abdomen with the loss of contour of uterus on ultrasound and with features of shock but only 8 weeks of amenorrhea. Accurate diagnosis and subsequent emergency management saved the woman from this potentially fatal complication.
CASE REPORT

A 22-year-old woman was referred from a district hospital on the early morning of July 28, 2012 as a case of hydatidiform mole with pain in the abdomen since the past 2-3 h. She was married for the past 6 years, had 2 pregnancies but has only 1 live child, the first pregnancy, the second pregnancy ended in an infant death. Both were home deliveries with no known complications. This pregnancy was the 3rd which she conceived after 1-year of the last childbirth. The eldest child was 5-year-old whom she conceived within 1-year of her marriage. She had amenorrhea of 2 months (Last menstrual period was on 25-5-2012), it was 9th week of gestation. She had no history of bleeding per vaginum or passage of vesicles. There was no suggestive family or past history. No history of any surgeries in the past including dilatation and curettage. On examination, she had a severe degree of pallor, afebrile, feeble pulse, blood pressure - 100/70 mmhg. Abdominal examination revealed 14 weeks size mass with tense abdomen, size of uterus was confirmed by bimanual examination. Urgent ultrasound in the emergency ward revealed molar pregnancy with ill-defined left lateral wall of the uterus and moderate fluid in the peritoneal cavity, may be ascites or possibility of rupture had to be considered.

Serological investigations

Investigations revealed:
Hemoglobin: 5.5 g%
Platelets: 3.2 lakhs
Bleeding time: 2 min 18 sec
Clotting time: 3 min 30 sec
Random blood sugar: 84 mg%
Renal parameters:
Blood urea: 40 mg%
Serum creatinine: 0.9 mg%
Serum electrolytes:
Sodium: 136 mEq/l
Potassium: 3.5 mEq/l
Chloride: 103 mEq/l
HIV: Non-reactive

Laparotomy under general anesthesia was done using sub umbilical midline incision.

Laparotomy findings

Hemoperitoneum of about 2 L, uterus of the size of 18 weeks, 2 sites of perforation on the uterus one anterior surface of uterus below the attachment of round ligaments with vesicles protruding out and another on posterior surface of uterus with vesicles protruding, myometrium was thinned out on the anterior and left lateral side of the fundus of the uterus (Figure 1).

Right ovary was healthy, left ovary was hemorrhagic and cystic. Subtotal hysterectomy with left-sided oophorectomy was done. Total blood loss was estimated to be 4 L, 3 units of cross-matched A +ve blood was transfused pre-operatively, 2 units intraoperatively, and 5 units postoperatively. Totally, 10 units of cross-matched blood were transfused. Her post-operative period was uneventful, and she was discharged on the 21st day, after checking her hemoglobin which was 10 g% and B-HCG, which was 19.8 mIU/mL (Figure 2).

She was followed-up up to December 2013 and had no complications whatsoever.

DISCUSSION

Hydatidiform mole is abnormal pregnancy which should be evacuated as soon as possible, and follow-up is most important. Invasive mole may totally penetrate the myometrium and be associated with uterine rupture and
Bilateral cystic ovaries are seen in about half of the cases, but surgery is indicated only if there is rupture and hemorrhage. Differential diagnosis of molar is from normal pregnancy which can be confirmed by ultrasound and B-HCG levels. In normal pregnancy, B-HCG values are below 60,000 mIU/ml.

CONCLUSION

Emergency laparotomy helps in saving the life of the patient presenting with perforating mole. If we diagnose it early and evacuate early, we can prevent the patient from landing up in a life-threatening complication. Therefore, I insist that all women should have an early scan almost mandatory at 5-6 weeks of gestation. In this case, the woman had an ultrasound only after she developed symptoms of an abdominal catastrophe. Had she been diagnosed earlier she would not have had to lose her uterus. The more dreaded complication of lung infiltration by the trophoblastic tissue is however not seen in this patient but there is a 15-20% chance of lung involvement, which either regresses completely after evacuation or responds to chemotherapy single or multiple agent.  

REFERENCES

A Unique Case of Appendicular Leiomyoma: Usual Lesion in an Unusual Site

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INTRODUCTION

Most appendicular neoplasm in adults are carcinoid tumors.¹ Benign tumors including leiomyoma are extremely rare. Ultrasonography is a useful aid in the diagnosis of appendicitis,² but the sonographic appearance of appendicular leiomyoma is poorly documented and, therefore, it is impossible to diagnose it preoperatively. This is the reason most of the diagnosis is only established after the surgery. Growth and proliferation of smooth muscle tissue in women coincide with estrogenic stimulation. Children rarely develop these tumors.³,⁴ Here, we present a rare case of typical appendicular leiomyoma in a 45-year-old female patient with hemangioma in the liver.

CASE REPORT

A 45-year-old female with the unremarkable past history presented in the surgery clinic for evaluation of the abdominal pain since 2 months. There was no history of trauma or accident. Underwent tubectomy 8 years back, with a menstrual history suggestive of perimenopause. On surgical examination, tender mass in the right iliac fossa was identified. Underwent tubectomy 8 years back, with a menstrual history suggestive of perimenopause. On surgical examination, tender mass in the right iliac fossa was identified. On surgical examination, tender mass in the right iliac fossa was identified. The sono-graphy revealed hemangioma in segment vii of liver measuring 1.7 cm diameter and non-compressible appendix, surrounded by a hypoechoic thickened wall more than 2 mm in diameter. The clinical and radiological diagnosis of recurrent appendicitis with hemangioma of liver was made and the patient underwent appendicectomy.

