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REVIEW ARTICLE

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Original Article

Surgical Apgar Score - A Simple Prognostic Tool in Surgery

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Abstract

Introduction: In today's era cost of health care is of growing importance and it is important to recognize patients at increased risk of post-operative morbidity and mortality and to find interventions to reduce the risk. Hence, there is a need of an objective prognostic tool to assess the post-operative outcome of patients, than the subjective gut feeling of surgeons. The surgical Apgar score (SAS) is a simple score that uses intraoperative information on hemodynamics and blood loss of patient to predict post-operative morbidity and mortality. Score on a scale of 0-10 calculated from three parameters collected during the operative procedure, lowest heart rate (HR), lowest mean arterial pressure (MAP), and estimated blood loss.

Materials and Methods: It is an 18 months prospective study done in St. Martha's Hospital, Bengaluru. Emergency and elective major cases were included in this study. SAS calculated based on intraoperative parameters lowest MAP, lowest HR, and amount of blood loss.

Results: A total of 100 patients studied, age ranged from 18 to 70 years. 61 elective and 39 emergency surgeries, the majority were gastrointestinal surgeries. SAS was significantly associated with post-operative morbidity and mortality within 30 days ($P < 0.001$). Of 100 patients, 30 had SAS 4 or less. Complications noted in 16 out of 30 patients. By comparison among 5 patients with SAS 9 or 10 none experienced complications.

Conclusion: SAS is a simple prognostic tool for assessing post-operative outcome in general surgical patients.

Key words: Estimated blood loss, Mean arterial pressure, Surgical Apgar score

INTRODUCTION

The surgical Apgar score (SAS) is a simple score that uses intraoperative information on hemodynamic and blood loss to predict post-operative morbidity and mortality score on a scale of 0-10 calculated from three parameters collected during the operative procedure.[1]

1. Lowest heart rate (HR)
2. Lowest mean arterial pressure (MAP)
3. Estimated blood loss (EBL).

Post-operative morbidity and mortality reduction is the basic aim of any surgical procedure. The key to reduce post-operative morbidity and mortality is by effective perioperative management of patients for which objective assessment of the patient is needed, which can be assessed with the risk scoring system. Risk scoring seeks to quantify a patient's risk of adverse outcome based on the severity of illness derived from data available at an early stage of hospital stay. Ideally, risk-scoring systems should provide objectivity and mortality prediction enabling communication and understanding of the severity of illness. The possible outcome of surgical operation is needed to ensure appropriate resource allocation and for the evolution of more effective treatment regimens and also enable informed decision making by the recipient.

Surgeons have a need for predictive tools to assess perioperative risk. Several algorithms have been used or developed for risk stratification such as the American Society of Anesthesiologists Physical Status classification system (ASA classification),[2-4] the physiologic and operative severity score for enumeration of mortality and morbidity (POSSUM),[5,6] the Acute Physiology and Chronic Health

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Evaluation (APACHE),[1] and the simplified acute physiology score (SAPS).[5,6] However, each of these systems has limitations and restricted uses. The ASA classification was initially intended as a means to stratify a patient's systemic illness but not post-operative risk. Although the ASA classification has proved to be a predictive pre-operative risk factor in mortality models, its subjective nature and inconsistent scoring between providers make it less than ideal for performing evidence-based post-operative risk calculation. The POSSUM, APACHE, and SAPS and their later derivations (Portsmouth POSSUM, colorectal POSSUM, APACHE II and III, and SAPS II) are more accurate and objective predictive algorithms, but not all of the variables needed are easily and consistently attainable in an operating room setting, making them more practical in their initially intended role as critical care auditing tools rather than predictive tools.[7-9]

The SAS because of its availability in real time, simplicity, inexpensively collected in any hospital, and immediately usable for clinical decision has made it a powerful tool for broad safety improvement in surgery. SAS provides a readily available "Snapshot" of how an operation went by rating the condition of a patient after surgery from 0 (indicating heavy blood loss, hypotension, and an elevated HR or asystole) to 10 (indicating minimal blood loss, normal blood pressure, and a physiologically low to normal HR).

MATERIALS AND METHODS

This is a prospective study was undertaken at St. Martha's Hospital over a period of 18-month, sample size 100 patients.

Study Endpoint

The patient follow-up was up to the 30th post-operative day after surgery.

Inclusion Criteria

1. Age-18-70 years
2. Elective or emergency surgeries requiring intensive perioperative monitoring
3. Outpatient follow-up required
4. ASA class two and above.

Exclusion Criteria

1. Comorbid condition like ischemic heart disease, patients on beta blockers, etc.,
2. Surgeries under local anesthesia.

Methodology

Using EBL, lowest HR, and lowest MAP during the surgical procedure, the SAS is calculated (Figure 1).[1-3] (occurrence of pathologic bradyarrhythmia, including sinus arrest, atrioventricular block or dissociation, junctional or ventricular escape rhythms, asystole, and also receives 0 points for lowest HR). Scores are categorized into 0-4, 5-7, 8-10 for simplicity

Data such as lowest HR and lowest MAPs are noted intraoperatively are collected from an anesthesiologist's records (manual/electronic).

Blood loss is calculated using the formula:[10]

Blood loss = EBV × $(HB_i - HB_f) \div \{(HB_i + HB_f)/2\} + \{500 \times Tu\}$ where,

EBV = Estimated blood volume (body weight in kgs × 70 ml/kg)

HB_i = Pre-operative hemoglobin (g/dl),
HB_f = Post-operative hemoglobin (g/dl) around 24 h after surgery
Tu = Sum of whole blood, packed red blood cell transfused.

Note: 500 constant changes according to hospital blood bank protocols.

Patients are followed up for the occurrence of any major complications or deaths within 30 days of surgery. The following events are considered major complications: Acute renal failure, bleeding that requires a transfusion of 4 U or more of red blood cells within 72 h after surgery, cardiac arrest requiring cardiopulmonary resuscitation, coma of 24 h or longer, deep vein thrombosis, myocardial infarction, unplanned intubation, ventilator use for 48 h or more, pneumonia, pulmonary embolism, stroke, wound disruption, deep or organ-space surgical site infection, sepsis, septic shock, systemic inflammatory response syndrome, and vascular graft failure. All deaths are assumed to include major complications.[11] Superficial surgical site infection and urinary tract infection are not considered major complications.[11] Other occurrences that involve complications of Clavien Class III and greater (those that require surgical, endoscopic, or radiological intervention or intensive care admission or are life threatening) are also considered major complications.[2]

The occurrence of major complications and mortality within 30 days postoperatively was based on follow-up data in admitting ward and surgical outpatient clinic notes. Major complications definitions were according national confidential enquiry into patient outcome and death classification.[12,13] Patients were subsequently grouped into three categories based on their SAS for purposes of risk stratification. Thus,

- Risk group: Surgical Apgar score
- High: 0-4
- Medium: 5-7
- Low: 8-10.

RESULTS

A total of 100 patients studied, 42/females and 58/males, 61 were elective surgeries, and 39 were emergency.

Most of the surgeries were gastrointestinal surgeries; open/laparoscopic.

- A total of 21 complications were seen (3 deaths and 18 major complications)
- Out of 18 major complications, 15 were observed in patients operated on emergency basis while 3 were seen in an elective case
- Of the 18 major complications:
  a. 9 had deep wound infection
  b. 7 had pneumonia
  c. 1 had sepsis
  d. 1 on prolonged ventilator.

DISCUSSION

In this study, 100 patients were included. There was male predominance noted with 58% male and 42% female. Most patients were between 40 and 50 years of age (27%) mean age 42.8 years. The youngest patient was (18) years old and oldest was 70 years old and distribution of surgical apgar score as shown in Table 1. In the study by Regenbogen *et al.*[2] (2009), the mean age was 64.2 years. Gawande *et al.*[1] (2007) had a patient population with a mean age of 63.6 years.

In this study, 61% surgeries were elective in nature and 39% surgeries emergency. The most common indication for surgery was cholecystectomy (27%) as an elective while appendectomy (17%) as emergency procedure. The timing of most surgeries was elective. The majority of the emergency surgeries were operated within 2-3 h after admission. A study on emergency surgical admission by Capewell showed that 46-57% of all surgical admissions are emergency in nature.[14] The general anesthesia was the most common form of anesthesia.

Most common comorbidities noted were diabetes mellitus followed by hypertension and obesity and were significantly associated with post-operative morbidity and mortality.

In this study, (18%) morbidity and (3%) 30 days mortality was noted, (79%) patient's made an uneventful recovery. Wound infection was most frequent morbidity noted, followed by pneumonia. Similarly, in the study by Regenbogen *et al.*[3] in patients undergoing laparotomy for gastrectomy or colectomy the mortality was 5.2%. Gawande *et al.*[1] observed a mortality rate of 4% in patients undergoing colectomy.

The majority of complications were noted in age group >60 years. 42% (8 out of 19) patients in age group >60 had low Apgar score of <4. Only 5.5% (4 out of 72) in the younger group of <50 years have low Apgar score of <4. Moreover, all patients with higher SAS (9-10) belong to <60 years group. A study by Gawande *et al.*[1] showed significantly high rate of major complications of 16% with a mean age of 64.2 years. Emergency surgery in aged carries a higher morbidity and mortality than elective surgery.[15] In the study by Regenbogen *et al.*,[2,3] patients with scores between 0 and 4 had complication rates of 54-75% while those with scores of 7-10 had rates of 5-13%. This demonstrates the ability of the SAS in identifying patients

Table 1: SAS distribution in patients studied

SAS	Gender		Total
	Female (%)	Male (%)	
0-4	10 (23.8)	20 (34.5)	30 (30)
5-7	19 (45.2)	25 (43.1)	44 (44)
8-10	13 (31)	13 (22.4)	26 (26)
Total	42 (100)	58 (100)	100 (100)

44% patients showed SAS between 5 and 7 while 30% between 0 and 4.
SAS: Surgical Apgar score

Table 2: Post-operative complications in patients studied

Post-operative complications	Gender		Total (*n*=100)
	Female (*n*=42)	Male (*n*=58)	
Wound infection	2 (4.8)	7 (12.1)	9 (9)
Pneumonia	4 (11.9)	3 (5.2%)	7 (8)
Ventilator	0 (0)	1 (1.7)	1 (2)
Sepsis	0 (0)	1 (1.7)	1 (1)
Uneventful	38 (83.3)	46 (79.3)	84 (80)
Total	42 (100)	58 (100)	100 (100)

Total 18 complications were observed out of which wound infection and pneumonia were predominant

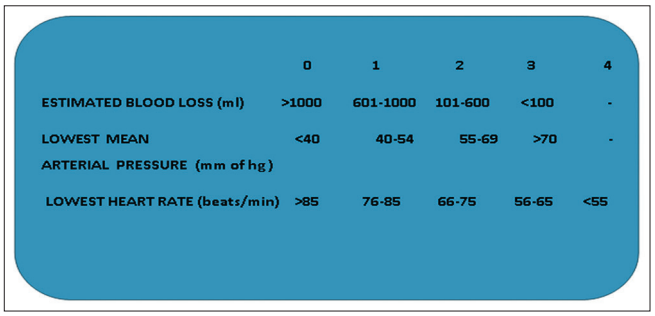
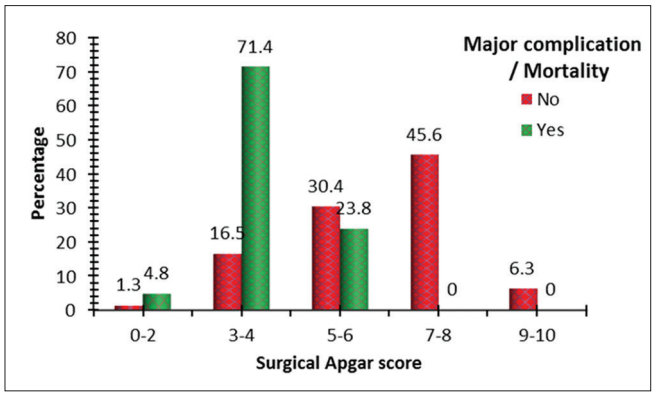


Figure 1: Surgical Apgar score



Graph 1: Surgical Apgar score in relation to major complications and mortality. *P* < 0.001, significant, Fisher exact test. As the surgical Apgar score decreases more complications and death seen

at higher than average risk of major post-operative complications.

Most common complication noted in this study (Table 2) was deep wound infection followed by pneumonia. Prolonged ventilator and sepsis are other complications. Three mortality noted out of three-two deaths secondary to septic shock and one secondary to cardiopulmonary arrest.

Of the 100 patients, there was (3%) 30 days mortality and (18%) major complications and (79%) no complication. The difference in surgical outcome between patients in different score group was also statistically significant. Among the patient with SAS 0-4, major complications occurred in (50%) 15 out of 29 patients and 30 days mortality in (10.3%). In contrast patients with SAS of >8 no major complications or mortality seen. A study by Regenbogen *et al.*[2] showed among major surgeries, patient with score of 4 or less were 6.5 times more likely to have major complications (95% confidence interval [CI], 4.7-8.9, $P < 0.001$), Moreover, 112 times more likely to die within 30 days of surgery.

It was also noted that in every 2 point score category the incidence of both major complications and death was significantly greater than that of patients in next higher category (Graph 1). A similar result with relative risk of major complications among low scored operations was 16.1 (95% CI, 7.7-34, $P < 0.0001$), compared with those in high scored operations was noted in a study by Gawande *et al.*[1]

The long duration of surgery as a factor in the occurrence of major complication as has been established in most studies on the SAS.[16,17] This may be a reflection complexity of surgery necessitated by possibly extensive disease. However, long duration surgery was not associated with a lower mean SAS in our study.

The burgeoning literature on the SAS also identifies potential weakness of the scoring system. For example, calculation of the score relies on EBL, which critics have often tagged as imprecise. However, the previous studies have shown that the broad categories used to calculate the amount of blood loss (0-100 ml, 101-600 ml, 60-1000 ml, >1000 ml) are easily within observers' range of precision.[18,19] Another hypothetical weakness lies in the fact that intraoperative hemodynamics maybe affected by anesthetic medications and interventions such as induction and intubation, and therefore, alter the computation of the SAS. For example, a transient episode of hypotension associated with anesthetic induction would be treated the same as prolonged hypotension and resulting a lower (worse) SAS. On the other hand, a transient bradycardic episode would contribute to a higher (better) score. Nevertheless, several studies demonstrate that persistent HR elevation and hypotension are strongly associated with poorer outcomes, regardless of their cause.[18,20] Finally, other potentially predictive perioperative variables such as coronary artery disease, volume of intravenous fluids administered, patient age, surgical time, functional status, renal function, and chronic steroid use are excluded from the SAS. The exclusion of these potentially predictive pre-operative risk factors could be interpreted as a weakness of the score. The prevalence of cardiovascular disease increases with age. Unfortunately, this is the same age group in which the largest number of surgical procedures is performed. However as previously mentioned, an important aspect of the usefulness of the SAS is its simplicity.

CONCLUSION

The SAS shows how intraoperative events affect post-operative outcomes. Calculating the SAS in the operating theater provides immediate, reliable, real-time feedback information about patient post-operative risk. Strengths of the SAS include the ability to calculate the score quickly and objectively. The provider could then anticipate the need for further or more aggressive interventions. Ultimately, the score may also prove useful in guiding preventive strategies such as optimizing intraoperative HR or blood pressure.

The SAS could be incorporated into electronic documentation packages for real-time calculation either during or at the end of surgery, providing an automated warning to clinicians. This prognostic value may alert the provider that additional diagnostic testing, further resuscitation, or more intensive monitoring is indicated.

1. The SAS is strongly associated with clinical decisions regarding immediate intensive care unit (ICU) admission after high-risk surgery.
2. The SAS, despite using simple and widely available intraoperative parameters, is adequate in stratification of post-operative risk of major complications following major surgery.
3. For patients with scores ≥7, very few complications noted hence can consider usual care. The patients with a score of 6 or less are high risk for major complication, and patients with a score of 4 or less are very high risk and should be considered at high risk of decompensation and monitored very closely, often in an ICU setting. It may also be useful to make nursing staff aware of these patients who are particularly high risk, so the care team can be notified early of any signs of decompensation.
4. Patients with comorbidities such as diabetes mellitus, hypertension, and anemia found to have a higher risk of complications.
5. Complication rates are higher in emergency surgeries as compared to elective surgeries.
6. Emergency surgery in elderly carries a higher morbidity than elective surgery, elderly should be strongly motivated to undergo elective surgery rather than put off surgery until the disease gets worse.

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Original Article

Clinical Study of Prolapse Vault – Anterior Fixation and Posterior Colpoperineoraphy

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Abstract

Introduction: The purpose of the clinical study was to assess the result whether the anterior fixation is better than posterior fixation in cases of vault prolapse for post hysterectomy patients.

Materials and Methods: Randomised prospective studies were perform in 20 cases of anterior fixation and posterior colpoperineoraphy. Technique is simple, without bleeding and reproducible with least post operative complications And the results were recorded.

Results: There were significant and marked improvement and the results after follow up of 3 years were very good. In one case we had recurrence and surgery was repeated with good results.

Conclusion: Posterior fixation for vault prolapse is standard procedure and we have achieved the results with our anterior fixation technique.

Key words: Prolapse vault, Anterior fixation, Posterior fixation, Proline suture & Posterior colpoperineoraphy.

INTRODUCTION

Vaginal vault prolapse is a condition in which the upper portion of the vagina loses its normal shape and sags or drops down into the vaginal canal or outside of the vagina[1,2]. This can occur either in conjunction with uterine prolapse or even after a hysterectomy[3].

Levels of support defects (according to DeLancey classification)-Level 1: Apical defects caused by loss of support of the uterosacral ligaments, paracolpium, and parametrium: Level II: Disruption of the normal lateral at-rachments of the midvagina; and Level III: Lower vaginal defects in the perineal body or fusion of the distal urethral to the pubic bone[4,5].

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As women live longer and healthier lives, pelvic floor disorders continue to become even more prevalent and are an important health and social issue. The lifetime risk of surgery for pelvic prolapse or incontinence has been estimated at 11%, with a reoperation rate for failure at 29%. The management of pelvic organ prolapse can be difficult because different support defects often coexist. The pelvic surgeon must be adept in the thorough evaluation and management of these issues. An understanding of the anatomy and the relationship of the vagina to surrounding structures is imperative[6,7].

The true incidence of vaginal vault prolapsed is unknown. However, there is an overall perception that the number of procedures being performed for vaginal vault prolapsed is increasing. The main goal of any procedure aimed at suspending the vaginal vault should be to suspend the vaginal vault as near as possible to its normal anatomic position. This should reapproximate the upper vaginain the midline over the levator plate[8]. Distortion of the vaginal vault, whether in an anterior or posterior direction, can lead to a recurrent prolapsed opposite the vaginal vault in a significant number of patients.

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The ultimate goal of pelvic reconstructive surgery is to restore anatomy, maintain or restore visceral function, and maintain or restore normal sexual function. It is extremely important to determine preoperatively whether lower urinary tract dysfunction, sexual dysfunction, and defecatory dysfunction exist. Urinary dysfunction may be masked in patients with advanced pelvic organ prolapsed by obstructing or kinking the urethra. Thus, reductive maneuvers aimed at simulating what surgery will accomplish should be used in the hope of identifying those patients who will require an anti incontinence procedure in conjunction with their pelvic reconstructive surgery. It is also important to initiate local estrogen therapy preoperatively in patients who have urogenital atrophy[9,10].

Many operations have been described for suspending the prolapsed vaginal vault. There is no general consensus on what is the best procedure. The procedure that the surgeon ultimately chooses is influenced by many factors, including the comfort and skill of the surgeon performing the operation, whether the prolapse is primary or recurrent, the patients age state of health, anticipated outcome, sexual activity, and overall state of the tissue. We believe it is important for the surgeon to have a variety of operative approaches available for the individual patient[11,12].

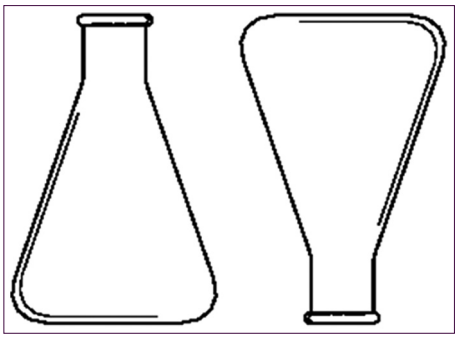
MATERIALS AND METHODS

The protocol was approved by the local Ethics committee and written informed consent was obtained from each patient.

Randomised prospective studies were perform in 20 cases of anterior fixation and posterior colpoperineoraphy in post hysterectomy patients were taken up for this study. Technique is simple, without bleeding and reproducible with least post operative complications the results were recorded. Grade I prolapse 10 cases, Grade II prolapse 7, Grade III prolapse 3 cases.

OPERATIVE TECHNIQUE

The patient is kept in modified lithotomy position and suprapubic transverse incision given. Perurethrally 16F Foleys catheter passed with 10 ml to balloon. Bladder neck is dissected and urethra with catheter was held. Sponge on stick passed vaginally and pushed right paraurethral area at vaginal vault apex. Proline 1 suture was taken bites and mesh was taken and it is suspended to periosteum retropubically. And same time it is repeated other side also. By doing this the prolapse imaginarily looks like beaker. After correction it appears like inverted beaker. The vagina is inspected and evaluated for any remaining defects. Usually a posterior colporrhaphy and a perineoplasty are also required in all cases.



RESULTS

Overall the long term results from Colpopexy have been very good. Automatically cystocele is corrected in this repair. Intraoperative complications are unusual.

DISCUSSION

DeLencey divided the support of the vagina into three levels. This concept is helpful in understanding normal anatomic, in some patients and not in others. Level I support defects are apical defects caused by loss of support of the uterosacral ligaments, paracolpium, and parametrium. Level II support defects result from disruption of the normal lateral attachment of the midvagina. Level III support defects result from defect in the perineal body or fusion of the distal urethra to the pubic bone. Although the exact indication were controversial many surgeons primarily try vaginal repair in all cases of posthysterectomy vault prolapse.

This procedure indicated due to average operative time, reproducible, in failed vaginal repairs and also in cases of fore shortened vagina.

Excellent results have been reported by us. The complications are very minimal

CONCLUSION

On the basis of our surgical technique and simplification this procedure has got advantage over posterior colpopexy in post hysterectomized patients.

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Original Article

Effects of Tobacco Chewing on Serum Lipid Profile in South Indian Population

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Abstract

Introduction: Nicotine which is an active ingredient in tobacco stimulates adrenal medulla to release catecholamine. Catecholamines activate the adenyl cyclase of adipose tissue which causes lipolysis of stored triglyceride (TG) and the release of free fatty acids into plasma.

Materials and Methods: A total of 40 healthy adult male participants were recruited in that 20 were non-chewers and 20 were chewers of tobacco. The chewers were again divided into the users of <10 years and users of more than 10 years. 5 ml of blood samples were collected and the serum was separated. The total cholesterol, TG, low-density lipoprotein (LDL), and high-density lipoprotein (HDL) were estimated by enzymatic and precipitation methods.

Results: A significant increase in the total cholesterol, LDL levels were observed in the long-term users of tobacco when compared with non-users and short-term users. However, HDL levels were similar in all the 3 groups. TGs were higher in the control group when compared with tobacco chewers.

Conclusion: Increased levels of total cholesterol and LDL could be considered as risk factors in the developing coronary heart disease. Tobacco chewing can be considered as one of the preventable risk factors of coronary heart disease.

Key words: Coronary artery disease, Lipid profile, Tobacco chewing

INTRODUCTION

Tobacco was introduced by Portuguese merchants in the 16th century and now India is one among the world's top five tobacco producers and consumers.[1] The WHO attributed 4 million tobacco-related deaths every year and is expected to raise 8.4 million deaths by 2020.[2] Various forms of smokeless tobacco products are available which include pan (piper betel leaf filled with sliced areca nut, lime, catechu, and other spices chewed with or without tobacco), pan-masala or gutkha (a chewable tobacco containing areca nut), and mishri (a powdered tobacco rubbed on the gums as toothpaste).[3]

Tobacco is pathogenetically a cholesterol-dependent risk factor and it acts synergistically with other risk factors for the causation of coronary heart disease as the cause of coronary heart disease is a multifactorial. Thus, a strong synergistic interaction exists between hyper cholesterolemia and tobacco consumption in the genesis of coronary heart disease.[4]

Nicotine is the active ingredient in tobacco.[5] Nicotine stimulates adrenal medulla to release catecholamine.[6] Catecholamines are the only hormones which effectively stimulates lipolysis in humans.[7] Tobacco smoking and its effects on lipid profile have been proved by several studies.[8,9] There are very few studies regarding the effect of tobacco chewing on lipid profile. Hence, this study is conducted to determine the effect of tobacco chewing on lipid profile.

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MATERIALS AND METHODS

This study was conducted on 40 male subjects in the age group ranging from 20 to 50 years. Twenty subjects were non-chewers of tobacco and 20 were chewers of tobacco. The chewers or tobacco users were divided into

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2 groups again. They were tobacco chewers of <10 years (9 subjects) and tobacco chewers of more than 10 years (11 subjects). Thus, there were total 3 groups - non-users, users <10 years, and users more than 10 years. Care was taken to see the average age of controls and chewers were same. All the research participants were explained about the procedures and recruited after obtaining informed consent. Subjects with multiple tobacco habits, alcoholics, liver diseases, chronic renal failure, nephrotic syndrome, hypothyroidism, diabetes mellitus, drugs (β blockers, glucocorticoids, thiazide diuretics, and lipid lowering drugs), and also with other chronic illness were excluded from the study.

About 5 ml blood samples were collected after an overnight fasting and serum was separated from the blood. The serum lipid profile was studied and the lipid levels were calculated by Freidewald's formula. Estimation of total cholesterol, triglycerides (TGs), low-density lipoprotein (LDL), and high-density lipoprotein (HDL) was done by standard methods.

RESULTS

The mean and standard deviations of total cholesterol levels of the non-users, users of <10 years and >10 years were 148.6 ± 32.63, 144.1 ± 23.84 and 169.6 ± 25.95, respectively. It is found that there is no significant difference in cholesterol values between non-users and users of <10 years. However, long-term users (<10 years) show increased cholesterol levels compared to short-term users. This may be due to the long-term effects of sustained blood nicotine values. These data are shown diagrammatically in Table 1 and Figure 1.

Serum TG levels in three groups were shown in Table 2. Remarkably non-users have higher levels than the other two groups. In fact, there is statistically significant difference between non-users and users of <10 years. This may be an incidental finding as this is a cross-sectional study.

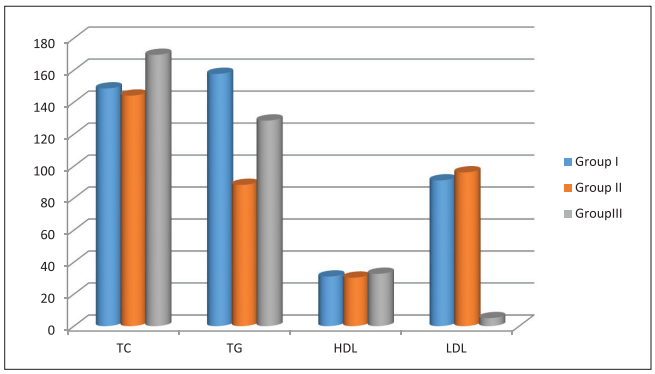

Figure 1: The parameters (triglyceride, high-density lipoprotein and low-density lipoprotein) in three groups

There seems to be no difference in the HDL cholesterols (HDL-C) of three groups, but the LDL cholesterol (LDL-C) levels seem to be increasing with chewing tobacco. There is gradual increase in the blood levels of LDL-C with the users of over 10 years showing maximum blood levels (Table 3). There is a statistically significant difference between non-users and users as well as between users of <10 years duration and the users of >10 years duration.

Table 1: Serum cholesterol levels in all three groups

Mean, SD and SE	Non users	Users <10 years	Users >10 years
Number	20	9	11
Mean	148.6	144.1	169.6
SD	32.63	23.84	25.95
SE of mean	7.30	7.95	7.83

t=2.27, P<0.02 (between users of <10 years and >10 years). SD: Standard deviation, SE: Standard error

Table 2: Serum triglyceride levels in all three groups

Mean, SD and SE	Non users	Users <10 years	Users >10 years
Number	20	9	11
Mean	157.7	88.3	128.5
SD	90.29	61.44	61.78
SE of mean	20.19	20.48	18.63

t=2.09, P<0.05 (between non-users and users of <10 years). SD: Standard deviation, SE: Standard error

Table 3: HDL-cholesterol levels

Mean, SD and SE	Non users	Users <10 years	Users >10 years
Number	20	9	11
Mean	31.0	30.3	32.7
SD	2.71	3.12	5.18
SE of mean	0.61	1.04	1.56

Not significant. SD: Standard deviation, SE: Standard error, HDL: High-density lipoprotein

Table 4: Serum LDL-cholesterol levels

Mean, SD and SE	Non users	Users <10 years	Users >10 years
Number	20	9	11
Mean	91.1	96.1	111.2
SD	28.07	12.07	13.68
SE of mean	6.28	4.02	4.12

t=2.22, P<0.05 (between non-users and users of<10 years). t=2.59, P<0.02 (between users of <10 years and users of >10 years. SD: Standard deviation, SE: Standard error, HDL: High-density lipoprotein

This proves that there is gradual increase of LDL-C levels in tobacco chewers. These data are shown diagrammatically in Figure 1 and Table 4.

DISCUSSION

Nicotine which is an active ingredient in tobacco stimulates adrenal medulla to release catecholamine. Catecholamines activate the adenyl cyclase of adipose tissue which causes lipolysis of stored TG and the release of free fatty acids (FFAs) into plasma. The released FFAs are immediately bound to plasma albumin and are then transported to various tissues of the body particularly to the liver. Hepatic TG and very LDL-C (VLDL-C) synthesis is stimulated by increased influx of FFA. The increased levels of plasma FFAs could act to depress the plasma HDL-C and increases plasma TG and VLDL-C.[1]

In this study, total serum cholesterol was higher in long-term users when compared to non-users and users of <10 years. There was no significant difference between the non-users and the users of <10 years. This could be explained as due to long-term effects of sustained blood nicotine levels. This was also recorded by other Indian workers. Khurana *et al.* and Rao and Subash observed a rise in the levels of total cholesterol, TG, LDL, and VLDL with a decrease in the HDL level in smokers and tobacco chewers, which was in concurrence with the results of this study in relation to total cholesterol and LDL levels, whereas TGs were higher in non-users than users and the levels of HDL were similar in all the groups.[4,10] Latha *et al.* administered nicotine to rats and found that the concentration of TGs increased in both serum and tissues.[11] Our study results are consistent with the above two studies with reference to total serum cholesterol.

The serum TG levels in this study, however, show a different picture. It is higher in the non-users compared to users of more than 10 years. This is perhaps an incidental finding because this is a cross-sectional study and the average age of non-users is slightly higher than users. However, the long-term users (<10 years) have higher levels of TGs compared to the short-term users (users of <10 years).

The HDL levels in the study and control groups did not show any difference. However, there was a notable gradual increase in the blood levels of LDL-C. The non-users have the lowest levels and the long-term users have the highest levels. This can be explained as one of the chronic effects of sustained blood nicotine.

CONCLUSION

With the limitations of this study, we could conclude that there is a definite impact of chewing tobacco on the serum lipid profile. Tobacco chewing causing increased total cholesterol and LDL levels in the blood serum which is harmful and may be responsible for the greater risk of developing atherosclerosis in the tobacco users than in the non-tobacco users.

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Original Article

Computed Tomography Study of Paranasal Sinuses Pathologies

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Abstract

Introduction: The application of computed tomography (CT) in the paranasal sinuses study has allowed the detail assessment of inflammation, cysts, benign, and malignant conditions. CT has increased the accuracy of patient management with a consequent decrease in morbidity and mortality. The purpose of this study is to determine the role and efficacy of CT scan in diseases of the paranasal sinus. This was the cross-sectional prospective study of 1½ years duration.

Aims and Objective: To evaluate the various pathologies affecting the paranasal sinuses on CT and study various physiological variants.

Materials and Methods: This was cross-sectional prospective study conducted at RKDF Medical College from June 2014 to December 2015. A total of 110 patients of varied age group presenting with symptoms and signs of paranasal sinus diseases were included in the study. Imaging diagnosis was confirmed either by histopathology or by positive response to treatment.

Results: In our study, paranasal sinuses pathologies were more common in male (62%) compare to female population (33%). Most common age group affected by the paranasal sinuses pathologies was 11-30 years age group (45.5%) and least common age group was less than 10 years (<2%). The most common paranasal sinuses pathologies in our study were inflammatory (60%) followed by neoplastic (33%) and miscellaneous (7%). Most commonly affected paranasal sinuses in descending order were maxillary (86%), ethmoidal (54%), frontal (31%), and sphenoidal (21%). Common anatomical variants observed in our study were deviated nasal septum (40%), concha bullosa (43%), agar nasi cells (59%), Haller cells (16%), and Onodi cells (31%).

Conclusion: CT scan depicts both soft tissue and bony details of nose and paranasal sinuses thereby accurately detect various pathologies affecting the paranasal sinuses. Various important anatomical variants can be easily detected on CT of paranasal sinuses.

Key words: Computed tomography, Histopathological diagnosis, Paranasal sinuses

INTRODUCTION

The head and neck radiology, similar to that of other subspecialties in radiology, began with the discovery of the X-ray in 1895 by Wilhelm Konrad Roentgen (1845-1923). Another early investigator was Caldwell (1870-1918), who became fascinated by X-rays only 2 years after Roentgen's discovery. In 1903, he wrote one of the first textbooks on diagnostic and therapeutic radiology. His interest in head and neck radiology is reflected by a view of the paranasal sinuses that still bears his name, "the Caldwell view," which is a depiction of the ethmoid and frontal sinuses that include both orbits. In 1914, Waters and Waldron, two British radiologists, introduced a projection that defined the paranasal sinuses and facial bones to greater advantage. At the present time, the waters view is still being used to survey sinus disease and facial fractures.

An important historic achievement occurred in 1972 with the introduction of computed tomography (CT) by Godfrey Hounsfield of Great Britain. The foundation for CT was based on mathematic equations that had been formulated in 1963 and 1964 by Cormack, a Professor of Physics at Tufts University in Boston. The development of spiral CT in the past few years has allowed a shorter examination time and thinner sections, with the capability of three-dimensional reconstruction. Most recently, multi-detector row CT with increased spatial resolution, with

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a section thickness as small as 0.5 mm and acquisition capabilities of 16 images per second, has been developed.

Diseases of paranasal sinuses are a major health problem. Most of the times physical examination is nonspecific and radiological evaluation has been relied on as an aid in confirming the diagnosis. Traditionally, plain radiographs were the modality of choice in the evaluation of paranasal sinuses. In recent years, because of technologic advancements in imaging, CT has supplanted conventional radiography as the primary diagnostic modality and has also contributed in the change in therapeutic approach. Standard plain radiographs still have a limited role in the imaging of the paranasal sinuses and are used as the initial technique before the application of CT. The refinement of CT technology has resolved the traditionally difficult problem of identifying lesions of the paranasal sinuses. It has also allowed improved accuracy in evaluating the soft tissues about the sinuses. The improvement in tissue resolution that CT offers over plain films allows evaluation of subtle changes of soft tissues, bones and air containing spaces. The ability of CT to image the bony details as well as soft tissues is the greatest advantage over previous radiographic modalities. Furthermore, coronal and axial CT scanning has dramatically improved the imaging of the anatomy of the paranasal sinus. CT excellently displays the bony architecture and its mucosal covering as well as the narrow air channels of the osteomeatal complex. CT accurately depicts the boundaries between the paranasal sinuses, the orbit and the intracranial compartment and also the relationship between the optic nerve, cavernous sinus, carotid artery and fifth cranial and vidian nerves to the sphenoid sinuses. Contrast media helps evaluate the vascularity and contrast enhancing characteristics of lesions, giving clues to the histology and extent of abnormality.

The aims and objective of this study is to determine the role and efficacy of CT scan in diseases of paranasal sinus and study of various physiological variants.

MATERIALS AND METHODS

The present prospective study was conducted at RKDF Medical College from June 2014 to December 2015.

Study Area

The study area includes Bhopal city and district with peripheral small towns/villages.

Study Population

A total of 110 patients of varied age group presenting with symptoms and signs of paranasal sinus diseases were included in the study.

Inclusion Criteria

- Patients referred for CT of paranasal sinuses, who were suspected to have paranasal sinus disease.
- Patients who were suspected to have some paranasal sinus pathology on conventional radiographs and were then referred for CT of paranasal sinuses.

Exclusion Criteria

- Patients presenting with trauma to face
- Patients with contrast allergy
- Patients who were lost to follow-up without a definite diagnosis.

Equipment used

Spiral CT, Siemens Somatom, Siemens Medical Systems, Forchiem, Germany.

CT scan of paranasal sinuses (PNS) requires imaging of the anatomy into coronal and axial planes. A lateral 256 mm scout scan was first obtained at 120 kVp and 100 mA. Routinely axial scanning was done in supine position. Reformatting in coronal and sagittal planes was done using software provided.

Direct coronal imaging was done whenever deemed necessary either by referring physician or by the radiologist. For direct coronal imaging, the patient was kept in prone position or in supine position with the head of the patient free leading edge of the table of the scanner. The gantry angle used in case of coronal imaging was perpendicular to the plane of hard palate. 3 mm sections from anterior margin of nose to the posterior margin of sphenoid sinus were taken.

Final imaging diagnosis correlated with histopathological confirmation or treatment response.

OBSERVATIONS AND RESULTS

CT scan was performed in 110 patients who presented with history, symptoms, and signs of the paranasal sinuses pathologies. The results are enumerated in Tables 1-8.

DISCUSSION

The varied etiology of the diseases of PNS forms the basis of their evaluation. The lack of specificity in clinical examination and the imprecise result of conventional radiography render CT as the modality of choice other than magnetic resonance imaging.

In the present study, 110 patients were evaluated for their various symptoms pertaining to PNS. The gender ratio in this study was 2.05:1 (male:female) (Table 1).

Table 1: Gender distribution

Gender	*N* (%)
Female	36 (32.73)
Male	74 (67.27)
Grand total	110 (100)

Table 2: Age and gender distribution

Age distribution	Female	Male	Total
1-10	1	1	2
11-20	6	19	25
21-30	6	19	25
31-40	8	10	18
41-50	6	10	16
51-80	9	15	24
Grand total	36	74	110

Table 3: Etiopathological distribution of case

Etiology	Female	Male	Total	Percentage
Inflammatory	21	45	66	60
Sinusitis	14	26	40	
Polyposis	6	12	18	
Other	1	6	7	
Neoplastic	12	24	36	32.7
Miscellaneous	3	5	8	7.3
Grand total	36	74	110	100

Table 4: Age distribution of pathologies

Age range	Inflammatory	Neoplastic			Miscellaneous
		Benign	Malignant	Total	
1-10	0	0	1	1	1
11-20	14	5	3	8	3
21-30	19	3	0	3	3
31-40	13	1	4	5	0
41-50	8	2	6	8	0
51-80	12	1	10	11	1
Grand Total	66	12	24	36	8

The etiologic distribution of the lesions was inflammatory (60%), neoplastic (32.7%), and miscellaneous (7.3%). Thus, the inflammatory disease was found to be the most frequently occurring pathology affecting the PNS. The incidence of neoplasms increases sharply after age of 40 years (Table 4). There is another peak in teen age due to increase in incidence of angiofibroma and rhabdomyosarcoma at this age.

Acute sinusitis was diagnosed when there was air fluid level, enhancing mucosal thickening. Chronic sinusitis showed decrease in sinus size with sclerosis and thickening of the walls. Considering the inflammatory etiology of the various sinuses, the following was the percentage affection of individual sinuses. Maxillary (89.4%), frontal (31.8%),

Table 5: Various sinuses involved

Sinus involved	*N* (%)
Maxillary	95 (86.36)
Ethmoidal	59 (53.63)
Frontal	34 (30.9)
Sphenoids	23 (20.9)

Table 6: Sinuses involved in various pathologies

Sinus involved	Inflammatory	Neoplastic			Miscellaneous
		Benign	Malignant	Total	
Maxillary	59	6	23	29	7
Ethmoidal	33	8	16	24	2
Frontal	21	4	7	11	2
Sphenoids	10	5	6	11	2

Table 7: CT features of benign and malignant neoplasms

CT parameter	Benign (*n*=12) (%)	Malignant (*n*=24) (%)
Sinus size increased	8 (66.6)	14 (58.3)
Erosions	7 (58.3)	24 (100)
Thinning	2 (16.6)	5 (20.8)
Sclerosis	1 (8.3)	1 (4.1)
Extensions in at least one region	4 (33.3)	23 (95.8)

CT: Computed tomography

Table 8: Anatomical variants

Anatomical variant	Total (%)
DNS	44 (40)
Concha bullosa	48 (43.6)
Agger nasi	65 (59.1)
Haller cells	18 (16.3)
Onodi cells	34 (30.9)
EEB	9 (8.2)
PMT	15 (13.6)
DUP	12 (10.9)
PUP	4 (3.6)

DNS: Deviated nasal septum, EEB: Enlarged ethmoid bulla, PMT: Paradoxical middle turbinate, DUP: Deviated uncinate process, PUP: Pneumatized uncinate process

sphenoids (15.2%), ethmoidal (50%). Thus, maxillary sinus was most commonly involved and sphenoid sinus was least involved in inflammatory conditions. In the study conducted by Smith and Brindley,[1] maxillary sinus was involved in 55.5% of cases, ethmoidal air cells were involved in 46.5% of cases, frontal sinus in 30%, and sphenoid in 20%. Similarly, Maru and Gupta[2] reported maxillary sinus to be the most frequently involved sinus in inflammatory lesions (70.4%) followed by ethmoids (52.4%), frontal (48.3%), and sphenoid sinuses (40.8%). Zinreich *et al.*[3] published in his study that the maxillary sinus involvement was the most frequent in inflammatory lesions, i.e., 65% followed by ethmoid cells 40%, frontal sinus in

34%, and sphenoid sinus in 29% of cases. Kopp *et al.*[4] in his study of 105 cases of aspergillosis of paranasal sinuses or nasal fossa detected the characteristic CT features of foci of increased attenuation in affected paranasal sinuses. He also found that mycosis was always unilateral, and the maxillary sinus was infected in almost all cases. On the basis of similar findings, we were able to diagnose one case of fungal sinusitis involving maxillary sinus.

Airless sinus filled with mucoid density material, expanding the sinus with thinning of sinus walls is diagnostic of mucocele. One case of frontal mucocele, one case of frontoethmoid and two cases of maxillary mucocele were observed in our study. Zizmor *et al.*[5] found that mucocele most commonly occur in frontal sinus (60-65%) followed by ethmoid sinuses. In the present study, frontal and maxillary sinus involved in equal proportion.

We were able to diagnose allergic fungal sinusitis in two patients. There were characteristic findings of bilateral hyperdense polypoidal masses with expansion, remodeling and thinning of bony walls of sinuses. Mukherji *et al.*[6] emphasized on similar findings. He studied 43 patients of allergic fungal polyposis and concluded that it is more common in young male patients and commonly has bilateral involvement.

In the present study, 36 cases were diagnosed to have neoplastic lesions. 24 of them were detected to be malignant in nature depending on the enhancement pattern of the lesion, the presence of bony destruction and finally the extension of the lesion into various adjacent vital anatomical structures. In the present study, bony erosion was seen in all the 24 (100%) malignant masses and thus found to be most valuable CT criteria for the diagnosis of malignancy. However, 58.3% of benign neoplasms also showed bone erosions (Table 7).

In 95% of malignant neoplasms extension to one of the adjacent regions was present, compared to 33.3% in benign neoplasms. Rests of the criteria like increase in size of the sinus, thinning of walls, sclerosis did not differed much between the benign from malignant masses and not found to be useful in differentiating the two. We were able to demonstrate the precise location and extension of the tumors. Histological types could not be discriminated on imaging (CT) in most of the cases. Similar was emphasized by many authors including Peter Som *et al.*,[7] who concluded that it is not possible to diagnose tumor in the absence of bone destruction.

Graber *et al.*[8] used similar criteria to detect malignant tumors in 15 patients. He characterized malignant tumors in paranasal sinuses on CT scan by their nonhomogeneous structure, destructed bony margins of the sinuses and infiltration into neighboring regions. Graber depicted the precise location and extension of the tumors. Thus, helping in their exact staging and finally in the management of these tumors.

Considering the involvement of sinuses by various neoplasms in the present study, maxillary sinus was involved in 80.5% of cases, ethmoids in 66.6%, frontal in 30.5%, and sphenoid in 30.5% of cases. In a study conducted by Dolan and Smoker,[9] they noted similar findings, wherein maxillary sinus was the most frequently involved sinus affected by intrinsic or nearby or metastatic neoplasms, as seen in our study. According to the study conducted by Parsons and Hodson,[10] the tumor extension was most common into the region of orbit and into the pterygoid region. The two authors studied 15 cases of histologically proven malignancy, to evaluate their extension into adjacent anatomic structures. This was similar to our study where intraorbital and infratemporal fossa extension of the neoplastic lesions was found to be most common.

Two cases of inverted papilloma were diagnosed; CT showed middle meatus involvement along with the extension of the lesion to maxillary sinus, eroding the turbinates on the same side. Thus, we reemphasized the findings quoted by Lund and Lloyd.[11] They studied 60 patients of histologically proved inverted papilloma retrospectively and concluded that mass in the middle meatus of nasal cavity extending into adjacent maxillary antrum is highly suggestive of the tumor.

Total six cases of histologically proven angiofibroma were studied by us. All of them were males of age group between 15 and 25 years and presented with epistaxis. It is similar to Barnes *et al.*,[12] who stated that angiofibroma occurs almost exclusively in young males. Typical site of origin near pterygopalatine fossa and sphenopalatine foramen with widening of pterygopalatine fossa and strong contrast enhancement were the diagnostic criteria used by Som *et al.*[13] We found these criteria to be diagnostic. However, in one of our patient, the pterygopalatine fossa was not widened. Many of these angiofibromas extended into infratemporal fossa (66.6%) and sphenoid sinus (66%). Apostol and Frazell,[14] observed that sphenoid sinus is involved in 61% of the cases. Intracranial extension into middle cranial fossa was found in one patient (16.6%); similar was observed by Barnes *et al.*[12] The differential diagnosis of angiofibroma includes fibrosed antrochoanal polyp and angiomatous polyp.

Abrahams and Glassberg[15] observed that many of the maxillary sinus pathologies are related to dental disease. In the present study, four cases related to dental pathologies were encountered. All of them involved maxillary sinus. CT is diagnostic of osseous and fibro-osseous lesions. Four cases of fibrous dysplasia, two of osteomas and one of ossifying fibroma were diagnosed. Frontal sinus was

involved in both the osteomas and is the most common site of osteoma as studied by Fu and Perzin,[16] Both fibrous dysplasia and ossifying fibroma showed expansion and ground glass appearance. Because there is overlap in imaging appearance of Fibrous dysplasia and ossifying fibroma, Commins *et al*.,[17] suggested the term benign fibro-osseous lesion.

In our study, we came across some anatomical variants. Almost all types of anatomical variants were diagnosed. In descending order of their occurrence, we found agger nasi in 59.1%, concha bullosa in 43.6%, deviated nasal septum (DNS) in 40%, Onodi in 30.9%, Haller cells in 16.3%, paradoxical middle turbinate in 13.6%, deviated uncinate process in 10.9%, enlarged ethmoid bulla in 8.2%, and pneumatized uncinate process (PUP) in 3.6% of cases.

DNS causes decrease in the critical area of osteomeatal complex predisposing it to obstruction and related complications. It was found to be the one of the common anatomical variants in our study (40%). It was more than that of 38% reported by Asruddin *et al*.[18] Agger nasi cells lie anterior to the anterosuperior attachment of middle turbinate and frontal recess. This is the most common variant found in our study. These cells were present in 59.1% of cases in our study as compare to 48% of cases studied by Asruddin *et al*.[18] Concha Bullosa has been implicated as an etiological factor in the causation of chronic sinusitis due to compromise in the space of middle meatus region as quoted by Tonai and Baba;[19] Onodi cells are the extension of the posterior ethmoidal cells into the sphenoid sinus lying medial to optic nerve. The chances of injury to optic nerve are increased when the bony canal of the nerve is lying dehiscent. The incidence of Onodi cells was found to be 30.9% in our study. Another study that closely matched with the incidence in our study was conducted by Driben *et al*.,[20] where the incidence was 39%. Haller cells may narrow the adjacent ostium of the maxillary sinus, especially when they become infected. The incidence of Haller cells in our study was 16.3% as compared to 16% reported by Dua *et al*.[21]

CONCLUSION

CT scan evaluates both soft tissue and bony details of nose and paranasal sinuses. Due to complex anatomy, radiographic evaluation of paransal sinuses has major limitations and hence cost-effective CT is most common and widely used investigation to study the various PNS diseases. A wide spectrum of disease affecting the sinonasal cavities can be detected by CT with high accuracy in diagnosis of inflammatory conditions and their complications. It is also a very sensitive modality for detection, accurate localization and determination of exact extent of paranasal sinus neoplasms; hence is essential for preoperative evaluation. Various important anatomical variants can also be easily detected on CT of paranasal sinuses.

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Original Article

Microbiology of Peritonsillar Abscess: A Prospective Study

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Abstract

Introduction: Peritonsillar abscess remains a common deep infection of the head and neck. We performed culture and sensitivity studies on pus drained from a peritonsillar abscess. The objectives were to identify the bacterial flora and to compare the relative efficacies of three-point needle aspiration and incision and drainage in the initial management of peritonsillar abscess.

Materials and Methods: A total of 30 cases of peritonsillar abscess were randomly divided into two groups. One group underwent three-point needle aspiration and the other group incision and drainage. The pus obtained was sent to the laboratory for direct smear examination by Gram-stain and for culture and sensitivity studies.

Results: Bacteriologic studies showed positive culture in 73.3% of cases. The bacteria most commonly isolated was beta-hemolytic *Streptococcus* followed by *Staphylococcus*. Following intervention, immediate relief of pain in patients who underwent needle aspiration was 75%, and the same was 77.8% in patients who underwent incision and drainage.

Conclusion: The bacteria most commonly identified were beta-hemolytic *Streptococcus*. Three points needle aspiration of pus was found to be equally efficacious in relief of pain as incision and drainage in the initial management of peritonsillar abscess.

Key words: Culture, Gram-stain, Peritonsillar abscess

INTRODUCTION

A peritonsillar abscess remains the most common deep infection of the head and neck even today despite the liberal use of antimicrobial agents for pharyngeal infections. It is a common entity seen by otolaryngologists, occurring at a rate of approximately 30/100,000 persons-years.[1]

A peritonsillar abscess (quinsy) is a collection of pus between the fibrous capsule of the tonsil, usually at its upper pole, and the superior constrictor muscle of the pharynx. It usually occurs as a complication of acute tonsillitis or it may arise *de novo* with no preceding tonsillitis.

Peritonsillar abscess is a potential life-threatening infection. The proper management of this serious infection is important and requires surgical drainage as well as proper antimicrobial therapy.[2]

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Peritonsillar abscess has to be treated immediately and cannot await the culture and sensitivity reports. Hence, it is desirable to know the organisms most commonly isolated from the cases of quinsy.

MATERIALS AND METHODS

A total of 30 patients of peritonsillar abscess were randomized prospectively into two groups; one group to be treated by incision and drainage and another to be treated by needle aspiration.

The patients to be treated by incision and drainage had application of 4% topical lidocaine hydrochloride over the oropharynx. Next, preliminary needle aspiration was done to get pus for culture and sensitivity. Then, incision and drainage of the abscess were done at the point of maximum fluctuance or bulging.

In patients to be treated with needle aspiration, aspiration was done sequentially at three different points with an

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18-gauge needle and syringe. The area lateral to the superior tonsillar pole was aspirated initially with two additional aspirations 1 and 2 cm inferior to the initial point.

After aspiration of pus, the needle is removed and the syringe is capped with a rubber cap to provide an air tight seal. The pus is then sent to the laboratory for direct smear examination by Gram-stain and for culture and sensitivity studies.

The patients with severe dysphagia, trismus, and fever were admitted to the hospital and put on parenteral antibiotics and analgesics and intravenous fluids. Patients who could take orally were sent home with oral antibiotics and analgesics. For comparison purposes, the time required for relief of pain after each procedure was documented.

RESULTS

Peritonsillar abscess was found to be more common in the age group between 21 and 30 years followed by 31-40 years group. There was a male to female ratio of roughly 2:1. There were no cases with bilateral peritonsillar abscess seen. The majority of cases were seen between the months of May to July.

Out of the 30 patients, 6 patients had a previous history of throat pain while in 24 patients it was *de novo*.

Bacteriologic studies showed positive culture in 73.3% of cases. Gram-positive growth was seen in 68.1% of cases and Gram-negative growth in 31.9%. The bacteria most commonly isolated was beta-hemolytic *Streptococcus* (40.9%) followed by *Staphylococcus aureus* (27.7%). Other isolates seen were alpha-hemolytic streptococci, *Escherichia coli*, *Klebsiella*, *Pseudomonas*, and *Acinetobacter* (Table 1).

Group-A beta-hemolytic *Streptococcus* was found to be 100% sensitive to ciprofloxacin. Sensitivity to amoxicillin was 66.66%. *S. aureus* showed 100% sensitivity to amikacin, ciprofloxacin, and ofloxacin. *Klebsiella* showed 100% sensitivity to ciprofloxacin and ofloxacin. Sensitivity to gentamicin was 50%. *Pseudomonas aeruginosa* showed 100% sensitivity to ciprofloxacin and cefotaxime.

Table 1: Culture results obtained from pus samples in 30 patients with peritonsillar abscess

Bacterial flora	*N* (%)
Beta hemolytic streptococci	9 (30.0)
Staphylococcus aureus	5 (16.7)
Escherichia coli	2 (6.7)
Pseudomonas	2 (6.7)
Klebsiella	2 (6.7)
Acinetobacter	1 (3.3)
Alpha hemolytic streptococci	1 (3.3)
No growth	8 (26.7)
Total	30 (100)

Following intervention, immediate relief of pain in patients who underwent needle aspiration was 75%, and the same was 77.8% in patients who underwent incision and drainage. Chi-square value was 0.0311; $P > 0.5$ was not statistically significant. Hence, needle aspiration is as efficacious in producing relief of pain as incision and drainage.

DISCUSSION

A peritonsillar abscess (quinsy) is a collection of pus between the fibrous capsule of the tonsil, usually at its upper pole, and the superior constrictor muscle of the pharynx. It usually occurs as a complication of acute tonsillitis or it may arise *de novo* with no preceding tonsillitis.

Peritonsillar abscess is a potential life-threatening infection that often complicates acute tonsillitis. If not treated, it may rupture spontaneously with a risk of aspiration or progress to parapharyngeal space and along the neck vessels to the mediastinum. The proper management of this serious infection is therefore of paramount importance and requires surgical drainage as well as proper antimicrobial therapy.[2]

The drug of choice in the antimicrobial therapy should ideally be based on the culture and sensitivity reports of the pus drained from the abscess. However, peritonsillar abscess has to be treated immediately and cannot await the sensitivity reports. Hence, it is desirable to know the organisms most commonly isolated from cases of peritonsillar abscess so that the antibiotic to which most of these are sensitive can be used as standard drug.

According to Scott-Brown,[3] the bacteriology of acute tonsillitis and peritonsillar abscess is different. Although beta-hemolytic *Streptococcus* is frequently isolated, it is rarely isolated on its own. Mixed aerobic and anaerobic flora are found. Beta-lactamase producing organisms are recovered. Snow *et al*., in their study,[4] on 91 patients with peritonsillar abscess obtained a positive culture in 55 patients. Forty patients had pure growth of a single organism, the remaining 15 patients had mixed growth. The most common organism isolated was beta hemolytic streptococci.

Another important aspect is the type of intervention used in the initial management of peritonsillar abscess. Incision and drainage are the time honored and accepted form of treatment. But increasingly, surgeons have suggested that per mucosal needle drainage of pus is equally efficacious, less distressing for the patient and cost effective. In most patients, aspiration of pus can bring about immediate relief of odynophagia and trismus, so that hospitalization for intravenous administration of fluids is not necessary. In a study by Ophir *et al*.,[5] only 12% of the patients who underwent aspiration had to be hospitalized. In 85% of patients, the abscess resolved without further therapy. They concluded that aspiration of pus, along with oral antibiotics is a reasonable alternative to incision and drainage or hot tonsillectomy.

Our study correlates well with these findings regarding per mucosal needle aspiration of pus being equally efficacious, less distressing for the patient and cost-effective compared to incision and drainage in the initial management of peritonsillar abscess.

CONCLUSION

The bacteria most commonly identified were beta-hemolytic *Streptococcus* followed by *S. aureus*. Per mucosal three points needle aspiration of pus was found to be equally efficacious in relief of pain as incision and drainage in the initial management of peritonsillar abscess.

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Original Article

Morphometric Analysis of Mandibular Foramen in Dry Adult Human Mandibles

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Abstract

Introduction: The proper knowledge about the location of mandibular foramen (MF) is very much essential for dentists to anesthetize mandibular teeth, mandibular gingival, and lower lip by blocking inferior alveolar nerve (IAN). This study aims to find out the size and location of MF.

Materials and Methods: 100 dry mandibles were collected for the study.

Results: Size of the MF was measured by taking vertical and horizontal diameters of the foramen. The mean vertical diameter on right side was 9.23 ± 1.81 mm and on left side 8.89 ± 1.81 mm. The mean horizontal diameter on right side was 3.54 ± 0.65 mm and on left side 3.40 ± 0.82 mm. The mean distance between MF to mandibular notch, posterior border of the ramus and inferior border of ramus is little higher on right side compared to left side. However, the distance between MF to anterior border of ramus was higher on left side. Statistically significant difference was not found between right and left sides which indicate bilateral asymmetry.

Conclusion: The results of this study may be helpful in developing new or alternative techniques of IAN block and may also be useful in reconstructive surgery and anthropological assessments.

Key words: Anesthesia, Inferior alveolar nerve, Mandible foramen

INTRODUCTION

The mandibular foramen (MF) is located above the center on the medial surface of the ramus of the mandible. The mandibular canal starts at the MF and descends obliquely forward in the ramus and later in the body of mandible containing the inferior alveolar neurovascular bundle. Inferior alveolar nerve (IAN) is a branch of posterior trunk of the mandibular nerve. After its origin, it descends behind lateral pterygoid muscle. At the lower border of lateral pterygoid, the nerve passes between the sphenomandibular ligament and ramus of the mandible. The IAN enters the mandibular canal via the MF. Before entering into MF, it gives off a small mylohyoid branch. Within the mandibular canal, it gives branches to mandibular teeth, gingiva of mandible and lower lip.[1] IAN block is the most frequently used nerve block technique in dental practice. It is fundamental for achieving local anesthesia for mandibular restorative and surgical procedure.[2] The technique IAN block anesthetize the nerve before entering into the MF. Approximately, 20-25% of failure of the IAN block is due to improper knowledge of the location of MF.[3] Location of MF is clinically important in IAN anesthesia, dentoalveolar surgery planning, and endodontic treatments.[4] This study was undertaken to find out the size and location of MF.

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MATERIALS AND METHODS

The study was conducted at Deccan College of Medical Sciences, Hyderabad, Telangana. This study was a cross-sectional study consisting of 100 dry adult human mandibles consisting of 200 MFs (100 right and 100 left). Size was determined by measuring vertical and horizontal diameter of MF. Location was determined by measuring following parameters with digital vernier calipers: (Figure 1)

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(a) Center of MF to mandibular notch (MN), (b) center of MF to posterior border of ramus of mandible, (c) center of MF to inferior border (IB) of mandible, and (d) center of MF to anterior border (AB) (Figures 2-5).

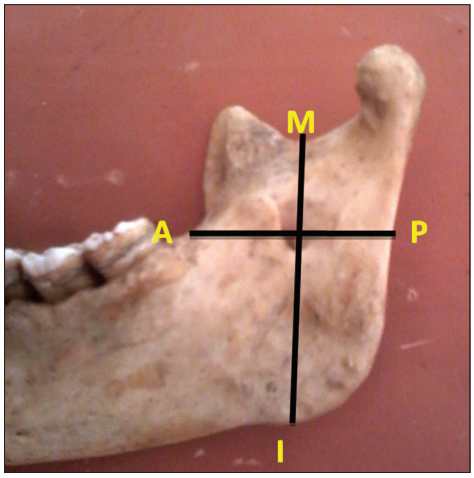

Figure 1: Location of mandibular foramen (MF) from various landmarks (anterior border, mandibular notch, posterior border and inferior border) from MF

Figure 2: Center of mandibular foramen to posterior border

Figure 3: Center of mandibular foramen to inferior border

RESULTS

Size of the MF was measured by taking vertical and horizontal diameters of the foramen. The mean vertical diameter on right side was 9.23 ± 1.81 mm and on left side 8.89 ± 1.81 mm. The mean horizontal diameter on right side was 3.54 ± 0.65 mm and on left side 3.40 ± 0.82 mm. Bilateral symmetry was observed.

To locate the MF four parameters were measured. The mean and standard deviation values of various parameters are shown in Table 1. It was found that there was no significant difference in the values on the right and left sides.

DISCUSSION

The proper knowledge on the location of MF is important as it is used to anesthetize mandibular teeth, gingiva of the mandible and lower lip to carry out many surgical procedures.

In this study, the mean distance between MF and AB of ramus was 16.52 ± 2.25 mm in right side and 17.77 ± 2.5 mm in left side. Thangavelu *et al.* reported that the MF is at an average distance of 19 ± 2.34 mm from AB of ramus of the mandible and concluded that the deposition of anesthetic solution at a distance of 23 mm from the AB in IAN block in IAN block. But based on this study, the deposition of anesthetic solution at a distance of 21 mm from the AB of the mandible. When a patient opens the mouth, the IAN may move few millimeters posteriorly. Therefore, 17 plus 4 mm (21 mm) distance of needle insertion inside the tissue from the AB of ramus would take the needle tip nearer to the IAN (Table 2).[5]

The distance between the MF and IB in the present study shows similarity with Thangavelu *et al.,* (an Indian study) but differs with Valente *et al.*. In Brazilian population, the distance is longer than the Indians. The distance from the

Table 1: Distance between MF and adjoining morphological landmarks

Parameter	Side	Mean±SD (mm)
MF to MN	Right	20.14±2.5
	Left	19.85±3.15
MF to PB	Right	14.05±2.19
	Left	13.90±2.35
MF to IB	Right	27.41±4.16
	Left	26.76±4.14
MF to AB	Right	16.52±2.25
	Left	17.77±2.51

MF: Mandibular foramen, MN: Mandibular notch, PB: Posterior border, AB: Anterior border, IB: Inferior border, SD: Standard deviation

Table 2: Comparison of the present study results with previous studies

Author	MF to AB		MF to PB		MF to MN		MF to IB	
	Right	Left	Right	Left	Right	Left	Right	Left
Thangavelu *et al*.,[5] 2012 (India)	18.9	18.88	14.31	14.39	-	-	27.62	27.3
Vitor Bonetti Valente 2012 (Brazil)	16.94	17.32	14.24	14.03	24.12	23.65	39.88	40.0
Md Mesbahul *et al*.,[6] 2013 (Bangladeshi)	16.34	16.27	14.14	14.04	22.29	22.18	-	-
Padmavathi *et al*.,[9] 2014 (India)	16.8	16.9	11.7	12.1	22.0	22.3	-	-
Present study 2015 (India)	16.62	17.7	14.05	13.90	20.1	19.85	27.4	26.7

MF: Mandibular foramen, MN: Mandibular notch, PB: Posterior border, AB: Anterior border, IB: Inferior border, SD: Standard deviation

Figure 4: Center of mandibular foramen to mandibular notch

Figure 5: Center of mandibular foramen to mandibular notch

center of MF to AB is in the present study was similar to the Hoque *et al*., Padmavathi *et al*. However, Thangavelu *et al*. reported higher values. The distance from MF to MN was less in the present study when compared to other studies. Thangavelu *et al*., Padmavathi *et al*., and Mesbahi *et al*. found bilateral symmetry of the MF which is similar with the present study.[5-7]

CONCLUSION

The MF was at the same distance from each anatomical landmark on both sides showing bilateral symmetry. This study results suggest that the needle can be inserted 21 mm distance from the AB of MF to anesthetize the IAN. The results of this study may be helpful in IAN block, reconstructive surgery, and anthropological assessments.

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Original Article

Detection of *Candida* Species by Hichrom Agar and Their Antimycotic Sensitivity in Hadoti Region

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Abstract

Introduction: Hichrom agar is a differential culture medium which facilitates the isolation and identification of some clinically important species of *Candida*.

Materials and Methods: A total of 100 *Candida* species were isolated from various mucocutaneous clinical specimens including oral thrush, vaginitis, balanitis, and angular cheilitis. Speciation of *Candida* was done using Hichrom agar and conventional methods simultaneously. Antifungal susceptibility testing was done by the disc diffusion method to amphotericin B, fluconazole, nystatin, itraconazole, ketoconazole, and clotrimazole.

Results: *Candida albicans* (54%) was the predominant species isolated. Non-albicans *Candida* spp. isolated was *Candida tropicalis* (22%), *Candida glabrata* (12%), *Candida krusei* (06 %), *Candida parapsilosis* (04%), and *Candida kefyr* (02%). Antifungal susceptibility testing was done using antimycotic sensitivity testing by disc diffusion method. Overall antifungal drug resistance for *Candida* in the present study was 26% for fluconazole, 24% for itraconazole, 29% for clotrimazole, 18% for ketoconazole, and 10% for nystatin. No resistance was observed for amphotericin B.

Conclusion: The advantage of using Hichrom agar is that it helps in the isolation and identification of *Candida* to species level. The performance of Hichrom agar paralleled that of conventional methods. Use of this medium is rapid, technically simple, and cost-effective compared to time-consuming technically demanding expensive conventional method. Hichrom agar serves as a primary isolation and differentiation medium for clinical specimens that could allow mycology laboratories to rapidly identify *Candida* spp., enabling clinicians to choose appropriate antifungal agents, thus decreasing patient's morbidity and mortality.

Key words: Antifungal susceptibility testing, *Candida*, Hichrom agar, Fluconazole

INTRODUCTION

Candida is the most common fungal infection found in the humans affecting mucosa, skin, nails, and internal organs. *Candida* species colonize the mucosal surfaces of all humans soon after birth, and the risk of endogenous infection is ever-present.[1] *Candida* species are a component of the normal flora of human beings and commonly found on the skin, gastrointestinal tract, and female genital tract, particularly higher in the vagina during pregnancy.[1] Carriage rate of *Candida* species tends to increase with age. *Candida* species are the fifth most common cause of blood stream infections and fourth common cause of nosocomial infections.[1,2] *Candida* species produces various cutaneous, mucocutaneous, and systemic manifestations depending on the immune status of the host and underlying predisposing factors. In developed countries, *Candida albicans* accounts for 40-60% of yeasts isolates, whereas Indian reports show an increased predominance of non-*C. albicans* (NAC) isolates.[3,4] Increase in the prevalence of non-albicans species such as *Candida glabrata* and *Candida krusei*[5] has been noted during the past decade because of the extensive use of antimycotic drugs particularly azoles for prolonged periods. *C. glabrata* is associated with severe complications than other species.[5]

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Several brands of chromogenic media have been developed to produce rapid yeast identification. *C. albicans* produces an enzyme b-N-acetyl-galactosaminidase[6] and incorporation of chromogenic or fluorogenic hexosaminidase substrates into the growth medium helps in identification of *C. albicans* isolates directly on primary isolation.[7] Hichrom *Candida* differential agar is a selective and differential medium, which facilitates rapid isolation of yeasts from mixed cultures and allows differentiation of *Candida* species namely *C. albicans, C. krusei, Candida Tropicalis,* and *C. glabrata* on the basis of coloration and colony morphology.

It is necessary to identify *Candida* to species level as many NAC have decreased susceptibility to antifungal agents. The present study was undertaken to evaluate the advantages of Hichrom agar over conventional method for speciation of *Candida* isolates and their susceptibility to antifungal agents by disc diffusion method.

MATERIALS AND METHODS

The study was conducted at the Department of Microbiology, Government Medical College and M.B.S Hospital, Kota, from June 2012 to September 2013. A total of 100 strains of *Candida* were isolated from various mucocutaneous clinical samples of patients admitted in MBS Hospital and associated Group of Hospitals - JK Lone Hospital and NMC Hospital, Kota, Rajasthan.

Hichrom agar was prepared as per the instruction manual (Himedia India) (Table 3). *Candida* spp. isolated was inoculated simultaneously to Hichrom agar plates and Sabouraud dextrose agar (SDA) tubes. These were incubated at 37°C for 48 h. Species were identified on Hichrom agar by morphology and color of the colony. Growth on SDA was speciated by standard methods using germ tube, corn meal agar, sugar fermentation, and assimilation test. Appearances of *Candida* spp. on Hichrom agar were as follows:[8]

- *C. albicans* - blue green
- *C. tropicalis* - dark blue-gray center with pink halo
- *C. krusei* - pink large rough spreading colonies with pale edge
- *C. parapsilisis* - pale cream colored colonies
- *C. glabrata* - cream to white smooth colonies.

Antifungal susceptibility was performed by disc diffusion method using antimycotic sensitivity test agar. Discs used were amphotericin B (100 units), fluconazole (10 mcg), clotrimazole (10 mcg), nystatin (100 mcg), itraconazole (10 mcg), ketoconazole (10 mcg), and sensitivity zones were measured as for the instruction manual (Himedia).[8,9] ATCC strain of *C. albicans* was used as control.

RESULTS

Table 1 shows *Candida* spp. isolated in various clinical samples. All isolates of candida grew on Hichrom agar after 48 h of incubation at 37°C.

Overall antifungal drug resistance for *Candida* in the present study was 26% for fluconazole, 24% for itraconazole, 29% for clotrimazole, 18% for ketoconazole, and 10% for nystatin. No resistance was observed for amphotericin B. The results of this study have been presented in Tables 1 and 2.

DISCUSSION

C. albicans (54%) was the most prevalent species of *Candida* reported in the present study (Table 1). This finding was consistent with the findings of other workers who reported that the incidence of *C. albicans* was 61.3% (Biradar *et al.*),[10] 49.3% (Feglo and Narkwa),[11] and 47% (Dominic and Dharwad).[12] However, Kashid *et al.*[13] found that *C. tropicalis* was the most prevalent species accounted for 46.2% followed by *C. albicans* (29.2%). *C. tropicalis* (22%) was the second most common species reported in the present study. This finding was comparable with other workers, Bobade *et al.*[14] (22.9%), Babin *et al.*[15] (26.4%), and Khan and Baqai *et al.*[16] (21%). However, *C. glabrata* was reported as second most common species by Feglo and Narkwa *et al.*[11] (17.9%) and Saldhei *et al.*[17] (11.9%).

Overall antifungal drug resistance for *Candida* in the present study was 26% for fluconazole, 24% for itraconazole, 29% for clotrimazole, 18% for ketoconazole, and 10% for nystatin. No resistance was observed for amphotericin B. In present study, 22.2% of *C. albicans* was found to be fluconazole resistant which is in consonance with Kashid *et al.*[13] and Babin *et al.*[15] However, a higher resistance was observed by Saldhei *et al.*[17] (81.1%). For NAC, the resistance varies from 0% in *Candida kefyr* to 100% in *C. krusei*. For AmB, no resistance was observed in the present study. This was in consonance with Kashid *et al.*[13] Bobade *et al.*[14] reported 7.5% resistance in *C. albicans*.

The conventional methods and the CHROM agar method were compared and were found to give similar results. This was similar to the findings of Nayak *et al.*,[18] who found that CHROM agar showed 100% specificity and 100% sensitivity when compared to SDA and conventional methods. The advantages of Hichrom agar are easy to prepare, i.e., boiling, facilitate the rapid isolation, and identification of yeast species. Hichrom agar facilitates identification between yeast spp. from specimens containing mixture of yeast spp. and do not affect the

Table 1: *Candida* species isolated from different clinical conditions

Clinical condition	*C. albicans* (%)	*C. tropicalis* (%)	*C. glabrata* (%)	*C. krusei* (%)	*C. parapsilosis* (%)	*C. kefyr* (%)	Total (%)
Oral thrush	23 (42.5)	17 (31.4)	6 (11.1)	6 (11.1)	0	2 (3.7)	54 (54)
Vaginitis	26 (68.4)	3 (7.8)	6 (15.7)	0	3 (7.8)	0	38 (38)
Balanitis	4 (80)	0	0	0	1 (20)	0	5 (5)
Angular cheilitis	1 (33.3)	2 (66.7)	0	0	0	0	3 (3)
Total	54 (54)	22 (22)	12 (12)	6 (6)	4 (4)	2 (2)	100

C. albicans: Candida albicans, C. tropicalis: Candida tropicalis, C. glabrata: Candida glabrata, C. krusei: Candida krusei, C. parapsilosis: Candida parapsilosis, C. kefyr: Candida kefyr

Table 2: Antifungal sensitivity profile of *Candida* isolates (in percentage)

Antifungal drugs	Fluconazole (25 µg)			Itraconazole (10 µg)			Clotrimazole (10 µg)			Ketoconazole (10 µg)			Nystatin (100 U/disc)			AmB (100 U)		
	S	I	R	S	I	R	S	I	R	S	I	R	S	I	R	S	I	R
C. albicans	48.1	29.6	22.2	29.6	44.4	25.9	14.8	55.5	29.6	29.6	44.4	25.9	66.7	29.6	3.7	100	00	00
C. tropicalis	54.5	31.8	13.6	54.5	31.8	13.6	40.9	36.3	22.7	90.9	9.1	00	40.9	36.3	22.7	100	00	00
C. glabrata	50	16.6	33.4	50	16.6	33.4	16.6	33.4	50	50	33.4	16.6	33.4	50	16.6	100	00	00
C. kefyr	100	00	00	100	00	00	100	00	00	100	00	00	100	00	00	100	00	00
C. parapsilosis	50	25	25	50	25	25	25	50	25	50	25	25	25	50	25	100	00	00
C. krusei	00	00	100	00	00	100	66.6	16.6	16.6	66.6	16.6	16.6	100	00	00	100	00	00
Total (in percentage)	48	26	26	38	38	24	26	45	29	50	32	18	58	32	10	100	00	00

S: Sensitive, I: Intermediate sensitive, R: Resistant, *C. albicans: Candida albicans, C. tropicalis: Candida tropicalis, C. glabrata: Candida glabrata, C. krusei: Candida krusei, C. parapsilosis: Candida parapsilosis, C. kefyr: Candida kefyr*

Table 3: Comparison of various studies showing *Candida* species recovered from clinical samples (in percentage)

Candida species	Present study	Bobade *et al.* 2013[14]	Saldhei *et al.* 2012[17]	Vijaya *et al.* 2011[8]	Kashid *et al.* 2011[13]	Feglo and Narkwa 2011[11]	Babin *et al.* 2011[15]	Shivanand *et al.* 2011[21]	Fouzia *et al.* 2010[16]	Birader *et al.* 2009[10]	Usharani *et al.* 2005[20]
C. albicans	54	36.6	79.1	45.9	29.2	49.3	35.5	47	30	61.3	62.5
C. tropicalis	22	22.9	5.9	35.29	46.2	11.9	22.9	30	21	18	15.6
C. glabrata	12	13.7	11.9	-	6.12	17.9	20.6	09	08	10.6	9.3
C. krusei	6	08.7	2.9	10.78	-	4.5	15.7	14	03	3.3	-
C. parapsilosis	4	03.6	-	7.84	10.2	1.5	-	-	10	-	-
C. kefyr	2	11.46	-	-	1.36	-	-	-	-	-	-

viability on subsequent subcultures.[19] Hichrom agar has the advantage of rapid identification of *Candida* species, technically simple, rapid, and cost-effective compared to technically demanding time consuming and expensive conventional method.

CONCLUSION

Although the results on Hichrom agar exactly paralleled that of the conventional method, it is superior to SDA in terms of suppressing the bacterial growth. Use of Hichrom agar medium would allow mycology laboratories to identify rapidly, clinically important *Candida* spp. while potentially decreasing laboratory cost. Furthermore, the species level identification of the *Candida* isolates along with their antifungal susceptibility patterns can greatly influence the treatment options for the clinician and may have an impact on the patient care.

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Original Article

Clinico Pathological Study of Autoimmune Vesiculobullous Disorders: A Case Series from a Resource-poor Rural Tertiary Care Center in South Tamil Nadu

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Abstract

Background: Autoimmune vesiculobullous disorders are rare diseases that are characterized by blisters over skin and oral erosions. An accurate diagnosis is achieved by clinical examination, pathological correlation, and immunofluorescence. In resource-poor settings where immunofluorescence is not available, the diagnosis is made only with the available resources.

Aims and Objectives: To study the clinical and pathological features of autoimmune bullous disorders.

Materials and Methods: A total of 45 patients admitted to the Government Theni Medical College from 2005 to 2015 were analyzed retrospectively. Detailed clinical examination, Tzanck smear, and histopathological examination of skin biopsy were done for all patients. Immunofluorescence was not done due to lack of availability in our center.

Results: Out of 45 cases studied, 32 (71%) were pemphigus, 10 (22.22%) belonged to bullous pemphigoid group, 2 (4.44%) were chronic bullous dermatosis of childhood, one case (2.2%) was a bullous systemic lupus erythematosus. Out of 45 patients, 31 patients (68.8%) were in the age group of 41-60 years, 6 patients (13.33%) in the range of 21-40 years, 5 patients (11.11%) in the age range above 60 years, and 3 patients (6.66%) below 20 years. Out of 45 patients, 17 (37.77%) were males and 28 (62.22%) were females. All the bullous disorders showed a female preponderance. The clinical spectrum was consistent in all patients enrolled (100%) Tzanck smear was consistent in 95.5% of patients. Histopathology was consistent in 100% of cases.

Conclusion: Thorough clinical examination, aided by Tzanck smear and histopathology was helpful in arriving at a diagnosis of these vesiculobullous disorders in resource-poor center like ours where the gold standard immunofluorescence studies are not available.

Key words: Autoimmuno bullous disorders, Bullous pemphigoid, Pemphigus

INTRODUCTION

Autoimmune vesiculobullous disorders are a rare group of disorders where auto antibodies are directed against specialized structures essential for maintaining the integrity of skin leading to blister formation. Erosions involving skin and mucous membranes depending on the level of blister formation. They are classified as epidermal and subepidermal. To arrive at a diagnosis, complete clinical examination, aided by Tzanck smear, histopathology of skin biopsy, and immunofluorescence studies need to be done. But in resource-poor centers like ours diagnosis could be achieved only with the available investigations. The aim of the study was to analyze the clinical and histopathological features of these disorders in our setup with the available resources.

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MATERIALS AND METHODS

A retrospective analysis of all vesiculobullous disorders admitted to our ward over a span of 10 years between 2005 and 2015 was analyzed.

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Thorough clinical examination was done for all patients. Tzanck smear was done for all patients by deroofing an early vesicle and making a smear on a glass slide and staining with Leishman's stain and examined under light microscope. A skin biopsy taken from an early vesicle was subjected to histopathological examination after staining with eosin and hematoxylin.

All data regarding the patients' age, sex, duration of disease, reports of Tzanck smear, and histopathological findings were documented.

RESULTS

Out of 45 cases studied, 32 (71.1%) belonged to pemphigus group. 10 cases (22.2%) belonged to bullous pemphigoid Group 2 patients (4.4%) belonged to chronic bullous dermatosis of childhood (CBDC) group and one patient (2.2%) was a bullous systemic lupus erythematosus (SLE) (Table 1).

Out of 32 cases of pemphigus, 28 were pemphigus vulgaris and 4 were pemphigus foliaceus. Predominant age group affected was 51-60 (16 patients) followed by 15 patients in the age group of 41-50. Youngest age incidence was seen in 3 patients in the range 0-10. The highest age range was seen in 5 patients in the ranges 61-70 years (Table 2).

Out of 45 cases, 28 were females (62.14%) and 17 (37.6%) were males (Figure 1) female predominance was seen in all the bullors disorders noted.

The clinical diagnosis could be arrived in all pemphigus patients with flaccid blisters and erosions, a positive Nickolsky sign in pemphigus vulgaris and no mucosal involvement in pemphigus foliaceus (Figure 2).

All bullous pemphigoid patients showed tense blisters and erosions over trunk and extremities. Mucosal erosions were seen in only 4 out of 10 patients (Figure 3). Both cases of CBDC showed, tense blisters with few lesions showing "cluster of jewels" appearance (Figure 4). No mucosal involvement was seen in both cases. Bullous SLE showed tense blisters over extremities and with other cutaneous and lab findings diagnostic of SLE.

Table 1: Bullous disorders prevalence

Bullous disorder	Number of cases (%)
Pemphigus vulgaris	28 (62.2)
Pemphigus foliaceus	4 (8.8)
Bullous pemphigoid	10 (22.22)
CBDC	2 (4.44)
Bullous SLE	1 (2.2)
Total	45

CBDC: Chronic bullous dermatosis of childhood, SLE: Systemic lupus erythematosus

Table 2: Age wise statistics of bullous disorders

Type	0-10	11-20	21-30	31-40	41-50	51-60	61-70	Total
Pemphigus	0	0	4	2	13	10	3	32
Bullous Pemphigoid	0	0	0	0	2	6	2	10
CBDC	2	0	0	0	0	0	0	2
Bullous SLE	1	0	0	0	0	0	0	1
Total								45

CBDC: Chronic bullous dermatosis of childhood, SLE: Systemic lupus erythematosus

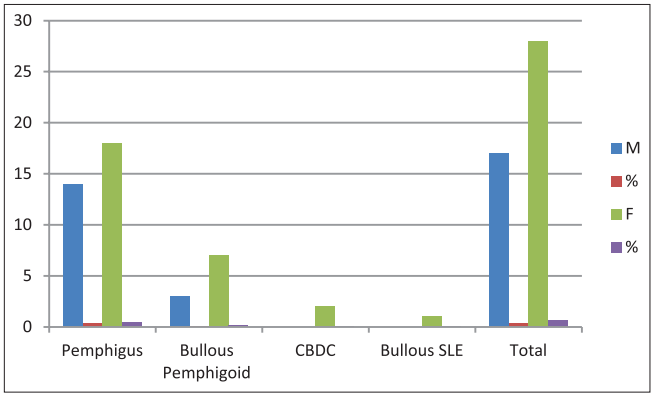

Figure 1: Sex wise distribution

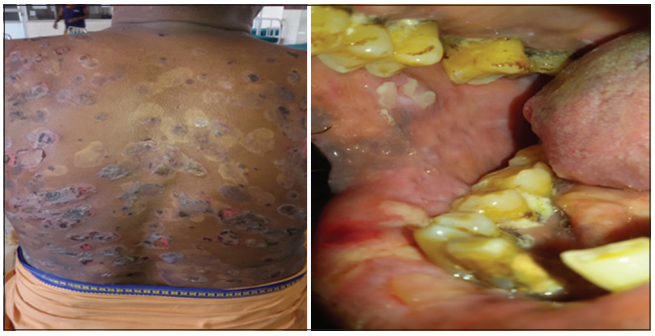

Figure 2: Flaccid blisters and erosions in pemphigus

Figure 3: Tense blisters in bullous pemphoid

Tzanck smear was consistent in all cases of pemphigus with predominant acantholytic cells. 8 patients with bullous pemphigoid showed eosinophils in the smear and 2 patients showed mixed inflammatory cells. Two cases of CBDC and one case of SLE showed predominant neutrophils in the smear (Figure 5).

Histopathology of all pemphigus vulgaris showed suprabasal bulla with acantholytic cells in the bulla cavity and pemphigus foliaceus showed subcorneal bulla with acantholytic cells.

A biopsy was consistent with all cases of bullous pemphigoid with subepidermal cleavage with predominant eosinophils.

CBDC and bullous SLE showed subepidermal bulla cavity with predominant neutrophils (Figure 5).

DISCUSSION

Autoimmune vesiculobullous disorders are characterized by antibody mediated destruction of structures essential for maintaining the integrity of skin leading to blisters and erosions over skin and mucosa. They are categorized into epiderrmal and subepidermal blistering disorders.

Figure 4: Chronic bullous dermatosis of childhood with "cluster of jewels appearance"

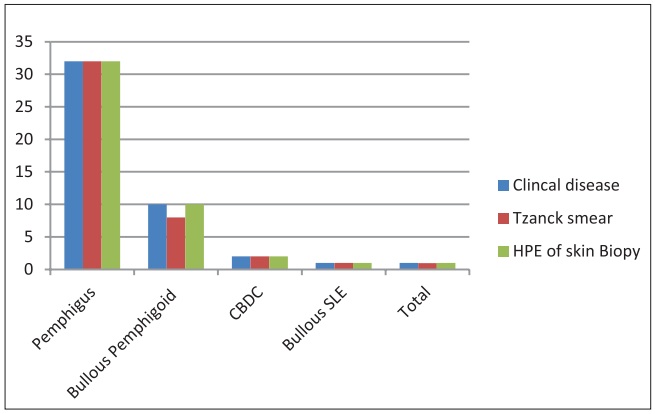

Figure 5: Clinical and histopathological correlation. CBDC: Chronic bullous dermatosis of childhood, SLE: Systemic lupus erythematosus

Epidermal disorders include pemphigus vulgaris and pemphigus foliaceus. Subepidermal disorders include bullous pemphigoid, cicatriceal pemphigoid, linear immunoglobulin A dermatosis, lichen planus pemphigoides, dermatitis herpetiformis, epidermolysis bullosa acquisita, and bullous SLE.

Thorough clinical examination aided by light microscopy and immunofluorescence would help us to make a definitive diagnosis of these bullous disorders.

Although immunofluorescence is considered as the gold standard, in resource poor settings where this facility could not be availed even in private labs diagnosis is based on the clinical and light microscopic findings only.

In our present study, pemphigus was the predominant bullous disorder in which pemphigus vulgaris was the most common. This was comparable with studies by Srinath *et al.*,[1] Arya *et al.*,[2] Huda and Afsar,[3] Zaraa *et al.*,[4] Daneshpazhooh *et al.*,[5] and Micali *et al.*[6]

Predominant age group for pemphigus was noted in the range 41-60 which was comparable with other studies.[1]

Pemphigus and all other blistering disorders showed a higher incidence in females (62.14%) which was contradictory to studies by Srinath *et al.*[1] and Arya *et al.*[2]

Bullous pemphigoid was the predominant subepidernal disorder noted and was comparable with other studies.[7,8]

Predominant age group of bullous pemphigoid was between 41 and 70, with majority of patients presenting in the age group of 51-60. This was contradictory to studies by Srinath *et al.*,[1] Wong and Chua,[8] Bastuji-Garin *et al.*,[9] and Jung *et al.*[10]

All cases of pemphigus vulgaris (100%) showed suprabasal bulla and acantholytic cells on histopathology and all pemphigus foliaceus case showed subcorneal bulla which was comparable with studies by Srinath *et al.*[1]

Biopsy findings was consistent in all cases of CBDC and bullous SLE which was comparable with Srinath *et al.*[1]

CONCLUSION

Although immunofluorescence was mandatory for definitive diagnosis of autoimmune bullous disorders, in resource poor settings where this facility is not available,

diagnosis could be arrived only with the available investigations.

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Original Article

Comparative Study of Analgesic Efficacy of Intravenous versus Intrathecal Fentanyl as an Adjuvant in Subarachnoid Block for Cesarean Section

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Abstract

Introduction: Cesarean section under spinal anesthesia with local anesthetics leads to intraoperative visceral pain, which may require analgesic supplementation.

Objectives/Purpose: To compare analgesic efficacy in perioperative period between intravenous fentanyl and intrathecal fentanyl as an adjuvant in the subarachnoid block for cesarean section.

Materials and Methods: The study was carried out on 100 parturients, aged 18-45 years, ASA status I and II, scheduled for elective cesarean section, randomly allocated in two groups of 50 patients each: Group A (intravenous group): Intrathecal 0.5% hyperbaric bupivacaine 2.0 ml + normal saline 0.25 ml, and intravenous fentanyl 12.5 mcg immediately after administration of spinal bupivacaine. Group B (intrathecal group): Intrathecal 0.5% hyperbaric bupivacaine 2.0 ml (10 mg) + fentanyl 12.5 mcg (0.25 ml), and intravenous normal saline 0.25 ml (placebo). We compared the requirement for intravenous fentanyl supplementation during surgery, the intraoperative pain scores by visual analog scale, and the time to post-operative rescue analgesia.

Results: The intravenous group (Group A) has higher intraoperative pain scores than Group B ($P < 0.05$). Higher amount of intraoperative intravenous fentanyl supplementation was required in the intravenous fentanyl group as compared to the intrathecal group (mean intravenous fentanyl requirement = 19.5 ± 3.56 versus 4.5 ± 1.87 mcg, respectively; $P = 0.002$). The time to first request for post-operative analgesia was significantly longer in the intrathecal fentanyl group than in intravenous fentanyl group (133.9 ± 20.68 vs. 115.4 ± 16.28 min, respectively; $P = 0.003$).

Conclusion: Intrathecal fentanyl supplementation of spinal anesthesia with bupivacaine during cesarean delivery resulted in a better quality of spinal analgesia than the same dose of intravenous fentanyl supplementation.

Key words: Analgesia, Bupivacaine, Cesarean section, Fentanyl, Subarachnoid block

INTRODUCTION

Subarachnoid block for cesarean delivery is a preferred and widely used technique[1] because it is safer and results in less maternal and neonatal morbidity than general anesthesia.[2,3]

The local anesthetics have a relatively short duration of action, thereby limiting the technique for comparatively long duration surgery and increasing the requirement of analgesics in the early post-operative period.[4,5] Furthermore, even the conventional recommended doses of the local anesthetic are unable to completely abolish visceral pain produced by the manipulation of the uterus and peritoneum, leading to intraoperative pain and nausea-vomiting,[4,6] necessitating an increase in doses of the local

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anesthetic, which is associated with a higher incidence of maternal and neonatal morbidity, (such as maternal hypotension).[7,8] Hence, analgesic supplementation is also needed for anesthetic management of visceral pain intraoperatively.[9] Thus, combination of local anesthetics with various adjuvants for spinal anesthesia has been studied.[9-13] Lipophilic opioids, especially fentanyl, is increasingly being administered intrathecally as an adjuvant to spinal anesthesia because they act synergistically with local anesthetics and intensify sensory block without increasing sympathetic blockade and prolonging motor block.[7,14]

In the form of intrathecal fentanyl, spinal opioids induce better analgesia. A significant amount of intrathecally administered fentanyl may diffuse into the epidural space[9,15] and subsequently into plasma, which suggests that the analgesic effect of intrathecal fentanyl may be induced by a systemic rather than a spinal action. If intrathecal fentanyl induces analgesia predominantly through absorption into blood stream, then the same dose injected intravenously should produce the best effect.[16]

In this study, the intrathecal fentanyl was compared with the same dose of fentanyl administered intravenously as an adjuvant regarding the analgesic efficacy in the perioperative period, by studying the need for intraoperative analgesic supplementation, intraoperative pain scores, and the time to request for first post-operative rescue analgesia.

MATERIALS AND METHODS

The prospective, randomized, double-blinded study was carried out on 100 patients, aged 18-45 years, ASA grade I and II physical status, scheduled for elective cesarean section, after obtaining ethical committee approval and written informed consent from the patient.

A detailed pre-anesthetic checkup, gestational age and parity, height, weight, and routine investigations were undertaken.

Exclusion Criteria

- Contraindications to spinal anesthesia
- Pregnancy with obstetric complications
- Uncontrolled diabetes mellitus or hypertension
- Fetal distress
- Women at risk for respiratory complications
- Allergy to study drugs or history of drug abuse
- Failed spinal block.

The patients were randomly allocated into two groups of 50 patients each.

Group A (intravenous fentanyl group) received intrathecal 0.5% hyperbaric bupivacaine 2.0 ml (10 mg) + normal saline 0.25 ml (to achieve the same volume), and IV fentanyl 12.5 mcg (0.25 ml) immediately after administration of spinal bupivacaine.

Group B (intrathecal fentanyl group) received intrathecal 0.5% hyperbaric bupivacaine 2.0 ml (10 mg) + fentanyl 12.5 mcg (0.25 ml) followed by immediate injection of IV normal saline 0.25 ml (placebo).

All patients were pre-medicated with ranitidine 50 mg IV, and metoclopramide 10 mg IV 45 min before surgery. On arriving in the operating room, all monitors were attached and were preloaded with 10 ml/kg ringer lactate solution. Under all aseptic precautions, lumbar puncture was performed in sitting position by midline approach at L3-L4 intervertebral space using a 25G Quincke's spinal needle and after free flow of clear cerebrospinal fluid (CSF) was seen, the study drug was given, immediately followed by the IV injection. Immediately after the block, each parturient was placed supine with 15° to 20° left uterine displacement. Oxygen 5 L/min was given via a face mask during the surgery.

Patients were monitored with a continuous pulse oximeter, heart rate, respiratory rate, and electrocardiogram monitoring. Non-invasive blood pressure measurement was recorded every 3 minutes for 20 minutes, and then every 5 min until the end of surgery. Fall in systolic blood pressure <100 mmHg or fall of ≥20% below the pre-induction level was treated with 5 mg boluses of IV ephedrine.

Level of sensory block was measured by pinprick every minute until the block reached T6 dermatome. Thereafter, the level was checked every 2 min until the maximum sensory block level was confirmed. Level of motor blockade was assessed using modified Bromage scale.[17] Time of onset of motor block to Bromage 3 was noted. Time to regression of sensory block to T12 dermatome and time for motor recovery to Bromage score 0 was assessed.

Pain was evaluated using visual analog scale (VAS), which was introduced to the patients before surgery.[18] Patients were asked to rate the VAS before delivery, when the uterus was exteriorized, after replacement of the uterus into the abdominal cavity, and whenever the patient complained of discomfort or pain during surgery. Each time VAS was >3; 25 μg increments of fentanyl IV was administered every 5 min until VAS became <3. A maximum dose of 2 μg/kg fentanyl IV was given after which rescue analgesia was given with IV ketamine.

Any adverse effects, such as intraoperative nausea, vomiting, pruritus, shivering, and respiratory depression were recorded and treated. After delivery, the Apgar scores of the neonates were assessed at 1 and 5 min. Time to the first request for rescue post-operative analgesia for the patient was recorded. Rescue analgesia was available in the form of IV 75 mg diclofenac sodium aqueous.

The data were analyzed using SPSS software version 20 by inserting the data into MS Excel. Unpaired/independent *t*-test was used on the data to compare the significant difference between the two groups for different parameters under study, and qualitative data were analyzed using non-parametric tests of statistics, that is, Chi-square test and Fisher's exact test, at 0.05 level of significance (that is, a $P < 0.05$ was considered significant). Data are presented as mean value ± standard deviation, median, mode, and incidence *n* (%).

RESULTS

The groups were comparable with respect to age, height, weight, gestational age, and parity (Tables 1 and 2). The sensory and motor block characteristics are summarized in Table 3. The time of onset to T6 sensory block, maximum sensory level achieved, and time required to achieve maximum sensory level is similar between the groups. In most patients, the maximum sensory level in both groups reached a level of T5. The difference between the groups in motor block onset, time for motor block recovery, and time to the recession of sensory block to T12 did not reach statistical significance. There was no significant difference between groups with respect to intrathecal injection to delivery time and duration of surgery (Table 1).

Table 1: Demographic data, time to delivery, and duration of surgery

Parameters	Group A (mean±SD)	Group B (mean±SD)	*P* value
Age (years)	27.26±5.13	25.76±3.11	0.215 (*P*>0.05)
Height (cm)	154.28±2.08	153.86±2.11	0.314 (*P*>0.05)
Weight (kg)	55.38±4.81	55.62±3.47	0.349 (*P*>0.05)
Gestational age in weeks	38.92±1.43	38.6±1.76	0.398 (*P*>0.05)
Time to delivery (min)	13.18±2.28	12.86±2.72	0.074 (*P*>0.05)
Duration of surgery (min)	53.3±5.68	52.7±7.09	0.231 (*P*>0.05)

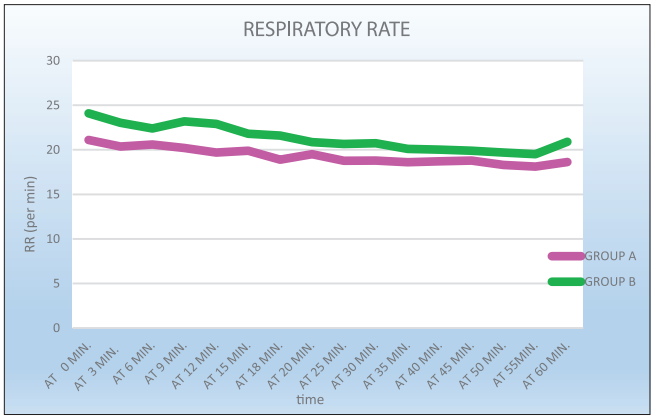
SD: Standard deviation

Table 2: Parity

Parity	Number of patients		*P* value
	Group A	Group B	
0	2	3	0.116 NS
1	28	29	0.123 NS
2	16	12	0.089 NS
3	3	4	0.096 NS
4	1	1	0.333 NS
5	0	1	0.211 NS
Total	50	50	

NS: Non-significant

Intraoperative pain scores are depicted in Table 4. Group A had a higher incidence (n = 10%) of moderate to severe pain (i.e., VAS > 3) than Group B (n = 2%) before delivery, which was of statistical significance (P = 0.004). There was also a statistically significant difference between the groups in the incidence of significant pain when uterus was exteriorized and when it was replaced in the abdomen. During exteriorization of the uterus, Group A had a significantly higher incidence of pain (n = 42%) than Group B (n = 10%) ($P < 0.001$); whereas when uterus was replaced in abdomen, 24% of Group A patients complained of moderate to severe pain as compared to only 4% of patients in Group B (P = 0.002). Group A patients required IV fentanyl intraoperatively for analgesic supplementation more frequently (n = 56%) than Group B (n = 14%), which was of statistical significance (P = 0.001) (Table 5). 22% patients needed IV fentanyl to be repeated intraoperatively in Group A as compared with only 4% patients in Group B ($P < 0.05$). A statistically significant higher amount of mean IV fentanyl supplementation was required intraoperatively in Group A (19.5 ± 3.56 μg) as compared with Group B (4.5 ± 1.87 μg) (P = 0.001) (Table 5). The time to first post-operative rescue analgesia showed a statistically significant difference between the two groups, with time being longer in Group B (133.9 ± 20.68 min) than Group A (115.4 ± 16.28 min) (P = 0.001) (Table 5). There was no statistically significant difference in the incidence of nausea, vomiting, pruritus, shivering, and respiratory depression between the two groups (Table 6 and Graph 1). The Apgar score of all neonates in both the groups was ≥8 at 1 min and ≥9 at 5 min (Table 6). The patients in both groups remained hemodynamically stable intraoperatively (Graphs 2 and 3).



Graph 1: Intraoperative respiratory rate (mean ± standard deviation)

Table 3: Sensory and motor block characteristics

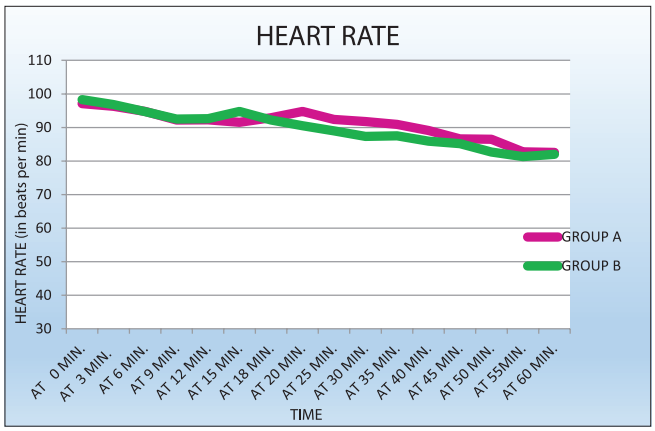
Block characteristics	Group A (mean±SD)	Group B (mean±SD)	*P* value
Time taken for T6 sensory block onset (in min)	2.6±0.728	2.8±0.808	0.136 (*P*>0.05) NS
Maximum sensory level achieved S_{max} (T-)	5.38±0.602	4.9±0.647	0.103 (*P*>0.05) NS
Time for S_{max} (in min)	4.12±1.35	5.0±1.36	0.098 (*P*>0.05) NS
Duration of sensory block recovery (regression to T12 dermatome)	127.9±16.29	137.5±16.23	0.053 (*P*>0.05) NS
Time to motor block onset to Bromage 3 (in min)	1.98±0.68	2.3±0.74	0.098 (*P*>0.05) NS
Motor block recovery time for Bromage 0 (in min)	115.1±15.89	123±17.14	0.090 (*P*>0.05) NS

NS: Non-significant, SD: Standard deviation

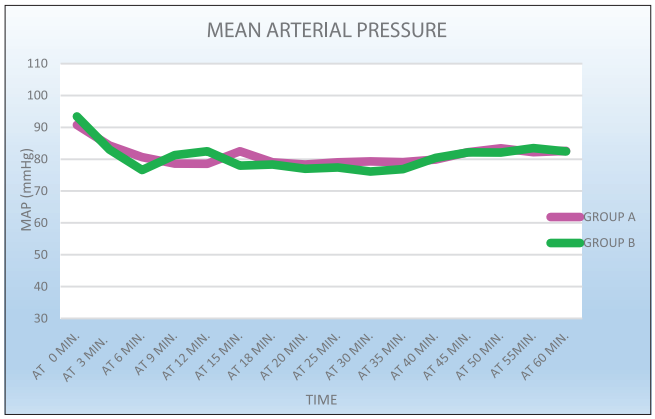
Table 4: Incidence of moderate to severe pain intraoperatively

Incidence of significant pain (VAS >3)	Group A *n* (%)	Group B *n* (%)	*P* value
Prior to delivery	10	2	0.004 (*P*<0.05)*
Uterus exteriorized	42	10	0.0001 (*P*<0.05)*
Uterus replaced	24	4	0.002 (*P*<0.05)*

*Implies statistically significant difference. VAS: Visual analog scale



Graph 2: Intraoperative heart rate (mean ± standard deviation)



Graph 3: Intraoperative mean arterial blood pressure (mean ± standard deviation)

DISCUSSION

Spinal anesthesia is often used for elective cesarean delivery.[19,20] However, even at recommended doses of intrathecal bupivacaine, it alone may be insufficient to provide complete analgesia intraoperatively as the surgery requires manipulation of the uterus and traction of peritoneum, which produces intraoperative visceral pain and nausea-vomiting.[4,6,21,22] Higher doses of intrathecal bupivacaine are associated with severe maternal arterial hypotension and delayed recovery of motor block.[6,11,21,23] Therefore, smaller doses of bupivacaine supplemented by intrathecal opioids have been recommended for spinal anesthesia in patients undergoing cesarean delivery. Their synergistic and potentiating effects on local anesthetics in subarachnoid block result in better perioperative analgesia and fewer adverse effects.[4,8,19,23]

In cesarean section, it is imperative to use the smallest effective dose of opioid to minimize the potential adverse effects on the mother and neonate.[4,24] Dose ranging studies have demonstrated that use of low dose of intrathecal fentanyl, 6.25-12.5 mcg is effective in cesarean delivery with minimal side effects.[19,24]

A significant amount of intrathecally administered lipophilic opioid, such as fentanyl, is lost by diffusion into the epidural space[15] and subsequently into the plasma, suggesting that intrathecally administered fentanyl may induce analgesia by a systemic rather than by a spinal action. It will produce at best the same effects as the same dose injected intravenously.[16]

This study was conducted to compare the analgesic efficacy of intrathecal fentanyl versus the same dose of IV fentanyl as an adjuvant to spinal bupivacaine, in terms of the intraoperative pain scores, amount of intraoperative analgesic supplementation, and duration of post-operative analgesia in women undergoing elective cesarean section.

