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Role of Transrectal Ultrasound Scan in Patients with Fistula-in-ano: A Clinical Study

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Abstract

Introduction: Anal fistulae are very common and have been studied extensively; some complex forms still continue to pose a difficult surgical problem. The aim of treatment for an anal fistula is to completely cure the fistula while preserving anal function and continence.

Materials and Methods: This is a prospective hospital-based study, comprising 30 patients who presented with fistula-in-ano to Department of general surgery, St. Martha’s Hospital, Bengaluru.

Results: Of the 30 patients, who underwent transrectal ultrasound scan, fistulous tracts were correctly depicted by transrectal ultrasound scan in 26 patients and internal openings were depicted in 28 patients. All the patients underwent surgical intervention. Intraoperatively, all fistulous tracts and internal openings were identified in 26 and 24 patients, respectively. Intra-operative findings were correlated with those from the transrectal ultrasound scan. Of the 30 patients who underwent surgery, transrectal ultrasound scan accurately identified the presence as well as the correct location of the tract/tracts in 26 patients (86.66%) and the internal opening in 28 patients (93.3%). Transrectal ultrasonography had a sensitivity of 92.85% and 95.83% for identification of the tract and internal opening, respectively, and a positive predictive value of 96.29% and 82.14% for the tract and internal opening, respectively.

Conclusion: Transrectal ultrasound scan is a very valuable tool which gives an accurate road map of the fistulous tract/tracts, internal opening and external opening which is of paramount importance in successful management of fistula-in-ano. Transrectal ultrasound scan is a reliable, noninvasive, less expensive, investigative procedure which serves as a beacon for the surgeon intraoperatively to ensure complete cure and prevent recurrences.

Key words: Fistula-in-ano, Transrectal ultrasound scan, TRUS, Perianal abscess

INTRODUCTION

Fistula-in-ano is a chronic abnormal communication, usually lined to some extent by granulation tissue, which run outward from anorectal lumen (the internal opening) to an external opening on the skin of perineum or buttock (or rarely, in women, to the vagina).¹

Anal fistulae may be found in association with specific conditions such as Crohn’s disease, tuberculosis, lymphogranuloma venereum, actinomycosis, rectal duplication, foreign body, and malignancy.¹

Pathogenesis

The majority of perianal fistulas are of cryptoglandular origin. The cryptoglandular hypothesis states that perianal fistulas arise from anal canal glands, located at the level of the dentate line. The ducts of these glands flow into the crypts of Morgagni and drain into the anal canal.

If these glands become blocked, stasis occurs and infection develops. Because a substantial number of these glands branch out into the intersphincteric plane, the infection can pass the internal anal sphincter that serves as a barrier against bacterial contamination. From the intersphincteric plane, the infection may progress and extend in various ways. Patients usually present with an abscess. In about half of these patients, a fistula persists after drainage of the abscess.
Anal glands provide free channels for infection to pass from the anal lumen deep into the sphincter muscles. Organisms entering by this route could set up acute inflammation in the longitudinal layer, which might then spread secondarily in almost any direction. If spread was downward in the longitudinal layer an acute perianal abscess would result; if it passed outward through the somatic muscles, it would reach the ischio-rectal space.

In the course of time, such an abscess would subside. It is quite likely that the anal glands, in common with many other glandular organs, can become the seat of chronic infection. Bacteria can reside and multiply in a gland which either is cystic or has an obstructed lumen. Being deep to the internal sphincter, the abscess will not readily discharge itself into the anal canal; the circular muscle coat of the bowel seems to be an effective barrier to infection. Once a chronic abscess has formed in this site infected material will continue to seep through any channel to the exterior. In fact, a fistula-in-ano is virtually a sinus secondary to a diseased anal gland, though the minute duct opening into an anal crypt makes it technically a fistula. This would fit in with the practical observation that about half the cases of anal fistula do not have a clinically detectable internal opening; in the remainder the overt internal opening is due to rupture of the intermuscular abscess through the internal sphincter into the anal canal. On this theory, then, fistula-in-ano is a granulation-tissue track which is kept open by an “infecting source” - That is, an abscess, deep to the internal sphincter, around a diseased anal gland. Knowing the anatomical site of the “infecting source,” it should be possible to remove it and thereby allow the secondary track to heal. It must be emphasized at this point that the origin of a fistula is the abscess in the longitudinal layer; all other tracks and ramifications are secondary to this.

Transrectal Ultrasonography (TRUS)

TRUS has been widely accepted as a popular imaging modality for evaluating the lower rectum, anal sphincters, and pelvic floor in patients with various anorectal diseases. It provides excellent visualization of the layers of the rectal wall and of the anatomy of the anal canal.

TRUS is an accurate tool for the staging of primary rectal cancer, especially for early stages (Figure 1).

Normal TRUS Anatomy of the Rectum and Anal Canal

The rectal wall is composed of five layers that can be clearly visualized by TRUS. The innermost hyperechoic line shows the interface of the balloon and the mucosal surface of the rectal wall. The inner hypoechoic layer represents the mucosa and muscularis mucosa, followed by a slightly thicker hyperechoicsubmucosal layer.

The outer hyperechoic layer represents the muscularis propria, and the outermost hyperechoic layer corresponds to the perirectal fatty tissue.

The anal canal is usually divided into three levels during the examination. The puborectalis muscle is easily seen and appears as a U-shaped echogenic band (sometimes described as a horseshoe sling) in the upper anal canal. When retracting the probe, this hyperechoic band closes anteriorly and forms the external anal sphincter.

The internal anal sphincter displays a band of maximum thickness anteriorly in the middle anal canal, in combination with the external anal sphincter ring. The external anal sphincter is usually hyperechoic, broad, and lies immediately outside the internal anal sphincter.

Three-dimensional TRUS also provides anatomic details of perianal spaces that are located in the intersphincteric space between the internal and external anal sphincters: The pyramid-shaped ischioanal space surrounds the anal canal, and the supralever space is located superior to the levator ani muscle.

Perianal fistulas appear as hypoechoic tracts or focal soft tissue lesions within anal wall structures. Abscesses may contain internal gas or hyperechoic debris, and fistulas show a narrow and irregular path on TRUS. Depending
on the internal composition or stage of inflammation, the primary fistula tract appears as variable echogenic fluid with a thickened wall.

TRUS provides excellent imaging of the rectal wall layers and anal sphincter and therefore is excellent at visualizing intersphincteric fistulas and their relationship to the anal canal.

Limitations of TRUS
Insufficient penetration of the ultrasound beam beyond the external anal sphincter limits the ability to visualize the region more distant from the anal canal, with the result that extensions from the primary tract may be missed.

One of the theoretical limitations of non-contrast TRUS is difficulty discriminating between an active tract and scar tissue since both tissues appear hypoechoic on noncontrast TRUS. The gas generated after H₂O₂ instillation makes the active tract hyperechoic. In this regard, contrasting with H₂O₂ could be more useful in patients with recurrent fistulae, which usually accompany previous operative scars.

Aim
To study the role of transrectal ultrasound scan in patients with fistula-in-ano.

Objective
To measure the accuracy of transrectal ultrasound in detecting fistulous tracts and internal openings in pre-operative evaluation of fistula-in-ano.

MATERIALS AND METHODS
Source of Data
This study was conducted in the Department of Surgery, St. Martha’s Hospital. The study group comprises patients with fistula-in-ano attending outpatient, inpatient Departments of Surgery.

Method of Collection of Data
A pro forma drafted for the study of all the patients with fistula-in-ano will be used.

Data collected will include:
1. Detailed history
2. Clinical examination findings
3. Routine and special investigations
4. Per-operative findings
5. Operative procedure.

Sample Size
30 patients studied over a period of 18-month from April 2014 to October 2015.

Parameters
Expected proportion = 0.80
Relative precision = 20
Confidence interval = 95.

Using online software N-master formula:

\[ n = \left( \frac{Z_\alpha + Z_\beta}{\rho (1 - \rho)} \right)^2 + d^2 \]

Z: Score at 95% confidence level (1.96)
P: Worst case percent
\( \rho \): Margin of error (0.05%).

According to the previous studies online software formula indicates minimum sample size of 30.

Inclusion Criteria
All patients above the age of 18 years admitted with fistula-in-ano.

Exclusion Criteria
1. Patients not willing for transrectal ultrasonography.
2. Patients those who are not willing for surgery.

RESULTS
Frequency of Symptoms
Out of 30 patients in our study 6 Patients had accessory fistulous tracts and 24 patients had simple fistula-in-ano (Table 1 and Graph 1).

All 30 patients underwent TRUS. TRUS correctly detected all fistulous tracts in 3 patients out of 6 patients with accessory fistulous tracts. Accessory fistulous tracts were not detected by TRUS in 3 patients (Table 2 and Graph 2).

Of these 3 patients, 2 patients with suspicious complex fistula underwent MR-fistulography preoperatively, where accessory fistulous tracts were detected.

And in 1 patient accessory fistulous tracts were subsequently found intraoperatively.

In all 30 patients, main fistulous tracts were detected intraoperatively.