The gross pathologic examination revealed a 1.5 cm circumscribed lobulated gray tan mucoid mass arising within the body wall of the appendix, not involving the base or tip (Figure 1). Microscopically, the tumor was composed of fusiform cells with long processes and nuclei with blunted ends, interdigitate with those of the lamina muscularis propria (Figure 2). The mucosa had apparently suffered pressure atrophy to the extent shown in the illustration (Figure 3). On the basis of the characteristic morphologic findings, the diagnosis of appendicular leiomyoma was rendered. At the last follow-up, the patient was well.

DISCUSSION

Leiomyomas of the uterus are the most common benign tumors of smooth muscle origin, but they arise in any...
Patient presents with pain abdomen and vomiting with tenderness in the lower abdomen. The reported age range includes 2 years child to those older than 60 years. In our case, patient had appendicular mass as well hemangioma of the liver which was noticed accidently while scanning. Estrogens have known growth stimulatory effects on the vasculature and most hemangiomas demonstrate estrogen receptors. In view of this, hyperestrinism in perimenopausal women could be the causes for the development of hemangioma and leiomyoma. In our case, after appendicectomy, the patient had an uneventful post-operative phase and was discharged 8 days after the operation.

**Histo-pathology**

On gross examination, body of the appendix was bulging. Histology showed a small leiomyoma in the submucosa. There were no inflammatory exudates in the lumen. The adjacent appendicular parenchyma is otherwise unremarkable.

The term “gastrointestinal stromal tumor” has become increasingly popular for variety of mesenchymal tumors, including smooth muscle tumors, spindle cell tumors with possible neural differentiation. Diagnostic criteria to distinguish leiomyoma from leiomyosarcoma which is highly aggressive depend on patient gender and anatomic site. Most leiomyoma arise in females, bland looking lesions with fewer than 10 mitosis per 50 hpf, located in the uterus, retroperitoneum, and extremities appear to be benign. Such lesions are commonly positive for estrogen and progesterone receptors and appear to have considerable similarities to gastrointestinal leiomyomas. As yet, there are insufficient data concerning comparable retroperitoneal lesions in males, and a diagnosis of leiomyoma in these setting should be made only with extreme caution.

**CONCLUSION**

Leiomyoma of the appendix is a very rare benign tumor. Clinical appearance and diagnostic exams are usually not sufficient for the definite diagnosis and require a histopathological examination. However, if the surgeons and pathologists are aware of it; conservative surgical treatment would protect the patient from dangers like complete obliteration of the appendicular lumen and tumor progression.

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Colocutaneous Fistula and Colonic Perforation: An Uncommon Case

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Colonic complications of severe pancreatitis occur very rarely. Although pancreatic complications such as pancreatic abscess, pseudocyst occurs in many patients, but colonic complications due to pancreatitis were 1%.¹² We report an unusual case of colocutaneous fistula and colonic perforation due to acute necrotizing pancreatitis. Pancreatic necroses with colonic complication were rare and early recognition and prompt treatment will reduce mortality.³

A 27-year-old male patient who is known alcoholic and smoker for 10 years duration admitted with complaints of abdominal pain for 1-month duration, more on epigastric region, radiating to back associated with history of nausea and vomiting for 10 days duration. Abdominal examination shows mild abdominal distension. On palpation tenderness present more on epigastric and right hypochondrial region. Free fluid was present. On auscultation, bowel sound was sluggish. The patient was diagnosed and treated for acute pancreatitis. During the course of the treatment, the patient developed bleeding per rectum for 4 days duration associated with increased abdominal distension and swelling in the right iliac fossa region for 2 days duration and ruptured on the next day.

Investigation showed anemia with leukocytosis. Mildly elevated liver function test. Renal function test showed hypokalemia. C-reactive protein was positive. Serum amylase and lipase were 896 U/L and 432 U/L, respectively. Contrast enhancing computed tomography Abdomen showed acute pancreatic necrosis with free fluid. Lesser sac collection with air pockets with appears to be communicating with colonic loops (Figures 1a and b). Upper gastrointestinal (GI) endoscopy showed an extrinsic impression on the greater curvature of the stomach and colonoscopy showed colonic perforation in the level of the transverse colon (Figure 2). The patient was diagnosed as acute necrotizing pancreatitis with colocutaneous fistula with colonic perforation. The patient was undergone laparotomy with transperitoneal necrosectomy with
diversion loop ileostomy. Postoperatively patient recovered well, except mild wound infection (Figure 3).

**Points to Ponder**
- Infected or necrotizing pancreatitis should be managed surgically as early as possible. This approach improves both morbidity and mortality due to pancreatitis related complications.
- Patient were diagnosed as pancreatitis presenting with upper GI or lower GI bleeding symptoms; it is always mandatory to do an upper GI endoscopy or colonoscopy to diagnose perforation or fistula formation due to pancreatitis related complications.

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