Siddik-Sayyid *et al.*[16] conducted a similar study on 48 ASA physical status I and II parturients, scheduled for elective cesarean section who were randomly allocated into two groups. 23 patients received 12 mg of hyperbaric bupivacaine (0.75%) plus 12.5 μg of fentanyl intrathecally (followed by injection of IV saline 0.25 ml as placebo), and 25 patients received 12 mg of hyperbaric bupivacaine (0.75%) alone (mixed with CSF to achieve the same final volume) followed by immediate injection of 12.5 mcg IV fentanyl. In a similar study conducted by Sheikh *et al.*,[25] it

Table 5: Intraoperative fentanyl requirement and post-operative analgesia

Number of patients *n* (%)	Group A (%)	Group B (%)	*P* value
Patients requiring fentanyl			
Once	28 (56)	7 (14)	<0.001 (*P*<0.05)*
Twice	11 (22)	2 (4)	0.0001 (*P*<0.05)*
Mean fentanyl requirement intraoperatively (micrograms)	19.5±3.56	4.5±1.87	0.001 (*P*<0.05)*
Time to first rescue post-operative analgesia (in min)	115.4±16.28	133.9±20.68	0.003 (*P*<0.05)*

*Implies statistically significant difference

Table 6: Side effects and neonatal Apgar scores

Number of patients *n* (%)	Group A (%)	Group B (%)	*P* value
Nausea	5 (10)	1 (2)	0.892 (*P*>0.05)
Vomiting	2 (4)	0 (0)	0.112 (*P*>0.05)
Pruritus	1 (2)	0 (0)	0.120 (*P*>0.05)
Shivering	1 (2)	0 (0)	0.211 (*P*>0.05)
Apgar score AT (median value)			
1 min	8 (8-9)	8 (8-9)	0.125 (*P*>0.05)
5 min	9 (9-10)	9 (9-10)	0.163 (*P*>0.05)

included patients with pregnancy-induced hypertension without proteinuria.

There were no significant differences between the intrathecal group and the IV fentanyl group with respect to age, height, weight, parity or gestational age, intrathecal injection to delivery time, and duration of surgery; which is in line with observations of Siddik-Sayyid *et al.*,[16] Sheikh *et al.*,[25] Biswas *et al.,*[26] and others.[4,19] Furthermore, the sensory and motor block characteristics showed no statistically significant difference between the groups. These findings are consistent with the findings of Siddik-Sayyid *et al.*,[16] Biswas *et al.,*[26] and others.[4,19,25,27] It has been documented that intrathecal opioids potentiate the effects of local anesthetic without intensifying motor and sympathetic blockade.[14]

Similar to observations of Siddik-Sayyid *et al.,*[16] the incidence of VAS > 3 (i.e. moderate-severe pain) before delivery was significantly lower in the IT fentanyl group as compared with IV fentanyl group. Furthermore, the incidence of significant pain (VAS > 3) during exteriorization of uterus and replacement of uterus into abdomen was found to be higher in the IV fentanyl group as compared with the intrathecal group in both the studies (Siddik-Sayyid *et al*);[16] the difference was of statistical significance in our study ($P < 0.05$) but was not so in the study by Siddik-Sayyid *et al.*[16] This may be explained by the fact that we used a lower dose and concentration (10 mg, 0.5%) of bupivacaine and a larger sample size as compared with Siddik-Sayyid *et al.*[16] (12 mg, 0.75%) ($n = 48$). Our results corroborate with those of Hunt *et al.*[20] and others,[8,26-29] where administration of more than 10 mcg of intrathecal fentanyl with 0.5% hyperbaric bupivacaine led to a marked decrease in the incidence of intraoperative pain or discomfort, indicating that intrathecal fentanyl effectively abolishes visceral pain. This high incidence of visceral pain in cesarean deliveries during manipulation of uterus and peritoneum under regional anesthesia has been demonstrated earlier.[6,21] This can be attributed to the fact that similar to the tourniquet pain, visceral pain is believed to be conducted by unmyelinated C-fibers. Hence, once the dose of local anesthetic is reduced these fibers become unblocked, while the Aδ-fibers transmitting incisional pain are still blocked.[6,30]

There was a statistically significant difference in the need for intraoperative analgesic supplementation with IV fentanyl and also the mean fentanyl requirements between the groups in our study, in consonance with Siddik-Sayyid *et al.,*[16] with greater requirement for supplementation in the IV group as compared with IT group. The decrease in the intraoperative analgesic requirement has been well documented in other studies as well.[19,20,24,29] However, this is not in agreement with findings of Dahlgren *et al.*,[4] as none of the patients in either group required intraoperative supplementary analgesics in their study. The varying local anesthetic concentrations, baricity, and doses may account for these differences in the requirement for intraoperative analgesic supplementation.

The duration of post-operative analgesia, i.e., the time to first request of post-operative analgesia was prolonged in the intrathecal fentanyl group as compared with the IV fentanyl group, and this difference was statistically significant, which is in agreement with Siddik-Sayyid *et al.*,[16] and most of the studies using an intrathecal fentanyl dose of >10 mcg such as Biswas *et al.*[26] and others.[4,19,25,27,29] Even a moderate increase in the duration of post-operative analgesia must be considered beneficial, as it allows early mobilization of the mother and a sooner mother-baby interaction.

The hemodynamic parameters and the incidence of maternal side effects (such as nausea, vomiting, shivering, pruritus, and respiratory depression) showed no statistically significant difference between the groups, which in conformity with the observations of other workers.[19,25-27]

However, a statistically significant lower incidence of intraoperative nausea and vomiting in the IT fentanyl group was seen by Siddik-Sayyid *et al*.,[16] which was probably due to hypotension and was cured after administration of ephedrine (which corrected the hypotension). The Apgar scores of all neonates were ≥8 at 1 min and ≥9 at 5 min in both the studies.[16] Studies by Frolich *et al*.[31] and Eisele *et al*.[32] found similar results for IV administration of fentanyl in doses up to 1 mcg/kg before delivery in cesarean section.

These results suggest that intraoperative analgesic supplementation of bupivacaine spinal anesthesia with intrathecal fentanyl results in a better quality of spinal anesthesia than IV fentanyl, as evidenced by the lower intraoperative VAS scores, as well as lesser need for additional intraoperative analgesics. In addition, the time to the first post-operative analgesic requirement was longer in the intrathecal fentanyl group as compared with the IV fentanyl group.

CONCLUSION

From our study, it can be concluded that:

- Intrathecal fentanyl analgesic supplementation was more efficacious than intravenous fentanyl supplementation of subarachnoid block in cesarean delivery, as intrathecal fentanyl supplementation was associated with lower intraoperative VAS scores, lower intraoperative analgesic requirements, and a longer time to first post-operative rescue analgesia than with intravenous fentanyl supplementation with comparable maternal adverse effects and fetal outcomes
- In view of better analgesia and lesser side effects, it can be concluded that intrathecal fentanyl supplementation of spinal anesthesia with bupivacaine during cesarean delivery resulted in a better quality of spinal analgesia than the same dose of intravenous fentanyl supplementation.

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Original Article

Diagnostic Accuracy of Pre-operative Staging of Colorectal Carcinoma in Comparison to Post-operative Pathological Staging

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Abstract

Background: Pre-operative staging of primary tumor is critical for planning treatment and it is directly related to prognosis of the patient. Hence, assessing the accuracy of this pre-operative staging is essential.

Aim: To evaluate the accuracy of computed tomography (CT) in pre-operative tumor staging of colorectal malignancies by correlating with post-operative histopathological staging.

Materials and Methods: This is a retrospective correlative study. The medical records of 45 consecutive patients who underwent resection for a colonic carcinoma at Father Muller Medical College, Mangalore, over a period of 13-month from January 2015 to February 2016 were retrospectively reviewed. Pre-operative CT staging was correlated with post-operative histopathological staging.

Results: In the CT staging of malignant lesions, 9 of the 11 cases were correctly staged as T1 and T2 lesions. 16 of the 18 cases were correctly staged as T3 lesions, and all the 7 cases were correctly staged as T4 lesions.

Conclusion: CT proved to be an excellent modality for the staging of colorectal carcinomas which helps in the proper planning of surgery and further management of the patient.

Key words: Colon cancer, Computed tomography staging, Histopathology staging, Pre-operative computed tomography staging, Tumor node metastasis staging

INTRODUCTION

Colorectal cancer is the third most common cancer in men and the second in women worldwide. Population-based time trend studies show a rising trend in the incidence of colorectal carcinoma in India.[1] Pre-operative staging of colon cancers is important to plan the best possible treatment options for the patients, which may include for example, neoadjuvant drug therapy to allow for pre-operative downsizing of the primary tumor.[2] Consequently, computed tomography (CT) has become an increasingly routine part of the pre-operative staging of colon cancer. The treatment and prognosis of patients with colorectal carcinoma is dependent on the stage of disease at the time of diagnosis.

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Aim

The study aim at evaluating the accuracy of CT in the tumor staging of malignant lesions. The pre-operative CT findings are correlated with post-operative histopathological findings considering histopathological staging as the gold standard.

MATERIALS AND METHODS

This was a hospital-based retrospective correlative study conducted in Father Muller Medical College and hospital,

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Mangalore, between October 2015 and April 2016. 45 consecutive patients who underwent resection for colorectal carcinoma at Father Muller Medical College, Mangalore, were included in the study. Their case sheets were reviewed. Pre-operative CT staging was correlated with post-operative histopathological staging. CT was performed using 16 slice GE Bright Speed CT scanner. All patients were placed in the supine position on the CT table, and a rectal tube was inserted. Room air was gently insufflated into the colon get adequate colonic distension. CT acquisitions were performed in the arterial phase (start delay of 25-35 s) and in the portal venous phase (start delay of 50-70 s) with a section width of 5 mm. In CT image analysis, only three T stages (≤T2, T3, or T4), are considered instead of the normal four T stages as reported in the tumor node metastasis (TNM) system. T1 and T2 tumors were combined to represent one T-stage, ≤T2. This classification is used to address known limitations of CT in distinguishing T1 and T2 lesions. Specimens were processed after fixing them for 48 h, cutting 6 mm axial slices along the tumor length, and embedding the slices in mega blocks for further fixation and processing. The mega blocks were all embedded in paraffin, mounted on glass, and stained with hematoxylin and eosin for histological assessment. Pathological staging of the specimens was then diagnosed by the pathologist according to the Seventh American Joint Committee on Cancer TNM staging system[3] as follows: pT0, no evidence of primary tumor; pT is, carcinoma *in situ*, intraepithelial, or invasion of lamina propria; pT1, tumor invades submucosa; pT2, tumor invades muscularis propria; pT3, tumor invades through the muscularis propria into the subserosal, or into non-peritonealized pericolic tissues; and, pT4, tumor directly invades adjacent organs or structures, and/or perforation of the visceral peritoneum.

RESULTS

Of the 11 cases staged as T1 and T2 on histopathology, CT correctly staged 9 cases (81.80%). Overstaging was done in 2 cases. Of the 18 cases staged as T3, CT correctly staged 16 cases (88.90%). Understaging was done in 2 cases. All the 7 cases staged as T4 on histopathology were correctly staged on CT (Table 1).

Table 1: CT in the staging of malignant lesions

Count	Histopathological staging			Total
	T1 and T2	T3	T4	
CT staging				
T1 and T2				
Count	9	2	0	11
	81.80%	18.20%	0.00%	100.00%
	81.80%	11.10%	0.00%	30.60%
T3				
Count	2	16	0	18
	11.10%	88.90%	0.00%	100.00%
	18.20%	88.90%	0.00%	50.00%
T4				
Count	0	0	7	7
	0.00%	0.00%	100.00%	100.00%
	0.00%	0.00%	100.00%	19.40%
Total				
Count	11	18	7	36
	30.60%	50.00%	19.40%	100.00%
	100.00%	100.00%	100.00%	100.00%

χ^2=53.99, *P*=0.000 HS. CT: Computed tomography

DISCUSSION

The prognosis of patients with colorectal carcinoma is dependent on the stage of disease at the time of diagnosis. An accurate staging of rectal cancer is necessary to indicate the most appropriate management. An early small colorectal cancer confined to submucosa (T1 stage) can be excised locally, whereas pre-operative chemotherapy and radiation therapy can be recommended for advanced rectal cancer for downstaging. Compared with surgery alone, pre-operative neoadjuvant therapy plus surgery for advanced rectal cancer (T3, T4) results in better survival rates, better local control, and comparable or better toxicity compared with standard post-operative adjuvant regimens. Accurate staging is, therefore, crucial in the selection of patients for trials on the evaluation of neoadjuvant treatment. Filippone *et al.*[4] did a study on the pre-operative T and N staging of colorectal carcinoma using contrast-enhanced multi-detector row CT colonography. They observed that the overall accuracy of contrast-enhanced multi-detector CT (MDCT) in tumor staging was 73% (30 of 41 patients) when transverse images were evaluated alone. Overall, accuracy improved to 83% (34 of 41 patients) when transverse and multiplanar reconstruction (MPR) images were evaluated in combination. Over and under staging using transverse images occurred in 9 of 41 (22%) patients and 2 of 41 (5%) patients, respectively. With transverse images and MPRs combined, over- and under-staging occurred in 5 of 41 (12%) patients and 2 of 41 (5%) patients, respectively. Horton *et al.*[5] did a study on the imaging features of colonic malignancy using spiral CT. They observed that CT allows detection of pericolic extension of disease and is more accurate than magnetic resonance imaging in staging the local extent of tumor, particularly for rectal cancers and detection of penetration of the lamina propria. They also observed that CT is better than colonoscopy at demonstrating early, mass like tumor recurrence at the surgical anastomosis due to the often largely extrinsic component of such recurrence.

Freeny *et al.*[6] evaluated the pre-operative staging and detection of post-operative recurrence in colonic cancers. Compared with the Duke's classification, CT correctly staged only 47.5% of patients: 16.6% were upstaged, and 83.3% were downstaged.

Balthazar *et al.*[7] did a pre-operative evaluation of 90 proved cases of colon carcinoma to know the detection rate and role of CT in the pre-operative evaluation. In this study, the overall detection rate was 84%; however, the rate varied from 68% in unprepared colons to 95% in clean colons that were adequately distended with air. Their study shows that CT had a sensitivity of 55% for local invasion, 73% for regional nodes, and 79% for liver metastases.

Ng *et al.*[8] assessed the pathological significance of abnormal pericolic fat shown by CT in the context of colorectal carcinoma. According to their study abnormal pericolic fat had a sensitivity of 79%, specificity of 33%, positive predictive value of 91% in identifying extension of tumor infiltration beyond the muscle coat.

Harvey *et al.*[9] evaluated the role of spiral CT pneumocolon for assessing colonic neoplasms. According to their study, CT pneumocolon clearly showed the primary tumor in all cases as an enhancing soft tissue mass, and was able to detect local extension and lymphadenopathy as well as assess the liver, peritoneum and remaining abdomen. CT depicted the morphology of the primary tumor more clearly than barium enema, and in one case also detected a 1 cm polyp which was not seen on the barium study because the patient was incontinent of barium and views were limited. There was a good correlation between the CT and pathological findings.

Of the 11 cases staged as T1 and T2 on histopathology, CT correctly staged 9 cases (81.80%) (Figure 1). Over staging was done in 2 cases. Filippone *et al.*[6] in their study on the staging of colorectal carcinoma using MDCT were able to stage 93% of the lesions as T1 and T2 correctly. In our study, 16 cases (88.90%) were correctly staged as T3 (Figure 2). Under staging was done in 2 cases. Filippone *et al.* were able to correctly stage 90% of the cases as T3 lesions. All cases with T4 lesions were correctly staged in our study (Figure 3). Filippone *et al.* were able to correctly stage 98% of the lesions as T4.

CONCLUSION

CT is proved to have good diagnostic accuracy in pre-operative staging of malignant lesions which helps in the proper planning of surgery and further management of the patient.

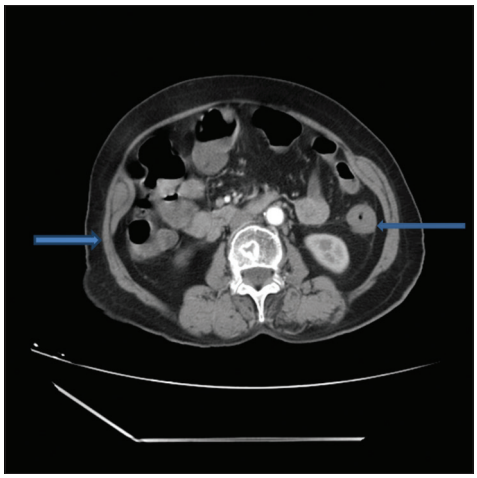

Figure 1: Axial contrast-enhanced computed tomography showing wall thickening of the descending colon (arrows) confined to the wall. No evidence of pericolic fat stranding - T2 tumor staging

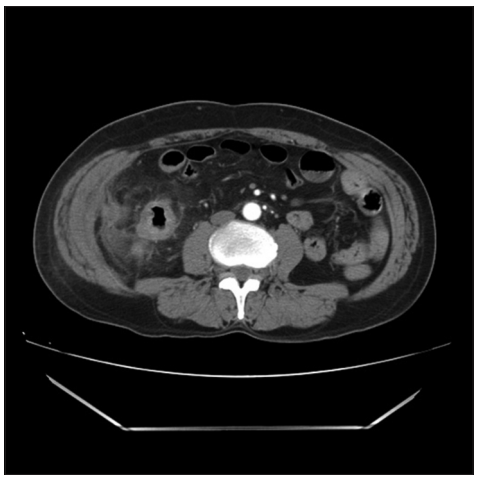

Figure 2: Axial contrast-enhanced computed tomography showing wall thickening of the ascending colon (arrows) with nodular margin and peri colonic fat stranding suggestive of malignancy - T3 tumor staging

Figure 3: Axial contrast-enhanced computed tomography showing heterogeneously enhancing asymetric wall thickening involving the descending colon with infilyration of the spleen suggestive of T4 stage

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Original Article

Pediatric Emergencies Seen in a Tertiary Hospital in Uyo, Akwa Ibom State of Nigeria: A two Year Review

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Abstract

Introduction: The trend in major causes of childhood illnesses and deaths may evolve or change over time, even within the same community. It is, therefore, important to perform periodic evaluations on the patterns of morbidity and deaths. This could bring to highlight emerging public health challenges and help to guide priority health-care planning and delivery.

Purpose: To determine the causes of hospitalization and deaths in children admitted to the children emergency unit (CHEU) of the University of Uyo Teaching Hospital, Uyo, Akwa Ibom State in a 2-year period.

Materials and Methods: A retrospective study, with review of the records of all children, from 7 weeks of age to 17 years, admitted and managed in the CHEU, between November 2012 and October 2014.

Results: There were a total of 2533 children, age ranged from 7 weeks to 17 years admitted in the 2-year study period, with a male/female ratio of 1.2:1. The leading causes of illnesses included malaria (29.6%), broncho-pneumonia (9.6%), diarrhea (9.0%), septicemia (8.5%), surgical emergencies (5.8%), trauma (4.6%), and sickle cell disease (4.0%). Others included meningitis (2.7%), measles (1.5%), poisoning (0.7%), and tetanus (0.5%). The month of march recorded the highest number of admissions. A majority (92.6%) of the patients were discharged with a mortality rate of 2.7%. The patients that left against medical advice constituted 4.7% of the total admissions.

Conclusion: The major causes of morbidity in these children were infective illnesses such as malaria, bronchopneumonia, and diarrhea. The trend showed a rising incidence of surgical emergencies, sickle cell disease, and trauma while measles and tetanus were noted to be on the decline.

Key words: Emergencies, Nigeria, Pediatric, Uyo

INTRODUCTION

The childhood period is fraught with various illnesses requiring hospitalization. Some may lead to deaths of affected children if not properly managed. This is especially so in children living within resource-poor countries, where health-care delivery is still sup-optimal, and a relatively high child-to-pediatrician ratio persists in most of the regions.[1]

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Surveillance of the common illnesses and causes of deaths in children living in these settings becomes imperative if child mortality reduction targets must be achieved.[1,2] Periodic evaluations of disease patterns for different localities even within the same country are necessary for informed priority setting. It helps to quantify progress against explicit health targets and evaluate which programs are working or not. Emerging public health challenges can also be easily identified.

Infectious and communicable diseases have been largely responsible for a greater percentage of childhood illnesses and mortality in developing countries in the last recent decades.[3] These include malaria, respiratory infections, diarrhea, measles, and malnutrition.[3] Furthermore, trauma and non-communicable diseases were a noticeable emerging trend.[3,4] However, the global burden of disease

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2010 reported substantial decreases in child mortality driven by reductions in diarrhea, lower respiratory tract infections, and more recently malaria.[5] These health statistics, which are based on various studies and data generated from several countries, may be inadequate to serve every population. It, therefore, behaves that indigenous studies are undertaken, to reveal better, what diseases prevail within each community.

This study was aimed at reviewing the pattern of pediatric emergencies seen in children older than 6 weeks of age, managed in the children emergency unit (CHEU) of the University of Uyo Teaching Hospital, Uyo, Nigeria. Moreover, to compare the present result from an erstwhile study done in the same unit over 5 years ago,[4] to assess if any changing trend. This would help re-prioritize interventions and health-care planning strategies.

MATERIALS AND METHODS

This study is retrospective and descriptive in design. It covered a period of 2-year, from November 2012 to October 2014. The records of all children aged 7 weeks to 17 years, as documented in the register were reviewed. The children from the 1st day of life to the age of 6 weeks are managed in the neonatal wards of this facility and were therefore excluded. Furthermore, any child with incomplete data entry was excluded. Information extracted from the records included age, gender, final diagnosis, duration, and outcome of the treatment.

The University of Uyo Teaching Hospital is one of the tertiary health-care facilities in Akwa Ibom State, located in the outskirts of Uyo about 6 km from the center of the city. The hospital is a 355 bed health-care facility and serves as a referral center, also accepting self-reported cases. The Department of Pediatrics provides in-patient and out-patient services for all children.

The CHEU has a 22 bed capacity with an average admission rate of 120 children/month. It is manned by a full complement of staff that includes consultants, resident doctors, interns, and nursing staff with 24 h shift duty coverage on all categories of staff. It undertakes basic resuscitation, treatment, and management of all children presenting there. A side room laboratory, diarrhea treatment unit, and pharmacy are also a functional part of the unit.

The definitive diagnosis documented was as made by the unit consultants. This was based on the presenting clinical features, with or without results of laboratory tests. The diagnosis of malaria, for instance, was supported by the presence of malaria parasites in the blood film. Anemia was diagnosed on clinical grounds, supported by a hemoglobin estimation and sickle cell disease by hemoglobin electrophoresis. Measles was based on clinical features, and septicemia/meningitis was diagnosed based on clinical features, with or without a positive blood culture or abnormal cerebrospinal fluid analysis. The patients with pneumonia were diagnosed either clinically or with chest radiographs or both. HIV/AIDS were diagnosed based on positive ELISA test on a patient with features of the World Health Organization clinical case definition, confirmed by the western blot test. The good clinical response to certain medications by some patients was used to assign the final diagnosis in some cases.

The outcome was classified as discharged, left against medical advice (LAMA), and death.

The data obtained was analyzed using the bar chart, frequency tabulations, and cross tabulations of the Microsoft Excel.

RESULTS

A total of 2533 children were managed in the 2-year period. The total number of males being 1470 (54.7%) and females 1216 (45.3%), giving a male:female ratio of 1.2:1. The leading causes of illnesses included malaria 29.6%, broncho-pneumonia 9.6%, diarrhea 9.0%, septicemia 8.5%, surgical emergencies 5.8%, trauma 4.6%, and sickle cell disease 4.0%. Others included meningitis 2.7%, measles 1.5%, poisoning 0.7%, and tetanus (0.5%). This is represented in Table 1.

The number of admissions per month is represented in Figure 1, and this shows that the months of March (310), February (274), and January (260) recorded the highest number of admissions.

Table 2 shows that children <5 years constituted over half of the total admissions in this study (51.0%), and also had the highest burden of infective illnesses, especially bronchopneumonia (87.2%), diarrheal diseases (79.9%) and malaria (27.3%).

The outcome of admissions showed a greater percentage (92.6) being discharged in satisfactory condition, with a low mortality percentage (2.7) as seen in Table 3.

DISCUSSION

This study revealed infectious diseases, especially malaria as the highest cause for hospital admissions in the CHEU.

Table 1: Pattern of admission over the study period

Disease	Number of patients (%)
Malaria	750 (29.6)
Bronchopneumonia	242 (9.6)
Diarrhea	229 (9.0)
Septicemia	216 (8.5)
Surgical emergencies	147 (5.8)
Trauma	117 (4.6)
Sickle cell disease	102 (4.0)
Meningitis	65 (2.7)
Measles	39 (1.5)
Poisoining	17 (0.7)
Tetanus	13 (0.5)
Others	596 (23.5)
Total	2533 (100.0)

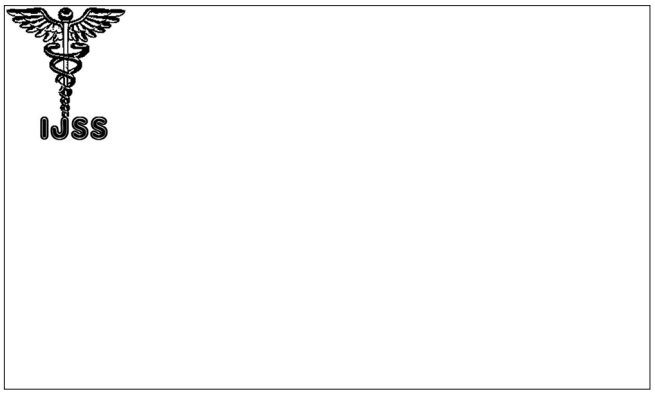

Figure 1: Number of admissions per month. Health workers industrial strike involving nurses and other paramedics occurred during the months of July and August

Table 2: Age distribution of the patients

Diagnosis	*N* (%)			
	<5 years	5-10 years	>10 years	Total
Malaria	295 (39.3)	250 (33.3)	205 (27.3)	750 (100.0)
Bronchopneumonia	211 (87.2)	31 (12.8)	0 (0.0)	242 (100.0)
Diarrhea	183 (79.9)	31 (13.5)	15 (6.6)	229 (100.0)
Septicemia	115 (53.2)	76 (35.2)	25 (11.6)	216 (100.0)
Surgical emergencies	68 (46.3)	49 (33.3)	30 (20.4)	147 (100.0)
Trauma	70 (59.8)	31 (26.5)	16 (13.7)	117 (100.0)
Sickle cell disease	36 (35.3)	51 (50.0)	15 (14.7)	102 (100.0)
Meningitis	29 (44.6)	27 (41.5)	9 (13.9)	65 (100.0)
Measles	37 (94.9)	2 (5.1)	0 (0.0)	39 (100.0)
Poisoning	12 (70.6)	4 (23.5)	1 (5.9)	17 (100.0)
Tetanus	1 (7.7)	11 (84.6)	1 (7.7)	13 (100.0)
Others	236 (39.6)	202 (33.9)	158 (26.5)	596 (100.0)
Total	1293 (51.0)	765 (30.2)	475 (18.8)	2533 (100.0)

Table 3: Outcome of admissions

Diagnosis	*N*			
	Discharged	LAMA	Died	Total
Malaria	720	24	6	750
Bronchopneumonia	220	15	7	242
Diarrhea	217	8	4	229
Septicemia	183	19	14	21
Surgical emergencies	134	7	6	147
Trauma	101	9	7	117
Sickle cell disease	97	5	0	102
Meningitis	53	7	5	65
Measles	37	0	2	39
Poisoning	11	3	3	17
Tetanus	10	1	2	13
Others	520	22	16	596
Total (%)	2346 (92.6)	119 (4.7)	68 (2.7)	2533 (100)

LAMA: Left against medical advice

This is similar to observations from other tertiary hospitals across the eastern and western parts of Nigeria.[5-8] It is also comparable to an erstwhile study in the same center and unit that was documented over 5 years ago.[4] The difference between both studies in the same center lies in the reduced percentage of malarial incidence in the past 2 years of study (29.6%), compared to the previous study, which was 56.6%. The reduction in the total incidence of malarial admissions may be related to the millions of long-lasting insecticide treated nets which have been distributed as part of the global malaria control strategy.[9] In addition, over-the-counter usage of artemisinin-based combination drugs, which are widely available and user-friendly must be sustained to reduce malarial associated illnesses and deaths in children, especially under-fives.

Pneumonia constituted 9.6% of total admissions in this study which is higher than observations from some other centers in Nigeria.[6,10-12] With the commencement of the pentavalent vaccine which gives immunity against some pneumococcal strains, this trend should be monitored and evaluated to assess the success of its recent inclusion in the schedule of the National Programme for Immunization. A reduction in the incidences of measles and tetanus may be as a result of improved vaccine coverage and uptake in the state.

Strikingly, childhood poisoning has remained at the rate of 0.7% of total admissions, as was recorded in the previous study in this center.[4] There is still need for sustained community enlightenment campaigns on the prevention of accidental childhood poisoning.

The month of March recorded the highest number of admissions. The rainy season usually starts about this month in Uyo, Akwa Ibom State of Nigeria. This is the period during which an increase in the incidence of malaria, pneumonia, diarrheal disease, and water-borne diseases is observed.[13,14]

The children aged <5 years constituted over half of total admissions during the period under review in this

study. This pattern is similar to the findings from other centers.[10,15,16]

A majority of the patients were discharged with a mortality rate of 2.7% observed in this study. This is lower than the 5.1% reported by Toma *et al*. in Jos Nigeria,[16] and the rate of 10.0% recorded by Anyanwu *et al*. in Abakaliki, Nigeria.[17] The common causes of death in this study included septicemia, bronchopneumonia, and malaria. This agrees with reports that pneumonia, diarrhea, and malaria rank high among the causes of pediatric deaths, particularly in children aged 1-59 months.[17,18]

The rate of "LAMA" observed in this study (4.7%) is higher than the rates of 2.0% observed by Ndukwu and Onah[19] 2.1% by Toma *et al*.,[16] and 3.8% observed by Anyanwu *et al*.,[17] respectively. Some of the common reasons for LAMA include lack of acceptance of the treatment modalities[20] and financial constraints.[21]

CONCLUSION

This study revealed that infectious diseases, particularly malaria and pneumonia, are common causes of morbidity and mortality in children presenting in our center. The outcome of the admissions in the CHEU of this facility is observed to be good, with the vast majority of children being discharged, and relatively low rates of mortality and LAMA. However, there is still need for continuous improvement and sustenance of the quality of health services provided, as well as community enlightenment on the common childhood diseases.

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Original Article

Evaluation of Visual Evoked Potential in Migraine Individuals

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Abstract

Background: Migraine is a multifactorial brain disorder characterized by recurrent disabling attacks of a headache. The migraine patients have visual disturbances during the attack as well as during the interictal period. In addition, even between attacks some aspects of cortical dysfunction are peculiar in migraineurs.

Aim: This study aims for knowing the pathogenesis of migraine in between attacks that lead to migraine disorder.

Materials and Methods: The study was conducted by evaluating the visual evoked potential of 30 migraine patients during the headache-free period and compared with 30 normal persons. The results were interpreted and statistically analyzed.

Results: There was statistically significant increase in amplitude of P100 wave of the migraine patients due to deficient habituation after a period of 15 min stimulation. In normal subjects, there was a decrease in amplitude of P100 wave due to the effect of habituation. The deficient habituation can be due to decreased serotonin levels leading to reduced pre-activation of the cortex.

Conclusion: The migraine patients has attributed to abnormal cortical processing in migraine with interictal hyperactivity leading to heightened responsiveness and lack of habituation and lack of intracortical inhibition.

Key words: Habituation, Migraine, Visual evoked potential

INTRODUCTION

Migraine is a common disabling primary headache disorder with a high prevalence, socio-economic, and personal impacts. The World Health Organization ranks migraine as one of the top 20 leading neurological causes of disability. The headache is a pervasive symptom and the most common problem that the neurologists encounter in their clinical practices. It is estimated that 12% of world's population suffer from migraine and in India, of 1200 million populations, there are 150-200 million migraineurs under treatment. The gender prevalence of migraine is about 20% in females and 6% in males. According to the International Headache Society (IHS), migraine is classified into headache with aura and headache without aura. Migraine is characterized by recurrent headache disorder manifesting in attacks lasting 4-72 h, with typical headache of unilateral location, pulsating quality, moderate or severe intensity, aggravation by routine physical activity, and association with nausea and/or photophobia and phonophobia. Visual disturbances are well-known clinical features of migraine. The migrainous aura is visual in 82% of cases, with symptoms such as flashes of light, stars, zig-zags, central or paracentral blind spot, and scotoma.[1] The migraine patients are also more sensitive to environmental light stimuli.[2] Apart from this, migraine in some can produce progressive brain damage. Pathophysiological studies in migraine patients and animal models of the migraine headache have identified the trigeminovascular system,[3] brainstem,[4,5] and the cerebral cortex[6-8] as structures which may have primary causative roles. Modern neuroimaging studies[9] have confirmed that migraine with aura symptoms are due to a cortical phenomenon similar to spreading depression. Various methods in electroneurophysiology are particularly

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appropriate for the study of migraine pathophysiology because they are a traumatic and able to detect functional abnormalities.[10] Among the evoked potentials, visual evoked potentials (VEPs) are commonly used and have been extensively studied in migraine during the past 30 years. Studies have shown that migraineurs are characterized by changes in the evoked potentials even during the headache-free period. The excitability of the cerebral cortex in the interictal state of migraine appears to be fundamental in the brain's susceptibility to migraine attacks. Between attacks, the migraine patients are characterized by potentiation instead of habituation of stimulation-evoked cortical responses. The pathogenesis could be due to increased or decreased cortical excitability. Although several studies have been done for the biochemical and neurophysiologic abnormalities that precipitate a migraine attack, the subtle factor that causes migraine disease, which if present should also be detectable in pain-free period, representing underlying dysfunction. This study is indented in knowing about the pathophysiology of migraine by evaluating VEP in migraine patients in between attack and comparing them with normal persons.

MATERIALS AND METHODS

It is a cross-sectional study, conducted in the Institute of Physiology and Experimental Medicine, Madras Medical College, from 2008 to 2011. Ethics Committee approval and Informed consent from patients were obtained. The migraine patients of both gender in the age group between 20 and 50, having the normal vision were selected fulfilling the IHS criteria for headache and were tested during the headache-free interval. The VEP test was performed using EMG, EP-MARK II (Recorders Medicare System) machine. The patients were asked to avoid oil or hair spray after hair wash and patients with refractory error were asked to wear their usual glasses. The FPz reference electrode was kept over the vertex (12 cm from the nasion), the Cz ground electrode over the forehead and Oz active electrode over the occiput (5 cm above the inion). The electrodes were connected to the preamplifier. The filter range was 2-100 Hz with sweep speed, duration, and sensitivity were 350 ms, 50 ms/D, and 2 μV, respectively. The amplification range was 20,000-1,00,000 with the number of epochs were 200 and with the electrode impedance kept below 5 kΩ. Black and white checkerboard of 80% contrast was used with the stimulus type of pattern reversal. The size of the pattern was 8 × 8 min with rate of stimuli 1-2 Hz. Full field was used with black and white. The focus was red with the mean luminance of the central field 50 cd/m^2 and with the background luminance of 20-40 cd/m^2. The visual stimulus was delivered by photo stimulator at frequency of 10 flashes/s. Both the study group and the control group were stimulated continuously for 15 min. This 15 min period was divided into four blocks of 3.8 min each. Each block was an average of 300 epochs. The response obtained was displayed in the monitor and the peak latency, peak to peak amplitude of the positive and negative wave was measured.

RESULTS

There is a very highly significant ($P < 0.0001$) decrease in the amplitude of P100 in the 4th block when compared to the 1st block in both the eyes in the controls (Table 1).

There is a very highly significant ($P < 0.001$) increase in the amplitude of P100 in the 4th block when compared to the 1st block in both the eyes in migraine patients (Table 2).

A very highly significant ($P < 0.001$) increase in the P100 amplitude is seen in the 4th block of migraine patients when compared to the controls (Table 3).

There is a progressive increase in the amplitude in the migraine patients from the first block to the fourth block. There is a progressive decrease in the amplitude from the first block to fourth block in the control group. The amplitude of the first block in migraine patients is lower than the amplitude of the first block in the controls (Table 4).

Tables 5 and 6 show a very highly significant ($P < 0.0001$) decrease in the latency of the N145 wave in the migraine patients when compared to the control group in both the eyes.

Table 1: P100 amplitude (mv) in the control group

Place	Pair	*N*	Mean±SD	*t* value	*P* value
Left eye	1st block versus 4th block	30	6.5643±1.32008	20.186	<0.0001**
		30	3.9127±1.09528		
Right eye	1st block versus 4th block	30	6.6283±1.47342	22.140	<0.0001**
		30	3.7157±1.23378		

SD: Standard deviation, **highly significant

Table 2: P100 amplitude (mv) in the migraine patients

Place	Pair	*N*	Mean±SD	*t* value	*P* value
Left eye	1st block versus 4th block	30	5.6203±2.66406	−7.160	<0.0001**
		30	6.5243±2.68805		
Right eye	1st block versus 4th block	30	5.8203±2.72149	−4.497	<0.0001**
		30	7.0247±2.61677		

SD: Standard deviation, **highly significant

Table 3: Comparison of P100 amplitude (mv) in the 4th block between the migraine patients and controls

Place	Group	*N*	Mean±SD	*t* value	*P* value
Left					
4th block	Migraine patients	30	6.524±2.6880	4.928	<0.0001**
	Controls	30	3.913±1.0953		
Right					
4th block	Migraine patients	30	7.025±2.6168	6.265	<0.0001**
	Controls	30	3.716±1.2338		

SD: Standard deviation, **highly significant

Table 4: Amplitude of P100 wave (mv) from 1st block to 4th block

Place	Mean values	
	Controls	Migraine patients
Left eye		
1st block	6.56	5.62
2nd block	5.56	6.45
3rd block	4.75	6.57
4th block	3.91	6.52
Right eye		
1st block	6.63	5.82
2nd block	5.64	6.25
3rd block	4.71	6.58
4th block	3.72	7.02

Table 5: Comparison of VEP latency (ms) in the left eye

Variable	Group	*N*	Mean±SD	*t* value	*P* value
N75 (ms)	Controls	30	66.435±2.9452	−1.194	0.240
	Migraine patients	30	68.048±6.7846		
P100 (ms)	Controls	30	95.5853±3.46872	1.518	0.136
	Migraine patients	30	93.6697±5.97927		
N145 (ms)	Controls	30	148.283±10.9468	3.925	<0.0001**
	Migraine patients	30	136.688±11.9122		

SD: Standard deviation, VEP: Visual evoked potential, **highly significant

Table 6: Comparison of VEP latency (ms) in the right eye

Variable	Group	*N*	Mean±SD	*t* value	*P* value
N75 (ms)	Controls	30	66.251±3.0018	−0.903	0.371
	Migraine patients	30	67.225±5.0854		
P100 (ms)	Controls	30	95.7847±4.42328	1.701	0.096
	Migraine patients	30	92.9780±7.87919		
N145 (ms)	Controls	30	149.017±10.6557	4.074	<0.0001**
	Migraine patients	30	134.440±16.4475		

SD: Standard deviation, VEP: Visual evoked potential, **highly significant

DISCUSSION

The present study deals with the changes in the VEPs in patients with migraine. The changes are compared with the controls. There was no statistically significant difference in the age, height, weight, and gender between study and the control group. In this study, both the controls and the migraine patients were stimulated continuously for 15 min. This 15 min period was divided into four blocks of 3.8 min each. The data were statistically analyzed, and their significance derived using independent samples *t*-test and paired *t*-test. VEP results were interpreted with respect to their latency and amplitude. Amplitude of the wave denotes the number of fibers recruited. Increase in the amplitude indicates more number of fibers is being recruited. Decrease in the amplitude indicates less number of fibers is being recruited. Latency denotes the time taken for the impulse to travel from the retina to the occipital striate area. In this study, when the P100 amplitude of the first block and the fourth block were compared, there was a very highly significant ($P < 0.001$) decrease in the amplitude of the fourth block (Table 1) in the controls which may be because of habituation, whereas there was a very highly significant ($P < 0.001$) increase in the amplitude of the fourth block of the migraine patients (Table 2) indicating potentiation. When the amplitude of the P100 of the fourth block of the migraine patient was compared with the amplitude of the fourth block of the controls, a very highly significant increase ($P < 0.001$) in the amplitude of the P100 was noted in the migraine patients (Table 3). When all the four blocks were compared, there was a progressive increase in the P100 amplitude from the first block to the fourth block in migraine patients indicating that more and more number of fibers were recruited (potentiation) during the continuous period of stimulation for 15 min. In the controls, there was a progressive decrease in the amplitude from the first block to the fourth block indicating that the fibers recruited were decreasing during continuous period of stimulation probably because of habituation (Table 4). This result was consistent with the study done by Gawel *et al.* (1983),[11] Diener *et al.* (1989),[12] and Khalil (1991),[13] who have said that there was an increase in amplitude of P100 wave in migraine patients on pattern-reversal stimulus. Similarly, Afra *et al.* (1998),[14] found that during repetitive pattern-reversal stimulation lasting 2 min, the amplitude of the P100 wave increased in migraineurs when tested interictally, whereas it decreased in healthy control subjects. Hartner and White (1970), and Peachy *et al.* (1994),[15] said that check size (spatial frequency) influences the components of habituation behavior of pattern-reversal VEP, whereas Oelkers *et al.* (1999),[16] notes that the peak to peak amplitudes were consistently higher in migraineurs

at all spatial frequencies. Dienner *et al.* (1989),[12] found that there was a decrease in P100 amplitude after treatment with Beta-blockers. Contrary to the above studies, Benna *et al.* (1985),[17] Mariani *et al*. (1988),[18] Drake *et al*. (1990),[19] and Tagliati *et al*. (1995),[20] have said that there was no difference in the VEP amplitude between the migraine patients and the normal subjects. However, there was no significant difference in the latency of N75 and P100 between the migraine patients and the controls. This result was similar to the study done by Benna *et al*. (1985),[17] Mariani *et al*. (1988),[18] Drake *et al.* (1990),[19] and Tagliati *et al*. (1995).[20] In another study done by Oelkers *et al*. (1999),[16] migraineurs exhibited longer latencies than healthy controls when small checks were presented, i.e., high spatial frequency. A highly significant decrease ($P < 0.001$) in the latency of N145 wave (Tables 5 and 6) was observed in both the eyes of this study. This may be attributed to the increased excitability of the cerebral cortex in patients with migraine. Thus, habituation "a response decrement as a result of repeated stimulation" in VEP, which appears to be a physiological phenomenon in the visual cortex, is defective in migraineurs as evidenced by an increase in the amplitude of VEP. Habituation in the nervous system is a ubiquitous phenomenon with complex, region, and functional-dependent mechanisms. In cerebral cortex, it is likely to be modulated by excitatory neurons receiving thalamocortical input, intracortical inhibitory interneurons, and subcortical connections of the brainstem involving the neurotransmitters such as serotonin, dopamine, noradrenaline, and histamine that normally protects against cortical overstimulation.[21,22] Serotonin has widespread innervation of sensory cortices and exhibits tonic pacemaker activity and thus plays a modulatory role in cortical information and processing.[23] Since serotonin plays a pivotal role in migraine pathogenesis,[24] low interictal activity in the serotonergic pathway could be responsible for a low pre-activation level of sensory cortices which causes both increased detection thresholds and a wider range of suprathreshold activation before reaching a saturation or "ceiling" effect.[25-27] This leads to deficient habituation. Initial low amplitudes recorded in this study are due to low pre-activation of visual cortex (Table 4). Thus, habituation of the VEP, which appears to be a physiological phenomenon in the visual cortex, is defective in migraine patient's in-between attacks. Defective habituation is not limited to the processing of visual information alone. It has also been demonstrated for cortical auditory evoked responses,[28] event related potentials,[29] as well as for contingent negative variation.[30] Coppola *et al.* (2007),[31] in his study further substantiated that the deficient habituation is purely cortical phenomena, and this is due to abnormal thalamic control. A change in thalamocortical activity due to anatomical and functional disconnection of the thalamus from its controlling inputs (e.g., aminergic brain stem nuclei) can favor hypoactivity at the cortical level causing deficient habituation leading to thalamocortical dysrhythmia syndrome. Another explanation for an interictal habituation deficit might be due to lactate accumulation in sensory cortices during sustained activation. The abnormal cortical information processing in migraine during repetitive photic stimulation may have deleterious consequences on the metabolic homeostasis of the brain parenchyma. As habituation protects the cerebral cortex against sensory overload, repeated photic stimulation causes transient, excess of glycolysis accompanied by a significant rise in lactate levels.[32,33] Sappey-Marinier *et al*. (1992),[34] found that, during pattern-reversal visual stimulation in healthy control subjects, cortical lactate levels began to decrease only after the amplitude of the VEP had diminished by 50% and concluded that the response habituation was an adaptive mechanism prohibiting an excessive increase in cortical lactate levels. If this mechanism is defective, it induces metabolic instability leading to lactate accumulation thus triggering spreading depression (by Lauritzen, 1994[35]) or a similar dysfunctional leading to attack. Such metabolic shifts demonstrated with spectroscopy was seen in the study conducted by Welch *et al*. (1989); Barbiroli *et al*. (1992);[36] Montagna *et al*. (1994);[37] Sangiorgi *et al*. (1994).[38] Recent nuclear magnetic resonance (NMR) spectroscopy study performed interictally in migraine with aura patients disclosed elevated lactate levels in the occipital cortex Watanabe *et al*. (1996).[39]

CONCLUSION

Migraine patients have attributed to abnormal cortical processing in migraine with interictal hyperactivity leading to heightened responsiveness and lack of habituation and lack of intracortical inhibition. Further studies can be done to know the precise relationship between physiological and biochemical abnormalities of the cerebral cortex in migraine. This can be done by combining sensory activation with neurophysiological techniques for functional imaging such as positron emission tomography or NMR. The best insight into the nature of interictal cortical dysfunction will lead to novel therapeutic targets and may allow a better understanding of the mode of action of available therapies.

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Original Article

Incidence, Mortality Pattern, and Outcome of Low Birth Weight Babies Admitted in a Rural Tertiary Care Center: A Retrospective Study

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Abstract

Background: The purpose of this retrospective study was to assess the incidence, Mortality pattern, and outcome of low birth weight (LBW) babies in Mahatma Gandhi Memorial Government Hospital, Trichirapalli for 1 year January 2015 to December 2015.

Materials and Methods: All newborn babies weighing <2500 g delivered and admitted to neonatal intensive care unit at MGM Government Hospital, Trichirapalli and outborn babies weighing <2500 g who were referred to our hospital were included in the study. The incidence, mortality, and outcome of these inborn and outborn babies were analyzed separately since there is difference in antenatal care and mortality in the two groups of babies. The delayed referral of outborn babies also necessitates our team to study their profile separately. The statistical test used are percentages and proportions.

Results: Out of 3582 babies <2500 g (2171 inborn, 1411 outborn), incidence of LBW was 44%. Incidence of prematurity was 29% (34-37 weeks) and 26.5% (<34 weeks). The majority of baby's duration of stay was 4-7 days. Morbidity profile shows 43% with birth asphyxia, 41% for prematurity and its complications, 34% with respiratory distress syndrome. Out of 3582 babies admitted, the outcome of babies showed 89% (3216) of babies were discharged well and 6.72% (241) babies died in a period of 1-year.

Conclusion: Timely intervention, better awareness and interaction with obstetricians, timely resuscitation by trained personnel, adequate manpower, use of antenatal steroids, surfactant, continuous positive airway pressure ventilation, and close monitoring of LBW babies results in better outcome.

Key words: Extramural, Gestational age, Inborn, Intramural, Low birth weight babies, Morbidity, Mortality, Neonatal intensive care unit, Outborn, Preterm

INTRODUCTION

The global prevalence of low birth weight (LBW) is 15.5% which accounts to about 20 million LBW babies born each year, of them 96.5% belong to developing countries.

Neonatal and infant mortality rates can be reduced significantly by providing better care to the mother during the antenatal period, labor, and better management of the LBW babies.

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Appropriate care of LBW infants including their feeding, temperature maintenance, hygienic cord and skin care, early detection, and treatment of infection and its complications can substantially reduce mortality and morbidity.

Kangaroo mother care is a method of care of preterm infants weighing <2 kg it includes exclusive breastfeeding in addition to skin to skin contact and support for the mother-infant dyad and has shown to reduce mortality in hospital-based studies in low and middle-income countries. The WHO document Kangaroo mother care: A practical guide provides guidance on how to organize services in health facilities and on what is needed to provide effective Kangaroo mother care.

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Aim of the Study

1. To study retrospectively the incidence of low birth babies both inborn and outborn admitted at neonatal intensive care unit (NICU),[1] Mahatma Gandhi Memorial Government Hospital attached to KAPV Government Medical College, Trichirapalli for a period of 1-year from January 2015 to December 2015
2. To assess the mortality pattern in these babies admitted to NICU[2]
3. To know the duration of hospital stay, mortality and outcome in these babies[3]
4. The study includes all newborn babies both intrauterine growth restriction as well as preterm babies weighing <2500 g[4,5]
5. The study was undertaken since large number of LBW babies were delivered in this part of rural Tamil Nadu and this hospital caters to the need of antenatal mothers of four districts.[6,7]

MATERIALS AND METHODS

It is a retrospective study done at Mahatma Gandhi Memorial Government Hospital, Trichirapalli for a period of 1-year, from January 2015 to December 2015. After obtaining the approval from Ethical Committee, all inborn babies weighing <2500 g delivered and admitted in NICU and those outborn babies weighing <2500 g referred to our hospital requiring admission in NICU were included in this study. The incidence, morbidity, and outcome of these inborn and outborn babies were analyzed separately since there is difference in antenatal care and morbidity in the two groups of babies.[7] The delayed referral of outborn babies also necessitates our team to study their profile separately. The statistical test used are percentages and proportions.

Limitation of the Study

The detailed morbidity profile of LBW babies is not studied since it is a large study. The study mainly focuses incidence and outcome of LBW babies. The study did not include all LBW babies delivered in MGM Government Hospital, Trichirapalli and only includes LBW babies admitted to NICU.

RESULTS

Out of 3582 babies <2500 g (2171 inborn, 1411 outborn), incidence of LBW was 44%. Incidence of prematurity was 29% (34-37 weeks) and 26.5% (<34 weeks). The majority of baby's duration of stay was 4-7 days. Morbidity profile shows 43% with birth asphyxia, 41% for prematurity and its complications, 34% with respiratory distress syndrome (RDS). Out of 3582 babies admitted, the outcome of babies showed 89% (3216) of babies were discharged well and 6.72% (241) babies died in a period of 1-year (Tables 1-5).

DISCUSSION

Out of 3582 babies admitted to NICU from January 2015 to December 2015, 44% (1576) were LBW babies. 34.4% (1233) were between 1500 and 2499 g, 7.73% (277) were between 1000 and 1499 g, and 1.84% (66) babies were <1000 g.

Table 1: Birth weight census

Year 2015	*N* (%)		
	IM	EM	Total
Total admission	2171 (60.60)	1411 (39.39)	3582 (100)
>2500 g	1230 (56.65)	776 (54.99)	2006 (56)
1500-2499 g	763 (35.14)	470 (33.3)	1233 (34.4)
1000-1499 g	156 (7.18)	121 (8.57)	277 (7.73)
<1000 g	22 (1.01)	44 (3.11)	66 (1.84)

IM: Intramural (inborn), EM: Extramural (outborn)

Table 2: Gestational age census

Year 2015	*N* (%)		
	IM	EM	Total
Total admission	2171 (60.60)	1411 (39.39)	3582 (100)
>37 weeks	1012 (46.61)	579 (41.3)	1591 (44.41)
34-37 weeks	612 (28.18)	428 (30.33)	1040 (29.03)
<34 weeks	547 (25.19)	404 (28.63)	951 (26.54)

IM: Intramural (inborn), EM: Extramural (outborn)

Table 3: Outcome census

Year 2015	*N* (%)		
	IM	EM	Total
Total admissions	2171 (60.60)	1411 (39.39)	3582 (100)
Discharged	1982 (91.29)	1234 (87.45)	3216 (89.78)
Referral	43 (1.98)	29 (2.05)	72 (2.01)
Discharged against medical advice	23 (1.05)	35 (2.48)	58 (1.61)
Died	123 (5.66)	118 (8.36)	241 (6.72)

IM: Intramural (inborn), EM: Extramural (outborn)

Table 4: Duration of hospital stay

Year 2015	*N* (%)		
	IM	EM	Total
Total admissions	2171 (60.60)	1411 (39.39)	3582 (100)
<1 day	67 (3.08)	42 (2.97)	109 (3.04)
1-3 days	419 (19-29)	299 (21.19)	718 (20.04)
4-7 days	887 (40.85)	514 (36.42)	1401 (39.11)
>7 days	798 (36.75)	556 (39.4)	1354 (37.8)

IM: Intramural (inborn), EM: Extramural (outborn)

Table 5: Causes of death

Causes of death	Total
HIE/moderate–Severe birth asphyxia	43
Prematurity with complications	41
RDS	34
Major congenital anomalies	31
Sepsis/pneumonia/meningitis	26
MAS	11
Others (Hyperbilirubinemia/metabolic complications)	42
Causes not established	13
Total	241

MAS: Meconium aspiration syndrome, RDS: Respiratory distress syndrome, HIE: Hypoxic-ischemic encephalopathy

Classification according to gestational age showed 29% (1040) were between 34 and 37 weeks and 26.5% (951) babies were <34 weeks gestation. Their duration of stay showed, out of 3582 babies 39.1% (1401) babies stayed 4-7 days. 37.8% (1354) babies stayed more than 7 days. 20.4% (718) babies stayed between 1 and 3 days and 3% (109) babies stayed <1 day. Hence, the majority of baby's duration of stay was between 4 and 7 days.

Analyzing the outcome of babies admitted to NICU out of 3582 babies 89% (3216) were discharged well, 2% (72) babies were referred to higher center for want of bed or surgery. 1.61% (58) babies were discharged against medical advice and 6.72% (241) babies could not be saved.

Hence, in the period of 1-year from January 2015 to December 2015, the death rate was only 6.72% which is well below the national average and indicated good neonatal care and outcome in our NICU.[7]

Showing the mortality profile of babies, 43 were admitted for birth asphyxia, 41 for prematurity and its complications, 34 were admitted for RDS, 26 were admitted for sepsis, pneumonia and meningitis, 11 were due to meconium aspiration syndrome, 42 were for other causes such as jaundice, anemia, metabolic disorders, and causes not mentioned above. In 13 of babies the causes could not be established, since post-mortem of the babies are not done in our setup.[8,9]

CONCLUSION

Analyzing the data for the previous year, it is found that 44.4% of total admission is constituted by LBW babies <2500 g and preterm babies constitute 55.57%, now it is a challenge both in manpower, material, and money to treat such large number of LBW babies in NICU.[10,11] An average duration of hospital stay of 4-7 days of such large proportion of LBW babies and good outcome in 89.7% of LBW babies indicates good NICU care. Proper and persistent antenatal care from primary health care level to Medical College has to be taken to reduce the birth of preterm and LBW babies. Early referral of high-risk pregnancies to the tertiary care centers will greatly reduce the mortality and morbidity in LBW babies.[12,13] Managing the antenatal risk factors for LBW from the first trimester will greatly enhance the prospect of survival of these babies.[14]

Timely intervention, better awareness and interaction with obstetricians, timely resuscitation by trained personnel, adequate manpower, use of antenatal steroids, surfactant, continuous positive airway pressure ventilation, and close monitoring of LBW babies have mostly reduced the death rate of LBW babies in our center to 6.7%.[15]

Further proper antenatal care, correction of anemia, malnutrition will go a long-way in reducing the birth of LBW babies.[16]

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Original Article

A Comparative Study of Intrauterine Contraceptive Device Utilization among Currently Married Women in a Rural Area of Rani Block and Urban Slums of Guwahati City

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Abstract

Background: The Government of India as a part of its commitment toward the provision of quality spacing services in family planning introduced copper T (Cu-T) 380A in 2002 with an effective protection for 10 years replacing the earlier Cu-T 200.

Study Design: A cross-sectional, descriptive type of observation study.

Objectives: Rural-urban comparison of Cu-T utilization status and to determine the relevant factors influencing it.

Materials and Methods: A cross-sectional study was carried out in a rural block (Rani Block) and urban slums of Guwahati city between the periods from August 2012 to July 2013. Sample size was determined by 4 PQ/L^2, based on 43.3% prevalence of contraceptive practice by the modern method according to the National Family Health Survey-III, 2005-2006 of Assam and 20% permissible error was considered. So, the sample size was calculated as 130 eligible couples. So, 130 eligible couples from each area were studied for which 260 currently married women constitute the study population. Statistical analysis was done by applying Chi-square test.

Results: Cu-T acceptance was more in age group (25-29 years) in urban area (66.7%) than in rural area (33.3%). The level of education had no influence on Cu-T acceptance which was more in rural (16.2%) than in urban (7.9%). Cu-T acceptance was more among household workers both in the urban and rural area. Cu-T acceptance was more among women who earned Rs. 228-500 as per capita per month both in urban and rural. Spacing and postponement of pregnancy (66.7%) reasons for Cu-T acceptance. Desire for a child was the main ground for discontinuation of Cu-T. Majority of women had no complaints (77.8%) on Cu-T insertion, but few (22.2%) complained of spontaneous expulsion.

Conclusion: Organization of awareness camp in both rural and urban area with involvement of community influencers (Panchayat members health functionaries, ICDS workers) and behavior change communication through interpersonal communication is needed.

Key words: Contraceptive device, Intrauterine, Utilization

INTRODUCTION

In India, family planning program was started in the year 1952; the first country in the world to do so. Since 1977, the program was renamed as family welfare program and lastly to the present reproductive and child health program. This change was made particularly to emphasize adoption of family planning methods voluntarily without compulsion and also to increase the acceptance of contraceptive methods by reproductive age group people.

Due to emphasis on sterilization, spacing methods have not been actively promoted nor are they easily available to those who are willing to adopt them. Despite the many advantages of the intrauterine contraceptive device (IUCD) as a method of family planning, it generally suffers from unpopularity worldwide, with the exception of few countries such as China, Egypt, Mexico, and Turkey. The

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scenario in India is the same with <2% of currently married women adopting the intrauterine device (IUD) as a method of contraception. In India, the use of IUD by contraceptive users among married women of reproductive age has come down from 13% in 1969 to 4% in 1979, although since the introduction of copper T (Cu-T), its use has slightly increased to 5.4% in 1984,[1] but the statistical data have further shown an increased in IUD use to 18.4% (Year book on Family Welfare Programme in India; 1997-1998). The Government of India as part of its commitment toward provision of quality spacing services in family planning introduced CU-T 380 A in 2002 with an effective protection for 10 years replacing the earlier CU-T, 200B. In India, only 1.8% of married women of reproductive age use IUCD's, despite the fact that the Government offers IUCD (CU-T) services free of cost, it remains largely underutilized.

Sociocultural and behavioral factors influence the decision to use as well as the selection of a contraceptive method, discontinuation of use of contraceptives, and reasons for discontinuation of a contraceptive. In India, through review of birth spacing methods, especially the IUCD is needed since the surveys show a high rate of discontinuation.

With this background, this study was conducted with an objective to compare the current status of IUCD (CU-T) utilization between the urban and rural areas and to determine the relevant factors influencing it among the currently married women (15-49 years) of Kamrup district in Assam.

MATERIALS AND METHODS

This community-based cross-sectional study was conducted in the urban and rural area of Kamrup District in Assam, during from August 2012 to July 2013. A total of 260 eligible couples were chosen by simple random sampling technique (130 from rural and 130 from urban). Sample size determined by 4 PQ/L^2 based on 43.3% prevalence of contraceptive practice by modern method according to the National Family Health Survey-III, 2005-2006 of Assam and 20% allowable error was considered. The sample size was calculated as 130 eligible couples. So, 130 eligible couples from each area were studied for which 260 currently married women constitute the study population.

Sampling Procedure

The Town and Country Planning department Government of Assam, have identified 26 slums in Guwahati city. Out of these, 10 slums are selected using simple random sampling technique and from each slum, 13 respondents are selected by house to house visit to get the required sample size. Again, out of the 96 villages in Rani Block, 10 villages are selected by simple random sampling technique and then from each village, 13 respondents are selected by house to house visit to get the required sample size. As this is a comparative study between rural and urban slum population, the total respondents come to be 260. The study was approved by appropriate research body.

RESULTS

Total respondents were 260 currently married women. Out of which, 130 were from the rural and 130 women from urban area. The majority of the respondents were in the age group 25-29 years age group in urban area (66.7%) and slightly high in rural area (50%) in the age group 20-24 years (Table 1).

Cu-T utilization was greater among women who were just literate (33.3%), middle school (33.3%), and high school (33.3%) level in rural area, whereas in urban area, it was same among illiterate (33.3%), just literate (33.3%), and primary school (33.3%) level (Table 2). Again, CU-T acceptance was more among household workers (100% in urban and 83.3 in rural) (Table 3). Majority of women accepting CU-T had per capital income <Rs. 228 (33.3%) per capita per month and ranging from Rs. 228-700 (33.3%) per capita per month in the urban area, whereas in rural area, it was greater among women whose per capita income per month was greater among women whose per capita income per month was Rs. 228-500 (100%) (Table 4). From Table 5, in urban area, most of the eligible couple used Cu-T for <1 year (33.3%) and also for 2-3 years and above (33.3%), whereas in rural area, most of the married women used Cu-T for 2-<3 years (33.3%) and 3 years and above (50%). The reasons for accepting Cu-T among the married women were postponement of pregnancy (66.7%

Table 1: Distribution of wives according to age and IUCD practicing

Age of wives (in years)	IUCD		Total	
	Urban	Rural	Urban	Rural
15-19	-	1 (100) 16.7	2 (100) 5.3	2 (100) 2.7
20-24	1 (33.3) 33.3	3 (30) 50	3 (100) 7.9	10 (100) 27.0
25-29	2 (25) 66.7	2 (16.7) 33.3	8 (100) 21.1	12 (100) 32.4
30-34	-	-	9 (100) 23.7	9 (100) 24.3
35-39	-	-	11 (100) 28.9	3 (100) 8.1
40-44	-	-	5 (100) 13.2	2 (100) 5.4
Total	3 (7.9)	6 (16.2)	38 (100)	37 (100)

Row wise percentage is in parenthesis; column wise percentage is shown below without parenthesis. IUCD: Intrauterine contraceptive device

Table 2: Distribution of the wives according to their literacy status and IUCD practicing

Literacy status	IUCD		Total	
	Urban	Rural	Urban	Rural
Illiterate	1 (5) 33.3	-	20 (100) 52.6	-
Just literate	1 (14.3) 33.3	2 (28.6) 33.3	7 (100) 18.4	7 (100) 18.9
Primary school	1 (20) 33.3	-	5 (100) 13.2	4 (100) 10.8
Middle school	-	2 (40) 33.3	3 (100) 7.9	5 (100) 13.5
High school	-	2 (22.2) 33.3	1 (100) 2.6	9 (100) 24.3
HSLC	-	-	-	8 (100) 21.6
HS	-	-	-	4 (100) 10.8
Graduation and above	-	-	2 (100) 5.3	-
Total	3 (7.9)	6 (16.2)	38 (100)	37 (100)

Row wise percentage is in parenthesis; column wise percentage is shown below without parenthesis. IUCD: Intrauterine contraceptive device

Table 3: Distribution of the wives according to their occupation and IUCD practicing

Occupation	IUCD		Total	
	Urban	Rural	Urban	Rural
Household work	3 (9.7) 100	5 (19.2) 83.3	31 (100) 81.6	26 (100) 70.3
Daily way	-	-	3 (100) 7.9	3 (100) 8.1
Part time domestic work	-	-	1 (100) 2.6	2 (100) 5.4
Service	-	-	2 (100) 5.3	1 (100) 2.7
Business	-	1 (20) 16.7	1 (100) 2.6	5 (100) 13.5
Total	3 (7.9)	6 (16.2)	38 (100)	37 (100)

Row wise percentage is in parenthesis; column wise percentage is shown below without parenthesis. IUCD: Intrauterine contraceptive device

in urban and 66.7% in rural), spacing (66.7% in urban and 66.7% in rural), and maternal health (33.3% in urban and 16.7% in rural) (Table 6). Discontinuation of Cu-T among the married women was mostly due to want of a child (55.6% in urban and 60% in rural) and problems faced due to Cu-T use (44.4% in urban and 40% in rural) (Table 7).

DISCUSSION

It is revealed from the Table 1 that in urban slums, majority of the respondents were in the age groups 25-29 years (66.7%), whereas in rural area, it was slightly high (50%) in the age group 20-24 years. Contraceptive acceptance increases with the increase in the age groups of the wives, which was shared by Zutshi and Dhar (1970),[2] Raju *et al.* (1994),[3] and Singh and Benera (1999).[4] In Table 2, it is

Table 4: Distribution of eligible couples according to per capita income per month and IUCD practicing

Per capital per month (Rs.)	IUCD		Total	
	Urban	Rural	Urban	Rural
<228	1 (33.3) 33.3	-	3 (100) 7.9	2 (100) 5.4
228-500	1 (6.3) 33.3	6 (23.1) 100	16 (100) 42.1	26 (100) 70.3
501-700	1 (10) 33.3	-	10 (100) 26.3	2 (100) 5.4
701-900	-	-	5 (100) 13.2	3 (100) 8.1
>901	-	-	4 (100) 10.5	4 (100) 10.8
Total	3 (7.9)	6 (16.2)	38 (100)	37 (100)

IUCD: Intrauterine contraceptive device

Table 5: Distribution of eligible couples currently practicing contraceptive methods in relation to duration of use

Duration of use in years	IUCD		Total	
	Urban	Rural	Urban	Rural
<1	1 (33.3)	1 (16.7)	4 (10.5)	5 (13.5)
1-<2	-	-	1 (2.6)	2 (5.4)
2-<3	1 (33.3)	2 (33.3)	3 (7.9	4 (10.3)
3 and above	1 (33.3)	3 (50)	30 (78.9)	26 (70.3)
Total	3 (100)	6 (100)	38 (100)	37 (100)

IUCD: Intrauterine contraceptive device

seen that Cu-T utilization was greater among women who were just literate (33.3%), middle school (33.3%), and high school (33.3%) in rural area, whereas in urban area, it was same (33.3%) among illiterate, just literate, and primary school level literate women. The study findings hold good with the observations of Mazumdar (1955),[5] Chandra (1959),[6] Ranajit and Seal (1974),[7] Ghosh and Mohapatra (1993),[8] Upadhyay and Sharma (1995),[9] Bhuyan (1996),[10] and Sharma *et al.* (1997),[11] wherein it was that the female literacy was positively and significantly associated with higher adoption of contraceptive methods. Table 3 shows that both in rural and urban area the acceptance of Cu-T was more among household workers (100% in urban slums and 83.3% in rural area). However, observations by Raju *et al* (1994)[3] and Lingaraju (1998)[12] contradicted the present study finding by stating that contraceptive acceptance was high in women who worked outside their homes (80%) than the housewives (60%). It is evident from Table 4, majority of women accepting Cu-T had per capital income <Rs. 228 (33.3%) per capita per month in urban area, whereas in rural area, it was greater among women whose per capita income per month was Rs. 228-500 (100%). Various study findings by Gandhi *et al.* (1969)[13] stated that majority of the contraceptive acceptors belonged to the lower income group, whereas Awasthi (1973)[14] stated that

Table 6: Distribution of eligible couples according to reasons for practicing IUCD

Reasons	IUCD		Total	
	Urban (*N*-3)	Rural (*N*-6)	Urban	Rural
Postponement of pregnancy	2 (66.7)	4 (66.7)	13 (34.2)	14 (37.8)
Spacing	2 (66.7)	4 (66.7)	7 (18.4)	12 (32.4)
Limiting family size	-	-	15 (39.5)	14 (37.8)
Desired number of children achieved	-	-	19 (50)	17 (45.9)
Maternal health	1 (33.3)	1 (16.7)	4 (10.5)	5 (13.5)
Children's health	-	-	3 (7.9)	3 (8.1)
Poor socioeconomic condition	-	-	18 (47.4)	16 (43.2)
Money incentive	-	-	14 (44.7)	15 (40.5)
Cheap, safe, convenient	-	-	3 (7.8)	4 (10.8)
Afraid of approved contraceptive methods	-	-	7 (18.4)	4 (10.8)

Row wise percentage is in parenthesis. IUCD: Intrauterine contraceptive device

Table 7: Distribution of eligible couples by reasons for discontinuation of IUCD

Reasons for discontinuation	Ever practicing eligible couples IUCD uses		Total	
	Urban (*N*-9)	Rural (*N*-10)	Urban (*N*-24)	Rural (*N*-29)
Want of child	5 (55.6)	6 (60)	10 (41.7)	11 (37.9)
Dissatisfaction	-	-	5 (20.8)	7 (24.1)
Disinterest	1 (11.1)	1 (10)	6 (25)	7 (24.1)
Problems faced	4 (44.4)	4 (40)	15 (62.5)	19 (65.5)
Desire for son	-	-	1 (4.2)	1 (3.4)
Opposition from husband	1 (11.1)	1 (10)	1 (4.2)	1 (3.4)
Opposition from wife	-	-	4 (16.7)	5 (17.2)

Column wise percentage is in parenthesis. IUCD: Intrauterine contraceptive device

60% of the contraceptive acceptors belonged to families with monthly income of Rs. 201-400. However, Rao (1976),[15] Kaur (1976),[16] Zutshi and Dhar (1977),[2] Rele and Kanitkar (1980),[17] Upadhyay and Sharma (1995),[9] Sharma *et al.* (1997),[11] and Khokhar *et al.* (2000)[18] stated that the practice of contraceptive was significantly associated with the income status of the family it. Family planning practice was more in higher income group than lower income group. From Table 5, it is seen that, in urban area, the most of the eligible couples used Cu-T for less than 1 year (33.3%) and also for 2-3 years and above (33.3%), whereas in rural area, the most of the married women used Cu-T for 2-<3 years (33.3%) and 3 years and above (50%). Sehgal *et al.* (1990)[19] observed that 92.5% of the IUD acceptors used for 3 years and 7.5% for 2-4 years, whereas Rajeswari and Hasalkar (1996)[20] observed that majority of the IUD acceptors had used it for more than 2 years. Guharaj and Prasad (1970)[21] revealed that 93.8% and 6.2% used IUDs for 6 months and 8 months, respectively. It is evident from Table 6, in rural area, the most noteworthy among the reasons for practicing IUCD was postponement of pregnancy (66.7%) and in urban area, it was 66.7%. Other reasons include spacing (66.7% in urban and 66.7% in rural) and maternal health (33.3% in urban and 16.7% in rural). Some authors, viz., Gandhi *et al.* (1969)[13] Dutta and Sarma (1988)[22] have laid emphasis on other reasons as economics conditions and maternal health; Kaur (1976)[16] for children's education; Zutshi and Dhar (1977)[2] cited 54.16% preferred oral pills for convenience; finally, Islam and Islam (1998)[23] for happiness of family (81.4%). In Table 7, discontinuation of Cu-T among the married women was mostly due to want of a child (55.6% in urban and 60% in rural) and problems faced due to Cu-T use (44.4% in urban and 40% in rural). The NFHS II (1998-99)[24] in Assam and Singh and Benera (1999)[4] in slums of Delhi cited want of child (29% and 44%, respectively) as the reason for discontinuation, main reasons for IUD discontinuation cited by Chandra (1996)[25] were renewal (31.3%) followed by side effects (30.9%), Adarsh and Lal (1979)[26] medical reason (20%), want of child (4.5%) and Sehgal *et al.* (1990)[19] non-medical reason (58.2%) and family members opposition (40%).

CONCLUSION

Majority of the respondents in urban area were in the age groups 25-29 years (66.7%), whereas in rural area, it was slightly high (50%) in the age group 20-24 years. Cu-T utilization was greater among women who were just literate (33.3%), middle school (33.3%), and high school (33.3%) in rural area, whereas in urban area, it was same (33.3%) among illiterate, just literate, and primary school level literate women. Both in rural and urban areas the acceptance of Cu-T was more among household workers (100% in urban slums and 83.3% in rural area). The majority of women accepting Cu-T had per capital income <Rs. 228 (33.3%) per capita per month in urban area, whereas in rural area, it was greater among women whose per capita income per month was Rs. 228-500 (100%). In urban area, most of the eligible couples used Cu-T for <1 year (33.3%) and also for 2-3 years and above (33.3%), whereas in rural area, most of the married women used Cu-T for 2-<3 years (33.3%) and 3 years and above (50%). In rural area, the most noteworthy among the reasons for practicing IUCD was postponement of pregnancy (66.7%), and in urban area, it

was 66.7%. Other reasons include spacing (66.7% in urban and 66.7% in rural) and maternal health (33.3% in urban and 16.7% in rural). Discontinuation of Cu-T among the married women was mostly due to want of a child (55.6% in urban and 60% in rural) and problems faced due Cu-T use (44.4% in urban and 40% in rural).

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Original Article

High-resolution Computed Tomography Study of Temporal Bone Pathologies

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Abstract

Introduction: The application of high-resolution computed tomography (HRCT) in the temporal bone study has allowed the detailed assessment of complex bony anatomy and pathology. HRCT temporal bone accurately depicts bony erosion or destruction and associated soft tissue pathology. The purpose of this study is to determine the role and efficacy of HRCT temporal bone in evaluation of congenital, inflammatory, traumatic, and neoplastic conditions. This was the cross-sectional prospective study of 1½ year's duration.

Aims and Objectives: To evaluate the congenital, inflammatory, traumatic, and neoplastic conditions of the temporal bone with the help of HRCT.

Materials and Methods: This was cross-sectional prospective study conducted at RKDF Medical College between December 2014 to March 2016. A total of 120 patients of varied age group presenting with symptoms and signs of temporal bone pathologies were included in the study. Imaging diagnosis was confirmed either by histopathology or follow-up and response to treatment.

Results: In our study, temporal bone pathologies were more common in male (66.66%) compare to female population (33.33%). The most common age group affected by the temporal bone pathologies was 11-20 years age group (38.33%) and least common age group was more than 60 years (<4%). The most common temporal bone pathologies in our study were inflammatory (50%) followed by traumatic (11.66), benign neoplasm (10%), congenital (6.66), and malignant neoplasm (5%). Approximately, 16.66% cases of HRCT temporal bone study revealed no abnormality. Most common inflammatory pathology in our study was cholesteatoma (73.3%) followed by otomastoiditis/otitis externa constitute (26.66%). Out of 14 traumatic cases of temporal bone, 57.14% cases were associated with intracranial injuries in our study. Out of 18 cases of neoplastic pathology, 66.66% of cases were benign and 33.33% were malignant etiology.

Conclusion: HRCT scan of temporal bone depicts complex bony details and associated soft tissue pathologies accurately. Due to various limitations of clinical examination and radiography, HRCT temporal bone is single most important imaging tool for pre-operative evaluation and management of various pathologies of the temporal bone.

Key words: High-resolution computed tomography, Histopathological diagnosis, Temporal bone

INTRODUCTION

The temporal bone is a complex anatomic structure that contains the organs of hearing and balance. In addition, major vessels and nerves course through it and it also has a close proximity to the brain. Temporal bone has direct contact with brainstem, cerebellum and temporal lobe of brain. Before computed tomography (CT) imaging modalities available for the evaluation of temporal bone were plain radiograph, polytomography, angiography, and cisternography. Plain radiograph remains inexpensive tool of the study of temporal bone but has major limitations due to complex anatomy and overlapping of various bony structures.

High-resolution computed tomography (HRCT) offers excellent spatial and density resolution using special algorithms. It provides information not only about bony outline but also soft tissue changes making it possible to demonstrate the location and extent of disease as well as its complications. Furthermore, coronal and axial CT scanning together has dramatically improved the imaging of temporal bone. HRCT accurately depicts the boundaries between the external, middle and inner

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ear cavities thereby localized the disease precisely and also greatly demarcate thin boundary between temporal bone and intracranial compartment with exact details of intracranial spread of primary temporal bone disease. Contrast media help to evaluate the vascularity and contrast enhancing characteristics particularly in soft tissue lesions of temporal bone giving clues to the histopathology.

Aims and objective of this study is to evaluate the congenital, inflammatory, traumatic, and neoplastic conditions affecting the temporal bone with the help of HRCT.

MATERIALS AND METHODS

The present prospective study was conducted at RKDF Medical College, Bhopal, Madhya Pradesh from December 2014 to March 2016.

Study Area

The study area includes Bhopal city and district with peripheral small towns/villages.

Study Population

A total of 120 patients of varied age group presenting with symptoms and signs of temporal bone diseases were included in the study.

Inclusion Criteria

- Patients referred for HRCT, who were suspected to have of temporal bone pathology.

Exclusion Criteria

Post-operative cases of temporal bone pathology.

Equipment Used

Spiral CT, Siemens Somatom, Siemens Medical Systems, Forchiem, Germany.

HRCT was done using thin section, high-resolution and bone algorithm technique. Sections in both axial and coronal planes were obtained. Coronal imaging was done by neck extension and prone position and axial imaging done in supine and neutral position of the neck. Iodine Based contrast used mainly in the neoplastic pathologies. Final imaging diagnosis correlated with histopathological confirmation or follow-up and treatment response.

OBSERVATIONS AND RESULTS

HRCT scan was performed in 120 patients who presented with history, symptoms, and signs of the temporal bone pathologies. The results are enumerated in Tables 1-8.

Table 1: Gender distribution

Gender	Number of cases (%)
Female	40 (33.33)
Male	80 (66.66)
Grand total	120 (100)

Table 2: Clinical presentation

Sign and symptoms	Number of cases (%)
Deafness	78 (65.00)
Otorrhoea	70 (58.33)
Headache	32 (26.66)
Otalgia	48 (40.00)
Fever	16 (13.33)
Vertigo	20 (16.66)
Fascial nerve palsy	12 (10.00)
Ataxia	4 (3.33)
Tinnitus	12 (10.00)
Ear bleed	8 (6.66)

Table 3: Age distribution

Age distribution	Number of cases (%)
1-10	14 (11.66)
11-20	46 (38.33)
21-30	18 (15.00)
31-40	16 (13.33)
41-50	12 (10.00)
51-60	10 (8.33)
61 and above	4 (3.33)
Total	120

Table 4: Etiopathological distribution of cases

Etiology	Number of cases (%)
Inflammatory	60 (50)
Traumatic	14 (11.66)
Congenital	8 (6.66)
Benign	12 (10)
Malignant	6 (5.0)
Normal	20 (16.66)
Grand total	120 (100)

Table 5: Distribution of various lesions

Pathology	Number of cases
Congenital malformation	
External and middle ear anomalies	6
Inner ear abnormalities	2
Temporal bone fractures	14
Inflammatory process	
Otitis externa	3
Malignant otitis externa	1
Otomastoiditis	12
Cholesteatoma	
Congenital	2
Acquired	42
Neoplasm	
Benign	12
Malignant	6

Table 6: Distribution of external and middle ear anomalies

HRCT findings	Number of cases (%)
Bony atresia	4 (66.66)
Soft tissue atresia	2 (33.33)
Ossicular deformity	4 (66.66)
Thick atresia plate	4 (66.66)
Small tympanic cavity	4 (66.66)
Fascial canal	2 (33.33)
Inner ear anomaly	2 (33.33)

HRCT: High-resolution computed tomography

Table 7: Distribution of CT findings in temporal bone fracture

CT findings	Number of cases (%)
Longitudinal fracture	10 (71.42)
Transverse fracture	2 (14.28)
Complex fracture	2 (14.28)
Haemotympanum	10 (71.42)
Ossicular disruption	4 (28.57)
Labyrinthine injury	2 (14.28)
Fascial nerve canal injury	2 (14.28)
Intracranial injury	8 (57.14)

CT: Computed tomography

Table 8: CT features of cholesteatoma

CT findings	Number of cases (%)
Soft tissue lesion	42 (100)
Ossicular and scutum erosion	40 (95.23)
Erosion of tympanic wall	38 (90.47)
Erosion of sigmoid sinus plate	18 (42.85)
Opacified mastoid	24 (57.14)
Erosion of lateral semicircular canal	8 (19.04)
Erosion of tegmen tympanii	8 (19.04)
Erosion of vestibule and fascial canal	4 (9.52)

CT: Computed tomography

Table 9: Various complications of cholesteatoma

Complications	Number of cases (%)
Brain abscess	18 (42.85)
Post auricular abscess	8 (19.04)
Dural sinus thrombosis	6 (14.28)
Meningitis	4 (9.52)

Table 10: Distribution of neoplastic lesions

Neoplasm	Number of cases
Acoustic neuroma	6
Glomus tumor	3
Epidermoid	2
Osteoma	1
Primary carcinoma	4
Secondary metastasis	2

DISCUSSION

The varied temporal bone pathologies including congenital, inflammatory, traumatic, and neoplastic conditions were evaluated by HRCT. The lack of specificity in clinical examination and the imprecise result of conventional radiography renders CT as the modality of choice in the evaluation of temporal bone pathology.

In this study, 120 patients were evaluated for their various symptoms pertaining to PNS. The gender ratio in this study was 2:1 (male:female) (Table 1). A maximum number of patients presented with the chief complaints of hearing problem or deafness (65%) followed by otorrhea (58%) (Table 2). Other chief complaints were otalgia, vertigo, tinnitus, ataxia, and fascial nerve palsy. Patients with intracranial complications had headache, fever, vomiting in addition to above complaints. The most common age group involved was 11-20 years (38%) and least common age group was 61 and above comprising (3%) of total cases (Table 3).

The etiologic distribution of the lesions was inflammatory (50%) followed by traumatic (11.6%), benign (10%), congenital (6.6%), and malignant (5%) (Table 4). Thus, the inflammatory disease was found to be the most frequently occurring pathology affecting the temporal bone. Inflammatory pathologies were common in younger age group (<30 years) and neoplastic pathologies were common in older age group (>50 years). Traumatic conditions equally distributed in all age group. Congenital disease frequently diagnosed in <10 years of age group.

Congenital malformation of the external and middle ear is more common than inner ear anomalies. Atresia or hypoplasia of the external auditory canal (EAC) is most common anomaly detected in our study.[1,2] The degree of distortion range from web to small band of soft tissue covering EAC to complete absence.[3] Ossicular chain abnormalities are commonly found in association with external meatal atresia.[1,2] Isolated ossicular chain anomalies are less common.[4] The main role of HRCT in atresia of HRCT to identify the type of anomaly and determine the surgical correctability.[5] If surgical correction of EAC atresia is to be done to improve hearing normal inner ear structures and adequate middle ear cleft are necessary. It is important to evaluate the thickness of atresia plate, associated ossicular abnormalities, status of middle ear cleft, status of inner ear, course of fascial nerve canal and position of sigmoid sinus and mastoid pneumatisation.[6] In our study, we came across 6 cases of external and middle ear anomaly, out of 6, four cases had unilateral EAC atresia and two cases had bilateral atresia. In two cases, there was soft tissue atresia and in four cases bony atresia

was found. Ossicular deformities and thick atresia plate were present in 4 cases and in 2 cases anteriorly placed descending fascial canal was found. The present study correlated well with findings of Swartz *et al*.[4] Congenital anomalies of inner ear are relatively uncommon compare to middle and external ear anomalies. In this study, 2 cases (33.33%) of inner ear anomalies were detected on HRCT temporal bone. One case was unilateral enlarged vestibular aqueduct (EVA) or large vestibular aqueduct syndrome (LVAS) and the second case was bilateral EVA or LVAS with associated unilateral mondini dysplasia or also known as incomplete partition type II characterized by cystic cochlear apex with the normal basal turn. EVA has been reported to be the most common inner ear abnormality associated with sensorineural hearing loss and is also commonly associated with other inner ear abnormalities.[7]

Temporal bone fractures may be longitudinal, transverse or complex. Longitudinal fractures are common and comprise 70-90% of all temporal bone fractures.[8] In our study, 71.42% of cases had the longitudinal type of temporal bone fractures. These type of fractures extend across roof or posterior wall of EAC into tympanic cavity and lead to rupture of the tympanic membrane with hemotympanum.[8,9] Ossicular chain disruption is a common cause leading to hearing loss and incus is most vulnerable for dislocation due to lack of muscular anchor.[10] Fascial nerve palsy occurs in 10-20% of cases and usually delayed and incomplete. A common site for fascial nerve injury is horizontal segment.[10] Transverse fractures are less common and usually associated with temporomandibular joint or mandibular injury and fascial paralysis is more common in the transverse fractures.[10] In our study of two cases of fascial nerve palsy one case (10%) was seen associated with longitudinal fracture and the second case (50%) was seen in a transverse fracture of temporal bone. We studied 10 cases (71.42%) of longitudinal, 2 cases (14.28%) of transverse and 2 cases (14.2%) of complex type of temporal bone fractures. Labyrinth injury involving destruction of the vestibule-cochlear complex is more common in transverse fracture and resulting into sensorineural hearing loss, vertigo, nystagmus and pneumolabryinth.[10,11] In our study, out of two cases of labyrinth injury, one case was associated with transverse and the second case was associated with complex temporal bone fractures.

Otoscopic evaluation alone is usually sufficient to study external ear but HRCT temporal bone needed to rule out osteomyelitis, otomastoiditis or malignant otitis externa. In present study, one patient was found to have malignant otitis externa with soft tissue in EAC causing bony destruction and associated edematous pinna and subcutaneous tissue of the scalp.[12] Three cases of isolated otitis externa with opacified EAC and no bony erosion or destruction included in our study. Acute otitis media seen as middle ear opacification and concomitant mastoiditis seen as opacification or air fluid level in mastoid cavity on HRCT temporal bone.[13,14] Coalescent otitis media seen as resorption and destruction of mastoid bony septii with the irregular mastoid cavity and it can penetrate through bony cortex to form subperiosteal abscess or break at the tip of mastoid bone to form abscess in the neck.[15] In this study, we included 12 cases of otomastoiditis without cholesteatoma. Out of 12 cases of otomastoiditis 8 cases were without significant bony destruction or resorption and 4 cases were with resorption of bony septii and irregular mastoid cavity. 2 out of 4 cases of coalescent otomastoiditis were associated with subperiosteal abscess formation.

Cholesteatoma is the misnomer, it's not true neoplasm but sac of stratified squamous epithelium filled with exfoliated keratin and subepithelial fibrous stroma producing proteolytic enzyme which in turn causes bone resorption.[16-18] Congenital cholesteatoma accounts for 2% of cases.[16] In our study, out of 44 cases of cholesteatoma, 2 cases were of congenital cholesteatoma. Cholesteatoma found behind the tympanic membrane in the patient with no history of otitis media is considered congenital. These lesions can erode internal auditory meatus and semicircular canal leading to hearing loss.[19] In our study, one case of congenital cholesteatoma was present as a cystic lesion in the petrous apex with the destruction of internal auditory canal and the second case of congenital cholesteatoma present as small soft tissue lesion without bony destruction. Acquired cholesteatoma divided into two types primary arising from the pars flaccid and secondary arising from pars tensa. Pars flaccid cholesteatoma arising from the prussak space of epitympanum and extend into mastoid antrum with erosion of bony scutum.[16,17] Pars tensa cholesteatoma arises from posterosuperior retraction of tympanic membrane and spread into surrounding recesses. Cholesteatoma is most frequent soft tissue mass in the middle ear.[20] Expansion and scalloping of mastoid, erosion of lateral attic wall, erosion of the ossicles, tegmen tympani, sigmoid sinus plate, posterosuperior wall of EAC, labyrinth, and fascial nerve canal are signs indicating the presence of cholesteatoma.[17-20] Pre-operative CT scan is helpful in relation to diagnosis and decision making for surgery in cases of cholesteatoma and ossicular erosion.[21] In this study, the most common CT findings in the cholesteatoma was ossicular and scutum erosion (95%) followed by erosion of tympanic wall (90%), opacified mastoid (57%), erosion of sigmoid plate (42%), erosion of lateral semicircular canal wall and tegmen tympanii (19%) and erosion of vestibule and fascial canal (9.5%).

Cholesteatoma may be associated with extratemporal and intracranial complications, and almost all the complications are usually secondary to bone destruction and infected cholesteatoma.[22] Most common complications in our study (Table 9) in descending order are brain abscess (42%), post auricular abscess (19%), dural sinus thrombosis (14.2%), and meningitis (9%). Similar findings were observed in the Mafee *et al.,*[14] Bradley *et al.*,[23] and Sennaroglu *et al.*[24] study.

In this study, 18 cases of neoplastic pathology are included out of which 12 cases are benign tumors and 6 cases are malignant tumors (Table 10). Most common benign tumor in our study was acoustic neuroma[19] found in 6 (50%) out of 12 cases of benign tumors and presented as solid cystic mass at the CP angle extending into the internal auditory canal with its widening, invariably detected in all cases on HRCT study. Two known cases of NF2 with bilateral acoustic neuroma are included in our study. Glomus tumor is second most common tumor in our study.[25] They are commonly divided into glomus jugulare develop at jugular fossa, glomus tympanicum develop at middle ear, carotid body tumor and glomus vagale. In our study, one case of glomus tympanicum presented as small enhancing soft tissue mass in middle ear at cochlear promontory without bony destruction and three cases of glomus jugulare causing bony destruction of jugular fossa and invasion of hypotympanum with significant contrast enhancement are included.[25] Two cases of epidermoid tumor in our study appeared as CSF density lesions at CP angles on HRCT with variable degree extension into internal auditory meatus and no bony destruction or widening.[26] One case of osteoma detected in our study presented as postauricular hard mass and on HRCT broad based bone density lesion arising from the outer cortex of mastoid. Primary malignant neoplasm of ear are relatively uncommon and seen in older age group. Most common malignant neoplasm is squamous cell carcinoma (Ca) and in our study all the 4 cases of primary malignant neoplasm were squamous Ca.[27] HRCT detected soft tissue mass in EAC causing bony erosion and destruction with variable degree extension into middle and inner ear and surrounding extra temporal soft tissue.[27] Two cases of secondary bony deposits into mastoid and petrous part of temporal bones are included, in our study, seen in Ca breast and lung patients.

CONCLUSION

HRCT scan of temporal bone depicts complex bony details and associated soft tissue pathologies accurately. Due to various limitations of clinical examination and radiography, it is not possible to differentiate various pathologies affecting the temporal bone and study their extent. HRCT temporal bone overcome with all these limitations and its single most important imaging tool to evaluate various congenital, inflammatory, traumatic, and neoplastic pathologies of the temporal bone. Now HRCT temporal bone is standard imaging modality for pre-operative evaluation and management of various pathologies of the temporal bone.

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Original Article

Outcome of Neodymium-doped Yttrium Aluminum Garnet Laser Posterior Capsulotomy for Posterior Capsular Opacification: A Prospective Study

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Abstract

Introduction: Posterior capsular opacification is the opacity developing in posterior capsule of lens after cataract surgery commonly and rarely with crystalline lens primarily.

Aim: To study the visual outcome and analyze the complications in posterior capsular opacification treated with neodymium-doped yttrium aluminum garnet (Nd:YAG) laser posterior capsulotomy.

Materials and Methods: A prospective study of 100 patients attending our outpatient department with visual deterioration due to posterior capsular opacification after cataract surgery.

Results: Visual acuity improved in 96% of patients, 4% showed no improvement, which was related to previous retinal problems and thick posterior capsule.

Conclusion: Nd:YAG laser posterior capsulotomy is safe and effective procedure for creating capsular opening compared to invasive surgical techniques. The post-operative results are very good and the complication rate is low.

Key words: Posterior Capsular Opacification, Nd:YAG laser, Capsulotomy, Visual acuity

INTRODUCTION

A laser is the major technological advance in the medical field to give better results with less invasive method. Neodymium-doped yttrium aluminum garnet (Nd:YAG) laser posterior capsulotomy is one of the breakthroughs, for opening the posterior capsular opacities, the non-invasive characteristics of it provide an excellent outcome.[1-4]

MATERIALS AND METHODS

This prospective clinical study was done to analyze the results of Nd:YAG laser posterior capsulotomy in posterior capsular opacification following cataract surgery. This study was conducted in Government Theni Medical College and Hospital, Theni.

Eyes of 100 patients who underwent Nd:YAG laser posterior capsulotomy were studied. Eight patients were aphakic, 89 patients had posterior chamber intraocular lens, and 3 patients had anterior chamber intraocular lens. An informed consent was obtained from all patients.

The posterior capsulotomies were performed with Nd: YAG laser, usually starting with 1-2 mJ/pulse and gradually increased until the desired responses were obtained.

During each visit, the following data were recorded.[2]

- Visual acuity with Snellen chart
- Intraocular pressure with Schiotz tonometry
- Slitlamp examination
- Fundus examination with direct and indirect ophthalmoscopy
- Post-laser complications.

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RESULTS

Visual acuity profile reveals that 75% of patients had visual acuity in the range between 6/60 and 3/60 and 10% of patients had visual acuity < 3/60 before doing YAG laser capsulotomy.

Immediately after doing YAG laser capsulotomy within 1 h, 57% of patients had improved. Visual acuity had improved gradually during follow-up period at 24 h, 1 week, 1 month, and 3 months. The vision of four patients not improved. Among four 2 patients had optic atrophy and other 2 patients had thick posterior capsule (Tables 1-3).[5]

DISCUSSION

The documented visual improvement of the subjects in this study confirms the efficacy of Nd:YAG laser for the production of posterior capsulotomy. This non-invasive surgical laser allows omission of primary intraoperative capsulotomy, with its increased risk of the intraocular lens and vitreous displacement, cystoid macular edema and retinal detachment.[2]

CONCLUSION

Following extracapsular cataract surgery, increased incidence of posterior capsular opacification has been noted. The opening of posterior capsule by surgical methods has been noted to cause certain complications such as cystoid macular edema and retinal detachment.[3] The Nd:YAG laser is a non-invasive surgical tool that provides excellent posterior capsulotomies.

From the above study, it is clear that Nd: YAG laser posterior capsulotomy is a safe and effective procedure for creating capsular opening. The post-operative results are very good and the complication rate is low. [2]

Table 1: Laser power distribution

Total energy (mJ)	Cases
10-20	29
21-40	34
41-60	26
61-80	7
81-100	3
>100	1

Table 2: Post-laser visual acuity improvement

Follow-up	<3/60	6/60-3/60	6/18-6/36	6/6-6/12
1 h	4	12	57	27
24 h	4	10	45	41
1 week	4	1	39	56
1 month	2	2	31	65
3 months	2	2	30	66

Table 3: Complications following Nd:YAG laser capsulotomy

Complications	Cases
Intraocular pressure elevation	2
Iris bleeding	4
Intraocular lens damage	23
Vitreous in anterior chamber	4
Uveitis	1
Cystoid macular edema	0
Retinal detachment	0
Endophthalmitis	0

Nd: YAG: Neodymium-doped yttrium aluminum garnet

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Original Article

Multidisciplinary Approach to Papilledema: A Prospective Case Series

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Abstract

Introduction: Papilledema is swelling of optic disc due to elevated intracranial pressure. If untreated, it will lead to irreversible damage to the optic disc thereby affecting vision.

Aim: To analyze various causes for the papilledema at a tertiary care hospital in South India.

Materials and Methods: A total of 75 patients were recruited for the study after informed consent signed. All subjects underwent a comprehensive ophthalmic examination, including best-corrected visual acuity, color vision, visual field test, and intraocular pressure measurement with tonometer and fundus examination including ophthalmoscope. Computed tomography and magnetic resonance imaging were done in required cases for evaluating neurologic function.

Results: Papilledema is most common in the third decade of life and rare in the fifth decade of life with a female preponderance. A headache was the most common symptom, enlarged blind spot was the most common field defect, and idiopathic intracranial hypertension was the most common etiology for papilledema in this study.

Conclusion: A complete ophthalmic and neurological investigation is warranted to prevent the onset of secondary optic atrophy in chronic papilledema. It is also advisable to have an ophthalmic consultation in all the patients with a headache to rule out papilledema. If papilledema is detected later, it could lead to loss of vision. Hence, the early detection and management are essential to prevent progress of disease and loss of vision.

Key words: Headache, Idiopathic intracranial hypertension, Intra ocular pressure, Optic atrophy, Papilledema

INTRODUCTION

Papilledema is swelling of optic disc due to elevated intracranial pressure.[1] If untreated, it will lead to irreversible damage to the optic disc thereby affecting vision. The purpose of this study is to comprehensively analyze papilledema in a South Indian tertiary care hospital for a period of 2-year. Incidence, clinical features, and symptoms of the disease were analyzed thoroughly through this clinical study.

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MATERIALS AND METHODS

Prospective, observational case series was performed in 75 patients. Prior approval from the Institutional Ethics Committee was obtained, and the patients were enrolled in the study after informed consent was obtained. The study was conducted in accordance with the principles of Declaration of Helsinki. Patients who were presented with symptoms of headache, nausea and vomiting, defective vision with ophthalmoscope findings of bilateral swollen optic disc were included in this study. Patients with inflammatory optic disc edema, unilateral papilledema, and pseudo papilledema were excluded from the study.

A thorough examination of symptoms, mode of onset, duration, associated features, and the pattern of presentation was done. History of patients was carefully sought to determine the presence or absence of risk

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factors such as hypertension, head trauma, brain tumor, use of oral contraceptives, steroids for the development of papilledema.

All subjects underwent a comprehensive ophthalmologic examination including best-corrected visual acuity, color vision, field's test, intraocular pressure measurement, ophthalmoscope examination, and slit lamp biomicroscopy to examine the extent of severity. Computed tomography brain scan and magnetic resonance imaging brain scan were done in selected cases suspected of neurologic dysfunction. Complete blood count was performed in all patients to rule out the possibility of anemia as it may play a role in elevating intracranial pressure.

RESULTS

Of 75 patients, the majority of papilledema diagnosed patients (9 men and 20 women) were in between 30 and 40 years of age, constituting 40% of study population (Figure 1). The majority of patients presented to the hospital were in the early stage of papilledema thereby; it was managed early in most of the patients (Figure 2) 41% of patients had enlarged blind spot, 22% of patients had peripheral field constriction (Figure 3).