<table>
<thead>
<tr>
<th>Complex fistula</th>
<th>Frequency (%)</th>
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<tr>
<td>Nil</td>
<td>24 (80)</td>
</tr>
<tr>
<td>Yes</td>
<td>6 (20)</td>
</tr>
<tr>
<td>Total</td>
<td>30 (100.0)</td>
</tr>
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</table>

Table 1: Frequency of complex fistula-in-ano among the subjects in the study population
Out of 30 patients in the study, 6 patients had accessory fistulous tracts. Of these 6 patients, accessory fistulous tracts were detected intraoperatively in 4 patients and accessory fistulous tracts were not detected in 2 patients (Table 3 and Graph 3).

**Formulae Used To Calculate Accuracy**

- **Sensitivity** = \( \frac{a}{a+c} \)  
  = Probability of being test positive when disease present.  

- **Specificity** = \( \frac{d}{b+d} \)  
  = Probability of being test negative when disease absent.  

- **PPV** = \( \frac{a}{a+b} \)  
  = Probability (patient having disease when test is positive)  

- **NPV** = \( \frac{d}{c+d} \)  
  = Probability (patient not having disease when test is negative)

**DISCUSSION**

The aim of our study was to determine the accuracy of TRUS in identifying fistulous tracts and internal openings.

A total of 30 patients are included in the study.

The majority of the patients are in the age group of 18-40 years (57%) with male predominance. Male to female ratio of the present study is 5:1 (Table 4 and Graph 4).
Discharge from the external opening is the most common presenting complaint, with the frequency of 93.3%. Out of 30 patients 28 patients were presented with discharge from external opening (Tables 5-8 and Graphs 5-8).
Out of 30 patients 10 patients had past history of undergoing incision and drainage for perianal abscess (Table 9 and Graph 9).

A study conducted by Lohsiriwat et al., on Incidence and factors influencing the development of fistula-in-ano after incision and drainage of perianal abscesses showed that the incidence of fistula-in-ano following incision and drainage of perianal abscess was 31%. Patients aged under 40 years and non-diabetic patients appeared to have a higher risk
for fistula formation. Administration of perioperative antibiotics significantly reduced the rate of subsequent fistula formation.\(^7\)

A similar retrospective cohort study conducted by Hamadani et al. showed that age younger than 40 years significantly increased risk of chronic anal fistula or recurrent anal sepsis after a first-time episode of perianal abscess. Patients with diabetes may have a decreased risk compared with nondiabetic patients. Gender, smoking history, perioperative antibiotic treatment, and HIV status were not risk factors for chronic anal fistula or recurrent anal sepsis.\(^8\)

Preoperatively, all the patients underwent thorough physical examination and all of them were found to have external openings (Table 10).

Internal openings were detected in 9 patients on pre-operative per rectal examination (Table 11 and Graph 10).

A study conducted by Toyonaga et al., on comparison of accuracy of physical examination and endoanal ultrasonography for pre-operative assessment in patients with acute and chronic anal fistula showed that the accuracy of endoanal ultrasonography was significantly higher than that of physical examination in detecting the primary tract (88.8% vs. 85.0%, \(P = 0.0287\)) and horseshoe extension (85.7% vs. 58.7%, \(P < 0.0001\)) and in localizing the internal opening (85.5% vs. 69.1%, \(P < 0.0001\)).\(^9\)

All the patients underwent TRUS. All fistulous tracts were correctly depicted by TRUS in 26 patients and internal openings were depicted in 28 patients (Table 12 and Graph 11).

All the patients underwent surgical intervention.

Intraoperatively, all fistulous tracts and internal openings were identified in 26 and 24 patients, respectively (Table 13 and Graph 12).

Intraoperative findings were correlated with those from the TRUS.

Of the 30 patients who underwent surgery, TRUS accurately identified the presence as well as the correct location of the tract/tracts in 26 patients (86.66%) and the internal opening in 28 patients (93.3%).

Similar study conducted by Bernstein et al., on the use of endoanal ultrasonography in identifying fistula-in-ano showed that endoscopic ultrasound scan (EUS) accurately identified the presence or absence as well as the correct location of the tract in 24 patients (86%) and the internal opening in 24 patients (86%). The fistula tract was misinterpreted by EUS in 4 patients and the internal opening in 4 patients overall. Endoanal ultrasonography had a sensitivity of 95% and 92% for identification of the tract and internal opening, respectively, and a positive predictive value of 88% and 92% for the tract and internal opening, respectively.\(^10\)

Our study conducted on role of TRUS in fistula-in-ano showed that TRUS had a sensitivity of 92.85% and 95.83% for identification of the tract and internal opening,
respectively, and a positive predictive value of 96.29% and 82.14% for the tract and internal opening, respectively (Tables 14 and 15).

CONCLUSION

TRUS has an important role in the management of fistula-in-ano.

Adequate surgical management requires appropriate imaging to delineate anatomy and relationship of tracts to the sphincter complex.

Pre-operative TRUS can dictate the surgical procedure of choice and is an important determinant of outcome.

It may alert the surgeon to the presence of significant disease requiring specialist management given the associated risk of incontinence.

TRUS is a very valuable tool which gives an accurate road map of the fistulous tract/tracts, internal opening and external opening which is of paramount importance in successful management of fistula-in-ano.

Transrectal ultrasound scan is:
- Reliable
- Noninvasive
- Less expensive, investigative procedure which serves as a beacon for the surgeon intraoperatively to ensure complete cure and prevent recurrences.

REFERENCES

Outcome between Operative and Non-operative Treatment of Intra-articular Calcaneal Fractures: A Comparative Study

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Abstract

Background: Calcaneal fractures accounts for 75% fractures of the foot and 2% of fractures overall. The majority of fractures are intra-articular comprising 75%. Between 7.7% and 17% calcaneal fractures are open.

Aim: To compare the outcome between operative and nonoperative treatment of intra-articular calcaneal fractures.

Materials and Methods: A total of 26 patients with 32 fractures with displaced intra-articular calcaneal fractures were included in the study. Only Sanders II, III, and IV part fractures were included in the study. The patients were randomly allocated in study group operative and nonoperative treatment.

Results: The modified Maryland foot score at the end of 1 year is excellent in 8 cases (47.1%), good in 4 cases (23.5%), fair in 3 cases (17.6%), and poor in 2 cases (11.8%) among the operative group whereas among the non-operative group excellent score in one patient (6.7%), good in 8 patients (53.3%), fair in 3 patients (20%), and poor in 3 patients (20%).

Conclusion: To conclude open reduction with internal fixation with plate osteosynthesis provide excellent functional outcome compared to nonoperative management and also statistically significant P-value.

Key words: Bohler’s angle, Gissane angle, Intra-articular, Maryland foot score

INTRODUCTION

The calcaneum or Os calcis is the most frequently fractured bone in the foot. Most calcaneal fractures occur in young, active male industrial workers, making its treatment economically significant.¹ Many studies have reported that the patients may be totally incapacitated for a period of 3-year and partially incapacitated for 5 years after injury.² Open reduction and internal fixation have the advantage of anatomic reduction and rigid internal fixation of the subtalar joint. It restores the anatomic morphology of the calcaneus and the biomechanics and function of the hindfoot.³ Operative treatment is complicated by wound infection which results in osteomyelitis and may require multiple surgeries. These complications can be avoided by delayed intervention after the appearance of wrinkles, extensile lateral approach and by subperiosteal exposure. With the advent of newer techniques of radiological imaging, improved methods of fixation and rehabilitation, operative treatment of calcaneal fractures has now become a standard method. The advent of computed tomography scans has allowed classification systems to offer prognostic significance. It provides information regarding the size and number of fracture fragments, displacement of sustentaculum relative to the superomedial fragment, congruity of posterior facet and lateral malleolus impingement on the tuberosity.⁴ Calcaneal fractures accounts for 75% fractures of the foot and 2% of fractures overall.⁵ The majority of fractures are intra-articular comprising of 75%.⁶ Calcaneal fractures are associated with other injuries such as spine fractures accounting for 10% and 26% are associated with other extremity injuries.
Between 7.7% and 17% calcaneal fractures are open.90% of calcaneal fractures occur in men between 21 and 45 years of age. In these patients displaced intra-articular calcaneal fractures are the result of high-energy trauma such as fall from height or a motor vehicle accidents.

**Aim**
To compare the outcome between operative and nonoperative treatment of intra-articular calcaneal fractures.

**MATERIALS AND METHODS**
This is a prospective study conducted in Department of Orthopedics, Tirunelveli Medical College Hospital. Institutional Ethics Committee approval and informed consent from the patients were obtained. 26 patients with 32 fractures with displaced intra-articular calcaneal fractures were included in the study. Only Sanders II, III, and IV part fractures were included in the study. The patients were randomly allocated in study groups.

**Inclusion Criteria**
1. Age group between 19 and 50 years,
2. Displaced intra-articular calcaneal fractures with >2 mm step,
3. Decrease in Bohler’s angle <20°,
4. Increase in Gissane’s angle >115°, and
5. Sanders II, III and IV part fractures.

**Exclusion Criteria**
1. Open fractures of calcaneum,
2. Fractures >3 weeks old,
3. Severe soft tissue compromise like blistering, massive prolonged edema with absent wrinkle sign,
4. Associated major injuries,
5. Patients with peripheral vascular disease and insulin dependent diabetes mellitus, and
6. Patient refusal to undergo surgery.

**RESULTS**
From Table 1, it is very clear that majority of the operative cases (52.9%) belongs to the age group of 31-40 years. Similarly, the majority of the nonoperative cases (60%) also belongs to the age group of 31-40 years.

Table 2 shows comparison between operative and nonoperative group by “t” test which shows that it is statistically insignificant.

In our series, the radiological parameters which include the Bohler’s angle, Gissane’s angle, calcaneal height and width among the operated group when compared with the nonoperative group is statistically significant \( P < 0.05 \) (Table 3).

**DISCUSSION**
Since the last decade, open reduction and plate osteosynthesis have become a standard surgical modality in the operative treatment of intra-articular calcaneal fractures. Plate osteosynthesis has been improved by fixation with locking plates, which is more stable, allows early weight bearing and rarely requires bone graft.8,9 Our operative group has been osteosynthesis with a low profile calcaneal plate in 16 patients and locking plate in one patient. All patients were grafted of which 4 cases were grafted with G-bone. Although criticized by Sanders et al., grafting has the advantage of maintaining the calcaneal height and prevents post-operative collapse.10,11 In our series, the calcaneal height was maintained, and the allograft incorporation with host bone was satisfactory. Excellent results have been obtained by
multiple studies using an extensile lateral approach and plate osteosynthesis. In our study, the modified Maryland foot score is excellent for 8 cases (47.1%), good in 4 cases (23.5%), fair in 3 cases (17.6%), and poor in 2 cases (11.8%) among operated cases. Buckley et al., in his randomized prospective trial, stated that the functional results after operative and nonoperative treatment were equivalent, but led to a better outcome among operative group when workers compensation injuries were excluded from the study. The mode of operative treatment is variable with plates, screws or pins and grafting was optional. We followed a standard operative protocol but done by different surgeons and grafting was done in all patients.

Buckley and Meek in their comparative study of 34 cases stated that operative treatment yields better outcome provided an anatomical reduction of subtalar joint is achieved. Our study correlated with Muller et al., regarding comminution. The most comminuted fractures in Sanders IV shows excellent and good results with plate osteosynthesis than with nonoperative treatment. The most challenging fact regarding operative treatment is anatomic restoration of subtalar joint congruency which was obtained in 12 of our patients and the scoring was excellent in 8 patients and good in 4 patients. The functional outcome correlates with subtalar congruency in our series. Operative treatment is limited by its wound complications, which averages between 16% and 25% reported by Buckley et al. and Potter requiring repeated surgeries. The complication rate, in our series, is 5 patients (29.41%) out of which two patients required implant removal. We have evaluated the radiological parameters Bohler’s angle, Gissane’s angle calcaneal height and width which has statistically significant results when compared with the nonoperative group. Restoration of Bohler’s angle and Gissane’s angle is associated with excellent results in our study. The modified Maryland foot score which evaluates pain, functional ability, cosmesis and range of movements is better than non-operative group but statistically insignificant, since the fractures are not randomized and the nonoperated group has 4 severely comminated fractures whereas the operative group has 8 patients in Sanders IV. The number of patients and the follow-up period is much lower. When comparison is based on individual fracture patterns with respect to modified Maryland foot score, Sanders Type II fractures among operative group is better than nonoperative group and it is statistically significant. Sanders Type III and severely comminuted Type IV fractures when compared with nonoperative group is better but statistically insignificant. Our study is coherent with Jain et al., by the fact that, Type IV fractures experiences poor results even after open reduction. This may be due to subtalar restriction and arthritis, soft tissue impingement and smashed heel pad syndrome. Even then, Type IV fractures require open reduction to correct heel varus, height and to decompress peroneal tendons, since functional results continue to improve even 1 year after surgery.

CONCLUSION

To conclude, open reduction and internal fixation with plate osteosynthesis provide excellent and statistically significant results when compared to nonoperative patients in Sanders Type II fractures. In Sanders’ Type III and severely comminuted Type IV fractures, though the outcome is better than non-operative group is statistically insignificant due to a short period of follow-up. Since the functional outcome of operated patients tends to improve even after 1 year, we recommend a longer period of follow-up of these patients for significant results when compared to the non-operative group.

REFERENCES


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Magnetic Resonance Study of White Matter Lesions: A Cross-sectional Study

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Abstract

Background: Magnetic resonance imaging (MRI) is an important noninvasive imaging modality with very high sensitivity for detecting white matter lesions. The objectives are to evaluate the role of MRI in white matter diseases, to establish an accurate diagnosis. To assess the severity and extent of the underlying lesion in various conditions and to demonstrate the different patterns of abnormal myelination in white matter diseases.

Materials and Methods: A total of 50 patients who were clinically suspected of white matter diseases underwent MR imaging in using 1.5T PHILIPS Achieva machine. Various MR sequences were used in imaging.

Results: Among the 50 patients, 26% had leukodystrophies, 16% had acute disseminated encephalomyelitis (16%) and 16% had vacuolating leukoencephalopathies, 12% had hypomyelination, 8% had multiple sclerosis and microvascular ischemic changes (SVIC), 4% each of Leigh’s disease, human immunodeficiency virus encephalopathy, nonspecific demyelination, and 2% had progressive multifocal leukoencephalopathy. Patients in the pediatric age group constituted 82% of the total study group with slight male predominance.

Conclusion: MR imaging has become the primary imaging modality in patients with white matter diseases and plays an important role in the identification, localization, and characterization of underlying white matter abnormalities in affected patients. Its multiplanar imaging capability and excellent gray-white matter resolution make MRI very sensitive in detecting subtle white matter lesions. In our study, we observed that Fluid attenuated inversion recovery sequence has better sensitivity for white matter lesions especially those in periventricular locations. Specificity of MR imaging can be improved by MR Spectroscopy studies.

Key words: Leukodystrophies, Leukoencephalopathy, Magnetic resonance imaging, White matter diseases

INTRODUCTION

Only recently with the advances in imaging technology have white matter diseases of central nervous system been extensively studied and understood. Computed tomography (CT) and magnetic resonance imaging (MRI) are the imaging modalities which are currently available for the investigation of these diseases and it has been proven beyond doubt that MRI is far superior to CT and the imaging modality of the choice in these diseases.

Functional MRI of brain was introduced by Oqawa et al., in 1992, and developed by Rosen et al. In 2003, Paul Lauterbur and Sir Peter Mansfield awarded jointly Nobel Prize for their discoveries concerning MRI.¹ MRI has a very high sensitivity for detecting white matter lesions due to its excellent gray-white matter resolution. Multiplanar imaging is possible only with MRI, which helps in the detection and localization of lesions. It is also found to be ideal in posterior fossa imaging and allows simultaneous imaging of extracerebral sites such as spinal cord and optic nerve. MRI thus is very helpful in defining the pathogenesis and in the early diagnosis of disease and in monitoring the treatment. Recent advances such as MR spectroscopy (MRS), diffusion imaging, and magnetization transfer imaging have revolutionized the role of MRI in increasing the specificity of diagnosis in many of these conditions. By correlating the clinical features and biochemical analysis with the MRI findings, we can come to a diagnosis in the majority of cases. Many of the diseases if detected early
are reversible, and thus, play the major role of MRI in the early diagnosis so that the treatable conditions among them can be detected early and cured.

Ashikaga et al. evaluated cases of HSE with conventional SE and fluid attenuated inversion recovery (FLAIR) sequences and opined that the lesion conspicuity in the gray and white matter was found to be greatest with FLAIR sequence.²

This study is selected because of the important role of MRI in investigating white matter diseases and also to evaluate the data obtained from cranial MRI in these diseases.

The objectives of the study were to evaluate the role of MRI in white matter diseases, to assess the severity and extent of the underlying lesion in various conditions of white matter diseases and to demonstrate the different patterns of abnormal myelination in white matter diseases.

MATERIALS AND METHODS

The source of data for the study is patients from Navodaya Medical College Hospital and Research Centre. All patients referred to the Department of Radio Diagnosis with clinical history suspicious of white matter diseases and the patients with incidental finding of white matter diseases/lesions in all age groups in a period of 1-year from October 2015 to September 2016 were included in the study. The patients with clinical suspicion of post-traumatic white matter injury, intracranial tumors and metastatic disease, history of claustrophobia and history of metallic implants insertion, cardiac pacemakers, and metallic foreign body in situ were excluded from the study. A total of 50 patients were included.

Imaging was done with 1.5 Tesla PHILIPS Achieva machine using sense head coils. Sequences like localizer sequence conventional spin echo, sagittal FLAIR, short time inversion recovery, T1 FS, axial and sagittal T1-images, axial, sagittal and coronal T2-images, proton density images, diffusion-weighted imaging (DWI) and apparent diffusion coefficient (ADC) map and axial gray matter only and white matter only sequences were used for imaging purpose. Other optional sequences like diffusion tensor imaging and fiber tracking, IV contrast study; time of flight (TOF) angiography were included in the study as and when required. MRI findings were correlated with biochemical parameters (for metabolites) where feasible to increase the accuracy of diagnosis.