The most common symptom in maximum number of patients is headache (88%, 66 patients). Diplopia was the least reported symptom with only 9% (11 patients) experiencing it and it was due to VI nerve palsy (false localizing sign) in 9 patients while in 2 patients it was due to III and IV nerve palsy. The majority of the study population (77.4%, 58 patients) had a good visual acuity >6/18 at presentation. This can be attributed to acute onset of symptoms of papilledema in most of the patients. While, poor visual acuity was observed in 11 patients and various causes for poor visual acuity varied from dural venous thrombosis, cortical vein thrombosis, recurrent cerebellopontine angle tumor, neurocysticercosis, frontoparietal preisylvian anaplastic astrocytoma Grade 3, supratentorial space occupying lesion, and sphenoid ridge meningioma. Homonymous hemianopia was observed in 2 patients (2.6%), it is due to neurocysticercosis presenting with multiple cysts in the cerebellum and occipital cortex in one patient while it is due to mass in the parietal lobe presenting with right hemiplegia in another patient. The most common cause of papilledema is idiopathic intracranial hypertension in 24 patients with 32%. The patients with idiopathic intracranial hypertension were medically managed and showed drastic improvement in symptoms. Two patients underwent lumbar puncture to reduce the cerebrospinal fluid pressure. One was of unknown cause presenting with severe visual loss; another was a steroid induced benign intracranial hypertension,

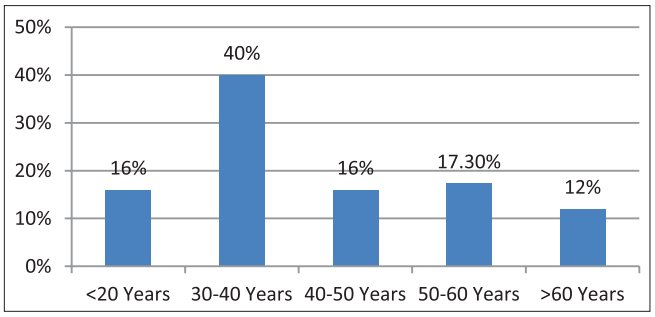

Figure 1: Bar diagram showing the age wise distribution of study population

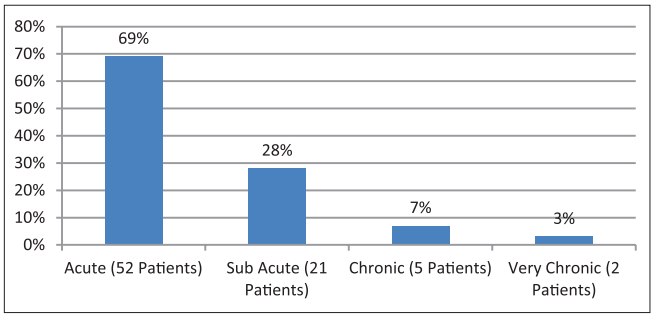

Figure 2: Bar diagram depicts the distribution of papilledema stages in study population

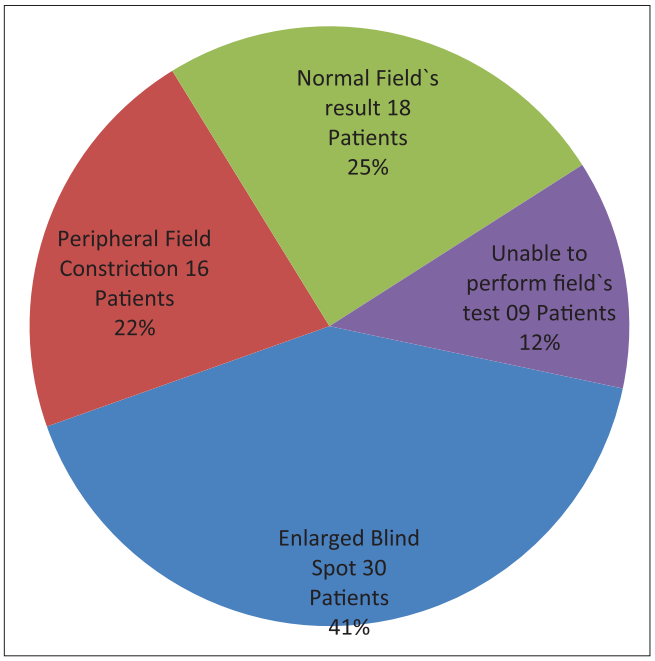

Figure 3: Pie chart showing the field's test measurements in study population

presenting with severe headache. Papilledema in patients with iron deficiency anemia (6 patients, 8%) is mainly due to cerebral ischemia and cerebral edema and it is very rare. These results are in concurrence with the results obtained by Biousse *et al.*[2] Out of the 75 patients in the study, one patient was a case of Behcet syndrome with deep vein

thrombosis who developed papilledema and recovered after treatment which is in concurrence with a case report by Pamir *et al.*[3] 4 patients with cerebral venous thrombosis in the study presented with a sudden visual loss in both eye and multiple cranial palsies. Absolute afferent pupillary defect in both eyes was noted in 9 cases of dural venous thrombosis.

DISCUSSION

In our study, the main cause of the development of papilledema is idiopathic intracranial hypertension, and if it is left untreated, it develops to progressive visual loss; hence, there is a need for careful examination of fundal changes and visual function in the patients who were having intracranial hypertension of known or idiopathic cause. The percentage of patients who were reported with a headache in our study is in concurrence with the results obtained by Vengala *et al.*,[4] in the study by Jacobs,[5] it was found that patients with severe iron deficiency anemia have low levels of cytochrome oxidase which is an iron-containing enzyme, in the buccal mucosa, however, it reaches back to normal levels following treatment with iron therapy. In our patients who were having severe iron deficiency anemia, we had administered 4-5 units of blood to improve hemoglobin levels and later were placed on iron medications. A gradual reduction in optic disc swelling was observed in the patients.

In the patient who was diagnosed with Behcet syndrome, non-parenchymal neurological involvement was observed. The patient was presented to our hospital with symptoms of oral and genital sores, diplopia and severe headache. Fundoscopy indicated bilateral optic disc swelling, and bilateral enlarged blind spot was observed through the visual field test. Magnetic resonance venography revealed deep vein thrombosis. His intraocular pressure was <20 mm Hg in both eyes. After neurologic consultation, the diagnosis was confirmed as Behcet syndrome and treatment was initiated with prednisolone 30 mg/day, warfarin 5 mg/day, azathioprine 50 mg/day patient has shown a gradual reduction in the symptoms by the end of 4th day, and optic disc swelling resolved in few months.

CONCLUSION

A high degree of suspicion, with a headache being the most common indication of papilledema, a complete ophthalmic and neurologic examination, timely imaging and a multidisciplinary approach would give an accurate diagnosis and optimum visual results in patients with papilledema. The chronicity of the papilledema is directly proportional to the onset of secondary optic atrophy and visual loss is the outcome, hence early treatment is necessary to retain vision. The rare proven causes of papilledema like Behcet syndrome and iron deficiency anemia have to be borne in mind while examining a patient with indications of papilledema.

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Original Article

Hematological Analysis of Pancytopenia: A Prospective Study

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Abstract

Background: Pancytopenia is manifestations of many illnesses which can be life threatening at times. The severity of pancytopenia and the underlying pathology determine the management and prognosis. This study was conducted to evaluate hematological and bone marrow findings in patients presenting with pancytopenia.

Materials and Methods: In this study, a total of 80 cases were studied by performing complete hemograms, examining peripheral smears, and bone marrow aspiration.

Results: Among the 80 cases studied the age of the patients ranged from 4 to 80, with a slight preponderance in the males. Most of the patients presented with generalized weakness and fever. The most common physical finding was pallor, followed by generalized weakness and fever. The most common cause for pancytopenia was megaloblastic anemia followed by aplastic anemia, subleukemic leukemia, and myelodysplastic syndrome. The most common bone marrow finding was hypercellularity with erythroid hyperplasia.

Conclusion: This study highlights the importance of detailed primary hematological investigations along with bone marrow aspiration in patients with pancytopenia which will help to identify the cause which is important for planning further investigation and management.

Key words: Bone marrow, Hematological parameters, Megaloblastic anemia, Pancytopenia

INTRODUCTION

Pancytopenia is a disorder in which all three major formed elements of blood (red blood cells, white blood cells [WBC] and platelets) are below normal reference.[1] It may be a manifestation of a wide variety of disorders which primarily/secondarily affect the bone marrow. The presenting symptoms are often attributed to anemia/thrombocytopenia. Leukopenia is an uncommon cause of initial presentation but can become the most serious threat to life during the course of the disorder.[2]

Pancytopenia is a serious hematological problem, the underlying cause of which is diagnosed by bone marrow examination.[3] Underlying pathology determines management and prognosis of patients, hence it is extremely important to study the etiology of pancytopenia.

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MATERIALS AND METHODS

The present prospective study was conducted spanning a period of 2-year in the Department of Pathology at Goa Medical College, Goa. The patients of all age groups with hematological diagnosis of pancytopenia on peripheral smear and followed by bone marrow aspiration were included in the study. The other inclusion criteria were presence of all 3 of the following: Hemoglobin, ≤10 g/dl; total leukocyte count, ≤4000/mm^3; platelet count, ≤100,000/mm^3. Relevant clinical data were collected.

About 2 ml anticoagulated blood sent for complete hemogram by the respective departments was run on a coulter counter for the following results: Hemoglobin, total count, platelet count, packed cell volume, and red blood cell indices. Peripheral smear was studied after staining

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with Wright's stain. Special stain myeloperoxidase and Perl's stain were used as indicated. Bone marrow aspirates on slides sent to department of pathology were stained with Wright's stain.

RESULTS

A total of 80 cases which presented with pancytopenia formed the study sample. The following results were recorded and analyzed. Age of patients ranged from 4 to 83 years, the most common age group was 21-30 years (20%). The incidence of pancytopenia showed slight preponderance in males, male: female ratio being 1.28:1.

Hemoglobin in the majority of the cases was in the range 5.1-7 g/dl. (41.0%) and WBC in the majority of the cases were in the range 3,100-4,000 cells/mm^3 (37.5%). Platelet count in the majority of the cases was in the range 76,000-100,000/mm^3 (46%).

Hypercellular marrow was noted in 67 out of 80 patients (83.75%) and the most common cause was megaloblastic anemia followed by leukemia, myelodysplastic syndrome (MDS), hypersplenism, paroxysmal nocturnal hematuria, mastocytosis, and falciparum malaria.

Hypocellular marrow was noted in 9 of 80 patients (11.25%). 1 was diagnosed as hypoplastic MDS and 8 being diagnosed as aplastic anemia. 5 of 8 had no etiological factor, thus diagnosed as idiopathic aplastic anemia and 3 of 8 gave a history of HIV receiving antiretroviral therapy (ART).

Normocellular marrow was noted in 3 of 80 patients (3.75%), 1 case was that of hypersplenism and the other 2 that of megaloblastic anemia and one with iron deficiency anemia (Tables 1 and 2).

The most common presenting complaints in the cases with pancytopenia were generalized weakness (37.5%), fever (35%), and breathlessness (30%). The most common physical findings were pallor (100%) followed by splenomegaly (32.5%) (Table 3).

In this study, megaloblastic anemia was the major cause of pancytopenia, constituting 60% (48) of the cases of which 28 were males and 20 females. The highest incidence was found in the age group 21-30 years (25.8%), least were in the age group of more than 80 years (2%) and <10 years (2%). 21/48 cases were pure megaloblastic anemia. 27/48 cases were megaloblastic anemia associated with iron deficiency anemia (Figure 1).

The second most common causes were aplastic anemia 8 cases (10%) and subleukemic leukemia 8 cases (10%). There were 5 males and 3 females. The highest incidence was found in the age group 31-40 years. In 5/8 cases etiology was not known and grouped under idiopathic aplastic anemia and 3/8 cases gave a history of HIV on ART (Figure 2).

There were 6 males and 2 females with subleukemic leukemia with the highest incidence being in the age group <10 years (37.5%). 4/8 cases were diagnosed as acute

Table 1: Age and sex wise distribution of patients with pancytopenia

Age group	Female	Male	Number of cases (%)
≤10	1	5	6 (7.5)
11-20	7	3	10 (12.5)
21-30	6	10	16 (20)
31-40	5	8	13 (16.25)
41-50	5	8	13 (16.25)
51-60	5	4	9 (11.25)
61-70	3	4	7 (8.75)
71-80	3	2	5 (6.25)
>80	0	1	1 (1.25)
Total	35	45	80 (100)

Table 2: Clinical features of pancytopenia

Clinical features	Number of cases (%)
Pallor	80 (100)
General weakness/fatigue	30 (37.5)
Fever	28 (35)
Splenomegaly	26 (32.5)
Dyspnea/breathlessness	24 (30)
Weight loss/appetite loss	14 (17.5)
Bleeding	12 (15)
Hepatomegaly	16 (20)
Abdominal pain	6 (7.5)
Lymphadenopathy	6 (7.5)
Jaundice	8 (6.25)
Pedal edema	3 (3.75)
Rash	2 (2.5)
Ascites	2 (2.5)
Sore tongue/ulcers	1 (1.25)

Table 3: Distribution of the various etiological causes of pancytopenia

Etiological causes	Number of cases	Males	Females	Percentage
Megaloblastic anemia	48	28	20	60
Aplastic anemia	8	5	3	10
Subleukemic leukemia	8	6	2	10
MDS	7	4	3	8.75
Hypersplenism	5	2	3	6.25
Paroxysmal Nocturnal Hematuria	1	1	0	2.5
Mastocytosis	1	0	1	2.5
Falciparum malaria	1	1	0	2.5
Hemophagocytosis syndrome	1	1	0	2.5
Total	80			100

MDS: Myelodysplastic syndrome

myeloid leukemia (AML) and 4/8 cases were diagnosed as acute lymphoblastic leukemia (ALL) (Figure 3).

MDS was the third most common diagnosis with 7 cases (8.75%). There were 4 males and 3 females and the highest incidence was found in the age group 61-70 years (43%). 1/7 case was diagnosed as hypoplastic MDS and 6/7 cases were diagnosed as refractory cytopenia with multilineage dysplasia.

There were 5 cases of hypersplenism and one case each of paroxysmal nocturnal hematuria, mastocytosis, falciparum malaria and hemophagocytosis syndrome.

DISCUSSION

In this study done at the Goa Medical College over a period of 2 years, a total number of hemograms were 62,698 and bone marrow aspirations sent was 764; pancytopenia was found in 80 cases.

In this study, age of patients with pancytopenia ranged from 4 to 83 years. Most of the studies by Tilak and Jain[4] Tariq *et al*.,[5] Mussarrat *et al*.,[6] Qamar and Aijaz[7] Khodke *et al*.,[8] and Gayathri and Rao[9] reported patients to be in the same age range. Pancytopenia showed its highest incidence in the age group 21-30 years similar to the studies by Mussarrat *et al*.[6] and Qamar and Aijaz.[7]

The most common cause of pancytopenia reported from various studies worldwide has been aplastic anemia. This is in sharp contrast with the results of the present study where the most common cause of pancytopenia was megaloblastic anemia. This seems to reflect the higher prevalence of nutritional anemia in Indian subjects as well as in developing countries[3] (Table 4).

In this study, megaloblastic anemia was the most common cause of pancytopenia, the incidence being 60%. Incidence of 72% was reported by Khunger *et al*.,[20] 68% by Tilak and Jain[4] and 74% by Gayathri and Rao,[9] 49% by Rangaswamy *et al*.,[27] 62% by Khanduri and Sharma,[30] 72.6% by Javalgi and Dombale,[28] and 26.42% by Subrahmanyam and Padma.[29]

All the above-mentioned studies have been done in India, and they stress the importance of megaloblastic anemia as the major cause of pancytopenia. As facilities, for estimating folic acid and Vitamin B12 levels are not routinely available in most centers in India the exact deficiency is usually not identified.[31]

Age and Sex Distribution

The age of the patients with megaloblastic anemia ranged from 4 to 83 years and male:female ratio was 1.4:1. This

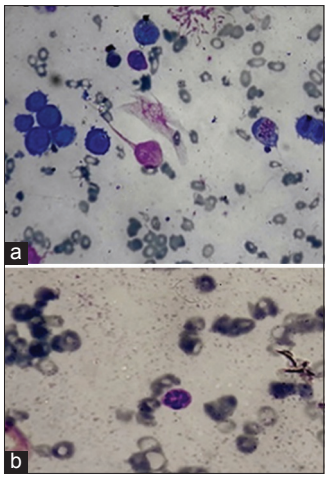

Figure 1: Megeloblastic anemia. (a) Bone marrow aspiration of a case of megaloblastic anemia showing erythroid hyperplasia with magaloblastic maturation (×100), (b) peripheral smear case of megaloblastic anemia showing hypersegmented neutrophil (×40)

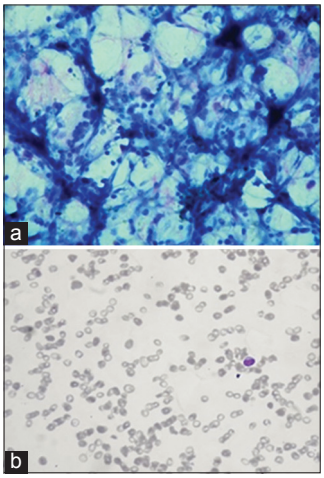

Figure 2: Aplastic anemia. (a) Bone marrow aspirate of a case of aplastic anemia showing markedly hypocellular marrow (×100), (b) peripheral smear of a case aplastic anemia (×40)

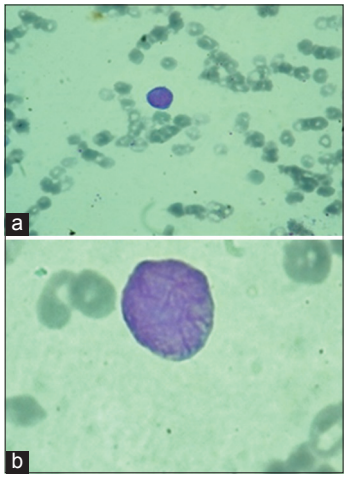

Figure 3: Subleukemic leukemia. (a) Peripheral smear of a case of subleukemic leukemia presenting as pancytopenia (×40), (b) myeloblast showing auer rods (×100)

Table 4: Causes of pancytopenia in various studies

Name of the study	Place and year	Number of cases	Most common cause	2nd common cause
Retief and Heyns[10]	South Africa 1976	195	Bone marrow failure 67.7%	Severe infections 9.7%
International agranulocytosis and aplastic anemia study group[11]	Europe 1987	389	Aplastic anemia 52.7%	MDS 10.5%
Imbert *et al*.[12]	Europe 1989	213	Malignant myeloid disease 42%	Malignant lymphoid disease 18%
Keisu and Ost[13]	Sweden 1990	100	Neoplastic disease 32%	Aplastic anemia 16%
Hossain *et al*.[14]	Bangladesh 1992	50	Aplastic anemia	Chronic malaria, Kala Azar
Varma and Dash[15]	India 1992	202	Aplastic anemia 40.6%	Megaloblastic anemia 23.26%
Tilak and Jain[4]	India 1998	77	Megaloblastic anemia 68%	Aplastic anemia 7.7%
Savage *et al*.[16]	Zimbabwe 1999	134	Megaloblastic anemia	Aplastic anemia
Khodke *et al*.[8]	India 2000	166	Hypoplastic anemia 29.5%	Megaloblastic anemia 23.3%
Khan *et al*.[17]	Pakistan 2001	30	Aplastic anemia 20%	Megaloblastic anemia 16.7%
Kumar and Raghupathi[18]	India 2001	166	Aplastic anemia 29.5%	Megaloblastic anemia 22.3%
Ishtiaq *et al*.[19]	Pakistan 2002	100	Megaloblastic anemia 39%	Hypersplenism 19%
Khunger *et al*.[20]	India 2002	200	Megaloblastic anemia 72%	Aplastic anemia 14%
Mussarrat *et al*.[6]	Pakistan 2004	89	Aplastic anemia 38.3%	Megaloblastic anemia 27.7%
Dodhy *et al*.[21]	Pakistan 2005	392	Megaloblastic anemia 35.95%	Hypersplenism 16.3%
Rahim *et al*.[22]	Pakistan 2005	424	Megaloblastic anemia 24.92%	Aplastic anemia 14.15%
Memon *et al*.[23]	Pakistan 2008	230	Aplastic anemia 23.9%	Megaloblastic anemia 13.04%
Jha *et al*.[24]	Nepal 2008	148	Hypoplastic anemia 29.5%	Megaloblastic anemia 23.64%
Gayathri and Rao[9]	India 2008	104	Megaloblastic anemia 74.04%	Aplastic anemia 18.26%
Tariq *et al*.[5]	Pakistan 2010	50	Aplastic anemia 36%	Megaloblastic anemia 16%
Santra and Das[25]	India 2010	111	Aplastic anemia 20%	Hypersplenism 11.7%
Kumar *et al*.[17]	India 2011	48	Hypoplastic marrow 16%	
Qamar and Aijaz[7]	Pakistan 2011	150	Aplastic anemia 50.67%	Megaloblastic anemia 36.6%
Lakhey *et al*.[26]	Nepal 2012	54	Hypoplastic anemia 29.6%	Hematological Malignancy 27.78%
Rangaswamy *et al*.[27]	India 2012	100	Megaloblastic anemia 49%	Aplastic anemia 14%
Javalgi and Dombale[28]	India 2013	106	Megaloblastic anemia 72.6%	Iron deficiency anemia 12.2%
Subrahmanyam and Padma[29]	India 2015	106	Megaloblastic anemia 26.42%	Hypersplenism 24.53%
Present study	India 2015	80	Megaloblastic anemia 60%	Aplastic anemia and leukemia 10% each

finding is in accordance with the studies by Jha *et al*.[24] wherein the age of the patients ranged from 10 to 79 years with a male preponderance (male:female = 1.5:1) and Rangaswamy *et al*.[27] wherein the age ranged from 12 to 85 years with a male preponderance, male:female = 3.4:1.

Hematological Parameters

The hemoglobin percentage varied from 1.6 to 9.9, the total leukocyte count was in the range of 1000-3900 cells/mm^3 and the range of platelet count varied from 20,000 to 90,000/mm^3. This finding is in agreement with that of Jha *et al*.,[24] Kumar and Raghupathi,[18] and Rangaswamy *et al*.[27]

On peripheral smear, 21 of 48 cases were found to be pure megaloblastic anemia where macro ovalocytosis with anisopoikilocytosis (seen in all cases) and hypersegmented neutrophils (17/21, 81%) were found to be the main features. Prabhu *et al*.[28] also found macro ovalocytosis with anisopoikilocytosis in all cases. Khodke *et al*.[8] found anisocytosis in 20/22 cases, Tilak and Jain[4] in 51/53 cases. Khodke *et al*.[8] found hypersegmented neutrophils in 20/22 cases (91%), Tilak and Jain[4] in 45/53 cases (84.9%), Gayathri and Rao[9] in 51.35% cases.

62% (13/21) showed relative lymphocytosis comparable to Tilak and Jain[4] (50%), Gayathri and Rao[9] (52.63%) and Khunger *et al*.[20]

Mean corpuscular volume was found to be more than 100 fl in 70% of our cases compared to Prabhu *et al*.[28] in 57.5% cases.

On bone marrow examination, marrows were found to be hypercellular, with erythroid hyperplasia, megaloblastic maturation, and reversal of M:E ratio. All cases showed shift to the left in myeloid series and 47.6% showed hyperplasia. Rangaswamy *et al*.[27] found 87.8% of the marrows to be hypercellular.

Around 27 of 48 (56.25%) cases were megaloblastic associated with IDA with dimorphic blood picture. Most had hypochromia with both microcytes and macrocytes. Khodke *et al*.[8] reported dimorphic blood picture in 10/22 (45.5%) and Gayathri and Rao[9] reported 39/72 cases, (54.2%).

Aplastic anemia was the second most common cause and constituted 10% cases of pancytopenia which is comparable to the studies of Tilak and Jain[4] 7.7%,

Khunger *et al.*[20] 14%, Rahim *et al.*[22] 14.15%, Rangaswamy, Rangaswamy *et al.*[27] 14% and Khodke *et al.*[8] 14%.

The incidence of aplastic anemia quoted from the West is much higher than that observed by US. The increased incidence may be related to environmental factors.[10] A few studies that quote aplastic anemia to be the most common cause in India as well as elsewhere are International Agranulocytosis and Aplastic Anemia study group[11] 52.7%, Varma and Dash[15] 40.6%, Khodke *et al.*[8] 29.5%, Khan *et al.*[17] 20%, Kumar *et al.*[32] 29.5%, Mussarrat *et al.*[6] 38.3%, Memon *et al.*[25] 23.9%, Jha *et al.*[24] 29.5%, Mohammad Tariq *et al.*[5] 36%, Lakhey *et al.*[26] 29.6%, Santra and Das[25] 50.67%, Kumar and Raghupathi[18] 16%, Qamar and Aijaz[7] 20%.

Age and Sex Distribution

Age of patients with aplastic anemia ranged from 7 to 67 years and male: female being 1.7:1. studies by Kumar and Raghupathi[18] Jha *et al.*,[24] Rangaswamy *et al.*[27] and Tilak and Jain[4] reported similar age range and male:female ratio.

Hematological Parameters

Hemoglobin varied from 3.2 to 8.6 g/dl, total WBC count varied from 400 to 3900 cells/mm^3 and platelet count varied from 20,000 to 90,000/mm^3. Similar hematological parameters were reported by Tilak and Jain[4] Jha *et al.*,[24] Kumar and Raghupathi[18] and Rangaswamy *et al.*[27]

Peripheral Smear and Bone Marrow Aspiration Findings

In our study, five of the eight patients showed anisocytosis and three of eight showed relative lymphocytosis. In a study by Khodke *et al.*,[8] three of seven patients showed anisocytosis and one of three showed relative lymphocytosis. In a study by Tilak and Jain,[4] two of six patients showed anisocytosis and three of six showed relative lymphocytosis.

Bone marrow findings were the following: Markedly hypocellular with increased fat spaces, marked depression of all 3 series and increase in plasma cells, lymphocytes, and reticular cells. Mohler[33] in their analysis of 50 cases reported 74% patients with hypocellular marrow, 16% with normocellular marrow which later became hypocellular and 10% were acellular.

5/8 cases etiology was not known, grouped under Idiopathic aplastic anemia.

3/8 cases gave a history of HIV on ART. Khodke *et al.*[8] reported 1 case of HIV (50 cases). Ishtiaq *et al.*[19] reported 1 case of AIDS presenting with pancytopenia, so did Rangaswamy *et al.*[27]

Leukemia was also the second most common cause and constituted 10% of the cases of our study, which is comparable to the studies of Tariq *et al.*[5] (14%), Mussarrat *et al.*[6] (13.6%) and Qamar and Aijaz[7] 11%.

Khoo and Keihani[33] in a study of 188 cases of pancytopenia found leukemia to be the most common cause, most of the cases being AML.

In the study by Jha *et al.*[24] acute leukemia alone constituted 19.59% of the total cases of pancytopenia, in contrast to the studies by Khodke *et al.*[8] and Tilak and Jain[4] where one case of AML was detected as a cause of pancytopenia. Khunger *et al.*[20] reported incidence of 5% and so did Rangaswamy *et al.*[27] Santra and Das[25] reported incidence of 1.8% and Ishtiaq *et al.*[19] 1.8%.

Nevertheless, in the study of Bashawri[34] the main indication for bone marrow examination in cases of pancytopenia was acute leukemia.

Pancytopenia can be seen in 30% of acute leukemia at the time of presentation.[8]

The highest incidence was found in the age group <10 years (37.5%) and the age ranged from 5 to 57 years with a male: female = 3:1, which is in agreement to that reported by Jha *et al.*[24] years and Rangaswamy *et al.*[27]

Hemoglobin varied from 3.7 to 8.1 g/dl. Total WBC count varied from 400 to 3800 cells/mm^3. Platelet count varied from 20,000 to 94,000/mm^3 similar to the hematological parameters reported by Jha *et al.*,[24] Kumar and Raghupathi[18] and Rangaswamy *et al.*[27]

Bone marrow aspiration revealed all cases to be hypercellular, with decreased fat spaces and marked suppression of megakaryocytic and myeloid series. 4/8 cases were diagnosed as AML, showed presence of myeloblast and were myeloperoxidase positive. 4/8 cases were diagnosed as ALL, showed presence of lymphoblast and were myeloperoxidase negative. In the study by Rangaswamy *et al.*[27] 80% marrows were hypercellular and 20% hypocellular.

In the study by Tariq *et al.*[5] ALL constituted 12% cases and AML 2% cases whereas Varma and Dash[15] reported AML to be 12.8%. Gayathri and Rao[9] reported 4 cases of leukemia, 3 being AML and 1 ALL and Kumar and Raghupathi[18] reported 13 cases of AML and 5 cases of ALL.

The incidence of MDS in our study was 8.75%. Lakhey *et al.*[26] reported an incidence of 7.4%, Kumar and

Raghupathi[18] 8.3% which is comparable to our study. Qamar and Aijaz[7] reported incidence of 5.3%, Mussarrat *et al.*[6] 2.4%, Khunger *et al.*[20] 2%, Jha *et al.*[24] 0.94% and Tariq *et al.*[5] 14%.

In a study of 118 patients with MDS by Juneja *et al.*,[35] age ranged from 48 to 95 years, study by Lakhey *et al.*[26] age ranged from 30 to 79 years. In the present study, highest incidence was found in the age group 61-70 years (43%) and age of patients ranged from 28 to 65 years, male:female=1.3:1

6/5 cases showed hypochromia, anisocytosis, microcytes, macrocytes. Anemia associated with MDS can be microcytic, normocytic, or, most commonly, macrocytic.[36]

Six of seven cases were diagnosed as refractory cytopenia with multilineage dysplasia. Marrow was hypercellular, showed dysplastic features in erythroid series ranging from increased mitotic activity in normoblasts, abnormal mitosis, megaloblastoid change, nuclear hypoblasts, irregular hypersegmentation, ringed nuclei and abnormal segmentation. Dysgranulopoeis and dysmegakaryopoiesis were also noted.

In a study by Kumar and Raghupathi[18] of the four cases of MDS, one was refractory anemia, two refractory cytopenia with multilineage dysplasia and one MDS unclassified.

Hypersplenism constituted 6.25% cases of pancytopenia. Age of patients ranged from 21 to 63 years male:female = 3:4.

Retief and Heyns[10] found hypersplenism to be the cause of pancytopenia in 7.7% cases, which is comparable to our finding.

Rangaswamy *et al.*[27] found hypersplenism to be a cause of pancytopenia in 10% cases, with male:female ratio of 1:1.5. Ishtiaq *et al.*[19] in 12% with a female preponderance being 1:1.3.). In a study of 195 patients, Kumar and Raghupathi[18] reported incidence of hypersplenism in 11%, age ranging 14-49 years. Momen *et al.*[36] in 4.34%, Santra and Das[25] 11.7%, Tariq *et al.*[5] in 10%.

Hemoglobin varied from 5.4 to 9.9 m/dl, total WBC count varied from 1100 to 3600 cells/mm^3 and platelet count varied from 50,000 to 90,000/mm^3. This is in conformity with the findings of Kumar and Raghupathi[18] and Gayathri and Rao.[9]

A single case of paroxysmal nocturnal hematuria was encountered. Santra and Das[25] in a study of 111 cases of pancytopenia encountered one case and so did Khan *et al.*[17] in a study of 30 cases of pancytopenia.

A 55-year-old male presented with hematuria, jaundice and splenomegaly. Laboratory investigations revealed elevated lactic acid dehydrogenase levels, raised erythrocyte sedimentation rate and C-reactive protein, mildly elevated fetal hemoglobin, serum ferritin 37 μg/L, and total iron binding capacity 289/μg/dl.

We encountered a single case of falciparum malaria causing pancytopenia.

In the study of Hossain *et al.*,[14] chronic malaria was the second most common cause of pancytopenia. In the study of Khunger *et al.*,[20] incidence was 1%, Gayathri and Rao[9] 1.93%, Tilak and Jain[4] 3.9%, Kumar and Raghupathi[18] 3%, and Santra and Das[25] 1.8%.

We encountered a single case of mastocytosis causing pancytopenia.

None of the above studies of pancytopenia have encountered a case of mastocytosis. Systemic mast cell disease is characterized by bone marrow involvement by mast cells and frequently by peripheral blood cytopenias and may result in pancytopenia.[37,38]

A 16-year-old female presented with fever, macular-papular rash on face. Hemoglobin 5.4 g/dl total count 1900/mm^3 platelet count: 48,000/mm^3. Peripheral smear revealed moderate hypochromia, moderate anisocytosis. Bone marrow was hypercellular. Fat content was decreased. M:E ratio was reversed to 1:3.

Erythroid series were hyperplastic at all levels. Most showing megaloblastoid change. Myeloid series showed shift to left with mild increase in eosinophilic precursors. A Large number of mature mast cells, precursors were seen scattered in marrow, forming 40% of the nonerythroid cells. Megakaryocytic series were normal and iron staining was mildly increased +4.

A single case of hemophagocytosis was encountered in our study. Tilak and Jain[4] also encountered one such case in a study of 77 cases of pancytopenia.

A 4-year-old boy presented with fever, breathlessness, bleeding and was found to have hepatomegaly. Erythrocyte sedimentation rate was raised.

Hemoglobin was 1.9 g/dl, the total count of 3500/mm^3 and platelet count of 90,000/mm^3. Peripheral smear examination revealed moderate hypochromia and moderate anisocytosis, 2 normoblasts/100 WBC' S. Differential count showed shift to left and presence of toxic granules.

Bone marrow aspiration revealed the following: No marrow fragments were aspirated, mainly sinusoidal blood. Few myeloid and erythroid cells seen which show normal morphology. Occasional megakaryocytes seen. Scattered among the marrow cells are few histiocytes showing phagocytosis of WBC's.

We were not able to determine the exact etiology of hemophagocytosis syndrome.

CONCLUSION

Pancytopenia is not an uncommon hematological problem encountered in clinical practice and should be suspected on clinical grounds when a patient presents with unexplained anemia, prolonged fever and tendency to bleed.

Physical findings and peripheral blood picture provide valuable information in the workup of cytopenic patients.

Bone marrow aspiration is an important diagnostic tool in hematology which helps to evaluate various causes of cytopenia and to plan further investigations and management of the patients.

Since a large number of causes for pancytopenia are remediable and reversible, accurate diagnoses and timely intervention may be lifesaving and will definitely have an influence on the morbidity and mortality in these patients.

The early detection of the underlying conditions would also help to enhance the prognosis of a patient with pancytopenia.

Thus, a comprehensive, clinical, and hematological study of patients with pancytopenia will usually help in identifying the underlying cause.

Further research with a larger sample size is required to replicate the findings of this study.

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Original Article

Cervical Cancer and its Demographic Factors at Central India

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Abstract

Introduction: Cancer of the uterine cervix is the 7th most common cancer in the world, and it is the most common cancer causing death among women in developing countries. Africa, Central America, India, Pakistan, and most of the African countries have an incidence between 20 and 30/100,000.

Objective: With the objective to determine different abnormal cervical pattern and age, parity, socioeconomic status, and literacy wise distribution of cancers.

Materials and Methods: The present study was carried out at the Sanjay Gandhi Hospital and SS Medical College, Rewa, in 1-year duration with 200 samples were taken in account.

Results: Reactive changes 39 cases (19.5%) show epithelial abnormalities including atypical squamous cells of undetermined significance and atypical glandular cells of undetermined significance (13 cases) 6.5%. 15 cases (7.5%) show Low-grade squamous intraepithelial lesion (SIL), 8 cases (4%) show high-grade SIL, and 3 cases (1.5%) show carcinoma.

Conclusion: Most of the cases with abnormal smear were seen from the parity more than three and above. Furthermore, it has been observed that literacy and socioeconomic conditions are also having a high impact on rate among carcinoma cervix as it has been seen that lower socioeconomic condition and lower rate of literacy have more incidences of abnormal smear.

Key words: Cervical cancer, High-grade squamous intraepithelial lesion, Low-grade squamous intraepithelial lesion, Smear

INTRODUCTION

Cancer of the uterine cervix is the 7th most common cancer in the world, and it is the most common cancer causing death among women in developing countries.[1] Globally, the annual estimated number of new cases is 352,414 which accounts for 9% of all cancer diagnosed in women. 86% of the cancers occur in the developing countries,[2] whereas 20% in the undeveloped countries.[3]

The incidence of cancer of uterine cervix varies from part to part in the world. The highest incidence is seen in Sub Saharan african countries, Latin America. About 84 per cent of cervical cancer cases occurred in less developed countries like India, Pakistan and most of the African countries where incidence ranges between 20 and 30 per 100, 000. Most of the developed world, China and Middle East have a low incidence of <8/100,000.

In India, the peak age for cervical cancer incidence is 55-59 years.[4] Current data from the National Cancer Registry Program indicate that the most common sites of cancer among women are the breasts and the cervix.[5] It can be detected at a very early stage by simple technique of exfoliative cytology. Early stage detection is important because early stage is 100% curable reducing the morbidity and mortality from invasive cancer cervix. However, the most common lesions of the female genital tract are inflammatory lesions and parasitic lesions. Some inflammatory lesions such as trichomonas and human papillomavirus are forerunners of malignancy underlining the importance of diagnosing these conditions.

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Cytology, as we know it today, is an interpretative art with histopathology as its basis. Cytology does not replace histology rather it supplements histology. The two can be considered as opposite sides of the same coin.

Apart from this, screening is an inherently attractive approach to cancer control. This includes evaluation of the test itself in terms of its sensitivity and predictive value for detection of cancer and precancerous state in the population. One of the essential prerequisites for the introduction of screening program is that the natural history of disease could be known. For cancer of cervix, we recognized that the majority of the cases pass through an *in situ* phase when they are detectable using cervical smear, and it is believed that this is preceded by a phase of dysplasia.

Aims and Objectives

1. To determine different abnormal cervical patterns
2. To determine age, parity, socioeconomic status, and literacy wise distribution of cancers.

MATERIALS AND METHODS

The present study titled "A study of cervical cancer and its demographic factor at Central India" was carried in the Department of Obstetrics and Gynaecology with the help of the Department of Pathology, at Sanjay Gandhi Hospital and SS Medical College, Rewa. Duration of study is 1 year. The present study comprises of examination of 200 cervical/vaginal smears, taken from the patients attending Outpatient Department (OPD) at the Sanjay Gandhi Hospital, Rewa.

The cases were examined in detail and findings recorded on the standard preformed. First, a careful history of the patient was taken, complaints noted in the order of importance and duration. A detailed obstetric, menstrual, contraceptive history has been noted. A detailed general physical, systemic, and per speculum examination were also carried out besides visualization of the cervix.

Specimens were taken from the vagina and cervix. For the vaginal specimen, aspiration should be done before the induction of specimen. For cervical specimen, smear was made by placing the small end of the cervical scraper through the external orifice high into the cervical canal and rotating the spatula through 360°, scraping the squamocolumnar junction. The material was spread on the clean, pre-labeled glass slide and fixed immediately in fixative. 95% ethyl alcohol is normally used as fixative. Many reagents are used in staining technique such as Harris hematoxylin, OG - 6, EA 36, lithium carbonate, hydrochloric acid, alcohol, xylol, distilled water, and Canada balsam/DPX.

Relevant data on age, parity, socioeconomic status, literacy, and hygienic condition were recorded in a separate sheath. Pap smear findings were then clinically correlated followed by analysis.

RESULTS

In the present study, Pap smears were taken from 200 patients who were preferably more than 25 years of age, symptomatic or with some clinical lesion of the cervix, attending and admitted to the Gandhi Memorial Hospital associated with SS Medical College, Rewa (MP).

Data such as age, sex, location of tumors, and socioeconomic classification were taken as records.

Out of all parity cases, Table 4 shows that significant percentage of abdominal smears is seen mainly in patients with party 3 and above.

Women with no literacy or primary level of education have more cases of abnormal smear and cervical cancer lesions.

Lower and middle socioeconomic conditions were more responsible to cause abnormal smear and cases.

DISCUSSION

Date from 200 patients, attending the OPD and admitted to the Gandhi Memorial Hospital, Rewa (MP), were collected and analyzed.

Table 1 shows different types of pap smear and their distribution taken from different age groups and parity.

Table 2 shows that the bulk of patients 105 belong to age group 25-35 years.

Table 3 shows that maximum number of patients belong to parity group 3-4 (160 cases).

Table 4 shows that woman with parity 3 or more are at higher risk of developing squamous intraepithelial lesions and carcinomatous changes.

Parity and dysplasia comparison

Parity	YL Devi	Rao
2-3	30.64	27.06
4-5	35.48	40.44
6-7	28.58	23.44
Above 7	5.40	9.04

Women with a large number of pregnancies usually start sexual life early, and the early age of first intercourse

might be etiologically more important than the number of pregnancies. The period of early squamous metaplasia is the time of greatest risk for cellular transformation and the development of cervical neoplasia. Early squamous metaplasia is most frequent in puberty, early adolescence, and first pregnancy. Therefore, women who begin sexual activity at an early age when the metaplastic process is most active would have a greater chance of developing cervical cancer.

High parity usually means a young age at marriage and first pregnancy. All observed an increasing risk of development of carcinoma cervix with each pregnancy. Shah and Shah (1980) noted that the incidence of dysplasia increased in parity 4 and above. This is also confirmed by the present study. Maliphant (1949) stressed the increasing risk with each pregnancy. He was of the opinion that with every pregnancy a married woman doubles the risk compared to a married woman without children, and ten times the risk when unmarried women are taken into consideration.

Table 5 indicates that common gross appearance of cervix per speculum was chronic cervicitis in abnormal smears. Chronic cervicitis was seen in 53.3% cases of low-grade squamous intraepithelial lesion (L-SIL), 62.5% cases high-grade SIL (H-SIL), and 33.33% cases carcinoma cervix.

Table 1: Description of Pap smear

Pap smear	Total *N* (%)
Adequacy of smears	
Satisfactory for evaluation	195 (97.5)
Unsatisfactory for evaluation	5 (2.5)
General categorization	
Normal smears	20 (10)
Benign cellular changes	136 (68)
Specific infection	21 (10.5)
Trichomonas	10 (5)
Gardnerella	11 (5.5)
Reactive changes	115 (57.5)
Inflammatory smears	108 (54)
Atrophic smears	5 (2.5)
Endocervicitis	2 (1)
Epithelial cell abnormality	39 (19.5)
Atypical epithelial cells	13 (6.5)
ASCUS	12 (6)
AGUS	1 (0.5)
HPV mild dysplasia/CIN–I	15 (7.5)
H-SIL (moderate and severe dysplasia/CIN–II and III)	8 (4)
Malignancy	3 (1.5)

ASCUS: Atypical squamous cells of undermined significance, AGUS: Atypical glandular cells of undermined significance, L-SIL: Low-grade squamous intraepithelial lesion, CIN: Cervical intraepithelial neoplasia, HPV: Human papillomavirus, H-SIL: High-grade squamous intraepithelial lesion

Table 2: Age distribution of the patients

Age in year	*N* (%)
25-35	105 (52.5)
36-45	54 (27)
46-55	26 (13)
>55	15 (7.5)

Table 3: Distribution of patient according to total number of pregnancies

Number of pregnancy	Total number of cases (%)
0	-
1	16 (8)
2	28 (14)
3	80 (40)
4	50 (25)
5	18 (9)
>/6	8 (4)

Table 4: Effect of parity in positive cases

Parity	Total number of cases	L-SIL (%)	H-SIL (%)	Cancer of the cervix (%)
P_0	-	-	-	-
P_1P_2	44	3 (20)	1 (12.5)	-
P_3P_4	130	7 (46.6)	3 (37)	1 (33.3)
>/P_5	26	5 (33.3)	4 (50)	2 (66.6)

L-SIL: Low-grade squamous intraepithelial lesion, H-SIL: High-grade squamous intraepithelial lesion

Table 5: Gross appearance of cervix

Appearance	Total number of cases (%)
Normal	64 (32)
Chronic cervicitis (hypertrophied cervix)	84 (42)
Cervical erosion	48 (24)
Bleeding on touch	4 (2)

Table 6: Distribution of patients according to literacy

Literacy	Total number of cases	L-SIL (%)	H-SIL (%)	Cancer of the cervix (%)
Illiterate	77	5 (33.33)	4 (50)	2 (66.66)
Primary	58	4 (26.67)	2 (25)	1 (33.33)
Secondary	36	3 (20)	1 (12.5)	
Graduate	29	3 (20)	1 (12.5)	

L-SIL: Low-grade squamous intraepithelial lesion, H-SIL: High-grade squamous intraepithelial lesion

Table 7: Distribution of patients according to socioeconomic

Socioeconomic status	Total number of cases	L-SIL (%)	H-SIL (%)	Cancer of the cervix (%)
Low (<5000/month)	106	7 (46.67)	4 (50)	2 (66.66)
Middle (5000-10,000)	66	5 (53.33)	2 (25)	1 (33.33)
High (>10,000)	28	3 (20)	2 (25)	-

L-SIL: Low-grade squamous intraepithelial lesion, H-SIL: High-grade squamous intraepithelial lesion

Cervical erosion was presenting 33.33% cases of L-SIL, 37.5% cases of H-SIL, and 66.66% cases of carcinoma cervix.

Table 6 shows the relationship of different level of literacy with the incidence of cervical cancer lesions, which clearly describe illiterate has maximum number of cases. Which also tells as literacy increases awareness increases towards health.

Table 7 describe relation of cases with Socio economic status in society. Low socio economic status has maximum no of cases which decline drastically as status increases.

A close association of dysplasia and malignancy with unhealthy cervix, e.g., cervical hypertrophy, cervical erosion has been observed by many people (Singh *et al*., Guard *et al*., Gupta *et al*., Panda *et al*., etc.) Therefore, all cases of suspected cervical lesion should be routinely subjected to Pap smears, and patients should be kept on regular follow-up.

Out of 200 smears and analyzed 7.5% were of L-SIL, 4% were of H-SIL, and 1.5% were malignant.

MacGregor and Baird (1963) screened 2683 cases and reported 18 (0.67%) to be malignant. Wahi *et al.* (1972) found rate of malignant smears to be 0.6% and that of dysplastic smears 6.7%.

From the above observation of different workers, it is concluded that there is a wide variability in the incidence of carcinoma diagnose by cytology, and also the result of present series of work differ much from results of others.

CONCLUSION

In the present study, 200 Pap smear analyzed, which shows the distribution pattern of various conditions, of which, 115 cases (57.5%) show reactive changes, 39 cases (19.5%) show epithelial abnormalities including atypical squamous cells of undetermined significance and atypical glandular cells of undetermined significance (13 cases) 6.5%. 15 cases (7.5%) show L-SIL, 8 cases (4%) show H-SIL, and 3 cases (1.5%) show carcinoma. Most of the cases with abnormal smear were seen from the parity more than 3 and above. Furthermore, it has been observed that literacy and socioeconomic conditions are also having a high impact on rate among carcinoma cervix as it has been seen that lower socioeconomic condition and lower rate of literacy have more incidences of abnormal smear.

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Original Article

Visual Impairment Due to Refractive Errors among Female School Students Attending Tertiary Care Hospital, Ananthapuramu

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Abstract

Introduction: Refractive errors are of various types, predominantly affecting school going children. Mostly in developing countries, refractive errors are responsible for either visual impairment of blindness. The aim of this study is to know the prevalence of refractive errors among female schoolchildren of 7-18 years age group and assessment of socio-demographic features among myopia children.

Materials and Methods: This is a prospective cross-sectional study conducted for 1 year (2014) among female schoolchildren attending the Department of Ophthalmology at Government General Hospital, Ananthapuramu. A total of 1600 female schoolchildren presenting with complaints of visual impairment were examined by standard ophthalmic procedures such as Snellen chart, slit-lamp examination, retinoscopy, and ophthalmoscopy to detect refractive errors.

Results: Out of 1600 schoolchildren, 1424 (89%) had myopia, 75 (4.6%) had hypermetropia, and 101 (6.3%) had astigmatism. Most of the female schoolchildren were presented to the outpatient department complaints of difficulty in seeking blackboard from back benches and headache/eye ache. Out of 1600 children, only 768 (48%) were attending routine eye checkups yearly once at various hospitals, 262 (16.3%) and 112 (7%) were attending 2 and 3 years once, respectively, and 458 (28.6%) did not have eye checkups at all.

Conclusion: Government and non-government organizations are helping a lot in India in reducing the incidence of visual impairment. Individuals should aware and support these organizations by seeking medical advice, which will reduce the visual impairment incidence.

Key words: Female schoolchild, Myopia, Refractive errors

INTRODUCTION

Since the last three decades, recognition of concept of avoidable blindness (i.e., preventable or curable) is rising. For prevention of blindness, major global initiatives have taken. They are: WHO: Prevention of Blindness Programme (1978), Vision 2020 - The right to sight (1999) and vision for the future (2001). Refractive errors are the one among five major blinding eye conditions taken by WHO globally for immediate attention to achieve the goals of Vision 2020.[1]

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Blindness problem has gained importance globally; its magnitude is much higher in India. Of the estimated 45 million, India alone has 9 million blind people, which comes to one-fifth of the total in world.[2]

Refractive errors are of various types, predominantly affecting school going children. It is one of most common public health problem, which is treatable eye condition. Refractive errors are common cause of visual impairment, second treatable blindness. It is estimated that there are 35 million people in the world who require low vision care and 8 million (18%) are blind due to refractive errors.[2] During survey period, blindness National Programme for Control of Blindness survey (2001-2002)[3] reported 19.7% refractive

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errors, and rapid assessment of avoidable blindness survey (2006-2007)[4] reported 6.3% of refractive errors responsive for blindness.

Mostly in developing countries, refractive errors are responsible for either visual impairment of blindness.[5] Children may not be aware of this problem. Usually, they will not complain of defective vision. Visual impairment problems hinder their education, personality development, and career opportunities, in addition to causing an economic burden on society.[6]

Awareness has to create among schoolchildren, parents, guardians, and teachers regarding refractive errors. School health programs are helping to screen schoolchildren with visual impairment. Many school health programs were supplementing the vitamin A to reduce the nutritional deficiency visual impairment.

The aim of this study is to know the prevalence of refractive errors among female schoolchildren of 7-18 years age group and assessment of socio-demographic features among myopia children.

MATERIALS AND METHODS

This is a prospective cross-sectional study conducted for 1 year (2014) among female schoolchildren attending the Department of Ophthalmology at Government General Hospital, Ananthapuramu. The study has started after Institutional Ethical Committee approval and consent form studied population.

Female schoolchildren with the age group of 7-18 years were included in this study. Children presenting in ophthalmology outpatient department (OPD) with complaints of ocular manifestations other than refractive errors were excluded from the study.

Based on various literature, sample size was estimated. A total of 1600 female schoolchildren presenting with complaints of visual impairment were examined. Children wearing spectacles were also examined, and change in visual acuity was noted.

Details regarding age, socio-demographic features, and standard questionnaire related to visual impairment were documented. All the data were entered into excel sheet and kept unlinked anonymously.

Children were examined by standard ophthalmic procedures such as Snellen chart, slit-lamp examination, retinoscopy, and ophthalmoscopy to detect refractive errors. Visual acuity was measured and advised for correction, those with uncorrected visual acuity of 20/40 or worse in either eye underwent refraction under cycloplegia. Children with ocular morbidities were treated accordingly.

RESULTS

A total of 1600 female schoolchildren were included in this study. Age group of 7-18 years children presenting with complaints of visual impairment were selected to do this study.

Refractive errors were predominantly seen in the age group of 11-15 years followed by 7-10 and 16-18 years. Out of 1600 schoolchildren, 1424 (89%) had myopia, 75 (4.6%) had hypermetropia, and 101 (6.3%) had astigmatism. Myopia was the predominant type among refractive errors (Table 1).

Most of the female schoolchildren were presented to the OPD complaints of difficulty in seeking blackboard from back benches and headache/eye ache (Table 2). Out of 1600 schoolchildren, 1225 (76.5%) were complaining of difficulty in seeking blackboard from back benches, 984 (61.5%) were complaining of headache/eye ache, 35.1% were suffering from eye strain after near work like reading, 50.8% were half-shutting their eyes for better vision, 51.4% were having discharge from eyes, and 19.6% were presented with itching of eyes.

On assessing the correlation of family history of schoolchildren regarding refractive errors, it was observed majority of female schoolchildren had family history of visual impairment in single parent followed by no family

Table 1: Age distribution of refractive errors

Type of Refractive errors	Age (%)			Total
	7-10 years	11-15 years	16-18 years	
Myopia	363 (25.4)	878 (61.6)	183 (12.8)	1424
Hyper metropia	19 (25.3)	47 (62.6)	9 (12)	75
Astigmatism	26 (25.7)	54 (53.4)	21 (20.7)	101
Total	408 (25.5)	979 (61.1)	213 (13.3)	1600

Table 2: Various presenting complaints of school children

Presenting complaints	Number of children *n*=1600 (%)
Difficulty in seeing blackboard from back benches	1225 (76.5)
Headache, eye pain	984 (61.5)
Eye strain after near work-like reading	562 (35.1)
Half-shutting of the eyes for better vision	814 (50.8)
Discharge from eyes	823 (51.4)
Itching of eyes	314 (19.6)

history of refractive errors (Figure 1). Among 1600 schoolchildren, 872 (54.5%) had family history of single parent, 453 (28.3%) had no family history, 218 (13.6%) had family history of siblings, and 57 (3.5%) had both parents refractive error. 132 (8.2%) children had family history of both siblings and single parent refractive error.

Refractive errors were assessed by correlating with various socio-demographic features. Socioeconomic status (SES) was assessed by modified Kuppuswamy scale. Out of 1600 children, 658 (41.1%) were upper lower class, and 565 (35.3%) were lower middle class. Many of the female children with refractive errors belong to lower SES (Table 3).

Out of 1600 children, only 768 (48%) were attending routine eye checkups yearly once at various hospitals, 262 (16.3%) and 112 (7%) were attending 2 and 3 years once, respectively, and 458 (28.6%) did not have eye checkups at all (Figure 2).

DISCUSSION

Refractive errors were the second most common cause of visual impairment. Refractive errors are treatable cause and can decrease its incidence by school health programs or health education in communities.

We have selected female gender of schoolchildren to investigate refractive errors in this study because female gender is usually neglected in few communities since birth, reasons for these may be low SES, illiteracy, bad beliefs, less food supplements, and also showing less interest in seeking to medical care toward female child. Many studies also reported that refractive errors were common in females.[7-9]

Table 3: Socio-demographic profile of female school children

Socio-demographic features	Number of schoolchildren (%)
SES	
Upper	79 (4.9)
Upper middle	204 (12.75)
Lower middle	565 (35.3)
Upper lower	658 (41.1)
Lower	94 (5.8)
Religion	
Hindu	804 (50.2)
Muslim	518 (32.3)
Christian	226 (14.1)
Others	52 (3.2)
Caste	
ST	216 (13.5)
SC	442 (27.6)
BC	357 (22.3)
OC-General	585 (36.5)

SES: Socioeconomic status

Refractive errors were predominantly seen in the age group of 11-15 years followed by 7-10 and 16-18 years in the present study. Khader *et al.*[10] found lowest for the youngest age group (7.8%) and increased until it reaches 20.6% for 14 years children. After that age, prevalence decreased gradually. Lin *et al.*[11] documented that among the schoolchildren in the age 7, 12, and 15 years, the prevalence of myopia was 20%, 61%, and 81%, respectively, and Kalikivayi *et al.*[12] reported that the prevalence of myopia was significantly higher among children aged >10 years compared to those <10 years.

In this study, out of 1600 schoolchildren, 1424 (89%) had myopia, 75 (4.6%) had hypermetropia, and 101 (6.3%) had astigmatism. Myopia was the predominant type among refractive errors.

Kumari and Lakshmi[13] documented that major refractive error was myopia (89.8%) followed by astigmatism (6.1%) and hypermetropia (4.1%). A study by Dulani and Dulani[14] found myopia at 63.4% and astigmatism (25.8%) followed by hypermetropia (11.35%). Rohul *et al.*[15] observed that myopia as 59.59% followed by astigmatism (35.23%) and hypermetropia (14.17%). In contrast to this study, lesser prevalence of myopia was observed by Kalikivayi *et al.*[12] and Dandona and

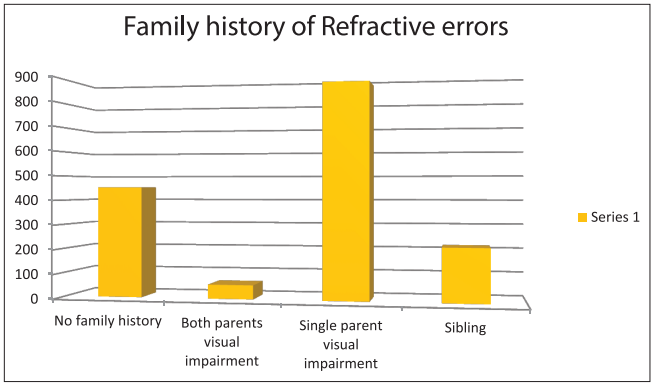

Figure 1: Number of students with family history of refractive errors

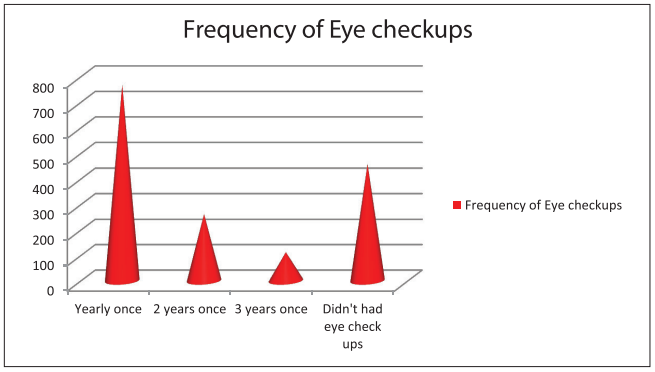

Figure 2: Frequency of eye checkups by schoolchildren

Dandona[6] was found to be 10%, 8.6%, and 4.44%, respectively.

As per this study, out of 1600 schoolchildren, 1225 (76.5%) were complaining of difficulty in seeking blackboard from back benches, 984 (61.5%) were complaining of headache/eye ache, 35.1% were suffering from eye strain after near work like reading, 50.8% were half-shutting their eyes for better vision, 51.4% were having discharge from eyes, and 19.6% were presented with itching of eyes.

Among 1600 schoolchildren, 872 (54.5%) had family history of single parent, 453 (28.3%) had no family history, 218 (13.6%) had family history of siblings, and 57 (3.5%) had both parents refractive error. 132 (8.2%) children had family history of both siblings and single parent refractive error. Studies done by Rohul *et al*.,[15] Ip *et al*.,[16] and Khader *et al*.[10] found that among myopic children 39.9%, 58.5%, and 56.4%, respectively, had a family history of myopia.

SES was assessed by modified Kuppuswamy scale. Out of 1600 children, 658 (41.1%) were upper lower class, and 565 (35.3%) were lower middle class. Many of the female children with refractive errors belong to lower SES. Ahmed *et al*.[8] observed that students from low socioeconomic conditions were having a higher prevalence of myopia when compared to students from higher SES.

Out of 1600 children, only 768 (48%) were attending routine eye checkups yearly once at various hospitals, 262 (16.3%) and 112 (7%) were attending 2 and 3 years once, respectively, and 458 (28.6%) did not have eye checkups at all as per this study. 28.6% of students did not have eye checkups, which is a quite significant; it signifies that less awareness regarding visual impairment.

Approach of vision 2020 toward refractive errors is to eliminate visual impairment (visual acuity <6/18) and blindness due to refractive errors or other causes of low vision.

CONCLUSION

From this study, we conclude that among refractive errors, myopia is the most common. Refractive errors were common in the age group of 7-15 years, students from low SES, with family history of myopia.

Health administrators or organizations should create awareness among schoolchildren, and their parents regarding refractive errors and also should demand them to seek medical advice as refractive services. Screening is necessary, as a school health programs among individuals with poor vision, refractive services, optical services, low vision services, all those needed for to avoid blindness resulting due to refractive errors. Government and non-government organizations are helping a lot in India in reducing the incidence of visual impairment. Individuals should aware and support these organizations by seeking medical advice, which will reduce the visual impairment incidence.

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Original Article

Analysis of Results of Platelet-rich Plasma with Arthroscopic Acromioplasty and Arthroscopic Acromioplasty: A Comparative Study

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Abstract

Introduction: Platelet-rich plasma (PRP) is widely used to treat a variety of clinical conditions. It has been hypothesized that PRP augments tendon healing. The mechanism of action of PRP is not fully elucidated. Our study is to compare the coapplication of PRP and arthroscopic acromioplasty (AA) with AA regarding clinical and tissue effect.

Methods: The study was conducted on 85 patients diagnosed as rotator cuff tendinopathy (RCT). The patients were randomized into AA (40 patients) and AA + PRP injection (45 patients). Patients were followed for a minimum 1 year. The results were evaluated with visual analog scale and Oxford shoulder score and Bonar score.

Results: There was significant improvement occurs in both groups from baseline symptom. We have found no statistical difference between the groups. When Bonar scoring for tendinopathy was compared, there was a statistically significant difference was found. The improved tendon healing was found in AA + PRP group.

Conclusion: AA significantly improves symptoms of RCT. In combination with PRP significantly improve tendon healing on histopathology. However, further studies with a larger and more varied ethnic and occupations group may be warranted to bring certainty in this dilemma.

Key words: Arthroscopic acromioplasty, Platelet-rich plasma, Rotator cuff tendinopathy

INTRODUCTION

Rotator cuff tendinopathy (RCT) is an important condition of the upper extremity, affecting 1 in 50 adults.[1] It is the third most common musculoskeletal problem over age of 65 years.[2-4] It causes shoulder pain and loss of function. Its greatest impact is on workers with repetitive and high-load upper extremity tasks and on athletes leading to significant morbidity, affecting activities of daily living, recreation, and work life.[5,6]

The exact pathophysiology of pain in rotator cuff disease is not known.[3] The patho-etiology of RCT can be attributed to extrinsic and intrinsic mechanisms, as well as to environmental factors. Shoulder impingement is the main extrinsic cause of RCT. It causes mechanical compression of the external portion (bursal side) of the tendon. Upon repeated compression during movement, the coracoacromial ligament also thicken, decreasing the subacromial space. The anatomical variants (acromial shape, subacromial joint spurs, and acromioclavicular joint spurs) can lead to RCT. Furthermore, the angle and shape of the acromion could be a possible cause of the pathology. Overuse activity coupled with coracoacromial arch changes leads to decreasing the subacromial space which has a significant effect on tendon injury.

Intrinsic mechanisms are associated with the tendon itself and can be from aging, altered biology, microvascular blood supply, degeneration, tendon overload, overuse, or trauma. Histopathology studies reveal mainly degenerative changes with a fibroblastic and a vascular response known as angiofibroblastic degeneration of the rotator cuff tendons.[7] The subacromial bursa is rich free nerve

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endings and nociceptive agents.[8,9] Proposed cellular changes associated with intrinsic mechanisms of RCT are increased matrix metalloproteinases (MMP) and reduced tissue inhibitors of MMP. The inhibitors are tendon cell apoptosis, insulin-like growth factor (IGF-1), nitric oxide synthetase, chondroid metaplasia of the tendon and matrix changes, fatty infiltration (following tears), cytokines, and caspases. Levy *et al.* showed that subjects with acute RCT had hypovascularity in the supraspinatus tendon in comparison to hypervascularity in chronic tendinopathy. Hence, the intrinsic factors have an influence on the morphology and performance of the tendon.

The tendon normally heals with scar tissue formation. The scar tissue is rich in Type 3 collagen. Type 3 collagen has excellent elastic properties but inferior strength property. As a result scar tissue is inferior to native tendon because of the structural organization and poor matrix formation. Therefore, scar tissue must thicken to make up for its mechanical insufficiency, resulting in a stiffer tendon.

Platelet-rich plasma (PRP) is a preparation of concentrated autologous platelets containing growth factors and bioactive substances essential to musculoskeletal healing.[10-12] These growth factors are transforming growth factor β1 (TGF β1), platelet-derived growth factor, vascular endothelial growth factor (VEGF), hepatocyte growth factor, and IGF-1. These factors are biologically active and stimulate angiogenesis, epithelialization, cell differentiation, proliferation, and the formation of extracellular matrix and fibrovascular callus. PRP can be used to enhance extracellular matrix organization by enhanced cell proliferation and total collagen. *In vitro* and animal model studies suggest that PRP augments tissue healing and prevent the structural failure of the tendon in RCT by increasing tenocyte number and production of collagen (Types 1 and 3), which makes up a major portion of the tendon.[13-15]

Conservative management is the mainstay of treatment which includes relative rest, pain medication, physical therapy, and corticosteroid injections. However, many patients are refractory to standard care, and arthroscopic acromioplasty (AA) is done on those cases. Although most patients improve after AA, some fail to improve after surgery and many do not return to normal.[10] Some studies fail to show improvement after AA. PRP has been suggested as a treatment option for refractory tendinopathies including RCT.[10,16]

In case of refractory RCT, AA fails to show improvement. This leads to increasingly widespread use of PRP in clinical practice with high expectations. The aim of this prospective study is to investigate the clinical and tissue effect of coapplication PRP with AA in patients with chronic RCT. We hypothesized that PRP with AA would improve both clinical outcome and tissue characteristics.

METHODS

This was an institution-based, prospective longitudinal study. The study was conducted in our institution after getting ethical permission. All the patients were counseled about the advantages, disadvantages, and complications of the procedure. After getting written consent from patients, we performed procedure. The study period was from January 2012 to January 2015 (36 months duration).

Adult persons aged 40-70 years were recruited from a referral-based outpatient sports medicine practice. Inclusion criteria of our study were RCT with symptoms for 6 months or more, failed conservative treatment of at least 4 weeks of formal physical therapy (including rotator cuff strengthening and scapular and proprioceptive stabilization), at least one corticosteroid injection and single shoulder involvement. Exclusion criteria were joint instability, history of shoulder surgery, and corticosteroid injection within 3 months. Patients with labral lesion, complete rotator cuff tear, and adhesive capsulitis on magnetic resonance imaging (MRI) were excluded.

MRI was performed in all cases preoperatively and also on clinical follow-up period. MRI of rotator cuff was scored on a 0-5 severity scale (0: No tendinopathy; 1: Mild tendinopathy; 2: Moderate tendinopathy; 3: Moderate tendinopathy + partial thickness tear present; 4: Severe tendinopathy ± partial thickness tear present; 5: Severe tendinopathy + full thickness tear present). Patients with Grade 1 and Grade 5 were excluded from the study.

Arthroscopic procedure was done in lateral position under general anesthesia. During the procedure, shoulder joint was thoroughly examined to evaluate any other pathological condition-like labral lesion. Full thickness rotator cuff tear, frozen shoulder, or osteoarthritis and patients were withdrawn from the study. A standard AA was performed through the posterior and anterolateral portal.

PRP was prepared from the 50 ml whole blood taken from the patient. The blood was divided into five 10 ml syringes, and anticoagulant dextrose A (phosphogluconate dehydrogenase-A) solution was mixed 1:9 volume. The syringes were placed in centrifugation machine. The rotation speed and time was 3000 rpm × 3 min. It would separate red blood cell from plasma. The supernatant fluid was taken out and put in another five syringes, and 1 μg prostaglandin E1 in each syringe was mixed. The second centrifugation was performed at 4000 rpm for 15 min.

The supernatant was discarded leaving 0.65 ml in syringe, and the sediment was mixed with-it using a vortex mixer. Finally, 0.65 ml of PRP solution was prepared from 10 ml of the whole blood in the syringe. The PRP was injected into the margin of partial tear and the subacromial space.

During the arthroscopic procedure, tendon biopsy specimen was taken at baseline under general anesthesia and at the 3-month follow-up under ultrasonography guidance.

Patients were followed up at 8, 12, and 52 weeks. The primary outcome measurements were visual analog scale (VAS) score and Oxford shoulder score (OSS). Secondary outcomes included functional tests (empty can exercise with dumbbell resistance, drop arm exercise with dumbbell resistance, side-lying external rotation with dumbbell resistance, full can exercise with dumbbell resistance, external rotation at 0 and 90° with Thera-Band resistance). Bonar scoring was used for histopathological grading.

RESULTS

Demographic

About 130 patients were included in the study. Of these, 85 patients met the inclusion criteria. Among them, AA was done in 40 patients, and AA + PRP injection was given in 45 patients. The average platelet count was in 2.5 ± 3.1 AA group and 2.5 ± 3.8 in AA + PRP group. The baseline OSS in AA and AA + PRP group was 24.5 ± 3.2 and 23.6 ± 4.1, respectively. There was no statistical difference between the groups regarding demographic parameters (Table 1).

Functional Outcome

The parameters for primary outcome functional measures (VAS score and OSS) were statistically significantly improved in both groups (Table 2). The VAS and OSS were improved >95% compare to baseline. In (AA + PRP) group, the VAS and OSS were improved from 7.5 ± 0.3 and 23.6 ± 4.1 to 0.34 ± 0.2 and 48 ± 2.3, respectively. Similarly, in AA group, the VAS and OSS were significantly improved from 7.6 ± 0.3 and 24.5 ± 3.2 to 0.4 ± 0.1 and 45 ± 2.1, respectively ($P < 0.001$). Secondary functional outcome measures were also improved significantly (Table 2). The maximum effect was found in Thera-Band external rotation at 90°. The average mean was improved from baseline 33.4 ± 5.7 (AA + PRP) and 34.2 ± 4.9 (AA) to 72.3 ± 1.7 (AA + PRP) and 72.3 ± 1.7, respectively. Another parameter drop arm test also improved dramatically from 44.3 ± 7.8 (AA + PRP) and 45.3 ± 6.7 (AA) to 83.4 ± 1.5 (AA + PRP) and 83.2 ± 1.2 (AA), respectively. However, when both the groups were compared regarding primary and secondary outcome measures, there was no statistical difference (Table 3).

Table 1: Demographic parameters

Parameters	AA	AA+PRP	*P* value
Age	55.50±4.18	52.81±4.71	<0.01
Gender: Female/male	22/18	25/20	
Length of symptoms	14±1.7	13±2.1	
Baseline OSS	24.5±3.2	23.6±4.1	
Pre-operative platelet count	2.5±3.1	2.5±3.8	
Pre-operative MRI findings			
Grade 2	12	10	
Grade 3	18	22	
Grade 4	10	13	

AA: Arthroscopic acromioplasty, PRP: Platelet-rich plasma, MRI: Magnetic resonance imaging, OSS: Oxford shoulder score

MRI and Histopathology

Grade 2 MRI severity score was improved to Grade 1 in all patients in both the groups, and there was no statistical difference. In Grade 3 and Grade 4 group, there was statistically significant improvement was seen in (AA + PRP) group. Among the 22 patients, Grade 3 in (AA + PRP) group, 18 patients were improved to Grade 1. In comparison to (AA) group, where only 3 patients were improved to Grade 1 among 18 points. Similar result was found in Grade 4 in (AA + PRP) group, where among 13 patients of Grade 4 group, 11 patients were improved to Grade 1 (Table 4). According to histopathological parameters of Bonar scoring system, significant improvement was found in (AA + PRP) group (Table 5). Even after difference in histopathology, there was no difference in functional outcome measures.

There was no complication was found in both groups.

DISCUSSION

RCT is a common overuse injury in athletes and workers that occur because of the high chronic repetitive loading that surpasses the adaptive abilities of the tendon and causes micro tears and degeneration in the tendon substance. Many factors have been suspected to predispose patients to this condition by increasing the supraspinatus tendon overload. The high chronic repetitive loading stimulates the local release of cytokines, with an autocrine and paracrine modulation of cell activity that fails to adapt to continued abusive load and irritation and leads to intratendinous damage. The poor regeneration capacity of tendons, explained by the poor vascularity, oxygenation, and nutrition of this tissue, cannot cope with the applied forces and explains the low healing potential and the difficulties in the treatment of this chronic tendon disease.

In cases of injury, platelets are the first cells carried to the lesion site. In fact, they play a key role in mediating healing

Table 2: Primary and secondary outcome measurements

Parameters	Mean				*P* value
	Baseline	Week 8	Week 12	Week 52	
VAS pain (AA+PRP)	7.5±0.3	3.3±0.4	0.7±0.3	0.34±0.2	<0.001
VAS pain (AA)	7.6±0.3	3.8±0.38	0.8±0.3	0.4±0.1	<0.001
Side-lying external rotation (number of repetitions) (AA+PRP)	17.5±1.6	23.8±0.9	32.3±3.5	38.2±1.6	<0.001
Side-lying external rotation (number of repetitions) (AA)	18.1±1.5	24.7±0.7	31.3±3.6	37.5±1.2	<0.001
Empty can (sec to fatigue) (AA+PRP)	59.1±7.9	71.8±4.7	76.5±10.5	80.4±2.5	0.65
Empty can (sec to fatigue) (AA)	57.3±7.2	71.5±4.1	77.2±9.2	81.2±1.7	0.63
Drop arm (sec to fatigue) (AA+PRP)	44.3±7.8	67.7±6.5	78.2±12.5	83.4±1.5	0.002
Drop arm (sec to fatigue) (AA)	45.3±6.7	68.2±5.9	79.1±10.3	83.2±1.2	0.002
Full can exercise (no. of repetitions) (AA+PRP)	27.4±3.9	38.6±4.0	47.1±5.2	51.3±2.4	<0.001
Full can exercise (number of repetitions) (AA)	26.7±2.5	37.8±3.7	46.3±5.0	52.7±2.7	<0.001
Thera-band external rotation at 0° (s) (AA+PRP)	37.7±4.3	54.8±5.6	62.1±3.3	68.1±2.1	<0.001
Thera-band external rotation at 0° (s) (AA)	38.1±4.3	55.2±5.0	61.9±3.1	68.3±2.3	<0.001
Thera-band external rotation at 90° (s) (AA+PRP)	33.4±5.7	47.9±3.2	61.5±3.0	72.3±1.7	<0.001
Thera-band external rotation at 90° (s) (AA)	34.2±4.9	48.3±2.8	62.8±2.6	71.6±1.9	<0.001
OSS (AA+PRP)	0.23.6±4.1			48±2.3	<0.001
OSS (AA)	24.5±3.2			45±2.1	<0.001

VAS: Visual analog scale, AA: Arthroscopic acromioplasty, PRP: Platelet-rich plasma, OSS: Oxford shoulder score

Table 3: Comparison between AA and AA and PRP injection

Parameters	AA	AA+PRP	*P* value
VAS pain (0-10 points)	0.4±0.1	0.34±0.2	<0.001
Side-lying external rotation (number of repetitions)	37.5±1.2	38.2±1.6	
Empty can (sec to fatigue)	80.4±2.5	81.2±1.7	
Drop arm (sec to fatigue)	83.4±1.8	83.2±1.2	
Full can exercise (number of repetitions)	51.3±2.4	52.7±2.1	
Thera-Band external rotation at 0° (s)	68.3±2.3	68.1±2.1	
Thera-band external rotation at 90° (s)	71.6±1.9	72.3±1.7	
OSS	45±2.1	48±2.3	

AA: Arthroscopic acromioplasty, PRP: Platelet-rich plasma, OSS: Oxford shoulder score

Table 4: Comparison of MRI gradings

Parameters	AA (pts)	AA+PRP (pts)	*P* value
Grade 2	12	10	
	Grade 1-12	Grade 1-10	<0.001
Grade 3	18	22	>0.05
	Grade 2-15	Grade 1-18	
	Grade 1-3	Grade 2-4	
Grade 4	10	13	
	Grade 1-0	Grade 1-11	
	Grade 2-2	Grade 2-1	
	Grade 3-8	Grade 3-1	

AA: Arthroscopic acromioplasty, PRP: Platelet-rich plasma, MRI: Magnetic resonance imaging

Table 5: Comparison or Bonar score

Parameters	Before operative procedure	After operative procedure	*P* value
AA	9.53±1.5	7.31±1.7	>0.05
AA+PRP	9.48±1.4	2.3±1.29	

AA: Arthroscopic acromioplasty, PRP: Platelet-rich plasma

of the damaged tissue because of the capacity to release growth factors from their α-granules. Platelets are a rich source of growth factors which augment tissue healing. Among them, TGF β, VEGF, platelet-derived growth factor, IGF-1, and epidermal growth factor are important. So, PRP provides the potential for an autologous and relatively in expensive solution to facilitate tissue repair. *In vitro* studies demonstrated this mitogenic activity and that the stimulated tenocytes synthesize VEGF and hepatic growth factor, thus suggesting a beneficial effect for the treatment of tendon injuries by inducing cell proliferation and promoting the synthesis of angiogenic factors during the healing process. An animal model has also confirmed the usefulness of platelet concentrate for the treatment of tendon damage, with an increased tendon callus strength and stiffness after percutaneous injections in transacted tendons; a more rapid recovery in surgically repaired tendons has also been seen in a human study. Currently, PRP is widely used experimentally in different fields of medicine, but the evidence base for the clinical use of PRP is still in its infancy. Molloy *et al.* has applied PRP in various sports injury and concluded PRP augments tissue healing.[12] Only a few articles specifically address treatment applications in the orthopedic field and, to our knowledge, only one study has been published regarding the treatment of tendinopathy through PRP injections. Mishra treated patients affected by severe chronic tennis elbow and reported promising result, with improvement in pain and function and no complications. In delayed and nonunion of bone, it has been used with bone marrow, and the result is encouraging. Now a days, the domain has been increased and applied in spinal surgery, periodontal, and craniofacial surgery.[17,18]

The mechanism of action of PRP is not fully understood. Recently, in anterior cruciate ligament reconstruction with semimembranosus quadruple graft is used with PRP and

the tendon-bone healing on MRI is found. In partial tear of tendoachilles, retrocalcaneal tendonitis, patellar tendonitis disease, PRP injection result is encouraging. PRP has been recommended as an alternative treatment option for refractory tendinopathies including RCT.[10,16] Early clinical evidence suggests that PRP improves pain and function outcomes in some tendinopathies compared to control injection and baseline status.[19,20] One study has assessed PRP as an adjunct to arthroscopic shoulder repair, but no rigorous study has assessed PRP as primary therapy for RCT.[21]

During the study period, there was a significant improvement in VAS and OSS in both the groups. However, when both the groups were compared, there was no statistical difference both in primary and secondary outcome measurements. The results of MRI finding are encouraging and inspiring. In our study, we have found that Grade 3 and Grade 4 patients with RCT statistically significant improvement found. More than 90% patients were improved to Grade 1 (minimal tendinopathy). On MRI, complete healing of partial tear occurred in maximum patients. According to Boner staging on histopathology, there was statistically significant improvement of tendinopathy in AA + PRP group. Both these findings suggest that significantly tendon healing occurs with injection of PRP.

Our study has several limitations. First, our patients had previously received, physical therapy, corticosteroid injection, etc. PRP has not been given as the first line of treatment. Second, the sample size is small and derived from a single tertiary orthopedic center. Third, our study evaluates the result of co-application AA + PRP but not PRP alone. Fourth, a single dose and lack of knowledge of optimal dosing and concentration and also the procedure of production of PRP are the limiting factors.

CONCLUSION

Our study showed that there was significant improvement occurred in both the groups according to functional parameters. The study also concluded that significant tendon healing occurred in PRP patients according to MRI and Bonar scoring. Although there was no statistical difference was found in both groups according to functional parameters. Many aspects of rotator cuff disease are controversial, and further research is necessary in areas such as imaging, pathophysiology, and natural history to further our understanding of the disease and make improvements in diagnosis and treatment.

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Original Article

Reactive Hyperplastic Lesions of the Oral Cavity: A Retrospective Analysis in Jammu Region of Jammu and Kashmir State, India

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Abstract

Introduction: Oral mucosa is constantly under the influence of various stimuli, and thus exhibits a variety of inflammatory, reactive, and neoplastic lesions. Reactive lesions of the oral cavity are the common lesions faced by a dentist during routine examinations.

Aim: The aim of this study was to evaluate the prevalence of oral reactive hyperplastic lesions (RHLs) over a period of 5-year from 2010 to 2015 in Jammu province.

Materials and Methods: In this retrospective study, records were procured from the archives of the Department of Oral Pathology, Indira Gandhi Government Dental College, Jammu. Records with both clinical and histopathological diagnosis were analyzed. History of patient's age, gender, and anatomic location lesions was extracted from the records.

Results: From total 402 specimens diagnosed from 2010 to 2015, 88 cases were diagnosed as RHL (21.8%). From a total of 88, RHL diagnosed fibroma was the most common lesion (32.9%), followed by inflammatory hyperplasia (27.2%), pyogenic granuloma (25%), peripheral ossifying fibroma (10.2%), and peripheral giant cell granuloma (3.4%). Of all the lesions evaluated, age of the patient ranged from 14 to 75 years, mean age being 45 years.

Conclusion: Findings in our study were broadly similar to the results of the previous studies with few differences. Knowledge of the frequency and distribution of these is beneficial during diagnosis and treatment plan in clinical practice and thus can reduce dentoalveolar complications.

Key words: Fibroma, Inflammatory hyperplasia, Peripheral giant cell granuloma, Peripheral ossifying fibroma, Pyogenic granuloma, Reactive hyperplastic lesions

INTRODUCTION

Reactive hyperplastic lesions (RHLs) are common oral mucosal lesions caused by chronic and recurrent irritation of the mucosa and histologically represent chronic inflammation, granulation tissue, mineralized tissue, multinucleated giant cells and proliferation of endothelial cells, and fibroblast.[1] These lesions are of varying sizes and usually have no radiographic features. However, erosions and cup-shaped radiolucency can be seen. Clinically, it may be sessile or pedunculated masses with ulcerated or smooth surfaces.[2] Surgical excision is the treatment of choice and elimination of chronic irritant is mandatory. Majority of these do not recur. However, if the source of trauma persists, frequent recurrences are possible. The purpose of this retrospective study was to survey and evaluate the frequency of various types of RHLs in Jammu province of Jammu and Kashmir state and to analyze the clinical features with histopathologic diagnosis treated at Indira

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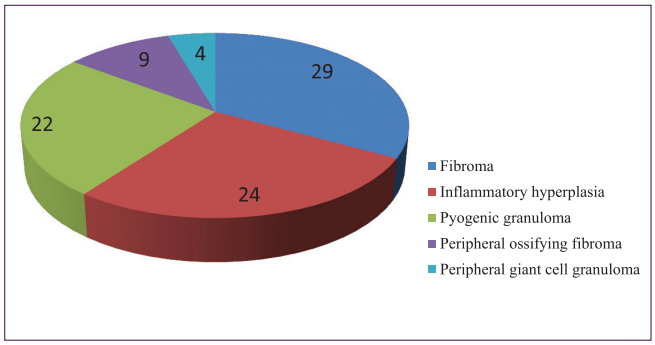
Gandhi Government Dental College, within a span of 5 years from 2010 to 2015.

MATERIALS AND METHODS

RHL was classified into five groups: Fibroma (F), pyogenic granuloma (PG), peripheral giant cell granuloma (PGCG), peripheral ossifying fibroma (POF), and inflammatory hyperplasia (IH). A retrospective archive review of different RHL between 2010 and 2015 from the records of the Department of Oral Pathology, Indira Gandhi Government Dental College, Jammu, was carried out. Classification of the lesion was followed by the academic oral maxillofacial text. Histopathological slides, which were missing or not properly stained, were not included. Records with both clinical and histopathological diagnosis were selected. History of patient's age, gender, and anatomic location lesions was extracted from the records. Clinical characteristics such as base, surface, size, and color of the lesions were also collected from the records. All the findings of our study were then compared with other studies conducted in different parts of the world.

RESULTS

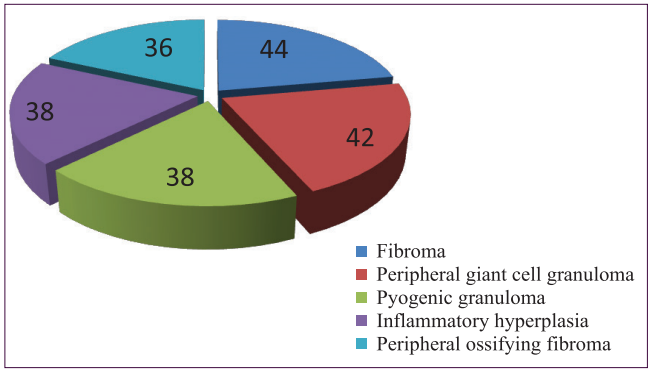
Of the total 402 specimens diagnosed from 2010 to 2015 in the registers, 88 cases were diagnosed as RHL (21.8%). From a total of 88, RHL diagnosed during the assessed period of 5 years, fibroma was the most common lesion (32.9%), followed by IH (27.2%), PG (25%), POF (10.2%), and PGCG (3.4%) (Table 1 and Graph 1). Of all the lesions evaluated, age of the patient ranged from 14 years to 75 years, mean age being 45 years. Mean age of fibroma was 44 years, PG was 38 years, PGCG was 42 years, POF was 36 years, and IH was 38 years (Table 2 and Graph 2). Of these, 58 were females (65.9%) and 30 were males (34%) (Table 3 and Graph 3). Thus, male:female ratio was 1:1.5. The most common site was gingiva (70%) followed by buccal mucosa (14.7%), palate (7.9%), lips (3.4%), and retromolar region (3.4%) (Table 4 and Graph 4). No such lesions were found in the tongue, vestibule, and alveolar mucosa. Chief complaint in the majority of lesions was a painless growth. History of burning sensation was given by few patients. The presence of local irritant was the most common cause and was seen in approximately 60-70% of cases. Others causes were overhanging restoration, abrasion, minor trauma, and hormonal imbalance. The size of the lesion varied between 6 mm and 2 cm (Table 5 and Graph 5). The duration of the lesion at the time of diagnosis ranged from 2 to 8 months approximately. Most of the lesions were firm with sessile base and smooth surface. Ulceration was seen in very few lesions. The color varied from normal to grayish to reddish brownish. All the lesions were surgically excised, and the diagnosis was confirmed by histopathological examination (Figures 1-5).



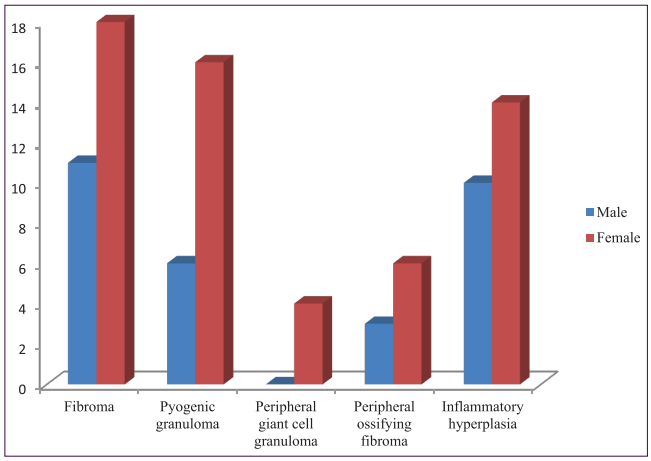
Graph:1 Distribution of patients with reactive hyperplasia according to prevalence (n-88)

DISCUSSION

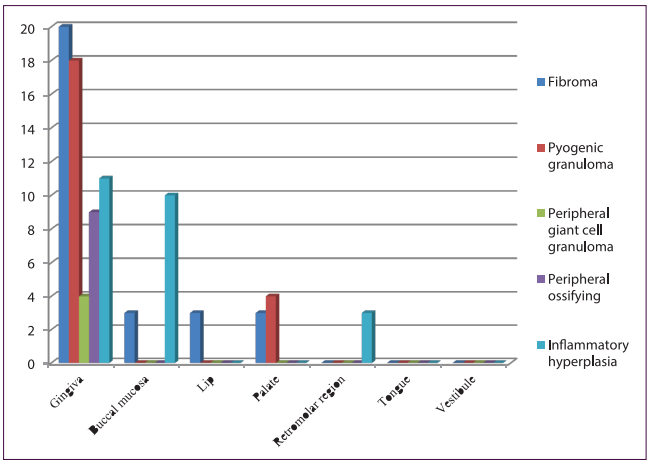
The reactive lesions are benign tumor-like proliferations in the oral cavity because oral mucosal tissues are frequently exposed to traumatic injuries. Chronic trauma can induce inflammation which produces granulation tissue with proliferation of endothelial cells and fibroblast and chronic



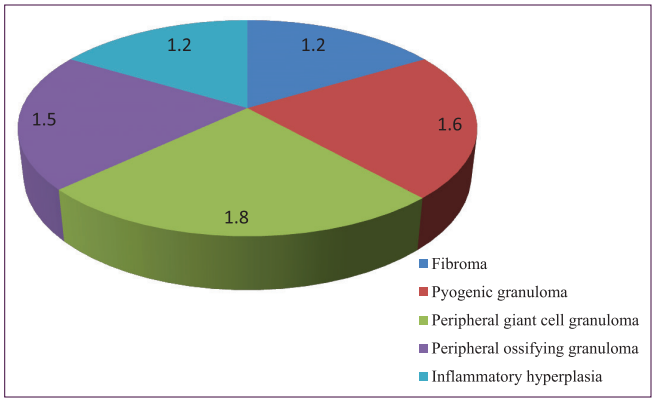
Graph 2: Distribution of patients with reactive hyperplasia according to age



Graph 3: Distribution of patients with reactive hyperplasia according to Sex



Graph 4: Distribution of patients with reactive hyperplasia according to location



Graph 5: Distribution of patients with reactive hyperplasia according to size

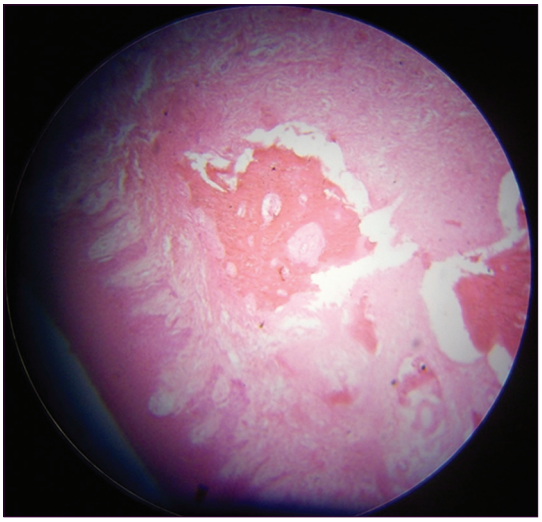


Figure 1: Peripheral ossifying fibroma 10X

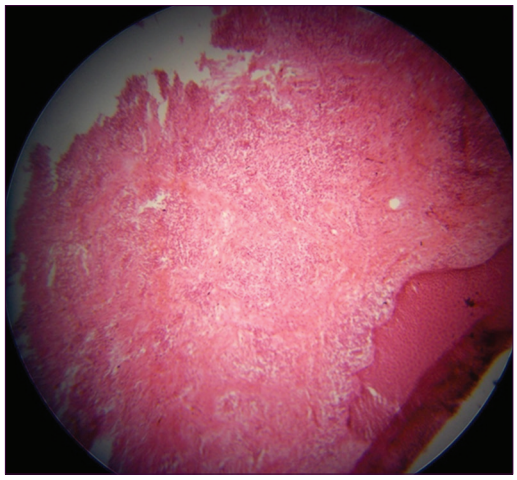


Figure 2: Inflammatory hyperplasia 10X

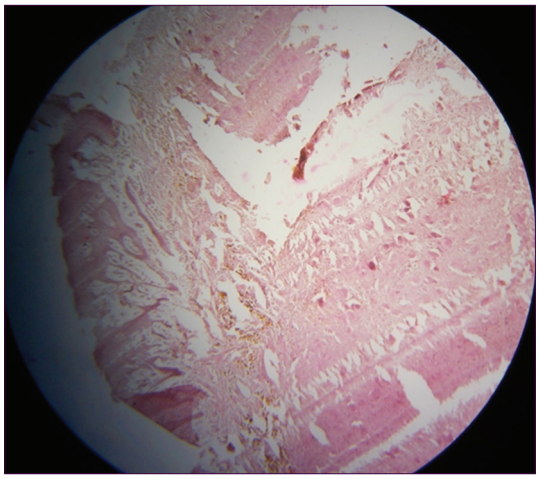


Figure 3: Peripheral giant cell granuloma 10X

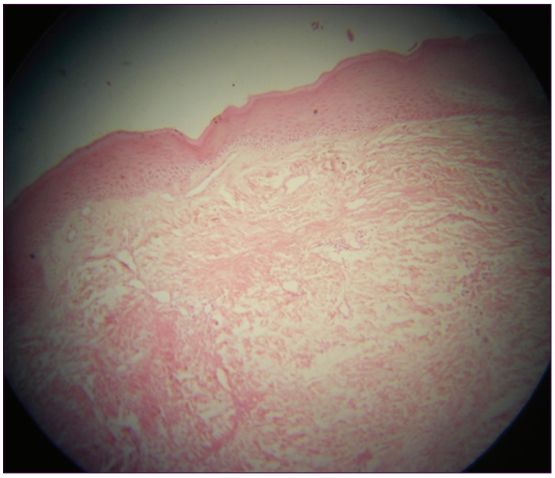


Figure 4: Fibroma 10X

inflammatory infiltrate resulting in a fibrous overgrowth called reactive hyperplasia.[3]

In our study, fibroma was the most common RHL which constituted 32.9% of the total cases with 44 years as the

mean age and 37.9% in males and 62% in females. This finding is consistent with the finding given by Kadeh *et al.*[4] Our results were also close to findings given by Daley *et al.* in Canada and Zhang *et al.* in China.[5,6] Studies reported by Ababneh *et al.*, Kashyap *et al.*, and Zarei *et al.* quoted PG to be most prevalent reactive lesion.[7-9] In series of studies reported by Naderi *et al.*, PGCG was the most prevalent lesion which was in agreement with the reports mentioned above including our study.[10] Our findings were consistent with the data given by Buchner *et al.* except that PGCG comprised only 4.5% of the cases as compared to the findings reported by Buchner *et al.*, where PGCG comprised of 18.7% of cases.[11] In our study, IH comprised 27.2% of total cases which is high as compared to the findings reported by Zain and Fei which was 15.7%.[12] Our percentage of POF was 10.2% which was higher than studies given by Maturana-Ramírez *et al.* 2.9% and Ababneh 7.2% and much lower than reported by Macleod and Soames 40%.[13] The differences may be due to different classification and terminology of lesions and number of cases.

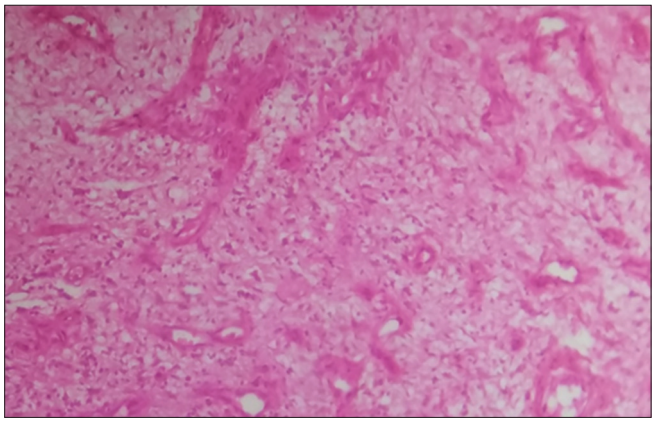


Figure 5: Pyogenic granuloma 10X

Table 1: Distribution of patients with reactive hyperplasia according to prevalence (n-88)

S.No	Lesion	No. of cases	Age %
1	Fibroma	29	32.9
2	Inflammatory hyperplasia	24	27.2
3	Pyogenic granuloma	22	25
4	Peripheral ossifying fibroma	9	10.2
5	Peripheral giant cell granuloma	4	4.5

Table 2: Distribution of patients with reactive hyperplasia according to age

S No.	Lesion	Mean age (in years)
1	Fibroma	44
2	Peripheral giant cell granuloma	42
3	Pyogenic granuloma	38
4	Inflammatory hyperplasia	38
5	Peripheral ossifying fibroma	36

Table 3: Distribution of patients with reactive hyperplasia according to Sex

S No.	Lesion	Male	Female
1	Fibroma	11	18
2	Pyogenic granuloma	6	16
3	Peripheral giant cell granuloma	-	4
4	Peripheral ossifying fibroma	3	6
5	Inflammatory hyperplasia	10	14

It was interested to note that all RH lesions occurred more in females with male:female ratio as 1:1.5. PG was seen two times more common in females as compared to males probably reflecting hormonal imbalance. Studies conducted by Zarei *et al.* and Ala Aghbali *et al.* male:female ratio was 1:1.8 and 1:1.4, respectively.[1,7] Salum *et al.* and Kfir *et al.* also reported a higher RHL frequency in females except for PGCG, which was higher in males.[14,15] Maturana-Ramírez *et al.* also reported a higher frequency in males.[16] Ethic differences between studies could be the reason.

In the present study, the mean age of the patient was third and fourth decades which is comparable with the findings of other studies.[6,17] The highest RHL prevalence was found in the group of 50-59 years as reported by Maturana-Ramírez *et al.*[16] Few studies have shown.[6,14-17] In our study, only one case of PG was female who was 14 years of age. According to location, the most common site was gingiva accounting for 70% of total cases. Anterior region was more commonly involved with slightly greater prevalence in the maxilla. This is comparable to few other studies reported in the literature.[6,11,14] Buccal mucosa was the second most common site 14.7% followed by palate 7.9%, lips 3.4%, and retromolar region 3.4%. Thus, the present study supports previous assertion that traumatic fibroma and PG can involve any oral mucosal site with

Table 4: Distribution of patients with reactive hyperplasia according to location

S No.	Lesion	Gingiva	Buccal mucosa	Lip	Palate	Retromolar region	Tongue	Vestibule
1	Fibroma	20	3	3	3	-	-	-
2	Pyogenic granuloma	18	-	-	4	-	-	-
3	Peripheral giant cell granuloma	4	-	-	-	-	-	-
4	Peripheral ossifying	9	-	-	-	-	-	-
5	Inflammatory hyperplasia	11	10	-	-	3	-	-

Table 5: Distribution of patients with reactive hyperplasia according to size

S No.	Lesion	Mean size
1	Fibroma	1.2 cm
2	Pyogenic granuloma	1.6 cm
3	Peripheral giant cell granuloma	1.8 cm
4	Peripheral ossifying granuloma	1.5 cm
5	Inflammatory hyperplasia	1.2 cm

special preference to gingiva while POF and PGCG occur exclusively on the gingiva, and IH cases were equally distributed between gingiva and buccal mucosa,[18] and a few cases occurred in the retromolar region. Periodontal ligament, periosteum, and connective tissues are the origin of the reactive lesion as a result of which gingiva is the common site. Daley *et al.* suggested that vascular component of PG is gradually replaced by fibrous tissues, and hence, diagnosed as fibrous hyperplasia or fibroma.[5] Eversole and Rovin suggested that limitation of PGCG and POF to the gingiva supports possible histogenic derivations from the superficial periodontal ligament which contains cells capable of producing bone and cementum.[19] Despite the similarities, few differences have been found between the findings of this study and the previous reports. It may be due to socioeconomic and cultural variations, racial differences, different selected classification methods, available resources, type of department, where the research was conducted and histopathologic case arrangement in lesions.

CONCLUSION

Oral reactive lesions are often detected by dental professionals, surgeons, and ear, nose, and throat specialist. They are mucosal response to chronic low-grade irritation caused by plaque and calculus or any other irritant. The differences in findings of various studies may also be influenced by the intensity of irritation, duration of lesion and possibly the effect of hormones. Complete surgical excision of the lesion is the treatment of choices. Imperative in the treatment of reactive gingival lesion is the complete removal of local irritants with follow-up care as well as dental hygiene maintenance to prevent or treat recurrence. Knowledge of the frequency and presentation of common oral lesions is beneficial in developing a clinical impression of such lesions encountered in practice. In spite of some clinical differences, their features are sometimes quite similar to those of tumors and can be troublesome in the differential diagnosis. Our knowledge of the distribution of reactive lesion can be a useful tool for correct diagnosis.

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Original Article

Assessment of Regenerate in Limbs by Ilizarov External Fixation

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Abstract

Introduction: Limb lengthening procedures are performed to correct significant length discrepancies, in the upper or lower extremities, that have resulted from various congenital or acquired abnormalities. The issue of limb lengthening was introduced in orthopedic surgery in the year 1950 and has been practiced up to the present time. This study comprises an analysis of bone regeneration, especially the response of bone, periosteum and endosteum to distraction limb lengthening.

Materials and Methods: This study involves all patients in a tertiary care teaching hospital from January 2010 to July 2015, where bone regenerate as been produced by Ilizarov methods. 131 regenerates have been analyzed. Ilizarov external fixator was applied, and corticotomy was done. Distraction was started at a rate of 1 mm/day after the latent period (7-10 days). X-rays were taken at intervals of 1 month. Occasionally, ultrasonography was used to assess the early regenerate.

Results: There were 105 normotrophic regenerate, 14 hypertrophic regenerate, and 14 hypotrophic regenerate. The lengthening achieved ranged between 3 cm and 23 cm. The average increase in length was 6.4 cm. The incidence of major complications, in our study, was 30.1 %, and overall complication was 60%.

Conclusion: Ilizarov external fixator is used in limb lengthening, deformity correction, and segmental long bone defect reconstruction. In our study, we achieved good to excellent results in 90% of our cases which is at par with many other studies. We achieved 10.7% excellent, 81.7% good, and 7.6% poor results. We had good to excellent or better results in the upper tibial metaphyseal area compared to any other area.

Key words: Corticotomy, Ilizarov, Limb lengthening, Regenerate

INTRODUCTION

Professor Gavriil Abramovich Ilizarov of U.S.S.R known as the "magician" of Kurgan invented the ring external fixator now known as Ilizarov external fixator. With this, he was also the pioneer in the most stunning discovery in orthopedics. The biological production of new tissues was termed as neo-osteogenesis or osteoneogenesis.[1] When it encompassed all tissues, which were generated during limb lengthening, were coined as histoneogenesis or neo-histogenesis. Limb lengthening procedures are performed to correct significant length discrepancies, in the upper or lower extremities, that have resulted from various congenital or acquired abnormalities. The issue of limb lengthening was introduced in orthopedic surgery in the year 1950 and has been practiced up to the present time. Although clinical studies have proved the effectiveness of different methods of limb lengthening, there is still need for further research to study regeneration of the bone tissue. This study comprises an analysis of bone regeneration, especially the response of bone, periosteum and endosteum to distraction using ring fixators. Clinical studies include radiological and functional outcome, long-term results, and patient satisfaction after limb reconstruction.