A circulatory head coil was used for excitation and signal reception. Standard head coil was used for the acquisition of images. The MR imaging protocol is part of our routine protocol and comprises T2-weighted (T2W) (axial and coronal), T1-weighted (T1W) (axial), FLAIR (axial), DWI (axial), gradient recalled echo (axial), susceptibility weighted imaging (axial) and magnetic resonance angiography (TOF-circle of Willis and neck). The total imaging time with 1.5 T-whole body MR imager was approximately 20 min 53 s. After localizer images were obtained, the axial images were tilted parallel to the corpus callosum. The sagittal images were planned on the axial sections. The coronal images were planned on the sagittal/axial sections. For PD + T2W axial imaging, we used a turbo spin echo sequence with a repetition time (TR) of 3380 ms; echo time (TE) of 14,86 ms; 5 mm section thickness; 30 mm intersection gap; 150 flip angle; 230 mm field of view; 512 × 512 matrix and imaging time of 3 min 7 s. For T1W axial imaging, we used a turbo spin echo sequence with a repetition time (TR) of 500 ms, echo time (TE) of 8,1 ms, 5 mm section thickness, 30 mm intersection gap, 90 flip angle; 230 mm field of view, 512 × 512 matrix and imaging time of 3 min 55 s. For FLAIR axial imaging, we used a turbo spin echo sequence with a repetition time (TR) of 9000 ms, echo time (TE) of 87 ms, 5 mm section thickness, 30 mm intersection gap, 150 flip angle, 230 mm field of view, 512 × 512 matrix and imaging time of 4 min 32 s. For T2W coronal imaging, we used a turbo spin echo sequence with a repetition time (TR) of 3850 ms, echo time (TE) of 114 ms, 5 mm section thickness, 30 mm intersection gap, 150 flip angle, 210 mm field of view, 512 × 512 matrix and imaging time of 2 min 39 s. Diffusion-weighted axial imaging was performed with a single shot echo planar sequence with three diffusion weighted b values of 0.500 and 1000 s/mm². The imaging parameters were a repetition time (TR) of 4200 ms, echo time (TE) of 109 ms, 5 mm section thickness, 30 mm intersection gap, 90 flip angle, 230 mm field of view, 512 × 512 matrix and imaging time of 52 s. ADC maps were produced from diffusion weighted images. For gradient axial imaging, we used a gradient echo sequence with a repetition time (TR) of 860 ms, echo time (TE) of 26 ms, 5 mm section thickness, 30 mm intersection gap, 20 flip angle, 230 mm field of view, 512 × 512 matrix and imaging time of 2 min 58 s. About 3 ml of gadolinium based contrast was used for selected cases. SV PRESS 144, SV PRESS 31 Single voxel spectroscopy; 2D PRESS 144 multi voxel spectroscopy was performed at TE of 144 ms and 31 ms, TR was at 2000 ms. In single voxel studies, the voxel is placed on the lesion so that it covers the maximum area of the solid tumoral area. In multivoxel spectroscopy, the voxel was extended to cover perilesional area in selective cases of high-grade tumors, avoiding areas of cysts or necrosis and with minimal contamination from the surrounding non-tumoral tissue. Volume of interest size ranged between 1.5 cm × 1.5 cm × 1.5 cm (3.4 ml) and 2 cm × 2 cm × 2 cm (8 ml). We used PRESS and T1 FFE postcontrast sequence as localization sequence with
5 mm thickness. Spectroscopy was avoided in small lesions close to the bone and sinuses. MultiHance (Gadobenate Dimeglumine) was used as contrast agents in dose of 0.1 mmol/kg body weight. Post-contrast coronal and axial T1W were taken and sagittal T1W were taken wherever necessary. Special sequence like FLAIR sequence was obtained in all cases. The images were analyzed for lesion number, size, location, signal intensity changes, mass effect, and contrast enhancement. Detailed clinical history was noted in patients admitted in our hospital and for referred cases from outside hospitals as per the pro forma.

All patients were followed up to reach a therapeutic/biopsy diagnosis. Findings of cerebrospinal fluid examination, muscle or nerve biopsy, electromyography, and electroencephalography were compared with the MRI features. The symptomatic response of the patient to medical therapy was noted which helped in the retrospective confirmation of the diagnosis, and thus the final outcome of the disease was recorded. Biochemical analysis could not be performed since the facility is not available in our institution. However, we could retrospectively confirm our diagnosis from patients who were referred to higher center and came back to our institute for follow-up treatment.

Data were entered into Microsoft Excel data sheet and analyzed using Epi Info 7 version software. Categorical data were represented in the form of frequencies and proportions. Bar diagrams and Pie chart were plotted to represent graphically wherever necessary.

RESULTS

In the study, it was observed that most common white matter disease was leukodystrophy (26%). Leukodystrophies includes adrenoleukodystrophy (ALD), Alexander disease, Canavan disease, Krabbes disease, metachromatic leukodystrophy (MLD), and nonspecific leukodystrophy. Second most common disease was acute disseminated encephalomyelitis (ADEM) (16%) and cavitating leukoencephalopathies (16%) (periventricular leukomalacia [PVL], megalencephalic leukoencephalopathy and cavitating leukoencephalopathy and vanishing white matter disease (WMD). Followed by hypomyelination (12%), multiple sclerosis and microvascular ischemic changes (SVIC) (8%) and others (Table 1).

The majority of the subjects were in the age group of <5 years, i.e., 70% and least no of subjects were observed in the age group >50 years 8%. Hence, the white matter diseases are common in children that in adults and elderly (Table 2).

In this study, the majority (n = 47) of the patients were found with supratentorial lesions and 19 were found to be having infratentorial lesions. Degree of myelination was adequate in nearly two-thirds of the individuals (n = 35) (Table 3).

According to the locations of the lesions, in nearly half of the cases, the lesions were in frontal region (n = 24), in 26 patients the lesions were seen in parietal area, 22 had lesions in temporal area, 19 in occipital region, deep gray matter lesions were seen in 17 cases, periventricular lesions in 36 cases and brainstem lesions were seen in 10 cases (Table 4).

In all the cases, hypointensity was noticed in T1W images and hyperintensity in the case of T2W images. Hyperintensity was observed in diffusion weighted images in case of 15 study participants, and ADC matching was present in the case of only 10 cases. Contrast enhancement was seen in 8 cases out of 16 in whom the contrast study was done (Table 5).

Table 1: MRI diagnosis in white matter diseases

<table>
<thead>
<tr>
<th>MRI diagnosis</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leukodystrophy</td>
<td>13 (26)</td>
</tr>
<tr>
<td>ADEM</td>
<td>8 (16)</td>
</tr>
<tr>
<td>Cavitating leukoencephalopathies</td>
<td>8 (16)</td>
</tr>
<tr>
<td>Hypomyelination</td>
<td>6 (12)</td>
</tr>
<tr>
<td>Multiple sclerosis</td>
<td>4 (8)</td>
</tr>
<tr>
<td>SVIC</td>
<td>4 (8)</td>
</tr>
<tr>
<td>Leigh’s disease</td>
<td>2 (4)</td>
</tr>
<tr>
<td>HIV encephalopathy</td>
<td>2 (4)</td>
</tr>
<tr>
<td>Non-specific</td>
<td>2 (4)</td>
</tr>
<tr>
<td>PML</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Total</td>
<td>50 (100)</td>
</tr>
</tbody>
</table>

MRI: Magnetic resonance imaging, ADEM: Acute disseminated encephalomyelitis, SVIC: Microvascular ischemic changes, HIV: Human immunodeficiency virus, PML: Progressive multifocal leukoencephalopathy

Table 2: Age distribution of subjects

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;5</td>
<td>35 (70)</td>
</tr>
<tr>
<td>5-50</td>
<td>11 (22)</td>
</tr>
<tr>
<td>&gt;50</td>
<td>4 (8)</td>
</tr>
<tr>
<td>Total</td>
<td>50 (100)</td>
</tr>
</tbody>
</table>

Table 3: Supratentorium and infratentorium lesions in white matter disease and degree of myelination

<table>
<thead>
<tr>
<th>Lesions</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supratentorium</td>
<td></td>
</tr>
<tr>
<td>Absent</td>
<td>3 (6)</td>
</tr>
<tr>
<td>Present</td>
<td>47 (94)</td>
</tr>
<tr>
<td>Infratentorium</td>
<td></td>
</tr>
<tr>
<td>Absent</td>
<td>31 (62)</td>
</tr>
<tr>
<td>Present</td>
<td>19 (38)</td>
</tr>
<tr>
<td>Degree of myelination</td>
<td></td>
</tr>
<tr>
<td>Inadequate</td>
<td>15 (30)</td>
</tr>
<tr>
<td>Adequate</td>
<td>35 (70)</td>
</tr>
</tbody>
</table>
was cavitating leukoencephalopathy, vanishing WMD, respectively (Table 8).

In ADEM, the lesion was more common in Frontal region (75%), followed by parietal lesion in 62.5%. Lesion was observed in all the regions in varying proportions (Table 9).

**DISCUSSION**

This study was directed to evaluate the role of MRI in patients presenting with global developmental delay and clinically suspected of white matter disease.

About 50 patients clinically suspected of white matter disorders were submitted for MRI scan of brain. In the study, it was observed that most common white matter disease was leukodystrophy (26%). The second most common disease was ADEM (16%) and cavitating leukoencephalopathies (16%) followed by hypomyelination (12%), multiple sclerosis and SVIC (8%) and others.

In our study, five out of 13 cases of leukodystrophies suffered from MLD (38.4%), among which 4 were males (80%) and 1 was female (20%). Alves et al. reported that late infantile constitutes 70% of all cases and this is the commonest variety. MR imaging of these patients revealed bilaterally symmetrical and confluent lesions in all cases among which 100% incidence of periventricular white matter involvement, 80% of patients showing frontal white matter involvement and 60% showing parietal, temporal and cerebellar white matter involvement. Kim et al. studied 7 patients of MLD, of which all of them showed bilateral, symmetrical and confluent high signal intensities on T2W imaging. They reported 100% incidence of periventricular white matter and centrum semi ovale. One of our patients, aged 25 months, showed involvement of subcortical U-fibers. This is in correlation with the study by Kim et al. who reported that a follow-up MRI of a 26-month-old patient showed demyelinating process progressed to the subcortical U-fibers. In a study of three patients of MLD by Humera et al., all of which were male patients showed 100% involvement of periventricular white matter showing high signal intensities on T2W and FLAIR images (Figure 1).

In our study, three out of 13 cases of leukodystrophies suffered from ALD (23.1%), among which two were males (66.67%) and one was female (33.33%). Age of patients ranged from 9 months to 6 years. Snyder et al. reported that childhood onset ALD (4-8 years) is the most common type. White matter abnormalities usually appear in the occipital regions initially, with early involvement of the splenium of the corpus callosum and posterior limbs of internal capsules. The progression pattern of the disease is centrifugal and posteroanterior. This results

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**Table 4: Location of lesions**

<table>
<thead>
<tr>
<th>Lesions</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frontal Absent</td>
<td>26 (52)</td>
</tr>
<tr>
<td>Frontal Present</td>
<td>24 (48)</td>
</tr>
<tr>
<td>Parietal Absent</td>
<td>24 (48)</td>
</tr>
<tr>
<td>Parietal Present</td>
<td>26 (52)</td>
</tr>
<tr>
<td>Temporal Absent</td>
<td>28 (56)</td>
</tr>
<tr>
<td>Temporal Present</td>
<td>22 (44)</td>
</tr>
<tr>
<td>Occipital Absent</td>
<td>31 (62)</td>
</tr>
<tr>
<td>Occipital Present</td>
<td>19 (38)</td>
</tr>
<tr>
<td>Deep gray matter Absent</td>
<td>33 (66)</td>
</tr>
<tr>
<td>Deep gray matter Present</td>
<td>17 (34)</td>
</tr>
<tr>
<td>Periventricular Absent</td>
<td>14 (28)</td>
</tr>
<tr>
<td>Periventricular Present</td>
<td>36 (72)</td>
</tr>
<tr>
<td>Subcortical U-fibers Absent</td>
<td>34 (68)</td>
</tr>
<tr>
<td>Subcortical U-fibers Present</td>
<td>16 (32)</td>
</tr>
<tr>
<td>Cerebellum Absent</td>
<td>37 (74)</td>
</tr>
<tr>
<td>Cerebellum Present</td>
<td>13 (26)</td>
</tr>
<tr>
<td>Brainstem Absent</td>
<td>40 (80)</td>
</tr>
<tr>
<td>Brainstem Present</td>
<td>10 (20)</td>
</tr>
</tbody>
</table>

**Table 5: MRI findings**

<table>
<thead>
<tr>
<th>MRI method and finding</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1W Hypointense</td>
<td>50 (100)</td>
</tr>
<tr>
<td>T2W Hypointense</td>
<td>50 (100)</td>
</tr>
<tr>
<td>DWI Hypointense</td>
<td>35 (70)</td>
</tr>
<tr>
<td>DWI Hyperintense</td>
<td>15 (30)</td>
</tr>
<tr>
<td>ADC Matching Absent</td>
<td>40 (80)</td>
</tr>
<tr>
<td>ADC Matching Present</td>
<td>10 (20)</td>
</tr>
<tr>
<td>Contrast enhancement Not performed</td>
<td>34 (68)</td>
</tr>
<tr>
<td>Contrast enhancement Present</td>
<td>8 (16)</td>
</tr>
<tr>
<td>Contrast enhancement Absent</td>
<td>8 (16)</td>
</tr>
</tbody>
</table>

Dwi: Diffusion-weighted imaging, ADC: Apparent diffusion coefficient

In the study, only 11 patients were taken for MRS peak and it was observed that in leukodystrophy MRS peak was observed in choline, N-acetyl aspartate, Myo inositol and lactate. In leukoencephalopathies, MRS peak was observed only in lactate. ADEM had peak for choline (Table 6).

Among 13 leukodystrophy conditions various diagnosis in the study were MLD (38.4%), ALD (23.1%), Canavan disease (15.4%), 7.7% Krabbes disease, Alexander disease, and nonspecific leukodystrophy (Table 7).

Among 8 leukoencephalopathies 50% was PVL, 25% was megalencephalic leukoencephalopathy and 12.5% was cavitating leukoencephalopathy, vanishing WMD, respectively (Table 8).

Among 8 leukoencephalopathies 50% was PVL, 25% was megalencephalic leukoencephalopathy and 12.5% was cavitating leukoencephalopathy, vanishing WMD, respectively (Table 8).

In ADEM, the lesion was more common in Frontal region (75%), followed by parietal lesion in 62.5%. Lesion was observed in all the regions in varying proportions (Table 9).
in the most characteristic imaging feature of the disease. Our study shows no involvement of frontal white matter in all three patients. All patients showed temporal and occipital white matter abnormalities (100%) and 66.67% showing periventricular and brain stem involvement. All patients showed enhancement on contrast study (100%) and also choline peak in MRS. In a study of three patients of ALD by Ahsan et al., it was reported 66.67% involvement of periventricular white matter specifically in trigonal area showing high signal intensities on T2W and FLAIR images. Melhem et al. in a study of 43 patients of ALD reported 21 patients (49%) showing contrast enhancement.

MR imaging findings of multiple sclerosis patients were bilateral periventricular hyperintensities on T2W and FLAIR images. Deep gray matter hyperintensities were also identified in all patients. One patient showed hyperintense lesions in bilateral frontal, parietal and occipital lobes, each lesion measuring approximately 5-10 mm in size. In a study by Tas et al. showed that gadolinium-enhancement
In this study, two patients out of 13 cases of leukodystrophies were reported to have Canavan disease (Figure 5). One of our two patients showed diffuse bilateral symmetric cerebral and cerebellar white matter high signal intensities on T2 and FLAIR images and no lobar predominance. Another patient showed involvement of bilateral deep gray matter and subcortical U-fibers. Both the patients were subjected to MRS study which revealed marked increase in the N-acetylaspartate (NAA) peak. Michel and Given reported a case of Canavan disease in which there was diffuse, bilateral, and symmetric increased T2 signal intensity throughout the cerebral white matter. These findings were noted to a lesser degree in the cerebellar white matter, thalamus, globi pallidi, and dorsal brainstem.

Our study revealed one male patient of 2 years of age found to be a case of Alexander disease (Figure 4). MR imaging study of this patient showed hyperintensities on T2W images predominantly in the frontal white matter with extension into the parietal and temporal white matter, periventricular regions and subcortical U-fibers. The lesions show contrast enhancement. MRS revealed a rise in Lactate peak. In a study by van der Knaap et al., five MR imaging criteria were defined: Extensive cerebral white matter changes with frontal predominance, a periventricular rim with high signal on T1W images and low signal on T2W images, abnormalities of basal ganglia and thalami, brain stem abnormalities, and contrast enhancement of particular gray and white matter structures. Four of the five criteria had to be met for an MR imaging-based diagnosis. Our study meets four criteria mentioned in their study, thus correlating with the study.