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MATERIALS AND METHODS

This was a prospective interventional study conducted in a high volume tertiary care teaching hospital in Southern India for almost 5 years from January 2010 to July 2015. This study involved all patients who fulfilled the inclusion criteria. The patients undergoing limb lengthening or

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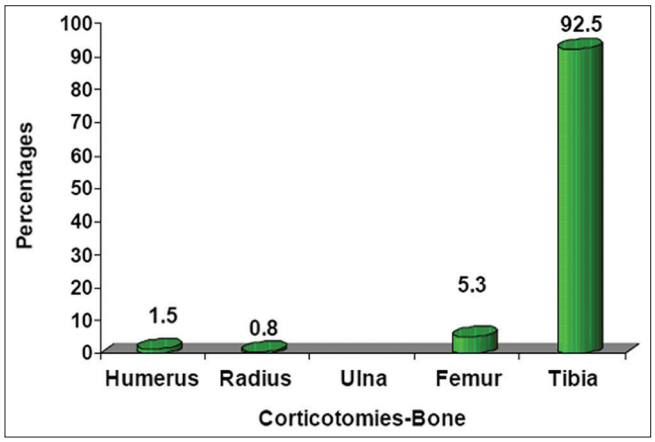
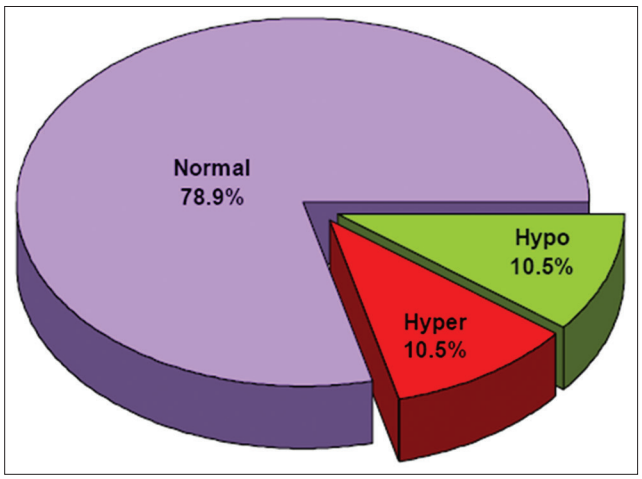
bone transport using Ilizarov external fixation following congenital, post-traumatic, post-polio residual paralysis, infected nonunion of long bones, and tumors were included. Patients lost to follow-up, and limbs which were amputated before regenerate was consolidated were excluded from the study. The objectives of this study were to investigate bone regeneration after corticotomy and distraction lengthening, to assess treatment of posttraumatic shortening of limbs using the Ilizarov distraction device and to evaluate the results of limb lengthening. In our study, there was a total of 133 corticotomies in 113 patients. Two patients were lost to follow-up. Hence, 131 regenerates were finally analyzed. Ilizarov external fixator was applied, and corticotomy was done. Distraction was started at a rate of 1 mm/day after the latent period (7-10 days). X-rays were taken at intervals of 1 month. Occasionally, ultrasound was used to assess the early regenerate before it was visible on X-rays. Depending on the quality of regenerate in the X-rays and or ultrasound, if the quality of regenerate was poor, the distraction was either stopped and delayed or slowed down and distraction did at a rate of 0.5 mm/day. In some patients, compression was done to reduce the gap and distracted again (accordion technique). Bone marrow infiltration was done in 12 patients, where we saw either poor regenerate or delayed consolidation. Results of regenerate were evaluated on the basis of four parameters, both clinically and radiologically. The parameters included consolidation of regenerate, absence of deformity, absence of limb length discrepancy, and absence of infection. The score was excellent - all four parameters; good - 3 parameters; poor - 2 or less.

OBSERVATIONS AND RESULTS

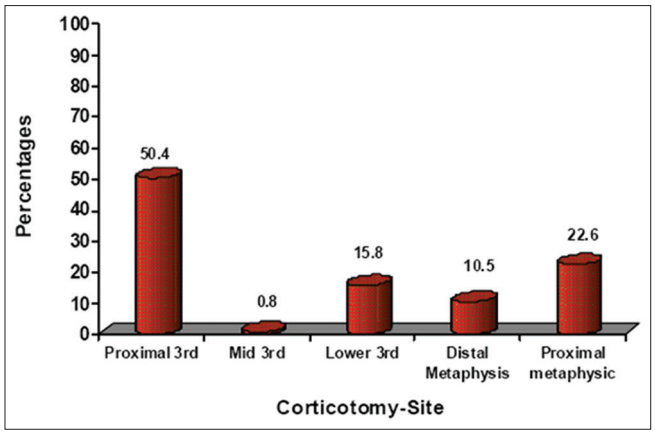
A total of 131 regenerates in 113 patients were analyzed. 83 (73.5%) were males and 30 were females, and the maximum number of patients (38) were in the age group of 21-30 years. Maximum affected and operated bone was the tibia, which was 92.5% of cases in our series (Graph 1). Anatomical site of corticotomy was proximal metaphysis in a maximum number of cases (Graph 2, Graph 5). A type of regenerate was normotrophic in 78.9% cases, hypertrophic in 10.5% cases, and hypotrophic in 10.5% cases (Graph 3). The residual shortening was maximum in post polio residual paralysis cases followed by acute fractures (Graph 4). The lengthening achieved ranged between 3 cm and 23 cm. The average increase in length



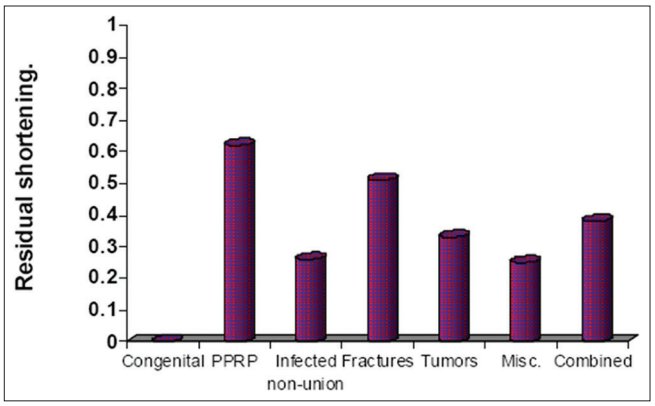
Graph 1: Bones involved in Ilizarov fixation



Graph 3: Type of regenerate



Graph 2: Site of corticotomy

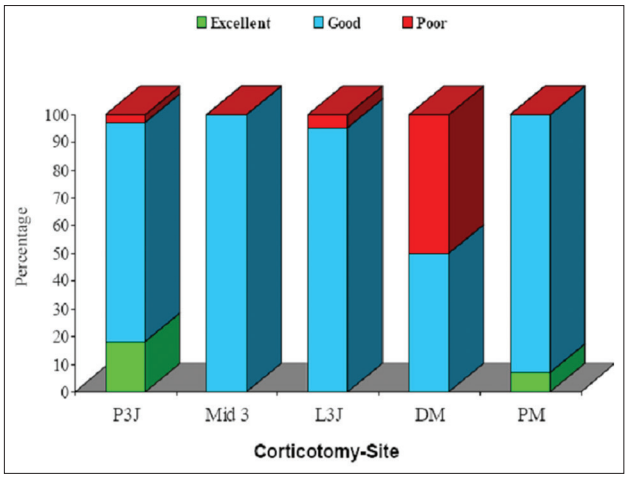


Graph 4: Residual shortening according to diagnosis

was 6.4 cm. Good to excellent results were achieved in 90% of cases (Graph 6). The incidence of minor complications in our study was 29%, and overall complication was 60%. The most common complication encountered was pin tract infection followed by deformity of the regenerate (Graph 7).

DISCUSSION

Ilizarov external fixator results in rapid advances in limb lengthening, deformity correction, and segmental long bone defect reconstruction.[2-4] The mechanical features of and biologic response to using distraction osteogenesis with the circular external fixator are the unique aspects of Ilizarov's contribution. Alan found in his study that the average increase in length was 5.9 cm and the rate for the lengthening phase was 12 days for one centimeter with the Ilizarov technique.[5] Paley found in his study that the average increase in length was 5.6 cm. In our study, the average increase in length was 6.4 cm and the lengthening phase was 10 days for one centimeter.[6] Aronson found that



Graph 5: Assessment of outcome of regenerate according to corticotomy site

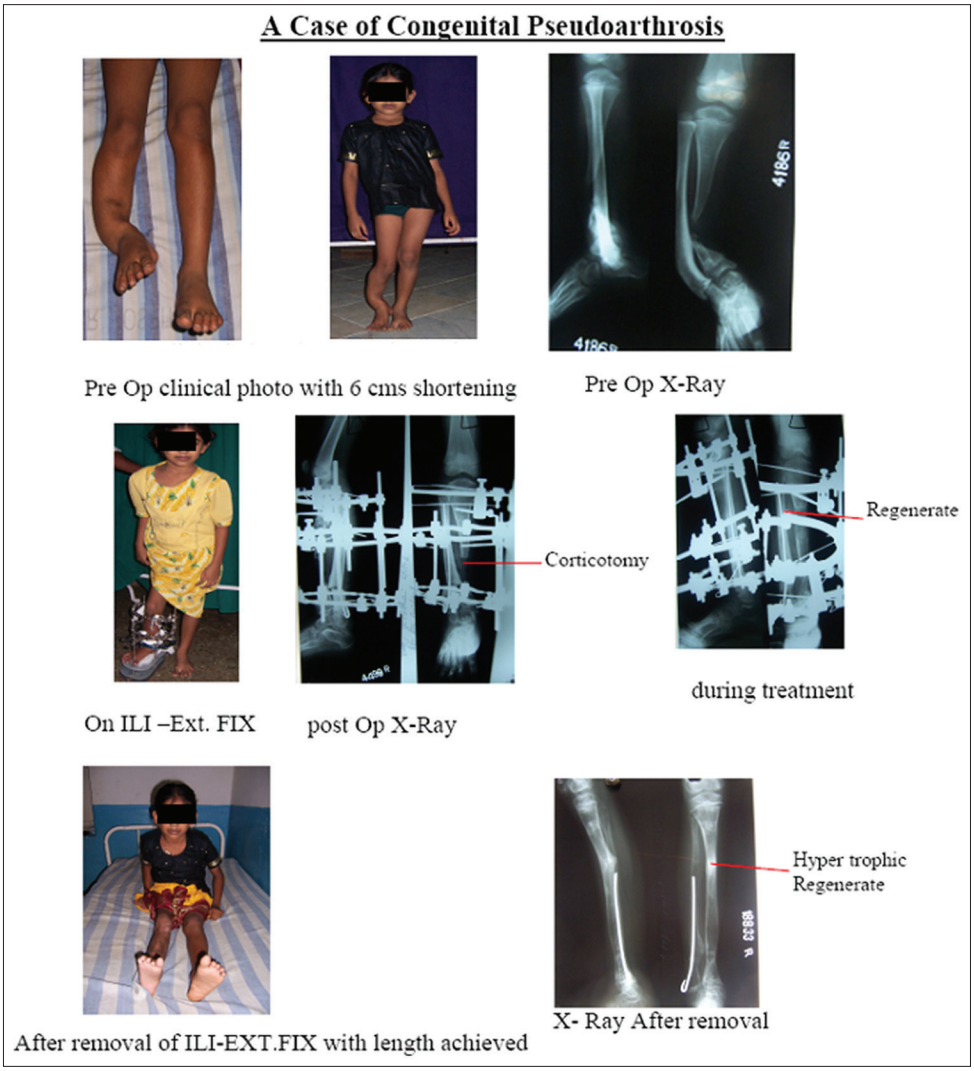


Figure 1: Case of Congenital pseudoarthrosis of Tibia managed with Ilizarov

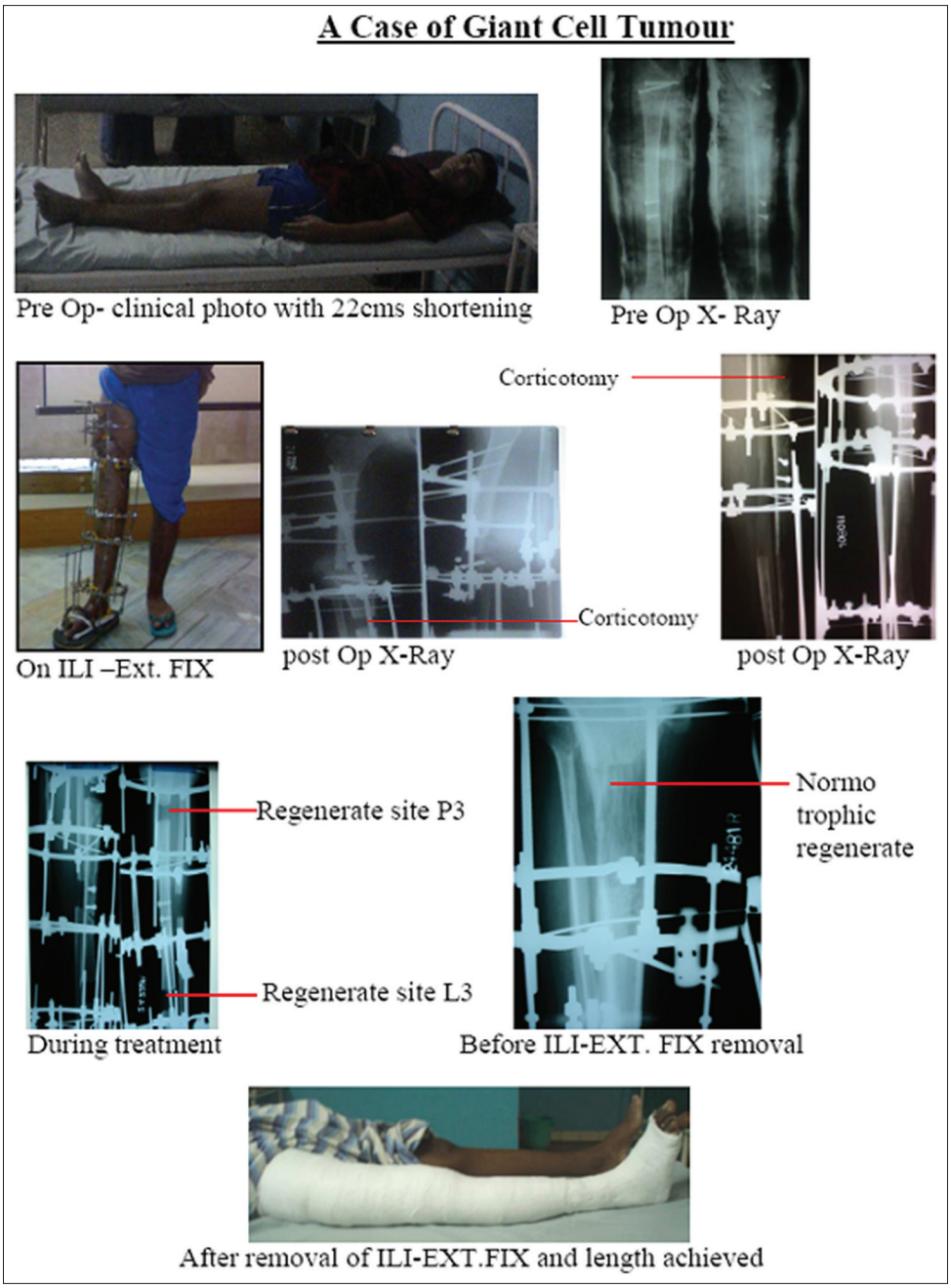


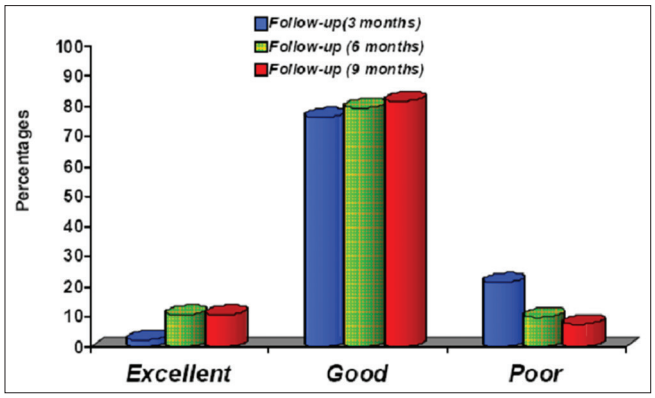
Figure 2: Case of Giant cell tumor, post excision with shortening managed with Ilizarov

new bone formation was better and faster in metaphyseal than in diaphyseal bone.[7] In our study, we had good to excellent results in the upper tibial metaphyseal area. Poor or hypotrophic regenerates seen in corticotomies performed in cortical bones and in post-polio residual paralysis patients whose bone diameter was less and were treated with the accordion technique of compression and distraction.

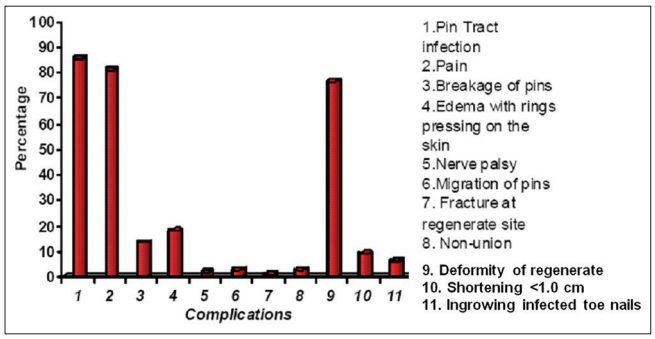
Paley found the incidence of minor complications in his study was 10.6%, major complications was 20.6% and altogether was 31.2%.[6] In our study, minor complications were 29% and major complications were 30.1% and altogether was 60.3%. Yun found good to excellent results in 78% of the cases in his study.[8] In our study, we achieved good to excellent results in 90% of our cases which is at par with many other studies.

CONCLUSION

Ilizarov external fixator is used in limb lengthening, deformity correction, and segmental long bone defect reconstruction. In all metaphyseal corticotomies rate of distraction was 1 mm/day (0.25 mm four times a day),



Graph 6: Final outcome of regenerate in long bones treated by Ilizarov external fixation



Graph 7: Complications

which has been found good enough for a good regenerate to be obtained. In all other corticotomies of cortical bone, the initial rate of distraction from 1 mm/day had to be reduced if necessary as per X-ray findings. In radius, ulna, post-polio residual paralysis of femur and tibia which are thin, and corticotomies in the shaft of such bones, the distraction rates were reduced to 0.5 mm/day. In our study, we achieved good to excellent results in 90% of our cases which is at par with many other studies. We achieved 10.7% excellent, 81.7% good and 7.6% poor results. We had good to excellent or better results in the upper tibial metaphyseal area compared to any other area.

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Original Article

Hemoglobin E in Marathwada Region of Maharashtra: Report of 14 Cases

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Abstract

Introduction: Hemoglobin E (HbE) (β26 glu → lys) is the most common hemoglobin variant in South East Asia and the second most prevalent worldwide. However, in India, it is prevalent in the North-Eastern region but relatively rare in the rest of country. Identification of this Hb variant is important because the double heterozygous state for HbE and β thalassemia is characterized clinically by thalassemia major. Thus, the affected individual may be symptomatic and transfusion dependent at an early age.

Materials and Methods: This paper reports 9 cases with HbE trait and another 5 cases with HbE β thalassemia. Laboratory investigations are based on red blood cell indices and high-performance liquid chromatography.

Results: We have discussed here the clinical and hematological features of this disorder. These disorders cause a public health concern due to a high level of morbidity, mortality and fetal loss in the backward, underprivileged, and vulnerable people. The main aim is to increase the awareness of this relatively rare disorder so that it can be included in the differential diagnosis of patients presenting clinically such as thalassemia intermedia or thalassemia major.

Conclusion: This awareness may also help in the prenatal diagnosis, genetic counseling, and clinical management.

Key words: Hemoglobin E, Hemoglobin E β thalassemia, High-performance liquid chromatography, Red cell indices

INTRODUCTION

Hemoglobinopathies are genetically important hematological disorder affecting millions of people worldwide. The cumulative gene frequency of hemoglobinopathies in India is 4.2%.[1] Hemoglobin E (HbE) is the second most globally prevalent Hb variant and common in South East Asia.[2] In India, it is prevalent in North-Eastern region.[3] It is relatively rare in the rest of the country, with only occasional case reports from other parts of the country. However; there are no published reports on the occurrence of this HbE variant in the region of Marathwada in Maharashtra. This is for the first time, we report the clinical and hematological profile of 14 such patients diagnosed and confirmed as having HbE/β thalassemia and HbE trait during the last 8 years in routine clinical and laboratory investigations. Since sickle cell hemoglobinopathy and thalassemia are widely prevalent in tribal as well as normal communities in Maharashtra, we focused the present study on 14 cases of HbE disorders encountered for the first time during screening and investigation for anemia and hemoglobinopathies. HbE is caused by a substitution of glutamic acid by lysine at codon 26 of the β globin gene. This mutation also activates a cryptic mRNA splice site which results in reduced synthesis of β-E chain and leads to a thalassemia phenotype. HbE disorder may be found in heterozygous (AE), homozygous (EE), and compound heterozygous states (e.g., HbE with other abnormal hemoglobin's or thalassemia) with widely variable clinical phenotype. In many countries, facilities for the control of these conditions are extremely limited. The awareness of this relatively rare Hb variant in this part of India may help in the clinical diagnosis and management of these patients and may also help in prenatal diagnosis and genetic counseling. Our present study focuses on the HbE

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disorders that were encountered during screening and investigation of hemolytic anemia.

MATERIALS AND METHODS

We studied a total 3707 patients from January 2008 to December 2015. Patients suspected of having thalassemia or other hemoglobinopathy were referred from the outpatient department or wards to the Department of Pathology, Government Medical College, Aurangabad. A detailed clinical and hematological evaluation and other investigations were performed in these cases. The clinical evaluations on the presence and absence of pallor, icterus, hepatosplenomegaly were carefully noted. Data pertaining to age, sex, place of origin, caste, history of blood transfusion, and hospitalization were also recorded. A complete hemogram with red blood cell (RBC) indices was performed on automated cell counter. High-performance liquid chromatography (HPLC) using variant β thalassemia short program (Biorad Laboratories) was carried out in all cases. HPLC was used as confirmatory test for identification of hemoglobinopathy in all cases. Each type of Hb has a characteristic retention time. HPLC utilizes the principle of cation exchange based on differential retention time. The introduction of HPLC for detection of hemoglobinopathies is an important advancement for hematology laboratories. All together 14 cases with HbE trait and HbE β thalassemia were identified. HbE has the same elution time as HbA2 on HPLC, but HbE can be distinguished by its higher concentration.

RESULTS

Here, we report total 14 cases, of which, 9 cases of HbE trait and 5 cases of HbE β thalassemia. All the cases of HbE β thalassemia had splenomegaly. The size of spleen varied from 1 to 8 cm below the left costal margin. Whereas 4 out of 5 cases had hepatomegaly (1-4 cm). Total Hb level varied from 5 to 7.2 g/dl with mean of 5.6 g/dl. Mild to moderate icterus was observed in 3 cases. History of multiple transfusion was given by 4 patients from the age of 1 year onward and needed 1-10 units of whole blood. The peripheral smear examination revealed a microcytic hypochromic blood picture with predominant target cells. The age variation of our patient was between 3 months and 33 years. The age of onset, clinical presentations and disease course of all the cases were such as β thalassemia major patients of this region. While the 9 cases of HbE trait did not have any symptoms. They had mild anemia with mean Hb level of 11.1 g/dl. Peripheral smear revealed mild hypochromia and microcytosis as seen with β thalassemia trait. There was no history of blood transfusion. The RBC indices of all these patients were available, and the diagnosis was confirmed by HPLC (Figures 1 and 2).

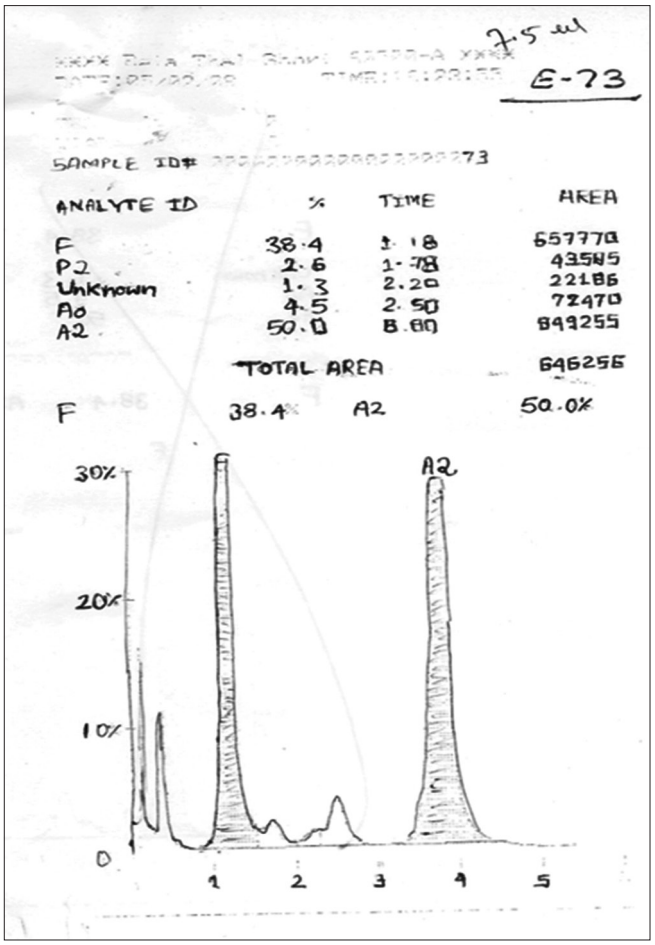

Figure 1: Hemoglobin E β thalassemia

Table 1: Mean values of Hb, RBC, mean corpuscular volume, mean corpuscular Hb, HbA2, and HbF in a tabular form

Mean values	Hb	RBC count	MCV	MCH	HbA2	HbF
HbE trait	11.1	4.4	68.2	22.5	29.2	0.4
HbE β thalassemia	5.6	2.5	66.4	20.9	47.5	22.8

Hb: Hemoglobin, RBC: Red blood cell, MCV: Mean corpuscular volume, MCH: Mean corpuscular hemoglobin, HbA2: Hemoglobin A2, HbF: Hemoglobin F

Table 1 shows the mean levels of RBC indices, Hb A2/HbE, and HbF levels in the two groups of patients in HbE trait and HbE β thalassemia, and the same is represented in multiple bar charts (Figure 3).

The mean HbA2 level in HbE trait cases was 29.2 and that with HbE β thalassemia patients was 47.5, whereas the mean value of HbF in HbE trait patient was 0.4 and that with HbE β thalassemia patients was 22.8. It is known that a raised HbF value reduces the severity of symptoms.

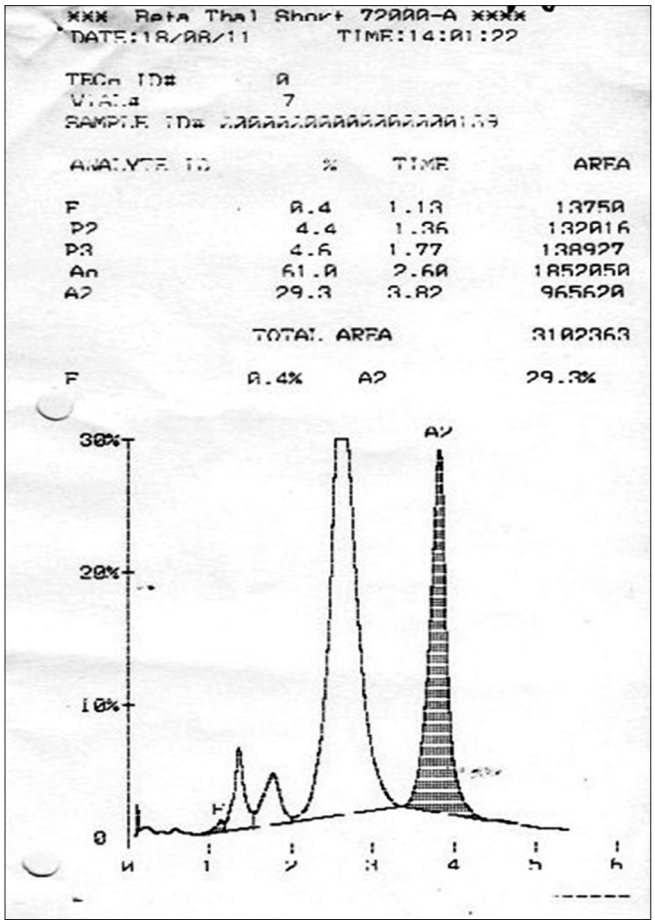

Figure 2: Hemoglobin E trait

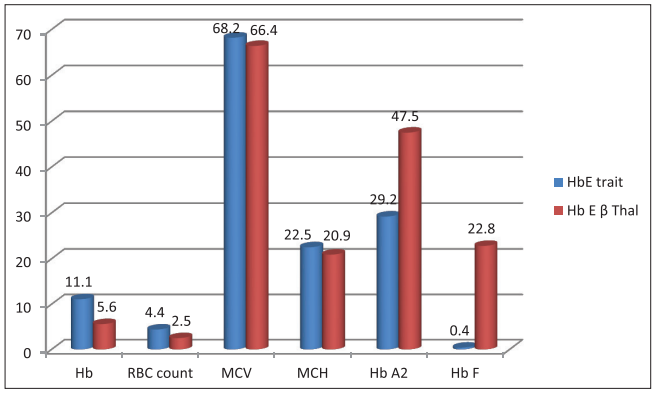

Figure 3: Multiple bar diagram in the two group of patients

DISCUSSION

Hemoglobinopathies are a growing global public health problem with an estimated 9.00,000 births of clinically significant thalassemia disorders expected to occur in next 20 years.[4] This growth will occur in disorders previously uncommon in many parts of the world. Although hemoglobin disorders are of a worldwide occurrence, yet some communities and geological regions have high prevalence of specific hemoglobin variants either due to practice of consanguinity or natural selection against malaria.[5]

HbE (Glu→ lys) is the most common Hb variant in South East Asia[2] and second most prevalent Hb variant worldwide. In India, it is mostly prevalent in the North-Eastern states[3] and Bengal. Case reports are also available from North India.[6]

Although the incidence of HbE disease is increasing which may be as a result of increased awareness, still little is known about the natural history, the reasons for clinical diversity or management of patients having this variant.

HbE is variant hemoglobin with a mutation in β globin gene causing substitution of glutamic acid for lysine at position 26 in β globin chain. HbE disease presents in 3 forms namely heterozygous state (genotype AE or HbE trait) homozygous state (genotype EE or HbE disease) and compound heterozygous state HbE β thalassemia (EB thalassemia), sickle cell/HbE disease (shared epitope genotype).[7-9]

Pathophysiology is complex which involves ineffective erythropoiesis, apoptosis, oxidative damage, and shortened red cell survival. HbF is the strongest predictor of morbidity.

Blood count, Hb, red cell indices, HPLC, and DNA analyses are the various diagnostic modalities which are used worldwide to assess the prevalence of thalassemia and hemoglobinopathies. HPLC provides effective separation of hemoglobin and detects a majority of hemoglobin variants.[10]

Clinical features of HBE β thalassemia range from that of β thalassemia minor through thalassemia intermedia to thalassemia major. It has been documented that the symptoms start usually before the age of 5 years. Most severely affected individuals are transfusion dependent and have hepato-splenomegaly, intermittent jaundice, and growth retardation.[7-9] Death from infection in childhood is common, but some patients live until adult life.[11] In our study, out of 5 cases, 4 cases were transfusion dependent from the age of 1 year onward and needed multiple transfusions varying from 1 to 10 units.

All of these patients had pallor, intermittent jaundice, fatigue, recurrent fever, splenomegaly, and 4 cases had hepatomegaly of varying grades and degrees. The clinical feature in our study is compatible with the other studies reported from other parts, especially from North-Eastern

region of India where the frequency is reported to be very high.[3,5,12,13] The peripheral blood smear examination revealed a hypochromic and microcytic picture with predominance of target cells.

Individuals with HbE trait are usually not anemic and have no symptoms. Hematological investigations of these individuals reveal mild microcytosis and hypochromia as seen with β thalassemia trait. Even in our study, the patients did not suffer from any symptoms.

However, identification of these individuals is of crucial importance as they may be the transmitters of the abnormal gene, giving rise to various combinations of hemoglobinopathies and thalassemia in their progeny.

These new insights into the knowledge of these diseases are important because they are gradually becoming a global health problem and impart diagnostic challenges to all the experts involved in the treatment of patients with thalassemia. Many cases have been misdiagnosed and misinterpreted as hemolytic anemia and met premature death without adequate diagnosis and management. The awareness of HbE, relatively rare Hb variant in this part of India, may have utility in clinical management and genetic counseling, and thus reducing the burden of this disease.

CONCLUSION

HPLC forms a rapid, accurate, and reproducible tool for early detection and management of hemoglobinopathies and variants. Findings must be supplemented by hemogram findings, family studies, hemoglobin electrophoresis, and molecular studies.

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Original Article

External Quality Assessment Scheme in Biochemistry: Four Years Experience as a Participating Laboratory

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Abstract

Background: The attainment of quality services in a laboratory requires a both internal and external quality control material. External quality assessment scheme (EQAS) programs are accepted by laboratories to assess the performance of their testing systems.

Aim: The goal of this study was to review EQAS results from time to time in an effort to improve the performance of the laboratory. It is an observational study done at pronounced NABL accredited hospital in Lucknow, from January 2012 to December 2015.

Materials and Methods: In the current study, we have evaluated EQAS test result of the past 4 years, from 2012 to 2015. We receive prepared masterpool of human serum as per the WHO recommended procedure, dispensing the correct volume into the vials which are stored at 2-8°C in the refrigerator. The lyophilized vials are sealed, well packed in thick envelopes, and distributed to all the participating laboratories. The laboratories are requested to reconstitute the sample, analyze, and enter the results. The test results are analyzed and documented.

Results: If outliers are seen, then the root cause analysis is done for those parameters.

Conclusions: This participation in EQAS over the last 4 years has helped us significantly to improve our laboratory services.

Key words: External quality assessment scheme, Laboratory, NABL

INTRODUCTION

Laboratory quality control (QC) is designed to detect, reduce, and correct deficiencies in a laboratory's internal analytical process before the release of patient results, to improve the quality of the results reported by the laboratory. QC is a measure of precision, or how well the measurement system reproduces the same result over time and under varying operating conditions. Laboratory QC material is usually run at the beginning of each shift, after an instrument is serviced, when reagent lots are changed, after calibration, and whenever patient results seem inappropriate.[1] QC material should approximate the same matrix as patient specimens, taking into account properties such as viscosity, turbidity, composition, and color. It should be simple to use, with the minimal vial to vial variability because variability could be misinterpreted as systematic error in the method or instrument. It should be stable for long periods of time and available in large enough quantities for a single batch to last at least 1 year. Liquid controls are more convenient than lyophilized controls because they do not have to be reconstituted minimizing pipetting error.[1]

Interpretation of QC data involves both graphical and statistical methods. QC data are most easily visualized using a Levey-Jennings chart.[2]

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MATERIALS AND METHODS

External quality assessment scheme (EQAS) samples from the Christian Medical College, Vellore, are received and processed at our laboratory.

For each year, every month's sample was shipped to our center for specific tests as recommended by the organizing laboratory. Each time, unknown samples packed with coolant were received within 3 days of dispatch. All the samples were handled as part of routine work samples, and recommended tests were performed by the concerned laboratory technician on duty. The tests are performed (Table 1) and mailed to the organizing laboratory within 1st week of the month.

Every year, a total of 12 samples for biochemistry are received. All tests were performed by dedicated staff using the conventional technique available in the department.

RESULTS

Our study reviewed EQAS result from a pronounced NABL accredited laboratory in Lucknow. The outliers seen month wise in 4 years are mentioned in Table 2.

As seen in Table 2 and Figure 1, most number of outliers were seen in the year 2014, i.e., 67 outliers and in the month of June, i.e., 11 outliers. The next most common year was 2015 with 53 outliers, then came 2013 with 40 outliers. Least number of cases was seen in the year 2012 with 38 outliers.

Outliers seen in the year 2012 are shown in Table 3. Alkaline phosphatase was seen to be most common parameter showing outliers, i.e., 9 times, then comes high-density lipoprotein (HDL) showing outlier 5 times. Next comes total protein, potassium, uric acid, and sodium, all showing outliers 3 times. Total bilirubin, creatinine, serum glutamic pyruvic transferase (SGPT), serum glutamic oxaloacetic transaminase (SGOT), calcium, and urea showed outlier 2 times.

Outliers seen in the year 2013 are shown in Table 4. In the year 2013, most number of outliers were seen in uric acid, i.e., 8. Then, comes total bilirubin showing 7 times outlier; next comes HDL showing 5 times outlier, sodium showed 4 times outlier. SGPT, glucose, alkaline phosphatase, SGOT, and triglyceride (TG) showed 2 times outlier. Total protein, urea, calcium, and cholesterol showed one time outlier.

Outliers seen in the year 2014 are shown in Table 5. In the year 2014, 9 times outliers were seen in HDL. Alkaline phosphatase, calcium, and uric acid showed 6 times outlier. Next comes total bilirubin and glucose which show 5 times outlier. SGPT, urea, and TG showed 4 times outlier. Next come sodium, potassium, SGOT, and albumin which show 3 times outlier. The least common outlier was seen in creatinine, i.e., 2.

Outliers seen in the year 2015 are shown in Table 6. In the year 2015, maximum number of an outlier was seen in total bilirubin, i.e., 8 times, then comes calcium showing 6 times outlier. 5 times outliers were seen in alkaline phosphatase, potassium, and glucose. 4 were seen in urea and uric acid.

Table 1: Tests with their methords

S No.	Analyte	Method
1.	Glucose	God-pod
2.	Urea	Ned dye
3.	Creatinine	Jaffe's kinetic
4.	T.Bilirubin	Jendrassik
5.	T-protein	Biuret
6.	Albumin	Bcg
7.	Calcium	Arsenazo
8.	Uric acid	Enzymatic
9.	Cholesterol	Chod-pap
10.	Triglyceride	Enzymatic
11.	Hdl cho	Direct method
12.	Sodium	ISE
13.	Potassium	ISE
14.	AST	UV kinetic
15.	ALT	UV kinetic
16.	ALP	PNP AMP kinetic

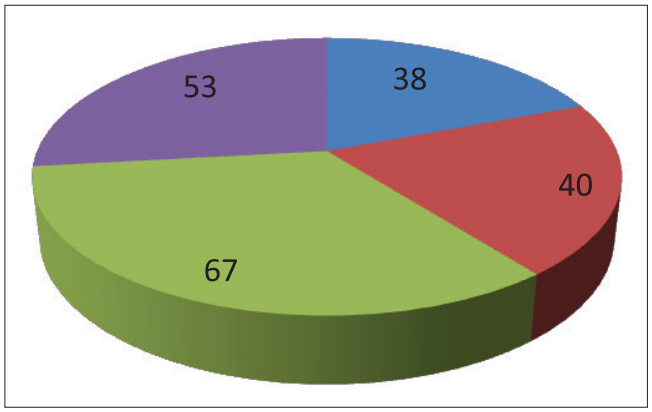

Figure 1: Outliers seen in 4 years

Table 2 : Outliers seen in 4 years

Month	2012	2013	2014	2015
Jan	3	5	6	7
Feb	3	3	2	4
March	5	5	4	4
April	3	1	6	9
May	1	4	5	3
June	3	1	11	4
July	5	3	3	3
August	No entry	3	6	3
Sept	2	1	7	2
Oct	2	4	7	5
Nov	5	6	6	4
Dec	6	4	4	5

Then, comes HDL and sodium with 3 times outlier. 2 times outliers were seen in albumin, SGOT, TG, and creatinine.

Root cause analysis was done to rule out the cause of outliers. Inter laboratory comparison was done with two other NABL labs. Root cause analysis was done following these few points:

- Temperature and reagents were checked
- QC was checked for whole week
- If outlier was seen then, QC was rerun and machine calibrated
- Engineer was called, and the machine was maintained if required.

DISCUSSION

An EQAS program plays an important role in improving the efficiency of a laboratory service, thereby optimizing the overall quality of a health care system. The program provides an opportunity to the participating organizations to compare activities and modify their own practices, based on what they learn.[3,4] In a clinical laboratory service, EQAS evaluates the performance of procedures, equipment, materials and personnel and suggests areas for improvement. As a participant of EQAS, we performed all the prescribed tests by strictly following the departmental standard operating procedures and manufacturer's instruction, considering each lot as routine working samples.

CONCLUSION

An EQAS program plays an important role in improving the efficiency of a laboratory service and thereby optimizes the overall quality of a health care system. In the last 4 years, we could significantly improve our laboratory services in terms of performance evaluation, patient care and overall

Table 3: Outliers seen in year 2012

Month	Outlier	VIS
Jan	Total bilirubin	239
	Sodium	274
	Alkaline phosphatase	223
Feb	Creatinine	231
	Alkaline phosphatase	209
	HDL	381
March	Total protein	213
	HDL	400
	Sodium	226
	Potassium	323
	Alkaline phosphatase	400
April	Total protein	320
	SGPT	235
	Alkaline phosphatase	252
May	Alkaline phosphatase	400
June	Calcium	344
	Potassium	211
	Alkaline phosphatase	400
July	Urea	400
	HDL	400
	Alkaline phosphatase	337
	SGOT	273
	Potassium	261
August	No result was sent	
Sept	Alkaline phosphatase	312
	HDL	393
Oct	Urea	257
	Uric acid	325
Nov	Total bilirubin	263
	Uric acid	371
	HDL	309
	Alkaline phosphatase	216
	SGOT	204
Dec	Creatinine	286
	Total protein	298
	Calcium	336
	Uric acid	400
	SGPT	205
	Sodium	354

Table 4: Outliers seen in year 2013

Month	Outlier	VIS
Jan	Total bilirubin	400
	Creatinine	400
	Uric acid	241
	HDL	400
	SGPT	400
Feb	Uric acid	211
	Total protein	290
	Urea	209
March	Glucose	400
	Sodium	400
	Alkaline phosphatase	391
	SGOT	400
	SGPT	400
April	Creatinine	333
May	Uric acid	346
	SGOT	288
	Sodium	228
	Alkaline phosphatase	268
June	Total bilirubin	213
July	Total bilirubin	383
	Triglyceride	400
	HDL	27
August	Total bilirubin	400
	Triglyceride	325
	Uric acid	298
Sept	Uric acid	400
Oct	Total bilirubin	400
	Calcium	400
	Uric acid	400
	HDL	304
Nov	Glucose	329
	Total bilirubin	400
	Uric acid	400
	Cholesterol	286
	HDL	400
	Sodium	346
Dec	Total bilirubin	310
	Uric acid	400
	HDL	272
	Sodium	268

Table 5: Outliers seen in year 2014

Month	Outlier	VIS
Jan	Urea	400
	Total bilirubin	400
	Calcium	336
	Uric acid	208
	Triglyceride	212
	HDL	400
Feb	Total protein	249
	Calcium	383
March	Creatinine	263
	Uric acid	202
	HDL	400
	Potassium	206
April	Total bilirubin	400
	Calcium	206
	HDL	400
	Sodium	349
	Potassium	256
	Alkaline phosphatase	213
May	Calcium	379
	Uric acid	206
	HDL	279
	Sodium	400
	Potassium	400
June	Glucose	400
	Urea	250
	Creatinine	354
	Total bilirubin	400
	Total protein	276
	Albumin	400
	Calcium	400
	HDL	256
	SGOT	400
	SGPT	400
	Alkaline phosphatase	322
July	Total bilirubin	326
	HDL	400
	SGPT	217
August	Glucose	400
	Uric acid	400
	Triglyceride	276
	Sodium	201
	SGOT	400
	Alkaline phosphatase	400
Sept	Glucose	210
	Urea	216
	Albumin	257
	Uric acid	395
	Triglyceride	216
	HDL	368
	SGPT	230
Oct	Glucose	200
	Total bilirubin	273
	Total protein	312
	HDL	400
	SGOT	400
	SGPT	218
	Alkaline phosphatase	400
Nov	Glucose	219
	Urea	387
	Total protein	333
	Albumin	391
	Triglyceride	268
	Alkaline phosphatase	254

Contd...

Table 5: Contd...

Month	Outlier	VIS
Dec	Calcium	284
	Uric acid	400
	HDL	400
	Alkaline phosphatase	381

Table 6: Outliers seen in year 2015

Month	Outlier	VIS
Jan	Urea	222
	Total bilirubin	310
	Albumin	223
	Calcium	213
	Uric acid	400
	SGOT	400
	Alkaline phosphatase	400
Feb	Total bilirubin	400
	Calcium	400
	HDL	350
	Alkaline phosphatase	400
March	Total bilirubin	400
	Calcium	305
	Potassium	268
	Alkaline phosphatase	400
April	Glucose	400
	Urea	400
	Total protein	209
	Albumin	220
	Calcium	400
	Uric acid	400
	Cholesterol	246
	HDL	400
	Alkaline phosphatase	295
May	Glucose	274
	Total bilirubin	400
	Potassium	400
June	Glucose	400
	Urea	400
	Calcium	300
	Uric acid	400
July	Sodium	219
	Potassium	243
August	Glucose	238
	Total bilirubin	400
	Potassium	400
Sept	Total bilirubin	400
	Uric acid	319
	Triglyceride	215
Oct	Glucose	400
	Urea	399
	Creatinine	226
	Sodium	331
	SGOT	400
Nov	Total bilirubin	354
	Calcium	400
	Sodium	328
	Potassium	395
Dec	Creatinine	236
	Total bilirubin	252
	Triglyceride	308
	HDL	211
	Alkaline phosphatase	386

quality of laboratory practices.[5,6] We believe that global participation in such an EQAS program will definitely improve the quality of a hospital service because no health care facility can be totally self-sufficient, and there is always a scope for improvement and development in a system.

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Original Article

Acute Neurological Complications in Peripartum Period: A Retrospective Study

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Abstract

Introduction: Acute neurological conditions are rare in young age. A mean age of pregnancy in female has increased in recent years and thereby increases the risk of neurological complications.

Objective: To study the clinical profile of patients presenting with neurological manifestations in a peripartum period.

Study Design: A retrospective study done at Government Theni Medical College and Hospital during November 2015 to April 2016. 30 cases studied. All patients in the peripartum period requiring neurological consultation were included in the study.

Results: A total of 30 women were included in this study. The incidence of neurological complications in the study period was 0.01%, but the mortality rate due to neurological complications was 6%. It occurred most commonly in primigravida.

Conclusion: This study concluded that proper management of pre-eclampsia can prevent eclampsia and reduce maternal mortality and morbidity.

Key words: Eclampsia, Hypertension, Mortality, Neurological

INTRODUCTION

Acute neurological conditions are rare in young age. A mean age of pregnancy in female has increased in recent years and thereby increases the risk of neurological complications. Conditions like pre-eclampsia cause no significant damage as long as it does not progress to eclampsia. Pre-eclampsia and eclampsia are directly related to pregnancy whereas conditions such as cerebral venous thrombosis (CVT), ischemia, and hemorrhage are indirectly related to pregnancy. Neurological abnormalities contribute significantly to maternal mortality in eclampsia. In this study, we will discuss the varied clinical presentation of neurological complications in the peripartum period.

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MATERIALS AND METHODS

A retrospective study was conducted at Government Theni Medical College and Hospital in Department of Obstetrics and Gynecology during a 6-month period, from November 2015 to April 2016 involving a total of 30 patients. All patients with recent onset of neurological damage requiring neurological consultation were included in this study. Those who were known case of seizure disorder or cerebrovascular accident were excluded from study. The clinical presentation, imaging reports and prognosis of these 30 patients were followed up.

RESULTS

The total number of deliveries in this study period was 3208. Of this, only 30 patients developed acute neurological complications accounting for 0.01%. The results of this study are shown in Tables 1-6.

DISCUSSION

The most common age group affected by neurological complications is 20-25 years of age (40%). Complications

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Table 1: Distribution of patients according to age

Age group (years)	Number of patients
<20	4
20-25	12
25-30	8
30-35	5
>35	1

Table 2: Distribution of patients according to parity

Parity	Number of patients
Primi	19
Multi	10
Grand multi (>5)	1

Table 3: Distribution of patients according to onset of acute neurological complications

Day	Complication occurred
Antenatal	3
Intrapartum	2
PND 1	7
Within PND 7	13
>PND 7	5

PND: Postnatal day

Table 4: Maternal morbidity following acute neurological complications

Complication occurred	Number of patients
Seizure	23
Hemiplegia	2
Unconsciousness	5

Table 5: Results of imagination studies

CT report	Number of patients
Normal study	20
CVT	2
PRES	5
Hemorrhagic infarct	2
Granuloma	1

CT: Computed tomography, CVT: Cerebral venous thrombosis, PRES: Posterior reversible encephalopathy syndrome

Table 6: Maternal outcome

Recovery of patients	Number of patients
Discharged in good condition	25
Referred out	3
Death	2

occur more in primigravida (63%) than multigravida (27%). This incidence is comparable with the Al-Hayali *et al.* study where neurological complications occurred more in primigravida (85%) compared to multigravida (15%).[1] This is because general incidence of preeclampsia is more common in primigravida. Risk factors for neurological complications include associated anemia and dehydration.[2]

A headache is the most common symptom of neurological conditions, and therefore, it is necessary to distinguish benign headache from headache due to complications in pregnancy. Moreover, the most common sign was seizure occurring in 76% of patients. In our study, 25 of the 30 patients had complaint of headache before the onset of neurological complications (83%). This is similar to Gupta study where a headache was the symptom in 90% of cases and seizure occurred in 92% of cases.[3]

The most patients presented in postpartum period (66%) with headache, seizures, visual disturbances, 23% on day of delivery and remaining 43% within a week of delivery, 1% in the antenatal period, <1% in intrapartum period.

Careful clinical evaluation of the patient can identify high-risk cases but it is the imaging studies that help us diagnose the disorder in the majority of cases. Hence, a computed tomography (CT) brain study was done for these 30 patients as per neurologist's orders and reports showed 66% of CT reports were normal with 6.66% each of CVT and hemorrhagic infarct. 16% cases developed posterior reversible encephalopathy syndrome (PRES), a reversible encephalopathy caused due to an acute increase in blood pressure.

PRES has rapid onset in the postpartum period with symptoms of visual loss, seizures, and headache. If blood pressure is controlled, symptoms resolve within days to weeks. CT findings are usually present. Magnetic resonance imaging (MRI) shows fluid-attenuated inversion recovery abnormalities in parieto-occipital lobes, with occasional intracerebral hemorrhage.

CVT presents in the third trimester or postpartum with symptoms of headache at onset. Seizures can occur and CVT evolves over several days. CT and MRI reveal non arterial and territorial infarcts.

As mentioned earlier, the incidence of acute neurological complication in peripartum period is 0.1% in our hospital. Of this 2 patients died due to neurological complications, accounting for a mortality rate of 6%. Comparing to overall maternal mortality in our hospital in the same study period, 2 out of 7 deaths were due to neurological complications (28%). This is similar to the incidence of 20% maternal deaths due to neurological diseases as mentioned in Hosley and McCullough study.[4] This is a significant proportion of maternal mortality stating the importance of monitoring neurological complications.

CONCLUSION

The symptom of headache in a peripartum woman with or with our pregnancy induced hypertension must be taken seriously. A thorough neurological examination followed by imaging will pick up early lesion of CVT. Thus, the treatment could be planned and carried out which will reduce the complications significantly.

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Original Article

Mortality Profile and Timing of Death in Extremely Low Birth Weight Infants from 2013 to 2015 Admitted to Neonatal Intensive Care Unit, Government General Hospital, Anantapur

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Abstract

Introduction: Infant mortality is a major public health problem worldwide, whereas many programs related to children have started to decrease the infant mortality rate.

Materials And Methods: A retrospective study done to understand the mortality profile, etiology, and timing of death among ELBW infants in a tertiary care Neonatal Intensive Care Unit (NICU), Government General Hospital, Anantapur

Results: A total of 97 ELBW were died due to various causes from 2013 to 2015. Among 97 ELBW studied children, males and females were equally affected. Out of 97 ELBW children, 48 (49.4%) were males and 49 (50.5%) were female (Table 1). Gestational age of ELBW children was around 26.1 ± 1.5 weeks.

Conclusion: From this study, we conclude that there is a rise in mortality rate in ELBW babies, whereas most of the deaths due to multiple cause occurring within 7 h of hospital admission.

Key words: Mortality, Death, Low Birth Weight, Infants

INTRODUCTION

Infant mortality is a major public health problem worldwide, whereas many programs related to children have started to decrease the infant mortality rate. Among infant mortality, most of the data come from neonatal deaths, approximately two-third of all infant mortalities.[1]

Extreme low birth weight (ELBW) is defined as a birth weight of a liveborn infant of <1000 g. Most ELBW infants are also the youngest of premature newborns, usually born <28 weeks gestational age.[2] ELBW infants are also at high risk of developing neonatal infections.

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Causes of LBW are mainly preterm birth which is due to precocious fetal endocrine activation, uterine overdistension, decidual bleeding, and intrauterine inflammation/infection.[3] Other causes include short gestational age (SGA) which may be constitutional or intrauterine growth restriction due to various reasons such as infections during pregnancy (TORCH), babies with congenital anomalies or chromosomal abnormalities, and environmental factors.[4,5]

Data regarding deaths in ELBW babies help to know the cause of death, assess disease patterns, and its complications, to implement necessity actions to reduce the mortality rate and also to plan and implement programs.

Many recent advances in perinatal care have resulted in a decrease in mortality rate for very LBW infants by antenatal steroids and surfactant therapy.[6,7] However, few studies are concerning about problems by these advances in therapy such as prolong dying, extend suffering, or use resources for infants who will eventually die.[8,9]

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The purpose of the study is mainly to evaluate the cause of deaths in ELBW babies, timing of death, and to assess the mortality profile.

MATERIALS AND METHODS

A retrospective study done to understand the mortality profile, etiology, and timing of death among ELBW infants in a tertiary care Neonatal Intensive Care Unit (NICU), Government General Hospital, Anantapur. All the data related to children were kept unlinked anonymously. The study was approved by the Institutional Ethical Committee.

All neonates admitted in NICU from 2013 to 2015 with ELBW both inborn and outborn, who were died with various causes were included in this study. A total of 97 ELBW deaths were studied.

All the data of live born neonates either from inborn or outborn, will enter into a register and registers for deaths are separately maintained in NICU as per our institutional board. Even infant anthropometric data were recorded at the time of birth. All the ELBW infants were treated according to the NICU protocols from birth to discharge or death or transfer to another hospital. If an infant died before diagnosing the cause of illness, they were sent for immediate verbal autopsy, and the probable diagnosis and cause of death were made with attending doctors.

Data related to deaths of ELBW infants including age at death, sex, home or hospital delivery, birth weight, gestational age, cause of death, timing of death, and duration between hospital admission and death were collected from death register.

Gestational age of ELBW babies was assessed using new Ballard's score. According to the International Classification of Diseases, 10th revision, infant deaths were classified into six major categories including congenital anomalies, short gestation/LBW, respiratory conditions, infections, sudden infant death syndrome, and external causes such as injuries, homicide, and unknown causes.

All the data were recorded in a predesigned, structured pro forma and were entered into excel sheet, the results were analyzed and tabulated.

RESULTS

A total of 97 ELBW were died due to various causes from 2013 to 2015.

Among 97 ELBW studied children, males and females were equally affected. Out of 97 ELBW children, 48 (49.4%) were males and 49 (50.5%) were female (Table 1). Gestational age of ELBW children was around 26.1 ± 1.5 weeks.

Duration between hospital admission and deaths of ELBW children was depicted in Table 2. Out of 97 ELBW deaths, most of the deaths occurred in between >12 and ≤72 h (45.3%) followed by ≤12 h (21.6%). Less number of deaths were noted in >28 days (1.03%) of hospital admission.

ELBW deaths were assessed according to age at death, out of 97 ELBW deaths, most of them occurred within 6 days - 75 (77.3%) (Table 3 and Figure 1).

Most of the ELBW infants' deaths are due to multiple etiologies. Out of 97 ELBW deaths, 75 (77.3%) were due to multiple causes and 22 (22.6%) were occurred because of single etiology. Respiratory distress syndrome (RDS)

Table 1: Demographic details of studied population

Demographic data	2013 (%)	2014 (%)	2015 (%)	Total (%)
Number of ELBW deaths	28	31	38	97
Males	15 (53.5)	16 (51.6)	17 (44.7)	48 (49.4)
Out born	21 (75)	23 (74.1)	22 (57.9)	66 (68)
Caste				
SC	3 (10.7)	2 (6.5)	3 (7.9)	8 (8.2)
ST	2 (7.1)	1 (3.2)	2 (5.3)	5 (5.1)
BC	20 (71.4)	21 (67.7)	28 (73.7)	69 (71.1)
OC	3 (10.7)	7 (22.6)	5 (13.1)	15 (15.4)
Mean birth weight of ELBW infant deaths (g)	811.4	833.4	863.4	836.0
Gestational age (weeks)	26.1±1.3	25.4±1.6	26.5±1.2	26.1±1.5

ELBW: Extreme low birth weight

Table 2: Duration between hospital admission and deaths of ELBW children

Duration	Number of cases 2013 *n*=28 (%)	Number of cases 2014 *n*=31 (%)	Number of cases 2015 *n*=38 (%)	Total *n*=97 (%)
≤12 h	7 (25)	5 (16.1)	9 (23.7)	21 (21.6)
>12-≤72	10 (35.7)	15 (48.3)	19 (50)	44 (45.3)
>72 h-7 days	4 (14.3)	6 (19.3)	5 (13.2)	15 (15.4)
8-14 days	1 (3.2)	1 (3.2)	4 (10.5)	6 (6.1)
15-28 days	6 (21.4)	3 (9.6)	1 (2.6)	10 (10.3)
>28 days	0 (0)	1 (3.2)	0 (0)	1 (1.03)
Total	28 (28.8)	31 (31.9)	38 (39.1)	97 (100)

ELBW: Extreme low birth weight

Table 3: Age at death of ELBW children

Age in days	Number of cases 2013 *n*=28 (%)	Number of cases 2014 *n*=31 (%)	Number of cases 2015 *n*=38 (%)	Total (%)
<1	11 (39.3)	8 (25.8)	10 (26.3)	29 (29.8)
1-6	10 (35.7)	15 (48.4)	21 (55.3)	46 (47.4)
≥7	7 (25)	8 (25.8)	7 (18.4)	22 (22.6)
Total	28 (28.8)	31 (31.9)	38 (39.1)	97 (100)

ELBW: Extreme low birth weight

Table 4: Etiologies of ELBW infant deaths

Cause of death	Number of cases 2013 *n*=28 (%)	Number of cases 2014 *n*=31 (%)	Number of cases 2015 *n*=38 (%)	Total *n*=97 (%)
RDS	10 (35.7)	11 (35.5)	15 (39.5)	36 (37.1)
Sepsis	5 (17.8)	12 (38.7)	9 (23.7)	26 (26.8)
Birth asphyxia	8 (28.6)	2 (6.4)	7 (18.4)	17 (17.5)
NEC	2 (7.1)	3 (9.7)	1 (2.6)	6 (6.1)
MODS/DIC/Shock	1 (3.6)	2 (6.4)	5 (13.2)	8 (8.2)
Congenital anomalies	1 (3.6)	1 (3.2)	0 (0)	2 (2.0)
Others	1 (3.6)	0 (0)	1 (2.6)	2 (2.0)
Total	28 (100)	31 (100)	38 (100)	97 (100)

RDS: Respiratory distress syndrome, NEC: Necrotizing enterocolitis, MODS: Multiorgan dysfunction syndrome, DIC: Disseminated intravascular coagulation, ELBW: Extreme low birth weight

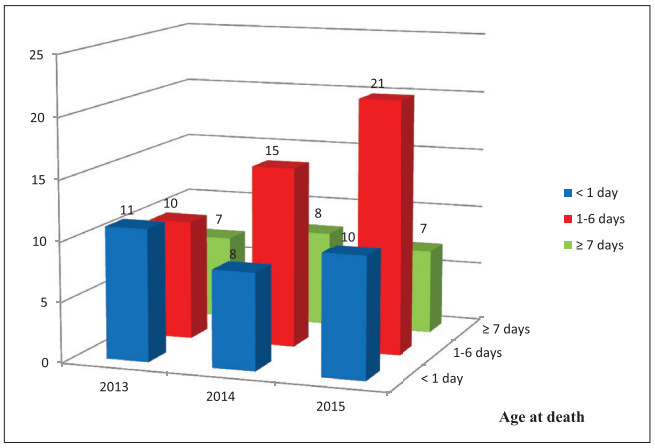

Figure 1: The number of extremely low birth weight children deaths at different ages from 2013 to 2015

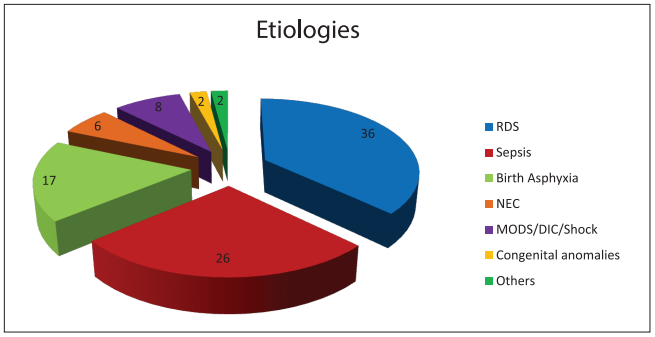

Figure 2: Etiologies of extremely low birth weight infant deaths

was the most common cause responsible for ELBW infant deaths (37.1%), followed by sepsis (26.8%), which is the second most common cause (Table 4).

In 3 years, various causes were responsible for deaths including RDS - 36 (37.1%), sepsis - 26 (26.8%), birth asphyxia - 17 (17.5%), necrotizing enterocolitis (NEC) - 6 (6.1%), multiorgan dysfunction syndrome (MODS)/disseminated intravascular coagulation (DIC)/shock - 8 (8.2%), congenital anomalies – 2 (2.06%), and others - 2 (2.06%) (Figure 2).

DISCUSSION

ELBW or SGA is one of the causes for increase in neonatal mortality rate. On this, many other factors combined with ELBW play a major role in increasing the incidence of mortality rate. In this study, we have discussed the various factors which influence the mortality rate among ELBW children.

A total of 97 ELBW children were died due to various causes. All the studied children were premature children. ELBW deaths were increasing in recent years, as in 2015 deaths were 38. In this study, 30 ELBW deaths per year on an average were observed which is quite significant. Patel *et al.*[10] observed a decrease in ELBW infant deaths from 2004 to 2011; it was 28.5% in 2004-2007, and 25.8% in 2008-2011.

Out of 97 ELBW infant deaths, males and females were equally affected. Out of 97 ELBW children, 48 (49.4%) were males and 49 (50.5%) were females (Table 1). Gestational age of ELBW children was around 27 weeks. Mean birth weight of ELBW babies was around 830 g in this study. Patel *et al.*[10] reported that deaths occurred at mean gestational age of 24.3 ± 1.7 weeks and birth weight was around 660 g. Mukhopadhyay *et al.*[11] reported mean birth weight was 843 ± 108 g and gestational age was 29.1 ± 2.6 weeks among ELBW neonates. Many studies have found that neonates <750 g weight and <28 weeks gestational age were associated with higher mortality.[12,13]

Duration between hospital admission and deaths of ELBW children was depicted in Table 2. Out of 97 ELBW deaths, most of the deaths occurred in between >12 h and ≤72 h (45.3%) followed by ≤12 h (21.6%). Less number of deaths were noted in >28 days (1.03%) of hospital admission. Patel *et al.*[10] documented that most common cause of death within 12 h after birth is immaturity, which was observed from 2000 to 2011 and also observed that deaths occurring after 12 h are due to RDS.

Most of ELBW deaths occurred within 72 h in the present study. Even with good hospital care, death rate is rising among ELBW children and as days in hospital increases death rate is decreasing, which indicates ELBW babies need care in hospitals from the time of birth to prevent various etiologies responsible for deaths. Patel *et al.*[10] reported that 40.4% of deaths occurred within 12 h after birth and 17.3% occurred after 28 days.

ELBW deaths were assessed according to the age at death, out of 97 children, most of them occurred within 6 days – 75 (77.3%). In this study, within 6 days, highest death rate signifies the disease pattern which is more severe. Yasmin

et al.[14] reported that 84% of neonatal deaths occurred in first 7 days and half of those within 48 h. Jacob *et al.*[1] observed 59% of NICU deaths within 7 days of birth and 85% within 28 days after birth.

As per this study, out of 97 ELBW deaths, 75 (77.3%) were due to multiple causes and 22 (22.6%) were occurred because of single etiology. In 3 years, various causes were responsible for deaths including RDS - 36 (37.1%), sepsis - 26 (26.8%), birth asphyxia - 17 (17.5%), NEC - 6 (6.1%), MODS/DIC/shock - 8 (8.2%), congenital anomalies - 2(2.06%), and others - 2 (2.06%).

Mukhopadhyay *et al.*[11] observed major causes of mortality were sepsis (46%), birth asphyxia (20%), and pulmonary hemorrhage (19%). Mukhopadhyay *et al.*[11] and Kermorvant-Duchemin *et al.*[15] reported 46% and 71% mortality due to sepsis. Yasmin *et al.*[14] reported the predominant cause of NICU deaths was LBW (14%), followed by sepsis (12%), acquired bowel disease (11%), lung hypoplasia (9.5%), intraventricular hemorrhage (9.4%), RDS (8%), hypoxic ischemic encephalopathy (6.1%), genetic syndromes (5%), major heart defects (3.4%), bronchopulmonary (2.8%), hemorrhagic shock (2.2%), pulmonary hemorrhage (2%), renal failure (2%), congenital diaphragmatic hernia (1.7%), air leak syndrome (0.6%), and pulmonary hypertension (0.6%).

Evaluating the cause of death, age at death, and deaths in hospital even after treatment is quite significant to understand the reasons behind mortality rate. Nam *et al* and Carver *et al.*[16,17] documented that reliability of finding the underlying cause of death is adversely affected because evaluating the disease differs among health-care providers.

Deaths of babies impart emotional stress to parents. Increase in mortality rate indicates poor health seeking behavior of mothers, poor diagnostic, infrastructure, and health-care facilities at institutions and overall signifies defects in societal health developments.

CONCLUSION

From this study, we conclude that there is a rise in mortality rate in ELBW babies, whereas most of the deaths due to multiple cause occurring within 7 h of hospital admission. To reduce the incidence of ELBW deaths needs the utmost care of children at hospital by finding the cause earliest. Design of policies and implementing health education units, regular monitoring of mortality statistics, making preventive and corrective actions in various aspects helps to get mortality rate to baseline.

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Original Article

Efficacy of Saline Infusion Sonography in Diagnosing Intrauterine Pathology in Patients with Abnormal Uterine Bleeding: An Observational Study

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Abstract

Background: To describe the efficacy of saline infusion sonography (SIS) in the diagnosis of abnormal uterine bleeding (AUB).

Methods: This prospective observational study was conducted in patients with AUB admitted to our hospital gynecology ward. After obtaining consent from each patient, 100 women in the age group of 25-45 with H/O AUB from March 2015 to March 2016 (a period of 1-year). SIS was done using an 8 Fr size Foley's catheter, and the results were analyzed.

Results: The most common lesion in the study group was adenomyosis followed by intramural fibroid, submucous myoma, and endometrial hyperplasia. Least common lesions found in our study were endometrial polyp and Mullerian anomalies. Positive predictive value of SIS in the diagnosis of AUB was 100% for Mullerian anomalies and submucous myoma. Positive predictive value for diagnosing adenomyosis was 90% and 88% for intramural fibroid. Positive predictive value for diagnosing endometrial polyps was 85%, and positive predictive value for endometrial hyperplasia was 85%.

Conclusion: SIS has the advantages of being non-invasive, cheap, affordable, shorter duration, and accurate method for uterine cavity evaluation. SIS has enhanced the diagnostic accuracy of transvaginal scan and can be an effective screening test before hysteroscopy.

Key words: Abnormal uterine bleeding, Intrauterine pathology, Saline infusion sonography

INTRODUCTION

Abnormal uterine bleeding (AUB) is defined as any bleeding from the genital tract, which is a deviation of normal in frequency, cyclicity, and quantity. It is one of the most common disorders in gynecology and accounts for 30-40% of cases in the outpatient clinic. It can occur at any age but is most common in premenopausal age group. If the treatment not is instituted early, it can lead to severe anemia. If blood loss is acute, it can result in hypovolemic shock.

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AUB includes menorrhagia, polymenorrhea, menometrorrhagia, and metrorrhagia. In patients who do not respond to medical treatment, it is ideal to evaluate the endometrial status. It can be used in patients above 40 years also. Even though ovulation and breakthrough bleeding are considered normal, other forms of irregular uterine bleeding necessitate excluding local causes. The most common cause of AUB in premenopausal women is oligoanovulation, which reflects dysfunction in the hypothalamo-pituitary-ovarian axis. Without cyclic progesterone, endometrial lining remains proliferative and hyperplastic and present with non-cyclic menstrual blood flow with timing and amount being erratic. AUB can also be caused by anatomic conditions such as polyps, fibroids, hyperplasia, and even frank carcinomas, which needs appropriate evaluation.

Hysteroscopy combined with guided biopsy has been considered as gold standard in the evaluation of AUB.

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Even though hysteroscopy is gold standard, it requires trained personnel, equipment, and anesthesia. It has its own complications and needs hospital stay. The search of a procedure, which is less invasive, cost-effective, and accurate in diagnosis led to the advent of endometrial imaging using saline as a contrast medium. Sonosalpingography otherwise called as saline infusion sonography (SIS) was first described by Nannini *et al*.,[1] in 1981, it was Richman *et al*.,[2] in 1984, used this technique first for evaluation of tubal patency in infertile women.

This test is easier, better, cost-effective, less time-consuming, and an efficient diagnostic modality with minimal morbidity in patients with AUB. The instillation of saline into uterine cavity provides a contrast that helps to localize abnormalities as intracavitary; endometrial or submucosal fluid represents an excellent medium for transmission of sound waves and provides a good contrast to examine the endometrial cavity, just as it is better to look at the fetus in case of polyhydramnios. We designed this study to analyze the efficacy, safety of SIS in the diagnosis of women with AUB.

MATERIALS AND METHODS

This prospective observational study was conducted in patients with AUB admitted to our hospital gynecology ward. Hospital ethical committee approval was obtained to conduct the study. After obtaining consent from each patient, 100 women with H/O AUB were included in the study. The inclusion criteria of women with age group of 25-45 years are:

1. Irregular uterine bleeding
2. Heavy and/or prolonged periods aged 40 years or more after excluding fibroid in ultrasonography (USG)
3. Heavy and/or prolonged periods below 40 years of age, who do not respond to medical treatment
4. Cystic, echogenic endometrium on USG
5. Hyperechoic line around the endometrium
6. Failure to visualize the endometrium on ultrasound.

Patients with unhealthy cervix, genital infection, tuberculosis, genital malignancy, suspected endocrinological abnormality, large myoma, cervical stenosis were excluded from the study. A detailed history was taken, and medical and gynecological examination was done to rule out the pelvic inflammatory disease. The patients had taken tablet doxycycline 200 mg and metronidazole 400 mg 1 h before the procedure.

Timing of the Procedure

Procedure is done on 8th or 9th day of the menstrual cycle in patients with regular cycles or just after cessation of the bleeding in those with irregular cycles. Patients with bleeding are best seen in proliferative phase, to rule out polyps and with suspected fibroid, best in the secretory phase. In proliferative phase, since the endometrium is thickened, it provides a contrast to hypoechoic leiomyomata.

Procedure

Patients positioned in dorsal lithotomy position. Before SIS, routine standard transvaginal ultrasound is done with empty bladder. Transvaginal probe is removed. SIMS speculum is introduced to retract the anterior vaginal wall and cervix visualized. Size 8 Fr Foley's catheter was introduced into the external Os, and the Foley bulb was inflated with 2 ml of sterile distilled water, and the catheter was withdrawn so that the Foley's bulb is placed at the level of internal Os. The transvaginal probe is reintroduced into the vagina beneath the catheter, and 20 ml of sterile saline is slowly injected through the catheter and the uterine cavity distended. The uterus is scanned in longitudinal axis (sagittal plane) and transverse axis (coronal plane) and the intracavitary pathologies if present is detected. After the procedure is over, the probe is removed, Foley's bulb is deflated and the catheter withdrawn and the patient is allowed to dress before discussing further management.

Criteria for diagnosis in SIS:

1. Normal endometrium: Normal looking endometrium with uniform thickness all around within the normal range
2. Endometrial hyperplasia: Diffuse and irregularly thickened endometrium, without any breech in surface, with intact endomyometrial interface; thickness >10 mm
3. Endometrial polyps: Not as round and regular in outline as fibroid polyp; smooth marginated echogenic mass with homogenous echotexture; sway with the movement of the fluid in the cavity
4. Endometritis: Bright echogenic foci with irregular surface
5. Submucous fibroid: Solid round structures of mixed echogenicity that cause bulge or protrusion of the endometrium that does not move with the medium
6. Intrauterine adhesions: Thread-like immobile strands
7. Subseptate/bicornuate uterus.

OBSERVATION AND RESULTS

In our observational study, 100 patients were studied for the efficacy of SIS in detecting intracavitary lesions. Patients from 25 to 45 years patients were taken in this study. Out of 100 patients, 28 belong to 25-35 years age group and remaining 72 belong to 36-45 years age group. This shows the incidence of AUB more common around perimenopausal age (Table 1). In our study, nullipara and Para 1 were 2% only. 3 patients had one abortion. Patients with Para 4 were 3. Patients with Para 1, Para 2, and Para 3 totally occupied 90% out of 100 patients. Para 2 had

the highest incidence of AUB of about 53% followed by Para 3, which included 28% of patients. This clearly denoted that AUB more common in multiparous women.

About 27 patients out of total 72 patients in the age group between 36 and 45 were having menorrhea with 37% as the most common symptom. This was followed by polymenorrhagia with 25% of patients. Patients with polymenorrhea were 23%. Menometrorrhagia and metrorrhagia were the least common symptoms. Out of 100 patients, the most common symptom was polymenorrhea which included 35% of the patients, followed by menorrhagia which included about 32% of the patients. This was followed by polymenorrhagia with 20% of patients. Menometrorrhagia, metrorrhagia, and oligomenorrhea all constituted about 13% of patients (Table 2).

The most common lesion in the age group 36-45 years were adenomyosis with 25% of patients followed by fibroid with 21% of patients. Patients with submucous myoma were 15%. Patients with endometrial hyperplasia and polyps were least in number. There were no patients with Mullerian anomaly. 20 patients had a normal uterus. In age group between 25 and 35, all the pathologies were almost equal. Fibroid, polyp, and Mullerian anomaly were equal in number with 2 patients each. Submucous myoma and endometrial hyperplasia group patients were in equal in number with 3 patients. Patients with adenomyosis were 6 in number. 10 patients had a normal uterus (Table 3).

As routine transvaginal ultrasound is performed before SIS, scan findings were also observed. Out of 100 patients, 30 patients SIS test were normal. In remaining 70 patients, adenomyosis was the most common diagnosis with 18% of total 100 patients followed by patients with fibroid with 16%. Patients with endometrial hyperplasia and submucous myoma were 12%. Patients with endometrial polyp were 10%. The least common was Mullerian anomalies, which were only 2% (Table 4).

About 60 patients in this study underwent hysterectomy. Their uterine specimen were analyzed and found to be normal in 24 patients with 40%. Polyp was found in 9 patients with 15%. Patients with submucous myoma were found to be 19%.16 patients had intramural fibroid with 26%.

The positive predictive value of each condition varies from 85% to 100%. The positive predictive value was 85% for endometrial hyperplasia which was the least. The positive predictive value for fibroid was 88% followed by the positive predictive value of adenomyosis which was 90%. The positive predictive values for submucous myoma and Mullerian anomalies were 100%. The positive predictive value for diagnosing normal uterine cavity was 100% (Table 4).

Table 1: Age incidence

Age group in years	Number of patients (%)
25-35	28 (28)
36-45	72 (72)

Table 2: Various symptoms in study group

Symptoms	Number of patients (%)
Menorrhea	32 (32)
Polymenorrhea	35 (35)
Polymenorrhagia	20 (20)
Menometrorrhagia	7 (7)
Metrorrhagia	5 (5)
Oligomenorrhea	1 (1)

Table 3: Incidence of lesions in study group

Lesion	Number of patients (%)	
	25-35 years of age	36-45 years of age
Intramural fibroid	2 (8)	15 (21)
Endometrial polyp	2 (8)	2 (3)
Submucous myoma	3 (11)	11 (15)
Endometrial hyperplasia	3 (11)	5 (7)
Adenomyosis	6 (14)	19 (25)
Mullerian anomalies	2 (8)	0 (0)
Normal	10 (40)	20 (29)
Total	28 (100)	72 (100)

Table 4: Diagnosis by saline infusion sonography and positive predictive valve

Diagnosis	Saline infusion sonography	Positive predictive value (%)
	Number of patients (%)	
Intramural fibroid	16 (16)	88
Endometrial polyp	10 (10)	85
Submucous myoma	12 (12)	100
Endometrial hyperplasia	12 (12)	85
Anomaly	2 (2)	100
Adenomyosis	18 (18)	90
Normal	30 (30)	100

DISCUSSION

AUB is often seen in peri- and post-menopausal women. The etiology varies from simple dysfunctional uterine bleeding to benign lesions such as polyps and even frank malignancies. Apart from the clinical diagnosis, various diagnostic methods are available to confirm the diagnosis. AUB can cause anemia, and in some cases, it can cause hypovolemic shock and the patient may collapse if the bleeding is too severe and acute. Various diagnosing tools are available to detect the pathology. In our study, the efficacy of SIS in the diagnosis of AUB studied because SIS is a cost-effective, easy, reliable, and an outpatient procedure. Even though, hysteroscopy is the

gold standard investigation of choice in evaluating patients with AUB, its disadvantages, does not make it the first line of investigation in these people.

As stated by de Kroon *et al*.,[3] SIS can effectively replace hysteroscopy and reduces the cost of anesthesia, theater set up, disinfection, sterilization, and reserialization and guides the need for hysteroscopy in a particular patient. This technique is quite safe with occasional vasovagal reaction and exacerbation of dormant pelvic infection being very rare complications.

In our study, most of the patients present with history of menorrhagia (in 32% of patients), poly menorrhea (35% of patients), poly menorrhea being the most common symptom. In our study, when 100 patients are subjected to clinical examination, 50% of the patients were found to have normal size uterus and were diagnosed to be having dysfunctional uterine bleeding, and the next most common diagnosis being fibroid and adenomyosis. This finding was well correlated with the study conducted by Mathew *et al*.,[4,] who concluded that 48% of patients were normal uterine cavity, and fibroid and polyp were the next most common pathologies found in patients with AUB.

In our study, most of the patients (54%) have given birth to two children (parity two), and this is because of the increasing awareness of the family welfare programs and health education made available. Multiparous women suffer more from AUB.

In our study, most of the patients present in the perimenopausal age group. 72% of the patients belong to 36-45 years of age and with less incidence of the problem in the age group of 25-35 years (28%). These findings well correlated with study conducted by Pasrija *et al*.[5]

Grimbizis *et al*.[6] compared the transvaginal sonography (TVS) and SIS and concluded that SIS detected more intrauterine abnormalities than TVS alone. This finding was well correlated with our study. The detection of intrauterine pathologies, such as polyp, submucous myoma, and endometrial hyperplasia, was more accurate and more in number with SIS when compared to an initial survey by TVS.

The diagnostic accuracy for SIS is highest for Mullerian anomalies, polyps, endometrial hyperplasia, and submucous myoma. 60 patients out of 100 patients were subjected to hysterectomy, and the findings were correlated with SIS. In our study, the overall sensitivity was 95%, and the overall positive predictive value was 90%. These findings were comparable to Reddi Rani *et al*.[7,] and Ryu *et al*.[8] Sharma *et al*.[9] also showed similar sensitivity for SIS in their study.

Bonnamy *et al*.[10] warned about possible side effect-like endometritis in SIS. In our study, there were no complications occurred.

CONCLUSION

SIS has the advantages of being non-invasive, cheap, affordable, shorter duration, and accurate method for uterine cavity evaluation. SIS has enhanced the diagnostic accuracy of transvaginal scan and can be an effective screening test before hysteroscopy.

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Original Article

Computed Tomography Scan Correlation between Anatomic Variations of Paranasal Sinuses and Chronic Rhinosinusitis

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Abstract

Introduction: The aim of this study was to analyze the incidence of anatomic variations of the paranasal sinuses in patients with persistent symptoms of rhinosinusitis and their correlation with paranasal sinus disease.

Materials and Methods: This retroprospective study of 500 patients between the age group 13 and 77 years was performed at Manipal Hospital, Bengaluru, from March 2013 to June 2014 in the Department of Radiodiagnosis.

Results: Multiparametric statistical analysis with Fischer's exact test showed a correlation between left septal deviation and left maxillary sinusitis (MS) ($P < 0.02$). We also found a correlation between bilateral concha bullosa and bilateral MS ($P < 0.002$). In addition, there was a statistically significant difference between left agger nasi cell and homolateral frontal sinusitis ($P < 0.02$).

Conclusion: Computed tomography of the paranasal sinus has improved the visualization of paranasal sinus anatomy and variations and has allowed greater accuracy in evaluating paranasal sinus disease.

Key words: Anatomic variations, Chronic rhinosinusitis, Paranasal sinus

INTRODUCTION

Chronic sinusitis is one of the more prevalent chronic illnesses worldwide, affecting persons of all age groups. The National Institute of Allergy and Infectious Diseases' estimates approximately 134 million Indians to suffer from chronic sinusitis. One in eight Indians suffers from chronic sinusitis.[1] Among Indians, this disease is more widespread than diabetes, asthma or coronary heart disease.

Chronic sinusitis is an inflammatory process that involves the paranasal sinuses and persists for 12 weeks or longer despite adequate medical treatment, the symptoms of which include but are not limited to debilitating headaches, fever and nasal congestion and obstruction. It is almost always accompanied by concurrent nasal airway inflammation and is often preceded by rhinitis symptoms; thus, the term chronic rhinosinusitis has evolved to more accurately describe this condition.[2]

Several authors have assessed the relationship between sinonasal anatomic variants and the incidence of rhinosinusitis.[3] There is now worldwide interest among otolaryngologists in the radiological definition of paranasal regional anatomy. Certain anatomic variations forming the lateral wall of the nose are very important because they can contribute to the blockage of the osteomeatal units, drainage, and ventilation and can thereby increase the risk of sinus mucosal disease. Moreover, anatomic variants with a potential impact on surgical safety occur frequently and need to be specifically sought as part of the pre-operative evaluation. Anatomic variations - such as deviation of the nasal septum, concha bullosa or paradoxical middle turbinate, ethmoidal bulla hypertrophic, agger nasi cell, lateral or medial bending of uncinate process (UP), and Haller cell - are common and emphasized in routine

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evaluation of computed tomography (CT) images. Occasionally, some uncommon anatomic variations, in addition to those mentioned above, can increase the risk of surgical complications, associated with a residual disease or recurrence. Appropriate radiologic imaging and accurate interpretation play an important role in the diagnosis and management of these conditions.[3]

For many years, otorhinolaryngologist and radiologists have to rely on plain radiograph of the paranasal sinuses for assistance in the diagnosis and management of the paranasal sinus diseases. A plain film yields minimal information about delicate bony structures, mucosal changes, and anatomic variations.

The non-invasive cross-sectional imaging techniques of CT provide excellent resolution and good definition of the complete osteomeatal complex (OMC), subtle anatomic variations, soft-tissue abnormalities and to image distal structures such as the posterior ethmoid sinus, relationship of the sinuses to the orbit and the brain that cannot be viewed with direct endoscopy.[4,5]

Recently, the introduction of spiral CT and multidetector CT represents an interesting but incremental change in the way CT is performed. It minimizes patient motion, allows excellent coronal images.[6] The coronal view is best correlated with findings from sinus surgery[7] and allows any desired angle to be created from images made in the axial plane. In addition, this technique provides the advantage of speed and the ability to generate very thin images while producing least radiation dose. Technical advances like cone-beam tomography can further improve dose reduction as well as spatial resolution.[8]

MATERIALS AND METHODS

Study Period

This retroprospective study was performed at Manipal Hospital, Bengaluru, from March 2013 to June 2014 in the Department of Radiodiagnosis on patients who are referred for CT scan of paranasal sinus on clinical grounds of chronic sinusitis. The patients were of age group 13-77 years (average age 45 years). The study group included both urban and rural cases that fulfilled the inclusion criteria.

Inclusion Criteria for Study Group

Adult patients presenting with a history of nasal obstruction, nasal discharge, postnasal discharge and headache, clinically diagnosed to have chronic rhinosinusitis (symptoms for a period of 12-week or more despite adequate medical treatment) and are willing for CT evaluation.

Exclusion Criteria for Study Group

Patients with the previous alteration of the paranasal sinus anatomy due to facial trauma and surgery, patients with tumors, polyposis of the sinonasal cavity, complicated sinusitis, cystic fibrosis, osteomyelitis, and aggressive fungal infections.

Sample Size

This retroperspective study included a sample volume of 500 patients diagnosed to have chronic rhinosinusitis and was willing to undergo CT evaluation.

Technique

Before subjecting the patients for radiographic examinations, informed consent, age, sex, and detailed clinical history will be obtained along with thorough ear, nose and throat examination. Chronic sinus disease is best scanned at 4-6 weeks after medical therapy and not during active infection. The CT examination will be performed with a general electric medical systems, 64-slice multidetector CT LightSpeed VCT. CT techniques include thin-section, axial scanning. The scanning parameters are as follows: Individual detector width 0.625 mm; gantry rotation time 600 ms; tube voltage 120 kVp; tube current, 250 mA; pitch 0.97. Axial images will be reconstructed using the following parameters: 1.25 mm section thickness, high-spatial-frequency reconstruction algorithm (bone preset), and an 18 cm field of view.

Statistical Method

The statistical analysis to assess the relationship between anatomic variations and sinusitis was evaluated using the Fisher's exact test.

RESULTS

A total of 310 of 500 patients showing symptoms of chronic rhinosinusitis who had at least one sign on CT anatomic variation were included in this study during period of 15-month. 202 (65.16%) patients were male and 108 (34.83%) were female (Chart 1) with ages ranging from 13 to 77 years (mean 45.5 years).

Regarding the CT prevalence of sinusal opacities in the group of 310 patients with sinusitis, 256 (82.5%) had maxillary sinusitis (MS), 136 (43.8%) anterior ethmoid sinusitis, 134 (43.2%) posterior ethmoid sinusitis, 89 (28.7%) frontal sinusitis, and 86 (27.7%) had sphenoid sinusitis (Chart 2). Pathology at OMC on CT scan was observed in 91 (29.3%) patients in this series (Table 1).

A detailed analysis of CT scans showed 310 of 500 (62%) patients had common or uncommon anatomic variations, 59.1% of patients were affected by common anatomic

variations, and 9 patients (2.9%) with uncommon variations. CT scans showed that the affected side was right in 83 (26.7%) patients and left in 143 (46.1%). 190 (38%) patients had no signs of disease on CT.

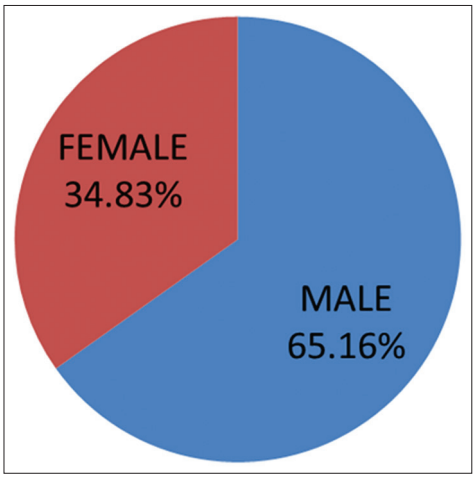

Chart 1: Gender distribution in the study group

The most common anatomic variation observed on CT scans (Chart 3) was a nasal septal deviation, which was presented by 232 patients (74.8%). Concha bullosa of the middle turbinate was the second most common variant, observed in 102 patients (32.9%). A total of 22 patients (9.1%) had hypertrophic ethmoid bulla, whereas agger nasi cell was observed in 11 (3.5%). Considering the UP, its lateral deviation was found in 5 patients (1.6%), whereas its medial deviation was presented by 9 patients (2.9%) and pneumatization UP was observed in 8 patients (2.6%). Haller cell was observed in 56 patients (18%) and onodi cell in 8 patients (2.6%), paradoxical middle turbinate was observed in only 21 patients (6.7%), hypoplastic MS was present in 1 patients (0.32%), and septated MS in 5 patients (1.6%). With respect to the level difference between the ethmoid and cribriform plate, Keros Type I was the most common and seen in 49 patients (15.8%), followed by Type II in 28 (9.03%) and Type III in 7 patients (2.2%); single large sphenoid sinus was seen in 8 patients (2.6%) (Table 2).

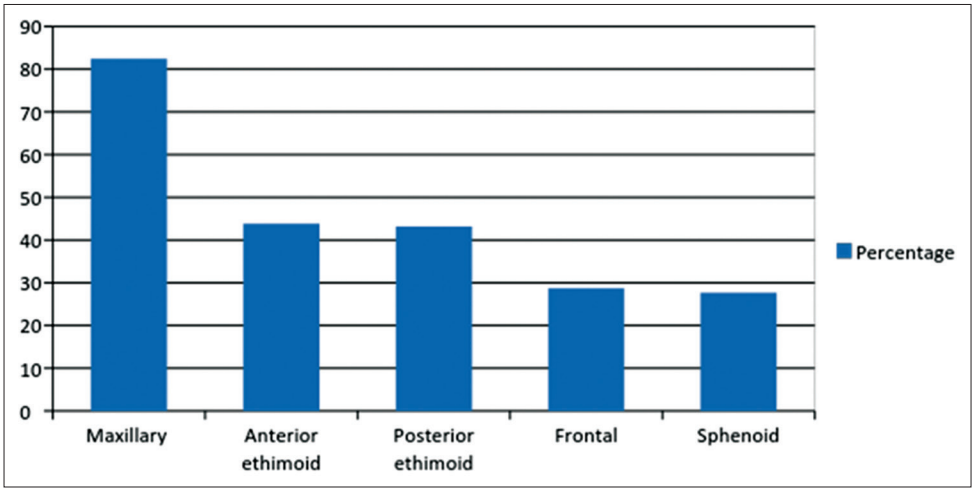

Chart 2: Distribution of sinusitis in the study group

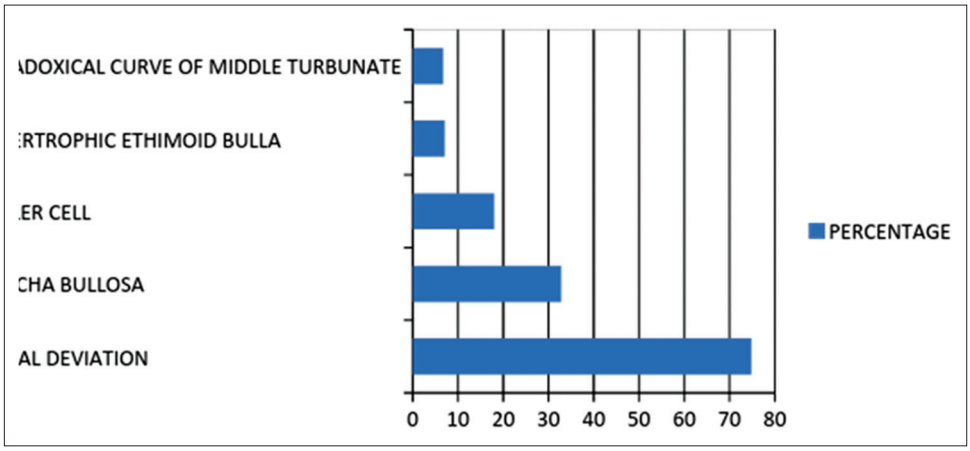

Chart 3: Most common anatomic variations in the study population

A total of 4 uncommon anatomic variations were seen 9 patients (2.9%) in the 310 patients. These included atelectatic of UP in 3 patients (1%), hypoplastic MS in 1 patient (0.32%), pneumatization of crista galli was observed in 3 patients (1%), and pneumatization of the nasal septum in 2 patients (0.64%) (Table 3).

Multiparametric statistical analysis correlations are represented in Table 4. With regard to septal deviation, there was a statistically significant significance between left septal deviation and left MS ($P < 0.02$). We also found a correlation between bilateral concha bullosa and bilateral MS ($P < 0.002$). In addition, there was a statistically significant significance between left agger nasi cell and homolateral frontal sinusitis ($P < 0.02$).

No other statistically significant correlations were demonstrated between any other common and uncommon anatomic variations and ipsilateral, contralateral or bilateral sinusitis (Figures 1 and 2).

Table 1: Prevalence of sinusal opacities of the study population

Sinusitis	*N* (%)				
	Unilateral			Bilateral	Total
	Right	Left	Total		
Maxillary	31 (10)	64 (20.6)	95 (30.6)	161 (51.9)	256 (82.5)
Anterior ethmoid	13 (4.2)	21 (6.7)	34 (10.9)	102 (32.9)	136 (43.8)
Frontal	12 (3.8)	26 (8.3)	38 (12.2)	51 (16.4)	89 (28.7)
Posterior ethmoid	13 (4.2)	15 (4.8)	28 (9)	106 (43.2)	134 (43.2)
Sphenoid	14 (4.5)	17 (5.5)	31 (10)	55 (17.7)	86 (27.7)
Closed OMC	19 (6.1)	14 (4.5)	33 (10.6)	58 (18.7)	91 (29.3)

OMC: Osteomeatal complex

DISCUSSION

Anatomic variations of paranasal sinus structures may predispose patients to recurrent sinusitis and, in selected cases, to a headache. However, the relative importance of anatomic variations is still a matter of discussion, and variable results have been reported. Kim *et al.*, Lerdlum *et al.*,[9] and Stallman *et al.* showed no specific association of anatomic variations in rhinosinusitis, and claimed that local, systemic, environmental factors or intrinsic mucosal disease were more significant in the pathogenesis of rhinosinusitis.[9-11]

The nasal septal deviation is present in 20-31% of the general population, and severe deviation has been noted as a contributing factor for sinusitis.[12] However, some studies have not demonstrated a causal relationship between nasal septal deviation and sinusitis.[13] We found a statistically significant correlation between left septal deviation and left MS ($P < 0.02$) (Table 4).

Normal ethmoid bulla was detected in 288 of 310 patients (92.9%), compared to 17-89% of cases in previous reports.[14,15] Ethmoid bulla hypertrophic - prominent - was present in 7.1% of patients in our study (Table 2). Krzeski *et al.* reported a frequency of 26.75%,[14] while Scribano estimated that it is only 3.5%.[16] In our

Table 2: Common anatomic variations in CT scans

Common anatomic variations	*N* (%)			Bilateral	Total
	Unilateral				
	Right	Left	Total		
Septal deviation	130 (41.9)	102 (32.9)	232 (74.8)	-	232 (74.8)
Hypertrophic ethmoidal bulla	4 (1.3)	3 (1)	7 (2.2)	15 (4.8)	22 (7.1)
Large agger nasi cell	2 (0.64)	3 (1)	5 (1.6)	6 (1.9)	11 (3.5)
Middle turbinate					
Concha bullosa	39 (12.6)	22 (7.1)	61 (19.6)	41 (13.2)	102 (32.9)
Paradoxical	12 (3.8)	4 (1.3)	16 (5.1)	5 (1.6)	21 (6.7)
Uncinate process					
Lateral deviation	1 (0.32)	2 (0.64)	3 (1)	2(0.64)	5 (1.6)
Medial deviation	1 (0.32)	3 (1)	4 (1.3)	5 (1.6)	9 (2.9)
Pneumatization	1 (0.32)	5 (1.6)	6 (2)	2 (0.64)	8 (2.6)
Haller's cell	14 (4.5)	7 (2.2)	21 (6.7)	35 (11.3)	56 (18)
Onodi cell	3 (1)	0	3 (1)	5 (1.6)	8 (2.6)
MS					
Septated	1 (0.32)	2 (0.64)	3 (1)	2 (0.64)	5 (1.6)
Roof of ethmoid					
Type I	49 (15.8)				84 (27.1)
Type II	28 (9.03)				
Type III	7 (2.2)				
Single large sphenoid sinus	-	-	-	-	8 (2.6)

study, there was no significant correlation between hypertrophic ethmoidal bulla and sinusitis of anterior ethmoid.

The term concha bullosa was coined by Zuckerlandl in 1862 to describe pneumatization of the middle turbinate and its incidence was reported to range from 9% to 20% based on initial anatomical dissections. The significance of this most common anatomic variation of the middle turbinate lies in the potential secondary deformity of the turbinate, which increases the probability of obstruction of the middle meatus and lead to recurrent ethmoid sinusitis.

Table 3: Uncommon anatomic variations in CT scans in study population

Uncommon anatomic variations	*N* (%)			
	Right	Left	Bilateral	Total
Pneumatization of crista galli	-	-	-	3 (1)
Pneumatization of nasal septum	-	-	-	2 (0.64)
Atelectatic uncinate process	2 (0.64)	1 (0.32)	0	3 (1)
Hypoplastic MS	1 (0.32)	0	0	1 (0.32)

MS: Maxillary sinus, CT: Computed tomography

Table 4: Correlation between anatomical variations and disease extension of sinusitis (Fisher's exact test)

Anatomic variations (%)	Sinusitis (%)	*P* value
Left septal deviation (32.9)	Left maxillary (64)	0.02
Right septal deviation (41.9)	Right maxillary (31)	0.41
Bilateral concha bullosa (13.2)	Bilateral maxillary (51.9)	0.002
Medial deviation of uncinate process	Anterior ethmoid	
Right (0.32)	Right (4.2)	0.95
Bilateral (0.64)	Bilateral (32.9)	0.52
Haller's cell	Maxillary	
Right (4.5)	Right (31)	0.58
Left (2.2)	Left (64)	0.40
Bilateral (11.3)	Bilateral (51.9)	0.48
Ethmoidal bulla hypertrophic	Anterior ethmoid	
Right (1.3)	Right (4.2)	0.84
Bilateral (2.2)	Bilateral (32.9)	0.58
Agger nasi cell	Frontal	
Right (0.64)	Right (3.8)	0.92
Left (1)	Left (8.3)	0.02

$P<0.05$ is significant

Bolger *et al.*[17] reported three types of the middle turbinate pneumatization: The vertical lamella was pneumatized in 46.2% of cases ("lamellar cell") in the inferior bulbous portion in 31.2% of patients and in the entire middle turbinate in 15.7% of cases ("true" concha bullosa). Unilateral or bilateral concha bullosa was detected in 32.9% of patients in the present series. According to data from the literature, the incidence of positive CT findings for concha bullosa varies from 14% to 62%.[18] In particular,

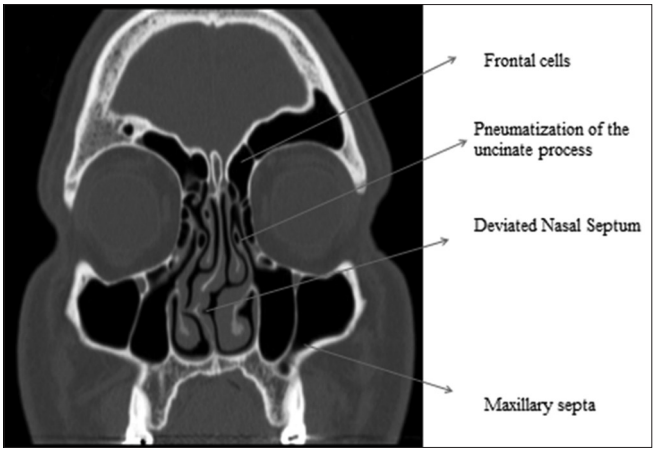

Figure 1: some important anatomic variations: Left Type I frontal cells,pneumatisation of uncinate process,Deviated nasal septum with bony spur to right and bilateral maxillary septa

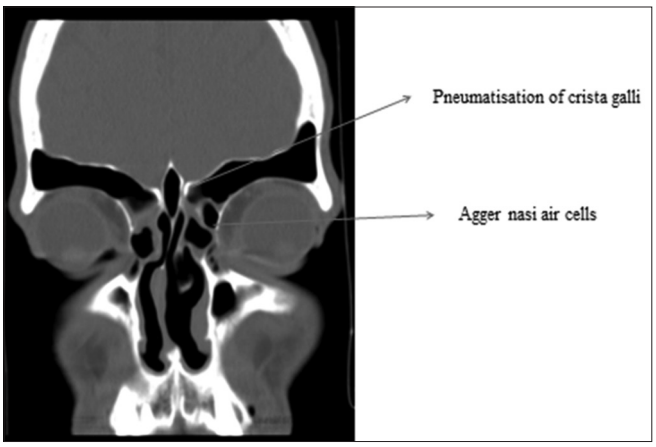

Figure 2: Left Agar Nasi cells and pneumatisation of Crista Galli

Table 5: CT scan findings in anatomic variations in various studies

Anatomic variations	Present study (%)	Peres-Pinas *et al.* (%)	Dua K *et al.* (%)	Zinreich *et al.* (%)	Bolger *et al.* (%)
Year	2013	2005	2000	1993	1991
Number of patients	500	115	55	230	202
Concha bullosa	32.9	24.50	16	36	53.60
Paradoxicalmiddle turbinate	6.7	10	10	15	27
DNS	74.8	58	44	21	96
Haller cells	18	2.70	16	10	45.90
Onadi cells	2.6	10.90	6	8	11
Prominent AG N-cells	3.5	98	40		98.50

CT: Computed tomography

incidences of 37.5%, 44% and 48.1%, respectively, were reported by Krzeski *et al.*,[14] Stallman *et al.*,[3] and Ozcan *et al.*[4] There are different opinions in the literature concerning concomitance with mucosal pathologies. Herein, multivariate analysis showed that bilateral concha bullosa was associated with sinusitis bilateral maxillary ($P < 0.002$) (Table 4) in agreement with previous reports,[4,16] while other studies found no direct relationship.[19] Stallman *et al.* reported a significant relationship between the presence of concha bullosa and deviation of the nasal septal on the contralateral side ($P < 0.0001$).[3]

The paradoxical curvature of the middle turbinate is described as a convexity pointing toward the middle meatus and is reported as a possible cause for closed OMC and mucosal pathologies.[20] In our study, the incidence of middle paradoxical turbinate was 6.7% and was not associated with mucosal pathologies. The rates of this variation in previous publications are highly variable, with incidences ranging from 3% to 40%.[15,17,21] Nouraei *et al.*,[22] in a review of 278 CT scans, found only 2 (0.7%) cases with paradoxical curves.