In this study, two patients out of 13 cases of leukodystrophies were reported to have Canavan disease (Figure 5). One of our two patients showed diffuse bilateral symmetric cerebral and cerebellar white matter high signal intensities on T2 and FLAIR images and no lobar predominance. Another patient showed involvement of bilateral deep gray matter and subcortical U-fibers. Both the patients were subjected to MRS study which revealed and marked rise in the N-acetylaspartate (NAA) peak. Michel and Given reported a case of Canavan disease in which there was diffuse, bilateral, and symmetric increased T2 signal intensity throughout the cerebral white matter. These findings were noted to a lesser degree in the cerebellar white matter, thalamus, globi pallidi, and dorsal brainstem. The white matter abnormality specifically involved the subcortical white matter. There was no lobar predominance of white matter abnormalities. Single-voxel point-resolved spatially localized MRS revealed a marked increase in both

<table>
<thead>
<tr>
<th>Location of lesions</th>
<th>ADEM Present</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frontal lesion</td>
<td>6</td>
<td>75</td>
</tr>
<tr>
<td>Parietal lesion</td>
<td>5</td>
<td>62.5</td>
</tr>
<tr>
<td>Temporal lesion</td>
<td>4</td>
<td>50</td>
</tr>
<tr>
<td>Occipital lesion</td>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td>Deep gray matter lesion</td>
<td>1</td>
<td>12.5</td>
</tr>
<tr>
<td>Periventricular lesion</td>
<td>3</td>
<td>37.5</td>
</tr>
<tr>
<td>Subcortical U-fibers lesion</td>
<td>4</td>
<td>50</td>
</tr>
<tr>
<td>Cerebellum lesion</td>
<td>4</td>
<td>50</td>
</tr>
<tr>
<td>Brainstem lesion</td>
<td>4</td>
<td>50</td>
</tr>
</tbody>
</table>

ADEM: Acute disseminated encephalomyelitis
the NAA peak and the ratio of NAA to creatinine. The choline peak was not elevated. Our MR findings are in correlation with their study.

One case of progressive multifocal leukoencephalopathy (PML) was encountered in our study (Figure 6). The patient was 33-year-old male patient with human immunodeficiency virus (HIV) seropositive status. MR imaging findings revealed multifocal bilateral parietal, occipital, periventricular, subcortical U-fibers, deep gray matter and bilateral cerebellar white matter hyperintensities on T2W and FLAIR images. Ahsan et al. reported, in their study, that one male patient suffered from PML. He was 30-year-old and tested positive for HIV. MRI showed abnormal signal intensity in deep white matter of brain in right frontal regions, parietooccipital regions, putamen, and midbrain. The signals were isointense on T1 and hyperintense on T2W images. It is observed that these findings are in correlation with our study.

CONCLUSION

In general, patients in the pediatric age group constituted 82% of the total study group, and there was slight male predominance. Leukodystrophies constituted 26% of total cases, the commonest being MLD. All patients of acute disseminating encephalomyelitis had a prior history of viral fever. The most common symptom noted was altered sensorium and site of involvement was cerebral white matter, asymmetric multifocal pattern being the most common. The patient with PML was HIV positive and showed focal white matter lesions without mass effect or enhancement. In leukodystrophies, we had 13 cases of which five were MLD, three were ALD, two cases of Canavan disease and one each case of Krabbes disease, Alexander disease and nonspecific leukodystrophy. In leukoencephalopathies, we had 8 cases of which four were PVL, two were megalencephalic leukoencephalopathy and one each case of cavitating leukoencephalopathy and vanishing WMD. All patients were
from the pediatric age group, and male predominance was noted. All cases of hypomyelination showed periventricular white matter involvement. Elderly patients showed punctate and confluent hyperintensities involving supratentorial and infratentorial brain white matter lesions, attributing to degenerative changes of small vessels multiplanar imaging capability and excellent gray–white matter resolution makes MRI very sensitive in detecting subtle white matter lesions. FLAIR sequence has better sensitivity for white matter lesions especially those in periventricular locations. Post-contrast studies help in differentiating acute from chronic lesions and thus monitoring the progression of the disease. Allows simultaneous imaging of orbit especially in cases of multiple sclerosis. Helps in early diagnosis of mild and atypical cases so that treatment can be started early in curable disease. Ideal for posterior fossa and spinal cord imaging. Noninvasive imaging modality which can be done on outpatient basis and with no radiation hazards. Specificity of MR imaging can be improved by MRS studies. Only limitation is that though sensitive and not as specific in aiding in the specific diagnosis of diseases. However, the specificity can be improved by clinical correlation and laboratory tests.

REFERENCES

Observational Study on Neonatal Septicemia

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¹Assistant Professor, Department of Pediatrics, Mahatma Gandhi Memorial Hospital, Kakatiya Medical College, Warangal, Telangana, India,
²Associate Professor, Department of Pediatrics, Mahatma Gandhi Memorial Hospital, Kakatiya Medical College, Warangal, Telangana, India

Abstract

Introduction: Neonatal septicemia is a life-threatening disease. Early diagnosis and prompt treatment are essential. Isolation of pathogenic organism from blood provides definite diagnosis. Nut culture takes 24-48 h for confirmation of diagnosis. Hence, a number of bedside laboratory tests have been devised to facilitate the early diagnosis of septicemia.

Materials and Methods: The material for this study comprised 65 neonates who were clinically diagnosed as neonatal septicemia from the Neonatal Intensive Care Unit at M.G.M Hospital, Warangal. The period of study spread over a period of 1-year from June 2015 to May 2016.

Results: In 24 cases, blood culture has grown an organism. In 33 cases, blood culture is sterile and they are having clinical features of septicemia and C-reactive protein (CRP) is positive. In 8 cases where blood culture could not be done, septicemia is diagnosed basing on clinical features and CRP positivity.

Conclusion: Significantly, number of babies with septicemia are from rural domicile. This is more indicative of the kind of population seeking Government Hospital services rather than indicative high incidence of septicemia in rural babies because generally rural patients predominate in all diseases in M.G.M Hospital.

Key words: Neonatal, Septicemia, Meningitis

INTRODUCTION

When compared to developed countries, the incidence of neonatal septicemia is very high in developing countries. In India, it is in between 10.8% and 14.28%. The manifestations of neonatal septicemia are variable and confusing, so the diagnosis is difficult. Neonatal septicemia is a life-threatening disease. Early diagnosis and prompt treatment are essential. Isolation of pathogenic organism from blood provides definite diagnosis. Nut culture takes 24-48 h for confirmation of diagnosis. Hence, a number of bedside laboratory tests have been devised to facilitate the early diagnosis of septicemia.

Micro-erythrocyte sedimentation rate (ESR), band cell count, band cell/neutrophil ration, gastric aspirate for polymorphs, Sr. IgM, C-reactive protein (CRP), alpha-haptoglobin, and Sr. Fibrinogen levels are helpful for the screening of neonatal septicemia. Positive CRP was found to be the single most sensitive specific test in the diagnosis of neonatal septicemia.² The choice of antibiotic in the neonatal sepsis is governed by the knowledge of the prevalent bacterial flora of a particular newborn nursery and their sensitivity pattern to various available antibiotics.³ Hence, another aim of this study is to know the bacteriological pattern of neonatal septicemia in our neonatal unit and choice of antibiotic combination which will be suitable for our unit.

MATERIALS AND METHODS

The material for this study comprised 65 neonates who were clinically diagnosed as neonatal septicemia from the Neonatal Intensive Care Unit at M.G.M Hospital, Warangal. The period of study spread over a period of 1-year from June 2015 to May 2016.

Clinical diagnosis of neonatal septicemia was based on well-established criteria such as depressed activity, lethargy,
poor sucking, hypothermia, apneic spells, abdominal distention, episodes of cyanosis, and respiratory distress. Information was recorded on a prepared pro forma by questionnaire method. Detailed antenatal, natal and postnatal history was recorded for any evidence of antenatal infection, difficult labor, premature rupture of membrane or abnormal delivery, jaundice, convulsions, cyanotic spells, and birth asphyxia.

Beside clinical examination, the investigation like blood total leukocyte count (TLC), differential count, hemoglobin, blood group, micro-ESR, CRP by latex agglutination, test ratio of band forms “O” neutrophil count in the blood were performed. Blood cultures were taken from the peripheral veins under aseptic conditions before starting of antibiotics.

Preparinized microhematocrit tube (75 mm length, 1.1 mm internal diameter, and 1.5 mm outer diameter) was used for determination of micro-ESR, by filling them completely with capillary blood and one end of the tube being closed with plasticin. They were fixed vertically using plaster and fall in 1 h was measured accurately to the nearest millimeter.4

CRP latex agglutination kit was used for the estimation of CRP; CRP kit consists of one vial of CRP latex antigen, one vial of positive control, one vial of negative control, glass slide disposable droppers (0.05 ml) drop size, and mixing sticks. The neonates serum is used for testing. The serum was diluted to 1: 16 with 0.9% saline before testing (0.5 ml of serum + 0.75 ml of 0.9% saline). All the reagents were brought to room temperature. With the plastic dropper provided, one drop of diluted test serum, positive and negative control sera are placed on the glass slide in each of the three rectangular areas, respectively. Then, the latex antigen and the test sera, positive and negative controls are mixed well the plastic mixing sticks and mixture is spread on the each of the rectangular areas of the slide. The slide tilted gently back and forth. If the agglutination occurs on or before 1 min after mixing, it indicates the presence of CRP and considered as positive. If there is no agglutination by 1 min, after thorough mixing it indicates a negative test result.

Concentration of CRP = Tire × CRP sensitivity (µm/ml)
= 16 × 0.33 µm/ml.
= 5.28 µm/ml.

A CRP concentration of equal or more than 5.28 µm/ml was taken as positive.

About 5 ml of blood was drawn from a peripheral vein before starting of antibiotics.

Every precaution has been taken to prevent contamination of the specimen. 2 ml of the blood collected in glucose broth glass bottle containing 10 ml of medium. Remaining blood was used for band cell to neutrophil count and CRP test. Inoculated blood culture bottles are incubated at 37°C centigrade. The cultures are incubated for 24 h and subculture was done when the growth is suspected in suitable media.

Swabs for culture and sensitivity were taken from the conjunctiva, umbilicus superficial skin lesions, whenever indicated before administering antibiotics. Lumbar puncture (LP) was done only in symptomatic babies and cerebrospinal fluid (CSF) sent for cell count, biochemical analysis, culture and sensitivity.

**RESULTS**

Table 2 shows sex distribution of the babies with septicemia; out of 65 cases, 40% are female babies and 60% are male babies.

In 42.1% cases, blood culture is positive, out of 57 cases in which blood culture is done (Table 3).

In 8 cases, blood culture could not be done.

In 24 cases, blood culture has grown an organism. In 33 cases, blood culture is sterile and they are having clinical

<table>
<thead>
<tr>
<th>Table 1: Frequency of area of residence of septicemia babies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Residence</strong></td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>Rural</td>
</tr>
<tr>
<td>Urban</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

83.1% of septicemia babies are coming from rural households.

<table>
<thead>
<tr>
<th>Table 2: Sex distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Residence</strong></td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>Rural</td>
</tr>
<tr>
<td>Urban</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Two-sided P: 0.035

<table>
<thead>
<tr>
<th>Table 3: Frequency of blood culture positivity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Residence</strong></td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>Positive</td>
</tr>
<tr>
<td>Negative</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>
features of septicemia and CRP is positive. In 8 cases where blood culture could not be done, septicemia is diagnosed basing on clinical features and CRP positivity (Table 4).

Table 4: Frequency of blood culture pattern

<table>
<thead>
<tr>
<th>Residence</th>
<th>Frequency (%)</th>
<th>Cum percent</th>
<th>95% confidence limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coagulase negative</td>
<td>1 (1.5)</td>
<td>1.5</td>
<td>0.0-8.3</td>
</tr>
<tr>
<td>Staphylococcus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Escherichia coli</em></td>
<td>13 (20.0)</td>
<td>21.5</td>
<td>11.1-31.8</td>
</tr>
<tr>
<td><em>Klebsiella</em></td>
<td>4 (6.2)</td>
<td>27.7</td>
<td>1.7-15.0</td>
</tr>
<tr>
<td><em>Staphylococcus aureus</em></td>
<td>6 (9.2)</td>
<td>36.9</td>
<td>3.5-19.0</td>
</tr>
<tr>
<td>Sterile</td>
<td>33 (50.8)</td>
<td>87.7</td>
<td>38.1-63.4</td>
</tr>
<tr>
<td>Not done</td>
<td>8 (12.3)</td>
<td>100.0</td>
<td>5.5-22.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>65 (100.0)</strong></td>
<td><strong>100.0</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Septicemia diagnosis basing on clinical features and CRP

Significantly, number of babies with septicemia are from rural domicile ($z = 7.37$, $P = 0.001$). This is more indicative of the kind of population seeking Government Hospital services rather than indicative high incidence of septicemia in rural babies because generally rural patients predominate in all diseases in M.G.M. Hospital.

In this study, it is found that the incidence of neonatal septicemia is higher in males than in females ($P = 0.035$). The same was reported by several other workers.\(^3\)

Among the 65 neonates 43\% of the septicemia babies are admitted at 1 day of postnatal age. 75\% of the babies are below 5 days of postnatal age. Hence, early septicemia is seen in 70\% of our cases. Early septicemia is common in both male and female babies.

About 49.2\% (32) of septicemia babies are of low birth weight (LBW), and 49.8\% (33) are of normal birth weight. Although there is no statistical difference between LBW and normal birth weight, clinically this is of relevance, 49.2\% of septicemia babies being LBW gives indication of probability of high burden of LBW babies in this population. However, more concerning is predominately normal birth weight babies are also seen with septicemia (49.8\%). It requires further studies in this population to know the exact prevalence of LBW babies and more importantly to know the neonatal care practices contributing to neonatal septicemia in both LBW and normal birth weight babies.

The mean birth weight of female and male septicemic babies is not statistically different (2.2 kg in both groups. Sex of the baby is not associated with LBW.

Positive blood culture positive in our study *Escherichia coli* grown in 20\% *Staphylococcus aureus* grown in 9.2\% *Klebsiella* grown in 6.2\% and coagulase negative *Staphylococcus* grown in 1 case.

Gram-negative organisms isolated more in cultures than Gram-positive organism. This finding is correlates with the study of Chowday *et al.* (1975)\(^5\) who observed Gram-negative organisms in 68.7\% of cases and Gram-positive organisms in 31.3\% of cases.

There is no sex predilection in blood culture positive septicemia cases though males are predominate in total septicemia cases. This can be further clarified by improving the blood culture sample size.

Blood culture positive septicemia is have equal chance in both rural and urban septicemia babies.

In nearing 63\% of cases, septicemia is diagnosed basing on clinical findings and CRP positivity. This shown that practical difficulty of proving neonatal septicemia by blood culture in routine clinical practice settings.

CRP test is positive in 82\% of cases. Sing *et al.* (1987)\(^6\) found that CRP to be the single most sensitive (90\%) and specific test in distinguishing infected from non-infected group. Chandna *et al.* (1988)\(^7\) found CRP to be positive in 83\% of cases of neonatal septicemia. Gupta *et al.* (1987)\(^8\) found CRP to be 90.9\% sensitive in diagnosing infection when it is present. The sensitivity to CRP in this study closely correlating with the observation of Chandna *et al.* (1988).\(^7\)

- When a baby having blood culture positive the chance of having meningitis is high compared to culture negative septicemia
- Other laboratory parameters like micro-ESR TLC are not associated with blood culture positivity. Hence does not seem to be useful
- Other laboratory parameters like micro-ESR TLC are not associated with blood culture positivity. Hence does not seem to be useful
- Band cell count percentage significantly more in Blood culture positive cases
- Pneumonia is found in significant no. of blood culture positive septicemia cases (37.4) ($P = 0.008$). It shows the need to take routine X-ray chest in neonatal septicemia as it is difficult to diagnose pneumonia clinically in the neonatal period.
CONCLUSION

Magnitude of septicemia like other illness is high in rural population. Male babies are having high chance of getting neonatal septicemia. Early septicemia is found in significant number of babies. Blood culture methodology needs improvement as this is the gold standard to diagnose septicemia. Other lab parameters such as CRP, TLC, neutrophil count, and micro-ESR though believed to help in neonatal septicemia we found them not useful. Band cell count is to some extent useful in the diagnosis of neonatal septicemia. Pneumonia is to be identified in neonatal septicemia by routine X-ray chest especially when blood culture is positive. 1.5% of cases are having meningitis by examining the CSF. In blood culture positive cases meningitis evidence is found in 80%. Hence, routine LP needs to be done in blood culture positive septicemia cases. In blood culture, sterile cases LP can be done depending on clinical need.

REFERENCES

Subtotal Cholecystectomy - A Clinical Experience

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Abstract

Introduction: Subtotal cholecystectomy (SC) is a safe procedure in cases of difficult gallbladder (GB) where the Calot’s anatomy is unclear. Continuing with laparoscopic cholecystectomy in unclear Calot’s anatomy may be dangerous and may result in common bile duct injury. In our study, a significant number of patients got converted to open and underwent SC due to unclear anatomy at the Calots. The purpose of our study is to do the retrospective analysis and assess the results of subtotal cholecystectomies in the last 1 year which has made us to come to the conclusion that SC is a safe alternative to standard cholecystectomy in difficult GBs.

Materials and Methods: Patients who were planned for laparoscopic cholecystectomy between March 2015 and August 2016 were evaluated retrospectively. A total of 142 cholecystectomies were performed during this period. Twelve patients underwent SC out of which ten were open and two were laparoscopically done. In these cases, the GB was resected at the neck, the stones were evacuated, and the remnant was closed by continuous sutures.

Results: A total of 142 cholecystectomies were performed between March 2015 and August 2016 out of which 12 subtotal cholecystectomies were done, 2 were laparoscopically done and 10 were open, 8 were males and 4 were females. Bile leak was noticed in three patients who underwent endoscopic retrograde cholangiopancreatography and made an uneventful recovery. Seroma and post-operative wound infection were other morbidities which were noticed. No mortalities were present. Average length of hospital stay was 7 days.

Conclusion: In cases where there are dense omental or bowel adhesions in the Calot’s area and it is difficult to identify the structures, it is safe to undertake a SC.

Key words: Subtotal cholecystectomy, Gangrene gallbladder, Empyema gallbladder

INTRODUCTION

Cholecystectomy is one of the common operations which a general surgeon deals in his day-to-day practice. Although it is common, it is potentially a difficult operation due to the variable anatomy at the Calots. The presence of dense omental or bowel adhesions due to inflammation and fibrosis in the wall of the gallbladder (GB) and surrounding structures makes it a more difficult operation.