The UP is another important structure in relation to paranasal sinus drainage, and the incidence of variations in this structure is generally from 15.9% to 44.3%,[14,23,24] in our study, it was 8.1%.

Medial deflection of UP was previously described in 3-19% of cases.[14,25] Herein, it was observed in 2.9% of patients, while lateral deflection of UP was observed in 1.6% of cases. We found that the UP was pneumatized in 2.6% of patients. The rate of UP pneumatization in previous studies has been reported to be from 1% to 9%.[15,17,21]

MS hypoplasia (MSH) is the most important anatomical variation among those involving the MS. MSH typing was done by Bolger *et al.* in 1990.[17] Since MSH is often associated with orbital enlargement, thickening of the bony sinus wall, mucosal pathology, anterior ethmoidal cell variation or frontal sinus hypoplasia, it is important to identify these anatomical variations for proper surgical planning to prevent complications.[26] The incidence of MS septae was found to vary from 20% to 31% in previous reports.[27] In our study, the MS was hypoplastic in 0.32% and septated in 1.6%, less than that previously reported. There was no significant correlation between these anatomical variations and mucosal pathologies; in agreement with literature data.[2]

The OMC is a functional entity of the anterior ethmoid complex that represents the final common pathway for drainage and ventilation of the frontal, maxillary and anterior ethmoid cells. Thus, anatomical variations that redirect nasal airflow or narrow the OMC have been implicated in the development of chronic rhinosinusitis.[28] In this study, the patients with pathologies at OMC (91/310) had involvement of multiple sinuses and were found to have increased symptom severity.

Another common anatomic variant was the presence of infraorbital ethmoid cells, also known as Haller cells. These are found between the MS and the orbit and can increase the risk of orbital injury during ethmoidectomy.[21] Haller cells are a clinically significant anatomic variation because they have been implicated as a possible etiologic factor in recurrent MS due blockage of the OMC.[6] In previous studies, a variable incidence of Haller cells has been noted. In particular, Kennedy and Zinreich[29] and Meloni *et al.*[30] both reported rates of 10%, while Arslan *et al.*[20] reported an incidence of 6% and Bolger *et al.*[31] an incidence of 45.1%. Possible reasons for this discrepancy include differences in interpretation of Haller cells, or in the technique of CT scanning. In our study, the incidence of Haller cells was 18%, and we found no statistically significant relationship with MS, in disagreement with what reported by Van Alyea.[32]

The reported prevalence of the agger nasi cell varies widely among investigators. In anatomic dissection, Messerklinger[33] encountered the agger nasi cell in 10-15% of specimens. Kantarci *et al.*,[7] however, noted this cell in 47% of specimens, while Krzeski *et al.*[14] reported its presence in 52.9% of cases and Van Alyea[32] in 89% of individuals. Kennedy and Zinreich noted the presence of the agger nasi cell in nearly all patients evaluated.[17] Similarly, Bolger *et al.* reported that it was present in 98.5%, of cases.[17] In our study, agger nasi cells were detected in 3.5% of cases, and by multivariate analysis was associated with frontal sinusitis ($P < 0.02$) (Table 5). The incidence rates reported in the literature, from 3% to 100%.[10] may in part be related to the different method of analysis employed by Krzeski *et al.*[14]

Although the sphenoethmoid (onodi) cell is an anatomic variant that is not associated with sinusitis, its presence poses an increased incidence of surgical complications for risk of injury to optic nerves or carotid arteries. In our work, these cells were present in 2.6% of patients. Nouraei *et al.* reported an incidence of 4.7%,[34-36] while Stallman *et al.* reported an incidence of onodi cells from 3.4% to 51%.[3]

According to Keros' classification of the roof of the ethmoid, in our study, there were 15.8% of patients in Group I, 9.03% in Group II, and 2.2% in Group III.[30]

CONCLUSIONS

The results of this retrospective study highlight the statistically significant correlation between some anatomical variations of the paranasal sinuses and chronic rhinosinusitis. Therefore, knowledge of anatomic variations of the paranasal sinuses is important in all cases of chronic rhinosinusitis.

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Original Article

Occurrence of Tuberculosis in Patients Attending a Tertiary Care Hospital in Khanpur, Sonepat, Haryana

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Abstract

Background: Tuberculosis (TB) is a major public health problem in India, estimated 2.3 million new cases annually makes it the highest TB burdened country. In 2010, India has estimated one-quarter (26%) of all TB cases worldwide. India has more TB cases annually than any other country globally, with estimated disease prevalence 256/100,000 population, the incidence of 185/100,000 and death of 26/100,000. The prevalence of TB is an important epidemiological index to measure the burden in a community.

Materials and Methods: A study was conducted on patients attending BPS, Government Medical College (GMC) (women), Khanpur, Sonepat, Hospital. Clinically TB suspected cases were investigated in the Department of Microbiology by staining the sputum samples by Ziehl–Neelsen staining and smears were examined by direct microscopy.

Results: The patients attended to BPS, GMC (women), Khanpur, Sonepat hospital during January 2015 to December 2015 were screened, and 4267 patients were suspected for TB. Out of 4267 patients, 528 (12.37%) were smear positive. Out of 528 positive cases, 402 (76.14%) were male and 126 (23.86%) were female. A maximum number of cases 101 (19.13%) were positive in 41-50 years group.

Conclusions: This study provides important information on TB status in Sonepat, Haryana. It can serve as baseline data for future evaluation, the impact of disease control measures and epidemiological trends. However, TB is a major public health problem, and there is need to maintain and further strengthen TB control measures on a sustained and long-term bais. Epidemiological information on TB has always been vital for planning control strategies and has now gained further importance for monitoring the impact of interventions against the disease.

Key words: Burden, Epidemiological, Occurrence, Tuberculosis

INTRODUCTION

Tuberculosis (TB) is still a major public health problem in India, with an estimated 2.3 million new cases annually that making it the highest TB burden country in the world. In 2010, India alone accounted for an estimated one-quarter (26%) of all TB cases worldwide.[1]

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India has more TB cases annually than any other country in the world, with an estimated disease prevalence of 256/100,000 population, incidence of 185/100,000 and deaths of 26/100,000.[2] TB is responsible for as many as 29 deaths per year per 100,000 people. In a country with over a billion people, this translates to as many as 290,000 deaths in a year. With a reported prevalence of 283 cases per 100,000 population, India is among the 22 high TB burden countries in the world.[4]

Currently under Revised National TB Control Programme (RNTCP), any person presenting with a cough of more than 2 weeks is screened for pulmonary TB (PTB) by two sputum smear examinations, one spot and one overnight

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sample. The samples are collected and examined at designated microscopic centers. The treatment of TB patients is based on the internationally recommended directly observed treatment short course strategy.[2]

Different studies across the country have estimated a prevalence of smear-positive PTB between 60 and 760/100,000 population, culture positive TB between 170 and 980, and culture and/or smear-positive prevalence between 180 and 1270/100,000 people.[4]

The prevalence of TB disease is an important epidemiological index to measure the burden in a community and if it is measured periodically, will enable trends in disease prevalence to be observed over time. Epidemiological information on TB is also vital for the planning of control strategies and service delivery systems.[1]

In view of low health service coverage, a developing diagnostic network, and a weak disease notification system, it is not only difficult to determine the magnitude of TB from case notification alone but it is also impossible to monitor the effectiveness of control measures.[4]

Global targets for TB control now include a 95% reduction in TB deaths and <10 cases per 100,000 population by 2035. Such targets will be achieved by strategies to diagnose and treat people with active TB earlier in their disease course.[4-10]

This study was conducted in BPS Medical College, Khanpur, Sonepat to know the occurrence of TB.

MATERIALS AND METHODS

The study was conducted in the Department of Microbiology during January 2015 to December 2015 on patients attending BPS, Government Medical College (GMC) for women, Khanpur Kalan, Sonepat, Hospital. A history of the patient was taken. Individuals were questioned for chest symptoms relating to TB, namely: Persistent cough for 2 weeks or more, chest pain for 1 month or more, fever for 1 month or more, and hemoptysis anytime in last 6 months. History of TB treatment, alcohol consumption, tobacco smoking were collected. Persons with any of these symptoms (deemed as "chest symptomatics"), and also those with a previous history of anti-TB treatment, were considered eligible for sputum collection. Two sputum samples - one spot and one overnight - were collected from each eligible individual in a sterilized container.

Sputum smears were prepared directly from each sputum specimen, and also from concentrated samples. Two direct smears were made from each specimen on new labeled slides under aseptic conditions in a bio-safety cabinet. Smears were stained using Ziehl–Neelsen stain and examined with oil-immersion microscopy for the presence of acid-fast bacilli (AFB). About 10% of randomly selected sputum smears were cross-examined by one of the investigators (SS), and quality assurance protocols were followed as per RNTCP guidelines. A TB case was defined as an individual in whom any of the two sputum specimens was positive for AFB by Ziehl–Neelsen microscopy. All bacteriologically positive cases were referred to the concerned health authorities for anti-TB treatment under the RNTCP using its standardized treatment regimens.

RESULTS

The patients attended to BPS, GMC for Women, Khanpur Kalan, Sonepat Hospital during January 2015 to December 2015 were screened for TB. A history of the patient was taken. Individuals were questioned for chest symptoms relating to TB, namely: Persistent cough for 2 weeks or more, chest pain for 1 month or more, fever for 1 month or more, and hemoptysis anytime in last 6 months. History of TB treatment was taken. 4267 patients were suspected for TB. Sputum samples of suspected patients were collected. Two sputum samples - one spot and one overnight - were collected from each eligible individual in sterilized container. Two direct smears were made from each specimen on new labeled slides under aseptic conditions in a bio-safety cabinet. Smears were stained using Ziehl–Neelsen stain and examined with oil-immersion microscopy for the presence of AFB.

Out of 4267 patients suspected for TB 528 (12.37%) cases were smear-positive. Out of 528 smear, positive cases 402 (76.14%) were males and 126 (23.86%) were females. In this study, a maximum number of cases 101 (19.13%) were positive in 41-50 years group.

DISCUSSION

TB is still a major public health problem in India. This study was conducted in BPS, Medical College, Khanpur, Sonepat, to know the occurrence of TB. The patients attended to BPS, GMC(women) Khanpur, Sonepat Hospital during January 2015 to December 2015 were screened for TB.

In this study, 4267 patients were suspected for TB. Out of 4267 patients, 528 (12.37%) were smear positive.

In a study done by Sharma *et al.*, in 2015, a total of 81 (4.4%) sputum samples were found smear positive while 82 (4.4%) were culture positive. 63 (3.4%) subjects were both smear and culture positive.[4] In a study done by

Table 1: Occurrence of tuberculosis according to age and gender

Age	Male (%)	Female (%)	Total (%)
11-20	21 (3.97)	22 (4.16)	43 (8.14)
21-30	66 (12.50)	34 (6.44)	100 (18.94)
31-40	65 (12.31)	11 (2.08)	76 (14.39)
41-50	86 (16.28)	15 (2.84)	101 (19.13)
51-60	69 (13.06)	17 (3.21)	86 (16.28)
61-70	71 (13.44)	17 (3.21)	88 (16.66)
71-80	15 (2.84)	8 (1.51)	23 (4.35)
81-90	9 (1.70)	2 (0.38)	11 (2.08)
Total	402 (76.14)	126 (23.86)	528 (100)

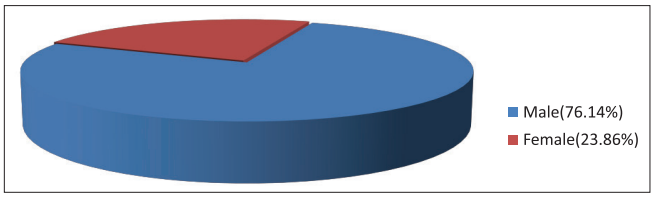
Rao *et al.*, in 2012, PTB was found to be 255.3/100,000 population.[1] In a study done by Yadav *et al.*, in 2010, TB prevalence was 146/100,000.[1] In a study done by Rao *et al.*, in 2010, TB prevalence was 1518/100,000.[1] In a study done by Bhat *et al.*, in 2009, TB prevalence was 387/100,000.[6] In a study done by Chakraborty 2004, the prevalence of total PTB cases was 20.0/1000.[12] In a study done by Chakma *et al.*, in 1996, TB prevalence was 12.7/100,000 population of Morena district of Madhya Pradesh.[1]

TB occurrence rates could not be similar between areas in India. This is due to the regional diversities in terms of ethnic, economic, cultural complexities and variables, pervading the vast land masses and the population size of near continental dimensions.[12]

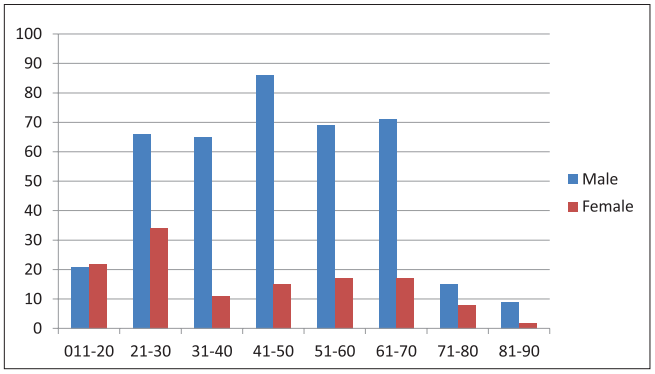
In this study out of 528 positive cases, 402 (76.14%) were male and 126 (23.86%) were female. In a study done by Aggarwal *et al.*, in 2015, TB was more among men (34.5/100,000) as compared to women (14.2/100,000).[5] In a study done by Bhat *et al.*, in 2012, males contributed 76.9% of the total bacteriologically positive PTB cases.[1] In a study done by Chadha *et al.*, in 2012, male to female ratio in these surveys has been found to vary between 2:1 and 5:1. It was 6:1 during the present survey.[3] In a study done by Gopi *et al.*, in 2010, the prevalence of PTB in males (2156/100,000) was more than double that among females (933/100,000).[9] In a study done by Bhat *et al.*, in 2009, the prevalence of bacillary TB was more than double among males (554/100,000) than females (233/100,000).[6]

In general, the disease occurrence rates are about similar in both sexes, till the puberty in females. This is followed by a continuing widening of the gap between the sexes in favor of the females, the differences acutely accentuated past the 35-40 years age mark.[12]

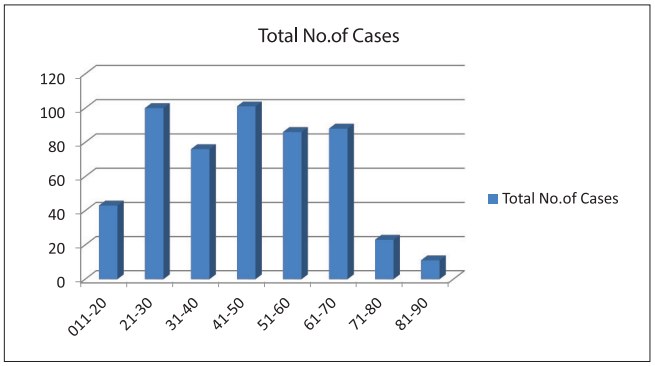
In this study, a maximum number of cases 101 (19.13%) were positive in 41-50 years group. In a study done by Dhanaraj *et al.*, in 2015, while the maximum prevalence of bacteriologically positive PTB 1241/100,000 was found in the age group of 55-64 years.[2] In a study done by Bhat *et al.*, in 2012, the highest proportion of positive PTB cases (25.8%) was seen in the 35-44 years age group.[1] In a study done by Rao *et al.*, in 2010, the prevalence increased with age, being 546/100,000 in the 15-24 years age group, increasing to 3086/100,000 in the 55+ years age group.[9] In a study done by Bhat *et al.*, 2009, the prevalence increased with age being 174/100,000 in the 15-24 years age group to 990/100,000 in the 55+ years age group.[6]



Graph 1: Tuberculosis according to gender



Graph 2: Tuberculosis in relation to gender and age



Graph 3: Tuberculosis in relation to age

It was observed that, of the prevalent cases in the community, the age-wise proportion of cases were substantially higher 35-44 years onward, to be at the peak for the age group 55-64 years (28.40%).[12] The occurrence of TB rise with age, in both sexes (Table 1 and Graphs 1-3).[12,13]

CONCLUSIONS

This study provides important information on TB status in Khanpur Kalan, Sonepat, Haryana. The study indicates

high occurrence of TB in males they were affected more in 76.14% cases and female were affected in 23.86% cases. Maximum affected age group was between 41 and 50 years. The study results provide vital information on the TB disease situation among the population and can serve as baseline data for future evaluation of the impact of disease control measures and epidemiological trends. The findings suggest that the TB situation among the Khanpur, Sonipat, population is not that different from the situation among the population in the country.

However, TB remains a major public health problem among the population, and there is a need to maintain and further strengthen TB control measures on a sustained and long-term basis. Epidemiological information on TB has always been vital for planning control strategies and has now gained further importance for monitoring the impact of interventions against the disease.

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Original Article

Primary Adenoid Cystic Carcinoma of Head and Neck: Its Prognosis and Management - A Retrospective Analysis from a Tertiary Care Center

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Abstract

Background: Adenoid cystic carcinoma (ACC) is a rare malignant tumor of head and neck primary. It affects most commonly the major and minor salivary glands and rarely the paranasal sinuses, lacrimal gland, larynx, ear, vulva, etc. It is a slowly growing tumor, asymptomatic for a long period of time and usually presents with swelling and pain at the time of diagnosis. A wide radical resection of the tumor followed by radiotherapy is the main treatment modality.

Aim of the Study: To know the aggressiveness, diseases free interval and the prognosis of the ACC of head and neck.

Materials and Methods: Six cases of ACC of head and neck were taken. Three cases were having hard palate as the primary site, one case with nasopharynx as the primary site, one case with maxillary sinus, and one having the floor of mouth as the primary site. Cases were treated aggressively with surgery, adjuvant radiotherapy, palliative radiotherapy, and palliative chemotherapy (CT).

Results: Out of six cases, five cases were treated with surgery followed by radiotherapy. Four cases are now on regular follow-up without any disease recurrence or distant metastases. One case developed lung metastasis after 2-year of follow-up and is continuing palliative CT. One case presented with isolated temporal lobe metastasis and received radiotherapy to nasopharynx, its locoregional area and whole brain.

Conclusion: The behavior and survival status of ACC is not clear due to inefficient study data in literature. The study needs continuation with a more number of cases and longer duration of follow-up to draw significant data regarding disease-free interval and survival outcome of the diseases.

Key words: Adenoid cystic carcinoma, Head and neck primary, Management and prognosis

INTRODUCTION

Adenoid cystic carcinoma (ACC) accounts for approximately 1% of all head and neck malignancies and 10-15 (22%) of all salivary gland neoplasms.[1,2] ACC is arises within glands, most commonly from major and minor salivary glands of the head and neck. The minor salivary glands of the oral cavity are the most common site.[2] It can occur also in the breast, trachea, paranasal sinuses, lacrimal glands, larynx, tracheobronchial tree, external ear, skin, and vulva and are known as non-salivary ACC.[3] ACC is a malignant tumor with benign histologic appearance. It is characterized by different histologic patterns, indolent, locally invasive growth with unpredictable clinical behavior, prolonged clinical course, and increased propensity for local recurrence and distant metastases.[4] Regional lymph node involvement occurs infrequently in ACC.[5] Aggressive surgical excision with adjunct radiotherapy is the required treatment modality.[6] Six patients of ACC of head and neck were taken in this study.

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MATERIALS AND METHODS

Six cases of ACC of head and neck were studied in between August 2013 and until date at All India Institute of Medical Sciences, Bhubaneswar, Odisha, India.

Out of 460 cases of head and neck cancers, only six cases (1.30%) were ACC. Five out of six cases presented at 30-50 years age group and one case presented in the age group of 60 years. Out of six cases, four cases are male and two cases are female. The oral cavity (hard palate and floor of the mouth) is the primary site of presentation in four cases. The nasopharynx and maxillary sinus as the primary site are seen in one case each. Pure cribriform type histology is seen in two hard palate cases and in one maxillary primary. Pure tubular, pure solid and mixed form seen in one cases each. All the six cases presented as locally advanced not less than T3 lesions and one case presented with isolated solitary temporal lobe brain metastasis. Three hard palate cases were treated with aggressive surgery (left extended maxillectomy with degloving approach) followed by adjuvant radiotherapy of 66 GY in 33 fractions to bilateral face and neck by CO60 in reduced portals after 45 GY. All the three cases are now on regular follow-up without any disease recurrence or distant metastases. One case of the floor of mouth primary underwent surgery (wide local excision + marginal mandibulectomy + bilateral modified neck dissections) with post-operative pathological staging of PT3N0MX with margin positivity and received adjuvant concurrent chemoradiation of 66 GY radiotherapy in 33 fractions along with weekly cisplatinum. After 2-year of follow-up, the patient developed bilateral lung metastasis and was treated with palliative chemotherapy (CT) with paclitaxel, cisplatin, and 5-flourouracil regimen up to six cycles with partial response, followed by oral tablet everolimus 10 mg once daily till date. The case with nasopharynx as the primary site found initially with isolated solitary temporal lobe metastasis was treated with palliative external beam radiotherapy (EBRT) to the brain of 30 GY in 10 fractions and local EBRT 66 GY in 33 fractions to bilateral face and neck. The ACC of maxillary sinus involved the inferior wall of orbit and was treated with surgery followed by EBRT of 66 GY in 33 fractions to bilateral face and neck and is now under regular follow-up since 26 months.

DISCUSSION

According to the World Health Organization (2005), ACC is defined as "A basaloid tumor consisting of epithelial and myoepithelial cells in various morphological configurations, including tubular, cribriform, and solid patterns. It has a relentless clinical course and usually a fatal outcome."[7] The term ACC is still misleading as the tumor is not cystic.[8-10] The most cases arise in the minor salivary glands (60%). Palate, buccal region, maxilla, retromolar region, and lips are the common sites of involvement in the oral cavity.[11] The maxillary sinus ACC is the second most common sinonasal tumor.[12] and accounts for 10% of all sinonasal tract malignancies.[13] A recent review showed 74.3% of ACCs of the nasopharynx are presented at an advanced stage in the time of diagnosis.[14]

Gender predilection is an inconsistent feature in the literature. The peak age of incidence in ACC is 4th to 6th decades of life though cases have been reported in between ages of 10 and 96 years.[15] There are equal male and female distributions in ACCs.[5] Few data showed male predominance[16] in ACCs, whereas few showed female predominance.[1] Arsenic compounds, nickel, oak, or beech wood dust may be possible etiological factors.[17]

In this study, the majority were male, presented in the age group between 30 and 45 years, and hard palate as the primary. But, a large number of case studies are necessary for a significant data regarding the median age of presentation, incidence of the disease.

Histopathology

ACCs are poorly encapsulated infiltrative lesions with grayish pink appearance.[17] The characteristic histopathologic features of ACC is proliferation of round or cuboidal cells with scarce cytoplasm and large, oval and hyperchromatic nuclei, and cells are arranged in the form of islands or sheets surrounded by abundant hyaline stroma exhibiting pseudocystic structures.[18] Microscopic examination of ACC comprises epithelial and myoepithelial cells.[19] ACC has a distinct histopathological appearance. Histopathologically, it has three main growth patterns: (1) Cribriform, (2) tubular, and (3) solid.[19]

Histologically, a mixture of patterns is common. Classification is based on the predominant pattern. Tumor with more than 30% of the solid pattern is classified as the solid variant, indicating its more aggressive behavior.

The tubular patterns are well differentiated or Grade I and is characterized by slender tubules, solid cords, and glandular structures infiltrating a well-hyalinized background. Cribriform pattern is the most common pattern, moderately differentiated or Grade II and is characterized by invasive tumor islands with multiple holes (pseudocysts or pseudolumina) punched out in a "Swiss cheese" or sieve-like pattern. The solid pattern is poorly differentiated or Grade III and consists of large islands of carcinoma composed predominantly of myoepithelial cells with infrequent true lumina, lined with cuboidal epithelial

cells, and occasional pseudocysts. Stroma is usually fibrous and extensive hyalinization can occur. Mitotic figures and apoptotic cells are commonly seen in the high-grade or solid pattern. Necrosis is seen only in the solid pattern, often centrally located within cell nests and appearing as a come do appearance.[20,21] Mitotic figures and apoptotic cells are occasionally seen in the cribriform pattern. Perineural spread is commonly seen in all patterns. The tubular pattern has best prognosis, whereas cribriform pattern has intermediate and solid pattern has worst prognosis.[17]

In this study, out of six cases, three cases were a purely cribriform pattern, one with mixed tubular and cribriform pattern, one with the purely tubular pattern, one with purely solid pattern supporting the literatures.

Presentation

Most of the metastatic ACC remain asymptomatic for a long time.[22] Clinical signs and symptoms of ACC depend on the primary site and extent of the lesion. It can present as a painless slow-growing mass in the face or mouth. Locally advanced tumors may invade nerves, causing paresthesia and paralysis. ACC has a tendency to infiltrate neural structures and to spread perineurally.

Intracranial involvement is rarely seen.[3,23] Tumors of the lacrimal gland may cause vision impairment and proptosis. ACC is the most common primary epithelial malignancy in the lacrimal glands.[24] ACC is the second most common primary tumor of the trachea with a poor prognosis. ACC of the larynx may present with hoarseness and difficulty in breathing.[25]

Maxillary sinus primary may present with nasal obstruction, epistaxis, nasal discharge, swelling, facial pain, paresthesia, etc., mimicking inflammatory conditions resulting in a late diagnosis of the disease.[12,26] ACCs have a prolonged natural history and slow growth even in local recurrence and distant metastatic situations.[27] There is a high propensity of ACC for perineural invasion and early hematogenous spread.[28,29] Brain involvement may occur by direct extension of tumor.[17] Regional metastases are seen in <3% of cases,

Table 1: Demographic data with pre-treatment staging

Age in years	Sex	Site of the primary lesion	Histopathological subtype	TNM stage	Stage	Distant metastasis at presentation
35	F	Right hard palate	Mixed cribriform and tubular type	CT4N0M0	III	No
45	M	Left hard palate	Cribriform type	CT4N0M0	III	No
30	M	Right sided nasopharynx	Tubular type	CT4N0M1	IV	Temporal lobe
42	M	Right sided floor of mouth	Solid type	CT3N1M0	II	No
40	F	Left maxillary sinus	Cribriform type	CT4N0M0	III	No
60	M	Left hard palate	None	CT3N0M0	II	No

Table 2: Radiological findings and treatment

Case number	CT/MRI findings	Initial treatment	FU in months	Recurrence/ metastasis	Palliative treatment
Case 1	MRI: Mass on the right maxilla involving adjacent soft palate and hard palate	EMDA (PT4N0MX)→EBRT of 66 GY in 33 fractions to bilateral face and neck	28	-	-
Case 2	MRI: Left paramedian hard palate lesion, involving left pterygoid plates, pterygoid muscles, pterygomaxillary fissure, maxillary antrum	EMDA (PT4N0MX)→EBRT of 66 GY in 33 fractions to bilateral face and neck	18	-	-
Case 3	CECT: Mass on right sided nasopharynx involving posterior nasal cavity causing obliteration of B/L nasopharyngeal airway, eustachean tube, torus tubaris and fossa of rosenmuller MRI: Metastasis in right temporal lobe	EBRT of 66 GY in 33 fractions to bilateral face and neck along with 30 GY in 10 fractions to whole brain	-	-	-
Case 4	MRI: Mass in right side floor of mouth involving anterior half of tongue, genioglossus, hyoglossus, geniohyoid muscles, mandible with right level IA, IB lymphadenopathy	WLE+mandibulectomy+MND PT4N0MX→concurrent CTRT of 66 Gy radiotherapy in 33 fractions along with weekly cisplatin	24	B/L lung metastasis	Palliative CT with paclitaxel+cisplatin→tablet everolimus
Case 5	CECT: Mass in the left maxillary sinus involving nasal septum, inferior wall of orbit	EMDA (PT4N0MX)→EBRT of 66 GY in 33 fractions to bilateral face and neck	26	-	-
Case 6	CECT: Mass in the left maxillary sinus eroding posterolateral wall involving hard palate, left side nasopharyngeal wall	EMDA (PT4N0MX)→EBRT of 66 GY in 33 fractions to bilateral face and neck	15	-	-

FU: Follow-up, EMDA: Extended maxillectomy with degloving approach, CTRT: Chemoradiation, B/L: Bilateral, CT: Chemotherapy, MRI: Magnetic resonance imaging, EBRT: External beam radiotherapy, WLE: Wide local excision, MND: Modified neck dissections

whereas distant metastases are comparatively common with the lung being the most common site followed by bones, liver, brain and omentum.[30]

The present study showed all the patients had T3 or T4 lesions, the majority with T4 lesions, one patient had distant metastasis as temporal lobe metastasis at initial presentation, and one had N1 disease clinico-radiological, but post-operative pathology showed PT4N0 with margin positive, the patient developed bilateral lung metastasis after 2 years of completion of treatment.

Prognosis

ACC of minor salivary glands has worse prognosis than those of major salivary glands possibly due to more easy infiltration of the lesion of the minor salivary gland to extra glandular soft tissues and bone resulting increased dissemination of the tumour.[5] Solid histologic pattern, tumor size >4 cm, perineural invasion, delayed diagnosis, delayed treatment, surgical margin positive, recurrent local lesions, and distant metastases are associated with worse prognosis.[5]

Management

ACC is found in younger age groups in comparison to squamous cell carcinoma and is relatively resistant to treatment. Tumor markers have no significant role in determining the prognosis.[6] Treatment modalities depend on the stage of the tumor. It is difficult to prevent and predict the late local recurrence and distant metastases in ACC. There is no standard guideline for optimal treatment and outcome of the disease due to lack of prospective randomized multicentric trials. Surgical resection with possible widest margins with or without neck node dissection is the cornerstone of the treatment.[31] Neck node dissection depends on strong clinic-radiological suspicious of lymph node metastases. The majority cases present at an advanced stage during diagnosis and complete surgical resection remains difficult due to the larger size of the tumor and presence of nearby critical neurovascular structures.[32] Late diagnosis of ACCs contributes to poor prognosis of the disease.[33] Combination modality of treatment with surgery and radiotherapy is commonly required[1] and results in better overall survival.[16] The tumor cells extend well beyond the clinical or radiographic margins and undergo perineural invasion and spread. Therefore, surgery requires excision with widest possible margins.[5] In maxillary sinus ACC, due to slow spread, late manifestations of the disease, and complex anatomy of the maxilla, complete surgical resection with widest margin is difficult. Rehabilitation options in huge maxillary defects still need further exploration.

ACCs are radiosensitive but not radio curable. Post-operative radiotherapy improves locoregional control and overall outcome.[31,34] A recent series data showed no difference in survival, the rate of recurrence, and time of recurrence between treatment with combination modality of surgery and radiotherapy or surgery alone.[35] In the case of inoperable/unresectable tumor and patient refusal for surgery, primary radiotherapy is recommended. The role of CT is not established as an effective modality of treatment for ACC.[26] As prolonged survival is not unusual even after distant metastasis, CT should be best withheld in inoperable cases with local recurrence and distant metastasis until symptoms appear.[36] Clinical trials are going on for combination CT regimens treatment in local recurrent lesions or in distant metastases.[37] In ACC of head and neck, survival curve drastically declines at 10- and 15-year of survival even after combination treatment of surgery and radiotherapy.[14] Tumor growth rate and metastatic potential are independent tumor properties.[38] The 5-, 10-, and 15-year survival rates are 75%, 20%, and 10%, respectively.[38] 5-year overall survival for maxillary sinus primary is 62.9%.[26]

Five out of six cases in this study treated with surgical resection with possible widest margins, but one case showed post-operative margin positive and all the five cases received adjuvant radiotherapy (Tables 1 and 2).

CONCLUSION

The combination of surgical resection and radiotherapy is the main modality of treatment. Complete surgical resection with widest possible margins is the cornerstone of treatment. The role of CT is not clear. ACCs of head and neck presented at an advanced stage (Stage III/IV) and complete surgical resection with clear margins is difficult due to late presentation, the larger size of tumor and nearby critical neurovascular structures. There is no clear data regarding prevention and prediction of local recurrence and distant metastases and it needs further clarification. This study needs continuation with more data and a longer period of follow-up to draw a possible survival outcome.

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Original Article

Diagnosis and Declaration of Death: A Dilemma

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Abstract

Diagnosis and thereby declaration of death are one of the important duties of a clinician. Development in the field of advanced resuscitation techniques together with the benefits and need for cadaveric organ donation has made the need for scientific and correct diagnosis of brain deaths; where the brain stem is irreversibly damaged but heart is still beating and body is kept alive by ventilator, so as to make organ donation feasible. In the review we have tried to elaborate it in completeness. We have here tried to summarize the different accepted guidelines for clear cut diagnosis of brain death, such as to make it more precisely

Key words: Apnea testing, Asystolic donors, Brain death, Cadaveric organ donation, Cardiopulmonary resuscitation, Heart beating brain dead donors

INTRODUCTION

The diagnosis, confirmation, and certification of death are the vital necessary skills for any medical professional, especially those who are attached with big institutions and intensive care unit. Although confirmation of death is straightforward in the majority of cases, development in the field of advanced resuscitation techniques together with the need and benefits of cadaveric organ donation presents the clinicians working in the advanced center with the specific challenge to understand the essential distinctions between what is alive and what is dead. We have here tried to summarize the different accepted guidelines for clear cut diagnosis of brain death, such as to make it more precisely.

HISTORICAL PROSPECTS

A history is full of examples of failure to distinguish deep coma from death and phrases like, "graveyard shift" has emerged. The effectiveness of cardiopulmonary resuscitation in maintaining cerebral perfusion has challenged the concept that cardiac arrest is irreversible associated with death. Similarly, intervention in patients with terminal respiratory arrest secondary to an intracranial catastrophe has led to the emergence of a state of profound and irreversible apneic coma in patients whose heart continue to beat for as long as mechanical ventilation is continued. This second group of patients has led to the emergence of widely accepted criteria of brain death. Now, the key elements of brain death are irreversible loss of capacity to breathe, combined with the irreversible loss of capacity for consciousness.[1,2] Hence, death has been divided into two groups: Brain death and cardiopulmonary or somatic death. To distinguish between the two is important as outcomes of transplantation from organs retrieved from "Heart beating brain dead donors are considered superior to those from asystolic donors." Hence, nowadays, brain death has become inextricably linked with organ donations.

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FUNDAMENTAL CONCEPT OF DEATH

The possibility of successful resuscitation in a patient who has recently suffered a cardiac arrest together with the maintained circulation and somatic physiology in an individual, who is brainstem dead, highlights the inadequacy of using only the cardio-respiratory criteria in the diagnosis of death. The diagnosis of death by cardio-respiratory criteria can be done with confirmation if there is continuous asystole for more than 5 min duration. This should be done by continuous electrocardiogram and intra-

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arterial pressure monitoring and/or an echocardiography examination.[3] If there is return of signs of any cardiac or respiratory activity within this 5 min period, the check should be continued for another 5 min asystole period. At least two different sets of clinician, one of them being a neurologist or an anesthesiologist should confirm the diagnosis before the declaration of death.

Practical parameters for determining brain death in adults:[4,5]

A. Prerequisites: Brain death is the absence of clinical brain function when the proximate cause is unknown and demonstrable irreversible.
   1. Clinical or neuroimaging evidence of an acute central nervous system (CNS) catastrophe that is compatible with the clinical diagnosis of brain death
   2. Exclusion of complicating medical conditions that may confound clinical assessment 9 no severe electrolyte, acid-base, or endocrine disturbance)
   3. No drug intoxication or poisoning
   4. Core temperature ≥32°C.

B. The three cardinal findings in brain death are coma or unresponsiveness, the absence of brainstem reflexes, and apnea.
   1. Coma or unresponsiveness - no cerebral motor response to pain in all extremities (nail bed pressure and supraorbital pressure).
   2. The absence of brainstem reflex.
      a. Pupil
         i. No response to bright light
         ii. Size: Mid position (4 mm) to dilated (8 mm).
      b. Ocular movement
         i. No oculocephalic reflex 9 tested only when no fracture or instability of cervical spine is apparent)
         ii. No deviation of eyes to irrigation of each ear with 50 ml of cold water (allow 1 min after injection and at least 5 min between testing of each ear).
      c. Facial sensation and facial motor response
         i. No corneal reflex to touch with a cotton swab
         ii. No jaw reflex
         iii. No grimacing to deep pressure on nail bed, supraorbital ridge or temporomandibular joint.
      d. Pharyngeal and tracheal reflexes
         i. No response after stimulation of posterior pharyngeal wall with tongue depressure
         ii. No cough response to bronchial suction.
   3. Apnea testing performed as follows:
      a. Prerequisites
         i. Core temperature ≥36.5°C
         ii. Systolic blood pressure ≥90 mm Hg
         iii. Euvolumia-positive fluid balance in the previous 6 h
         iv. Normal $PaCO_2$-arterial $PaCO_2$ ≥40 mm Hg
         v. Normal PaO_2-pre-oxygenation to obtain arterial PaO_2 ≥200 mm Hg.
      b. Connect a pulse oximeter and disconnect the ventilator.
      c. Deliver 100% O_2, 6 L/min, into the trachea by placing a cannula at the level of the carina.
      d. Look closely for respiratory movements (abdominal or chest rising).
      e. Measure arterial PaO_2, PCO_2, and pH after approximately 8 min and reconnect the ventilator.
      f. If respiratory movements are absent and arterial PCO_2 is ≥60 mm Hg, the apnea test result is positive supporting the diagnosis of brain death.
      g. If respiratory movements are observed, the apnea test result is negative, suggesting no death as yet.
      h. Connect the ventilator if, during testing, the systolic blood pressure becomes ≥90 mm Hg or the pulse oximeter indicates significant oxygen desaturation and cardiac arrhythmias are present; immediately draw an arterial blood sample and analyze arterial blood gas. If PCO_2 is ≥60 mm Hg or PCO_2 increase is ≥20 mm Hg over baseline normal PCO_2, the apnea test result is positive (it supports the clinical diagnosis of brain death); if PCO_2 is ≤60 mm Hg or PCO_2 increase is ≤20 mm Hg over baseline normal PCO_2, the result is intermediate, and an additional confirmatory test can be considered.

Drug Intoxication

Drug intoxication represents a clinically significant reversible cause of coma and may complicate assessment on occasions where the patient has received an infusion of sedative drugs as part of their critical care treatment and when their brain injury is drug induced.[6] The most problematic of circumstances are those where drug elimination is impaired by reduced hepatorenal function, or where agents with long half-lives have been used. A possible approach should be as follow:

a. A period of observation of four times the elimination half-life of the agent involved to allow effective drug elimination. This approach is best suited to circumstances where short-acting agents like propofol and alfentanil have been given to patients with normal hepato-renal functions.
b. The administration of specific antagonists such as flumazenil or naloxone in circumstances where the residual effects of opioids or benzodiazepines are required.
c. Plasma analysis to confirm that a suspected sedative

is either not detected or at a sub-theraputic level. This opinion is particularly suited for agents with long or unpredictable half-lives, such as thiopental or phenobarbital.

d. A confirmatory test to demonstrate the absence of cerebral blood flow or perfusion, as cerebral angiography.
e. Despite this general guidance, the revised Academy of Medical Royal College Code remains permissive and give a clinician the liberty to dismiss the influence of sedative drugs in circumstances where there is independent evidence to suggest that the patient is brainstem dead as suggested by computed tomography of head or a prolonged period of malignant intracranial hypertension.
f. Other causes of apnea as some neuromuscular weakness from any cause, cervical spinal cord injury which causes respiratory paralysis. A nerve stimulator is used routinely to confirm the absence of residual drug related neuromuscular block.
g. Hypothalamic and anterior pituitary functions may be preserved to some extent for a certain period of times after the onset of brain death. The response of the immune system to stimulation is modified considerably after total and irreversible loss of CNS function.

Pitfalls in the Diagnosis of Brain Death

The following conditions can interfere with the clinical diagnosis of brain death so that the diagnosis cannot be made with certainty on clinical grounds alone. In such cases, confirmatory tests are recommended.

1. Severe facial trauma
2. Pre-existing pupillary abnormalities
3. The toxic level of any sedative drugs, aminoglycosides, tricyclic antidepressants, anticholinergics, antiepileptic drugs, chemotherapeutic agents, or neuromuscular blocking agents 16
4. Sleep apnea or severe pulmonary diseases resulting in chronic retention of CO_2.

Clinical Observations Still Compatible with the Diagnosis of Brain Death

These manifestations are seen occasionally and should not be misinterpreted as evidence of normal brainstem function.

1. Spontaneous spinal movements of limbs (not to be confused with pathological flexion or extension response)[7-9]
2. Respiration like movements (shoulder elevation and adduction, back arching, intercostal expansion without significant tidal volume
3. Sweating, blushing or tachycardia
4. Normal blood pressure in the absence of pharmacological support
5. The absence of diabetes in sipidus (normal osmolar control mechanism)
6. Deep tendon reflexes, triple flexion responses or Babinski's reflex.[10,11]

Confirmatory Laboratory Tests Supporting the Diagnosis of Brain Death

Brain death is a clinical diagnosis. Hence, repeat clinical evaluation after about 6 h. A confirmatory test is not mandatory but can be used as supportive data in which specific components of clinical testings cannot be reliably performed or evaluated. Remember to write down the names of the physicians interpreting the ancillary tests, as this will be needed in the declaration of death note.

1. Conventional angiography: No intracerebral filling at the level of the carotid bifurcation or circle of Willis is observed. The external carotid circulation is present, and filling of superior sagittal sinus may be delayed.[12]
2. Electroencephalography-no electrocerebral activity is present during at least 30 min of recording that adheres to the minimal technical criteria for electroencephalogram (EEG) recording in suspected brain death as adopted by American encephalographic society, including 16 channels EEG. It should include the absence of non-artefactual activities and no change should appear with auditory, visual or painful stimulation. Electrocardiographic artifact should be visible. No need is seen for the patient to be normothermic, but core body temperature should be above 90*F. If an EEG is obtained, the absence of EEG activity should be confirmed by a neurologist before the declaration of brain death. This should be noted in the patient's medical record.[13,14]
3. Transcranial Doppler ultrasonography:[15]
   a. Small systolic peaks in early systole occurring without diastolic flow or with the reverberating flow are indicative of very high vascular resistance associated with greatly increased intracranial pressure and lack of tissue blood flow.
   b. Previously documented Doppler signals are lost, because 10% of patients may not have temporal window that permits insonation, however, the initial absence of Doppler signals cannot be interpreted as consistent with brain death.
   c. Technetium-99-hexamethylpropyleneamineoxime brain scan; No uptake of isotope in brain parenchyma (hollow skull phenomenon) occurs, as interpreted by a nuclear medicine physician.
   d. Somatosensory evoked potentials: The N20-P22 response with median nerve stimulation is absent bilaterally. The recording should adhere to the minimal technical criteria for somatosensory evoked potentials recording in suspected brain

death as adopted by American encephalographic society.

Diagnosis of Brainstem Death in Children

Brainstem death is diagnosed in the same way in children of more than 2 months old. Diagnosis is made by two clinicians among whom one must be a pediatrician. In infants younger than 2 months of age, the diagnosis of brainstem death becomes difficult. Coma in this age group is often multifactorial. Although hypoxic encephalopathy remains the most likely cause of massive brain injury. It is often difficult to demonstrate structural brain damage, and thus, the preconditions are rarely met. In preterm infants of gestational age below 37 weeks, there is little evidence regarding normal brainstem reflexes and as such their absence is difficult to demonstrate, and thus, the diagnosis of brainstem death is inappropriate. There are certain guidelines for brain death in children.[16-18]

A. History: Consider the cause of coma so as to eliminate reversible and remediable conditions
B. Criteria for physical examinations
   1. Coma and apnea.
   2. The absence of brainstem functions.
      a. Fully dilated pupil
      b. Absence of caloric-induced eye movement
      c. Absence of bulbar musculature, corneal, gag, sucking, and rooting reflexes
      d. Absence of respiratory effort with standardized Apnea testing.
   3. There should be no hypotension or hypothermia
   4. Flaccid tone and absence of spontaneous or induced movements excluding activities initiated at spinal cord level
   5. The examination should remain consistent throughout the predetermined observation period.
C. Observation period according to age:
   1. 7 days to 2 months age: Two examinations and EEGs, 48 h apart.
   2. 2 months to 1 year age: Two examinations and EEG 24 h apart and/or one examination and an initial EEG showing elecrocerebral silence combined with a radionuclide angiogram showing absence of cerebral blood flow.
   3. Over 1 year age: Two examinations 12 and 24 h apart and EEG.

Although the guidelines are exhaustive, there are several fallacies:

1. In case of intrauterine injury, the duration of assault and its severity may be difficult to establish
2. Normal systemic arterial pressure is difficult to determine
3. The EEG and transcranial Doppler sonography may not be 100% reliable
4. The clinical examinations cannot be reliable due to immaturity.[17]

CONCLUSION

Diagnosis and thereby declaration of death are one of the important duties of a clinician. Social, professional, and sometimes legal complications are reported due to a misdiagnosed death. Hence, it should be carried out patiently and with proper documentations. Death consists of the loss of capacity for consciousness and the loss of the ability to breathe. Brainstem death occurs after neurological injury when the brain stem has been irreversibly damaged, but the heart is still beating and body is kept alive by a ventilator. Always two appropriately qualified clinicians are required to diagnose a brainstem death after exclusion of reversible cause of unconsciousness, confirmation of the absence of brainstem reflexes and completion of apnea testing. Cardiorespiratory death can be diagnosed after 5 min of observed asystole, long enough for irreversible damage to the brain stem to have occurred.

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Original Article

Comparison of Oral Metoprolol and Oral Pregabalin for Suppression of Hemodynamic Responses to Laryngoscopy and Tracheal Intubation

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Abstract

Background: Hemodynamic responses of laryngoscopy, intubation, and pain are powerful noxious stimulus which should be attenuated by the appropriate premedication, smooth induction, and rapid intubation. Laryngoscopy and tracheal intubation are such a noxious stimuli causing intense sympathetic hemodynamic response.

Aim: The aim of this study to know about the efficacy of oral metoprolol and oral pregabalin in decreasing this stress response.

Methods: Prospective, randomized, double-blinded, placebo controlled study in which adult the American Society of Anesthesiology I and II patients undergoing elective surgery of both the sexes were divided into three groups. Group A received metoprolol 100 mg, Group B received oral pregabalin 150 mg, and Group C received placebo orally. Baseline heart rate (HR), systolic, diastolic blood pressure (BP), and mean arterial pressure and before induction, after induction, at the time of laryngoscopy and at the end of 0, 1, 3, 5 and 10 min were recorded.

Results: When compared to metoprolol and pregabalin, there was a significant increase in HR and BP in the control group after laryngoscopy and tracheal intubation.

Conclusion: Metoprolol is found to be better than pregabalin in blunting the cardiovascular stress response to laryngoscopy and intubation.

Key words: Hemodynamic response, Laryngoscopy, Metoprolol, Pregabalin, Tracheal intubation

INTRODUCTION

Laryngoscopy and tracheal intubation are essential in providing general anesthesia, but produce sympathetic over drive by catecholamine release resulting in hypertension and tachycardia.[1] This is usually tolerated by healthy individuals, but susceptible patients are likely to overreact to the hemodynamic fluctuations.[2] Left ventricular compromise, myocardial ischemia, and cerebral hemorrhage can be precipitated by this sudden rise in blood pressure (BP).

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Numerous attempts have been done previously and are continuing to find out the suitable drug or technique to attenuate this intubation response. This involves the use of opioids, volatile agents, lignocaine, beta blockers, vasodilators, and calcium channel blockers. Since none of these drugs prove to be the best choice for attenuating the pressor response, the quest continues. The most commonly used drugs are benzodiazepines and opioids. The effects like variability in patients response, respiratory complications and post-operative nausea and vomiting, delay in recovery of bowel function with benzodiazepines and opioids. It creates the need to find a much more suitable drug with limited side effects. Recently, an increasing emphasis has been made on the use of non-opioid drugs as a part of multimodal regimen for decreasing anxiety and the intubation response. Many recent studies show that drugs such as gabapentin and pregabalin are known to decrease

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stress response due to laryngoscopy and intubation. Only minimal evidence is available in our literature related to the cardiovascular properties of pregabalin in patients undergoing surgery.[3,4]

Aim

Laryngoscopy and tracheal intubation are such a noxious stimuli causing intense sympathetic hemodynamic response. This study aims to know about the efficacy of oral metoprolol and oral pregabalin in decreasing this stress response.

METHODS

Prospective, randomized, double-blind, placebo-controlled study was conducted in the Department of Anesthesiology, Government Kilpauk Medical College Hospital, and Government Royapettah Hospital. 90 normotensive patients of both sexes in the American Society of Anesthesiology I and II physical status, between the age group of 18 and 45 years, who were posted for elective surgery under general anesthesia, were included in this study. Institutional Ethical Committee approval and written informed consent were obtained. They were divided into three groups: Group A - metoprolol group, Group B - pregabalin group, and Group C - placebo group. Exclusion criteria are patient refusal, Mallampati score >3, those with morbid obesity, end stage liver/renal disease, asthma, chronic obstructive pulmonary disease, hypertension, diabetes mellitus, and epilepsy. The two drugs were compared in terms of their effects on heart rate (HR), systolic BP (SBP), diastolic BP (DBP), and mean arterial pressure (MAP). All patients were assessed preoperatively by history, physical examination, routine laboratory tests, chest X-ray, and electrocardiogram. A pre-operative visit was made to allay the anxiety and to develop a good rapport. The patients were instructed to fast overnight and aspiration prophylaxis was advised. On the day of surgery, the patients were examined in the waiting room and the pulse rate, SBP, DBP, and MAP were recorded as the baseline value. An 18-gauge intravenous (IV) cannula was placed and the crystalloid infusion was started. All patients were premedicated with injection ranitidine 150 mg and injection ondansetron 4 mg IV Half an hour later patients were given injection glycopyrrolate 0.005 mg/kg IV, injection midazolam 0.05 mg/kg IV. On arrival in the operating room, the vitals parameters were monitored. All patients received fentanyl 0.02 mg/kg IV in the operating room. Then, induced with injection propofol 2 mg/kg IV and injection vecuronium 0.1 mg/kg was given to achieve muscle relaxation. Controlled positive pressure ventilation was done with 100% oxygen using bag and mask. A direct laryngoscopy was done 3 min after the injection of the muscle relaxant and the patients were intubated with appropriate size cuffed oral endotracheal tube. The patients who strained on laryngoscopy, duration of laryngoscopy took more than 15 s, when the second attempt was required and patients in whom the surgical procedure lasted for more than 3 h were excluded from the study. HR and BP (systolic, diastolic, MAP) were recorded at the 1st, 2nd, 3rd, 5th, and 10th min following intubation and were recorded as T0, T1, T3, T5, and T10, respectively. All patients were ventilated using oxygen and nitrous oxide mixture in the ratio of 40:60%. Muscle relaxation was maintained with additional doses of injection vecuronium 0.02 mg/kg. At the end of surgery, neuromuscular paralysis was reversed with injection neostigmine 0.04 mg/kg IV and injection glycopyrrolate 0.01 mg/kg IV. Patients were extubated after thorough oral suctioning. The patients were then shifted to the post-operative ward and observed for up to 24 h.

Statistical Methods

Descriptive and inferential statistical analysis have been performed in this study. Results on continuous measurements are presented on mean ± standard deviation (min-max) and results on categorical measurements are presented in number (%). The significance is assessed at 5% level of significance. Analysis of variance has been used to find the significance of study parameters between three groups of patients. Chi-square/Fisher's exact test has been used to find the significance of study parameters on categorical scale between two or more groups. Statistical software: SPSS.

RESULTS

A total of 90 patients were inducted into the study. In this study, there is no rise in HR and BP with a single dose of 100 mg metoprolol (in Group A) for the expected hemodynamic response to laryngoscopy and intubation and the HR and MAP (T0, T1, T3, T5, T10) are all below the baseline values. In Group B, with single dose of 150 mg pregabalin, the rise in HR, and MAP are not significant and reached the baseline within 10 min of intubation. Thus, it indicates that both the drugs were effective in blunting the pressor response to laryngoscopy and intubation when compared with the control group where there is highly significant rise in HR, BP, and MAP which are well above the baseline parameters until 10th min after intubation.

At the time of induction and at each minute of monitoring, HR in Group A is less than that of Group B which is less than that of Group C. At 5th min, HR in Group A and B are below baseline, but there is a significant rise in Group C (Table 1).

At the time of induction, Group A has less MAP than Groups B and C. At each minute of monitoring, mean

arterial pressure maintained below baseline in Group A, whereas in Group B there is a rise from baseline but it's insignificant. In Group C, there is a significant rise from baseline values (Table 2).

DISCUSSION

Although the patients are well anesthetized before performing laryngoscopy and tracheal intubation, reflex cardiovascular response to this noxious stimuli arises as described by Reid and Brace.[1] Orotracheal intubation with the use of laryngoscope normally needs elevation of epiglottis, thereby exposing the glottic opening. This maneuver causes sympathetic activation leading to tachycardia and hypertension. The increase in pulse pressure of around 10 mmHg is associated with 20% or more risk of any events occurring in the renal, cardiovascular, and central nervous systems in both hypertensive and normotensive individuals.[2] Many anesthetic techniques and different drugs such as opioids (fentanyl, remifentanil,[3] alfentanil), beta blockers (esmolol, labetalol, metoprolol, earlier bunitrolol, propranolol), calcium channel blockers (verapamil, diltiazem, nicardipine), vasodilators (nitroglycerin, sodium nitroprusside), IV lignocaine, and newer drugs like gabapentin,[6] pregabalin with various doses were tried to blunt this reflex pressor response, but none proved to attenuate this reflex fully. Many drugs used in the past to reduce this response is associated with some adverse effects.

Table 1: HR response

HR	Group A	Group B	Group C	*P* value
Pre-operative	79.9±4.84	88.7±11.4	84.8±11.5	0.004*
Pre-induction	79.9±4.84	88.7±11.4	84.8±11.5	0.004*
T0 (scopy)	80.5±8.05	98.16±9.80	106.4±14.4	<0.0001**
T1	83.4±6.6	100.6±10.25	109.7±10.77	<0.0001**
T3	80.1±5.82	96.46±11.5	104.66±11.49	<0.0001**
T5	76.0±6.65	88.1±8.57	96.2±9.15	<0.0001**
T10	73.86±5.90	84.8±7.04	86.6±10.47	<0.0001**

Data were expressed as mean±SD. *Means there was a significant difference in HR between the three groups (*P*<0.05). **Means there was a highly significant difference in HR between three groups (*P*<0.01). HR: Heart rate, SD: Standard deviation

Table 2: MAP

MAP	Group A	Group B	Group C	*P* value
Pre-operative	94.2±4.69	94.46±10.8	87±6.81	<0.0001**
Pre-induction	82.6±8.73	83.3±6.30	92.7±7.00	0.000**
T0 (scopy)	83.7±10.5	91.4±14.74	93.8±17.56	0.024*
T1	84.6±9.7	95.1±10.10	113.2±10.98	<0.0001**
T3	81.7±9.65	87.1±9.27	104.06±11.31	<0.0001**
T5	82.9±8.3	85.3±8.76	93.5±12.8	<0.0001**
T10	82.4±6.28	87.7±8.12	88.4±7.74	0.004*

Data were expressed as mean±SD. *Means there was a significant difference in HR between the three groups (*P*<0.05). **Means there was a highly significant difference in HR between three groups (*P*<0.01). MAP: Mean arterial pressure, SD: Standard deviation, HR: Heart rate

Jakobsen *et al.* used 100 mg metoprolol for hysterectomy under general anesthesia and found it to be useful in reducing the cardiovascular stress response. Poupak rahimzadeh and coworkers used metoprolol specifically in nasal surgeries and found it to be effective not only in blunting the laryngoscopic and intubation response but also less bleeding and clear field for the surgeon to operate due to hypotension caused by metoprolol. They concluded that repetitive doses or large doses are needed to do such effect. Recently, gabapentin and pregabalin are being used along with preedicant drugs to blunt the cardiovascular stress response occuring to laryngoscopy and tracheal intubation but with different doses and conflicting results.[5-7] Bockrader *et al.* did a comparison of the pharmacokinetics and pharmacodynamics of gabapentin and pregabalin. They found pregabalin to be distinct with better pharmacodynamics. In another study by Bashyam *et al.* between 600 mg of gabapentin with 150 mg of pregabalin, it has been found pregabalin to be better than gabapentin in maintaining the hemodynamics, sedation and anxiolysis without significant adverse effects. Hence, we took pregabalin 150 mg as another drug and compared its effect in blunting the response to laryngoscopy and intubation metoprolol 100 mg. In our study, there was a significant rise in HR and BP following laryngoscopy and intubation in the Group C. This is consistent with the study done by Mullet *et al.* In our study, we found there is no rise in HR and BP with a single dose of 100 mg metoprolol (in Group A) for the expected hypertensive and tachycardic response to laryngoscopy and intubation and the HR and MAP are all below the baseline values. This is consistent with the study done by Saarnivaara *et al.* In Group B, with single dose of 150 mg pregabalin, the rise in HR and MAP is not significant and reached the baseline within 10 min of intubation. This result is consistent with the study done by Talikoti *et al.* Similarly, Rastogi *et al.* used two different doses of pregabalin to find out the clinically effective and safe dose during airway manipulation. The response is found to be dose-dependent and 150 mg pregabalin reduced the stress response significantly and maintained stable hemodynamics intraoperatively without any prolongation in the recovery time. The mechanism by how pregabalin blunts the cardiovascular effects to laryngoscopy and intubation is not clear till now but it has been postulated to be due to its action against nociceptive receptors. This mechanism most likely modifies the calcium current selectively by binding to the voltage-gated Ca^{2+} channels and act in the same way as calcium channel blockers in maintaining the cardiovascular hemodynamics. As beta blockers are known to reduce HR and BP even in the intraoperative period also, there is no occurrence of bradycardia or hypotension which necessitates treatment. Though pregabalin is known to have sedative effect,[3] there is no significant drowsiness in

patients who were given pregabalin. This is consistent with the study done by Gupta *et al.*

CONCLUSION

With this study, both metoprolol and pregabalin are found to be effective in attenuating the cardiovascular response to laryngoscopy and intubation when compared with the control group. The blunting of HR response is less with pregabalin than with metoprolol. Hence, we conclude that metoprolol is found to be better than pregabalin in blunting the cardiovascular stress to laryngoscopy and intubation.

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Original Article

Pattern of Fractures and Dislocations in Road Traffic Accident Victims in a Tertiary Care Institute of Central India

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Abstract

Introduction: Due to the rapid economic transition, there is an increase in a number of automobiles on the road and rapid increase in road traffic accident (RTA).

Aim: The study was conducted with the aim to evaluate the pattern of different types of fractures and dislocations in the RTA victims in a tertiary care institute.

Materials and Methods: The study was conducted at Chirayu Medical College and Hospital situated on the Bhopal-Indore State highway with heavy traffic load. The data of 748 RTA victims admitted to the hospital were collected from January 2013 to December 2015 and analyzed.

Results: Most of the victims were young in the age group of 15-30 years - 254 (33.9%). Most of the accidents were due to the driving of two wheeler 440 (58.8%) patients.

Conclusion: As seen there is an alarming increasing trend of trauma cases in the last decade. Trauma causes significant financial and social burden requiring prioritized focus and attention. A cost-effective policy should be kept in mind in the triage of trauma patients. Similar studies help in making policy and planning for trauma patients and decrease the morbidity and mortality. Further research should be done to better understand RTA and prevention strategies.

Key words: Head injury, Road traffic accidents, Trauma

INTRODUCTION

During 2008, road traffic injuries (RTI) ranked fourth among the leading causes of death in the world.[1] Nearly, 1.3 million people die every year on the world's roads and 20-50 million people suffer non-fatal injuries, with many sustaining a disability as a result of their injury.[2] RTI are the leading cause of death among young people aged 15-29 years and cost countries 1-3% of the gross domestic product.[2,3]

The World Health Organization in its international conference on road traffic accident (RTA) noted the importance of adequate data on traffic injuries. Indeed, accurate estimates of the public health burden of RTA can establish the priority of this public health problem and provide a rational basis for policy decisions.[4,5]

India has just 1% of the total vehicles in the world but it contributes to 6% of the global RTAs.[6] Estimates suggest that Delhi has the highest number of road crash fatalities in India.[7]

Hence, this study was conducted to study the socio-demographic profile of victims with RTI and pattern of fractures and dislocations sustained.

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MATERIALS AND METHODS

After Ethical and Research Committee clearance, the data were retrospectively analyzed. All trauma case files between January 2013 and December 2015 were retrieved from medical record section through a proper channel and all

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data's mentioned in case record format were extracted from individual files. A total of 748 cases were found in which fracture or dislocation of bones or some joint occurred, depending on these cases observations and results were laid down. A detailed history and examination of all patients were done with regards to age, sex, injury type (blunt/penetrating), and mode. Apart from these injury patterns, causes of head and spinal cord injury were also noted. Any injury on the road without the involvement of a vehicle (e.g., a person slipping and falling on the road and sustaining injury) or injury involving a stationary vehicle (e.g., persons getting injured while washing or loading a vehicle) was excluded from the study.

RESULTS

In our study, the majority of the patients belong to the 15-30 and 31-50 years age group. A total number of male patient in our study was 598 (79.4%), whereas the number of female patients, in our study, was only 150 which comprise only 20.05% of the total patient (Table 1).

In our study, a maximum 440 (58.8%) cases were from fall from the motorcycle followed by injury from cycle accident which were 122 (16.3%), the least common mode of injury was hit by an animal which was only 1.5% in our study (Table 2).

In our study, multiple fractures in which more than two sites involved were found in majority 123 (21.39%) of the cases followed by fractures of the tibia and fibula 73 (12.69%). Spine and patella fractures were the least commonly found fracture in our study which accounts for only 08 (1.39%) and 6 (1.04%) cases, respectively (Table 3).

In our study, wrist joint was the most commonly dislocated joint found in 76 (61.78%) of the cases followed by elbow joint dislocation found in 32 (18.49%) of the cases. Ankle joint was the least commonly affected joint in our study which was found only in 15 (8.67%) of the cases (Table 4).

Table 1: Demographic profile of the patients

Variables	*N*=748 (%)
Age	
<15	160 (21.3)
15-30	254 (33.9)
31-50	250 (33.4)
>50	84 (11.2)
Sex	
Male	598 (79.94)
Female	150 (20.05)

Table 2: Mode of injury

Mode of injury	*N*=748 (%)
Motor cycle fall	440 (58.8)
Bicycle	122 (16.3)
Pedestrian	72 (9.62)
Car accident	72 (9.62)
Heavy motor vehicle	30 (4.01)
Animal	12 (1.60)

Table 3: Distribution of the patients according to the bones involved in fracture

Bone	*N*=575 (%)
Head	18 (3.13)
Spine	12 (2.08)
Radius and ulna	46 (8.00)
Tibia and fibula	73 (12.69)
Radius only	34 (5.91)
Humerus	45 (7.82)
Ulna only	28 (4.86)
Tibia only	22 (3.82)
Femur	16 (2.78)
Hand	62 (10.78)
Spine	8 (1.39)
Foot	42 (7.30)
Pelvis	14 (2.43)
Fibula only	32 (5.56)
Patella	06 (1.04)
Multiple fractures	123 (21.39)
Total	575 (100)

Table 4: Distribution of the patients according to the site of dislocation

Joint dislocation	*N*=173 (%)
Shoulder	21 (12.13)
Ankle	15 (8.67)
Elbow	32 (18.49)
Hip	12 (6.93)
Wrist	76 (61.78)
Knee	17 (13.82)
Total	173 (100)

DISCUSSION

Due to the rapid economic transition, there is an increase in a number of automobiles on the road and rapid increase in RTA. In this study, most of the injuries were seen in age group of 15-30 years - 254 (33.9%). Similar findings were noted in a study which was done by Swarnkar *et al.* in a hospital in central India.[8] This age group is the most productive age group, and trauma and its morbidity result in a huge economic setback for the country. A total number of male patient in our study was 598 (79.4%), whereas the number of female patients in our study was only 150 which comprise only 20.05% of the total patient. Similarly, a male predominance was seen in other studies which were done in India,[9,10] which could have occurred due to the fact that in India, males are still the main working community

and are hence more exposed to work-related stress and workplace injuries.[11]

In our study, a maximum 440 (58.8%) cases were from fall from the motorcycle followed by injury from cycle accident, which were 122 (16.3%). Two wheeler fall injury represented the majority of victims sustaining injury as a result of being knocked by a vehicle, motorbike, or cycle. This shows the erratic behavior and reckless driving on the road besides this condition of road light is not adequate on the highway. Our findings are consistent with the study done by Mishra *et al.*[12] In our study, multiple fractures in which more than two sites involved were found in majority 123 (21.39%) of the cases followed by fractures of the tibia and fibula 73 (12.69%). Spine and patella fractures were the least commonly found fracture in our study which accounts for only 8 (1.39%) and 6 (1.04%) cases, respectively. A similar result was obtained by Mishra *et al.* and Meena *et al.*[12,13] In our study, wrist joint was the most commonly dislocated joint found in 76 (61.78%) of the cases followed by elbow joint dislocation found in 32 (18.49%) of the cases. Ankle joint was the least commonly affected joint in our study which was found only in 15 (8.67%) of the cases. A similar result was obtained by Lalwani *et al.*[14]

CONCLUSION

In India, trauma is a significant social and financial burden, which requires attention. An effort has been made to decrease the morbidity and mortality which are associated with fall and RTAs in this region. Improvement in infrastructure and behavior change can decrease the burden of RTAs in India. This study could assist in raising the profile of RTAs as a public health problem which needs to be addressed as a preventable cause of RTAs.

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Original Article

Oral Squamous Cell Carcinoma in Patients Younger than 40 Years: A 10 Year Retrospective Study

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Abstract

Background: Oral squamous cell carcinoma (OSCC) is one of the leading causes of morbidity and mortality in India. It is considered as a disease of elderly with the majority of cases found in the fifth to eighth decades of life. Recently, it has been reported that there is an increasing incidence of OSCC in younger individuals, and this is believed to be etiologically distinct from OSCC in older adults, due to less significant exposure to the common risk factors such as tobacco and alcohol and a more aggressive course.

Materials and Methods: Archival records of 10 years were reviewed and all the cases of OSCC below 40 years with complete records were retrieved from the Department of Oral Pathology and Microbiology, Government Dental College, Thiruvananthapuram.

Results: A total of 740 histologically proven cases of OSCC were obtained. Out of this, 61 patients (8.3%) were under 40 years of age. Among these, 46 (75.4%) were males and 15 (24.6%) were females. The tongue was the most common site (40; 65.6%). Moderately differentiated carcinoma was the most common histological subtype (40; 65.6%). Family history had a significant influence in patients younger than 40 years (8.2%) when compared to those >40 years (1%).

Conclusion: The demographic details of OSCC in patients <40 years in a tertiary health care center have been described. There is increasing the incidence of OSCC in young patients in the recent years. Although the biological behavior was indistinct from that of the older, family antecedents of malignancy were higher in the younger age group. Furthermore, most of the cases were reported in the advanced stage. This warrants the need for oral health programs for screening, early detection, management, and proper follow-up of oral cancer.

Key words: Epidemiology, Oral squamous cell carcinoma, Young patients

INTRODUCTION

Squamous cell carcinoma is the most common of oral malignancies, holding the eighth position among the cancers worldwide. It is known that oral cancer incidence increases with age. Recent studies suggest that 4-6%[1] of oral squamous cell carcinoma (OSCC) occur at ages younger than 40 years. Several studies examining risk factors for oral cancer in the young provide evidence that many younger patients have never smoked or consumed alcohol, which are the recognized risk factors in older groups. Besides the duration of exposure may be too short for malignant transformation to occur. Information on many aspects of etiology for this disease in the young implicating occupational, familial risk, immune deficits, and virus infection are meager. The purpose of this study is to determine the frequency of OSCC in individuals <40 years and to describe the distribution according to gender, site, habits, genetic predisposition, and histopathologic types of OSCC reported over a period of 10-year in a tertiary health care center in Southern Kerala, India. We would like to add a note that this institute being the only tertiary dental health care center in Southern Kerala a relatively good cross-section of diagnosed non-healing ulcers and lesions suggestive of cancer are referred to this institution.

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MATERIALS AND METHODS

The 10 years archival records of patients who were histologically diagnosed with OSCC at the Department of Oral Pathology and Microbiology, Government Dental College, Trivandrum, between 2004 and 2014 were retrospectively reviewed. The data extracted were analyzed to determine the frequency of OSCC in individuals younger than 40 years and its distribution according to gender, site, habits, genetic predisposition, and histopathologic types. The patients were divided into 4 groups according to their ages at diagnosis: Group 1 (20-40 years); Group 2 (41-60 years); Group 3 (61-80 years); and Group 4 (above 80 years). The anatomical sites reviewed in this study included lip, buccal mucosa, alveolus, hard palate, tongue, floor of mouth (FOM), and gingiva. Variables analyzed for each patient included age, gender, site, family history, habits, and histologic grading. All variables were entered in a database for analysis. Unfortunately, recurrent OSCC patients very often directly report to Regional Cancer Centre, Trivandrum, and are lost to follow-up. Hence could not be included as a variable in this study.

RESULTS

A total of 740 patients with OSCC in the 10-year period from 2004 to 2014 were retrospectively analyzed in the present study. Among this 61 patients were below the age of 40 years and 679 patients were above 40 years. The mean age at presentation was 30.7 years. A significantly high male preponderance was noted in patients younger than 40 years ($P = 0.039$). There were 46 (75.4%) males and 15 (24.6%) females in the present study, with a male to female ratio of 2:1.

The tongue was the most common site identified with 40 (65.6%) patients followed by buccal mucosa in 12 (19.7%), alveolus in 6 (9.8%), FOM in 2 (3.3%) and palate in 1 (1.9%). Family history of OSCC was present in 5 (8.2%) patients who were younger than 40 years ($P < 0.01$), when compared to only 1 patient (0.1%) older than 40 years. More than half of the patients were habituated to either tobacco chewing, smoking or alcohol.

Histological confirmation was present in all 61 patients that were considered in the present study. Among these, 40 (65.6%) were moderately-differentiated tumors, 16 (26.2%) were well differentiated, and 5 (8.2%) were poorly differentiated tumors.

The statistical data of the considered variables in relation to age are represented in Tables 1-3 and Graphs 1-3.

Table 1: Percentage distribution of the sample according to selected variables

Variables	Number (%)
Age	
20-40	61 (8.3)
41-60	300 (40.6)
61-80	347 (47.0)
>80	31 (4.2)
Gender	
Male	467 (63.2)
Female	272 (36.8)
Site	
Buccal mucosa	228 (30.9)
Tongue	284 (38.4)
Alveolus	148 (20.0)
Hard palate	26 (3.5)
FOM	30 (4.1)
Gingiva	9 (1.2)
Lip	14 (1.9)
Grading	
WDSCC	262 (35.5)
MDSCC	445 (60.2)
PDSCC	32 (4.3)
Family history	
Nil	6 (0.8)
Tobacco	526 (71.2)
Alcohol	81 (11.0)
Pan chewing	243 (32.9)
Trauma	88 (11.9)
Family history	6 (0.8)

FOM: Floor of mouth, WDSCC: Well-differentiated squamous cell carcinoma, MDSCC: Moderately differentiated squamous cell carcinoma, PDSCC: Poorly differentiated squamous cell carcinoma

Table 2: Association between factors like gender, site and grading of cancer with age

Variables	Count (%)		χ^2	*P*
	≤40	>40		
Gender				
Male	46 (75.4)	421 (62.1)	4.27*	0.039
Female	15 (24.6)	257 (37.9)		
Site				
Buccal mucosa	12 (19.7)	216 (31.9)	21.72**	0.001
Tongue	40 (65.6)	244 (36.0)		
Alveolus	6 (9.8)	142 (20.9)		
Hard palate	1 (1.6)	25 (3.7)		
FOM	2 (3.3)	28 (4.1)		
Gingiva	0 (0.0)	9 (1.3)		
Lip	0 (0.0)	14 (2.1)		
Grading				
WDSCC	16 (26.2)	246 (36.3)	4.21	0.122
MDSCC	40 (65.6)	405 (59.7)		
PDSCC	5 (8.2)	27 (4.0)		

**Significant at 0.01 level, *Significant at 0.05 level. FOM: Floor of mouth, WDSCC: Well-differentiated squamous cell carcinoma, MDSCC: Moderately differentiated squamous cell carcinoma, PDSCC: Poorly differentiated squamous cell carcinoma

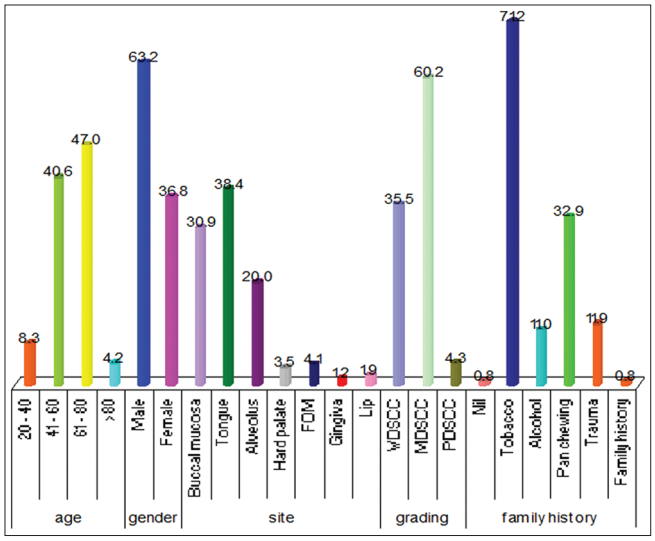
DISCUSSION

With the data collected from our Institutional Archives, this study confirms that OSCC affects predominantly older

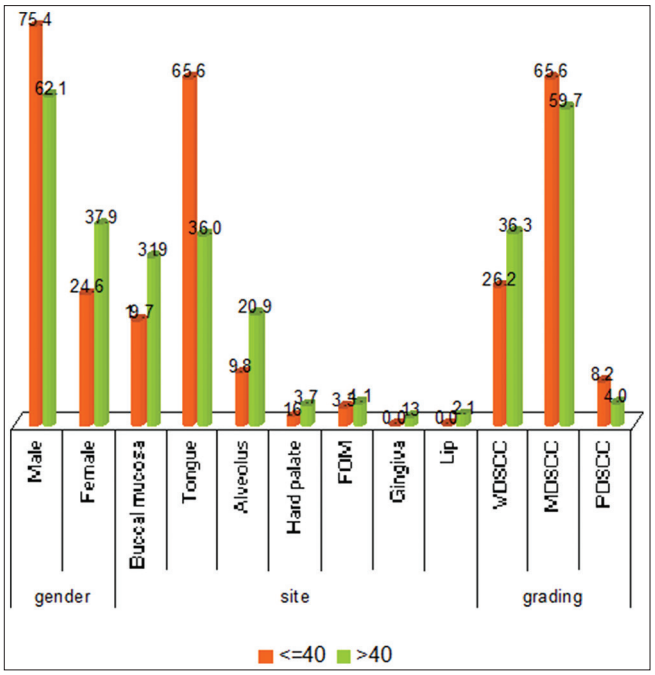
Table 3: Association between history and age

Variables	Count (%)		χ^2	*P*
	≤40	>40		
Any history				
No	58 (95.1)	675 (99.6)	13.92**	0.000
Yes	3 (4.9)	3 (0.4)		
Tobacco				
No	18 (29.5)	195 (28.8)	0.02	0.902
Yes	43 (70.5)	483 (71.2)		
Alcohol				
No	51 (83.6)	607 (89.5)	2.01	0.156
Yes	10 (16.4)	71 (10.5)		
Pan chewing				
No	52 (85.2)	444 (65.5)	9.9**	0.002
Yes	9 (14.8)	234 (34.5)		
Trauma				
No	49 (80.3)	602 (88.8)	3.82	0.051
Yes	12 (19.7)	76 (11.2)		
Family history				
No	56 (91.8)	677 (99.9)	45.03**	0.000
Yes	5 (8.2)	1 (0.1)		

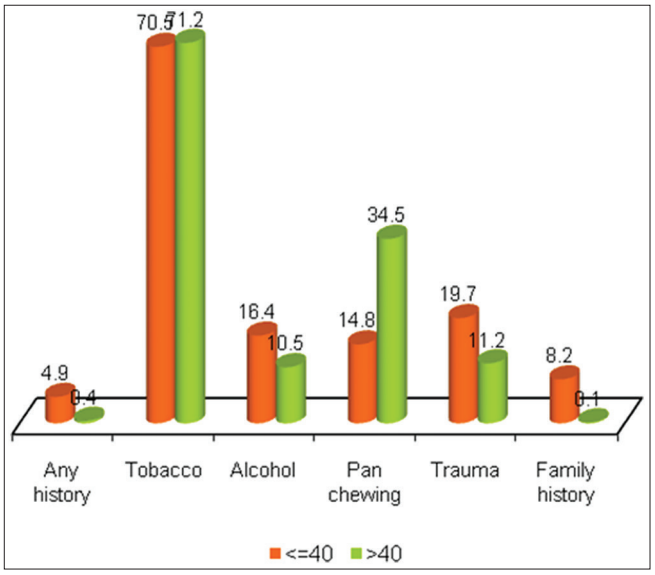
**Significant at 0.01 level



Graph 1: Percentage distribution of the sample according to selected variables



Graph 2: Association between factors like gender, site and grading of cancer with age



Graph 3: Association between history and age

patients (91%); however, there is a much higher incidence of this disease in the young patients (8.3%) than that reported by other authors, which has varied from 0.4% to 3.6%.[1,6,7] There is an overall male predominance in all intraoral subsites in patients younger than 40 years which is in agreement with most of earlier studies.[2,4,16]

The cause of OSCC is complex and multifactorial, and for young patients with OSCC possible risk factor seems to present a different pattern from that of the older patients.[13,17] As a result, many authors have tried to investigate and propose risk factors for OSCC in young subjects. This was also the focus of this study, with factors such as tobacco chewing, smoking, pan chewing, alcohol consumption, trauma, and family history taken into account. No statistical difference was found between the older and younger patients with regard to being a habitual consumer of tobacco and/or alcohol or not. Therefore, the higher occurrence of OSCC in patients over 40 years old seems to be due to a longer exposure and heavier consumption of tobacco and/or alcohol than to the habit itself. Although men and women in the older group were almost equally exposed to abnormal habits, men were more prone (60% vs. 7% for women) to consume tobacco, alcohol or pan chewing heavily, which explains the predominance of OSCC in older male patients.[4,8,9]

In contrast, OSCC of younger age group was almost equally distributed among those who were smokers and/or drinkers as compared to those who were not. Earlier, we had reported a case series of OSCC in non-habituate female patients younger than 40 years from our own department.[5] This points out that other factors such as genetic susceptibility, viral infection, hormonal and immunologic modulations, and other systemic diseases could have an upper hand in initiating and promoting OSCC.

A significant correlation ($P < 0.0001$) between OSCC in young patients and familial history of malignant neoplasm was obtained. In this study, we could not do any genetic evaluation but it was reported earlier from our own department that p53 was mutated in 51.5% of tumors in young patients, and an intense p53 expression was associated with large sized tumors[5] Such a relationship presumably indicate that this risk factor carries great weightage for young patients considering that the proposed risk factors like alcohol consumption and tobacco usage need a longer period of exposure for OSCC to develop.

Another important finding was that, in the younger patients, the disease occurred with greater frequency along the lateral border of the tongue (65.6%), whereas in the older patients this site was affected in only 36% of cases. This was in accordance with the study of Annertz *et al.*, who reported that 5.5% of tongue cancers occurred in patients aged 20-39 years, posterolateral border being the most implicated site.[15,18] To date, none of the studies have came up with any factor associated with the predominance of OSCC in the tongue of the young patients.[10-12]

Histopathological grading of tumors in this study showed that the majority of the tumors were moderately differentiated. This was not of much statistical significance and was consistent with the other studies done over the years.[6,7,11-14]

CONCLUSION

Recent studies have suggested that OSCC in young adults tends to be more frequently anaplastic resulting in a more aggressive behavior and poor prognosis.[2,3,16] As the survival rates are good if diagnosed in early stages of the disease, the need for early detection and clinical staging should be stressed. More in-depth studies are needed to investigate the etiology of intraoral cancer in younger patients. Any ulcer or lesion at a younger age should not be dismissed easily, even if it is not habit related. A high index of clinical suspicion should be attached in high incidence areas that would lead to further investigation and detection of the disease in an early stage, which is perhaps the only way to ensure a good prognosis.

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Original Article

Comparative Study of Lateral Approach and Parascalene Approach of Brachial Plexus Block for Upper Limb Surgeries using Nerve Stimulator

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Abstract

Background: Upper limb surgery previously done under general anesthesia has now been revolutionized with the advent of various regional blocks. The advantages of two approaches - lateral and parascalene for brachial plexus blockade - are discussed in this study and compared.

Aim: A comparative evaluation of brachial plexus blockade using supraclavicular lateral approach and parascalene approach.

Materials and Methods: A prospective, randomized, comparative study with 60 patients of American Society of Anesthesiologists Physical Status I and II category of both sexes in the age group of 20-50 years posted for upper limb surgeries formed the study group. Patients were allocated into two groups (Group A - lateral approach and Group B - parascalene approach), and the block was performed using a nerve stimulator.

Result: Parascalene approach was found to have statistically significant advantages over the lateral approach in terms of less time to perform block, more success rate, and less vascular complications.

Conclusion: It can be concluded that supraclavicular brachial plexus block by parascalene approach is associated with minimal adverse events with high success rate in comparison to lateral approach.

Key words: Lateral approach, Nerve stimulator, Parascalene approach, Supraclavicular brachial plexus block

INTRODUCTION

Brachial plexus blockade is gaining popularity day by day for upper extremity surgery because it lends a lot of advantages over general anesthesia.[1,2] It is possible and desirable for the patient to remain awake intraoperatively and ambulatory postoperatively. Patients who present for surgery with an upper extremity injury may improve as soon as pain has been relieved with a successful blockade. Various approaches for successful performance of the blocks and for reducing the complication have been described. The present study on brachial plexus blockade-a comparative study on supraclavicular lateral approach with parascalene approach was taken, as studies comparing both these approaches are much less and devoid of complications such as pneumothorax (usually associated with classical subclavian perivascular approach). Moorthy introduced the modified lateral paravascular approach of the supraclavicular block. Vongvises and Panijayanond described parascalene approach in 1979.

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MATERIALS AND METHODS

A prospective, randomized, comparative study of 60 patients of American Society of Anesthesiologists Physical Status (ASA PS) I and II category of both sexes in the age group of 20-50 years posted for upper limb surgeries in the

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Department of Orthopedics and Department of Plastic Surgery, Government Kilpauk Medical College Hospital and Government Royapettah Hospital, were included in the study. Institutional Ethical Committee approval and informed consent were obtained. Patients were allocated into two groups: Group A ($n = 30$) receiving supraclavicular brachial plexus block using lateral approach and Group B ($n = 30$) receiving supraclavicular brachial plexus block using parascalene approach. Brachial plexus block was performed by supraclavicular block technique assisted with nerve stimulator. Inclusion criteria are all consented patients of both sexes weighing between 50 and 70 kg and aged between 20 and 50 years belonging to ASA PS I and II category undergoing upper limb surgeries. Exclusion criteria are patient refusal, those with pre-existing coagulation disorders, peripheral neuropathy, allergy to any of the drugs used in the study, any distortion of local anatomy, contractures, local infection, previous history of surgery involving brachial plexus, and patients on anticoagulant therapy. ASA PS III and IV and failed block were other exclusion criteria. Patients were evaluated preoperatively both clinically and with routine baseline investigations and assessed for fitness. Patients selected were counseled about the risks and benefits involved in performing the block. After getting informed and written consent, patients willing to be included in the study were enrolled. All patients were kept in nil per oral state at least for 8 h before the procedure. Intravenous access secured with 18-gauge intravenous cannula. Local anesthetic test dose was done. Injection ranitidine 50 mg and injection ondansetron 4 mg were given intravenously 30 min before the procedure and sedated with injection midazolam (0.02-0.05 mg/kg). Boyle's machine, suctioning equipment, emergency intubation cart, and manual resuscitation bag with mask were kept ready. The procedure was carried out in the theater where facilities for resuscitation were available. Drugs used were 0.5% bupivacaine vial and 2% lignocaine with adrenaline (1:200,000) vial. Intra- and post-operative monitors used were pulse oximeter, non-invasive blood pressure (NIBP), and electrocardiogram (ECG). Initially, the pre procedure parameters were recorded, i.e., pulse rate, BP, SpO_2, and ECG. Then, block was administered; these parameters were monitored continuously except the NIBP, which was recorded intermittently. Patients were observed vigilantly for the development of any complications. Surface landmarks: The needle puncture site in Group A was 1 cm above the clavicle at the junction of medial two-third and lateral one-third of the clavicle. After raising a skin wheal, a 22-gauge short bevel 50 mm insulated needle was directed medially and toward the plane of interscalene groove, parallel to clavicle. The needle insertion point in Group B was identified by drawing a line from Chassaignac's tubercle to midpoint of the clavicle. The entry point of the block was at the junction of the upper two-thirds and lower one-third of the line drawn. The skin and subcutaneous tissue is infiltrated with local anesthetic solution. A 22-gauge, 50 mm long insulated short bevel needle, directed posteriorly at right angle to the skin. In both groups, the block was performed using a nerve stimulator connected to the proximal end of the needle which is set at 1 mA. The patient may feel discomfort if more than 1 mA current is used. The needle position is adjusted while decreasing the current to 0.5 mA with a sustained distal motor contraction response. A cough from the patient is a warning sign that the pleura is being contacted by the needle. Incremental injection of 15 ml of 0.5% bupivacaine with 15 ml of 2% lignocaine with adrenaline (1:200,000) injected slowly with intermittent aspiration. After injecting the local anesthetic, the block is tested for both sensory (using pin prick) and motor (using muscle power) and is compared with same stimulation or power in the contralateral arm using the Hollmen scale. Onset of blockade means minimum Grade 2 and complete blockade means minimum Grade 3 of Hollmen scale. Motor block is evaluated by thumb abduction (radial nerve), thumb adduction (ulnar nerve), thumb opposition (median nerve), and flexion of the elbow in supination and pronation of the forearm (musculocutaneous). Rescue analgesia was achieved with injection fentanyl 1-2 mcg/kg. Patients with failed block are excluded from the study. Postoperatively patient was monitored for 24 h. Baseline vital signs pulse rate/BP/SpO_2 were recorded and monitored. Time required for performing the block, onset, and completion of blockade, duration of blockade, level of sensory block to pinprick, successful blockade, complications of the block, and rescue analgesia was assessed. Data were analyzed using independent sample *t*-test performed in SPSS 17.

RESULTS

There was no statistically significant difference ($P > 0.05$) in population characteristics in lateral and parascalene approach group (Table 1).

Time to perform block is 4.7 ± 0.92 min and 2.9 ± 0.84 min in Group A and Group B, respectively. The difference was statistically significant ($P = 0.0001$). Time for onset of the sensory block is 6.13 ± 1.28 min and 6.2 ± 1.42 min in Group A and Group B, respectively. There was no significant difference ($P = 0.8915$). Time for onset of motor block is 11.87 ± 1.68 min and 11.93 ± 1.78 min. There was no significant difference ($P = 0.8801$). The procedure was more successful in the Group B nearly about 93.3% compared with 70% of the Group A. The difference was statistically significant ($P = 0.0453$) (Table 2).

No complications in the Group B and 7 cases of complications such as vessel injury in Group A. This difference was statistically significant ($P = 0.0053$). The

Table 1: Population characteristics

Analysis	Group A	Group B	*P* value
Age (in years)	36.6±11.6	35.4±10.8	0.5385
Sex (M: F)	80:20:00	60:40:00	0.159
Weight (in kg)	59.4±6.3	57.1±7.0	0.1693

Table 2: Analysis of outcome of the blocks

Analysis	Group A	Group B	*P* value
Time to perform block	4.7±0.92	2.9±0.84	0.0001
Time for onset of sensory block	6.13±1.28	6.2±1.42	0.8915
Time for onset of motor block	11.87±1.68	11.93±1.78	0.8801
Success rate	70	93.3	0.0453

Table 3: Analysis of outcome of the blocks

Analysis	Group A	Group B	*P* value
Complications	7	0	0.0053
Rescue analgesia (%)	30	6.70	<0.05
Level of sensory block to pin prick (shoulder level) (%)	0	76.70	<0.05

rescue analgesia requirement in the Group B (6.7%) is less than compared with 30% of the Group A. This difference was statistically significant ($P < 0.05$). The level of sensory block to pinprick up to the level shoulder level in the Group B (76.7%) is more than compared with Group A. This difference was statistically significant ($P < 0.05$) (Table 3).

DISCUSSION

Supraclavicular technique was chosen for this study because it provides a rapid onset, dense, and predictable anesthesia with a high success rate. In this study, two approaches of the supraclavicular block are compared. Kulenkampff in Germany, in 1911, performed the first percutaneous supraclavicular approach. This technique was later published, in 1928, by Kulenkampff and Persky (classical) approach the subclavian perivascular approach by Winnie and Collins, in 1964, parascalene approach by Vongvises and Panijayanond in 1979. Vongvises and Panijayanond described parascalene approach of brachial plexus block, conducted in 100 patients undergoing upper extremity surgery and found that it was a useful, simple, safe, and reliable technique for brachial plexus block, avoiding the complication of pneumothorax (1979).[3] Dalens *et al.* prospectively evaluated parascalene approach with the subclavian perivascular approach in 120 children, 60 patients in each group. The parascalene approach proved to be easier and more reliable while also being almost free of complications, although both techniques produced a high degree of sensory blockade in almost all infraclavicular branches of the brachial plexus (1987).[4] Sahu and Sahu found that supraclavicular brachial plexus block by lateral approach associated with minimal adverse effect in comparison to any other supraclavicular approach and more effective with high success rate.[5] A new approach Dr. Kothari evaluated supraclavicular brachial plexus block by the lateral approach. Quick and complete analgesia and motor loss with no serious side effect were the main features of this approach.[6]

CONCLUSION

Supraclavicular block of brachial plexus by parascalene approach provides an adequate sensory blockade and motor blockade, with less time to perform block, level of sensory block is higher (up to shoulder), high success rate, and fewer complications when compared to lateral approach.

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Original Article

Incidental Finding of Cervical Dysplasia in Hysterectomy Cases Done for Other Causes

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Abstract

Introduction: Cervical cancer is one of the leading causes of death in women. Squamous intraepithelial lesion (SIL) (cervical dysplasia) is usually diagnosed by cancer screening techniques. By keeping this in mind, we want to evaluate silent cells which have not been suspected or diagnosed previously, and the patient had hysterectomy for other cases. These findings will give us idea about the incidence of SIL in our population.

Materials and Methods: A retrospective data analysis of hysterectomy cases which were done for other benign indications. Women between 30 and 70 years age group are included in this study. The details were taken from the databases maintained by the Pathology Department, KAPV Government Medical College. Institutional board approval was obtained.

Results: During the study period, 100 hysterectomy cases in the age group of 30-70 years which were performed for benign causes were included. The most common indications for hysterectomy were leiomyoma and abnormal uterine bleeding. Among 100 cases, 14 cases were identified with SIL. All lesions are defined as squamous alterations in the cervical transformation zone that are induced by human papillomavirus infection.

Conclusion: Importance of screening procedures such as Papanicolaou smears and colposcopy not only for regular screening of individuals between age 30 and 70 years, these procedures are also to be followed before any hysterectomy procedures for other reasons. This one is important if cervical intraepithelial neoplasia III or high-grade squamous intraepithelial neoplasia or microinvasive disease identified to modify the surgical procedures. This will avoid further surgeries and complications due to metastasis or stump recurrence.

Key words: Cervical dysplasia, Cervical intraepithelial lesion, Papanicolaou smear

INTRODUCTION

Invasive cervical cancers are usually preceded by a long phase of preinvasive disease. This is characterized by a spectrum of events progressing from cellular atypia to various grades of dysplasia or cervical intraepithelial neoplasia (CIN) before progression to invasive carcinoma.

Early diagnosis of this preinvasive dysplasia can save the life of the patient. Finding out the actual incidence of cervical dysplasia helps to improve the screening techniques.

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Squamous cell carcinoma has been reduced steadily owing to effective cytological detection and eradication of its precursors.

MATERIALS AND METHODS

We performed a retrospective data analysis of hysterectomy cases which were done for other benign indications. Women between 30 and 70 years age group are included in this study. The details were taken from the databases maintained by the Pathology Department, KAPV Government Medical College. Institutional board approval was obtained.

All cases of hysterectomy performed for benign indication in the database from January 1, 2015, to December 10, 2015, were included in this analysis. Pre-operative surgical indications for hysterectomy were taken from the medical

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record. The diagnosis of cervical dysplasia (squamous intraepithelial lesion [SIL]) and its categories were established based on the final pathology report abstracted from the clinical record. The previous HPE slides were also reviewed.

The criteria for the diagnosis of cervical dysplasia is based on guidelines established by the WHO.

Carcinoma cervix and SIL can be discovered on routine Papanicolaou (Pap) smear in an asymptomatic woman. However, the disadvantages are the mucosal surface may be covered by normal epithelium, and the underlying malignant cells may escape detection by cytological smear.

It was observed that some cases of SILs regressed, some persisted and others progressed to carcinoma *in situ* (CIS).

A direct correlation with progression and histological grade was observed. These observations held to the concept of a single, continuous disease process by which normal epithelium evolves into epithelial precursor lesions and to invasive cancer.

We conducted a data analysis of cervical dysplasia in hysterectomy cases which were done for other benign indications for a period of 1-year January 1, 2015, to December 31, 2015. Women in 30-70 years were included in this study. In this study, 100 hysterectomy cases in the age group of 30-70 years which were performed for benign causes were included. Among 100 cases, 14 cases were identified with SILs. 86 patients had normal cervical epithelium. Among SILs, the number of patients with CIN I is 11, CIN II is 2, and CIN III is 1. Incidence of CIN I is more 78%, whereas CIN II is 14.5% and CIN III 7.5%.

RESULTS

During the study period, 100 hysterectomy cases in the age group of 30-70 years which were performed for benign causes were included. The most common indications for hysterectomy were leiomyoma and abnormal uterine bleeding. Among 100 cases, 14 cases were identified with SILs.

All lesions are defined as squamous alterations in the cervical transformation zone that are induced by human papillomavirus (HPV) infection.

The features of the low-grade squamous intraepithelial lesion (LSIL) include the presence of conspicuous superficial cell atypia with binucleation, 2-fold nuclear enlargement, variable nuclear chromatin, low N/C ratio with well-preserved polarity.

There are categories of LSIL that includes flat mature LSIL or flat Condyloma, mature exophytic LSIL or exophytic Condyloma, extensive exophytic LSIL or giant Condyloma, immature exophytic LSIL or immature Condyloma and immature flat metaplastic LSIL.

High-grade SILs (HSILs) exhibit atypia in all layers of epithelium. The features include less maturation, higher nuclear density, orderly transition from the immature to mature epithelial layers, nucleomegaly, hyperchromasia in the lower epithelial layers, loss of polarity, increased mitotic index, and abnormal mitotic Figures 1 and 2.[5]

DISCUSSION

We analyzed the data obtained from a sample of KAPV Government Medical College, Pathology Department. The incidence of SILs among 100 hysterectomy cases which were done for some other benign indications was

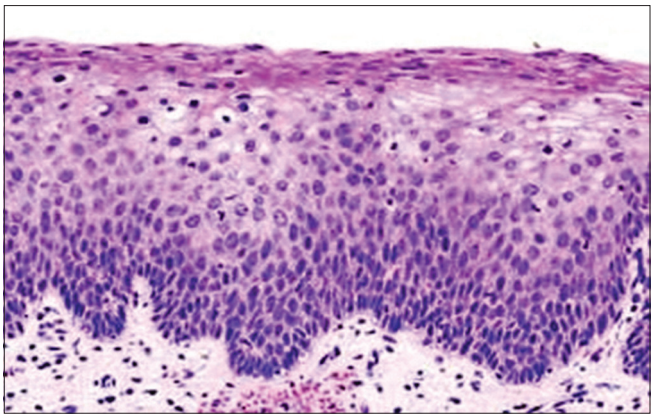

Figure 1: Cervical intraepithelial neoplasia I

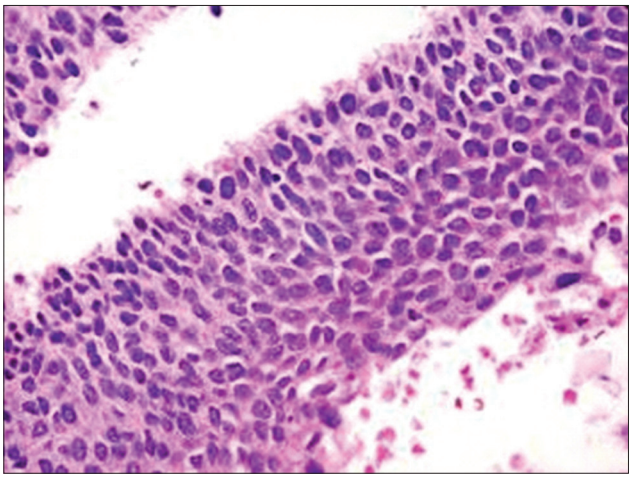

Figure 2: Cervical intraepithelial neoplasia III

14%. Among SILs, the number of patients with CIN I is 11, CIN II is 1, and CIN III is 1. Incidence of CIN I is more (85%), whereas CIN II is 7.5% and CIN III 7.5% (Table 1).

Cervical cancer is one of the leading causes of death in women. Significant public awareness must be created to enhance the early detection of cervical cancer. The mortality ratio of cervical cancer can be reduced by early screening techniques. The risk of cervical cancer increases with age.[1,2]

The replacement of areas of physiological columnar epithelium with mature stratified squamous epithelium beginning soon after birth. Before pubarche, the vaginal pH is neutral. After pubarche and before menarche, when plasma concentrations of estrogen rise and the vaginal and squamous cervical epithelia become glycogenated, lactobacilli are present in the normal flora and glycogenolysis causes the vagina to become acidic. The effect of this on columnar epithelium accustomed to conditions in the alkaline endocervical canal is thought to stimulate squamous metaplasia. Change of shape of the cervix, with exposure of the endocervical epithelium to the vaginal milieu, occurs on many occasions during adolescent and adult life and squamous metaplasia is, therefore, a recurring event.[3]

In early metaplasia, the simple columnar epithelium is retained above the proliferative squamous cells, but eventually, it is shed.

The histopathologist looking at a section of a cervical biopsy is faced with the task of deciding, whether a particular epithelium shows the changes of CIN and, if so, what degree of abnormality is present. Both these decisions may be fraught with difficulty. A number of benign physiological epithelial changes may be mistaken for CIN, and it is important that these are recognized for what they are. CIN is graded because of the belief that the degree of histological abnormality relates to the prognosis and so can be used as a guide for the management of the patient

Many of cervical dysplasia are undiagnosed, and the actual incidence is also unknown. The incidence of actual cases of cervical dysplasia is actually less than the original incidence.

Cervical precancerous conditions were reported using the categories of dysplasia and CIS, and still they are used in all countries. Many numbers of follow-up studied were conducted in women with such precancerous conditions. The main observations are some cases of dysplasia regressed, some persisted, and other progressed to CIS. These observations led to the concept of a disease process by which normal epithelium evolves into epithelial precursor lesions and on to invasive cancer.[4]

CIN was divided into Grades 1, 2, and 3. CIN I - corresponds to mild dysplasia, CIN II - moderates dysplasia. CIN III - severe dysplasia and CIS. Invasive cervical cancers are usually preceded by a long phase of preinvasive disease. This is characterized microscopically as a spectrum of events progressing from cellular atypia to various grades of dysplasia or CIN before progression to invasive carcinoma. CIN may be suspected through cytological examination using the Pap technique or through colposcopic examination. Final diagnosis of CIN is established by the histopathological examination of a cervical punch biopsy or excision specimen. A judgment of whether or not a cervical tissue specimen reveals CIN, and to what degree, is dependent on the histological features concerned with differentiation, maturation and stratification of cells, and nuclear abnormalities. The proportion of the thickness of the epithelium showing mature and differentiated cells is used for grading CIN progression rates to invasive cancer. The diagnosis of HSIL on a Pap test means the presence of precancerous cells, not cancer. Although it is the most preventable type of cancer, each year cervical cancer kills about 4,000 women in the U.S. and about 300,000 women worldwide. Cervical cancer mortality rates are reduced now thanks to increased screening and early detection with the Pap test.[5]

In our study, 21% of CIN I diagnosis occur in women ages 30-50, and about 14% occur in women 41-50, 35% occurs in women 51-60, and 14% occurs in women 61-70 years of age. The median age of diagnosis is 48 years. About 7% of women had CIN II between the ages of 51-60. About 7% of women had CIN III between the ages of 61-70 (Table 2).

Table 1: Incidence of CIN

CIN I	CIN II	CIN III
12 (85%)	1 (7.5%)	1 (7.5%)

CIN: Cervical intraepithelial neoplasia

Table 2: Agewise incidence of CIN

Age	CIN I	CIN II	CIN III
30-40	3	-	-
41-50	2	1	-
51-60	5		1
61-70	2	-	-

CIN: Cervical intraepithelial neoplasia

Cervical cancer is very rare in women younger than age 20. However, many young women become infected with HPV, which then can increase their risk of getting cervical cancer in the future. Young women with early abnormal changes who do not have regular examinations are at high risk for developing cervical cancer by their age 40 and for invasive cancer by age 50.

The best way to prevent cervical cancer is to avoid getting infected with HPV. CIN usually occurs after a woman becomes infected with the HPV. This is a virus that is spread through sexual contact. Some strains, such as HPV-16 and HPV-18, are more likely to infect the reproductive tract in women and cause CIN. A vaccine can protect against the major cancer-causing HPV strains in girls and young women who have not yet been exposed to the virus. Screening for cervical cancer includes regular Pap tests that remain the most effective way of identifying cervical cancer while it is in its earliest precancerous stages and preventing the development of invasive cervical cancer. About half of cervical cancer cases are diagnosed when the cancer is confined to the cervix. About 30-40% of cases are diagnosed after cancer has spread to adjacent areas or lymph nodes and about 10-20% of cases are diagnosed when cancer has already spread to distant regions. Low-grade cervical dysplasia (LGSIL and/or CIN1) often spontaneously resolves without treatment, but follow-up screening is recommended. Untreated high-grade cervical dysplasia may progress to cervical cancer over time. Surgical treatment of cervical dysplasia cures most women.[5]

Women who are sexually active are sometimes infected with HPV. About 50% of the HPV infections occur in women between the ages of 15 and 25. Mostly, the infections go away without causing any problems. According to Italian Group for Cervical Cancer Screening survey 2.4% of Pap tests were positive for cervical dysplasia. The problem with cervical screening is poor follow-up with abnormal pap smears. The problem with cervical screening is poor follow-up with abnormal Pap smears. The lack of symptoms, infrequent screening may lead the cervical dysplasia to develop into cervical cancer.[6] If early detected cervical dysplasia is treated easily. If it progresses to cervical cancer, the treatment will be a prolonged one.

The well-known classification system has incorporated the finding of HPV as a preneoplastic lesion HPV lesions are now grouped with CIN I (mild dysplasia) as a single category, low-grade SIL (low-grade SIL). High-grade lesions are called high-grade SIL and include lesions previously known as CIN II and CIN III (moderate dysplasia, severe dysplasia, and CIS). So, this system divides all lesions into two functional groups. CIN is characterized by a gradual progression of continuous derangements eventually culminating in a tumor capable of invasion.[7-10] Detection of cervical epithelial cell abnormality helps predict the prognosis and can be used as a guide to manage the patient. The hallmarks of CIN are its defining nuclear abnormalities. Nuclei are enlarged, pleomorphic, and with the wrinkled nuclear membrane. There is hyperchromasia and irregularly clumped chromatin. Nucleoli are rare. The differentiation is reduced when the nuclear abnormality is increased. Nuclear polarity will be altered. Mitotic activity is increased there will be increase in the height of the epithelium. Abnormal configurations present. The definition of an *in situ* carcinoma requires that the surface epithelium lacks all differentiation. So, that immature and undifferentiated cells occupy the entire thickness of the epithelium.

CONCLUSION

About 14 cases being discovered incidentally in hysterectomy specimens done for other reasons may also be taken as the incidence of SILs in our population in silent way. Hence, we here stress the importance of screening procedures such as Pap smears and colposcopy not only for regular screening of individuals between age 30-70 years, these procedures are also to be followed before any hysterectomy procedures for other reasons. This one is important if CIN III or high-grade squamous intraepithelial neoplasia or microinvasive disease identified to modify the surgical procedures. This will avoid further surgeries and complications due to metastasis or stump recurrence.

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Original Article

Association of Angiotensin-converting Enzyme Gene Insertion/Deletion Polymorphism with Coronary Artery Disease in South Indian Population

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Abstract

Introduction: The angiotensin-converting enzyme (ACE) gene contains a polymorphism in the form of either Insertion (I) or Deletion (D) of a 287 base pair alu repetitive sequences in intron 16. This polymorphism is shown to be associated with the interpersonal variability of ACE levels in circulating blood and DD genotype having approximately twice the level of ACE activity of II genotype and ID having an intermediate activity.

Aim: The aim of this work was to find the association between ACE gene I/D polymorphisms and coronary atherosclerosis in the South Indian population.

Materials and Methods: Genotype analysis was done on 61 patients with angiographically proven coronary atherosclerosis and 62 healthy controls by polymerase chain reaction (PCR) followed by agarose gel electrophoresis of PCR products.

Results: Results revealed that patients had significantly higher frequency of DD genotype than controls (65.7% vs. 39.3%; $P = 0.001$) with odds ratio of 3 (1.4-6.7); $P = 0.01$ between (II + ID) genotypes and DD genotype.

Conclusion: ACE DD genotype is found to be a significant risk factor for coronary atherosclerosis.

Key words: Angiotensin-converting enzyme gene, Coronary atherosclerosis, Insertion/Deletion polymorphism, Increased angiotensin-converting enzyme activity

INTRODUCTION

Atherosclerosis is the biggest killer of the 21st century.[1] Mechanisms contributing to atherogenesis are multiple and complex. Multiple theories including the role of dyslipidemia, hypercoagulability, oxidative stress, inflammation, and endothelial dysfunction have been put forth.[2,3] Coronary artery disease (CAD) is a polygenic disease whose phenotypic manifestation depends on the interaction of a number of environmental factors. The gene-encoding components of the renin-angiotensin system (RAS) present attractive candidates for cardiovascular disease. The RAS is present in circulating and tissue-based forms,[4-6] and it is involved in sodium homeostasis, cardiovascular remodeling, and maintenance of vascular tone. Angiotensin I (Ang I)-converting enzyme (ACE) is a key component within the RAS, where it hydrolyzes Ang I to generate Ang II (vasoconstrictor)[7] and the Kallikrein-Kinin system, where it inactivates bradykinin (vasodilator).[8] The observation that ACE inhibitors reduce atherosclerosis in cholesterol-fed rabbits supports the potential role for ACE or its substrates in the development of atherosclerosis.[9] ACE could affect smooth muscle cell and fibroblast migration and proliferation, low-density lipoprotein (LDL) oxidation, and endothelial cell function; these are all important factors in atherosclerosis. A polymorphic variant of the ACE gene correlates with higher circulating ACE levels and carries an increased risk of myocardial infarction and cardiomyopathies. The ACE gene located on chromosome 17q23[10,11] contains a polymorphism in intron 16[12-14] of an Insertion/Deletion (I/D) of a 287-bp alu repeat sequence. Insertion allele

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produces 490 bp product and deletion allele produces 190bp product, and this results in 3 possible genotypes of ACE gene as II, DD, and ID. It is said that ACE DD genotype is associated with twice the ACE activity of II genotype and ID with an intermediate activity.[15] Our aim is to test the hypothesis that deletion allele is associated with an increased risk of atherosclerosis. In this study, we sought to determine the distribution of ACE genotypes and the frequency of allele D in patients undergoing coronary angiography at our institution.

MATERIALS AND METHODS

Study Population

Cases

The study sample comprised 61 unrelated South Indian CAD patients (57 males, 4 females) with mean age of 55.4 years. Inclusion criteria were more than 50% stenosis of at least one of the major coronary arteries. Patients with <50% obstruction were excluded. All patients with acute myocardial infarction or unstable angina and patients with ischemic or idiopathic cardiomyopathy were also excluded.

Controls

Totally, 62 controls were studied, and they were recruited from outpatient department during their visit for non-cardiac cases. Age, sex, and other confounding factors such as diabetes mellitus (DM) and hypertension (HT) were matched. For all diabetic controls, treadmill test was done and only those with negative treadmill test were included in the study.

Biochemical Markers

Total cholesterol, high-density lipoprotein cholesterol (HDL-C), and triglyceride (TGL) concentration were determined enzymatically using kits and XL-300 auto analyzer at the Centralized Biochemistry Laboratory at G.G.H, Chennai-3. LDL-cholesterol (LDL-c) was calculated using Friedewald's formula.

ACE Gene Polymorphism Screening

DNA was extracted from Buffy coat by high salt method, and using ACE gene, forward 5'-CTGGAGACCACTCCCATCCTTTCT–3' and reverse 5'-GATGTGGCCATCAATTCGTCAGAT–3' primers genomic DNA (1 µg) was amplified in 25µl reaction mixture containing 0.3 µmol/L of each primer and red dye master mix (Bangalore Genei) containing 100 µmol/L of each dNTP, 2.5 µL of ×10 reaction buffer and 0.6 unit of Taq DNA polymerase. After the DNA was denatured for 5 min at 94°C, the reaction mixture was subjected to 30 cycles of denaturation for 1 min at 94°C, 1 min of annealing at 58°C, and 1 min of extension at 72°C. Final extension was carried over at 72°C for 10 min. Amplification products were separated by electrophoresis on a 2% agarose gel and visualized under ultraviolet light after ethidium bromide staining. The polymerase chain reaction (PCR) product is a 190 bp fragment in the presence of a deletion (D) allele and a 490 bp fragment in the absence of a deletion (I) allele. Thus, each DNA sample revealed one of the three possible patterns after electrophoresis: A 490 bp band (II genotype), a 190 bp band (DD genotype), or both 490 and 190 bp bands (I/D genotype).[14,16] Analysis was done using a low molecular weight DNA ladder for Bangalore Genei (Figures 1 and 2).

Statistical Analysis

1. Allele frequencies were calculated by allele counting.
2. Age, body mass index (BMI), and serum lipid levels were compared between controls and patients by Students' *t*-test.

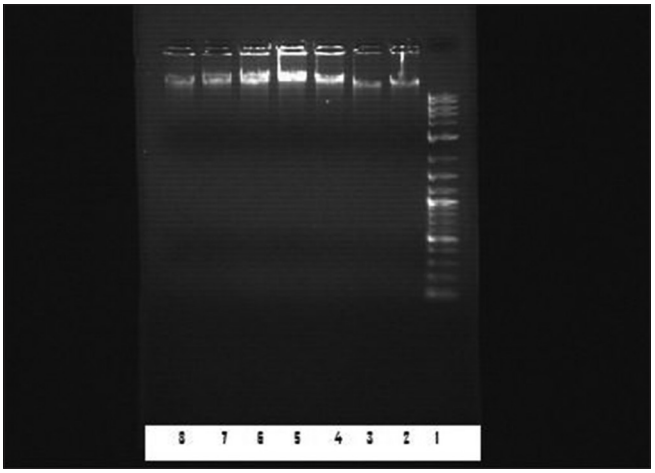

Figure 1: Extracted DNA (lane 2-8) was tested on 1% agarose gel using 1 kb ladder (lane 1) Ladder shows 10000, 8000, 7000, 6000, 5000, 4000, 3000, 2000, 1000 bp fragments

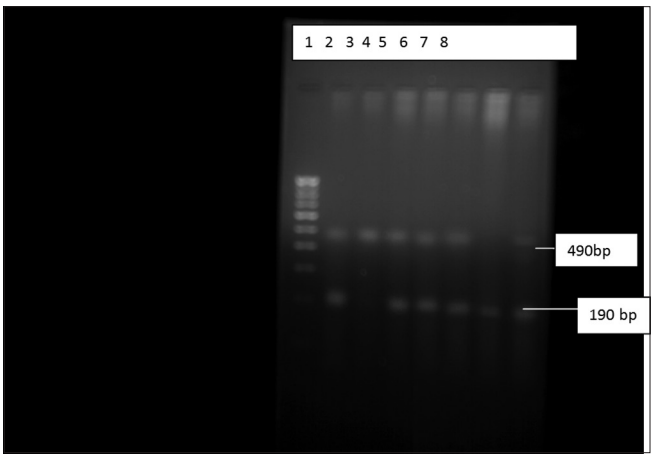

Figure 2: Agarose gel electrophoresis of polymerase chain reaction products. Deleted allele has 190 bp product and inserted allele has 490 bp product. Lane 1 shows ladder (100, 200, 300, 400, 500, 600, 700, 800, 900, 1000 bp), lanes 2, 4, 5, 6, 8 show both the products and indicating ID genotype, lane 7 shows only 190 bp product indicating DD genotype, lane 3 shows only 490 bp product indicating II genotype

3. Genotype frequency distribution between cases and controls was compared with a χ^2 test for 2*2 contingency table.
4. Logistic regression analysis was performed to evaluate the interaction between ACE genotypes II/DD/ID and other variables in relation to the prevalence of CAD Independent variables included in the analysis were age (quantitative), sex (male/female), smoking (Yes/No), alcoholism (Yes/No), HT (Yes/No), DM (Yes/No), serum levels of cholesterol and, TGL (quantitative). The analysis was executed by SAS Statistical program Version 6.10 for Macintosh.

RESULTS

Method of measurement of lipoprotein is not found in part of materials and methods. Table 1 shows age, sex, BMI, HDL levels, and conventional risk factor distribution among patients and controls. Since all the confounding factors were matched, there were no significant differences between the two groups. There was a significant difference in the HDL level - low in cases (37.2 ± 8) and high in controls (51.5 ± 12.5). LDL is high in cases than controls, but it is not significant.

Table 2 shows genotype distribution and allele frequencies of human ACE gene in patients with CAD and controls. ACE genotype distribution was in agreement with the Hardy-Weinberg expectations.

- DD genotype was more frequent among cases (65.7%) when compared to controls (39.3%). In contrast, ID and II were more common among controls (61.7%) when compared to cases (34.3%). There was a significant difference in the distribution of II genotype also between cases and controls (P = 0.001). I + genotype is more common among controls when compared to cases (P = 0.01) (Table 3).

Table 4 shows the age- and sex-adjusted odds ratio between I+ allele (ID+II genotypes) and I− (DD genotype), it was 3. (95% confidence interval, 1.4-6.7; P = 0.01). This shows that I allele protects against atherosclerosis, and homozygous DD genotype favors atherosclerosis.

Table 5 shows the multiple logistic regression analysis and shows that there is no significant difference between cases and controls when comparing with age, sex, DM, HT, smoking, and alcoholism, revealing that they are perfectly matched between cases and controls, and there is a significant difference in HDL levels (P = 0.000) and ace

Table 1: Characteristics of patients with CAD and controls

Variables	Case (61)	Control (62)	*P* value*
Age	55.1±10.7	55.5±12.1	0.94
Sex M: F	56:5	55:7	0.83
DM	13	21	0.10
HT	13	21	0.09
DM+HT	8	13	0.11
Smoking	14	14	0.96
Alcoholism	10	9	0.83
BMI	25.1±4.0	24.8±3.3	0.66
High-density lipoprotein	37.2±8.2	51.5±12.5	0.001
Low-density lipoprotein	91.3±31.5	87.7±41.6	0.59

*Independent Student's *t*-test and Pearson's Chi-square test. CAD: Coronary artery disease, DM: Diabetes mellitus, HT: Hypertension, BMI: Body mass index

Table 2: Genotype distribution of ACE gene between cases and controls

Genotype	Controls *n*=62 (%)	Cases *n*=61 (%)	*P* value
DD	24 (39.3)	40 (65.7)	*P*=0.001
ID	24 (39.2)	19 (31.1)	
II	14 (22.5)	2 (3.2)	

*Pearson's Chi-square test, ACE: Angiotensin-converting enzyme

Table 3: Allelic distribution of ACE gene between cases and controls

Genotype	Control *n*=62 (%)	Case *n*=61 (%)	*P* value*
I+	38 (61.7)	21 (34.3)	0.01
I−	24 (39.3)	40 (65.7)	

*Pearson's Chi-square test, ACE: Angiotensin-converting enzyme

Table 4: Univariate analysis

Genotype	Controls (*n*)	Cases (*n*)	OR (95% CI)
II/ID	38	21	3 (1.4-6.7)
DD	24	40	

OR: Odds ratio, CI: Confidence interval

Table 5: Multiple logistic regression analysis

Parameters	B	SE	Significant	Exp (B)	95.0% CI	
					Lower	Upper
Age	−0.069	0.024	0.794	0.933	0.890	0.978
Sex	−2.001	0.861	0.650	0.135	0.025	0.730
Smoking	−0.418	1.023	0.683	0.659	0.089	4.890
Alcoholism	0.301	1.151	0.793	1.351	0.142	12.887
DM	0.594	0.681	0.383	1.811	0.477	6.882
HT	0.346	0.688	0.616	1.413	0.367	5.446
BMI	0.030	0.078	0.695	1.031	0.885	1.200
TC	0.011	0.009	0.235	1.011	0.993	1.029
TGL	−0.008	0.005	0.083	0.992	0.983	1.001
HDL	−0.185	0.036	0.000	0.831	0.774	0.892
ACE-geno	0.578	0.540	0.045	1.782	0.618	5.134

DM: Diabetes mellitus, HT: Hypertension, BMI: Body mass index,
ACE: Angiotensin-converting enzyme, TC: Total cholesterol, TGL: Triglycerides,
HDL: High-density lipoprotein

genotype ($P = 0.045$) between cases and controls, proving our hypothesis.

DISCUSSION

Besides very well-known risk factors, genetic factors play a role in the development of CAD. Genetic factors differ in various populations. Among these, ACE gene polymorphism has most frequently been studied and proposed as a CAD risk factor. ACE gene polymorphism determines the serum and tissue ACE activity, which is high in subjects with DD genotype.[17] ACE by causing high Ang II) and low bradykinin levels may increase the risk of CAD.[18] Ang II increases the macrophage-derived growth factor and platelet-derived growth factor, which has a role in the genesis of atherosclerosis.[19] Furthermore, Ang II leads to LDL-C oxidation and stimulates neutrophil, macrophage, and T-lymphocytes.[19,20] ACE decreases nitric oxide release via the bradykinin-kallikrein system and causes endothelial dysfunction which has also an important role in the genesis of atherosclerosis. Homozygous deletion subset of the ACE I/D polymorphism is associated with deteriorated endothelial function.[21] It has been demonstrated by various studies that the ACE D allele is associated with the risk of CAD in various populations. However, other studies show that ACE gene polymorphism is not associated with CAD and MI. A large case–control study by Guardsman *et al*.[22] on Caucasian samples has shown that the D allele was associated with CAD in patients <61.7 years of age.

Hence, the clinical relevance of ACE gene polymorphism remains unclear. As CAD is a multifactorial disease, the ACE gene alone may not have a direct effect on the severity of CAD and premature death. However, the homozygous DD genotype is found to be significantly increased in our study samples.

In this study, we have not confirmed the DD genotypes using insertion-specific primers, as previous studies showed that there is a possibility of mistyping[23] due to preferential amplification of D allele and all the DD genotype positive cases to be confirmed by using another insertion-specific primer. This is the drawback of our study. Moreover, we have not tested the phenotypic variation associated with ACE genotypes, which is one more limitation of our study.

The present study is important as there is a need for confirmation of the risk gene for CAD, even if the effect is small, so as to contribute to our understanding of the pathology of CAD, and determine potential therapeutic strategies.

CONCLUSION

In the present study, ACE homozygous DD genotype is significantly associated with atherosclerosis. The presence of I allele protects against atherosclerosis.

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Original Article

Pattern of Ocular Trauma in a Tertiary Referral Hospital in South Tamil Nadu

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Abstract

Introduction: Trauma is an important causative factor of ocular morbidity. It is one of the common causes of preventable blindness in our Indian population.

Aim: To assess the pattern of ocular trauma causes and management done at Government Theni Medical College Hospital.

Materials and Methods: A retrospective study was conducted from May 2015 to April 2016 in 300 patients with ocular trauma who presented to casualty at Government Theni Medical College, Theni. We recorded the data based on the nature and cause of injury, time of injury, and time interval between injury and reporting to the hospital. The data were analyzed statistically by simple proportion.

Results: Of 300 patient examined, the most common age group was 25-35 years, more predominant in males. The most common cause being road traffic accidents. Most of the patients were managed with suturing and conservatively.

Conclusion: Our study shows a male preponderance and the most common age group being 25-35 years. The most common cause of ocular trauma is road traffic accidents followed by assault. Hence, there is an urgent need for reinforcement of traffic rules and people should adhere to them. The urgent need for more ambulance services to bring the patients to the nearby hospital as soon as possible and first aid training to paramedical workers, enhancing the facilities available at the emergency centers will go a long way in preventing disability and visual loss to the public.

Key words: Ocular trauma, Road traffic accidents, Subconjunctival hemorrhage

INTRODUCTION

Ocular injury is an avoidable cause of blindness and visual impairment. According to the WHO, 55 million eye injuries restricting activities occur for more than 1 day each year. 750,000 cases require hospitalization which includes 200,000 open globe injuries.[1] Ocular trauma usually occurs in the younger individuals and road traffic accidents are a more common. Our Government Theni Medical College is situated in a National Highway. Hence, we designed this study to determine the pattern of ocular trauma, its causes, and effective management.

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MATERIALS AND METHODS

A retrospective study was done at Government Theni Medical College from May 2015 to April 2016 on 300 patients who presented to the casualty, emergency, and trauma department. The patients who already had eye diseases such as glaucoma and operated eyes were excluded from the study. A thorough ophthalmic examination was done which included visual acuity measurement by Snellen's chart, slit lamp examination to evaluate anterior segment injuries and fundus examination by IDO and slit lamp biomicroscopy. Intraocular pressure was measured except in open globe injuries. The data collected included age, sex, place, and date and time of trauma, cause of injury. The data were finally analyzed statistically by simple proportions.

RESULTS AND DISCUSSION

In our study, out of 300 patients, 80% of the patients belonged to the age group of 25-35 years. 71% of them

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were males and 29% of them were females. As specified by the previous studies our analysis too showed a male preponderance (Table 1).[2]

The most common pattern of injury was found to be subconjunctival hemorrhage followed by lid trauma. A few cases of periorbital hematoma were noticed. A very few cases of open globe injury were recorded (Table 2).

Regarding the causes of ocular trauma, road traffic accidents formed the major bulk of causes, followed by assault (Table 3). This might be due to the reason that our Medical College is situated in a national highway.

About 16% of the patients were brought to the hospital within 24 h of injury. 52% of the patients were brought to the hospital within 24-48 h of injury and 28% of the patients were brought within 48 h - 1 week. 4% were brought after 1 week of injury (Table 4).

Most of the patients with subconjunctival hemorrhage (77%) were treated with topical antibiotics, steroid drops, and anti-inflammatory drugs and those who had laceration of lid (20%) were sutured, those with open globe injuries underwent repair with microsurgical techniques (3%) when compared to He *et al.*[3] who managed 52.6% with surgery and 22.2% conservatively.

The majority of our patients presented with good vision (69%) and 3% of them had visual impairment (Table 5). This might be due to the reason that most of them were closed globe injuries and were brought to the hospital earlier.

However, according to Omolase *et al.*,[4] 50.8% had a visual acuity ranging from 6/18 to 6/6, 32.6% <3/60. As per the study conducted by Iqbal *et al.*,[5] 81.1% had a visual acuity <3/60 and 12.2% had a visual acuity 6/60-6/18. As our study had a lesser degree of penetrating injuries, patients presented to us with a better visual acuity. Our hospital is easily accessible to the patients, so most of them were brought without delay. This might be the reason for a lesser damage to the ocular system.

Table 1: Age distribution

Age group (years)	Number of patients (%)
<5	12 (4)
5-15	12 (4)
15-25	60 (20)
25-35	120 (40)
35-45	48 (16)
45-55	24 (8)
55-65	24 (8)
>65	Nil (Nil)

Table 2: Pattern of trauma

Type of injury	Number of patients (%)
Contusion	12 (4)
Periorbital hematoma	24 (8)
Lid trauma	60 (20)
Subconjunctival hemorrhage	195 (65)
Open globe injury	9 (3)

Table 3: Causes of injury

Cause	Number of patients (%)
Road traffic accident	180 (60)
Assault	108 (36)
Accidental fall	12

Table 4: Duration of presentation

Duration	Number of patients (%)
<24 h	48 (16)
24-48 h	156 (52)
48 h-1 week	84 (28)
>1 week	12 (4)

Table 5: Visual acuity

Visual acuity at presentation	Percentage
<3/60	3
3/60-6/60	6
6/60-6/18	22
6/18-6/6	69

CONCLUSION

Our study shows a male preponderance and the most common age group being 25-35 years. The most common cause of ocular trauma is road traffic accidents followed by an assault. Hence, there is an urgent need for reinforcement of traffic rules and people should adhere to them. The urgent need for more ambulance services to bring the patients to the nearby hospital as soon as possible and first aid training to paramedical workers, enhancing the facilities available at the emergency centers will go a long way in preventing disability and visual loss to the public. People can be educated using media and health education and awareness regarding first aid measures and safety precautions for ocular trauma will help us to bring down the visual impairment caused by ocular injuries.

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Original Article

Clinical and Histomorphological Profile of Breast Neoplasms

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Abstract

Introduction: Breast neoplasms have a high degree of heterogeneity under several distinct viewpoints such as variable clinical presentations, diverse morphological features, and different therapeutic responses. Understanding the clinical prolife of breast cancer is important to develop early diagnosis efforts.

Aim: To evaluate clinical and pathological characteristics of breast neoplasms.

Materials and Methods: This study was conducted over a period of 2-year comprising 267 patients who underwent lumpectomy or modified radical mastectomy following a preliminary diagnosis on fine needle aspiration cytology or trucut biopsy specimens. The clinicopathologic evaluation was done in all of these cases following standard protocols.

Results: The study comprises 267 patients in the age range of 20-70 years. The majority of breast cancers occurred within the age range of 41-50 years with mean age of 45.5 years. Exceptionally one case of invasive ductal carcinoma was observed in the age 5 years. The most common benign tumor was fibroadenoma and in malignancy invasive ductal carcinoma was evident in 103 cases. Early menarche contributes to the major risk factor. Breast lump, nipple discharge, Peaud' orange appearance, and axillary lymphadenopathy are the common clinical presentations. Predilection toward the left side and location of lump over the upper outer quadrant has been documented. Most of the cases presented with American Joint Committee on cancer pathologic Stage II A.

Conclusion: This study gave an insight to the clinicopathological prolife of breast cases in our area.

Key words: Breast neoplasms, Epidemiology, Histopathology cancer, Stage

INTRODUCTION

Breast neoplasms encompass a heterogeneous group of lesions that may be presenting as a palpable mass, non-palpable abnormality detected on imaging analysis or an incidental microscopic finding. They constitute a wide spectrum of histological lesions ranging from a benign tumor at one end approximating to carcinoma at the other end. Breast cancer is the most common cancer of women worldwide representing approximately 16% of all female cancer.[1] It represents the second leading cause of cancer death among women after lung cancer.[2] In some of the studies, it occurs secondary to cervical cancer,[3,4] presently 75,000 new cases occur in Indian women every year.[5] Etiology of breast cancer is multifactorial. It includes diet, reproductive lifestyle, environmental and genetic factors.[4] This study is intended to clarify the epidemiological and pathological features of breast cancer to adopt an adequate strategy of care in our area.

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MATERIALS AND METHODS

A total number of 267 cases who attended the surgery outpatient department and for whom lumpectomy or modified radical mastectomy has been done were included in the study. Relevant clinical features such as age, parity, age of first childbirth, menstrual status, and family history were elicited. Location of lump, nodal enlargement, presence of nipple discharge, skin, and nipple changes were observed.

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The specimens were fixed in 10% formalin and usual techniques of histological processing, paraffin embedding, section cutting with microtome and hematoxylin and eosin staining were made. Histopathological evaluation was done with microscopy.

RESULTS

This study of breast neoplasms covers a total of 267 cases in which 120 cases were observed as benign and 147 cases as malignant neoplasms. The age range of patients was 20-70 with a median of 45 years.

As noted in Table 1, increased incidences of breast neoplasms were observed in 31-50 years (116 cases, 43.44%). The incidence is very low in pediatric age group <10 years (1 case, 0.37%) followed by 61-70 years (8 cases - 2.99%).

Bar diagram shows that benign lesions have a peak incidence in the age group of <20 years (55 cases - 45.84%) (Figure 1). Whereas malignancy reaches its peak in the age group 41-50 years (51 cases 34.93%). The findings of independent sample *t*-test are given in the following Table 2, which shows the difference in mean age between benign and malignant neoplasms.

Benign neoplasms occur at a relatively younger age than malignant neoplasms with statistical significance ($P < 0.001$). Clinical evaluation of malignant tumors is represented in Table 3.

All the cases presented with a breast lump. Risk factor like early menarche was seen in most cases (140 cases, 95.89%). Most of the women in our study were multiparous with a history of regular breastfeeding (141 cases, 96.57%). The tumor mostly involved the upper outer quadrant (85 cases, 58.21%) followed by diffuse involvement (36 cases 24.65%). Figure 2 illustrates the distribution of breast neoplasms. Malignant neoplasms predominate with (147 cases 54.66%) when compared with benign neoplasms (120 cases, 45.31%). Age incidence of individual benign neoplasms is given as shown in Table 4.

Most of the fibroadenomas are seen in the early reproductive age group, <20 years (53 cases, 50%) followed by 21-30 years (36 cases, 33.96%). Special forms of adenomas such as tubular adenoma and lactating adenoma were also observed in the same age group. One case of adenomyoepithelioma and myofibroblastoma was observed in the postmenopausal age group. Distribution of epithelial malignant tumors is shown in Table 5.

Table 1: Age incidence of breast neoplasms

Age group (years)	Number of cases (%)
<10	1 (0.37)
10-20	54 (20.22)
21-30	53 (19.85)
31-40	58 (21.72)
41-50	58 (21.72)
51-60	35 (13.10)
61-70	8 (2.99)
>70	-

Table 2: Comparison of mean age of benign and malignant neoplasms by independent samples *t*-test

Variable	Age (Mean±SD)	*t*-test value	*P* value
Benign diseases	24.9±9.7	16.15	<0.001
Malignant diseases	45.3±10.7		

SD: Standard deviation

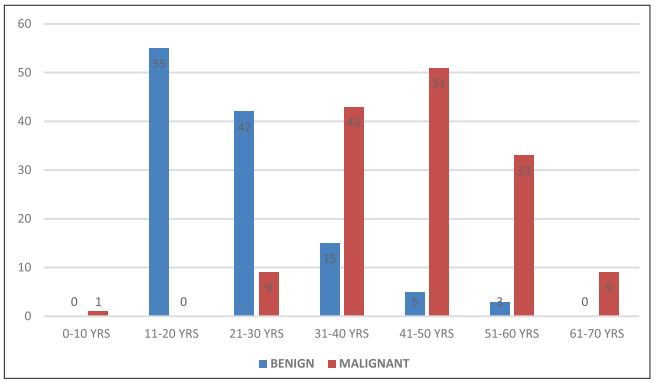

Figure 1: Comparison of age incidence of benign/malignant neoplasms

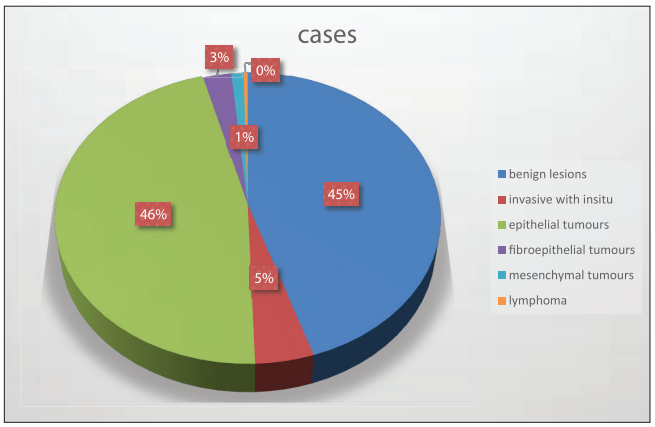

Figure 2: Distribution of breast neoplasms

Infiltrating ductal carcinoma (IDC) not otherwise specified (NOS) was observed as the most common malignant breast tumor (103 cases - 70.06%). Other fibroepithelial and non-epithelial malignant tumors of the breast that were observed are represented as shown in Table 6.

Table 3: Clinical evaluation of cases with malignant tumors

History/clinical features	Number of cases (%)
Early menarche	140 (95.89)
Age of first child birth	
Early	137 (93.83)
Late	9 (6.16)
Parous women	141 (96.57)
Nulliparous women	5 (3.42)
Breast fed	141 (96.57)
Menstrual status	
Menopausal	93 (63.69)
Menstruating	53 (36.30)
Family history	4 (2.73)
Treatment history	
Hormonal therapy	0 (0)
Previous biopsy for benign disease	2 (1.36)
Breast lump	146 (100)
Discharge	60 (41.09)
Skin changes	
Erythema	31 (21.23)
Peaude orange appearance	46 (31.50)
Ulceration	19 (13.01)
Nipple retraction	40 (27.39)
Axillary nodes	45 (30.82)
Location	
Upper outer quadrant	85 (58.21)
Upper inner quadrant	11 (7.53)
Lower outer quadrant	8 (5.47)
Lower inner quadrant	6 (4.10)
Diffuse-involving all quadrants	36 (24.65)

Table 4: Incidences of individual benign neoplasms

Type of benign neoplasm	Age groups				
	<20	21-30	31-40	41-50	51-60
Fibroadenoma	53	36	13	3	2
Fibroadenoma with benign phyllodes	1	3	-	-	-
Benign phyllodes	-	-	1	1	-
Others					
Nipple adenoma	-	1	-	-	-
Tubular adenoma	1	1	-	-	-
Lactating adenoma	-	1	-	-	-
Myofibroblastoma	-	-	-	1	-
Duct papilloma	-	-	1	-	-
Adenomyoepithelioma	-	-	-	-	1

Table 5: Distribution of epithelial malignant tumors

Type of tumor	Number of cases
IDC with DCIS	12
IDC-NOS	103
Invasive lobular carcinoma	2
Mucinous carcinoma	4
Medullary carcinoma	1
Invasive papillary carcinoma	5
Invasive micropapillary carcinoma	1
Infiltrating cribriform carcinoma	1
Adenoid cystic carcinoma	1
Neuroendocrine tumor	1
Metaplastic carcinoma	4
Adenomyoepithelioma with malignancy (epithelial)	1

IDC: Infiltrating ductal carcinoma, DCIS: Ductal carcinoma *in situ*, NOS: Not otherwise specified

Table 6: Distribution of fibroepithelial/ non-epithelial malignant tumors

Type of tumor	Number of cases
Fibroepithelial	
Malignant phyllodes	7
Mesenchymal	
Pleomorphic sarcoma	1
Fibrosarcoma	1
Angiosarcoma	1
Lymphoma	
Non-Hodgkin lymphoma	1

DISCUSSION

Globally breast cancer is the most common cancer in females. Significant variations are noted in geographic, socio-demographic, and histomorphological profiles. International variations in incidence and mortality rates are a striking feature of breast cancer. Breast cancer is more common in Arab countries and in Malaysian women, but the incidence is higher in China and India compared to Malaysia. This difference could be due to reproductive, environmental, and dietary factors.[6] Diomonde *et al.* in their study of the evolution of evolution of cancer at Ivory Coast showed that cervical cancer was the first cancer of women followed by breast with a frequency of 10.52% of cases.[4] As per Mohapatra *et al*'s., hospital data from South India breast cancer constitutes 15.05% next to cervical cancer.[3] In our study, the prevalence of breast cancer is 18.91% ranking second to cervical cancer in accordance. Contrary to this in metropolitan cities such as New Delhi, Mumbai, Ahamadabad, Kolkotta, and Trivandrum breast cancer takes the lead.[3]

The age-specific incidence of breast neoplasms ranges from 20 to 70 years and shows increased incidence in 31-50 years. Pertaining to benign neoplasms the mean age of incidence is 24.9 and for malignant lesions, it is 45.3. This is comparable with the studies of Ranabhat *et al*.[7]

In a study conducted at Nepal,[7] proportion of breast diseases was found to be 90.04% benign neoplasms and malignancy as 8.8%, whereas in our study they are almost equal comprising benign neoplasms to be 44.94% and malignancy 55.05%. Studies from Nepal, Lahore, Aurangabad, Mumbai,[7] and Malawi,[8] have found fibroadenoma as the most common benign breast lesion. In our study, fibroadenoma constitutes 89.16% with the peak incidence in the age group of <20 years. Next stands the

phyllodes tumor comprising 4.86% of mammary neoplasms in contrast to the literatures where phyllodes tumor accounts for <1% of all mammary neoplasms.[9] Malignant transformation has been observed in 7 cases, of which 3 showed heterologous differentiation of liposarcoma, chondrosarcoma and rhabdomyosarcoma, Special types of adenoma-like tubular adenoma and lactating adenoma were observed, Myoepithelial tumors exhibit a wide variety of patterns making it difficult to distinguish from other benign entities. Hence, the diagnosis of adenomyoepithelioma is restricted to cases falling outside the spectrum of well recognized common benign conditions. One case of adenomyoepithelioma and myofibroblastoma also have been reported. Breast cancer in women below 50 years constitutes 34.93% followed by 29.45% and 6.12% below 40 and 30 years of age, respectively. Premenopausal and perimenopausal incidence are reported in Indian[6,10,11] other Asian[7,12] and African countries.[8,13] In contrast, studies of Shirley *et al.*,[14] Western,[3] and Australian[15] literatures depict the predominant postmenopausal occurrence. These results point toward racial differences in the molecular profiles of breast carcinoma.[14] The incidence of breast carcinoma in males was found to be 1.3-1.7% in some of the studies[3,10] but to the contrary no male case has been reported in our study.

The risk factor evaluation shows history of early menarche in almost all cases in accordance with the literature[10] supporting the higher risk. Although nulliparity and low parity are associated with increased risk, in our study, the majority of patients are multiparous. Higher the parity higher is the association with triple-negative cancers[13] as it is not responsive to sex hormones associated with parity, Norway studies[16] report a high protective effect for women with early age of the first childbirth which is in contrast with our study where early age at first childbirth contributes to 93.83% of cases. Exclusive breastfeeding long practiced in developing countries reduces breast cancer through resting ovaries.[1] In the contrary in our study, 96.57% of them have breastfed. Raina *et al.*,[17] noticed 7% patients with breast cancer in first degree relatives. Similarly, 8.78% has been observed in Ivory Coast.[1] Rosen *et al.*[18] observed 31% followed by Siguan *et al.*[12] 27%. Familial breast cancers are not a significant entity in our series (2.72%). Advanced Western Nations have undergone a dramatic evolution in the diagnosis of breast cancer since mid-1980's. Subsequent to the widespread availability of mammographic screening, the diagnosis of clinically occult and non-palpable lesions is on the rising trend. In our study, women with breast cancer almost all detected their disease by themselves after finding a lump in breast emphasizing the need to educate women on self-breast examination. On viewing, the clinical scenario the incidence of breast carcinoma was documented on left side (62.54%) and in the upper outer quadrant (58.21%) corroborating with previous reports.[10,12,19] The possible explanations are that left breast is bulkier and upper outer quadrant has a relatively large volume of breast tissue.[10] Preponderance of right side is noted in some studies reflecting the ethnic variation in population,[6,7] As per studies of Raina *et al.*,[17] nipple discharge was present in 4.9% of patients whereas in our study it constitutes 41.09% of patients. Other nipple and skin changes are comparable with other available studies.

Regarding the histological types, IDC is the most common and is supported by other studies.[17,19] To our amazement a significant observation in our study is the incidence of IDC in a 5-year-old girl possibly as a consequence of genetic mutations. In most of the studies, lobular carcinoma[6,17,19] occupies the second place whereas in our study invasive papillary carcinoma (3.4%) is followed by mucinous carcinoma (2.72%) and metaplastic carcinoma (2.72%). Mucinous and papillary tumors predominate in the Jamaican studies,[14] In contrast to other studies[3] metaplastic carcinoma occupies a significant position in our study, interestingly metaplastic carcinoma with squamous and osteosarcomatous differentiation are evident. Intratumor heterogeneity underpinned by distinct genetic alterations paves way for morphological diversity with carcinoma and sarcoma at either ends of the spectrum. Regarding prognosis, anecdotal evidence suggests early recurrence and poor survival; they are triple negative tumors limiting potential systemic treatment.[9] Newer variants, invasive cribriform carcinoma, invasive micropapillary carcinoma, adenoid cystic carcinoma, and neuroendocrine tumor each contribute to 0.68%. Although these percentages are comparatively low, recognition of them is important as prognostic significance is there.

Breast is a rare site for a primary sarcoma. It needs deligent sampling to exclude focal evidence of biphasic epithelial or sarcomatous differentiation to rule out phyllodes and metaplastic carcinoma. 3 rare cases of fibrosacroma, pleomorphic sarcoma, and angiosarcoma have been documented. Primary angiosarcoma of breast though rare is the most common pure malignant stromal tumor of the breast. Radiation-induced sarcomas are well recognized and estimated to be 0.1%.[9] The interval between radiation exposure and development of angiosarcoma is usually between 2 and 10 years. Post-radiation angiosarcomas are more common than de nova angiosarcoma and that too particularly in therapy of older women. Angiosarcoma noted in our study does not have any history of exposure to radiation. Kaposi sarcoma predominates in Ivory Coast probably due to the impact of the HIV virus in their society.[1] Primary breast lymphoma is a rare clinical entity that accounts for <1% of all patients with Non-Hodgkin's lymphoma. We have come across a case of primary B-cell

lymphoma of breast. The incidence of B-lymphoma is high in Sub-Saharan African countries probably an endemic Burkitt lymphoma; the spreading of tumor cells from an unknown site to the mammary vessels could be thought of.[1] WHO stated that there are marked variations in the size ranging from under 10 mm to over 10 mm.[19] Recording the measurements of size, T1 <2 cm constitutes 2.4% and 85.36% and 12.24%, respectively, for T2 and T3 in our study. African literatures[13] report the presentation of tumor with stage III or IV in contrary to our study where stage II presentation is the most common.

Nodal positivity portrends the worst prognosis. The 10 years survival rate is 70-80% with node-negative carcinoma, 35-40% in carcinoma with 1-3 positive nodes and 10-15% in patients with more than 10 nodes.[3] Nodal positivity was noted in 29.93% of cases in contrast to studies of Amr *et al.*[11] which showed positivity in 61.7% of cases. 21.76% of cases show <3 nodes positive and 8.16% have more than 3 nodes positivity.

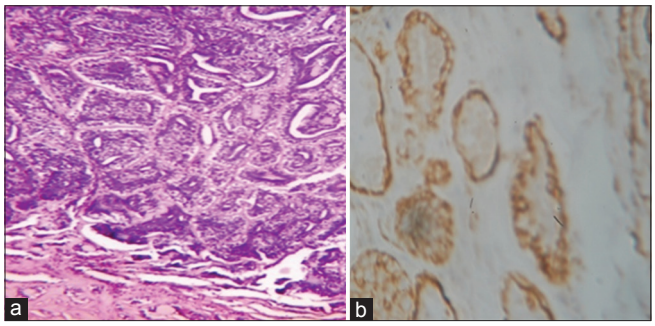

Figure 3: (a) Adenomyoepithelioma shows tubules lined by epithelial and myoepithelial cells. (b) Smooth muscle actin positivity

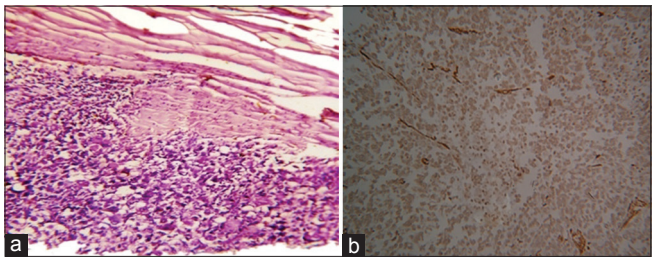

Figure 4: (a) Malignant phyllodes with rhabdomyoblastic, (b) myoglobin positivity of differentiation rhabdomyoblasts

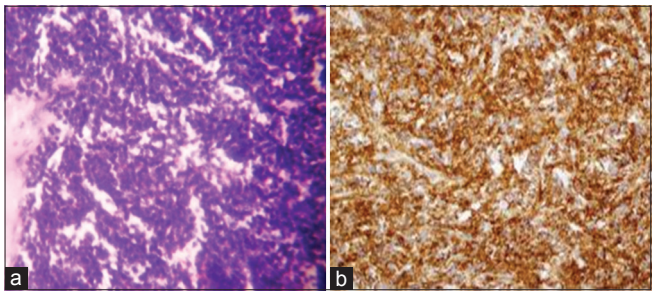

Figure 5: (a) Lymphoma showing sheets of (b) CD 20 positivity monotonous cells interspersed with blasts

Immunohistochemistry served as an adjunct tool for diagnosis of difficult cases. Smooth muscle actin shows positivity in a case of adenomyoepithelioma with suspicious malignancy (Figure 3a and b). Myoglobin positivity is observed in a case of malignant phyllodes with rhabdomyosarcomatous differentiation (Figure 4a and b) and a case of lymphoma was confirmed with CD 20 positivity (Figure 5a and b).

CONCLUSION

Breast cancer is the most common cancer in females posing a major health problem. There is a need for expedient evaluation of breast masses with an improved clinical and pathological characterization. The burden of breast cancer has to be brought down toward a declining trend. Hence, there is an urgent need to increase population screening program for early detection, training of women (breast self-examination), health worker, and medical practitioners. At present mammography serves as a screening tool but is less likely to be effective due to its insensitivity in high-density breast tissue at younger age. Moreover, most patients in our set up are unable to afford mammography due to their poor socio-economic background. Thus, there is a need for poverty alleviation programs, improved accessible and affordable health-care delivery services.

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Original Article

Sudden Death Causes: An Autopsy Study in Adults

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Abstract

Background and Objectives: Incidence of sudden death (SD) is quiet frequent to determine the cause of SD and observe the morphological changes in the heart after death.

Materials and Methods: A study for 50 cases was carried out in KAPV Government Medical College, Tiruchirappalli, in Pathology Department, in coordination with forensic medicine department from October 2015 to May 2016. A detailed autopsy finding with histopathological examination was done to analyze the cause of SD. We studied only heart specimen to explore the cause of SD.

Results: All cases revealed to between the age group 31 and 75 years with male preponderance common; out of 50 cases, 23 cases showed features of lesions; about 8 cases showed severe atheromatous change in aorta followed by 4 cases with early myocardial infarction (MI) and 4 cases with MI and complications such as atheromatous aorta with calcification, thrombus both old and fresh and a case myocarditis and medial hypertrophy of left ventricle. Rest of the cases the cause of death was undetermined.

Conclusion: The major causes of death were due to atherosclerosis, whereas MI and acute coronary events (thrombus) observed in 4% of cases of SD.

Key words: Atheroma, Autopsy, Heart, Morphology, Sudden death

INTRODUCTION

Sudden death (SD) is defined as an unexpected natural death due to cardiac cause within a short period (usually within 1 h) with or without onset of symptoms and without any prior condition that would appear fatal.[1] As the definition of SD varies, it is difficult task to compare one set of published data with another death from natural causes, in which interval between onset of signs and symptoms and death was not more than 24 h were regarded as SD.[2-4] It is by definition natural and it excludes all deaths due to poison, trauma. Various workers in this field have given different definitions. Although SD is a relative concept, this concept is currently described as unexpected death occurring within 1 h of new symptoms.[5] If the patient died instantaneously in the presence of witness or died while asleep, their death was classified as SD.

The incidence of sudden cardiac death has been steadily increasing all over the world. When SD occurs in adults and elderly persons, coronary atherosclerosis is the usual cause. These diseases are frequently concealed and discovered with surprise only at post mortem using through macroscopic and microscopic examination.

This present study was done for 50 cases with the cause of SD with autopsy examination, with coordinance with Pathology Department and Forensic Medicine at KAPV Government Medical College, Tiruchirappalli, Tamil Nadu, India.

MATERIALS AND METHODS

This present study is based on autopsy observation carried out in 50 cases and analyzed for the cause of SD. The cases were chosen as per the definition of SD and autopsied. The heart was examined grossly and microscopically to observe various histomorphological changes and findings were correlated.

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The randomized study on 50 cases was submitted for postmortem analysis; formalin fixed heart was inspected; sections were taken from right and left ventricular wall, stump of aorta and coronaries; multiple sections were taken at 4-5 mm interval; additional sections were made if needed. The tissue was processed, and paraffin sections were made at 4 mm thickness, stained with routine H and E staining.[6]

RESULTS

Out of 50 cases of SD, only 23 cases showed heart changes while rest 27 cases no known cause was made out as in Figure 1.

Our study was done for 50 cases with age range 25-80 years. The most common age group in our study with heart changes was in 51-60 years, and most predominance was in males as in Table 1.

The number of cases involved showed 21 male and 2 female cases; male: female ratio was 10.5:1.

The histomorphological changes were observed most common being solely atheromatous change in aorta (atherosclerosis) in 8 cases and next common being early changes in coronaries and aorta 4 cases; other complications such as calcification of plaques were also seen; thrombus formation was noted in 4 cases, of which one had an old thrombus formation and another with infected ball wall valve thrombus in aortic orifice; and rest one was reported to have focal myocardial infarction (MI) with atheromatous aorta and old thrombus formation. One case was noted with left ventricular hypertrophy with focal calcification of coronaries and one more case with medial wall hypertrophy of coronaries and one with myocarditis.

DISCUSSION

The term SD has no agreed universal definition; Goldstein proposed that SD should be defined as witnessed death within 1 h of the onset of symptoms, emphasizing the need for a uniform definition but saying that the definition of SD may be expressed in different terms depending on the nature and scope of the investigation.[7]

In our study, out of the total 50 cases of SD, 47 cases (94%) were male cases and 3 (6%) cases were females as shown Figure 2; male:female ratio was 15.6:1 for SD in general. This finding was consistent with study of Sarkojia *et al.* (82%),[8] Thomas *et al.* (73.9%),[8] Nordrum *et al.* (79.67%),[8] and Singh *et al.* (94.5%).[8]

The main aim of this study was to read out the cause of SD and the contribution of cardio vascular cause being the most common one. Data from post mortem of SD parallel the clinical observation on the prevalence of coronary disease, as the major structural etiological factor. More than 80% of cases have pathological findings of coronary heart disease; pathologic descriptions include a combination of long-standing atherosclerosis of the coronary arteries, and acute active coronary lesions, which include a combination of fissured or ruptured plaques, platelet aggregates, hemorrhage, and thrombosis.[9]

Although there are numerous causes of SD, cardiovascular causes are the principle cause among SD in the present

Table 1: Age and sex of occurrence in 23/50 cases

Age group (years)	Male	Female
25-30	-	-
31-40	4	-
41-50	5	-
51-60	8	1
61-70	3	-
71-80	1	1
Total	21	2

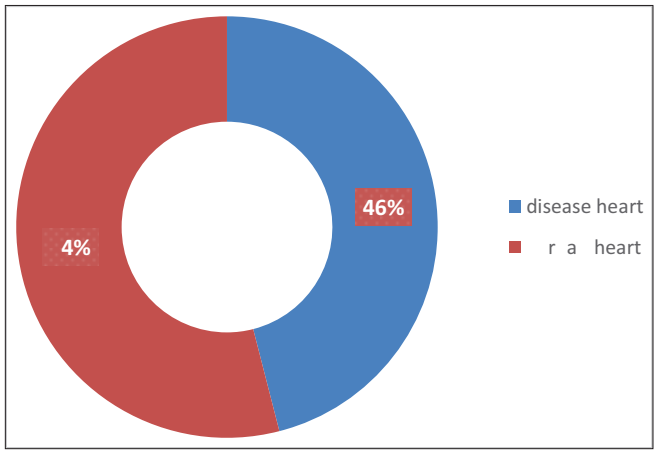

Figure 1: Autopsy changes in heart 50 cases

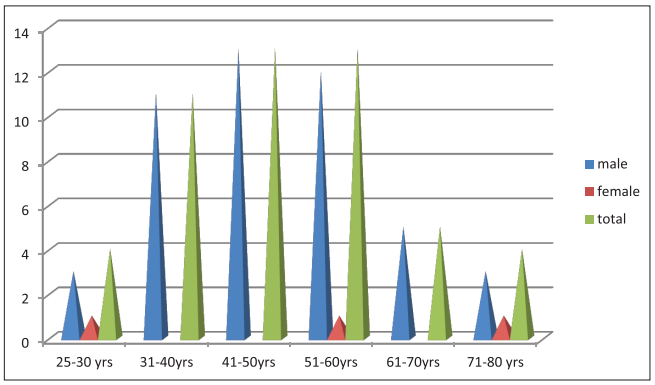

Figure 2: Age- and sex-wise distribution among sudden death cases (50 cases)

study. In our study, autopsy of 50 cases SD revealed heart changes in 23 cases (46%) with atherosclerosis (35%) of aorta followed by MI with early changes (18%) and MI with complication (18%), thrombus in coronaries (18%), coronary medial wall hypertrophy, left ventricular wall hypertrophy, and myocarditis each (4%) as shown in Figure 3, and the Figures 6-8 depicting the histopathological and microscopic changes in H and E.

Kuller *et al.*[10] studied showed that SDs are due to atherosclerotic disease, which correlated with our study.

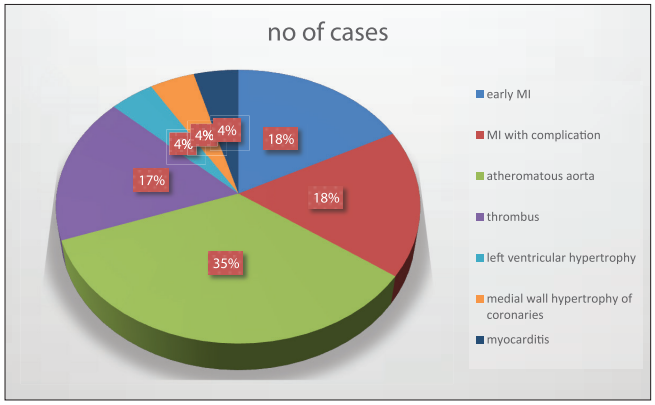

Figure 3: Histomorphological changes in heart (23 cases)

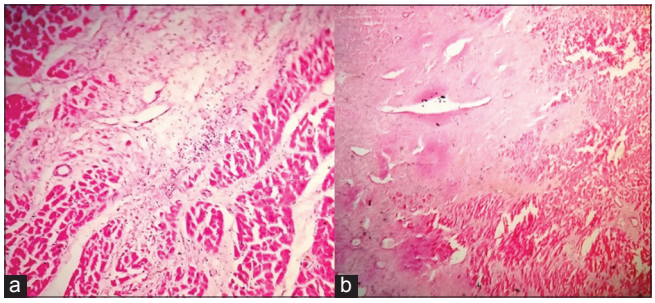

Figure 4: (a and b) Myocardial infarct changes in cardiac myocytes (H and E, ×100)

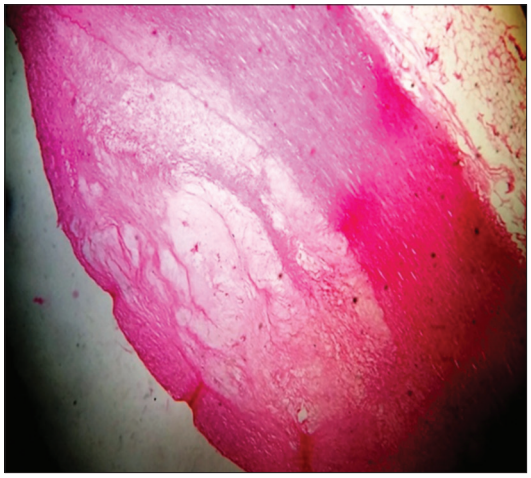

Figure 5: Atheromatous plaque aorta (H and E, ×100)

A study by Zanjad and Nanadkar showed SD due to cardiac causes (49.55%); Reddy and Nandy[8] stated that the most of the death were due to cardiovascular causes about 45-50%. Similar findings were seen in study of Kuller *et al.* (49.50%),[8] Siboni *et al.* (46.20%),[8] and Luke *et al.* (38%).[8]

Our study shows that incidence of male was high (21 cases male and 2 cases female) and average ratio of male: female was 10.5:1 which proved to be coherent with studies conducted by Farb *et al.*[10] that SD was more predominant in male, and Framingham[10] studies regarding male: female ratio.

The average age group of incidence was between 50 and 59 years in one study, and study series of Pentilla[10] also showed age group 55-66 years which was compatible with our study and they were the average age group was 50-60 years as shown in Figure 7.

The risk of SD increases dramatically beyond age 35 years and greatest rate of increase is between 40 and 65 years. Among older than 30 years of age, with structural heart

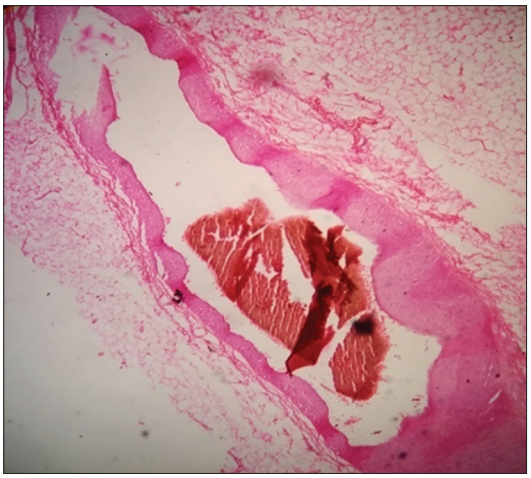

Figure 6: Coronary vessel thrombus (H and E, ×100)

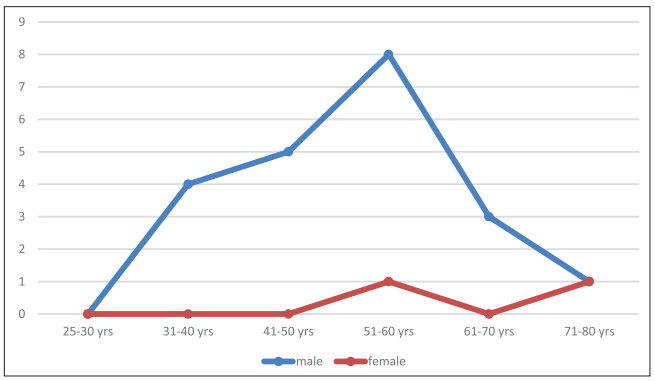

Figure 7: Age- and sex-wise incidence showing diseased heart changes in 23 cases (Total cases: 23, male - 21, female - 2)

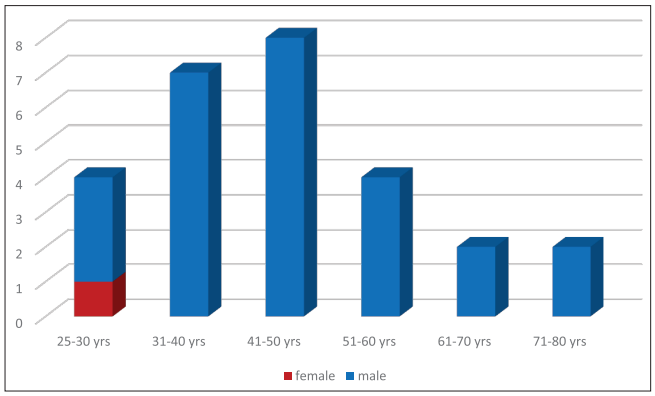

Figure 8: Age-wise and sex with normal heart findings (27 cases) in autopsy

disease and markers of high risk for cardiac arrest, the event may exceed 25% per year and age-related risk

The non-cardiac causes for SD have been reported in the central nervous system as intracerebral hemorrhage due to ruptured berry aneurysm, primary intracerebral hemorrhage, and epilepsy. The respiratory causes could be pneumonia, pulmonary embolism, chronic bronchitis, pulmonary hypertension, and acute asthma and rest of the causes elicited to be acute alcoholic poisoning, alcoholic fatty liver.[11] A variety of sedatives, tranquilizers, and mild analgesic drugs do contribute to causes of SD without cardiac change.[11] Cigarette smoking also increases the risk for SD.

The cause of SD in rest of 27 cases (54%) are of non-cardiac origin (Figure 8), so SD is not a just heart attack, and there remains a group, in which no cause can ever be found to explain death or undetermined attenuates.

CONCLUSION

Ischemic heart disease may be the leading cause of SD, with coronary atherosclerosis being the most significant pathogenic mechanism. This factor is being emphasized by many authors, and in our study, the cases have proven to that atherosclerosis was the major cause of sudden cardiac death, and we received only heart specimen pertained to this study.

SD is source of concern and detail post mortem examination is mandatory to ascertain the cause. The study helped us to find out cardiac causes but the non-cardiac causes were not definite in our study. So, more emphasis has to be made by obtaining complete history data, autopsy details, and histopathological examination of other organs would help out to find the cause. No one putative explanation for SD could be made.

Sudden cardiac death accounts for approximately over half of the total death due to the cardiovascular cause, to prevent this SD in the population.

Certain strategies have to be followed to achieve major population impact; effective prevention of underlining disease and development of new epidemiologic and clinical probes, for better individual risk prediction and specific high-risk groups in the population in needed.

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Original Article

Comparative Study of Coagulation Profile in Mild Pre-eclampsia, Severe Pre-eclampsia, and Eclampsia

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Abstract

Introduction: Alteration of coagulation factors increases the risk of bleeding complications in pre-eclampsia and eclampsia. To reduce the maternal morbidity and mortality need of accurate and rapid biochemical tests to detect the complications of pre-eclampsia and eclampsia. The aim of the present study is to detect the severity of hypertensive disorders during pregnancy and to compare the coagulation profile in mild pre-eclampsia, severe pre-eclampsia, and eclampsia patients.

Materials and Methods: A total of 200 pregnancy-induced hypertension (PIH) patients were selected for this study, among which 100 were presented with mild pre-eclampsia, 70 were severe pre-eclampsia, and 30 were eclampsia. Coagulation profile was investigated and analyzed.

Results: Platelet count was reduced in pre-eclampsia and eclampsia. Prothrombin time, activated partial thromboplastin time, bleeding time, and clotting time were prolonged in severe eclampsia and eclampsia. Statistical significance of coagulation profile was observed between mild pre-eclampsia and eclampsia, mild pre-eclampsia and severe pre-eclampsia.

Conclusion: Estimates of the biochemical parameters play an important role in the diagnosis of PIH and evaluation of risk factors, early detection, and effective antenatal services, prompt and proper management will decrease the maternofetal mortality, morbidity, and also perinatal mortality.

Key words: Coagulation profile, Eclampsia, Pre-eclampsia

INTRODUCTION

Pregnancy-induced hypertension (PIH) is hypertensive disorders usually appear after the 20th week of gestation, which often results in multiorgan failure.[1] PIH plays a major role in perinatal mortality and morbidity. Globally, about 5-10% of all pregnancies are complicated by hypertensive disorders.

PIH can present in the form of pre-eclampsia or eclampsia. Pre-eclampsia is a multisystem hypertensive disorder characterized by triad of hypertension, proteinuria, and edema. Eclampsia is a severe form characterized by convulsions or coma.

PIH may also result in a variety of hematological aberrations.[2] Thrombocytopenia is the most common hematological abnormality found in pre-eclampsia and eclampsia.[3] It is a strong indicator of severity of PIH.[2] Other coagulation abnormalities such as prothrombin time (PT), activated partial thromboplastin time (aPTT), fibronectin time, and antithrombin III level are more sensitive.[1]

Alteration of coagulation factors increases the risk of bleeding complications in pre-eclampsia and eclampsia. Hemorrhages are a major problem where it is the main cause of maternal mortality, which usually occur during operative delivery or regional anesthesia procedure.

To reduce the maternal morbidity and mortality need of accurate and rapid biochemical tests to detect the

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complications of pre-eclampsia and eclampsia including HELLP syndrome. Detecting the severity of PIH disorders, help in the better management of patients. Hence, the present study has undertaken to correlate coagulation parameters with the severity of PIH, which helped us in the early management of PIH before it worsens.

The aim of the present study is to detect the severity of hypertensive disorders during pregnancy and to compare the coagulation profile in mild pre-eclampsia, severe pre-eclampsia, and eclampsia patients.

MATERIALS AND METHODS

The study has done on pregnant women with PIH disorders for 1½ years at the Department of OBG, Government General Hospital, Anantapur, from April 2014 to December 2015. This prospective study has started after taking informed consent from all the studied patients. Ethical Committee has approved to do this study.

Inclusion Criteria

Pregnant women with both mild and severe pre-eclampsia and eclampsia in the age group of 16-35 years.

Exclusion Criteria

Pregnant women in labor or with abruptio placentae or with established disseminated intravascular coagulation (DIC) or anticoagulation therapy were excluded in this study.

A total of 200 PIH patients were selected for this study, among which 100 were presented with mild pre-eclampsia, 70 were severe pre-eclampsia, and 30 were eclampsia. Details of the study were explained to all PIH women. Data regarding age, sex, number of pregnancies, socioeconomic status, presenting complaints, significant past, and family history were noted. General, systemic, and obstetrical examination was done.

Patients were advised for blood investigations including routine blood and urine examination, renal and liver function tests, blood sugar, lipid profile, and coagulation profile. Coagulation parameters were assessed using following methods:

1. Platelet count - using automated hematology analyzer
2. PT and aPTT - using a coagulometer
3. Bleeding time (BT) - by Dukes method
4. Clotting time (CT) - by Wright's capillary tube method.

All the data regarding coagulation profile were entered into excel sheet and analyzed.

RESULTS

A total of 200 patients with PIH disorders were included in the study. Peak incidence of PIH disorders was seen in 26-30 years followed by 21-25 years (Figure 1). 90 (45%) patients were in the age group of 26-30 years followed by 78 (39%) were in the age group of 21-25 years.

Out of 200 patients selected for doing this study, 100 were mild pre-eclampsia, 70 were severe pre-eclampsia, and 30 were severe pre-eclampsia. All the three PIH disorders were most commonly observed in the age group of 26-30 years followed by 21-25 years, 31-35 years, and 16-20 years (Table 1).

Mean of coagulation parameters was estimated and tabulated in Table 2. Platelet count reduced with increase in severity (mild pre-eclampsia to eclampsia). PT, aPTT, BT, and CT were prolonged in severe eclampsia and eclampsia.

Statistical significance of coagulation profile was observed between mild pre-eclampsia and eclampsia, mild pre-eclampsia, and severe pre-eclampsia (Table 3).

Prolonged PT and aPTT were observed in severe pre-eclampsia when compared to eclampsia and mild pre-eclampsia (Table 4). PT prolongation in between mild pre-eclampsia and severe pre-eclampsia showed statistically significant ($P = 0.0001$).

DISCUSSION

Pre-eclampsia is an idiopathic multisystem disorder specific to human pregnancy and puerperium. Hematological abnormalities such as thrombocytopenia and decrease in some plasma clotting factors may develop in pre-eclamptic women. Subtle changes suggesting DIC is one of the serious outcomes of pre-eclampsia.

During pregnancy, there is increase in the concentration of clotting factor II, V, VII, VIII, IX, X, XII. Plasma

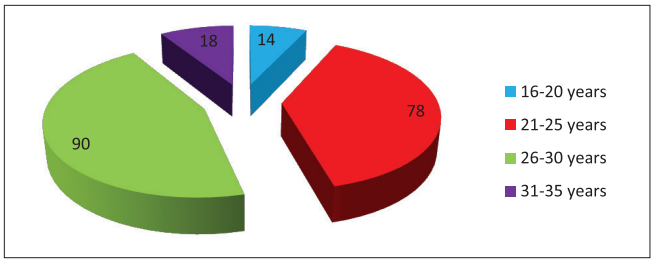

Figure 1: Age-wise distribution of cases

fibrinogen level is significantly increase. Plasma fibrinolytic activity is suppressed during pregnancy and labor. It returns to normal within 1 h of delivery of the placenta. This is due to the liberation of plasminogen inhibitor from the placenta. Because of the hypercoagulable state in pregnancy, the presence of any provocative factor can easily upset the normal balance culminating into IDC. In PIH, due to endothelial injury, the delicate hemostatic mechanism is triggered, which leads to coagulation failure.

In the present study, all the three PIH disorders were most commonly observed in the age group of 26-30 years followed by 21-25 years, 31-35 years, and 16-20 years.

Platelet count reduced with increase in severity (mild pre-eclampsia to eclampsia) in this study. This indicates that there is an inverse relationship between severity of PIH and platelet count.[1] Similar to our study, many studies have shown that platelet count decreased in pre-eclampsia and eclampsia when compared to normal pregnancy.[1-5]

PT, aPTT, BT, and CT were prolonged in severe eclampsia and eclampsia. Statistical significance of coagulation profile was observed between mild pre-eclampsia and eclampsia, mild pre-eclampsia and severe pre-eclampsia in this study. Pritchard *et al.*,[6] Osmanagaoglu *et al.*,[7] and Jambhulkar *et al.*[8] documented that coagulation factors such as PT, BT, coagulation time, and aPTT were decreased among PIH women when compared to normal pregnancy.

As per this study, prolonged PT and aPTT were observed in severe pre-eclampsia when compared to eclampsia and mild pre-eclampsia. Prolonged PT was seen in 8 PIH women and prolonged aPTT was seen in 23 PIH women. Leduc *et al.*[2] found 13 PIH women out of 100 had prolonged PT and aPTT.

An ongoing coagulopathy should be suspected if thrombocytopenia along with prolongation of PT and aPTT is found and treatment should be started at the earliest.

The abnormalities pertaining to coagulation parameters in PIH indicate the intravascular coagulation. Platelet count and aPTT have predictive value in detecting DIC in PIH, and these parameters show more abnormal results with increasing severity of PIH. Total platelet count with PT and aPTT can be taken as an earliest, simple, and rapid procedure for screening pre-eclampsia cases at admission.[9,10]

Table 1: Age-wise distribution of various categories of PIH cases

Age in years	*n* (%)		
	Mild pre-eclampsia	Severe pre-eclampsia	Eclampsia
16-20	7 (4)	5 (7.14)	2 (6.66)
21-25	39 (39)	28 (40)	11 (36.6)
26-30	45 (45)	31 (44.28)	14 (46.7)
31-35	9 (9)	6 (8.58)	3 (10)
Total	100 (100)	70 (100)	30 (100)

PIH: Pregnancy-induced hypertension

Table 2: Coagulation profile in different categories of PIH

Coagulation profile	Normal value	Mild pre-eclampsia	Severe pre-eclampsia	Eclampsia
Platelet count	1.5-4 lakhs	2.1±0.5 lakhs	0.8±0.3 lakhs	0.7±0.3 lakhs
PT	11-13 s	12.4±0.5 s	16.1±2.05 s	15.8±2.4 s
aPTT	27-38 s	33.6±5.4 s	44.6±2.3 s	42.4±3.5
BT	2-5 min	3.5±1.5 min	4.8±1.5 min	5.3±2.4
CT	3-5 min	4.2±1.6 min	5.4±4.3 min	5.6±1.3

PIH: Pregnancy-induced hypertension, PT: Prothrombin time, aPTT: Activated partial thromboplastin time, BT: Bleeding time, CT: Clotting time

CONCLUSION

We conclude that platelet count was decreased, and PT, aPTT, BT, and CT were prolonged in severe eclampsia and eclampsia, which was statistically significant. Prolonged PT and aPTT were observed most commonly in severe eclampsia. Estimates of the biochemical parameters play

Table 3: Statistical significance between PIH disorders

Coagulation profile	Mild pre-eclampsia versus eclampsia		Severe pre-eclampsia versus eclampsia		Mild pre-eclampsia versus severe pre-eclampsia	
	P value	Significance	*P* value	Significance	*P* value	Significance
Platelet count	0.0001	ESS	0.2018	NSS	0.0001	ESS
PT	0.0001	ESS	0.6046	NSS	0.0001	ESS
aPTT	0.0001	ESS	0.0056	ESS	0.0001	ESS
BT	0.0009	ESS	0.3372	NSS	0.0014	ESS
CT	0.0005	ESS	0.8082	NSS	0.0005	ESS

PIH: Pregnancy-induced hypertension, PT: Prothrombin time, aPTT: Activated partial thromboplastin time, BT: Bleeding time, CT: Clotting time, ESS: Extremely statistically significant, NSS: Not statistically significant

Table 4: Abnormal coagulation among PIH cases

Total number of cases	Mild pre-eclampsia	Severe pre-eclampsia	Eclampsia	Total
Patients with prolonged PT	1	4	3	8
Patients with prolonged aPTT	2	14	7	23

PIH: Pregnancy-induced hypertension, PT: Prothrombin time, aPTT: Activated partial thromboplastin time

an important role in the diagnosis of PIH and evaluation of risk factors, early detection, and effective antenatal services, prompt and proper management will decrease the maternofetal mortality, morbidity, and also perinatal mortality.

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Original Article

Comparison between Perivascular and Perineural Ultrasound-guided Axillary Nerve Block for Forearm Surgeries: A Randomized Controlled Study

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Abstract

Introduction: Brachial plexus block has evolved in procedures for upper limb surgeries when William Halsted performed it for the first time in 1884. Brachial plexus is formed by anterior primary rami of C5 to C8 and T1 nerves which emerge from intervertebral foramina.

Objective: The objective of this study was to compare ultrasound-guided perivascular (PV) and perineural (PN) axillary nerve block.

Materials and Methods: This prospective randomized comparative study was done in 50 patients posted for forearm surgery. This study was done to compare two techniques axillary block under ultrasound guidance. They were divided into two groups, namely, PN and PV group. In PN group, the median, ulnar, and radial nerves are blocked separately. In PV group, the local anesthetic is injected dorsal to the axillary artery. Intraoperatively, the imaging time, needling time, performance time, number of needle passes, vascular puncture, and onset of sensory and motor blockade were observed and recorded.

Results: According to this study, both PN and PV techniques have similar success rate. However, the performance time and number of needle passes were less in PV technique. Hence, the procedure-related pain was less in PV group.

Conclusion: The PV technique provides a simple alternative to axillary block under ultrasound guidance.

Key words: Axillary nerve block, Perivascular, Perineural, Ultrasound-guided

INTRODUCTION

Brachial plexus block has evolved in procedures for upper limb surgeries when William Halsted performed it for the first time in 1884. Brachial plexus is formed by anterior primary rami of C5 to C8 and T1 nerves which emerge from intervertebral foramina. They form roots between scalene muscles, trunks beneath the floor of posterior triangle, divisions behind the clavicle, and cords at the outer border of the first rib enter the axilla with the axillary artery.

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Use of image guidance for locating the peripheral nerve and neurofascial plane improves the success of this block with fewer complications. There are various techniques of imaging for nerve blocks. Among that ultrasound technique seems to be most reliable for nerve blocks. Ultrasound use was first described, in 1978, for supraclavicular brachial plexus block with the help of Doppler to detect blood flow. The nerve structures were first identified by Kapral, in 1994, visualized brachial plexus under ultrasound guidance. Ultrasound technology improved dramatically in last few years and leads to better understanding of sonoanatomy. Ultrasound-guided technology provides a good anatomy

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of the area of interest in real time.[1] This imaging helps to visualize neural structures such as nerve plexus and peripheral nerves and the surrounding structures such as blood vessels and pleura help to pass the needle toward the target nerves or facial plane, and visualize the extent of local anesthetic spread.[2] Ultrasound guidance allows visualization of the penetrating needle and nerve as well as a reasonable estimate of the spread of local anesthetic drugs.[3] In this study, we compared ultrasonography-guided perineural (PN) and perivascular (PV) axillary brachial plexus block (AXB) using compare performance time, number of needle passes, complications, onset time, success rate.

MATERIALS AND METHODS

This prospective randomized study was done to compare the PN and PV AXB under ultrasound guidance. This study was approved by the Ethical Committee of Hospital, and written informed consent was obtained from parents of the each patient. 50 patients of either sex undergoing surgery of forearm, wrist, and hand. 25 patients in each group were randomly allocated into two groups, namely, PV and PN group. The patients on either sex with the age group of 18-65 years with American Society of Anesthesiologists (ASA) physical status I, II, and III posted for elective upper limb surgeries were included in the study. This study was done in patients posted for arteriovenous fistula surgery. Patients with history of bleeding disorders, patients on anticoagulant therapy, with local infection, with documented neuromuscular disorders, with respiratory compromise, with known H/O allergy to local anesthetic drugs, and H/O psychiatric illness were excluded from the study. The detailed pre-anesthetic check-up was done on all patients, and relevant hematological, biochemical, and radiological investigations were carried out for all patients as per surgical requirements. Anesthesia equipment was checked, and resuscitative equipment and drugs were kept ready. In the operation theater, monitors such as pulse oximetry and non-invasive blood pressure were attached. Baseline values of parameters such as mean arterial pressure (MAP), pulse rate, and oxygen saturation (SPO_2) were recorded.

Sterile standard anesthesia tray prepared with the sterile towels, 4 × 4 gauze pack, local anesthetics mixture 12 ml of 0.5% bupivacaine, 6 ml of 2% lignocaine and 6 ml of sterile water, sterile gloves, one 2 cc 25 gauge needle for skin infiltration, one 23 gauge needle and 10 ml syringe for local anesthetic injection. Esaote ultrasound machine with probe frequency range of 10-15 MHz was used for the procedure.

Procedure

Patients were positioned supine with the shoulder abducted at 90° and the elbow flexed. The ultrasound probe was applied in a sterile fashion in the axilla. Betadine was used as a medium of interface to view the nerve structures. A high-frequency linear array probe of 10 MHZ frequencies was used for axillary block. Short axis views with sufficient compression to collapse the axillary vein was used to visualize neurovascular bundle. After obtaining a satisfactory image, a skin wheel was raised. In both groups, in-plane technique was used, in which the entire shaft and tip of needle were visible. In PV group, the needle is advanced until its tip is reached dorsal to axillary artery and the 24 ml of the local anesthetic mixture is deposited dorsal to the artery. A silhouette sign is sought to confirm proximity of needle tip to the artery. Silhouette sign is defined as blurring of arterial wall due to contiguity of blood and local anesthetic. In PN group, the median, ulnar, and radial nerves are blocked separately with 8 ml of local anesthetic mixture each.

The following parameters were assessed:

1. Imaging time: Defined as the time required to visualize axillary artery in PV group. In PN group, imaging time is defined as time needed to visualize all three nerves
2. Needling time: Time interval between the start of skin wheel and the end of local anesthetic injection
3. Performance time: Defined as the sum of imaging time and needling time
4. Number of needle passes
5. Vascular puncture
6. Time of sensory and motor blockade.

Motor and sensory blockade were assessed every 5 min up to 30 min. Sensory blockade of median, ulnar, and radial nerves was graded according to a 3 point scale using cold test (0 = No block; 1 = Analgesia - the patient can feel touch, not cold 2 = Anesthesia - the patient cannot feel touch). Sensory blockade was assessed in palmar aspect of the thumb for median nerve, in lateral aspect of the dorsum of the hand for radial nerve, and in palmar aspect of the fifth finger for ulnar nerve. Motor blockade of median, ulnar, and radial nerves was graded using 3 point scale (0 = no block; 1 = paresis; 2 = paralysis). Motor blockade was assessed by thumb abduction for radial nerve, thumb opposition for median nerve, and thumb adduction for ulnar nerve.

Sedation and rescue analgesics were not given during the procedure. If there was an inadequate motor or sensory block, the surgical procedure was completed with local infiltration. Intraoperatively, heart rate, MAP, and SPO_2 were recorded throughout the operation and were monitored at an interval of 5 min.

OBSERVATION AND RESULTS

The demographic profiles of the two groups were comparable in terms of age, sex distribution, and ASA physical status (Table 1). Imaging time was significantly higher in PN group compared to PV group. The imaging time in PV group was 19.8 s and in PN group was 111.6 s which was statistically significant ($P = 0.001$). Needling time was significantly prolonged in PN group compared to PV group. The needling time in PV group was 273.8 s and in PN group was 601.2 s which was statistically significant ($P = 0.001$). The performance time in total prolonged in PN group compared to PV group. The performance time in PV group was 293.6 s and in PN group was 712.8 s which was statistically significant ($P = 0.001$). As we expected the PV technique required fewer needle passes with mean value 1.4 compared to PN technique with mean value 5.16. The number of vascular punctures was less in PN group (2) than PV group (6) (Table 2). There was a higher rate of sensory anesthesia of median, radial, and ulnar nerve in PN group at 10, 15 min compared to PV group. However, there were no differences observed between two groups after 20 min (Table 3). There was a higher rate of the motor blockade of median, ulnar, and radial nerve in PN group at 5, 10, and 15 min compared to PV group, and there was no significant difference after 20 min (Table 4).

Table 1: Demographic details and ASA physical status

Variables	Group PV	Group PN	*P* value
Age (years), mean±SD	48.44±12.11	45.28±11.31	0.345
Gender (male/female)	16/9	17/8	0.432
ASA I/II/III	0/14/11	0/16/9	

P value≤0.05 is significant. PV: Perivascular, PN: Perineural, SD Standard deviation, ASA: American Society of Anesthesiologists

Table 2: Observation and results of the study in seconds (mean±SD)

Variables	Group PV	Group PN	*P* value*
Imaging time	19.8±3.67	111.6±16.5	0.001
Needling time	273.8±41.56	601.2±62.74	0.001
Performance time	293.6±41.17	712.8±62.15	0.001
Vascular puncture (yes/no)	6/19	2/23	

**P* value≤0.05 is significant. PV: Perivascular, PN: Perineural, SD: Standard deviation

Table 3: Number of patients achieve score 2 of sensory block in minutes

Time (min)	Number of patients radial nerve blocked		Number of patients median nerve blocked		Number of patients ulnar nerve blocked	
	PV	PN	PV	PN	PV	PN
5	3	5	1	10	1	11
10	10	15	6	20	8	20
15	20	23	20	23	18	24
20	23	23	23	24	24	25
25	24	25	23	24	24	25
30	25	25	25	25	25	25

PV: Perivascular, PN: Perineural

Table 4: Number of patients achieve score 2 of motor block in minutes

Time (min)	Number of patients radial nerve blocked		Number of patients median nerve blocked		Number of patients ulnar nerve blocked	
	PV	PN	PV	PN	PV	PN
5	1	4	0	4	0	4
10	10	18	9	15	10	15
15	20	24	20	23	22	23
20	23	24	24	24	23	24
25	23	25	24	25	25	25
30	24	25	24	25	25	25

PV: Perivascular, PN: Perineural

DISCUSSION

Ultrasound is very useful in direct visualization of nerve structures, and it is highly useful in targeted drug injection. In this study, the PV and PN group have comparable success rate and surgical anesthesia. However, the performance time and a number of needle passes are less in PV group compared to PN group. The onset time of sensory and motor blockade is faster in PN group, but it is comparable after 15 min. The incidence of vascular puncture is higher in PV group.

Imasogie *et al.*[4] compared a 2-injection PV to a 4-injection PN AXB and observed similar rates of surgical anesthesia but a shorter performance time with the PV technique. However, these authors used surgical anesthesia as the primary outcome and failed to record the number of needle passes.

Chan *et al.*[5] compared combined ultrasound and nerve stimulation technique with ultrasound alone for AXB. They found that combination of modalities lengthened the performance time without improving the power of axillary block. They concluded that ultrasound alone improves success rate rather than a combination of modalities. In this study, we used ultrasound without nerve stimulator which showed success rate.

Casati *et al.*[6] proved that compared to nerve stimulator ultrasound guidance decreases the number of needle passes and reduces procedure-related pain. In this study, we compared number of needle passes mainly to decrease procedure-related pain with success rate.

Tran *et al.*[7] and Fu Chaoliu *et al.* compared double injection axillary block with multiple injections under ultrasound

guidance, and they concluded with similar result in this study that double injection technique with fewer needle passes provides simple alternative to ultrasound-guided axillary block.

CONCLUSION

The PV and PN ultrasound-guided axillary block has comparable success rates. Because of fewer needle passes and less imaging, needling and performance time the PV technique can be preferred over a PN technique.

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Original Article

Effect of Sickle Cell Disease on Cardiovascular System: A 4.5 Years Autopsy Study Conducted in a Tertiary Care Center of Central India

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Abstract

Background: In Central India, the sickle cell gene is distributed mainly in Madhya Pradesh, Chhattisgarh, Maharashtra, Orissa and Jharkhand and in Chhattisgarh prevalence is nearly 10%. It has variable clinical presentation and most patients remain asymptomatic for longer period. SCA is ignored by autopsy surgeon to be considered as cause of death despite of its high prevalence. While doing autopsy in cases of death with no apparent cause, autopsy surgeon must keep in mind the possibility of death due to vaso-occlusive crisis in SCD.

Materials & Methods: A cross sectional study of duration 4.5 years from January 2012 to May 2016 was conducted in Central India Tertiary care center. Total no. of whole heart autopsy specimen received within this duration was 427 out of which 12 cases were found to have sickle cell disease. Clinical and history detail were collected then thorough gross and microscopic examinations were performed.

Results: History of chest pain was present in 5/12 cases i.e 41.67%. On Histopathological examination, congestion of vessel with Sickle shaped Red Blood Cells was present in 100% cases, MI without atherosclerosis in 41.66%, MI with atherosclerosis in 33.33%, medial calcification in 16.66%, and myocardial hypertrophy in 8.33% of cases.

Conclusion: Sickle cell disease should be considered as one of the cause in case of unexplained and sudden death.

Key Words: Autopsy, Autosomal Recessive, Myocardial Infarction, Prevalence, Sickle Cell Disease.

INTRODUCTION

Sickle cell anemia (SCA) is the most common inherited hematological disorder worldwide.[1,2] It is an autosomal recessive genetic disorder characterized by single point mutation at codon 6 of the globin gene on chromosome 11 resulting in replacement of valine for glutamic acid and thus formation of hemoglobin S.[3] SCA was first described, in 1910, by Herrik.[4] SCA is a common health problem in Chhattisgarh. Out of 26 million populations, about 27% of population is suffering with heterozygous hemoglobin trait and 2.5% of population with fatal homozygous hemoglobin disease.[5]

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Sickle cell disease (SCD) is highly prevalent among the triable of central, southern, and western India with frequency ranging from 10% to 23%.[6,7] There is also increasing prevalence in nontribal communities in the above-mentioned region. Among all states, higher prevalence of this disease is found in Maharashtra, Madhya Pradesh, Chhattisgarh, and Tamil Nadu.[8] The prevalence of SCA in Madhya Pradesh including Chhattisgarh is 1-40%.[9] Central India region is a focus of sickle cell disorder.[10] This disease has variable clinical presentation, and many of the Indian patients remain asymptomatic for a longer duration due to higher levels of HbF.

SCD produces considerable morbidity and mortality worldwide and also SCD presenting as death in clinically asymptomatic patients is not uncommon.[8] However, only

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very few numbers of deaths were reported due to SCA because of ignorance of autopsy surgeon in considering this disease as one of the causes of unexpected or sudden death despite its high prevalence in central India.[8]

MATERIALS AND METHODS

A cross-sectional study of duration 4.5 years from January 2012 to May 2016 was conducted in Central India Tertiary care center, in the Department of Pathology, Pt. Jawaharlal Nehru Memorial Medical College, Raipur, Chhattisgarh, India. Most of the autopsy specimens were received from primary health-care centers in peripheral districts and some from the Department of Forensic Medicine. Gross examinations were performed in all cases, and relevant findings were noted. After gross inspection for obvious lesions or scar formation, sections were taken from cardiac walls and coronaries. Standard hematoxylin and eosin staining were performed, and sections were examined under light microscope carefully, and results were noted.

RESULTS

Total autopsy specimens received during the above-mentioned study period were 544 cases, out of which, specimens of whole heart numbered 427. Total autopsied cases having SCDs on histopathological examinations were 12 in number, i.e., 12/427 cases (2.81%).

Age range found was 16-84 years with mean age of 39 years. Maximum number of cases lied between 25 and 49 years, i.e., 5/12 (41.66%) (Table 1).

Sex-wise distribution of cases showed male predominance. Out of 12 cases, 10 were male (83.3%) and remaining 2 (16.7%) were female with male: female ratio 5:1 (Table 2).

Maximum number of cases were found in the year 2016 from January to May 2016 (5 months), i.e., about 6/12 (50%). Two cases were found in each year 2012, 2014, and 2015, respectively. None of the cases was found in the year 2013 (Table 3).

Out of total 12 cases, only 1 of them was a known case of SCA. Rest of other cases came to notice having sickling as incidental autopsy finding. Most common presenting symptom was found to be chest pain which was present in 5/12 (41.67%) cases. Two of the cases had a history of hypertension, one of them also had H/O diabetes mellitus (Table 4).

On microscopic examination, in all the cases, i.e., 12/12 cases showed congestion of small and medium-sized vessels with sickle-shaped red blood cells (RBCs) suggestive of microvascular occlusion (Figure 1a and b). In some of the cases, coronaries were also congested with sickle-shaped RBCs (Figure 2a and b). Second most common finding observed was features of myocardial infarction (MI) without evidence of atherosclerosis (Figure 3) which was seen in 5/12 cases (41.66%) followed by MIs with atherosclerotic changes in coronaries in 4/12 (33.33%) of cases. Medial calcification was present in two of the cases. One case of myocardial hypertrophy and one case with features of atherosclerosis alone were also found. 2 of the 12 case showed no

Table 1: Age-wise distribution of cases

Age groups (in years)	Number of cases	Percentage
<25	3	25
25-49	5	41.7
50-75	3	25
>75	1	8.3
Mean age=39 years	Total=12	100

Table 2: Sex-wise distribution of cases

Sex	Number of cases	Percentage
Male	10	83.3
Female	2	16.7
Male:female ratio=5:1	Total=12	100

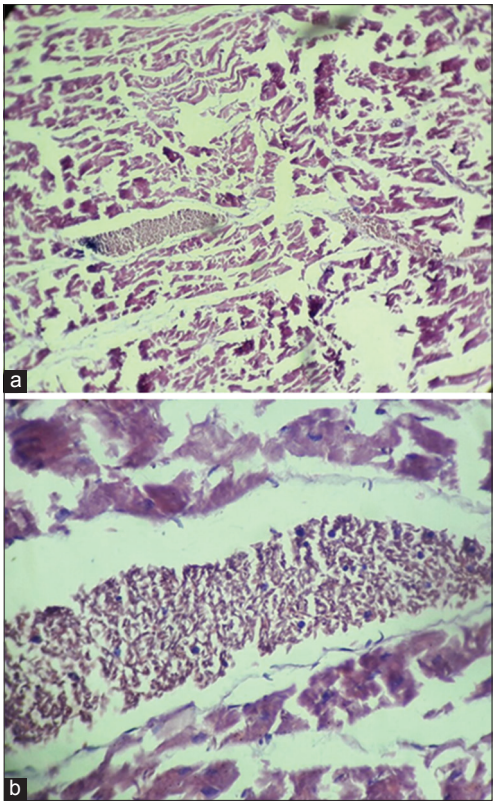

Figure 1: (a) Myocardial infarction and small vessels congested with sickle-shaped red blood cells (RBCs) (×4). (b) Small vessels congested with sickle-shaped RBCs (×10)

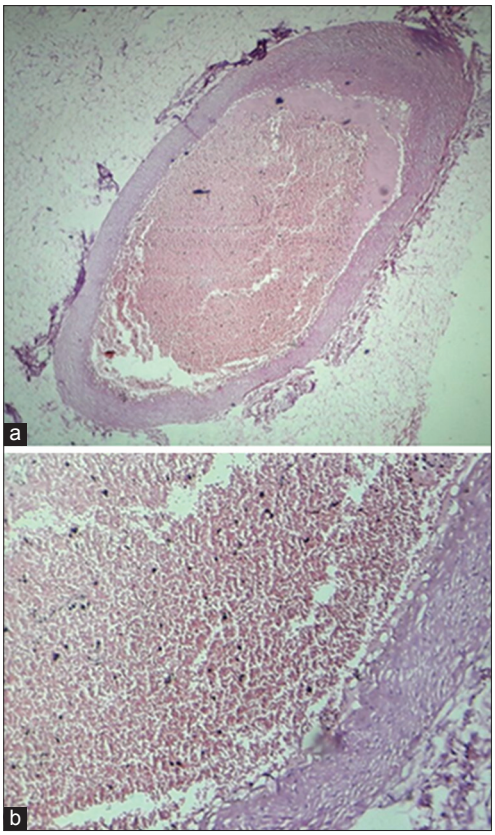

Figure 2: (a) Coronary artery filled with sickle-shaped red blood cells (RBCs) (×4). (b) Coronary artery filled with sickle-shaped RBCs (×10)

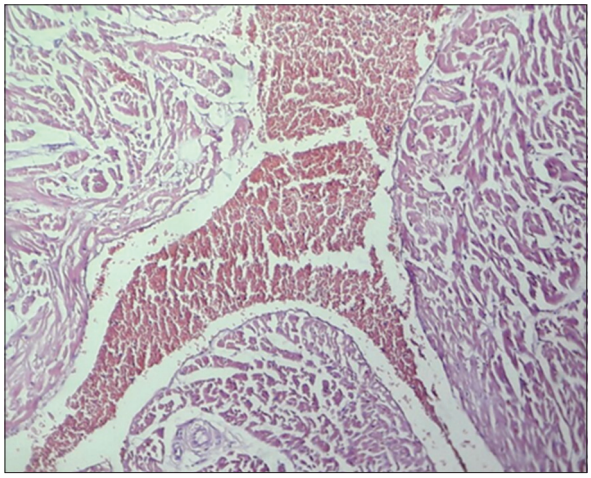

Figure 3: Myocardial infarction with medium-sized vessel congested with sickle-shaped red blood cells (×10)

specific pathology except for vessel congestion with sickle RBCs (Table 5).

DISCUSSION

SCA, the classical prototype of hereditary hemoglobinopathy, is an autosomal recessive disease manifesting in two forms heterozygous (sickle cell trait) or homozygous, SCD. The homozygous patients are symptomatic from an earlier age but heterozygous, i.e., trait patients are mostly asymptomatic and so ignorant about their disease and sickle cell crisis can occur in them with exposure to extreme hypoxic conditions.

Many studies have been done on various causes of deaths in SCA patients, but only a few studies focus on the effect of SCA on the cardiovascular system of the patient and causes of cardiac death in these patients.

Our study focused on the cardiovascular changes in these patients and tried to find out cardiac causes of death in them so that proper care or management could be provided to these vary group of patients to prevent morbidity and mortality among them. Our study found the mean age of death in patients with SCA was 39 years, ranging from 16

Table 3: Year-wise case distribution

Years of study	Number of cases studied (with SCD)	Total number of specimen of heart received (/year)
2012 (January-December)	02	101
2013 (January-December)	00	57
2014 (January-December)	02	110
2015 (January-December)	02	104
2016 (January-May)	06	55
Total number of years=4 years 5 months	Total=12	Total=427

SCD: Sickle cell disease

Table 4: Associated history

Associated history	Number of cases (%)
History of HTN	2 (16.67)
History of heart disease	1 (8.33)
History of poisoning	1 (8.33)
History of epilepsy	1 (8.33)
History of chronic alcoholism	1 (8.33)
History of chest pain	5 (41.67)
History of DM	1 (8.33)
Known case of SCD	1 (8.33)
Total	12 (100)

SCD: Sickle cell disease, DM: Diabetes mellitus, HTN: Hypertension

Table 5: Microscopic findings

Microscopic examination	Number of cases	Percentage of cases out of 12
MI with atherosclerosis	4	33.33
MI without atherosclerosis	5	41.66
Atherosclerosis only	1	8.33
Myocardial hypertrophy	1	8.33
Vessels other then coronaries congested with sickle-shaped red blood cells	12	100
Medial calcification	2	16.66
No specific pathology	2	16.66

MI: Myocardial infarction

to 84 years. It is similar to the study by Fitzhugh *et al.* as they also reported the mean age of death in SCD patients being 39 years.[11] This is comparable with a study done by Darbari *et al.*,[12] who found mean age to be 36 years.

Out of 12/427, 10 were male and only 2 were females with male to female ratio 5:1. Our observation shows discordance with the study conducted by Manci *et al.*,[13] who found no significant differences in presentation among male and female. In their study, male: female ratio was 1:0.98 in patients with homozygous (SS) and 1:1.44 in the heterozygous state. Probable reason behind this could be due to less number of study population included in our study.

In our study, we found 12 patients having SCA among 427 patients undergoing autopsy, i.e., 2.8% cases. Out of these, only 1 patient was a known case of SCA and rest 11 cases were diagnosed incidentally after histopathological examination only.

In the present study, out of 12 patients, 5 of them had history of chest pain as presenting complaint, i.e., 41.66%. Martin *et al.* found chest pain in 6/72 patients, i.e., in 8.33% of cases,[14] whereas Norris *et al.*[15] found chest pain in 100% of cases out of total 19 cases he studied. This could be explained by various factors such as type of disease, i.e., trait or homozygous, associated health conditions and geographical differences.

On histopathological examination, 100% cases showed small and medium-sized vessel congestion with sickle-shaped RBCs. This could be cause of microvessel occlusion leading to cardiac changes and deaths in the study group.

5/12 cases (41.66%) had features of MI without any atherosclerotic changes followed by features of MI with atherosclerosis in 4/12 (33.33%) of cases. Manci *et al.* found in their study that in 2.5% of homozygous (SS) cases the immediate cause of death was directly related to vaso-occlusion.[13] Martin *et al.* in their study found MI in 7/72 (9.2%) patients with SCD.[14]

In two of the cases, no specific pathology was noted during autopsy examination apart from the congestion of vessels with sickled RBCs.

Varies cardiac changes could be due to abnormal blood rheology in this disease that may result in vaso-occlusion, myocardial ischemia, and infarction.[16]

MI in SCD has been previously described in various case reports and series. These all have suggested microvascular disease related to vaso-occlusion as the likely cause of myocardial ischemia and injury in these patients.[14,15,17-28]

CONCLUSION

Clinical presentation of sickle cell patients in Central India is less severe as compared to African countries and is characterized by delayed presentation; patients are more asymptomatic, less incidence of vaso-occulsion, and low mortality due to which most of the patients remain undiagnosed. However, it is not uncommon in these patients presenting as death without any significant present or past history. Although many patients remain asymptomatic MI occurs in SCD and should be considered in differential diagnosis of patients with chest pain. Patients with SCD and chest pain who are suspected of having myocardial ischemia should be managed properly.

Furthermore, in case of unexplained death, during autopsy, it is important to keep in mind the possibility of SCD and so, proper histopathological examination along with hemoglobin electrophoresis, and molecular studies is needed to reach causes of death which would also be useful to their relatives to know the disease status in their family that could propel them to seek relevant management timely to prevent SCD related morbidity and mortality.

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Original Article

Clinical Study and Management of Parotid Tumors

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Abstract

Introduction: The parotid gland is the most common site for salivary gland tumors. 70-80% of salivary gland neoplasms occur in the parotid gland, of which 80% are benign, 20% are malignant of which 80% of the benign tumors are pleomorphic adenomas.

Aims and Objectives: (1) To know the incidence of parotid gland tumors with respect to age and sex. (2) To study the various modes of clinical presentation of parotid tumors. (3) To evaluate the various modes of surgery and outcome of surgical management of the parotid gland tumors at Mahatma Gandhi Memorial (MGM) Hospital, Warangal.

Materials and Methods: This study was conducted from November 2012 to May 2014, over a period of 1-year and 6-month. 30 patients admitted to MGM Hospital, Warangal, with parotid gland neoplasms are included in this study. Inclusion criteria all patients with parotid swelling due to parotid tumors from 13 years of age of MGM Hospital, Warangal. Exclusion criteria all pediatric patients, tumor-like conditions and infectious causes of swelling are excluded.

Results: (1) Age incidence in parotid tumors, (2) clinical presentation of parotid tumors, (3) incidence in relation to duration of mass, (4) surgical treatment adopted in the study, (5) distribution of HPE diagnosis of tumors, (6) fine needle aspiration cytology (FNAC) and histopathology corelation, (7) correlation of FNAC with histopathological examination, (8) incidence of benign and malignant parotid tumors, (9) distribution of benign tumors, (10) distribution of malignant tumors.

Discussion: In this study, the most patients were in the 3rd and 5th decade of life. Malignant tumors were common in the 4th and 5th decade. Malignant tumors were encountered more in the older age group in comparison to benign ones.

Conclusion: A total of 30 cases admitted to MGM Hospital attached to Kakatiya Medical College from November 2012 to May 2014 over a period of 1½ years were included in this study.

Key words: Parotid Tumour,Fine Needle Aspiration, Histopathological Examination

INTRODUCTION

The parotid gland is the most common site for salivary gland tumors.70-80% of Salivary gland neoplasms occur in the parotid gland, of which 80% are benign, 20% are malignant of which 80% of the benign tumors are pleomorphic adenomas.

Parotid tumors are generally slow growing and have been present for several years before the patient seeks medical advice. Because most of them are benign in nature and due to lack of health awareness in our setup, the number of patients seeking the treatment is less. Thus, the patients with malignant tumors present very late and need radical treatment which carries high morbidity.

Swelling is the most common symptom in parotid tumors. Most of the malignant tumors present with pain. Most of the benign tumors exhibit a slow growth pattern and malignant tumors Exhibit a rapid growth pattern.

Fine needle aspiration cytology (FNAC) is a good tool in diagnosing parotid gland tumors. Neural involvement is common in adenoid cystic carcinoma. Surgery is the main stay of the treatment for parotid tumors.

During the period from November 2012 to May2014, 30 cases of parotid tumors have been admitted to Mahatma

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Gandhi Memorial (MGM) Hospital, Warangal. 12 cases are presented in detail for the purpose of this dissertation.

Aims and Objectives

1 To know the incidence of parotid gland tumors with respect to age and sex
2 To study the various modes of clinical presentation of parotid tumors
3 To evaluate the various modes of surgery and outcome of surgical management of parotid gland tumors at MGM Hospital, Warangal.

MATERIALS AND METHODS

This study was conducted from November 2012 to May 2014, over a period of 1-year and 6-month. 30 patients admitted to MGM Hospital, Warangal, with parotid gland neoplasms are included in this study.

Inclusion Criteria

All patients with parotid swelling due to parotid tumors from 13 years of age of MGM Hospital, Warangal.

Exclusion Criteria

All pediatric patients, tumor-like conditions and infectious causes of swelling are excluded from the study.

All patients admitted were evaluated by documenting the history, thorough clinical examination, routine laboratory investigations and specific investigations. In history, importance was given to presenting complaints, duration of lump, rapid increased in size, associated symptoms of facial nerve involvement, previous surgical treatment or any medical problem.

Regarding physical examination, particulars mentioned in the proforma were noted. Importance was given to the site, extent of the tumor, deep lobe enlargement and fixity to the surrounding structures, facial nerve involvement, and regional lymphadenopathy. Associated medical conditions such as diabetes, hypertension, and anemia were managed and controlled before surgery with physician's advice.

As a part of general workup for surgery in all patients, hemoglobin level, bleeding time, clotting time, urine, sugar albumin, microscopy, and chest screening. Electrocardiogram, blood urea, serum creatinine, random blood sugar were estimated. Specific investigations like FNAC were done for all patients in the study group.

Sialography is not done for any of these patients because it may cause inflammation or infection. Extravasation of the dye may cause a severe inflammatory reaction preventing a clear demarcation of tumor margins and may also delay the planned surgical procedure.

After evaluation of the tumor by clinical examination and specific investigations, a surgical plan was formulated. The final decision was taken per operatively by the surgeon. The specimen was sent for histopathology for final diagnosis. The adjuvant treatment was decided depending on the final histopathological report.

Different modalities of treatment adopted in this study are as follows:

- Surgery alone
- Surgery and postoperative radiotherapy.

Different surgical procedures adopted in this study are as:

- Superficial parotidectomy
- Total conservative parotidectomy.

The follow-up period of these patients ranged from 3 months to 1 year. Long-term follow-up is necessary to study the tumor recurrence, which was not possible in this study.

RESULTS

The following observations were made in 30 patients who presented with parotid gland neoplasms in this study.

Age Incidence in Parotid Tumors

The age incidence of the patients in the study group ranged from 13 to 72 years. The malignant tumors occurred between the age group of 36-72 years. Most patients in this series were in the 4th decade of life. The mean age was 37.6 years for benign tumors and 50.7 years for malignant tumors (Table 1).

Sex Distribution of Parotid Tumors (Table 2)

Out of 30 patients parotid tumours,18 patients were Male, 12 Patients are female.

Side of the Tumor

About 60% of parotid tumors occurred in the left parotid gland in this study (Table 3).

Clinical Presentation of Parotid Tumors

All patients presented with swelling in the parotid region. Features of rapid growth, pain and associated facial paralysis were considered as signs of malignancy. Hard in consistency is noted mostly in a malignant tumor. Out of 30 patients, 5 patients presented with pain (16.67%) in swelling, out of which 5 were malignant.

Table 1: Age incidence in parotid tumors

Age group	Total number of cases	Percentage	Pleomorphic adenoma	Warthins tumor	Basal cell adenoma	Oncocytoma	Malignant mixed tumor	Acinic cell carcinoma
13-20	2	6.67	2		1			
21-30	8	26.67	5	1				
31-40	7	23.33	7				1	
41-50	9	30.0	6	1			2	1
51-60	2	6.67	1					
61-70	1	3.33				1		
71-80	1	3.33					1	
Total	30	100	21	2	1	1	4	1

Table 2: Sex distribution of parotid tumor

Sex	Number of cases	Percentage	Pleomorphic adenoma	Warthins tumor	Basal cell adenoma	Oncocytoma	Malignant mixed tumor	Acinic cell carcinoma
Male	18	60	11	2	1	1	2	1
Female	12	40	10				2	
Total	30	100	21	2	1	1	4	1

Pain occurred in 100% of the patients with malignant tumors. Deep lobe enlargement was seen in two patients in this series. No patient had fixity to masseter/mandible. No patient had facial nerve paralysis at presentation (Table 4).

Incidence in Relation to Duration of Mass

All patients presented with swelling in the parotid regions of which most cases (66.6%) presented within 5 years after noticing the swelling (Table 5).

FNAC Diagnosis of Tumors

In this study, the number of cases of pleomorphic adenoma cases diagnosed by FNAC was 26 which is the most common benign parotid tumor and among malignant tumors malignant mixed tumor has the highest incidence of two cases (Table 6).

Surgical Treatment Adopted in the Study

Surgery was performed in 30 patients, the type of surgery was chosen according to clinical impression, FNAC and per-operative findings. Superficial parotidectomy was performed in 25 patients (83.33%), conservative total parotidectomy in five patients (16.67%). In this study, radical parotidectomy and RND was not done in any of the patients (Tables 7-9).

In this study, after subjecting the specimens of tumor tissue for HPE among the benign tumors the number of cases of pleomorphic adenoma was 21 followed by warthins tumor - 2 cases among malignant tumors malignant cases, malignant mixed tumor were four cases followed by acinic cell carcinoma 1 case (Table 10).

FNAC and Histopathology Co-relation

All 30 cases subjected to FNAC and were reported as parotid tumors. After surgical excision or biopsy, all specimens were studied histopathologically and the table below shows corelation between FNAC reporting and histopathological diagnosis (Table 11).

FNAC showed 28 cases to be benign and 2 cases to be malignant but on HPE benign tumors are 24 and malignant tumors are 6 in number.

In this study, FNAC correctly diagnosed benign from malignant in 93.3% of the cases.

Table 3: Distribution of side of the tumor

Side of the tumor	Number of cases (*n*=30)	Percentage
Right side	12	40
Left side	18	60

Table 4: Clinical Presentation of parotid tumours.

Signs and symptoms	Number of cases	Overall (%)
Swelling	30	100
Pain	5	16.67
Fungating mass	0	0
Symptoms of facial palsy	-	-
Cervical lymphadenopathy	-	-
Deep lobe involvement	2	6.66
Fixity to masseter/mandible	-	-

Table 5: Incidence in relation to duration of the mass

Signs and symptoms	Number of cases	Overall (%)
1-12 months	5	16.67
1-5 years	15	50
6-10 years	9	30
11-15 years	1	3.33

Overall pleomorphic adenoma, constituted 70% of the tumor and among malignant tumor, malignant mixed tumor constituted 13% of the tumors in the series (Table 12).

In this study, among the benign tumors pleomorphic adenoma constituted 84% of the benign tumors and among the malignant tumors, malignant mixed tumor constituted 80% of the malignant parotid tumors (Tables 13 and 14).

Recurrent Tumor

One recurrent tumor was operated in this series. It was acinic cell tumor.

Adjuvant Treatment

Radiotherapy was given to five patients, with a malignant tumor of the parotid gland, five patients were given postoperative radiotherapy. Out of theses, four patients had a malignant mixed tumor and another one had acinic cell tumor. One patient received radiotherapy developed xerostomia, which was treated conservatively. No patients were given chemotherapy in this series.

Table 6: Distribution of FNAC diagnosis of tumors

Diagnosis	Number of patients	Percentage
Pleomorphic adenoma	26	86.7
Warthin's tumor	1	3.33
Acinic cell carcinoma	1	3.33
Malignant mixed tumor	2	6.7

FNAC: Fine needle aspiration cytology

Table 7: Types of surgical treatment adopted in the study

Procedure	Number of cases	Percentage
Superficial parotidectomy	25	83.33
Conservative total parotidectomy	5	16.67

Table 8: Types of surgical treatment adopted in the study

Procedure	Number of cases	Percentage
Superficial parotidectomy	25	83.33
Conservative total parotidectomy	5	16.67

Follow up

In this series follow-up ranged from 3 months to 1 year. To know the recurrence of a tumor long-term follow-up is necessary which was not possible in this study. In spite of repeated postal reminders, most of the patients in this study did not respond. During the study period, none of the operated patients came back with recurrent diseases.

DISCUSSION

In this study, most patients were in the 3rd and 5th decade of life. Malignant tumors were common in the 4th and the 5th decade. Malignant tumors were encountered more in the older age group in comparison to benign ones. The mean age group was 37.6 years for benign tumors and 50.7 years for malignant tumors. Whereas mean age for benign tumors is 51 years and mean age for malignant tumors is 40 years in the study by Lim *et al.* (Table 15).

Males were affected more than females in both benign and malignant tumors. The duration of swelling was form 8 months to 12 years. The history of the duration of the swelling is not significant, as long-standing benign tumor may turn malignant.

Sex ratio of both benign and malignant tumors has been 3:2 in the present study, compared to a near equal distribution of tumor in both sexes in other studies. However, there a general male preponderance as seen in the study by Suwala *et al.* and Kawata *et al.* (Table 16).

In the present series, left sided tumors are more common than on the right side. Similar observations are made by Suwala *et al.* and Marcello Donati *et al.* (Table 17).

Discussion on Clinical Features of Parotid Tumors

All patients presented with a history of swelling in the parotid region. 16.67% of the patients presented with pain in the swelling. No patient presented with facial nerve palsy. In this series, 100% of the patients with malignant parotid disease presented with pain. No patient presented with cervical lymph node metastasis.

Table 9: Complications following surgery

Complications	Pleomorphic adenoma	Warthins tumor	Basal cell adenoma	Oncocytoma	Malignant mixed tumor	Acinic cell carcinoma	Total
Immediate post-operative facial nerve weakness	4	1	0	1	1		7 (28.33)
Permanent facial nerve weakness	3		0	1	1		5 (16.66)
Parotid fistula	2	0					2 (6.66)
Wound infection	2					2	4 (13.33)
Frey's syndrome	1						1 (3.3)
Seroma	-	-	-	-	-	-	0
Bleeding/hematoma	-	-	-	-	-	-	0
Hypesthesia of cheek/ear lobule	-	-	-	-	-	-	0

Table 10: Distribution of HPE diagnosis of tumors

Diagnosis	Number of patients	Percentage
Pleomorphic adenoma	21	70
Warthins tumor	2	6.66
Basal cell adenoma	1	3.33
Oncocytoma	1	3.33
Malignant mixed tumor	4	13.33
Acinic cell carcinoma	1	3.33

HPE: Histopathological examination

Table 11: Correlation of FNAC with histopathological examination

Diagnosed as benign		Diagnosed as malignant	
FNAC	Biopsy	FNAC	Biopsy
28	24	2	6

FNAC: Fine needle aspiration cytology

Table 12: Incidence of benign and malignant parotid tumors

Individual tumors	Number of patients (*n*=30)	Percentage
Pleomorphic adenoma	21	70
Warthins tumor	2	6.66
Basal cell adenoma	1	3.33
Oncocytoma	1	3.33
Malignant mixed tumor	4	13.33
Acinic cell carcinoma	1	3.33

Table 13: Distribution of benign tumors

Benign tumors	Number of cases (*n*=25)	Percentage
Pleomorphic adenoma	21	84
Warthins tumor	2	8
Basal cell adenoma	1	4
Oncocytoma	1	4

Table 14: Distribution of malignant tumors

Malignant tumors	Number of cases (*n*=5)	Percentage
Malignant mixed tumor	4	80
Acinic cell carcinoma	1	20

The presence of facial nerve paralysis, skin infiltration or ulceration, and metastatic neck nodes were found only in patients with malignant tumors. A history of pain, hardness, and fixity, found in 30-50% of parotid cancers were significant indicators of malignancy as seen by Lam *et al.*[7]

Accuracy of FNAC

In this study, FNAC correctly diagnosed benign from malignant in 93.3% of the cases.

Superficial parotidectomy was performed in 25 patients (83.33%), conservative total parotidectomy in 5 patients (16.67%). In this study, radical parotidectomy and RND was not done in any of the patients (Table 18).

Table 15: Discussion on age incidence in parotid tumors

Author	Mean age for benign tumors (years)	Mean age for malignant tumors (years)
Lim *et al.*[2]	51	40
Present study	37.6	50.7

Table 16: Discussion on sex incidence in parotid tumors

Author	Males:female ratio
Suwała *et al.*[3]	1.01:1
Pietniczka-Załeska *et al.*[4]	0.7:1
Kawata *et al.*[5]	1.06:1
Present study	3:2

Table 17: Discussion on incidence of side of the tumor

Author	Side of the tumor	
	Right (%)	Left (%)
Suwala *et al.*	40	60
Marcello Donati *et al.*[6]	43.7	56.3
Present study	40	60

Table 18: Study on types of surgical treatments adopted in the study

Author	Superficial parotidectomy (%)	Total conservative parotidectomy (%)
Corcione *et al.*[8]	12.7	50.9
Patey *et al.*[9]	55.88	35.2
Present study	83.3	16.7

Preservation of the facial nerve and serious postoperative complications can be minimized following superficial and/or total conservative parotidectomy as seen in the study by al-Naqueeb *et al.*[10]

Radiotherapy was given to five patients with malignant tumors of the parotid gland. Five patients were given post-operative radiotherapy, and four patients are presented with malignant mixed carcinoma and one patient presented with recurrent Pleomorphic adenoma it turned out to be acinic cell carcinoma. In the management of malignant tumors, the usefulness of radiotherapy as an adjuvant to surgery has been accepted by all authors.

Chemotherapy is of doubtful benefit in the management of malignant parotid tumors and in this study it has not been given a trial (Table 19).

Table 19: Discussion on complications following surgery in parotid tumor

Complications	Bova.R *et al.*	Klintworth N *et al.*	Mantsopoulos K *et al.*	Present study
Immediate postoperative facial nerve weakness (%)	20	6	22.8	23.3
Permanent facial nerve weakness (%)	3.5	2	9.8	16.6
Parotid fistula (%)	-	2	-	6.6
Wound infection (%)	2.3	-	-	13.3
Frey's syndrome (%)	-	-	11.3	3.3
Seroma (%)	6.6	5	-	-
Bleeding/hematoma (%)	3.5	0.8/3	-	-
Hypoasthesia of cheek or ear lobule (%)	-	10	-	-

Temporary Facial Weakness

In this study, post-operative facial nerve weakness occurred in 7 patients (23.33%) And in 3 patients facial nerve weakness recovered completely over 6 months. Reported incidence of immediate post-operative facial weakness varies between 6 and 23% as per western literature. Normal function usually returns within 3-6 months but it may take up to 1 year. It may be caused by nerve ischemia, fatigue from excessive stimulation, stretching or hematoma formation.

Permanent Facial Weakness

In this study, postoperatively 16.6% (No. 5) of the patients developed permanent facial weakness, which is more compared with the western literature (3 patients with malignant mixed tumor and 1 patient with acinic cell pleomorphic adenoma). Reported incidence of permanent facial weakness in 2-9.8%, as per western literature.

Mehle *et al.* and Lacourrey *et al.* have reported 46% and 65% incidence of immediate post-operative facial weakness. Permanent facial weakness was 4% in both the series. Permanent facial weakness is slightly higher compared to western literature (Table 20).

Parotid Fistula

Parotid fistula occurred in 2 patients with pleomorphic adenoma who had undergone superficial parotidectomy, healed spontaneously within 3 months which is more compared to Klintworth *et al.* and Bova *et al.* As these cases are less frequently done in MGM hospital the number of parotid fistulas is more.

Wound Infection

Wound infection occurred in 4 patients due to poor nutritional status of the patients due to low socio-economic status of the patients, incidence of infection is more compared to other studies. Infection healed with antibiotic treatment.

Frey's Syndrome

There has been a single case of Frey's syndrome which is less compared to Mantusopoulos *et al.* In the studies carried out by Klintworth *et al.* and Bova *et al.*, cases of Frey's syndrome are nil as cases of parotid are done less frequently in MGM hospital. It was managed conservatively (Table 21).

Table 20: Studies on permanent facial nerve weakness

Author	Permanent facial weakness (%)
JMH Debetes and JDK Munting *et al.*[1]	7
Mehle *et al.* and Laccourreye *et al.*	4
Present study	16.67

Table 21: Discussion on distribution of benign and malignant tumors

Author	Benign tumors (%)	Malignant tumors (%)
Van Niekerek *et al.*[11]	80.2	19.8
Dunn *et al.*[12]	69.2	30.8
Suwała *et al.*[3]	88	12
Present study	83.3	16.7

Benign parotid tumors amount to 83.3% in the present study, whereas malignant parotid tumors amount to 16.7%. Similar observations were seen with other studies (Table 22).

Among benign tumors pleomorphic adenoma is the most common tumor amounting to 70% of all parotid tumors, which is slightly more compared to other studies. Whereas Warthin's tumor is less compared to other studies as the incidence is more in older white men.

Among malignant tumors, the incidence of the malignant mixed tumor is more-13.3% and a similar observation is made by Przewoźny *et al.* which is 20.6%.

In this study, pleomorphic adenoma was the most common tumor encountered constituting 70% of the parotid tumors. Among the benign parotid tumors Pleomorphic adenoma constituted about 84%, Warthin's tumor constituted about 8% of the benign parotid tumors. Among malignant tumors, the most common was malignant mixed tumor

Table 22: Discussion on distribution of individual tumors

Author	Pleomorphic adenoma (%)	Warthin's tumor (%)	Basal cell adenoma (%)	Oncocytoma (%)	Malignant mixed tumor (%)	Acinic cell carcinoma (%)
Przewoźny *et al.*[13]	65.5	24	4.2	-	20.6	-
Lee *et al.*[14]	61.6	13.2	-	-	-	-
Eddey *et al.*[15]	60.14	15.94	-	2.63	-	2.63
Present study	70	6.6	3.33	3.33	13.3	3.3

constituting 80%, Acinic cell carcinoma constituting 20% of the malignant tumors.

CONCLUSION

- Thirty cases admitted to Mahatma Gandhi Memorial Hospital attached to Kakatiya Medical College from November 2012 to May 2014 over a period of 1½ years were included in this study
- Incidence of parotid tumors is highest in the 3rd to 5th decade constituting 65% of patients
- Male to female ratio for parotid tumors is 3:2
- Benign tumors of the parotid constituted about 83.33% and malignant tumors constituted 16.66% of the parotid neoplasms in the study
- All patients presented with swelling in the parotid region
- Pain was the second most common symptom. The pain was noticed in 16.67% of the patients. Pain in the swelling occurred in 100% of the malignant tumors
- None of the patients in this series presented with facial nerve weakness or cervical lymph node metastasis
- Nearly, 6.66% of the patients presented with enlargement of the deep lobe of the parotid gland
- Pleomorphic adenoma was the most common tumor in this series constituting 70% of the overall parotid tumors
- Pleomorphic adenoma was the most common benign tumor constituting 84% of the benign tumors
- Malignant mixed tumor was the most common malignant tumor constituting 80% of the malignant parotid tumors
- FNAC was done in all patients. In this study, FNAC correctly diagnosed benign from malignant in 93.3% of the cases
- Sialography is seldom indicated in parotid gland neoplasms because it may cause inflammation or infection. Sialography was routinely done previously in patients with parotid gland neoplasms; Extravasation of the dye may cause a severe inflammatory reaction, preventing a clear demarcation of tumor margins and may also delay the planned surgical procedure
- The treatment of choice for parotid neoplasms is mainly superficial parotidectomy. This may be followed by radiotherapy if the tumor is malignant
- In this study, all patients with malignant tumors were given post-operative radiotherapy. No patient with benign tumors of the parotid was given radiotherapy
- No patients in the study were given chemotherapy
- Most common post-operative complication is facial nerve weakness
- The incidence of permanent facial nerve weakness was 16.6%. This is more comparable to western standard (2-9.8%) This has occurred mainly in patients with malignant tumors. In this study, no form of facial nerve repair was done
- In view of the late presentation, in this series, which can adversely affect in malignant tumors, increased community awareness for early referral is mandatory
- The adequacy of treatment cannot be commented because of the short follow-up of these patients in the study. The study group in this series is small, as compared to large series in western literature; so statistical data in this series may not represent the actual data quoted in the western literature.

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Original Article

Association of Menopause, Reproductive Years, and Bone Mineral Density in Postmenopausal Women with Natural Menopause

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Abstract

Introduction: The age at menopause has been found to be associated positively with bone mineral density (BMD), and the age at menarche has been found to be associated negatively with BMD. The association is due to the amount or duration of estrogen exposure.

Materials and Methods: Initial study population consisted of postmenopausal women of 40-70 years reporting to the Integral Institute of Medical Sciences and Research, Dasauli, Kursi Road, Lucknow, as outpatient department patients. The final study group included only postmenopausal women with natural menopause. Duration of study was of 2 years from April 2014 to April 2016. The association of reproductive years and timing of menopause, BMD, age of menarche, and age of menopause were compared in the study. The continuous and categorical variables were compared by analysis of *t*-tests and Chi-square analysis, respectively.

Results: Out of 1022 postmenopausal women studied, 389 women had low BMD, and 633 women had high BMD. Out of 389 women, 49 (12.6%) women were <30 reproductive years, 302 (77.6%) women were between 30 and 39 years, and 38 (9.7%) were more than 40 reproductive years. Out of 633 women, 79 (12.5%) women, 490 (77.4%) women, and 63 (9.9%) were of <30, 30-39, and >40 reproductive years, respectively. Out of 389 women with low BMD, 88 (22.6%) and 301 (77.3%) were women with early menopause <49 years and late menopause >49 years, respectively. Out of 633 women with high BMD, 138 (21.8%) and 495 (78%) were women with early menopause <49 years and late menopause >49 years, respectively. The study showed the comparison in mean age, BMD, age of menarche, and age of menopause between Group 1 (early menopause <49 years) and Group 2 (late menopause >49 years). The mean age of Group 1 and Group 2 was 43.50 years (standard deviation [SD] 7.39) and 54.2 years (SD 4.8), respectively. $P < 0.0001$, extremely statistically significant. *t*-test = 25.91, df = 1020, 95% confidence interval −11.5112-−9.8888.

Conclusion: Longer the reproductive years, late the menopause, and earlier the menarche, there was positive association with bone density.

Key words: Bone mineral density, Menopause, Osteoporosis

INTRODUCTION

According to some studies, age at menopause has been found to be associated positively with bone mineral density (BMD),[1,2] and the age at menarche has been found to be associated negatively with BMD.[3] The association is due to the amount or duration of estrogen exposure.[4] The estrogen levels at a given point of time are influenced by underlying physiological and environmental factors.[5] Some studies show age of menarche or menopause seems to be limited or of no importance for osteoporosis when subjects are of age 75 or older.[6,7]

Although dual-energy X-ray absorptiometry (DEXA) is the golden standard for diagnosis of osteoporosis, quantitative ultrasound (QUS) of calcaneum is a less expensive, portable, screening tool of sensitivity 67.6% as against DEXA 76.6%.[6-8] Some studies show QUS calcaneum

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sensitivity 39.25%, specificity 91.71%, positive prediction 72.41%, and negative prediction of 73.14%.[9,10]

This study sought to examine the relationship of the timing of menopause and reproductive years with BMD.

Aim

To study the association of menopause, reproductive years, and BMD in postmenopausal women with natural menopause.

Objective

To study the relationship of timing of menopause, length of reproductive years (calculated by age of menopause-age of menarche) with BMD in postmenopausal women with natural menopause.

MATERIALS AND METHODS

Study design: Cross-sectional study.

The initial study population will consist of postmenopausal women of 40-70 years reporting to the Integral Institute of Medical Sciences and Research, Dasauli, Kursi Road, Lucknow, Uttar Pradesh, India, as outpatient department patients.

Final study group will include only postmenopausal women with natural menopause.

Duration of study: 2 years from April 2014 to April 2016.

Sample size: Complete enumeration.

Inclusion Criteria

Subjects are women of 40-70 year old, who reported suspension of menstruation for at least 1 year before the study, without any medical or surgical reason.

Exclusion Criteria

a. Medical conditions such as renal disease, insulin-dependent diabetes mellitus, liver disease, rheumatoid arthritis, malignancy, chronic disease that affect skeleton, abnormalities of parathyroid, thyroid, and adrenal glands
b. Surgical conditions such as partial/total gastrectomy, hysterectomy with/without oophorectomy
c. Drugs-prior use of estrogen replacement therapy, corticosteroids, diuretics, cytotoxic drugs, anabolic steroids, bisphosphonates, calcitonin, or Vitamin D.

Data Collection

All of the women will be counseled, and information sheet in patients own language will be given and written informed consent will be obtained from the subjects participating in the study.

The self-administered questionnaire will be used to collect information about lifestyle, past and present health condition, previous and current physical activities, dietary calcium intake, reproductive history, and breastfeeding practices were taken. To further reduce the influence of variables, menopausal women, who are non-smokers, parous, breastfed women with moderate physical activity and with no contraceptive history, were included in the selection criteria.

Investigation BMD analysis by calcaneal QUS.

RESULTS

The mean age of 1022 postmenopausal women was 48.85 years (standard deviation [SD] 6.14). The mean age of menopause and mean age at menarche for all women was 48.20 (SD3.61) and 14.76 years (SD2.24). The reproductive years is calculated as (age of menopause age of menarche). The reproductive period ranged from 12 to 52 years, with mean 32.0 years (SD4.53). The reproductive years were further grouped into <30 years, 30-39 years, and ≤40 years. The BMD results were categorized into osteopenia/higher BMD (T score −1.0-−2.5) and low BMD/osteoporosis (T score −2.5 and below).

The *t*-tests were used for continuous variables. The ANOVA test was used for more than two groups. The *P* value was calculated. Out of 1022 postmenopausal women studied, Table 1 shows that 389 women had low BMD, and 633 women had high BMD. Out of 389 women, 49 (12.6%) women were <30 years reproductive years, 302 (77.6%) women were between 30 and 39 years, and 38 (9.7%) were more than 40 reproductive years. Out of 633 women, 79 (12.5%) women, 490 (77.4%) women, and 63 (9.9%) were of <30, 30-39, and >40 reproductive years, respectively.

Out of 389 women with low BMD, 88 (22.6%) and 301 (77.3%) were women with early menopause <49 years and late menopause >49 years, respectively. Out of 633 women with high BMD, 138 (21.8%) and 495 (78%) were women with early menopause <49 years and late menopause >49 years, respectively. Table 2 shows the covariates and BMDs by timing of menopause and length of the reproductive period, and it shows the comparison in mean age, BMD, age of menarche, and age of menopause between Group 1 (early menopause <49 years) and Group 2 (late menopause >49 years). The mean age of Group 1 and Group 2 was 43.50 years (SD 7.39) and 54.2 years (SD 4.8), respectively. $P < 0.0001$, extremely statistically significant. *t*-test = 25.91, df = 1020, 95% confidence interval −11.5112-−9.8888.

The mean age of menarche of Group 1 and Group 2 was 14.24 years (SD 2.24) and 15.28 years (SD 2.62), respectively. $P < 0.0001$, extremely statistically significant. *t*-test = 5.43, df = 1020, 95% confidence interval −1.4163-−0.6637. The mean age of menopause of Group 1 and Group 2 was 45.4 years (SD 3.61) and 51.10 years (SD 2.61), respectively. $P < 0.0001$, extremely statistically significant. *t*-test = 26.43, df = 1020, 95% confidence interval −6.1236-−5.2764. The BMD of Group 1 and Group 2 was −3.1 (SD1) and −2.3 (SD 1), respectively. $P < 0.0001$, extremely statistically significant. *t*-test = 10.61, df = 1020, 95% confidence interval −0.948-−0.652.

The women with three categories of reproductive years differed significantly by age at menarche and age at menopause. The mean age of 30, 30-39, and >40 was 54.07, 57.31, and 59.20 years, respectively. The $F = 47.543$, $P = 0.000$, highly significant, MS = 827.727, df = 2, SS = 1655.454. The age of menarche of 30, 30-39, and >40 was 16.20, 14.71, and 12.31 years, respectively. The $F = 41.269$, $P = 0.000$, highly significant, df=2, SS = 863.31, MS = 431.66. The age of menopause of 30, 30-39, and >40 was 43.56, 48.7, and 54.35 years, respectively. The $F = 125.017$, $P = 0.000$, highly significant, df = 2, SS = 6598.42, MS = 3299.21. The BMD of 30, 30-39, and >40 was −3.0, −2.6, and −2.1, respectively. The $F = 22.865$, $P = 0.000$, highly significant, df = 2, SS = 45.730, MS = 22.865.

Table 1: Distribution of variables in 1022 postmenopausal women according to bone mineral density

Variables	Bone Osteoporosis low BMD (*n*=389)	Density Osteopenia higher BMD (*n*=633)	All women (*n*=1022)
Reproductive period (years)			
<30	49 (12.6)	79 (12.5)	128 (12.5)
30-39	302 (77.6)	490 (77.4)	792 (77.4)
>40	38 (9.7)	63 (9.9)	101 (9.8)
Timing of menopause (%)			
Early (age <49 years)	88 (22.6)	138 (21.8)	226 (22.1)
Late (age >49 years)	301 (77.3)	495 (78)	796 (77.9)

BMD: Bone mineral density

DISCUSSION

Francucei *et al.*[1] in 2010, Bulgakavo and Davydkin[2] (2009) and Gallagher[3] (2007) found age at menopause to be associated positively with bone mineral density.

Boonen *et al.*[4] (2005) Panichkul *et al.*[5] (2004) Juby[6] (2004) and Tomkinson *et al.*[7] (2003) found the age at menarche to be associated negatively with bone mineral density. Also Tomkinson *et al.*[7] in 2003 showed the association is due to the amount or duration of estrogen exposure. Francucei *et al.*[1] in 2007 and Gallagher[3] in 2003 found the estrogen levels at a given point of time are influenced by underlying physiological and environmental factors.

However Francucei *et al.*[1] in 2010 and Gallagher[3] in 2003 found age of menarche or menopause seems to be limited or of no importance for osteoporosis when subjects are age 75 or older.

Quantitative ultrasound (QUS) of calcaneum is a less expensive, portable, screening tool of sensitivity 67.6% as against DEXA 76.6% as shown by Juby[6] (2004), Tomkinson *et al.*[7] 2003 and Diez-Perez *et al.*[8] 2003. Some studies by Van den Berg *et al.*[9] 2001 and Langton and Langton[10] 2000, show QUS calcaneum sensitivity 39.25%, specificity 91.71%, positive prediction 72.41% and negative prediction of 73.14%.

The menopausal loss of ovarian estrogen is known to be associated with rapid decrease in bone mineral density, leading eventually to increased fracture risk.

During, pregnancy and lactation there is increased loss of calcium and inorganic phosphates from the mother's body. The increased exposure to estrogen and progesterone, enhanced the absorption of calcium in the intestine and increased the conservation of calcium in the kidneys. The women with higher age had lower bone mass. The study showed, timing of menopause was statistically extremely significant. The BMD was low in <30 years reproductive years as compared to bone density in 30-39 years and >/40 years category.

Table 2: Covariates and bone mineral densities in postmenopausal women according to timing of menopause and length of reproductive period

Covariables	Timing of menopause				Reproductive periods (years)			
	Early <49 (*n*=226)	Late >49 (*n*=796)	*t*-test	*P*	<30	30-39	>40	*F*
Mean age (years)	43.50	54.2	28.05	<0.0001	54.07	57.31	59.20	47.54
BMD	−3.1	−2.3	12.41	<0.0001	−3.0	−2.6	−2.1	41.26
Age at menarche	14.24	15.28	6.50	<0.0001	16.20	14.71	12.31	125.01
Age at menopause	45.4	51.10	29.20	<0.0001	43.56	48.7	54.35	22.86

BMD: Bone mineral density

CONCLUSION

Thus, longer the reproductive years, late the menopause, and earlier the menarche, there was positive association with bone density. However, further studies may be needed to improve statistical significance in terms of risk analysis by including continuous variables and categorical variables such as weight, height, body mass index, number of pregnancies, number of births, smoking, use of oral contraceptives, breastfeeding, and calcium intake in the study.

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Original Article

Analysis of Outcomes of Surgical Treatment for Varicocele in Primary Infertility Based on Seminal Parameters and Pregnancy Rate

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Abstract

Introduction: Varicocele is the most commonly observed and correctable cause of male factor infertility. The exact pathophysiology of varicocele is not known for certain. The purpose of our study was to analyze the effect of varicocele on the semen composition characteristics by semen analysis before and after varicocele ligation and also to assess the improvement in fertility status after varicocele ligation.

Patients and Methods: A prospective, non-randomized study for a study period of 2½ years with a total number (*n*) of 51 cases was carried out. Screening, identification, evaluation, and treatment were given to the patients attending our infertility clinic over a period from August 2010 to January 2013. A detailed semen analysis was done after 3 days of sexual abstinence. The specimen was examined within 1 h of collection. The history and clinical data of the patients were analyzed using SPSS software and comparison done using paired Student's *t*-test.

Results: The median sperm concentration of 51 patients in baseline semen analysis was 8 million/ml, and the median total sperm count of 51 patients was 18 million. The median forward (A + B%) motility percentage of sperms in 51 cases was 20%. The median normal morphology of sperms in 51 patients was 8%. Except 4 patients (7.4%) who were smokers, others did not have any smoking history or exposure to tobacco in any form. On comparing the data, post-operative sperm count and motility improvement were slightly better in sub-inguinal varicocelectomy surgery as compared with other modalities such as inguinal surgery and laparoscopic surgery.

Conclusions: Varicocelectomy gives a statistically significant improvement in sperm concentration, motility, and overall morphology. All approaches to varicocelectomy (sub-inguinal, inguinal, or laparoscopic) have shown a significant improvement in seminal parameters, with sub-inguinal approach being good in improving motility parameter.

Key words: Male infertility, Oligospermia, Sperm motility, Varicocele, Varicocelectomy

INTRODUCTION

Varicocele is the most commonly observed and correctable cause of male factor infertility. Varicocele, defined as dilated and tortuous pampiniform plexus of veins, is caused mainly by retrograde blood flow through the internal spermatic vein.[1] The percentage of clinically evidenced varicocele in young adult subjects varies from 9% to 23%, as reported by the most recent case studies.[2,3] Furthermore, varicocele can be observed in over 40% of infertile males.[4,5] The varicocele is a disease of puberty and is only rarely detected in boys <10 years of age.[6] Many studies have been conducted to examine the etiology and pathophysiology of varicocele as well as the influence it can have on spermatogenesis. The exact pathophysiology of varicocele is not known for certain, but varicocele is thought to impair normal testicular function by elevating scrotal temperature via reflux of warm abdominal blood through incompetent valves of the spermatic veins.[7-9] The veins that are most commonly involved are the internal

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spermatic veins, but the external spermatic veins and cremasteric veins have also been implicated.[10,11] Varicoceles are currently the most common abnormality identified in men being evaluated for infertility.[12] Improvements in semen quality after varicocele repair were first suggested by Barwell, in 1885; Bennett, in 1889; Macomber and Sanders, in 1929.[13-15] In spite of these reports, surgical repair of the varicocele as a treatment for infertility was virtually forgotten until 1952, when the Edinburgh surgeon Selby Tulloch demonstrated the restoration of fertility following excision of bilateral varicocele in an azoospermic patient.[16] Since then, thousands of studies on the diagnosis and surgical correction of varicoceles have appeared in the literature. Unfortunately, this entire body of experimental evidence has not been able to either identify the mechanism of spermatogenesis impairment or explain why surgical correction improves semen parameters.

Varicocelectomy, a commonly performed operation, is indicated in infertile males with varicocele who have oligospermia, asthenospermia, teratospermia, or a combination of these factors. It is not clear if varicocelectomy is indicated if the patients have normal sperm density associated with asthenospermia or teratospermia. Ligation of varicocele is known to cause marked improvement in semen parameters and also improve the fertility and conception rate.

This study has been undertaken with an idea to analyze the effect of varicocelectomy on semen parameters and fertility status. The purpose of our study was to analyze the effect of varicocele on the semen composition characteristics by semen analysis before and after varicocele ligation and also to assess the improvement in fertility status after varicocele ligation.

PATIENTS AND METHODS

A prospective, non-randomized study for a study period of 2-year and 6-month with a total number (*n*) of 51 cases was carried out. The screening, identification, evaluation, and treatment were given to the patients attending the infertility clinic of urology department over a period from August 2010 to January 2013. The following is the detailed description of the methodology adopted.

All those patients presenting with primary infertility with oligoasthenoteratospermia, with any grade of clinical varicocele, subclinical varicocele with oligoasthenoteratospermia diagnosed on Doppler study and in those men, who have a vein diameter >2.4 mm with reflux in Valsalva maneuver with no apparent female factor infertility were included in our study.

Those patients with secondary infertility, varicocele with normal semen parameters, secondary varicocele, recurrent varicocele, and those males with associated female factor infertility were excluded from our study.

All the patients selected for the study were evaluated by a detailed history exploring all aspects related to fertility. This was necessary to exclude other factors which could affect the fertility. Only patients with demonstrable varicocele (clinically or by investigations) and with no other causes of infertility were taken up for the study.

A detailed semen analysis was done after 3 days of sexual abstinence. The specimen was examined within 1 h of collection. Three specimens from each patient were examined over a period of 2-month to give an assessment of baseline spermatogenesis. All the patients in the study were subject to repair of varicocele by sub-inguinal approach, inguinal approach, or laparoscopic approach. In cases of bilateral varicoceles, both the sides were operated at the same sitting. Meticulous follow-up of all the patients was done. The following parameters were assessed: History and clinical examination at every 3 months' interval, semen analysis at every 3 months' interval, and pregnancy rate.

The history and clinical data of the patients were analyzed using SPSS software and comparison done using paired Student's *t*-test.

RESULTS

During the study period from August 2010 to January 2013, a total (*n*) of 51 varicocele patients, who fulfilled our inclusion criteria were included in the study. The age of the patients ranged from 21 years to 40 years, majority of patients, and the median age was 30 years. About 33 patients (64.7%) belonged to 20-30 years age group. The median duration of infertility was 2.5 years with a range from 1 to 4 years. 29 patients (56.8%) had varicocele on the left side and 4 patients (7.8%) had varicocele on the right side. 18 patients (35.3%) had bilateral varicocele. Figure 1 demonstrates the pre-operative clinical and sonological findings of varicocele. Figure 1a depicts the Grade III varicoceles encountered in our study, which typically is described as a "Bag of Worms." Figure 1b shows the intraoperative findings of dilated pampiniform plexus. Figure 1c and d depict the Doppler findings of Grade III varicocele.

Even though, the clinical guidelines do not advice varicocelectomy for sub-clinical varicoceles as a treatment for infertility, the palpatory method of examination and diagnosing varicocele is subjective, and accuracy may vary

by 50% in low-grade varicocele. We considered patients with Doppler diagnosed varicocele to be included in the study if the physical examination is not satisfactory in view of body habitus of the patient.

The median sperm concentration of 51 patients in baseline semen analysis was 8 million/ml, and the median total sperm count of 51 patients was 18 million. The median forward (A + B%) motility percentage of sperms in 51 cases was 20%. The median normal morphology of sperms in 51 patients was 8%. Except 4 patients (7.4%) who were smokers, others did not have any smoking history or exposure to tobacco in any form. 29 patients (69.1%) underwent inguinal varicocele ligation, 13 patients (30.9%) underwent sub-inguinal varicocele ligation, and 9 patients (17.6%) underwent laparoscopic varicocele repair. In inguinal varicocele repair, 9 cases were bilateral and 20 were unilateral. In sub-inguinal varicocele repair, 7 cases were unilateral varicocele and 8 cases were bilateral. In laparoscopic varicocele repair, 2 cases were bilateral and 7 were unilateral.

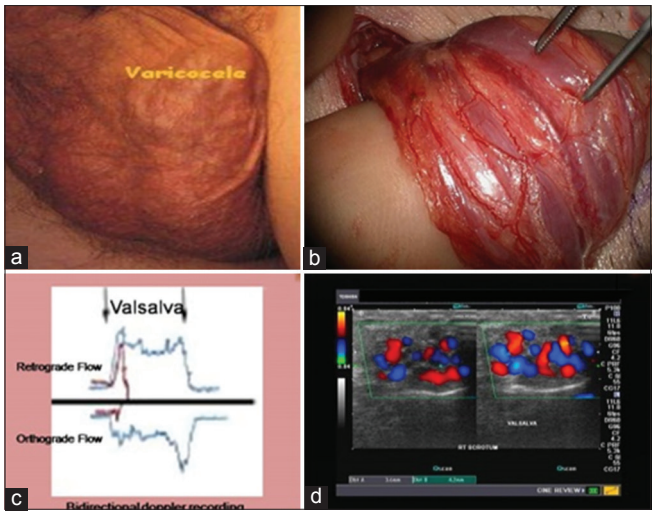
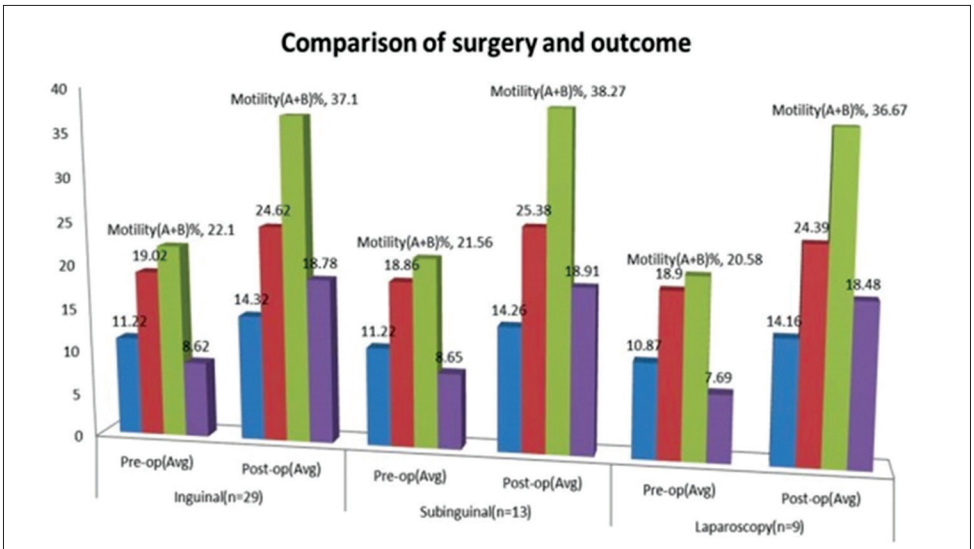


Figure 1: (a-d) Pre-operative clinical and sonological findings of varicocele

Figure 2 describes, in detail, the impact of the type of surgery on the ultimate outcome. In sub-inguinal varicocele repair (n = 13), the average pre-operative concentration of sperm is 11.22 million/ml, and post-operative average sperm concentration is 14.26 million/ml; this is statistically significant with $P < 0.001$. The average motility (A + B) in operative is 21.56% and that of in post-operative 38.27%, this is also statistically significant of $P < 0.001$. The average normal morphology of sperm in pre-operative is 8.65% and that of post-operative is 18.91%.

On comparing the above data, the post-operative sperm count and motility improvement is slightly better in sub-inguinal varicocelectomy surgery as compared with other modalities such as inguinal surgery and laparoscopic surgery, but it is statistically insignificant with $P < 0.568$.

Table 1 describes the percentage of improvement with the type of surgery. The percentage of improvement



	Inguinal(n=29)		Subinguinal(n=13)		Laparoscopy(n=9)	
	Pre-op(Avg)	Post-op(Avg)	Pre-op(Avg)	Post-op(Avg)	Pre-op(Avg)	Post-op(Avg)
Concentration(Million/ml)	11.22	14.32	11.22	14.26	10.87	14.16
Total Sperm(Million)	19.02	24.62	18.86	25.38	18.9	24.39
Motility(A+B)%	22.1	37.1	21.56	38.27	20.58	36.67
Morphology(Normal%)	8.62	18.78	8.65	18.91	7.69	18.48

Figure 2: Comparison of surgery and outcome

in inguinal, sub-inguinal, and laparoscopy in seminal parameters such as concentration, total sperm count, motility of sperms, and morphology of normal sperms was higher in sub-inguinal surgery with 78.2%, 74.3%, 63.4%, and 49.4%, respectively. The improvement in motility and morphology is evidently higher when compared with other types of surgeries.

Complications

All were discharged after 48 h if they had no complications. The following were the complications noted. Post-operative fever on the 1st day was noted in 4 patients in laparoscopic repair. The fever subsided by oral antipyretics. Wound infection was noted on the 7th post-operative day in three patients in inguinal repair. This subsided by oral antibiotic and daily dressings as op basis.

Follow-up

All the patients were asked to come for follow-up investigations at 3, 6, 9, and 12 months after surgery. During the follow-up, the following parameters were assessed: A detailed history including the history of conception or pregnancy, a thorough clinical examination, investigations including semen analysis, and Doppler study at 6 months postoperatively.

The findings of the follow-up study are presented below.

Pregnancy Rate

Of the 51 patients in our study, only 6 patients (11.8%) could successfully make his partner pregnant in the follow-up period. There were 3 patients of Grade II, 2 patients of sub-clinical, 1 patient of Grade 1 in the pregnancy.

Tables 2 and 3 illustrate the comparison of the percentage of improvement in successful pregnancy. On comparing the improvement of seminal parameters of successful pregnancy patients with the non-pregnant patients, there is statistically significant improvement in sperm concentration, total sperm count, motility, and morphology. On comparing the baseline values of the successful pregnant group with that of non-pregnant patients, the baseline values of pregnant were higher than as compared with baseline of non-pregnant.

Table 1: Percentage of improvement in type of surgeries

Percentage of improvement	Inguinal (%)	Sub-inguinal (%)	Laparoscopy (%)
Concentration (million/ml)	78.3	78.2	74.7
Total sperm (million)	73.2	74.3	71.5
Motility (A+B)%	60.6	63.4	56.2
Morphology (normal %)	45.6	49.4	41.6

Table 2: Percentage of improvement in pregnant patients

Parameters	Pre-operative (Avg)	Post-operative Avg)	Percentage of improvement in pregnant (%)
Concentration (million/ml)	8.83	11.1	79.50
Total sperm (million)	18.5	24.5	75.50
Motility (A+B)%	38.3	48.25	79.40
Morphology (normal %)	15.33	23.16	66.20

DISCUSSION

Varicocele and its association with infertility have been recognized for many centuries. In De Medicina, written during the first century A.D., Celsus credits the Greeks with the first description of a varicocele and then remarks on veins that are swollen and twisted over the testicle, which becomes smaller than its fellow, in as much as its nutrition has become defective.[17]

It is generally accepted that treatment of varicocele improves semen parameters, with improvement rates ranging between 60% and 80%. The WHO study has clearly identified varicocele as an important detectable cause of male infertility.[16] Improvement in seminal parameters following correction of varicocele has been variably reported in the literature ranging from 8% to 55%. Schlesinger *et al.* reviewed 16 studies that assessed the effect of varicocelectomy on sperm density and reported that post-operative significant improvements were demonstrated in 12 studies and that sperm motility was noted in 5 of these studies.[1]

Table 3: Analysis of successful pregnant post-varicocelectomy patients with non-pregnant

Parameters	Non-pregnant			Percentage of improvement in pregnant (%)
	Pre-operative (Avg)	Post-operative (Avg)	Percentage of improvement (%)	
Concentration (million/ml)	10.49	14.57	72.50	79.50
Total sperm (million)	16.4	21.3	73.50	75.50
Motility (A+B)%	22.6	35.56	67.50	79.40
Morphology (normal %)	8.77	18.1	49.50	66.20

Table 4: Grades of varicocele and percentage of improvement in semen parameters

Parameters	Percentage of improvement sub-clinical (%)	Percentage of improvement Grade I and II (%)	Percentage of improvement Grade III (%)
Concentration (million/ml)	70.80	72.70	46.70
Total sperm (million)	69.80	88.80	75.00
Motility (A+B)%	52.00	60.00	39.00
Morphology (normal %)	39.20	56.60	23.20

The total number of cases in our study was 51 patients, 33 patients (64.2%) had a unilateral varicocele, and 18 patients (35.3%) had a bilateral varicocele.

Table 4 illustrates the percentage of improvement in varicocele grades. On comparing the percentage of improvement in different grades of varicocele, the highest improvements in seminal parameters such as sperm concentration, total sperm count, motility, and morphology is seen in Grade I and II varicocele. The percentage of improvement in sub-clinical varicocele and Grade III varicocele is low as compared with that of Grade I and II. This implies that good improvement can be expected in Grade I and II varicocele after surgery.

Moazzam *et al.* have reported seminal improvement of sperm density, sperm motility, and sperm morphology in 60-80%.[18] 43 of the 51 patients (84.1%) in our study showed improvement of seminal parameters in the post-operative follow-up period. The two most widely quoted, prospective randomized controlled trials by Madgar *et al.* and Nieschlag *et al.* revealed a statistically significant improvement in sperm density after varicocele repair.[17,19]

Madgar *et al.* demonstrated a statistically significant improvement in pregnancy rate with 60% and Nieschlag *et al.* have shown a pregnancy rate of 29%. In our study, of the 51 patients, only 6 patients (11.8%) could have successful pregnancy in the follow-up period.

Matthews and coworkers found that 55% of men with azoospermia and 69% of men with zero motile sperm before surgery had motile sperm in their ejaculate after varicocele surgery.[11]

Sperm motility is another important factor that is taken into account for describing the fertilizing potential of the semen sample. Studies by Tinga *et al.*, Okuyama *et al.*, and Goldstein demonstrated an increased motility as well as increased sperm concentrations after varicocelectomy.[7-9] Similar results were seen in our study.

CONCLUSIONS

Varicocelectomy gives a statistically significant improvement in sperm concentration, motility, and overall morphology. The improvement in semen parameters did not have any significance in fertility potential. All approaches to varicocelectomies (sub-inguinal, inguinal, or laparoscopic) have shown a significant improvement in seminal parameters, with sub-inguinal approach being good in improving motility parameter. 6 patients (11.8%) post-varicocelectomy were able to successfully impregnate their partners. Even though there is an improvement in seminal parameters in 84.1% patients postoperatively, only 11.8% were only fertile. The rest of the patients cannot achieve successful improvement in fertility potential. On analyzing the patients with successful pregnancy showed that motility is probably the most crucial factor followed by morphology in achieving fertility. We need further studies to identify the reliable parameters based on which varicocelectomy as a treatment modality can be suggested.

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Original Article

Comparative Study between Oral Clonidine and Placebo in Laparoscopic Surgery to Attenuate the Hemodynamic Changes Due to Pneumoperitoneum and Hypercarbia

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Abstract

Background: Laparoscopic surgery has enormous advantages to the patient with regards to the post-operative pain and early discharge. However, it is not without disadvantages due to the hemodynamic swings that occur intraoperatively due to the intra-abdominal pressures. This study was undertaken to determine the efficacy of oral clonidine to attenuate these changes in response to pneumoperitoneum and hypercarbia.

Aim: A comparative study of oral clonidine and placebo in laparoscopic surgery to attenuate the hemodynamic response due to pneumoperitoneum and hypercarbia.

Materials and Methods: A prospective, randomized, double-blind, control study on 30 patients in two groups, one receiving placebo and the other receiving clonidine 5 μg/kg 90 min before induction was carried out. Intraoperative heart rate (HR) and non-invasive blood pressure (BP) were monitored along with post-operative complications such as nausea and vomiting were documented.

Results: Statistical analysis revealed oral clonidine was far beneficial maintaining intraoperative hemodynamic swings during laparoscopic surgery.

Conclusion: Oral clonidine was found beneficial with the ease of administration and control of HR and BP intraoperatively. Preoperatively, sedated and calm patient with a lesser incidence of polypharmacy intraoperatively was added advantages.

Key words: Clonidine, Hypercarbia, Laparoscopic surgery, Pneumoperitoneum, Stress response

INTRODUCTION

Laparoscopy or minimally invasive surgery has made huge advances in the field of surgery. It has a plethora of advantages being reduced pain, therefore, decreased hospital stay, reduction in medical cost with day care admissions, reduction in morbidity and mortality due to minimal handling. Patients may face a stormy intraoperative course if anesthesia fails to maintain the hemodynamics within the normal range during pneumoperitoneum and hypercarbia. Numerous studies have evolved over the years to identify agents capable of maintaining hemodynamics in a balanced spectrum during laparoscopic surgery. Clonidine is a centrally acting alpha 2 agonist used for premedication as it decreases polypharmacy, post-operative nausea, vomiting, and shivering. It has antihypertensive property by decreasing sympathetic outflow.[1] The use of drugs such as oral clonidine as a premedicant given before operation would be desirable to enhance the hypotensive action of inhalational agent without the disadvantages of intravenous (IV) vasodilators.

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Aim

Comparative study between oral clonidine and placebo in laparoscopic surgery to attenuate the hemodynamic changes due to pneumoperitoneum and hypercarbia.

MATERIALS AND METHODS

A prospective, double-blind study was undertaken in 60 patients: 30 patients in two groups belonging to American Society of Anesthesiologist (ASA) PS I and II. After obtaining approval from the Institute Ethical Committee and due patient consent, Group P (placebo) was given vitamin C 90 min before surgery; Group C (oral clonidine) was given clonidine 5 μg/kg 90 min before surgery. Both the administrator and receiver were blind to the groups allocated. Inclusion criteria were patients aged 20-50 years, ASA PS I and II patients, those undergoing abdominal laparoscopic surgeries, patient weighing 50-65 kg. Exclusion criteria were hypertension/ischemic heart disease/rheumatic heart disease, diabetes mellitus, obesity, anticipated difficult airway, sinus bradycardia/heart blocks/conduction defects, patients on antipsychotics, patients on digitalis, calcium channel blockers and b-blockers, H/o cerebrovascular disease (cerebrovascular accident), chronic renal disease with increased renal parameters, pre-operative hypotension, and patient refusal. The sedation score was assessed preoperatively using the sedation score. Patients were assessed for level of sedation at 30 min, 60 min, and 90 min after premedication. The following score was used to assess the degree of sedation:

Grade 1: Awake and alert patient
Grade 2: Awake and calm lying down quality
Grade 3: Drowsy, arousable on oral commands
Grade 4: Drowsy, arousable on mild physical stimuli
Grade 5: Drowsy, arousable on vigorous physical stimuli only.

Intraoperative heart rate (HR) and blood pressure (BP) were recorded every 5 min from the period of insufflations to release. Intraoperative top ups of fentanyl, propofol, and deepening the plane with sevoflurane were documented.

Pre-operative Assessment

Only those patients in the ASA Class I and II undergoing laparoscopic procedures were taken into this study. Nil oral duration was 8 h. Patients were given the oral premedicant, in a sealed cover 90 min before surgery and shifted to the operation theater with an 18G venflon and maintenance IV fluid. Sedation scoring was done to assess the efficacy of the premedicant. After shifting into the OT, monitors with non-invasive BP, SpO_2, and electrocardiography were connected. Antacid prophylaxis was given with injection. Ranitidine 50 mg and injection ondansetron 4 mg IV. Premedication was given with injection Glycopyrrolate 10 μ/kg, injection Midazolam 10 μ/kg and injection Fentanyl 2 μ/kg were given in IV. Preoxygenation with 100% O_2 done for 3-5 min. Patient induced with injection. Propofol 2 mg/kg and injection atracurium 0.5 mg/kg after ascertaining good mask ventilation. Maintenance with N_2O and O_2 2:1 and sevoflurane 0.75-2 vol%. Titrated doses of muscle relaxant, fentanyl, and propofol were administered according to the need intraoperatively. Monitoring of HR and BP was done every 5 min during and after intubation, positioning, pneumoperitoneum and during extubation. Pneumoperitoneum was achieved with CO_2 insufflation and intra-abdominal pressure was not allowed to exceed 12-15 mmHg. Time duration from insufflation to release was recorded. Rescue doses of fentanyl or propofol to deepen the plane of anesthesia was taken into consideration. Rescue with injection atropine was used if the HR <30%, injection ephedrine if the BP <30%, and injection nitroglycerin (NTG) infusion was used if the BP exceeded >30% of the patient's baseline. The patient was extubated at the end of surgery. The patients were then shifted to the recovery room and were kept under observation for about 60 min during which the HR, BP, respiratory rate, and SpO_2 were monitored at 30 min intervals for any signs of respiratory depression.

Statistics and Analysis

Data were expressed as mean, standard deviation, or absolute values. Qualitative data were compared with the Chi-square test and Fisher's exact test. Quantitative variables were compared with the Student *t*-test. The level of statistical significance was set at $P < 0.05$.

RESULTS

The mean age in Group C was 26.8 ± 4.40, and in the Group P, it was 26.3 ± 4.08 ($P = 0.649$). The mean weight in Group C was 53 ± 6.81. The mean weight in Group P was 51.13 ± 5.47 ($P = 0.246$). Sex distribution in each group was male = 17, female = 13. Thus, the demographic profile was comparable between the two groups. *P* value not significant.

At the end of 30 min following premedication, 25 patients in Group C were in the sedation score of 2, at the end of 60 min, 26 patients with the score of 3, and after 90 min, 23 patients had a score of 3. It was seen that all the patients in Group P were in the score of 1 till 90 min (Table 1).

9 (30%) patients in Group P supplemental doses of propofol and fentanyl when compared to 2 (6.66%) of Group C.

Table 1: Sedation score of both groups

Score	Grade of sedation and anxiolysis	30 min (%)		60 min (%)		90 min (%)	
		Group C	Group P	Group C	Group P	Group C	Group P
1	Awake and alert	4 (13.33)	30 (100.00)	0	30 (100.00)	0	30 (100.00)
2	Awake, calm, lying quietly	25 (83.33)	0	4 (13.33)	0	3 (10.00)	0
3	Drowsy arousable on oral commands	1 (3.33)	0	26 (86.67)	0	23 (76.67)	0
4	Drowsy arousable on mild physical stimuli	0	0	0	0	4 (13.33)	0
5	Drowsy arousable on vigorous physical stimuli only	0	0	0	0	0	0

i. It is hereby seen that a significantly higher consumption of sevoflurane >1 vol% almost 50% of patients in Group P was required when compared to Group C 2 (6.66%).
ii. 6 (20%) patients in Group P needed NTG infusion (0.1 mg/kg), whereas only 1 (3.33%) patients in Group C needed the same (Table 2).

Table 2: Reduction in requirements of anesthetic drugs and NTG seen in both groups

Drug	30 min %	
	Group C	Group P
Propofol/fentanyl	2 (6.67)	9 (30.00)
Sevoflurane		
1 vol%	2 (6.67)	5 (16.67)
2 vol%	0	15 (50.00)
>2 vol%	0	10 (33.33)
NTG	1 (3.33)	6 (20.00)
Atropine	1 (3.33)	0
Ephedrine	1 (3.33)	0

Table 3: HR during pneumoperitoneum

Time of observation	Group	HR (Bt/min)	SD	*P* value
Baseline	Group C	81.166	4.026	0.154
	Group P	79.633	4.213	
Preinduction	Group C	72.8	5.821	<0.0001
	Group P	91.6	3.45	
At Scopy	Group C	75.566	6.463	<0.0001
	Group P	95.098	18.422	
1 min after intubation	Group C	76.601	6.499	<0.0001
	Group P	94.223	2.721	
5 min after intubation	Group C	80.333	7.871	0.130
	Group P	85.396	16.294	
Average intraoperative value	Group C	65.6	8.071	<0.0001
	Group P	79.6	8.298	
During extubation	Group C	69.66	14.406	0.632
	Group P	85.232	18.436	
1 min after extubation	Group C	72.1	10.121	<0.0001
	Group P	89.03	6.206	
5 min after extubation	Group C	75.533	11.578	0.001
	Group P	84.733	5.051	
30 min after extubation	Group C	73.066	15.097	0.052
	Group P	78.795	4.727	
2 h after extubation	Group C	78.333	10.346	0.946
	Group P	78.13	124.3	
4 h after extubation	Group C	80.366	8.176	0.026
	Group P	76.466	4.651	

Cardiovascular Parameters

Mean values of hemodynamic parameters (HR, systolic arterial pressure, diastolic arterial pressure, and mean arterial pressure) were taken at preinduction, at scopy 1 and 5 min thereafter, and with pneumoperitoneum every 5 min intraoperatively for the first 30 min and 15 min thereafter. Hemodynamic stability was remarkable with Group C as seen by the comparisons with Group P (Tables 3 and 4). The equivalent stability was maintained in Group P with additional propofol and fentanyl top-ups and sevo 1-2 vol% and NTG infusion. The pressor response to both intubation and extubation was blunted in the clonidine group Figure 1. Mean duration of surgery was comparable in both groups and not found significant Table 5.

There was no respiratory depression in both the groups, more so in the clonidine group. The patients in both groups had a stable cardiovascular status in the post-operative period.

DISCUSSION

Laparoscopy has been the mainstay in most abdominal surgeries in the past few years. Advantages being its minimal bowel handling and early ambulation of the patients, the disadvantages were CO_2 insufflation, pneumoperitoneum, and hypercarbia. CO_2 absorption causes a trigger in the HR, hypertension, and an increase in systemic vascular resistance. Pneumoperitoneum causes an increase in intra-abdominal pressure causing a biphasic fluctuation in BP.[1,2] Positioning of the patient, namely, trendelenburg and reverse trendelenburg causes changes in the vascular physiology. CO_2 elimination is usually achieved with hyperventilation and deepening the plane of anesthesia which may result in a delay in recovery.[3] Pneumoperitoneum beyond pressures of 18 mmHg may result in a compartment-like syndrome and a fall in venous return to the heart.[4] Diaphragm being pushed upward reduces the FRC and ineffective ventilation due to increased airway pressures. Absorption of CO_2 into the third spaces causes oozing from surgical sites and blood loss.[5] Studies by Abe *et al.*, conducted on patients were focused on delineating the

Table 4: MAP during surgery

Time of observation	Group	MAP	SD	*P* value
Baseline	Group C	95.77	5.174	0.001
	Group P	92.22	5.276	
Preinduction	Group C	67.766	5.076	<0.0001
	Group P	84.333	6.26	
At scopy	Group C	73.333	5.64	<0.0001
	Group P	91.933	4.346	
1 min after intubation	Group C	76.9	6.676	<0.0001
	Group P	117.9	151.7	
5 min after intubation	Group C	92.077	8.342	0.003
	Group P	98.53	4.261	
Average intraoperative value	Group C	75.51	8.6111	0.070
	Group P	72.511	2.32	
During extubation	Group C	79.866	8.102	<0.0001
	Group P	87.88	3.408	
1 min after extubation	Group C	81.222	10.017	<0.0001
	Group P	90.955	3.833	
5 min after extubation	Group C	82.966	9.47	0.003
	Group P	90.243	4.633	
30 min after extubation	Group C	79.21	7.726	<0.0001
	Group P	89.555	3.358	
2 h after extubation	Group C	88.932	6.313	0.216
	Group P	90.554	3.284	
4 h after extubation	Group C	92.666	4.581	0.7722
	Group P	93	4.321	

Table 5: Duration of surgery

Group	Minutes	SD	*P* value
Clonidine	53.33	±17.137	0.331
Placebo	57.166	±12.844	

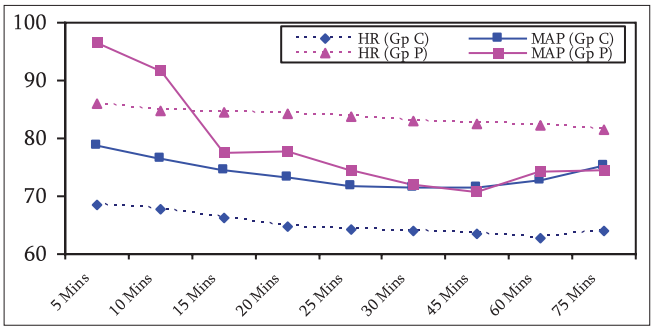

Figure 1: The heart rate and mean arterial pressures throughout the period of laparoscopy

appropriate IAP. Restricting IAP to <12 mmHg reduced hypercarbia and its associated complications.[6] van Zundert *et al.*, conducted studies with thoracic epidural segmental anesthesia as an adjuvant to GA. The good relaxation achieved with the epidural made laparoscopy easier at IAP <12 mmHg.[7] Esmolol, magnesium, IV doses of clonidine and dexmedetomidine were various agents used for hemodynamic stability.[8-11] In this study, oral clonidine was preferred over IV for the ease of administration. Patients were calm and sedated preoperatively. Intraoperative usages of anesthetic drugs were not required, and a good plane of anesthesia was maintained with minimal sevoflurane inhalant. The increase in HR and BP seen in the placebo group during intubation and insufflation was not seen in the clonidine group. Post-operative nausea/vomiting and respiratory depression were negligible. The advantages of clonidine as a premedicant in laparoscopic procedures can be summarized as follows:

- Excellent sedation and anxiolysis
- Attenuation of stress response to laryngoscopy and intubation
- Maintenance of intraoperative cardiovascular stability
- Good intraoperative analgesia
- Devoid of respiratory depression
- Less distressing side effects such as nausea and vomiting
- Easy administration.

CONCLUSION

Oral clonidine was found to be an excellent premedicant in laparoscopic surgery with a good hemodynamic control. However, it possesses certain limitations in its usage in patients with bradycardia, conduction disturbances, and cardiovascular instability as it is likely to worsen the cardiovascular status. As it may cause excessive sedation, it is better avoided or used with caution in patients with airway obstruction, obesity, and extremes of age. Clonidine at a dose of 5 mcg/kg body weight with a ceiling dose of 300 mcg is tolerated well by the patients without major complications.

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Original Article

Effect of HAART on the Oral Manifestations in Human Immunodeficiency Virus Positive Patients: A Clinical Study, Tiruchirappalli, Tamil Nadu

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Abstract

Introduction: Human immunodeficiency virus (HIV) infection remains as a pandemic health problem. The development of highly active antiretroviral therapy (HAART) has significantly altered the course of HIV disease into a manageable disease with enhanced quality of life chiefly in the developed countries. Very limited studies have been made available concerning the effect of HAART on oral lesions in developing countries like India.

Aims and Objectives: (1) To compare the oral lesions in HIV-seropositive patients between those who are newly diagnosed and those actively undergoing HAART and (2) To determine the therapeutic effects of HAART on oral lesions in HIV-seropositive patients.

Materials and Methods: Screening was done among the patients attending the VCTC Centre at Government Hospital, Tiruchirappalli. Screening was conducted on 240 patients both male and females who were confirmed with HIV positive status with CD4 count <200 cells/mm^3 were selected for the study. Out of these, 136 patients were already under HAART for the past 3 months and the rest 104 patients were newly diagnosed as HIV-patient, yet treatment to be started. The soft tissues of the oral cavity were examined thoroughly for the presence of any lesions. The results were tabulated in a standard form, and they were statistically analyzed using Chi-square test.

Results: The incidence of periodontal disease was decreased in patients under HAART after 3 months. There was strong decline in the severity of oral candidiasis, but there were increased the incidence of melanotic hyperpigmentation.

Conclusion: The oral manifestations of HIV infection have changed due to the advent of HAART. Many opportunistic infections have the fastest response to HAART as a result of an improved immune system. These lesions alongside immunologic parameters can be used as indicators of success or failure of antiretroviral therapy.

Key words: CD4 cell counts, Highly active antiretroviral therapy, Human immunodeficiency virus patients, Oral manifestations

INTRODUCTION

Acquired immunodeficiency syndrome (AIDS) is an infectious disease caused by human immunodeficiency virus (HIV) and it is a highly lethal, progressively epidemic viral infection characterized by profound impairment of the immune system that leads to opportunistic infections and secondary neoplasm.[1] The mortality rate is decreasing due to improvements in treatment regimen and increased to access to anti-HIV drugs.[2,3] The management modalities that have brought the mortality rates in the developed world down are the antiretroviral therapy (ART), especially the highly active ART (HAART).[4-7]

HIV is a retrovirus, which has a specific affinity for CD4 cells (T-helper cells).[1] CD4 count helps in evaluating disease diagnosis, progression, prognosis, and making the decision for ART.

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According to the new classification given by Center for Disease Control and Prevention, clinical AIDS is defined by a CD4 count of <200 and/or a CD4 <14%.[8]

One important factor to be considered to reduce the mortality and morbidity rates for patients with HIV is early diagnosis and identification of features with prognostic significance. In this regard, oral manifestations of AIDS have played a very important role and some of the oral lesions have both diagnostic and prognostic values.[9-11] The occurrence of oral manifestations is favored by immune deterioration.[12] Oral manifestations are seen in 30-80% of HIV patients. The more common of the oral lesions that occur along with HIV are the candidiasis, hyperpigmentation, angular cheilitis, gingivitis, periodontitis, aphthous ulcers, herpes simplex infections, and oral hairy leukoplakia of which oral candidiasis is of significance as far as prognostic indicators of immune suppression are concerned.[13-15]

The aim of our study is to compare the oral lesions in HIV-seropositive patients between those who are newly diagnosed and those actively undergoing HAART and to determine the therapeutic effects of HAART on oral lesions in HIV-seropositive patients.

MATERIALS AND METHODS

The screening was done among the patients attending the VCTC Centre at Mahatma Gandhi Memorial Government hospital, Tiruchirappalli. The screening was conducted on 240 patients both male and females of age group between 25 and 40 who were confirmed with HIV-positive status with CD4 count <200 cells/mm^3 were selected for the study. Out of these, 136 patients were already under HAART for the last 3 months and the rest 104 patients were newly diagnosed as HIV positive, yet the treatment to be started. Their HIV status was confirmed by western blot. CD4+ T-lymphocyte counts were assessed by flow cytometry. The study was approved by the Institutional Review Board and all the participants provided with voluntary informed consent. All potential risks and benefits were explained to all the subjects in a language that they could comprehend. Demographic data were collected using a standard questionnaire. Present medical status, past medical history, family history, and drug history were recorded. Findings were recorded using internationally accepted presumptive clinical criteria of erythematous candidiasis (European Community)-clearing house (1991-1993) on oral problems related to HIV infection and WHO collaborating center on oral manifestations of the immunodeficiency virus.[4] Oral examination was performed which included examining the individuals for lesions such as oral candidiasis, periodontitis, hyperpigmentation, aphthous, and herpes simplex ulcers. HAART consisted of the combination of two nucleoside reverse transcriptase inhibitors (NRTI's) (lamivudine + stavudine or lamivudine + zidovudine) and a non-NRTI (nevirapine orefavirenz). An intra-oral examination was performed clinically. Intra-orally the gingiva, periodontium, alveolar mucosa, buccal mucosa, lips, vestibule, dorsal, ventral, and lateral surfaces of the tongue and floor of the mouth were examined thoroughly. The results were tabulated in a standard form, and they were statistically analyzed using Chi-square test.

RESULTS

Out of 240 patients, 130 (54.16%) were males and 110 (45.83%) were females. When the age groups of the patients were compiled, the majority of patients were in the 25-40 (74%) years age group with the mean age of all the subjects being 34 years.

The distribution and comparison of oral lesions in individuals newly diagnosed with HAART were as follows. The occurrence of periodontal lesions was the most predominant (68.26%), followed by oral candidiasis (27.8%), hyperpigmentation (9.6%), aphthous ulcers (7.6%), and herpes (3.8%). During the intra-oral examination of individuals under active HAART, the incidence of periodontal diseases was still the most at 45%, followed by hyperpigmentation (38%), oral candidiasis (13%), aphthous ulcers (2%), and herpes (0.7).

Thus, it was observed that the occurrence of periodontal diseases was significantly reduced in patients under HAART (68.26% newly diagnosed and 33% under HAART). Interestingly, the occurrence of hyperpigmentation was higher in patients under HAART. Before HAART therapy, only 10 patients had hyperpigmentation whereas the total number of patients under HAART observed with hyperpigmentation was 38 patients which was statistically significant. The total number of patients who presented with oral candidiasis during diagnosis were 29 (27.8%) which had reduced to 13 (11.7%) in patients under HAART. Thus, the occurrence of oral candidiasis was significantly reduced in patients undergoing HAART actively. As far as the types of oral candidiasis observed in newly diagnosed patients, 14 patients exhibited erythematous candidiasis, 6 of them showed angular cheilitis, pseudomembranous candidiasis and chronic hyperplastic candidiasis were seen in 5 and 4 patients, respectively. During the examination of patients who are actively undergoing HAART, a number of patients exhibiting erythematous candidiasis reduced to 9, angular cheilitis to 1, whereas 2 patients had pseudomembranous candidiasis and only one patient exhibited chronic hyperplastic candidiasis (Tables 1 and 2).

Table 1: Oral lesions in patients newly diagnosed with HIV and those under HAART

Oral lesions	Newly diagnosed HIV patients (*n*=104) (%)	Patients under HAART (*n*=136) (%)	*P* value
Periodontal lesions	71 (68.26)	45 (33)	0.0001*
Oral candidiasis	29 (27.8)	13 (11.7)	0.0002*
Hyperpigmentation	10 (9.6)	38 (27.9)	0.00028*
Aphthous ulcer	8 (7.6)	2 (1.4)	0.019*
Herpes	4 (3.8)	1 (0.7)	0.1127

*Statistically significant. HIV: Human immunodeficiency virus, HAART: Highly active antiretroviral therapy

Table 2: The types of candidiasis in patients newly diagnosed with HIV and those who are actively under HAART

Oral lesions	Newly diagnosed HIV patients (*n*)	Patients under HAART (*n*)
Erythematous candidiasis	14	9
Angular cheilitis	6	1
Pseudomembranous candidiasis	5	2
Chronic hyperplastic candidiasis	4	1

HIV: Human immunodeficiency virus, HAART: Highly active antiretroviral therapy

DISCUSSION

HIV infection results in AIDS, which is a major global pandemic infectious disease. Some specific, common oral manifestations in HIV infection were found in association with immune suppression.[1] This study is unique since it covers oral manifestations of HIV patients who are newly diagnosed and those who are actively under HAART since such a study in India is sparse.

AIDS is a chronic progressive disease characterized by immunodeficiency that is the result of HIV attacking the host CD4+ T-lymphocytes. It is generally thought that immunodeficiency is the main cause for susceptibility to various opportunistic infections in HIV and AIDS patients.[16] It is generally accepted that the recognition of some oral manifestations of HIV disease is of great significance because they may represent the first sign of the disease, and they have been shown to be highly predictive markers of severe immune suppression and disease progression.

The oral lesions are often characteristic and in the majority of cases can be diagnosed by their clinical features alone.[17] A review of literature shows that the reports of oral lesions from developing countries are few when compared with those from the developed nations.[17] With the emergence of the antiretroviral combination therapy and prophylactic treatment, a change in the epidemiology of the opportunistic infections has occurred.[18] All these effects synergistically improve the CD4+ count and thus improve the immune status of the patient. This improved immune activity of the patients with HIV under HAART might reduce the risk of opportunistic infections such as oral candidiasis. An important observation that was made by us in this study was the presence of intraoral pigmentation in patients undergoing HAART. A statistically increased pigmentation was noted in patients under HAART. This result is concurrent with the studies made by Umadevi *et al.*[19] This finding could be due to increased α-melanocyte stimulating hormone as a result of systemic ketoconazole and zidovudine therapy. This might also be due to the deregulation of the cytokines in HIV or due to certain melanocyte stimulating drugs or use of antivirals, antifungals or due to Addison's disease.[20]

The oral manifestations of HIV infection have changed after the advent of HAART in 1995. Many opportunistic infections and neoplasms have resolved or fail to occur as a result of an improved immune system. According to our study, the prevalence of oral candidiasis and periodontal disease were less in patients who had access to HAART though there was a risk of oral hyperpigmentation.

CONCLUSION

Oral manifestations are common in HIV infected patients and are usually the first indicator of symptoms and disease progression. Our results showed that the number of oral manifestation decreased with HAART. Further large cross-sectional and longitudinal observational studies are required to evaluate the prevalence of oral lesions need to be done including less common manifestations.

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Original Article

Low Cost Negative Pressure Wound Therapy for Treatment of Diabetic Foot Ulcers

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Abstract

Background: Many techniques have been tried in the treatment of chronic diabetic ulcers. Recent studies have shown that application of negative pressure wound therapy (NPWT) has got an important role in healing of such wounds. However, this technology is commercially available and is expensive. Cost-effective alternatives can, therefore, be of great value to patients. Hence, we conducted a study to evaluate the effects of NPWT on wound healing in diabetic ulcers using hospital based devices.

Objective: To determine the effectiveness of "low cost" NPWT in the treatment of diabetic foot ulcers.

Materials and Methods: A prospective observational study was conducted on 35 patients with diabetic foot ulcers. After an initial debridement, NPWT was applied using the standard wall suction apparatus and gauze - freely available in all hospital set-ups.

Results: Mean ulcer size was 49.4 cm^2 at the start of therapy. The mean ulcer size at the end of 1, 2, and 3 weeks was 41.5 cm^2, 30.2 cm^2 and 24 cm^2, respectively (P value is significant <0.05). The mean duration of healing was 22.4 days. Out of 35 wounds, 26 underwent split skin grafting, 6 wounds healed by secondary intention, and 3 wounds required local flaps for coverage. None of them needed amputation.

Conclusion: "Low cost" negative pressure therapy using wall suction is an effective treatment for faster healing of diabetic wounds.

Key words: Diabetes mellitus, Foot ulcers, Negative pressure wound therapy

INTRODUCTION

Many techniques have been tried over the centuries to heal chronic foot ulcers. Although there exists no ideal wound dressing, the management of chronic wounds especially diabetic wounds has seen many new developments.

Diabetic ulcers are the most common cause of chronic wounds.

The lifetime risk of a person with diabetes developing a foot ulcer is as high as 25% and it is said that every 30 s a limb is lost somewhere in the world as a consequence of diabetes.[1]

In 1993, Fleischmann *et al.*[2] described a new technique called negative pressure wound therapy (NPWT) where sub-atmospheric pressure was applied over the surface of the wound to promote wound healing.

The exact mechanism of action of NPWT is still debated. Negative pressure applies mechanical forces to the wound to promote wound healing; these are known as micro- and macro-strain.[3-5] The visible changes that occur after the application of negative pressure is called as macro-strain, and the changes at the cellular level are called as micro-strain. Macro-strain includes drawing the wound edges together, removal of exudates, and even distribution of negative pressure. Micro-strain includes microdeformational changes occurring at the cellular level due to cell stretch resulting in a reduction of edema, enhancement of perfusion, and promotion of granulation tissue formation by facilitating cell migration.

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Based on this concept, commercial form of NPWT system also known as vacuum-assisted closure (VAC)[6] (KCI, San Antonio) has become available since many years. After its introduction, it has evolved into a widely accepted treatment modality of chronic wounds.

However due to its high cost, the commercially available forms of NPWT cannot be used for unaffordable patients and hospitals with limited facilities, especially in rural places. Shalom *et al.*[7] devised a "homemade" and cost-effective NPWT and the results were comparable to commercial NPWT.

Based on the same principles, we have applied NPWT to the wound surface using simple and easily available equipment available in any hospital settings.

MATERIALS AND METHODS

This study was a prospective observational study carried out to evaluate the effects of NPWT on diabetic foot ulcers and conducted in the Department of General Surgery from November 2013 to November 2015 at St. Martha's Hospital, Bengaluru. 35 patients presenting with diabetic foot ulcers and consenting for the procedure were studied after Ethical and Scientific Committee approval. All the wounds underwent prior debridement and wound swab was sent for culture and sensitivity testing. The patients were treated with broad spectrum antibiotics initially, later according to the sensitivity pattern.

NPWT was applied using sterile gauzes as wound bed cover over which a Ryle's tube was placed for the suction purpose. This dressing was secured with the help of sterile Ioban (iodinated drape). The Ryle's tube was connected to sterile tubing which in turn was attached to wall suction with a continuous pressure of −125 mmHg. The presence of negative pressure was confirmed by frequently checking the readings of suction apparatus and also by the collapse of dressing material after application of suction (Figure 1a-c).

The dressing was changed twice every week. At every dressing change, the wound was washed with saline and assessed for relevant parameters. The results were analyzed weekly till the wound was satisfactorily covered with healthy granulation tissue. In our study, we used paired *t*-test to check the level of statistical significance. A $P < 0.05$ was considered significant. Physician consultation was taken regularly for the management of diabetes and other comorbidities.

Inclusion Criteria

- Foot ulcers in diabetic patients aged more than 16 years.

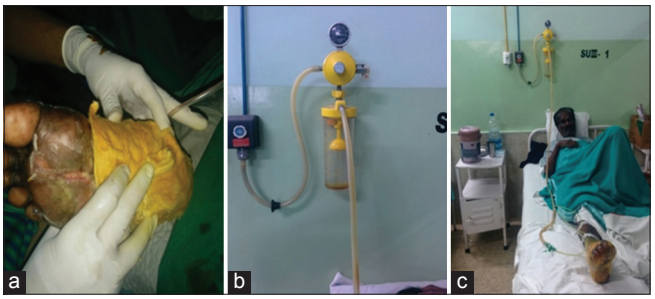


Figure 1: (a-c) Method of application of negative pressure wound therapy with wall suction, (b and c) The Ryle's tube being connected to the wall suction apparatus

Exclusion Criteria

- Malignant ulcers, ulcers with exposed bone or blood vessels, underlying osteomyelitis
- Critical limb ischemia (ankle-brachial index <0.4).

RESULTS AND OBSERVATIONS

A total of 35 patients were studied of which 22 were males (63%). Most of the patients belonged to age group 45-54 years (46%). 21 patients (60%) had a duration of diabetes mellitus (DM) <10 years. Most patients (82%) had glycosylated hemoglobin levels >7.5%. Hypertension was the most commonly associated comorbidity (31%). Chronic kidney disease was seen in 4 cases and peripheral vascular disease was seen in 4 cases (ankle-brachial index of <0.8).

The majority of the ulcers presented were spontaneous in onset (63%). Left foot was the most commonly involved (42%). The mean duration of ulcer was 7.02 weeks.

About 32 cases had purulent discharge at the time of presentation (91%). Pus culture and sensitivity was done in all the patients on admission (Graph 1). *Escherichia coli* was the most common isolate 12 cases followed by *Staphylococcus aureus* 6 cases and *Pseudomonas* 4 cases. 7 cases showed mixed growth (both Gram-positive and negative). Out of the 6 cases of *S. aureus*, 4 cases were methicillin-resistant *S. aureus* (MRSA).

Most patients had ulcer size in the range of 31-50 cm^2 (57%). The mean ulcer size at admission was 49.4 cm^2. The mean ulcer size at the end of 1, 2, and 3 weeks was 41.5 cm^2, 30.2 cm^2, and 24 cm^2, respectively. *P* value, calculated using paired *t*-test is significant ($P < 0.01$).

Evaluation of the granulation tissue at the time of application of NPWT showed that only unhealthy granulation tissue was seen in all wounds. At the end of 4 weeks, 28 wounds had attained 100% granulation and were taken up for skin grafting (Figure 2a-c). Rest 7 wounds had attained granulation >75% of wound area.

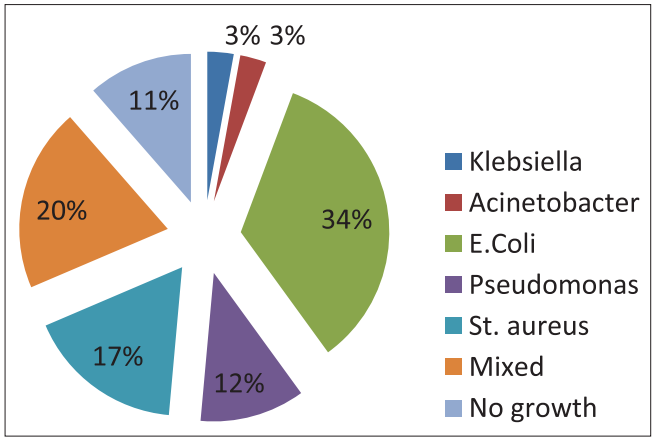
In our study time taken from the start of therapy to the time, they were ready for coverage ranged from 11 to 46 days. The mean duration of healing was 22.4 days.

About 26 wounds underwent split skin grafting, 3 wounds developed only partial granulation cover and these required local flap cover for wound closure and healing. In 6 patients not willing for surgery, the wounds had healed by complete epithelialization. No patient required any form of amputation.

DISCUSSION

Most of our patients are males in working age group, engaged in occupations like farming where they are always prone to trivial trauma. In our study, 21 of the 35 patients had duration of diabetes <10 years (60%). 29 patients (82%) had a poor glycemic control with the HbA1c levels more than 7.5%. Our results are comparable to Bansal *et al.*[8] where 51.46% had DM for <10 years and another study by Alva *et al.*[9] where glycosylated hemoglobin levels are more than 7% in 74% of patients. The above facts substantiate that majority of the patients were ignorant regarding foot care during the early years of DM treatment.

The mean duration of ulcer was 7.02 weeks, with most of the patients having ulcer for the duration of <6 weeks (51%). In a study by Jeffcoate *et al.*,[10] the mean ulcer duration was 15 days. In another study by Margolis,[11] the mean duration of diabetic foot ulcers was 5.39 months.



Graph 1: Culture-organism isolated

Figure 2: (a-c) Status of wound on admission, 2 weeks after negative pressure wound therapy and before grafting, respectively

Pus culture and sensitivity was done for all the patients on admission (Graph 1). In our study, the most common isolates were Gram-negative organisms (18 cases). *E. coli* was the most common isolate (12 patients, 34%) followed by *S. aureus* (6 patients, 17%). Of the 6 cases of *S. aureus*, 4 cases were MRSA. Our results are comparable to a study by Alva *et al.*[9] in which Gram-negative organisms (55.8%) were the major isolates. After the completion of therapy, once the wound culture was negative the wounds were subsequently taken up for grafting or for flap cover.

All the patients showed a significant decrease of wound discharge including the MRSA wounds. Of the 4 MRSA, 3 patients were taken up for Split-thickness skin grafts and one patient healed by complete epithelization (Figure 3a-f). The role of NPWT in reducing the bacterial load has been proven in a study by Nain *et al.*[12] where they found that 40% of wounds were sterile after 3 weeks of VAC therapy as compared to only 20% of the wounds treated by conventional dressing turning sterile after 3 weeks of treatment.

The mean ulcer size at admission was 49.4 cm^2. In our study, measurements of the wound were taken at the end of 1st, 2nd, and 3rd week. These findings are comparable to the mean ulcer size observed in the patients undergoing NPWT in a study conducted by Nather[13] which ranged from 6.9 cm^2 to 124 cm^2 with a mean size of 54.6 cm^2. As the duration of treatment with NPWT increases, larger wounds showed satisfactory decrease in size and

Figure 3: (a-f) Wound culture showed methicillin-resistant *Staphylococcus aureus*. Patient was started on appropriate antibiotics and negative pressure wound therapy. Patient was not willing for surgery. Wound had healed by complete epithelialization

better granulation tissue. The mean ulcer size at the end of 1, 2, and 3 weeks was 41.5 cm^2, 30.2 cm^2, and 24 cm^2, respectively. $P < 0.001$ was calculated using paired *t*-test and is statistically significant.

After the commencement of NPWT, the percentage of granulation at the end of every week was analyzed. At the end of the 3rd week, most of the wounds - 19 wounds (54%) had attained granulation of 100% and were taken up for grafting. Rest 16 patients had >75% granulation tissue over the wound. Lone *et al.*[14] observed granulation tissue deposition in 92.85% of wounds by 2nd week and 100% granulation by the 5th week of treatment in patients treated with NPWT.

32 wounds, 91% of cases developed healthy granulation after being treated by NPWT before closure of the wound. 3 wounds that did not attain satisfactory granulation were taken up for local flap cover. Nather,[13] Armstrong *et al.*,[15] also observed early deposition of granulation tissue in patients treated with NPWT.

The end point or the time taken for wound closure was taken as the day the wounds were treated by graft, flap or by complete epithelialization. In our study, at the end of 2 weeks, 6 patients attained complete closure and 19 patients attained complete wound closure at the end of 3rd week. Split skin grafting was the most common treatment modality used for wound closure following NPWT. Of the 35 patients, 26 (74%) underwent skin grafting. 6 patients not willing for grafting had healed by complete epithelialization of the wounding regular dressing. 3 patients were closed with a flap. Nain *et al.*[12] had similar findings where split skin grafting was the most common mode of closure employed (65% of patients). Lone *et al.*[14] also had similar results where grafting was used in 86.4% of patients treated with NPWT.

In our study, the mean duration of healing is 22.4 days. A study by McCallon *et al.*[16] observed the mean time for complete healing was 22.8 days. Vuerstaek *et al.*[17] had similar results where the average time to heal in the study group was 29 days. Nather[13] observed that the mean time to heal was 23.3 days. In our study out of the 35 ulcers, 30 healed within a month of initiation of the therapy.

Based on the principles of negative pressure therapy by Morykwas *et al.*[6] we have used easily available materials like wall suction and gauze to perform NPWT. The usage of foam mandates gas sterilization of foam – not readily available in all hospitals. Shalom *et al.*[7] had treated 15 patients successfully using wall suction and gelatin sponge. Gill *et al.*[18] performed similar studies using wall suction and foam to treat complex traumatic wounds. After foam contamination was noted with the usage of VAC system, Kiyokawa *et al.*[19] used saline irrigation with continuous aspiration and negative pressure for treatment of intractable ulcers. We have not noted any instance of wound infection or gauze contamination after the initiation of therapy.

Commercial NPWT machines are marketed by various companies. The cost of each unit ranges from 2 to 7 lakh rupees. The cost of each dressing ranges from 8000 rupees to 12,000 rupees. Expenses per dressing for our "low cost" NPWT ranges from Rs. 250 to 350 (depending on the wound size) along with nominal general ward charges, which is affordable by most of the patients.

The present medical practice is not only advancing technologically but also rapidly inching toward the evolution of cost-effective solutions. Although the outcomes are promising, expensive equipment cannot be afforded by everyone.

CONCLUSION

NPWT therapy is a reliable modality of treatment for chronic wounds. NPWT requires training to ensure appropriate and competent use.

Our study shows that patients who cannot afford or utilize commercially available products for any reason can also benefit from NPWT using standard wall suction apparatus and dressing materials - freely available in all hospitals and at affordable costs. Hospitals in rural set up where commercial equipment are not available or cannot be affordable might benefit from "low cost" alternatives.

We recommend the present method of treatment as the first line management in resource challenged conditions especially when the options for reconstruction are also limited.

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Original Article

Follicular Neoplasms Cytohistomorphological Aspects: A Case Study of 50 Cases

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Abstract

Background: Thyroid nodules are common clinically (prevalence about 5%) and even more common on ultrasound examination (about 25%). Most of the thyroid nodules are follicular neoplasms cytologically. Follicular neoplasms of the thyroid gland include benign follicular adenomas (FAs) and follicular carcinoma (FC).

Objectives: The objective of our study was to assess the histomorphological aspects of follicular neoplasms. The incidence of FAs and FCs was evaluated with respect to age, clinical presentation, and thyroid status. Our study also focuses on histopathology of the spectrum of follicular neoplasms.

Materials and Methods: This prospective study of 1 year included (June 2015-June 2016) 50 cases of thyroidectomy specimen received in the department of pathology. A careful sampling and multiple sections were taken to assess the histological aspects for differentiating between FAs and FCs. Clinical data, thyroid status, and fine needle aspiration (FNA) reports were retrieved from hospital records.

Results: About 50 thyroidectomy specimens studied showed 28 cases of follicular neoplasms, an incidence of 56% of which 25 were FAs and 3 diagnosed as carcinoma. The mean age of presentation was 41.5 years. The incidence of carcinoma in our study was 10.7%. Only one case had lymphnode metastasis.

Conclusion: FNA plays a significant role in thyroid nodules, but resection of the lobe is a definitive treatment as well as for the diagnosis between adenoma and carcinoma. Immunohistochemistry and molecular markers play a very small role in the diagnosis of follicular neoplasms.

Key words: Adenoma, Carcinoma, Histopathology, Thyroid nodule

INTRODUCTION

Follicular adenoma (FA) and follicular carcinoma (FC) of the thyroid gland are tumors of follicular cell differentiation that consists of a microfollicular architecture with follicles lined by cuboidal epithelial cells. A FA is a benign encapsulated tumor of the thyroid gland. About 5% of the thyroid nodules are malignant.[1] Most patients with a FA are clinically and biochemically euthyroid. Approximately, 1% of FAs are "toxic adenomas."[2]

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Adults who initially present with a thyroid lump, which on scan is usually "cold," sometimes "warm" and only rarely "hot." However, the large majority of "hot" nodules are benign.[3]

A FC cannot be distinguished from a FA based on cytologic features alone. It is distinguished from a FA based on capsular invasion, vascular invasion extrathyroidal tumor invasion, lymph node metastasis, systemic metastasis. Follicular neoplasm with tumor invasion into but not through the entire capsule is considered a FA. Occasionally FA will contain bizarre cells sometimes multinuclear cells may be seen. These lesions are benign. Vascular invasion is defined as tumor penetration into a large caliber vessel within or outside the capsule. Vascular invasion is the most valuable sign of malignancy.[4]

The incidence of thyroid cancers has steadily increased in most countries over the past two decades, predominantly

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attributed to increased detection of small tumors by imaging techniques.[5]

FC accounts for 10% of all cases of thyroid malignancy in iodine sufficient areas and 25-40% of thyroid malignancies in areas of iodine deficiency.[2,6] Most follicular cancers are nonfunctional. FC is usually unifocal and <10% have lymph node metastasis. The most patients with follicular neoplasms present with a solitary thyroid nodule. The diagnostic evaluation of a patient who presents with a thyroid nodule consists of routine fine needle aspiration cytology (FNAC), ultrasound examination of neck, and serum thyroid-stimulating hormone level.

FNAC of follicular neoplasms is characterized by abundant follicular epithelial sheets with crowding, overlapping and microfollicular formation with scant or no colloid.

According to Bethesda system of reporting thyroid cytopathology, this cytological appearance is classified as follicular neoplasms or suspicious for follicular neoplasms. FNAC specimen consistent with a follicular neoplasm accounts for 20% of all fine needle aspiration FNA biopsy results and has a 15-30% risk of malignancy.[7]

The differential diagnosis for a patient with a thyroid nodule and FNAC result consistent with a follicular neoplasm is a FA, adenomatous hyperplasia, FC, follicular variant of papillary carcinoma, and classic papillary carcinoma. Cytomorphologic criteria alone cannot distinguish a FA from a FC.[8,9]

MATERIALS AND METHODS

Surgically treated patients between June 2015 and June 2016 were prospectively analyzed. The study included 50 cases of thyroidectomy specimens. Histopathological analysis was performed. Clinical details and thyroid profiles were noted for available cases. Most of the patients had undergone an FNAC and those diagnosed as follicular neoplasms were correlated with histopathology analysis.

Most of the cases were found in the age group of 41-50 years with female preponderance (Figure 1 and Table 1). Out of the 28 cases, only 2 cases were male and rest was females. All the cases presented with thyromegaly, only 9 presented a solitary nodule. Out of the 28 cases, 9 cases were unifocal and rest was multifocal. The thyroid profile tests for most of the patients were retrieved. Most of them were found to be euthyroid.

Out of the 50 cases, histopathological study revealed 28 cases were diagnosed as follicular neoplasms (25 - FAs and 3 - FCs). An incidence of 56% of all thyroidectomy specimens received in our institution (Figure 2).

The cytological reports were analyzed retrospectively for the 28 cases along with clinical information. 19 of the 28 cases were reported as follicular neoplasms, 5 as adenomatoid nodule and 4 as goiter with papillary hyperplasia cytologically.

Out of the 28 cases, 13 cases presented as a solitary nodule, 9 as multiple nodules, 4 were with diffuse swelling, and 2 of them had no swelling and were diagnosed having a nodule only on ultrasound examination (Figure 3). All the patients were euthyroid except for one who showed toxic features.

FC was diagnosed in 3 cases (2 females and 1 male) wherein there was a capsular and vascular invasion. One of the

Table 1: Age wise distribution of SNG diagnosed as follicular neoplasms

Age distribution (in years)	Number of cases
20-30	5
31-40	7
41-50	11
51-60	4
61-70	1
Total	28

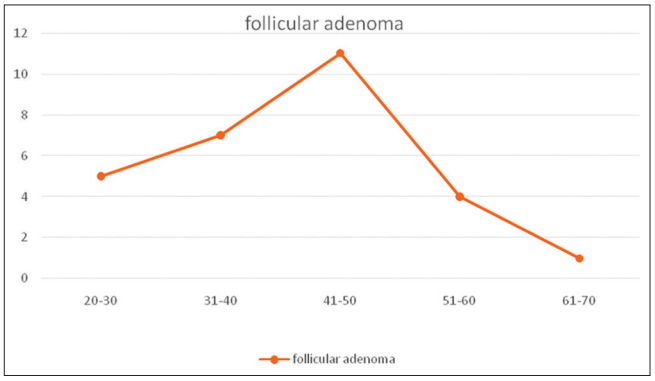


Figure 1: Line diagram depicting the incidence of follicular adenomas in various age groups

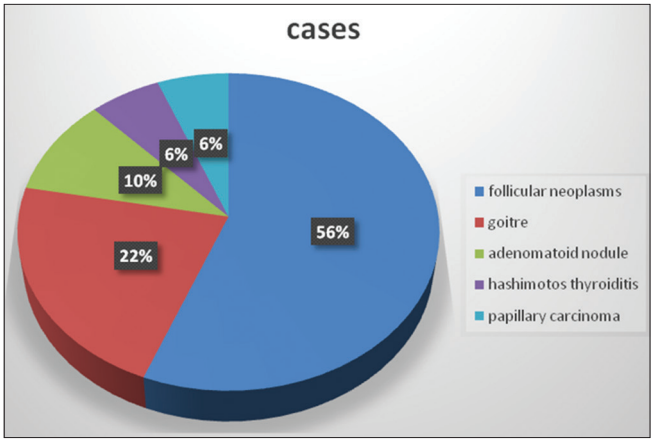


Figure 2: Incidence of cytological diagnosis of thyroid nodules (50 cases)

cases showed focal poorly differentiated carcinoma with lymph node metastasis. The incidence of FC was 10.7% in our institution. One case of Hurthle cell adenoma was diagnosed in a young female patient who had presented clinically as a colloid goiter.

Currently, a FC cannot be distinguished from an FA based on cytologic, sonographic or clinical features alone. The patients diagnosed as follicular neoplasms cytologically should undergo a diagnostic thyroid lobectomy which is a definitive treatment for a benign FA or a minimal invasive follicular cancer. Our study included 50 cases of thyroid swelling wherein clinical examination, ultrasound findings and FNAC was done to diagnose follicular neoplasms. Grossly, all the specimens diagnosed as follicular neoplasms clinically and cytologically were subjected to careful capsule inspection. All the lesions were encapsulated with a well-defined capsule (Figure 4). Two of the 28 specimens showed a very thick capsule and one among the two showed a capsular breach clearly.

Our study showed various morphological patterns among the adenomas. 8 cases showed a fetal pattern, 3 an embryonal pattern and the most common being a combination of one or two patterns - 12 cases (42.8%) (Table 2).

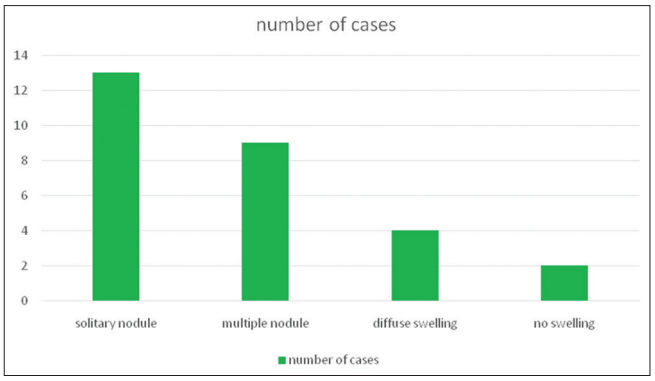


Figure 3: Clinical presentation of follicular neoplasms (28 cases)

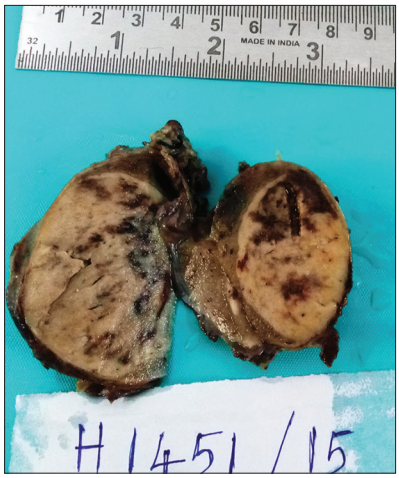


Figure 4: Gross specimen of follicular adenoma showing a tan brown circumscribed nodule

Table 2: Morphological patterns of adenomas

Patterns	Number of cases
Normofollicular (simple)	2
Macrofollicular (colloid)	3
Microfollicular (fetal)	8
Trabecular/solid (embryonal)	3
Combination	12
Total cases	28

DISCUSSION

Thyroid nodules showing follicular morphological features include adenomatous, nodule, FA, FC, and follicular variant of papillary thyroid carcinoma.[8] Cytologic features are known to overlap among these tumors and definitive diagnosis is mostly obtained by pathologic examination followed by complete excision of the lesion. The diagnosis of a solitary encapsulated nodule with follicular histology features is frequently problematic since a broad range of benign to malignant subtypes of follicular tumors (FT) need to be differentiated.[3] Differential diagnosis of FC from FA is based on the presence of capsular, vascular, extrathyroidal tissue invasion, and nodal or distal metastasis.[10]

FC used to comprise 10-20% of all primary thyroid cancers but it's frequency has dropped to <5-10% in the recent years attributable to increased detection of early papillary carcinoma and adoption of a more liberal approach in the diagnosis of follicular variant of papillary carcinoma. The incidence of FC is high in areas of endemic goiter; iodine deficiency appears to be the main contributing factor because addition of iodine supplement to the diet has been associated with a decline in the incidence of FCs in these geographic areas. Rarely FC may arise in a pre-existing FA dyshormonogenesis and irradiation predisposed to the development of FC.[5] Rare cases of follicular neoplasms occur as part of hereditary nonmedullary thyroid cancer syndromes.

So far significant differences have not been shown between FA and FC in terms of cytoarchitecture, histomorphometry, immunophenotypic profile, DNA ploidy, or molecular alterations. Up to 27% of adenomas may show aneuploidy and yet the patients remain well on follow of more than 5 years.[5] Furthermore, the prevalence of RAS oncogene mutation is nearly as high in FA as in FC. Hence if one accepts that some FAs are in reality *in situ* carcinoma, the

above results make sense the attempt to derive clear cut discriminatory parameters will be futile when one has to compare FCs with a mixture of adenomas and *in situ* carcinomas. However, for management purposes, it is not important to identify these hidden *in situ* carcinomas which lack metastatic potential. Currently, histologic evaluation remains the gold standard in the distinction between FC and FA.

Our study of 50 thyroidectomy specimens revealed an incidence of 56% of follicular neoplasms of which an incidence of 10.7% of FC which is slightly higher in iodine sufficient areas where FC accounts for 10% of all cases of thyroid malignancy and 25-40% in areas of iodine deficiency. Female preponderance in the age group of 40-50 years was the presentation in our study consistent with other studies. The three cases diagnosed histopathologically as FC did not reveal much atypia cytologically.

FAs are characteristically surrounded by a generally thin capsule that is grossly and microscopically complete. Microscopically adenomas may exhibit a variety of patterns singly or in combination - normofollicular (simple), macrofollicular (colloid), microfollicular (fetal), and trabecular/solid (embryonal).[3] The morphological differences among these various patterns may be striking. They have no apparent clinical significance but elicit different differential diagnosis. Thus, on a general rule the larger the follicles, the less likely that the lesion is a FA or a FC as opposed to a hyperplastic nodule or a follicular variant of papillary carcinoma. Instead a predominance of solid/nesting trabecular areas should alert one to the alternative possibilities of poorly differentiated or medullary carcinoma.[2]

Both iodine deficiency and irradiation have been implicated in the development of FC.[11] In contrast to the statement that FCs are common in iodine deficient areas we found that the incidence was equal to papillary carcinoma in spite of our area being an iodine sufficient one, 3 cases of papillary carcinoma thyroid was reported among the 50 thyroidectomy specimens.

FC should be defined in a generic sense as any malignant thyroid tumor exhibiting evidence of follicular differentiation. Grossly, follicular cancer varies in size has a yellow tan color and has a thick white fibrous capsule. Areas of hemorrhage and necrosis are not uncommon, as well as foci of cystic degeneration.[10] Gross differential diagnosis between adenomas and carcinomas may sometimes be difficult except for the marked thickening of capsule seen in cancers. Depending on the degree of invasiveness FC has been subdivided into a minimally invasive and a widely invasive form. A sampling of encapsulated follicular lesions is of paramount importance. Evans *et al.* have made the interesting observation that the capsule of FC tends to be thicker and more irregular than that of adenoma.

FCs present in elderly men carried worse prognosis.[10] In our study, we had a case of FC in an elderly male in the fifth decade who had a focal poorly differentiated carcinoma histologically.

The frequency of ipsilateral lymphadenopathy is considerably less than that observed in patients with papillary carcinoma and has been reported to be <10%. Our study showed one case with lymph node metastasis. Distant metastasis has been reported in up to 20% of patients at presentation with the most common sites of involvement being lungs and bone.[11] We did not have any case with metastasis.

The cytopathologic pattern in a well differentiated FC is similar to that seen in a FA making the differentiation between the two difficult. There is considerable controversy over differentiating FAs and FCs based on differences in nuclear size and nuclear pleomorphism, and the literature is mixed on this issue.

The chernobyl group of thyroid pathologists mentioned in the preceding section recommended the adoption of the following terminology for this situation.

1. For tumors showing definite capsular invasion and no papillary thyroid carcinoma (PTC) type nuclear changes - FC (Figure 5)
2. For tumors showing questionable capsular invasion – FT of uncertain malignant potential (UMP).

If PTC type nuclear changes are absent and well-differentiated tumor of UMP, if those nuclear changes are questionable (incomplete).

Widely invasive FC is the high-risk counterpart of the minimally invasive subtype. Recent classification of FC is done as:

1. Encapsulated
   i. With capsular (but no vascular) invasion
   ii. With limited (<4) vascular invasion (with or without capsular invasion).
   With extensive (≥4) vascular invasion (with or without capsular invasion)
2. Widely invasive.

The morphological criteria for identifying for sure signs of vascular invasion have been thoroughly described by Rosai *et al.* as well as the WHO book (Figure 6).[3,11] According to Mete and Asa about the ideal criteria for diagnosing vascular invasion (tumor cells invading the

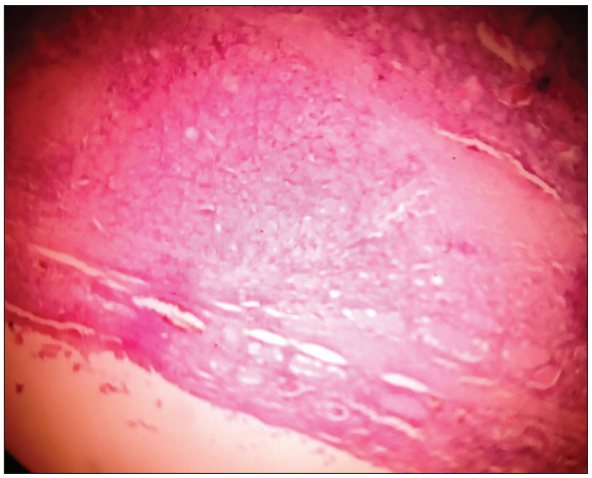


Figure 5: H and E section showing tumor cells mushrooming the capsule (×10)

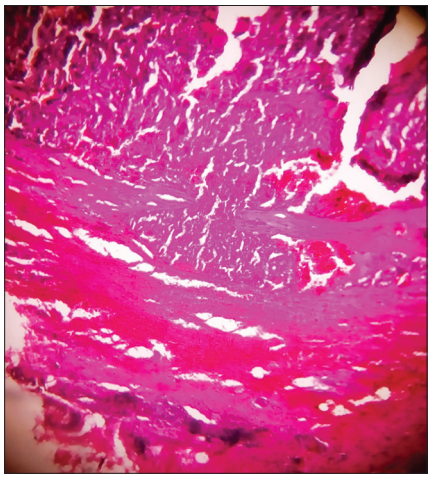
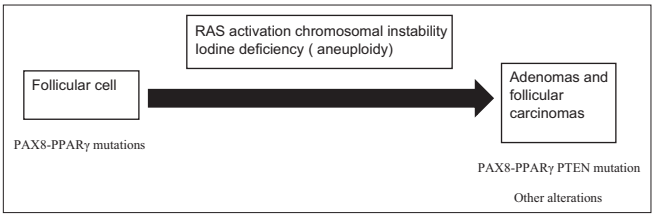


Figure 6: H and E section of follicular carcinoma showing definite vascular invasion (×40)

vessel wall associated with the thrombus adherent to intravascular tumor), we diagnose vascular invasion if we detect well preserved neoplastic tissue within a vein. Whenever facing the dilemma "vascular invasion or not," we do not rely on any immunostaining of endothelial cells. We search the additional sections of the capsule and stick to the following rule. If we do not detect any unequivocal signs of venous permeation we diagnose the tumor as non angioinvasive.[12] The search for such signs was made for the 3 cases after multiple sampling of the capsule.

The prognosis of FC is directly related to the degree of encapsulation, hence the important distinction between minimally invasive and widely invasive types.

The most prominent molecular features of FC are the prominence of aneuploidy and the high prevalence of RAS mutations and of PAX8-peroxisome proliferator-activated receptor γ (PPARγ) rearrangements, the latter as a result of a 2;3 translocation.[13]



The prognosis of FC thyroid depends on several factors such as age of the patient, size and staging of the tumors, completeness of surgery and responsiveness to radioactive iodine. It also depends on the degree of invasiveness of tumors. Minimally invasive carcinomas carry a much better prognosis than do widely invasive carcinomas. The coexistence of less well-differentiated areas in some FCs raises the problem of differential diagnosis between FC and poorly differentiated carcinoma. In our study, we had one case with such diagnostic problems for which careful sampling was done and reported as FC with focal poorly differentiated carcinoma.

Immunohistochemistry of endothelial cells of the capsular vessels does not provide useful diagnostic data. There is also no immunohistochemical or molecular feature that may be needed as a reliable marker of invasion.[14] Hence, no immunohistochemistry was used in our study and only careful histopathological analysis of our specimens was done to categorize the broad spectrum of follicular neoplasms.

CONCLUSION

Thyroid nodules whose FNA is diagnosed as follicular neoplasms should be resect unless there are significant contradictions to the surgical procedures. Our study of 50 thyroidectomy specimens of FAs and FCs has showed a slight increase in incidence 10.7% despite being an iodine sufficient area. Most of the patients were euthyroid and had come to the outpatient department only for a palpable thyroid swelling noted clinically. FNA does play an important role in the diagnosis of follicular neoplasms, but only histopathological examination can give the conclusive diagnosis.

For most thyroid tumors a diagnosis can be reached by morphologic assessment alone as with tumors in other endocrine organs the presence of nuclear atypia in a thyroid tumor is not necessarily synonymous with a diagnosis of malignancy.

Careful sampling of the specimen should be done to differentiate adenomas and carcinomas. Microscopically there should be a definite capsular and vascular invasion for the conclusive diagnosis of carcinoma.

Immunohistochemistry and molecular markers play a very insignificant role in the categorization and diagnosis of follicular neoplasms.

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Original Article

Comparison of Onset of Induction and Easiness of Laryngeal Mask Airway Insertion in Adults: Propofol versus Sevoflurane Single Vital Capacity Breath Technique-high Concentration (8%)

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Abstract

Background: Laryngeal mask airway (LMA) insertion is an imperative tool in difficult airway scenarios. The ease of insertion in a spontaneously breathing patient and without the use of paralytic agents makes it a highly advantageous airway device.

Aims: In our study, we compare the onset of induction, to assess ease of LMA insertion, to assess number of attempts taken for correct placement, complications, if present during or following insertion of LMA, hemodynamic stability using sevoflurane high concentration inhalational technique and propofol intravenous (IV) induction technique in patients undergoing elective minor surgical procedures.

Materials and Methods: Prospective randomized study of American Society of Anesthesiologists physical status 1 or 2 patients was anesthetized with either a single vital capacity breath technique with sevoflurane 8% or IV propofol 2 mg/kg. Onset of induction and easiness of LMA insertion were studied, along with number of attempts taken for correct placement of LMA, hemodynamic stability, and complications.

Results: This study shows no significant difference between the two groups based on the demographic variables. The mean onset of induction was 44.40 s in the propofol group and 61.45 s in the sevoflurane group. The mean time for LMA insertion was 19.05 s in sevoflurane group and 12.88 s in propofol group.

Conclusion: Ease of insertion and placement of the LMA was found easier with propofol and prolonged in sevoflurane.

Key words: Laryngeal mask airway, Propofol, Sevoflurane, Vital capacity breath technique

INTRODUCTION

The laryngeal mask airway (LMA) is an airway device used frequently in anesthesia and critical care for airway management. It is an alternate and appropriate airway device to the facemask when endotracheal intubation is not mandatory. Acceptable placement of LMA needs enough depth of anesthesia. This study is undertaken to compare the easiness of insertion of LMA using propofol/sevoflurane for induction. In recent times, inhalational induction with sevoflurane using single vital capacity breath (VCB) technique has been used. It is an alternate method to intravenous (IV) induction in adult patients. This method is rapid, with greater acceptances light excitatory phenomena and better hemodynamic profiles. LMA placement is more rapid after VCB induction using 8% of sevoflurane. This makes the sevoflurane sole drug for both maintenance and induction of anesthesia. It will make conversion period easier. Hence, this study is conducted to compare the consistency, excellence, and time to LMA insertion in adults after using sevoflurane induction and propofol induction.

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MATERIALS AND METHODS

A prospective, randomized, controlled trial was conducted in Government Kilpauk Medical College and Hospital, Chennai. Institutional Ethical Committee approval and written informed consent were obtained. 80 adult patients under American Society of Anesthesiologists (ASA) physical status 1 and 2 of either sex undergoing elective minor surgical procedures were enrolled for this study.

Inclusion Criteria

Elective minor surgical procedures, both gender, ASA physical status 1-2, age from 18 years to 50 years, patients with normal body mass index from 18.5 to 25.

Exclusion Criteria

Patients not satisfying inclusion criteria, patients with cardiac disease, known case of malignant hyperthermia or suspected genetic propensity, patients with reactive airway disease. Boyles machine with circle CO_2 absorber circuit, volatile anesthetic drug sevoflurane with vaporizer, propofol, classic LMA size 3 and 4. Resuscitation kit should be kept ready; approximate size endotracheal tubes, airways, suction apparatus. Patients in both the groups were IV cannulated with 18-gauge venflon. Monitors connected are non-invasive blood pressure (NIBP), electrocardiogram (ECG), and pulse oxymetry, end tidal CO_2 ($ETCO_2$), premedicated with IV injection glycopyrrolate 0.2 mg, fentanyl 2 μg/kg, ranitidine 50 mg, ondansetron 0.1 mg/kg, then preoxygenated for 3 min with 100% O_2.

Propofol Group

Patients in the propofol group were preoxygenated with 100% oxygen for 3 min and anesthetized using propofol 2 mg/kg IV, given over a period of 30 s. The onset of induction (loss of eyelash reflex) was assessed. 30 s after the achievement of induction (i.e., 60 s after the start of propofol), jaw relaxation was assessed and, if achievable, LMA placement was attempted. If not possible, attempts were repeated every 30 s up to a max. 4 attempts, every time preceded by IV boluses of propofol about 0.5 mg/kg. NIBP, ECG, SPO_2, and $ETCO_2$ readings were recorded for 5 min in 1 min interval. Any failure of placement, defined as failure to insert the LMA after 4 attempts, they were rescued with suxamethonium 25 mg IV. The existence of difficulties correlated to induction and placement of the LMA was noted such as excitatory movement or withdrawal from pain, gagging, coughing, apnea, and laryngospasm. At the end of the surgery, the existence of blood on the LMA was noted.

Sevoflurane Group

A closed circuit with circle absorber for CO_2 with a 2-L breathing bag was used. The closed circuit was primed with 8% sevoflurane in a 2:1 of N_2O to O_2 for 1 min at a rate of 6 L/min of fresh gas flow. Then, the patients were asked to take a deep breath after maximum exhalation and to hold as long as possible and then expire to residual volume. The onset of induction (loss of eyelash reflex) was assessed. 90 s after the induction, the jaw relaxation was assessed. 90 s was selected because it signifies the time at which all patients finished their VCB. If jaw relaxation was not possible, attempts were repeated every 30 s up to a max 4 attempts. At this time, anesthesia sustained with sevoflurane 8% and N_2O 67% in O_2. Once jaw relaxation was possible, LMA insertion was tried. Successful LMA insertion, time to LMA insertion (s), number of attempts (n), presence of blood on LMA, and hemodynamic parameters were observed.

The data were analyzed with SPSS software version 19.1 and $P < 0.05$ was considered statistically significant. Demographic data, the onset of induction, the time taken for LMA insertion, complications, and hemodynamic variables among the groups were analyzed with unpaired Student's *t*-test. Chi-square analysis was used for comparing gender and number of attempts for insertion.

RESULTS

The number of attempts for LMA insertion was comparable in both the groups without any statistically significant difference. The only thing was time to LMA insertion was prolonged in sevoflurane group.

Compared between both groups, there was significant variation in the 1, 3 min post-insertion mean blood pressure, $P < 0.0001$ (Tables 1 and 2). This study shows no significant difference between the two groups based on the demographic variables. The time to LMA insertion in sevoflurane group was significantly longer than propofol group ($P < 0.05$) (Table 3). Onset of induction in sevoflurane group was longer than the propofol group ($P < 0.05$). The hemodynamic responses were more stable in the sevoflurane group ($P < 0.05$). There was no statistical difference between the two groups in number of attempts and complications for LMA insertion (Tables 4 and 5).

DISCUSSION

In our study, we observed sevoflurane single VCB inhalational induction takes more time for the onset than the propofol group which was statistically significant (Table 6).[1,2] The time taken for LMA insertion was more with the sevoflurane group which was statistically significant. The hemodynamic stability was better with sevoflurane group. Placement of LMA after propofol

Table 1: Comparison of 1 min BP after LMA insertion between propofol and sevoflurane group

Group	Mean	SE	*P* value
Propofol	77.55	0.9	<0.0001
Sevoflurane	83.90	0.5	

BP: Blood pressure, LMA: Laryngeal mask airway, SE: Standard error

Table 2: Comparison of 3 min BP after LMA insertion between propofol and sevoflurane group

Group	Mean	SE	*P* value
Propofol	86.78	0.8	<0.0001
Sevoflurane	91.35	0.6	

BP: Blood pressure, LMA: Laryngeal mask airway, SE: Standard error

Table 3: Comparison of time to LMA insertion between propofol and sevoflurane group

Group	Mean	SE	*P* value
Propofol	12.88	0.6	<0.0001
Sevoflurane	19.05	0.6	

LMA: Laryngeal mask airway, SE: Standard error

Table 4: Comparison of occurrence of apnea between propofol and sevoflurane group

Group	Apnea		*P* value
	Present	Absent	
Propofol	17	23	0.009
Sevoflurane	4	36	

Table 5: Comparison of number of attempts between propofol and sevoflurane group

Group	Mean	SE	*P* value
Propofol	1.1	0.04	0.215
Sevoflurane	1.2	0.06	

SE: Standard error

Table 6: Comparison of onset of induction (obliteration of eyelash reflex) between propofol and sevoflurane group

Group	Mean	SE	*P* value
Propofol	44.40	0.7	<0.0001
Sevoflurane	61.45	1.0	

SE: Standard error

induction was achieved in all patients, paralleled with two failures in sevoflurane group.[3] The number of attempts and complications of LMA insertion were comparable in both the groups. With sevoflurane VCB technique, the hemodynamic parameters during the induction and placement of LMA were stable. Sevoflurane produced a lesser frequency of apnea and allowed better conversion to the phase of maintenance.[4] On the other hand, the onset of induction and the time taken for LMA placement were longer. The time delay to LMA insertion was due to jaw muscle tightness. The safety and consistency of sevoflurane single VCB induction makes it, an alternate method to IV induction of propofol for the placement of the LMA in adult patients when propofol is contraindicated.[5] Propofol is an IV induction agent which has a rapid onset of action with good relaxation properties. It is administered as a 1% solution. Administration of 1.5-2.5 mg/kg IV produces unconsciousness within 30 s. The rapid induction and rapid return of consciousness with minimal residual effects are the most important advantages of propofol.[6] Sevoflurane is an inhalational anesthetic agent. With a blood gas partition coefficient of 0.69% and minimum alveolar concentration of 2.1, it ensures rapid induction and rapid recovery after discontinuation of anesthesia. Sevoflurane causes least degree of airway irritation among the other volatile anesthetics and has smooth conversion to maintenance phase without apnea.[5,7] Sevoflurane associated with delayed jaw muscle relaxation and may take a longer time for insertion of LMA. On the other hand, it has better hemodynamic profile and can be used in high-risk patients.[8] Molloy and Buggy (1999): Conducted a study titled "Propofol or sevoflurane for LMA insertion." The study population consisted of 88 patients of ASA I or II underwent general anesthesia for the elective surgeries allocated into 2 groups. Patients in propofol group (n = 44) received 2.5 mg/kg propofol IV and in sevoflurane group (n = 44) received sevoflurane 8% in N_2O 50% and O_2 50%. LMA placement is attempted at 1 min interval from loss of eyelash reflex. The mean time to successful LMA placement is 1.3 min in propofol group and 2.2 min in sevoflurane group. They noted that complications were similar in both groups. They concluded that modified VCB inhalational induction with sevoflurane 8% is efficient for LMA placement in many cases, but it takes longer time than the propofol.[2] Kati and Demirel (2003): Conducted a study titled "Comparison of propofol and sevoflurane for LMA insertion." In this study, 100 patients aged between 20 and 40 years are randomly assigned into two groups. Group 1 received propofol (2.5 mg/kg IV) for induction, and the Group 2 received sevoflurane 6% (50% N_2O + 50% O_2) by the tidal volume technique of inhalational anesthesia. In both the groups, insertion of appropriate sized LMA was attempted. LMA placement time is found to significantly lengthier in the sevoflurane group than in the propofol group.[9] Priya and Divatia (2002): Conducted a study titled "A comparison of propofol versus sevoflurane for LMA insertion." 50 female patients of ASA Grade I/II are randomly allocated into 2 groups (n = 25 in every group) - Group S (inhalational sevoflurane) and Group P (IV propofol). Group P received IV propofol mean dosage 2.5 mg/kg and Group S 8% sevoflurane in 50%

N_2O and 50% O_2 for 30 s. After loss of eyelash reflex, LMA insertion was excellent in Group P (64%) than in Group S (32%). 72% of patients in Group P had complete jaw opening when compared to 44% of Group S. Hence, they concluded that propofol is better than sevoflurane for LMA insertion. Philip and Lambard (1999): Conducted a study titled "Comparison of vital capacity induction with sevoflurane to IV induction with propofol for adult ambulatory anesthesia." In this study, there were 56 patients allocated randomly to receive either 8% sevoflurane in 75% N_2O/O_2 from already primed circuit (VC group n = 32 patients) or propofol 2 mg/kg bolus (IV group n = 24) and time to induction, loss of consciousness, and side effects are monitored. In the VC group patients, 59% have lost responsiveness in one breath taking 39 ± 3 s. All vital capacity patients finished the induction and all measures; induction time is appreciably shorter time for the vital capacity group than IV group. They concluded that vital capacity induction with sevoflurane is a satisfactory alternative to propofol IV induction of general anesthesia for the adult ambulatory anesthesia.[10]

CONCLUSION

In our study, we conclude that inhalational induction by VCB technique using 8% sevoflurane is an alternate to IV induction using propofol for insertion of LMA in adult patients. When compared to IV propofol induction, sevoflurane VCB technique had stable hemodynamic parameters and less incidence of apnea. It allowed smooth conversion to maintenance phase and minimal occurrence of apnea. Even though onset of induction is more and extended jaw muscle tightness can delay LMA placement in patients with sevoflurane, it is a good alternative to propofol especially when it is contraindicated.

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Original Article

Incidence of Microbial Contamination of Lenses in Long-term Soft Contact Lens Wearers

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Abstract

Introduction: Microbial keratitis is the most visually devastating complication associated with contact lens (CL) wear CL wear disrupts these protective mechanisms through breakdown of normal homeostatic surface renewal as well as damaging the corneal surface.

Materials and Methods: A study of 50 eyes in 30 patients was conducted at a tertiary care ophthalmic center. There was a check on microbial contamination of lenses in long-term soft CL wearers. Patients who wanted to change their lenses after 1 year use or who wanted to discard their lenses due to redness, pain, watering, or blurring of vision were requested to give their lenses for smear culture antibiotic sensitivity and microbial culture.

Results: The cultures were evaluated for bacterial, fungal, or *Acanthamoeba* growth. These were tabulated in a master chart and results documented.

Conclusion: This study was conducted to impress the need to stop dispensing CLs at the optometrist counters where proper advice as to care of the lenses and their maintenance is not given. It also creates awareness about CL hygiene.

Key words: Contact lens, Lens contamination, Microbial infection, Smear culture antibiotic sensitivity

INTRODUCTION

Microbial keratitis (MK) is the most visually devastating complication associated with contact lens (CL) wear CL wear disrupts these protective mechanisms through breakdown of normal homeostatic surface renewal as well as damaging the corneal surface.

Trauma, pre-existing ocular surface disease, and CL wear have been earmarked as the most common etiologies of microbial infection.

CLs share an intimate relationship with the epithelial surface; all forms of CL wear, regardless of lens material, and modality of wear have a profound effect on the physiology of this tissue. Studies have shown that the physical presence of a CL, irrespective of oxygen transmissibility, disrupts corneal epithelial renewal mechanisms, producing a thinned, and stagnant epithelium.

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MATERIALS AND METHODS

A study of 50 eyes in 30 patients was conducted at a tertiary care ophthalmic center for evaluating the incidence of microbial contamination of lenses in long-term soft CL wearers.

On screening, a patient who fitted into the inclusion criteria (Table 1) were impressed on to hand over the lenses for the study to enable collection of data. These patients underwent a detailed eye examination as shown in Table 2. A thorough anterior segment examination was done to differentiate between corneal and conjunctival infection.

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CLs documenting growth or eye lesions were photographed for prognosis (Figures 1-6). The lenses collected and were transported to the laboratory in a sterile autoclaved lens cleaning solution to avoid cross contamination.

At the laboratory, the lens were transferred to glucose broth and incubated at 37° for 2 h. This broth was further cultured on blood agar, McConkey's agar overnight at 37° and sabouraud's at room temperature and 37° for 3 weeks. The growth observed was documented as bacterial, fungal and *Acanthamoeba* growth. Digital pictures were taken (Figures 7-12).

Results were tabulated and inference drawn (Tables 3 and 4).

Table 1: Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
Age group: 15-35 years	Age group: <15 or >35
Lenses	Lenses: RGP, bandage soft CL
Soft, yearly wear in power range of+5-−20 which were discarded after the yearly use or prior to that due to redness pain watering or blurring of vision not permitting the wearer to use them	Conjunctivitis causing redness pain watering
Asymptomatic patient wearing CL for duration more than the prescribed schedule	Iridocyclitis causing redness pain watering
	Patient not willing for any eye procedure
Asymptomatic patient wearing CL and never having got them cleaned for >3 months in yearly wear schedule	Patient not willing to come for regular follow-up
Symptomatic patient wearing CL with redness pain watering	

RGP: Rigid gas permeable, CL: Contact lens

The wear and tear of soft CL as it is creates microcracks. If handled roughly with nails then this forms earlier. Once the integrity of surface is lost, normal commensals or opportunist which will grow into the CL. During the wear of CL, if there is an inadvertent eye injury, these organisms will latch on the cornea causing corneal ulcer and subsequent loss of vision.

The cultures gave us a mixed basket of organisms with almost 1/3rd as no growth. Only those patients who had redness/conjunctival congestion or corneal defects were treated with antibiotics.

All were counseled as to CL hygiene (Table 5). They were reinforced on the corrective measures to be taken. In the case of a problem visit to the eye doctor was mandatory. Better to be safe than sorry.

DISCUSSION

The potential role of CL care solutions in MK has recently gained significant interest due to increased reports of fungal and *Acanthamoeba* keratitis. More recent reports support the view that corneal staining may be directly related to inflammation. This compromise includes the inhibition of apoptotic desquamation and a slowed renewal mechanism, producing a thinned, stagnant epithelial sheet. It appears that it is the cumulative breakdown of these collective processes that results in CL related MK and further illustrates the multifactorial nature of the disease process.[1]

Table 2: Detailed eye examination and investigations

CL history	Clinical examination	Investigation
CL usage at what age	Visual acuity on logmar chart	CL sent for SCABS and KOH
Duration of CL usage in a day	BCVA: Spectacle power/CL power	BUT/Schirmers
Type of CL	Slit lamp examination	Sac syringing
Cleaning procedure for the CL	CL details	IOP measurement by a non contact tonometer
Any faulting in the usage	Soft/RGP	If corneal lesion present corneal scrape for SCABS and KOH
Sleeping with the lenses in the eye	CL fit tight or loose	CBC/ESR
Cleaning lenses with tap water	Lack of lustre on CL indicating over-usage	Urine: (Routine & Microscopy)
Washing the eye with tap water with the lenses in the eye	Deposits on CL	ENT/Dental focus of infection
Using OTC drugs - Pyrimon for any redness of the eye with the lenses on	Cornea	
Continuing the usage of lenses in spite of getting a FB sensation redness watering or discharge in the eye	Corneal lesion	
Not visiting a doctor but an optician for CL dispensing	Fluorescent staining	
Improper cleaning schedule for the lenses	Photo of the lesion	
	Corneal sensation	
	Sac status to r/o chronic dacryocystitis	
	IOP to r/o glaucoma	
	BUT to r/o dry eyes	

Increased risk of bacterial infection is a reality with which all CL wearers must live. Unfortunately, the most CLs wearers suffer from the "it-cannot-happen-to-me" syndrome. Those who have had a contact-lens-related bacterial infection now know better than to tempt fate.

Bacterial eye infections affecting the cornea are known as MK. MK is the most severe complication associated with CL wear. *Pseudomonas aeruginosa* is the most common bacteria involved in MK. It is also one of the most damaging. *P. aeruginosa* eats away at the cornea (causing

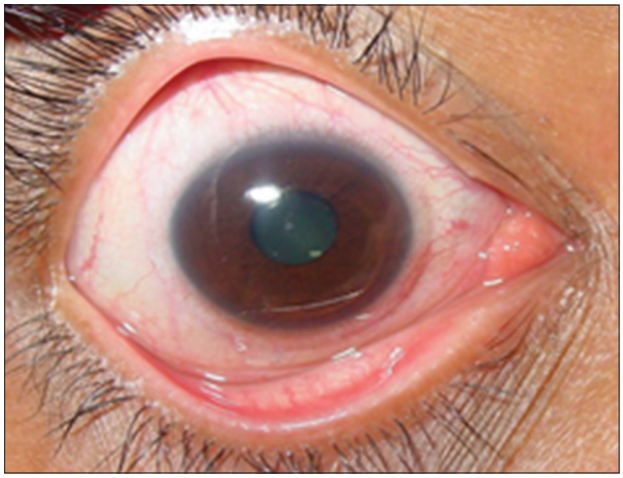

Figure 1: Tight fit lens causing hypoxia with ciliary congestion with corneal edema

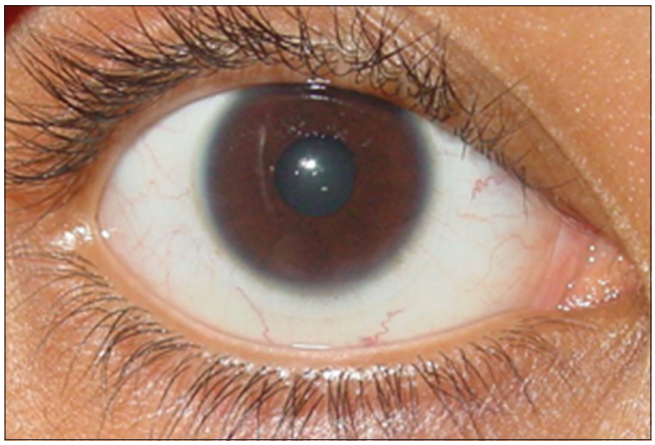

Figure 2: Lack of luster depicting an aged lens

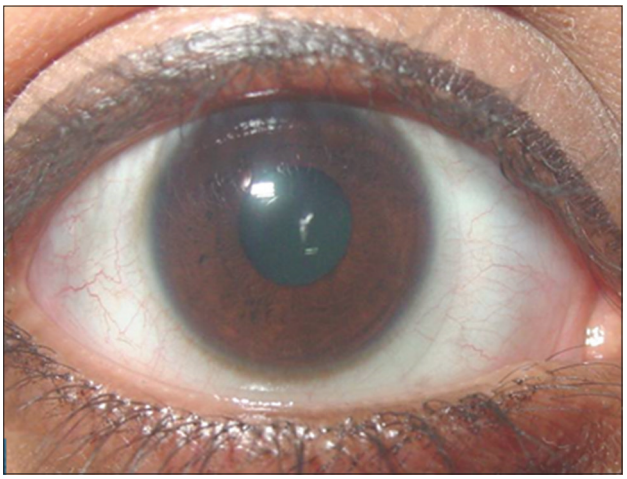

Figure 3: Lens deposit eroding into the lens

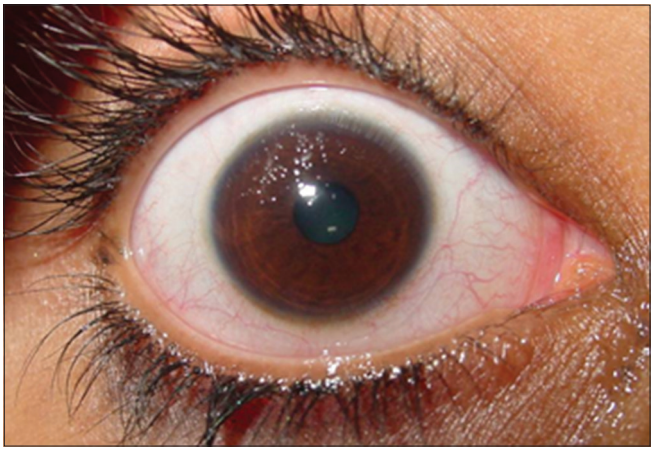

Figure 4: Multiple deposits on the contact lens causing FB sensation

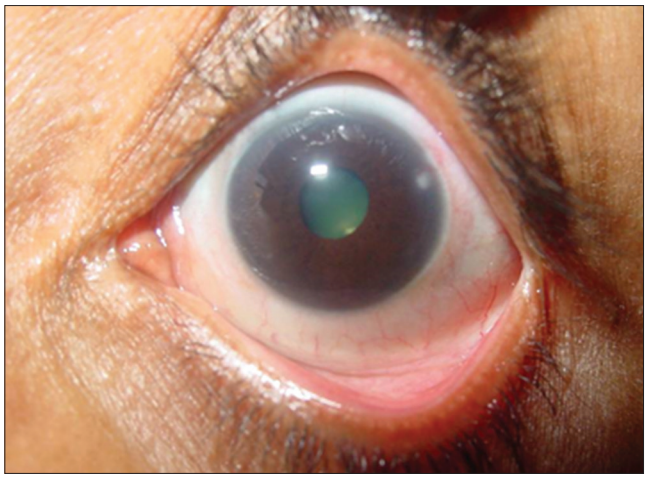

Figure 5: Peripheral corneal infiltrate with vascularization

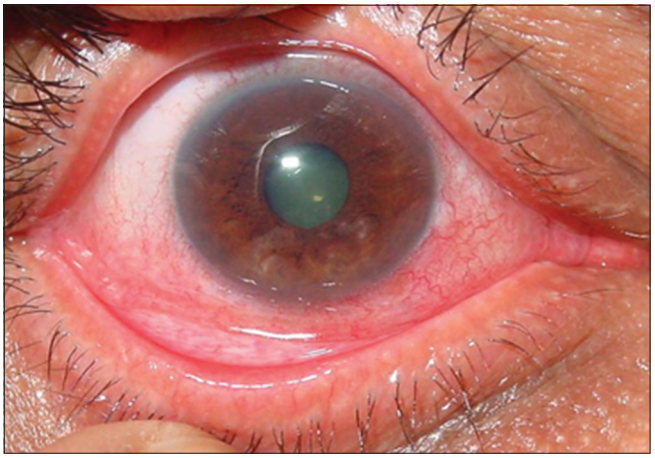

Figure 6: Corneal infiltrate with circumcorneal congestion following contact lens deposit

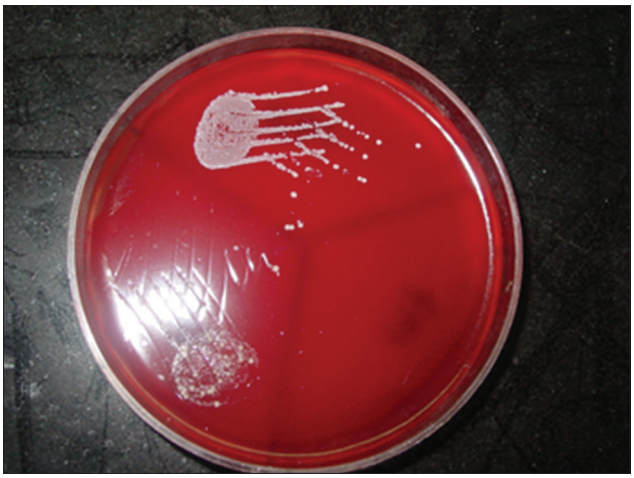

Figure 7: *Staphylococci*

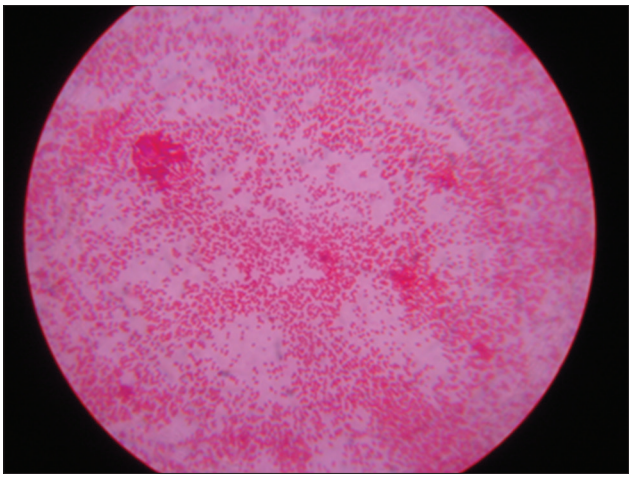

Figure 10: Gram-negative diplococci - *Neisseria* spp.

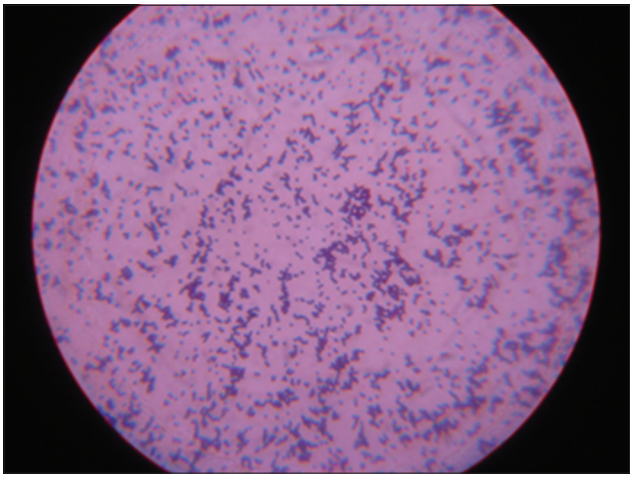

Figure 8: Gram-positive cocci in pairs and chains

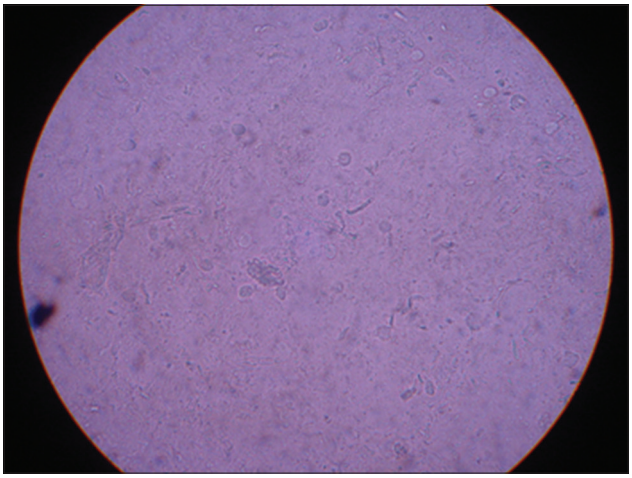

Figure 11: Fungal hyphae

Figure 9: Pink colonies of *Klebsiella* or *Enterobacter*

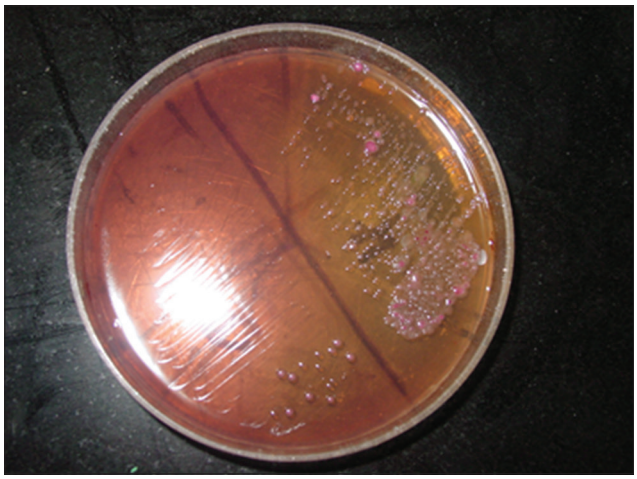

Figure 12: Non-lactose fermenting and lactose fermenting colonies

corneal ulceration), which could eventually lead to vision loss and blindness. Fungus and *Acanthamoeba* follow suit.

Overnight wear of daily CLs which are only meant for short-term wear is the biggest risk factor for eye infections. Others being dry eyes, smoking, chronic blepharitis, and allergic conjunctivitis.[2]

Soft CLs helps in surface disorders by preventing recurrent surface breakdowns and by restoration of the optical

Table 3: Results master chart

Subject	Age	Sex	Age of CL (in months)	Duration of symptoms (in days)	Pathogen isolated from CL
Case 1	15	F	11	5	*Escherichia coli*
Case 2	23	F	5	7	*Citrobacter*
Case 3	29	F	9	3	Non fermenter spp
Case 4	27	F	12	6	No growth
Case 5	33	M	17	4	*Serratia marcescens*
Case 6	22	F	7	3	*Morexilla* spp
Case 7	30	M	10	3	*Serratia marcescens*
Case 8	24	F	10	6	*Escherichia coli*
Case 9	18	F	12	3	*Acinetobacter*
Case 10	25	F	6	7	Proteus spp
Case 11	15	F	16	5	No growth
Case 12	29	F	10	5	No growth
Case 13	18	M	7	4	*Moraxella* spp
Case 14	35	F	9	7	No growth
Case 15	22	F	11	3	*Aspergillus*
Case 16	16	F	6	2	No growth
Case 17	28	F	18	4	No growth
Case 18	25	M	14	5	Streptococcus spp
Case 19	16	F	15	4	Streptococcus spp
Case 20	23	F	9	4	*Pseudomonas aeruginosa*
Case 21	19	F	6	5	*Escherichia coli*
Case 22	32	F	11	3	*Klebsiella* spp
Case 23	26	F	10	3	*Klebsiella* spp
Case 24	17	F	14	5	No growth
Case 25	31	M	11	2	*Fusarium*
Case 26	19	M	9	7	No growth
Case 27	16	F	13	5	*Acinetobacter* spp
Case 28	30	F	8	4	No growth
Case 29	31	F	18	5	No growth
Case 30	25	F	10	5	No growth
Case 31	28	F	6	6	*Fusarium*
Case 32	33	M	15	3	No growth
Case 33	21	F	12	5	No growth
Case 34	18	F	11	4	No growth
Case 35	30	F	17	4	No growth
Case 36	21	F	6	7	No growth
Case 37	29	M	11	6	*Pseudomonas aeurginosa*
Case 38	27	F	10	6	*Pseudomonas aeurginosa*
Case 39	21	F	7	3	*Citrobacter* spp
Case 40	25	F	15	5	*Citrobacter* spp
Case 41	24	F	18	6	No growth
Case 42	30	M	14	4	*Aspergillus*
Case 43	26	F	11	3	No growth
Case 44	19	M	13	6	No growth
Case 45	33	F	10	5	*Klebsiella* spp
Case 46	25	F	9	5	*Klebsiella* spp
Case 47	18	F	15	3	*Pseudomonas* spp
Case 48	22	F	11	4	*Pseudomonas* spp
Case 49	28	F	18	4	No growth
Case 50	24	F	13	4	No growth

integrity of the surface. However in a tight lens syndrome, it might cause corneal edema with subsequent rupture of corneal bullae secondary infection can lead to MK.[3]

Table 4: Micro-organisms grown with antibiotic sensitivity

Gram-positive sensitivity	Gram-negative sensitivity
Ox-Oxacillin	Cac-Ceftazidime-Clavulanic acid
Va-Vancomycin	Ce-Cephotaxime
Lz-Linezolid	Ci-Ceftriaxone
E-Erythromycin	G-Gentamicin
P-Penicillin A-Ampicillin	Pt-Piperacillin-Tazobactum
Co-Trimaxazole	I-Imepenem
Ca-Ceftazidime	Ao-Aztreonam
Cf-Ciprofloxacin	Tb-Tobramycin
Pseudomonas	Ci-Ceftriaxone
Pt-Piperacillin-Tazobactum	Ak-Amikacin
I-Imepenem	Cpm-Cefepime
Ao-Aztreonam	Ca-Ceftazidime
Tb-Tobramycin	
Ci-Ceftriaxone	
Ak-Amikacin	
Cpm-Cefepime	
Ca-Ceftazidime	

With the growth of soft CL wear, the incidence of CL-associated MK has increased up to 30% of all keratitis in developed countries. The microbes responsible for CL-associated keratitis include Gram-negative bacteria and rarely, Gram-positive bacteria and fungi, whereas *Acanthamoeba* predominated in the developed countries. Several CL-related and non-CL-related factors were attributed to the higher incidence of *Acanthamoeba* keratitis among CL wearers in developed nations. In contrast, bacteria were found to be the only pathogen for all CL-associated keratitis in this study. *P. aeruginosa* was reported to be the most common organism isolated from CL wearers in the developing world and similarly.

In developing countries like India, commonly used water is contaminated by gut commensals, especially *Pseudomonas*. A contact of CLs and CL storage cases with water can cause contamination by *Pseudomonas*, which survives well in the moist environment offered by CLs, CL storage cases, and lens care solutions. Contaminated CLs which were used by the patients, acted as a vector for transmitting the microbes from the CL storage cases to the patients' conjunctiva and cornea by forming polysaccharide-containing bio-film on the posterior surface of soft CLs by bacterial adherence. Bacterial adherence to artificial surface is also thought to be mediated by hydrophobic bonding and relatively hydrophobic strains adhere very readily to CLs.[4]

A CL can act as a vector for micro-organisms to adhere to and transfer to the ocular surface. Commensal micro-organisms that uneventfully cohabitate on lid margins and conjunctivae and potential pathogens that are found transiently on the ocular surface can inoculate CLs *in vivo*. In the presence of reduced tissue resistance, these

Table 5: CL hygiene and corrective measures to be taken

Factors-lens hygiene	Corrective measures
• No nail growth • No cracks/rough pulp of index finger	• When prescribing CL counsel on preventing injury to the lens • Do not use lens in case of redness pain watering and if worn then discard those lenses
• Rub the CL with cleaning solution while inserting and after removing • CL	• Do not use any unpreserved solution to clean or store lenses in c/o emergency use a tear substitute • Clean the lenses ultrasonically every 2 months as the rubbing action is insufficient to remove accumulated deposits
• Not to rub eyes immediately after CL removal. Least corneal abrasion happens in case of post CL corneal edema • Storage of CL • Change solution every 2nd day	• Clean the lens case with betadaine 5% solution when the patient comes for CL cleaning at the clinic • Visit eye doctor every 3 months to r/o tight lens syndrome or CL deposits on the lens
• Make sure CL borders are within well of CL storage box so that cap not put over CL • Ultrasonic/enzyme cleaning of CL every 2 months • CL cleaning solution to be kept in fridge/not to be replaced by tap water/use a transparent bottle so deposits can be cleaned • Do not wear CL in case of: Redness of eyes Watering of eyes Dropped vision Discharge	• Always get lenses from eye doctors and not optometrists

CL: Contact lens

resident micro-organisms or transient pathogens can invade and colonize the cornea or conjunctiva to produce inflammation or infection.[5]

Lens handling greatly increases the incidence of lens contamination, and the ocular surface has a tremendous ability to destroy organisms. Even when lenses are removed aseptically from the eye, 50% are found to harbor micro-organisms, almost exclusively bacteria. Coagulase-negative *Staphylococci* being most common and Gram-negative about 10%. In storage cases, the incidence of positive microbial bioburden is also typically >50%. All types of care solutions can become contaminated including up to 30% of preserved products. Thus, this detailed understanding of lens-related bioburden is important in the understanding of factors associated with infectious and inflammatory complications.[5]

Many complications arise when lenses are worn not as prescribed (improper wear schedule or lens replacement). Sleeping in lenses not designed or approved for extended wear is a common cause of complications. Many people go too long before replacing their lenses, wearing lenses designed for 1, 14, or 30 days of wear for multiple months or years. While this does save on the cost of lenses, it risks permanent damage to the eye and loss of sight. CL wear is the most important risk factor. The role of initial therapy for MK remains important.[6]

Severe MK with vision loss in CL wearers is more likely to be caused by an environmental pathogen, and to occur in tropical regions in association with high daytime temperatures.[6]

One of the major factors that cause CL complications are that the lens is a barrier to oxygen. The cornea needs a supply of oxygen to function and it normally gets that oxygen from the surrounding air while awake and from the blood vessels in the back of the eyelid while asleep. The most prominent risks associated with long-term, chronic low oxygen to the cornea include corneal neovascularization increased epithelial permeability, bacterial adherence, micro cysts, corneal edema, endothelial polymegethism, and potential increase in myopia.

Mishandling of CLs can also cause problems. Corneal abrasions can increase the chances of infection. When combined with improper cleaning and disinfection of the lens, the risk of infection further increases. Decreased corneal sensitivity following extended CL wear may cause a patient to miss some of the earliest symptoms of such complications.[7]

Genetic mutations in the innate immune system may be involved in individual susceptibility to MK.[8]

Cytokine gene expression is tightly regulated, and aberrant expression from environmental and genetic polymorphism has been implicated in a range of diseases, susceptibility to infections, and responses to treatment. This review concentrates on the functionality of cytokine and cytokine receptor gene polymorphisms; it is through these variants that genuine disease-associations are based. Several mechanisms for single nucleotide polymorphism (SNP) functionality are present within cytokine genes.[9]

CONCLUSION

The trend to use lenses is more in the pre-presbyopic age group hence it formed our sample base. 90% of the sample was contributed by the female gender. Cosmesis as well as reduced corneal sensation compared to the male population was the basis of this rigid gas permeable (RGP) lenses are safer but soft lenses are user-friendly hence the increase in demand and shift from RGP lenses in recent years. The younger generation is careless about the hygiene of wearing, cleaning and maintenance of the lens. There seems to be no gender bias. The duration of wear seems to have a bearing on the incidence of infection. This may be due to the micro-cracks in the CL due to wear and tear. The presence of clinical symptoms like redness pain watering and blurring of vision seems to herald the onset of microbial infection in the lenses. Hence, continuing to use the CL in the presence of these symptoms may be a contributing factor in people developing corneal infections following CL wear. The presence of infiltrates is a sure shot marker for isolating pathogens in the lenses. Hence, a complete slit lamp examination at every follow-up should be mandatory. Seeing an infiltrate should be an absolute indication to discard usage of the lenses.

Deposit on the lens was the hallmark of finding pathogens as they grow into it. It highlights the need for ultrasonic cleaning of lenses and frequent change of CL solution in the lens case. Disinfecting the lens case once a fortnight with betadine 5% solution would prevent deposit formation on the lenses. Storing the solution in the refrigerator and handling the bottle cap aseptically would go a long way in preventing CL solution contamination.

Pathogens were isolated in 60% of cases. They came in a mixed basket of Gram-positive specially staphylococcus, Gram-negative especially *Pseudomonas* and *Klebsiella*, Fungal hyphae in 10% as listed in Table 3. We could not isolate *Acanthameoba* in spite of literature reporting it as the most common organism in CL wearers.

The study emphasizes the need to clean hands with glycerine soap with clean water and dry them prior to handling lenses. Disinfecting sanitizer would definitely help. The need to emphasize cleaning of the CL case every week and rinsing them in betadiane solution 5% every fortnight before reuse. It is necessary to refrigerate the CL cleaning solution to prevent the growth of organism in them.

Immediate ophthalmic consultation in case of redness pain watering with blurred vision and refrain from wearing these lenses in these situations must be a compulsory mandate to prevent transfer of this infection to the cornea heralding the onset of infectious keratitis with significant loss of vision.

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Original Article

Functional Outcome of Patients Underwent Lumbar Microdiscetomy

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Abstract

Introduction: Inter vertebral disc prolapse (IVDP) is a very common cause for low back ache in younger population. When conservative treatment fails or when patient develops complications like neurological deficit, then the treatment is surgical discectomy. Open laminectomy and discectomy has a lot of morbidity when compared to micro discectomy which is the treatment of choice for such patients. In this study, we analyze the advantages and functional outcome of patients underwent micro lumbar discectomy.

Materials and Methods: This is an institution-based prospective study. We performed a prospective study of 15 microscopic discectomy in 15 patients who were non-responsive to conservative management. Their pre- and post-operative symptoms like pain and functional disabilities were evaluated over a period of 2-year using direct questionnaire method.

Results: About 95% of patients reported excellent pain relief on 1 year follow-up. Neurological recovery was 80% on 2 years follow-up. 2 patients had dural tear during the procedure which was treated by suturing with 5'0 prolene.

Conclusion: It is recommended that this procedure as the gold standard surgical method for the patients with IVDP who were failed with conservative treatment method.

Key words: Patients, Lumbar, Microdiscetomy

INTRODUCTION

The life time prevalence of lumbar disc herniation is approximately 2%. The natural history of sciatica secondary to lumbar disc herniation is spontaneous improvement in the majority of cases. Among patients with radiculopathy secondary to lumbar disc herniation, approximately 10-25% experience persistent symptoms. Pain typically begins in the lumbar area and radiates to sacroiliac and buttocks region. Radicular pain extends below the knee in the region of involved nerve root. Radicular pain may be accompanied by paresthesia and weakness in the distribution of involved nerve root.[1]

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The supine straight leg raise test (Laseugues test) and its variants (sitting straight leg raise test, bowstring test, contra lateral straight leg raise test) increase tension in sciatic nerve and are used to assess L5 and S1 nerve roots. The femoral nerve stretch test (reverse straight leg raise test) increases tension along femoral nerve and is used to assess the L2, L3, and L4 nerve roots.

Plain radiographs are not helpful in initial evaluation of suspected lumbar disc herniations. Although radiograph may show degenerative changes (disc space narrowing and osteophyte formation), there is poor correlation between these findings and clinical symptoms because these findings are also present in asymptomatic patients. Magnetic resonance imaging (MRI) is the preferred imaging test because it provides greatest amount of information about the lumbar region. About 90% of lumbar disc herniation occurs at L4 L5 and L5 S1 level. L3 L4 level is the next common level for symptomatic lumbar disc herniation.[2]

Disc herniation is described based on the circumference of the annulus fibrosus as central, posterolateral, foraminal,

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or extra foraminal. A posterolateral L4 L5 disc herniation compresses L5 nerve root. An L4 L5 foraminal or extra foraminal disc herniation compresses L4 nerve root. A central disc herniation compresses one or more of the caudal nerve roots.

Appropriate criteria for surgical intervention are follows:
1. Functionally incapacitating leg pain extending below the knee within a nerve root distribution
2. Nerve root tension signs with or without neurologic deficit
3. Failure to improve with 4-8 weeks of nonsurgical treatment
4. Confirmatory imaging study which correlates with patients' physical findings and pain distribution.

Open lumbar discectomy using microsurgical techniques remains the gold standard for the treatment of symptomatic lumbar disc herniation. Although a variety of alternative procedures have been proposed, no procedure has demonstrated superior surgical outcome compared with microsurgical approach.[3]

Complications of microscopic lumbar discectomy include:
1. Vascular injury
2. Nerve root injury
3. Dural tear
4. Infection
5. Increased back pain
6. Recurrent disc herniation
7. Cauda equina syndrome
8. Medical complications such as thrombophlebitis, urinary tract infection, etc.

The most common cause of surgical failure following lumbar discectomy is poor patient selection and wrong level of surgery. The incidence of recurrent disc herniation following non-surgical lumbar discectomy is 5-10%. If symptoms are predominantly radicular repeat lumbar discectomy may be beneficial. If symptoms include a combination of radicular pain and low back pain, discectomy combined with fusion may be considered in select patients.[4]

MATERIALS AND METHODS

Analysis of functional outcome of patients with herniated lumbar disc who have undergone microdiscectomy at Amala Institute of Medical Science, Thrissur over a period of 2-year. We performed a prospective study of 15 microscopic discectomy in 15 patients who were non responsive to conservative management. Pre- and post-operative neurological status, pain, functional disability were evaluated. Other studied variables were mean age sex ratio, level of prolapse, mean hospital stay, and time to return to work.

All patients with sciatica caused by herniated lumbar discs who did not respond to conservative treatment were enrolled in the study to undergo microdiscectomy between 2011 and 2013. The inclusion criteria were the presence of a herniated lumbar disc observed on MRI scans and the persistence of sciatica after 4-8 weeks of conservative treatment with rest, analgesia, nonsteroidal anti-inflammatory drugs, and physical therapy. The exclusion criteria were as follows age older than 60 years, previous surgery, associated lumbar spine stenosis, foraminal, or extraforaminal disc herniations. Only those patients with a final post-operative follow-up period of at least 2-year were included in this study. After the inclusion criteria were met and an informed consent was obtained, the patients were included in the study. The surgical procedures were performed under general anesthesia with the patient in the prone position with hip flexed to 90°. Prophylaxis with the first-generation cephalosporin was introduced 1 h before anesthesia and kept for 8 h after the procedure.

Procedure: Patient in a prone position with hip flexed to 90° (Figures 1 and 2).

Level identification done under C-arm control which is the most crucial step.

Count the level from below upward as open spaces as seen in MRI.

For example if it is second open space from below upward in MRI, under C-arm guidance in lateral view identify the second open space. 1 inch (2.5 cm) incision made between adjacent spinous process from spinous process above to spinous process below slightly to the side depending on the predominant symptomatic side. Deep fascia and muscles retracted to either side. Self-retaining retractors applied. Base of the spinous process identified. Through the gap between the spinous process and lamina ligamentum flavum excised and reached the lateral side of spinal cord. Search for root extension from the cord. Cord is then retracted medially to see the disc underneath. Excision of the disc was done. Hemostasis attained and wound closed in layers.

Post-operative lumbar corset given. The 3rd day wound inspection done and the patient is discharged. Reviewed after 10 days for suture removal. Reviewed after 6 weeks for reassessment. On follow-up, pain is assessed using

Figure 1: Patient in a prone position with hip flexed to 90°

Figure 2: Pre-operative image - Patient in a prone position with hip flexed to 90°

questionnaire method. Neurological status is assessed by clinical examination.

The surgical variables analyzed were the level and side of the herniated disc, side of root compression, pre- and post-operative neurological deficit, and post-operative pain relief. Pre- and post-operative evaluation consisted of a neurological examination, and questionnaire method for assessment of pain. The surgical wound pain was assessed 12 h after surgery using the questionnaire method. Clinical neurological status was evaluated using the Lasegue test, motor assessment by muscle strength, and testing of the sensory system (Figures 3 and 4).

Functional outcome was evaluated using the questionnaire method. The patients were reevaluated 1 week, 6 weeks, 6 months, 12 months, and 24 months after surgery. The time required for patients to return to work was also registered.

Results

Mean age: 591/155 = 39.4

Sex: M/F - 3:2

Level: L4 L5 level: 9 (60%)

L5 S1 level: 6 (40%)

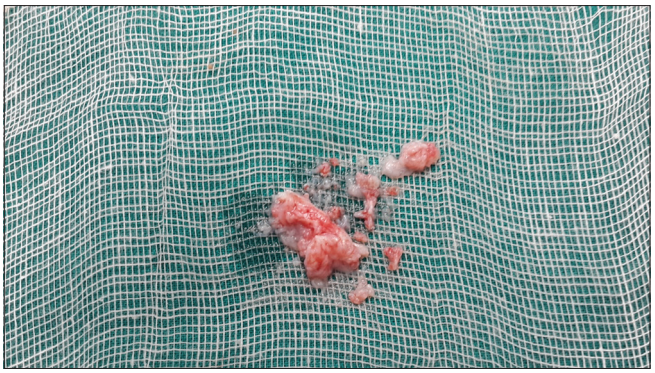

Figure 3: Excised part

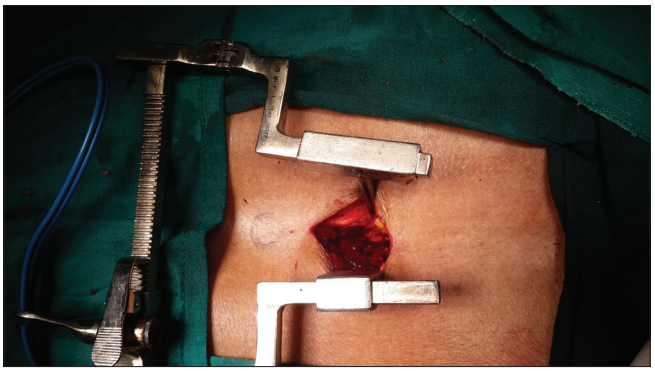

Figure 4: Post-operative

Pain relief:

Pain relief is assessed by questionnaire method.

Pain relief	1 week	6 week	6 months	1 year
Excellent	10	12	13	14
Good	4	2	1	0
Fair	0	1	1	1
Poor	1	0	0	0

Neurological status:

Motor deficit:

- Pre-operative: 10 (66.67%)
- 1 week post-operative: 8 (53.3%)
- 6 week post-operative: 5 (33.3%)
- 6 months post-operative: 4 (26.6%)
- 12 months post-operative: 4 (26.6%)
- 24 months post-operative: 3 (20%).

Sensory deficit:

- Pre-operative: 9 (60%)
- 1 week post-operative: 6 (40%)
- 6 week post-operative: 6 (40%)
- 6 months post-operative: 5 (33.3%)
- 12 months post-operative: 3 (20%)
- 24 months post-operative: 3 (20%).

RESULTS

A total of 15 patients were enrolled in the study. The mean post-operative follow-up period was 24 months. There were 9 men and 6 women with a mean age of 39.4. The vertebral level affected was L4 L5 in 9 patients, L5S1 in 6 patients. All patients is presented with pre-operative neurological impairment; 100% had a positive Lasegue sign (15 out of 15), 66.67% had motor deficits (10 out of 15), and 60% had sensory deficits (9 out of 15). After 6 months of follow-up, 26.6% had motor deficit and 33.3% had sensory deficit. After 12 months, these percentages changed to 26.67% and 20%, respectively, and after 24 months, they changed to 20% and 20%, respectively. Two patients had dural tear which was managed conservatively.

All 15 patients have full recovery from pain within 6 weeks and were able to resume their normal work.

DISCUSSION

Microscopic discectomy helps in faster post-operative mobilization, faster recovery, and resumption of work at the earliest. The development in recent years has made the treatment of herniated discs safer and less invasive. By using microscopic discectomy approaches through small incisions, nerve root decompression is achieved with minimal risk of complication and preserving normal anatomy. The superiority of microdiscectomy over traditional discectomy has been widely proven. The most important step in microdiscectomy is correct level identification and adequate decompression.

CONCLUSION

It is recommended that this procedure as the gold standard surgical method for patients with Inter vertebral disc prolapse who were failed with conservative treatment method.

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Original Article

Significance of Fragmented QRS Complex in Acute Coronary Syndrome and its Correlation with Coronary Angiography to Identify the Culprit Lesion

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Abstract

Background: Electrocardiogram (ECG) is the first step in the evaluation of any acute coronary syndrome (ACS) followed by invasive coronary angiogram (CAG) if indicated. ECG plays a valuable role in diagnosis of ST elevation myocardial infarction (STEMI). But in non STEMI (NSTEMI), the role of ECG is not very specific as far as the area of ischemia is involved. Fragmented QRS (fQRS) is said to be a valuable ECG marker of ACS. fQRS can play an additional role in the diagnosis of NSTEMI.

Aim: To evaluate ECG in patients with NSTEMI ACS and to find out its correlation with culprit vessel by coronary angiography.

Materials and Methods: We studied a total of 450 patients with NTEMI ACS. STEMI patients were excluded. The patients were clinically evaluated for symptoms, risk factors followed by ECG. All of them underwent ECG analysis for fQRS. The patients also underwent CAG for evaluation of the culprit vessel. Further ECG and fQRS correlation with culprit vessel were done.

Results: A total of 450 patients including 308 male and 142 female patients were studied. Among them, 230 patients had fQRS in the ECG, whereas 220 had no fQRS in the ECG. P value of ST depressions in anterior leads (P = 0.003) and T inversions in lateral leads (P = 0.0001) was significant in fQRS group as compared to the non-fQRS group. Coronary angiography of positive fQRS patients showed significant lesions in culprit vessel in 91.3% of patients. The sensitivity of CAG in patients with a positive fQRS was 63.24 with a specificity of 83.05 for localizing the culprit vessel. The highest specificity of 96.74% was seen in patients with positive fQRS in anterior leads with left anterior descending lesions in CAG, followed by fQRS in lateral leads in left circumflex artery lesions (94.35%).

Conclusions: Analysis of fQRS could help in giving an indication of the culprit vessel involved with a high specificity and good sensitivity. Thus, fQRS analysis can be seen as a good adjunct with CAG for diagnosis of patients with NSTEMI.

Key words: Coronary angiography, Fragmented QRS, Non ST elevation myocardial infarction

INTRODUCTION

The diagnosis of ST-elevation myocardial infarction (STEMI) has evolved a lot from electrocardiogram (ECG) to two-dimensional echocardiogram (2D echo/echo) to coronary angiogram (CAG) to comment on the culprit vessel involved in the MI. But still, the data are lacking in the correlation of non STEMI (NSTEMI) and the culprit vessel involved. In NSTEMI, there are ECG changes that may suggest that there is some ischemic activity going on in the heart but all are not very specific as compared to the STEMI. The researchers observed some slurring in the ECG in 1960. Investigators tried to correlate the same with the left ventricle (LV) dysfunction. It was Flowers *et al.*, who first discovered the presence of fragmented QRS (fQRS) complex in the

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patients who already had an MI. It was thus reported as a high-frequency component.[1] According to Friedman *et al.*, there are persistent changes in the Purkinje fibers and myocardial fibrosis that will slow down the myocardial activation which he analyzed in the canine heart with induced MI.[2]

Varriale and Chryssos suggested that RSR' complex unrelated to right bundle branch block or left bundle branch block could be associated with impaired depolarization within tissue surrounding the myocardial scar.[3] It was de Luna who suggested that abnormalities in the second half of the QRS complex (i.e., terminal slurring, sometimes with R' in lead V1) during MI might represent necrosis in late depolarized basal zones,[4] It was Das *et al.* who defined the fQRS in 2006, as presence of an additional R-wave (R') or notching in the nadir of the S wave, or the presence of >1 R' in 2 contiguous leads, corresponding to a major coronary artery territory on the resting 12-lead ECG with filter range 0.16-100 Hz, AC filter 60 Hz, paper speed 25 mm/s, and 10 mm/mV.[5] As very little is known about this fQRS in NSTEMI, we planned to do a prospective study.

MATERIALS AND METHODS

Aim

- To document the fQRS in the ECG of the acute coronary syndrome (ACS) patients and to correlate with the coronary artery involved by doing CAG.
- To determine the culprit artery from the fQRS leads.

Objectives

- To identify the incidence of fQRS in the ACS (NSTEMI/UA).
- To identify the sensitivity and specificity of the fQRS in determining the culprit artery in ACS.
- fQRS complex in ECG correlation with the CAG to identify the culprit lesion in ACS patients.

Hypothesis

The incidence of fQRS is around 60% which is due to the scarring of the myocardium.[6] It has a strong correlation in determining the culprit artery lesion.

Inclusion Criteria

- All patients with ACS undergoing CAG.

Exclusion Criteria

- Patients with atrial fibrillation, cardiomyopathy, myocarditis, valvular heart disease, congenital heart disease, and previous implantable cardioverter defibrillator.
- Patients with STEMI.
- All patients with bundle branch block.
- Patients not willing for CAG.

Study Population

- All the patients who were admitted to our hospital with chest pain, effort angina (EA), dyspnea, palpitation, with ECG changes fulfilling the inclusion criteria within the period of March 2014-October 2015 were included in the study.
- We studied the mode of presentation, past history such as diabetes mellitus (DM), hypertension (HTN), dyslipidemia (DLP), and peripheral vascular disease (PVD), and the family history of DM, HTN, DLP, coronary artery disease (CAD), as well as the habits like smoking and alcohol consumption.

The ECG changes in the various leads, like fQRS, ST-T changes (depression and inversion) were also recorded. These ECG changes were correlated with CAG to find out any relation between the two.

- This study was approved by the institutional ethics committee, and an informed consent was obtained from all enrolled patients.

Outcome

We recorded the ECG of all the patients who were admitted to the hospital on admission for CAG which was done within 24 h of admission. The ECG correlation was done with the CAG findings. No follow-up was done for the patients thereafter.

Electrocardiography

About 12-lead ECG was done in all the patients on admission as well as when the patient complains of chest pain. The ECG criteria for fQRS were met according to the definition by Das *et al.*[5] The resting 12-lead ECG filter range: 0.15-100 Hz; AC filter, 60 Hz, 25 mm/s, and 10 mm/mV.

Coronary Angiography

CAG were analyzed by two experienced interventional cardiologists. CAG was either done by radial or femoral route by standard technique. Coronary stenosis ≥70% was considered as significant.

Statistical Analysis

The quantitative variables in the baseline data were expressed in mean ± standard deviation. Presenting complaints, past history, family history, ECG, 2D echo, and CAG findings were all divided into 2 groups, one group with fQRS and the other without fQRS. We used two-tailed Students *t*-test for comparing the continuous variables. Chi-square and fisher exact tests were done to compare the dichotomous data. Sensitivity, specificity,

likelihood ratio, and positive and negative predictive values (NPV) were recorded to evaluate the diagnostic value of fQRS complexes in each patient. To examine the influence of various clinical factors, logistic regression analysis was used by estimating the probability of fQRS occurrence on an ECG. Receiver operating characteristic curves were used to assess the relationship between fQRS complexes and ischemic T-wave inversion and ST segment depression for the diagnosis of NSTEMI. To identify the independent predictors of fQRS in various risk factors, CAG findings, step-wise multivariate logistic regression analyses were performed.

RESULTS

Study Patients

A total of 450 patients with NSTEMI were evaluated. Among them, 68.4% (308) were male and 31.6% (142) were females. fQRS complexes were identified in 230 patients (51.11%). The baseline characteristics of the patients were divided into fQRS (Group 1) and non-fQRS (Group 2) group. It was found that the EF and blood sugar levels (BSL) were found to be significant. Furthermore, patients with a history of chest pain, EA, dizziness, smokers and those with family history of systemic HTN were more likely to have fQRS. All other characteristics were insignificant.

Most of the patients presented with EA, i.e., 284, among which 156 were in fQRS group and 128 were in non-fQRS group. Chest pain was the next presenting complaint with 118 patients in fQRS group as compared to 80 patients in non-fQRS group. Rest of the patients presented with dyspnea (34 in fQRS vs. 28 in non-fQRS group), dyspnea on exertion (DOE) (58 in fQRS vs. 62 in non-fQRS group), and palpitation (28 in fQRS vs. 26 in non-fQRS group). The mode of the presentation was also studied according to the two groups. In which it was found that chest pain, EA, dizziness was found to be significant.

A total of 196 patients had HTN among which 96 were in fQRS group, whereas 100 were in non-fQRS group. Out of 188 patients who had DM, 106 were in fQRS whereas 82 were in non-fQRS group. DLP and PVD were equal in both the groups with 52 patients and 2 patients each, respectively. Among the past history nothing was statistically significant ($P = 0.427$). Family history of HTN, DM, DLP, and CAD was a more common in the fQRS group than non-fQRS group (16 vs. 6, 20 vs. 10, 4 vs. 2, and 48 vs. 32, respectively). Family history of HTN was found to be significant ($P = 0.038$) in the fQRS group. Smoking and alcohol intake was also more common in the fQRS group. Among personal history smoking and alcohol intake was also more common in the fQRS group, but smoking was found to be significant ($P = 0.0001$).

Cardiac biomarkers like troponin I and CKMB were not only elevated in the fQRS group than non-fQRS group (44 vs. 22 and 16 vs. 0, respectively) but was also found to be significant ($P = 0.001/0.0001$). Mitral regurgitation (MR) was found to be more in non-fQRS group and was also found to be significant ($P = 0.029$). LV hypertrophy though more in non-fQRS group but was non-significant. Among the 450 patients, 4 patients were found to have raised JVP and presence of S3 which was also statistically insignificant ($P = 0.438$).

Regional wall motion abnormality (RWMA) was more in the fQRS group than in the non-fQRS group and was found to be significant in the anterior ($P = 0.007$) as well as inferior group ($P = 0.023$).

ECG correlation was done. In this ST depression in the anterior leads was found to be significant ($P = 0.003$), T-wave inversion in the lateral lead was found significant ($P = 0.0001$) in the fQRS group.

CAG was done in all the patients who were also found to be significant in all the coronaries except for left main coronary artery. Right coronary artery (RCA) was the most commonly involved artery (176) followed by left anterior descending (LAD) artery (172), followed by left circumflex artery (LCX) (130). And which was seen to be quite significant in the fQRS versus non-fQRS group.

In addition, non-fQRS group was more commonly associated with ectatic coronaries, normal coronaries, and minor CAD. Whereas fQRS group was more commonly associated with single vessel disease, double vessel disease (DVD) and triple vessel disease (TVD).

Similarly, the sensitivity, specificity, positive predictive value (PPV), NPV, likelihood ratio was calculated. The sensitivity of fQRS with CAG was 63.24 as compared to fQRS with ST status (52.23%) and fQRS with T status (58.87). The specificity of fQRS with CAG was again higher (83.05) as compared to the both.

On comparing individually fQRS in the various leads with the CAG corresponding vessels, it was found that the sensitivity of fQRS in the inferior leads in ECG with RCA lesion in CAG was highest with 59.69. Moreover, the specificity was the highest in fQRS in the anterior leads with LAD in CAG group (96.74) followed by fQRS in lateral leads in ECG with LCX in CAG (94.35).

The sensitivity and specificity of ST depression and T-wave inversion in various leads corresponding to their

CAG vessels were very low as compared to the fQRS group.

DISCUSSION

Ventricular depolarization (QRS complex) and ventricular repolarization (ST-T wave) changes are easily, quickly and less expensively detected on the ECG. Therefore, any changes in the ECG can be easily dealt with. Among the 450 patients who had NSTEMI, 68% were male whereas 32% were females. The patients in fQRS group in the present study had a higher mean age as compared with non-fQRS, but this was not statically significant (0.475).[5,7] However, Cetin *et al.*,[8] Guo *et al.*,[6] and Dabbagh Kakhki *et al.*,[9] found the association of age with fQRS as significant. Probably because of this contradictions age may not be playing a significant role. The fQRS was found in 51% patients. In other studies, like Guo *et al.*[6] fQRS was 60% whereas in another study by Li *et al.*[10] fQRS was 56% which is almost comparable to our study. The most common mode of presentation in fQRS group was EA, followed by chest pain as compared to the non-fQRS group, which was very significant. Rest all the modes such as dyspnea ($P = 0.57$), DOE ($P = 0.477$), and palpitations ($P = 0.0908$) were not statistically significant. As we know that the fQRS complex is normally formed when there is scarring of the myocardium, but having angina is an indication of ongoing ischemia or still viable myocardium which should be dealt with more aggressively in order to prevent the further LV dysfunction. Past history of HTN, DM, and DLP was insignificant in both the groups. Although we know that the presence of these risk factors leads to CAD, here these risk factors are insignificant in both the groups, similar to the study by Li *et al.*[10] The findings by Guo *et al.*[6] and Dabbagh Kakhki *et al.*[9] contrary to ours have significant DM patients in the fQRS group. In our study, the family history of HTN was significant which was not sought out in the studies like Li *et al.* and Guo *et al.* In our study, smoking was found to be significant in the fQRS group. Dabbagh Kakhki *et al.*[9] also report increased incidence of smoking in their positive fQRS group. As we all know that smoking itself leads to atherosclerosis, this might be one of the reasons that the more smokers have more fQRS as well as more severe CAD. In Guo *et al.*[6] study, it was tobacco they have compared, rather than smoking. According to Guo *et al.*, tobacco was not significant in their findings. According to our study, alcohol consumption was not found to be significant ($P = 0.052$).

Very few patients presented in our study with raised JVP and S3, which was again clinically insignificant ($P = 0.70$). On comparing the fQRS and the non-fQRS groups, it was found that differences in EF and BSL were statistically significant. The patients in the fQRS group had a wide variation in the EF, i.e., 58.67 ± 12.92 as compared to the non-fQRS group. The patients in fQRS group had low EF as compared to the non fQRS group. The reduced EF is due to more severe disease in the fQRS group as seen by CAG. This may need further evaluation. Dabbagh Kakhki *et al.*[9] also report a reduction of resting ejection fraction using the myocardial perfusion imaging studies. Abdelrehman,[11] Cheema *et al.*,[7] Korhonen *et al.*,[12] Li *et al.*,[10] and Yan *et al.*[13] have also reported reduced LV function in patients with fQRS.

Similarly, BSL variation was more in the fQRS group. Probably a better regulation of glucose levels may lead to improved outcomes. The association of fQRS with elevated BSL was also seen in the study by Çetin *et al.*[8] The association of elevated BSL was significant ($P = 0.006$) in our study, but it was not significant in the study by Cetin *et al.* Rest of the other baseline characteristics were similar in both the group.

The cardiac enzymes were raised in the fQRS group which suggests the ongoing ischemia and was significant, similar to the Çetin *et al.*[8] In Guo *et al.*[6] study, troponin T-value is not very significant ($P = 0.049$), which was contrary to our results. This could be explained by the ongoing ischemia or chest pain in the patients in our study, which has not been mentioned in the other studies.

The percentage of MR was seen to be less in the fQRS group as compared to non-fQRS group which could not be explained. Abdelrehman[11] has also reported a higher incidence of MR. We thought that the EF in the fQRS group was more variable and low as compared to the non-fQRS group, so the MR, if its ischemic should be more in the fQRS group, which was opposite to our prediction. As we had taken into account even the mild MR, we do not know who were the patients who previously had MR, so could be explained on that basis only.

Coming to ECG findings, patients with fQRS had associated findings like ST flattening, depression and T inversion in the anterior, inferior as well as lateral leads. ST depression in anterior leads ($P = 0.003$) and T inversion in lateral leads ($P = 0.0001$) in fQRS group was found to be significant. However, ST depression in inferior and lateral leads and T inversion in anterior and inferior leads were not significant. Guo *et al.*[6] reported that specificity of fQRS complexes in identifying lesions in the left circumflex and RCA was lower for the inferior and lateral leads. These ECG findings had sensitivity of 52.23% for ST depression and 58.87% for T inversion. Das *et al.*[14] report a sensitivity of 50% for fQRS in NSTEMI patients.

The patients with fQRS also had significant elevations of cardiac biomarkers like troponin and CKMB, and these elevations were highly significant indicating ongoing cardiac injury needing appropriate cardiac intervention.

Echocardiography findings of patients with fQRS showed significant association of RWMA of the anterior and inferior wall, whereas the RWMA involving posterior and lateral wall did not reach significance in the current study. Overall, 74% of patients in the current study showed RWMA (P = 0.0001) and this finding was significant. The patients with fQRS had reduction in basal EF as discussed before. The incidence of MR was less in our study. As echocardiography is easily available in most of the hospitals, this association of fQRS with RWMA is useful for evaluating patients non-invasively.

All patients in the current study underwent CAG. Patients with fQRS positivity had significant associations with lesions involving LAD, LCX, RAMUS, and RCA. Out of 230 patients with positive fQRS, 210 (91.3%) patients showed significant CAG lesions (P = 0.0001) with an OR of 8.43 (4.96-14.33). Whereas in the negative fQRS group of 220 patients, 122 (73.7%) patients showed significant CAG findings which is consistent with the Abdelrahman[11] study.

Patients with normal coronaries or minor CAD had lower incidence of fQRS (P = 0.0001) which was also significant. In our study, patients with fQRS had higher incidence of DVD (P = 0.0001) and TVD (P = 0.0001) which was consistent with the findings in the study by Guo *et al.* and Li *et al.*[6]

In fQRS group, the most common artery involved was RCA with 76.5% followed by LAD with 74.4% and then LCX with 56.5% which is comparable to study by Abdelrahman.[11]

The association of positive fQRS with significant CAG lesions had higher sensitivity of 63.24%, as compared to the association of fQRS with ST depression (52.63%) and T-wave inversion (58.87%). Furthermore, the association of positive fQRS with significant CAG lesions had more specificity (83.05%) with a PPV of 91.30 as compared to fQRS with ST depression and T inversion. Dabbagh Kakhki *et al.*[9] report a sensitivity of 78% and specificity of 65% using myocardial perfusion scan imaging. On comparing fQRS in each ECG leads territory with corresponding CAG lesions, it was found that the association of fQRS in anterior leads was highly specific for LAD lesion with a specificity of 96.74% whereas fQRS in inferior leads was associated RCA lesions with a high sensitivity of 59.69% along with a specificity of 84.38%. Similarly, the association of fQRS in lateral ECG leads was associated LCX lesions in CAG with a high specificity of 94.35%. Dabbagh Kakhki *et al.*[9] report a sensitivity and specificity of 52% and 87% for LAD lesions, 51% and 77% for RCA lesions and 15% and 96% for LCX lesions, respectively, with the myocardial perfusion imaging studies (Tables 1-7).

Table 1: Baseline clinical data

Variable	fQRS +ve (230)	fQRS −ve (220)	*P* value
Age	59.22±8.80	58.56±10.56	0.475
SBP	133.50±26.37	134.77±22.34	0.583
DBP	79.14±12.81	80.15±9.30	0.343
Pulse	76.28±12.99	75.25±13.66	0.416
EF	58.67±12.92	63.00±9.66	0.000
HB	11.91±3.39	12.23±3.54	0.321
BSL	101.41±89.85 (46)	79.53±77.15 (56)	0.006*
Total CHS	155.43±78.42	166.61±92.26	0.517
HDL	33.30±15.70	38.04±14.22	0.117
LDL	106.00±61.26	109.74±59.70	0.978*
TGL	95.39±51.96	101.52±71.33	0.967*

**P* value of BSL and EF is significant, SBP: Systolic blood pressure, DBP: Diastolic blood pressure, HB: Hemoglobin, BSL: Blood sugar levels, HDL: High density lipoprotein, LDL: Low-density lipoprotein, TGL: Triglyceride, fQRS: Fragmented QRS

Table 2: Presenting symptoms

Variable	fQRS +ve (230) (%)	fQRS −ve (220) (%)	Total (450) (%)	*P* value
Chest pain	118 (51.3)	80 (36.3)	198 (44)	0.001
Dyspnea	34 (14.7)	28 (12.7)	62 (13.7)	0.527
AOE	156 (67.8)	128 (58.2)	284 (63.1)	0.034
DOE	58 (25.2)	62 (28.2)	120 (26.6)	0.477
Palpitation	28 (12.1)	26 (11.8)	54 (12)	0.908
Dizziness	6 (2.6)	0 (0)	6 (1.3)	0.016*
Other	6 (2.6)	0 (0)	6 (1.3)	0.016*

*Fisher exact test used, AOE: Angina on exertion, DOE: Dyspnea on exertion, fQRS: Fragmented QRS

Table 3: Past/family/personal history

History	fQRS +ve (230) (%)	fQRS −ve (220) (%)	Total (450) (%)	*P* value
Past history				
HTN	96 (41.7)	100 (45.4)	196 (43.5)	0.427
DM	106 (46.1)	82 (37.2)	188 (41.7)	0.058
DLP	52 (22.6)	52 (23.6)	104 (23.1)	0.769
PVD	2 (0.86)	2 (90)	4 (0.88)	0.964*
Family history				
HTN	16 (7.9)	6 (2.7)	22 (4.8)	0.038
DM	20 (8.6)	10 (4.5)	30 (6.6)	0.078
DLP	4 (1.7)	2 (0.90)	6 (1.3)	0.438*
CAD	48 (20.8)	32 (14.5)	80 (17.7)	0.079
Personal history				
smoking	66 (28.6)	32 (14.5)	98 (21.7)	0.0001
Alcohol	12 (5.2)	4 (1.8)	16 (3.5)	0.052

*Fisher exact test. Chi-square test is used for find out the association between two categorical variables. HTN: Hypertension, DM: Diabetes mellitus, DLP: Dyslipidemia, CAD: Coronary artery disease, PVD: Peripheral vascular disease, fQRS: Fragmented QRS

Table 4: RWMA

RWMA	fQRS +ve (230) (%)	fQRS −ve (220) (%)	Total (450) (%)	*P* value
Anterior	38 (16.5)	18 (8.1)	56 (12.4)	0.007
Inferior	40 (17.3)	22 (10)	62 (13.7)	0.023
Lateral	12 (5.2)	12 (5.4)	24 (5.3)	0.911
Posterior	16 (6.9)	8 (3.6)	24 (5.3)	0.117
RWMA status	74 (32.1)	34 (15.4)	108 (24)	0.0001

Chi-square test is used for find out the association between two categorical variables. RWMA: Regional wall motion abnormality, fQRS: Fragmented QRS

Table 5: ECG abnormality ST depression and T-wave inversion

fQRS correlation with coronary artery	fQRS +ve (230)	fQRS −ve (220)	Total (450)	*P* value
ST ↓				
Anterior	14 (6.1)	2 (0.90)	16 (3.5)	0.003
inferior	32 (14.1)	42 (19.1)	74 (16.4)	0.139
Lateral	36 (15.6)	40 (18.2)	76 (16.8)	0.474
ST↓status	70 (30.4)	64 (29.1)	134 (29.7)	0.710
T ↓				
Anterior	44 (19.1)	32 (14.5)	76 (16.8)	0.194
inferior	38 (16.5)	38 (17.2)	76 (16.8)	0.832
Lateral	80 (34.7)	40 (18.1)	120 (26.6)	0.0001
T↓status	126 (54.7)	88 (40)	214 (47.5)	0.002

fQRS: Fragmented QRS

Table 6: Coronary angiography results

CAG	fQRS +ve (230) (%)	fQRS −ve (220) (%)	Total (450) (%)	*P* value
LMCA	26 (11.3)	22 (10)	48 (10.6)	0.654
LAD	172 (74.7)	94 (42.7)	266 (59.1)	0.0001
LCX	130 (56.5)	72 (32.7)	202 (44.8)	0.0001
RAMUS	4 (1.7)	0 (0)	4 (0.88)	0.020*
RCA	176 (76.5)	82 (37.2)	258 (57.3)	0.0001
CAG status	210 (91.3)	122 (73.7)	332 (73.7)	0.0001
Ecstatic	8 (3.4)	12 (5.4)	20 (4.44)	0.309
Normal	8 (3.4)	32 (14.5)	40 (8.8)	0.0001
Minor CAD	6 (2.6)	48 (21.8)	54 (12)	0.0001
SVD	48 (20.8)	54 (24.5)	102 (22.6)	0.352
DVD	54 (23.4)	16 (7.2)	70 (15.5)	0.0001
3VD	110 (47.2)	56 (25.4)	166 (36.8)	0.0001
NC	6 (2.6)	2 (0.90)	8 (1.7)	0.162*

*Fisher exact test. Chi-square test is used for find out the association between two categorical variables. CAG: Coronary angiogram, LMCA: Left main coronary artery, LAD: Left anterior descending artery, LCX: Left circumflex artery, RCA: Right coronary artery, CAD: Coronary artery disease, SVD: Single vessel disease, DVD: Double vessel disease, fQRS: Fragmented QRS

CONCLUSION

fQRS in NSTEMI has not been well established in day to day practice. In our study, we tried to establish the relationship between fQRS and the culprit vessel by CAG. We found that fQRS is seen in patients with significant lesions (DVD, TVD) on CAG as compared to patients with negative fQRS. The presence of fQRS is a predictor of coronary lesions with high sensitivity and specificity. We also found that patients with fQRS had higher BSL which were statistically significant. It was also found that Smokers had more fQRS as compared with the nonsmokers. Thus, we conclude that fQRS analysis can help in better evaluation of patients with NSTEMI.

Table 7: Correlation of fQRS in ECG with CAG and coronary artery

fQRS correlation with coronary artery	SENS	SPEC	PPV	NPV	LR +ve	LR −ve
fQRS anterior with LAD in CAG	19.55	96.74	89.65	45.40	5.99	0.831
fQRS lateral with LCX in CAG	12.78	94.35	65	57.07	2.28	0.9234
fQRS inferior with RCA in CAG	59.69	84.38	83.69	60.90	3.82	0.477

LAD: Left anterior descending artery, LCX: Left circumflex artery, RCA: Right coronary artery, PPV: Positive predictive value, NPV: Negative predictive value, LR: Likelihood ratio, fQRS: Fragmented QRS

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Review Article

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Sleep Apnea: An Overview

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Abstract

Sleep apnea is a common and potentially dangerous sleep disorder characterized by one or more pauses in breathing or instances of shallow breathing during sleep. The episodes of apnea can last from a few seconds to several minutes. It is estimated that 1 in every 15 Americans has sleep apnea. Sleep apnea is associated with an increased risk of developing cardiovascular disease, stroke, hypertension, arrhythmias, diabetes, and causing accidents due to falling asleep while driving. A 2012 study showed that the hypoxia caused by sleep apnea promoted angiogenesis which increased tumor and vascular growth. This led to a 4.8 time increase in the incidence of cancer mortality. Sleep apnea can often go undiagnosed as patients are unaware of it while they sleep. It is estimated that the average untreated sleep apnea patient's annual health-care costs 1336 dollars more than a person without sleep apnea which can cause 3.4 billion dollars a year in additional medical costs. It is a chronic condition which requires management throughout life. Lifestyle modifications, oral appliances, surgery, and breathing devices can treat sleep apnea in most patients. The introduction of the continuous positive airway pressure has greatly improved the management of sleep apnea.

Key words: Central sleep apnea, Complex sleep apnea, Mixed sleep apnea, Obstructive sleep apnea, Sleep apnea

INTRODUCTON

The three main types of sleep apnea are obstructive (84%), central (0.4%), and mixed or complex sleep apnea (15%) which is a combination of both types. Obstructive sleep apnea (OSA) is due to a physical blockage of airflow while central sleep apnea is due to a lack of respiratory effort. Both will present with excessive daytime sleepiness, lethargy, inability to focus and decreased alertness. In addition to these, OSA will have snoring. Below we will discuss each of the types of sleep apnea including how to diagnose and treat them.[1-3]

OSA

OSA is the most common type of sleep apnea and occurs when the muscles of the throat relax and block airflow during sleep. It can be a partial or complete obstruction of the upper airway. 2-4% of Americans are said to have OSA and it is most commonly diagnosed in middle-aged men.[4] OSA can be temporary in those who have upper respiratory tract infections, nasal congestion, tonsillitis, or are under the influence of alcohol. Risk factors for developing OSA include increased body mass index (BMI), large neck size, hypertension, diabetes, chronic nasal congestion, male gender, ages 18-60, smoking and using alcohol. Most of the cases of OSA are thought to be due to decrease in muscle tone, old age, and brain injury. OSA in children is usually caused by overgrown tonsils and adenoids. Muscle tone decreases with alcohol and certain drugs. Women are at the highest risk of developing OSA during pregnancy and prevalence is higher in post-menopausal women than menstruating women. Syndromes with craniofacial abnormalities (such as Down's syndrome) can increase the risk of developing OSA. OSA usually occurs in rapid eye movement (REM) sleep when the muscle tone in the neck, throat and skeletal muscles are decreased. This allows the oropharynx and tongue to relax and partially or completely block the flow of air. In some cases when the blood oxygen level decreases, a neurological stimulation can cause interruption of sleep which may cause awakening and will have a negative effect on the quality of sleep. This can occur in non-REM (NREM) Stage 3 as well which is the deepest stage of sleep and has a physically restorative effect on the body. In children, this stage of sleep (NREM Stage 3) is also responsible for the release of growth

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hormone and OSA can result in failure to thrive in the affected children. Clinical symptoms can be divided into nocturnal and daytime symptoms. The nocturnal symptoms include loud snoring, witnessed apneas, insomnia, nocturia, sudden arousal from sleep accompanied by gasping and choking. The daytime symptoms include non-restorative sleep, morning headaches, dry mouth on awakening, daytime fatigue that worsens throughout the day, daytime sleepiness with the need to take frequent naps, decreased the ability to concentrate, mood and personality changes and decreased libido. The patient will usually present as an obese adult with a thick neck who is either brought in by the patient's partner, who are alerted by the episodes of apnea and snoring, or by the patient themselves who complain of excessive daytime sleepiness. The daytime sleepiness usually begins with quiet activities such as watching TV or reading but can later progress to even activities which require alertness such as driving. A clinical diagnosis can be made by asking about the symptoms previously mentioned or by providing the patient with a questionnaire to fill which can then be scored to determine their likelihood of having OSA. Physical examination includes calculating the BMI (>30 is a risk factor) and measuring the neck circumference (>43 cm in men and >37 cm in women is a risk factor). Other findings on the physical exam can include an abnormal Mallampati score, enlarged tonsils, high-arched hard palate, large degree of overjet, and hypertension. The gold standard, however, to diagnose sleep apnea (obstructive or central) is with an overnight sleep study or polysomnography. This can either be done at home (less reliable) or at a sleep center. According to the results of the sleep study, sleep apnea can be graded. The number of events of apnea per hour is reported as the apnea-hypopnea index or AHI. An AHI of <5 is normal, 5-15 is mild, 15-30 is moderate, and >30 is severe. The treatment of sleep apnea includes lifestyle modifications such as weight loss, avoidance of sedatives, alcohol or tobacco, and sleeping on one's side. Mild to moderate OSA can be treated with oral appliances which help keep the throat open by bringing the lower jaw forward. The most common method of treating moderate to severe OSA is by continuous positive airway pressure (CPAP) or a CPAP machine. The machine is connected to a mask which is fitted over the nose and mouth or just into the nose and delivers an airway pressure which prevents the upper airway from collapsing during sleep. This decreases the episodes of apnea and improves the symptoms of OSA. The CPAP can be either a continuous (fixed) pressure or an auto-titrating pressure. Newer CPAP machines are much smaller and less noisy than the older ones. Certain surgeries can be done to treat sleep apnea such as turbinectomy, tonsillectomy, adenoidectomy, and maxillomandibular advancement.

CENTRAL SLEEP APNEA

Central sleep apnea occurs when the effort to breathe is absent or diminished. It is much less common that OSA and is prevalent in <1% of the general population. It is due to the respiratory centers in the brain not sending the correct signals to the muscles that control respiration. This will cause the individual to miss one or more breathing cycles. This increases the level of blood carbon dioxide which usually stimulates respiration through neurologic feedback which will cause a period of hyperpnea. Thus the individual may cycle through a period of apnea and hyperpnea throughout the night. There will be no chest movement or efforts to breathe seen during the periods of apnea. There can be awakenings during the periods of apnea which will be followed by a period of panic caused by the increase in blood CO_2 levels and sometimes the inability to breathe normally for a short duration following the sudden awakening. Some of the conditions that can lead to central sleep apnea are Parkinson's disease, brain infections, stroke, anything that harms the brainstem, cervical injures, heart failure, and drugs such as narcotics. Symptoms are similar to that off OSA without the snoring. There will be a lack of thoracic or abdominal movement individuals with central sleep apnea while they are asleep. Diagnosis is aided by clinical history, physical examination and confirmed with polysomnography at a sleep center. This will help differentiate between obstructive and central sleep apnea or whether the apnea is caused by a mixture of both (complex sleep apnea). The degree of sleep apnea is graded as before (mild, moderate, severe). The treatment is first based on addressing the medical conditions which could be causing the sleep apnea such as Parkinson's or opioid medications. Devices used include CPAP, bi-level positive airway pressure, and adaptive servo-ventilation. Certain drugs such as acetazolamide have been used to stimulate the respiratory centers. They do so by causing metabolic acidosis which then induces respiratory alkalosis (increased the respiratory rate) as a compensatory measure.

CONCLUSION

Sleep apnea is a serious sleep disorder affecting over 40 million Americans. There is an enormous amount of data showing that untreated sleep apnea is associated with cardiovascular disease, stroke, and other medical conditions. Physicians should be vigilant for the common signs and symptoms of sleep apnea and by asking a few additional questions, be able to identify those who may require further diagnostic workup. Due to the high prevalence of the disorder and its burden on the individual, society, and health-care system, untreated sleep apnea cannot be ignored.

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Case Report

Guidance of Eruption - Myth or Reality? A Case Report

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Abstract

The altered path of eruption causing the resorption of the permanent lateral incisor root after the ectopic eruption of the permanent canines is a common complication which is detected radiographically. The relationship of the permanent canines with the lateral incisor suggests that lateral incisor acts as guidance for the eruption of the permanent canines. The case presented here is a 9-year-old boy with permanent dentition showing the resorption of the roots of the lateral incisor due to the eruption of the permanent canines taking the lateral incisors as the guidance. This article aims at establishing that early detection and prompt preventive measures will lead to avoiding the critical complications arising out of the erupting canines and will preserve the morphological and functional integrity of the lateral incisors and the dentition.

Key words: Canines, Eruption, Incisors resorption, Ugly duckling

INTRODUCTION

The goal of "guidance of eruption" is to avoid the need for active orthodontic treatment or to reduce it to the minimal. A strong dependence between impacted canines the contact with their adjacent teeth and the root resorption of the incisors.[1-3] The frequency of root resorption of the lateral incisors is 12.5%. The treatment of impacted canines is complex and prolonged.

Ericson and Kurol[2,4] assume that the resorption of the lateral incisors after the ectopic eruption of the permanent canines is the most common complication and may be detected in all cases of considerably altered route of the canine eruption. It is most commonly seen in the lateral incisors-in 38%, and less frequently in the central incisors - in 9% of the cases. The apical and median third of the root are most commonly affected - in about 65%.[4-6]

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Thanks to computerized axial tomography, nowadays, we can detect even minimal resorption fields on the incisor roots and establish that in almost 50% of the cases with impacted canines.

Ericson and Kurol[2,4] group the severity of resorption of the lateral incisor in 4°:

- No resorption - intact surface
- Slight resorption - up to the middle of the depth of the root dentin
- Moderate resorption - affects more than half of the depth of the root dentin
- Severe resorption - reaches the root pulp.

Root resorption is a physiological event for the primary teeth and it is said to be regulated by the stellate reticulum and the dental follicle of the underlying permanent tooth via the secretion of the stimulatory molecules, i.e., cytokines and transcription factors. The primary root resorption process is regulated in a manner similar to bone remodeling, involving the same receptor ligand system known as (receptor activator of a nuclear factor [RANK]-kappa B/RANK ligand).[7] Primary teeth without a permanent successor eventually exfoliate as well, but our current understanding on the underlying mechanism is slim. The literature is also vague on how resorption of the

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pulp and periodontal ligament of the primary teeth occurs. Knowledge on the mechanisms involved in the physiologic root resorption process may enable us to delay or even inhibit exfoliation of primary teeth in those cases that the permanent successor teeth are not present, and thus, the preservation of the primary teeth is desirable.

CLINICAL CASE REPORT

The case presented involves a 9-year-old boy showing orthopantomogram (OPG) in mixed dentition period the upper left quadrant shows the erupting canines taking the guidance of lateral incisors root with the crown of the cuspids located at the apical 3rd of the lateral incisors. The central incisors and lateral incisors are flared depicting "Ugly duckling stage" (Figure 1).

Figure 1: Flaring of incisors depicting ugly duckling stage

The case was followed up after a period of 22-month and the OPG taken at this period presented with all permanent teeth and the roots of the lateral incisors completely resorbed, and the canine erupted into its final position with the crown located at and was neglected thinking it to be a physiologic process of eruption, but in the matter of just 22-months when the boy was 11-year-old the erupting permanent canine had totally resorbed the permanent lateral incisor (Figure 2).

Figure 2: Complete resorption of permanent left lateral incisor

DISCUSSION

The complications were seen due to resorption of the roots of the central and lateral incisors which are of considerable significance for the esthetic appearance and functional life of the dentition. The resorption as a complication may be foreseen, and measures can be taken for its prevention. Those are related to the provision of conditions for proper eruption of the canines. The inclination of the canine and the crossing the axis of the lateral incisor medially by the tip of the canine crown indicate canine impaction. By extracting the deciduous canine and ensuring space for the canine in the dental arch, the probability of canine eruption will be increased while the probability of the occurrence of complications related to the resorption of the adjacent teeth will be reduced.

The severity of lateral incisor root resorption cannot be accurately judged from two-dimensional (2D) radiographs alone. 2D radiographs are easy to use and provide useful information, although these images fail to detect the exact localization of the canines or any potential root resorption, especially with early or mild root resorption. Moreover, cone-beam computed tomography (CBCT) has a smaller radiation dose compared to CT and overcomes the limitations of conventional radiography. Therefore, CBCT is a useful method for diagnosing the position, inclination, distance from adjacent structures, complications of impacted canines, and detection of lateral incisors root resorption. Furthermore, this method may have a significant impact on diagnostic and therapeutic interventions.[7]

CONCLUSION

Timely detection in early mixed dentition and prompt preventive measures will lead to avoiding the severe complications due to impacted canines and preserving the morphological and functional integrity of the incisors. The loss of incisors seriously deteriorates the esthetic appearance and function which requires orthodontic and complex surgical-orthodontic treatment to repair the dental arch and occlusion. The early prevention will provide optimal esthetic appearance for the patient, preservation of the natural integrity of the dentition and will avoid a prolonged and expensive orthodontic treatment.

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