“In 1985 Prof Dr. Erich Muhe of Germany performed the first laparoscopic cholecystectomy. He performed 94 such procedures before another surgeon, Phillipe Mouret of Lyon, France, performed his first laparoscopic cholecystectomy in 1987, followed by Francois Dubois of Paris, France in 1988.”

The incidence of bile duct injury in laparoscopic cholecystectomy is 0.25-0.5%. The incidence is still higher in cases of difficult calots. Hence, clear identification of the structures in the Calot’s area is of great significance to perform a safe laparoscopic cholecystectomy. The incidence of bile duct injury in open cases is 0.2%.³

Subtotal cholecystectomy (SC) is considered as a safe, effective, and a definitive alternative to the standard cholecystectomy in most of the difficult cases where Calot’s anatomy is unclear including portal hypertension.⁴ In Type I Mirizzi syndrome, SC is the operation of choice.⁵

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MATERIALS AND METHODS

From March 2015 to August 2016, 142 patients were subjected to laparoscopic cholecystectomy in SIII unit in the Department of General Surgery, St. Marthas Hospital, Bengaluru. Of them 130 patients underwent laparoscopic cholecystectomy, in 12 patients, SC had to be done, 2 laparoscopic SC and 10 open SC (Table 1). The age of the patients was in the range of 35-75 years. Eight were male and four were females. The average stay in the hospital was 7 days. The indications for the SC in the present series were dense omental and bowel adhesions due to inflammation, perforation, gangrene, and empyema GB (Table 2).

Twelve patients were subjected to SC, in which two were laparoscopically and ten were open.

Preoperatively, the patients underwent the following investigations:

<table>
<thead>
<tr>
<th>Investigations</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>USG abdomen and pelvis</td>
<td>142</td>
</tr>
<tr>
<td>CT abdomen</td>
<td>3</td>
</tr>
<tr>
<td>MRCP</td>
<td>1</td>
</tr>
<tr>
<td>MRI</td>
<td>1</td>
</tr>
</tbody>
</table>

MRI: Magnetic resonance imaging, CT: Computed tomography, MRCP: Magnetic resonance cholangiopancreatography, USG: Ultrasonography

RESULTS

Twelve patients underwent SC from March 2015 to August 2016. This represents 8.4% of the total 142 cholecystectomies performed during the above period.

Post-operatively, three patients had significant bile leak which did not subside after conservative management. These three patients underwent endoscopic retrograde cholangiopancreatography (ERCP) and stenting and recovered. Two patients had post-operative wound infection out of which one developed incisional hernia. One patient had subhepatic collection which was managed conservatively and recovered. No mortality was noted (Table 3).

DISCUSSION

SC was first reported by Madding in 1955 as a replacement for cholecystectomy and a rescue procedure in cases of technically difficult total cholecystectomy. His technique involved incising the GB at the fundus down to 1 cm from the CD, followed by excising the redundant GB wall.⁶

Bornman and Terblanche described piecemeal excision of the Hartmann’s pouch to expose the cystic duct which is closed by the purse-string sutures from within and also leaves the posterior wall of the GB intact which is either cauterized or left intact.⁴

With the introduction of laparoscopic cholecystectomy by Muhe (1985) and Mouret (1987), laparoscopic SC was considered a rescue technique in cases of difficult GB to avoid misidentification injuries of the bile duct and vascular structures from severe inflamations that otherwise would have required conversion to an open cholecystectomy.⁷

SC is a safe and satisfying procedure in patients for whom the standard operation would entails considerable danger.⁴ The possibility of injury to the structures in the Calot’s region due to distorted anatomy as a result of severe inflammation and adhesions can be avoided by opting the above procedure.

For the experienced surgeon, the average operative time for a laparoscopic cholecystectomy is <1 h. The possibility of prolonged laparoscopic cholecystectomy should be anticipated in patients with acute cholecystitis with intra-abdominal adhesions and adhesions in the Calot’s region. Prolonged surgery increases the risk of complications such as bile duct injury and bleeding.⁸ In our study, the average operative time was 45 min to 2 h.

Elshaer et al. reported post-operative ERCP was performed in 4.1% of the patients and the indications were retained stones in 58.8% and persistent bile leak in 31.4%.⁹ In our

### Table 1: Surgeries for cholelithiasis from March 2015 to August 2016

<table>
<thead>
<tr>
<th>Surgeries</th>
<th>Number of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cholecystectomies</td>
<td>142 (100)</td>
</tr>
<tr>
<td>Laparoscopic cholecystectomies</td>
<td>130 (91.54)</td>
</tr>
<tr>
<td>Laparoscopic subtotal cholecystectomies</td>
<td>2 (1.40)</td>
</tr>
<tr>
<td>Open subtotal cholecystectomies</td>
<td>10 (7.04)</td>
</tr>
</tbody>
</table>

### Table 2: Indications for SC

<table>
<thead>
<tr>
<th>Indications</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dense omental adhesions</td>
<td>12</td>
</tr>
<tr>
<td>Empyema of the gallbladder</td>
<td>4</td>
</tr>
<tr>
<td>Gangrene of the gallbladder</td>
<td>4</td>
</tr>
<tr>
<td>Perforation</td>
<td>1</td>
</tr>
</tbody>
</table>

### Table 3: Post-operative complications

<table>
<thead>
<tr>
<th>Complications</th>
<th>Number of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bile leak</td>
<td>3 (25)</td>
</tr>
<tr>
<td>Wound infection</td>
<td>2 (16.6)</td>
</tr>
<tr>
<td>Subhepatic collection</td>
<td>1 (8.3)</td>
</tr>
<tr>
<td>Bile duct injury</td>
<td>0</td>
</tr>
<tr>
<td>Duodenal injury</td>
<td>0</td>
</tr>
</tbody>
</table>

Elshaer et al. reported post-operative ERCP was performed in 4.1% of the patients and the indications were retained stones in 58.8% and persistent bile leak in 31.4%.⁹ In our
study, we performed in 25% of the patients and were mainly for the persistent bile leak.

CONCLUSION

SC is a safe, effective, and definitive procedure in cases with unclear Calot’s anatomy where it achieves decreased morbidity rates compared to those reported with total cholecystectomy.

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Virus-specific Immunoglobulin M in Serum in Early and in Late Stages of Japanese Encephalitis Patients

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Abstract

Introduction: Japanese encephalitis (JE) continues to be endemic in West Bengal. The two districts of Bankura and Purulia have consistently reported cases to be occurring both sporadically as well as in the form of small outbreaks.

Aim of Study: To find out the diagnostic efficacy of serum immunoglobulin M (IgM) assay in JE patients within 5 days (early) and after 9 days of onset of symptoms.

Materials and Methods: The study was done from February 2014 to January 2015. Cerebrospinal fluid (CSF) and serum samples were collected on day 4 from patients admitted with acute encephalitis syndrome in pediatric and medicine wards. Another serum sample was collected on the 10th day of fever. The collected samples were analyzed for JE-specific IgM antibody by IgM antibody capture enzyme-linked immunosorbent assay (MAC-ELISA).

Results: During this period, 276 suspected patients were tested of which 31 (11%) were reactive in CSF. Out of them only 20 (64.5%) were reactive in 4th day serum sample, but 26 (83.8%) were reactive in 10th day serum sample. The positive predictive value of both 4th and 10th day serum samples were 100%, but their negative predictive values were 95% and 98%, respectively. The sensitivity of 4th day serum sample was 64.5% whereas sensitivity of 10th day serum sample was 84%.

Conclusion: A single serum sample collection in the early stage of disease missed almost one-third of cases. In many rural hospitals where CSF collection facility is not available, collection of paired sera is a good alternative for diagnosis of JE and also has immense epidemiological value.

Key words: Flavivirus, Immunoglobulin M antibody capture enzyme-linked immunosorbent assay, Japanese encephalitis

INTRODUCTION

A case of acute encephalitis syndrome (AES) is defined as a person of any age, at any time of year with the acute onset of fever not more than 5-7 days and a change in mental status (including symptoms such as confusion, disorientation, coma, or inability to talk) and/or new onset of seizures (excluding simple febrile seizures).¹ Japanese encephalitis (JE) is presently a major cause of “AES.” JE is leading cause of encephalitis in Asia, Asia Pacific, and Western Pacific countries. Now, an approximate 68,000 cases of JE occur globally each year with 20,000 deaths and nearly 15,000 disabled. The vast majority of cases (about 85%) occur among children <15 years and nearly 10% cases among those over 60 years. Mortality rates in locales with intensive care capabilities are 5-10%. In less-developed areas, mortality rates may exceed 35%. JE is reported from different parts of India. The disease is endemic in 18 states – Assam, Bihar, Haryana, Uttar Pradesh, Karnataka, West Bengal, and Tamil Nadu contribute about 80% of cases and death. In India, about 300 million people are at risk.² In West Bengal, JE has been reported consistently from Bankura and Purulia.
districts where it occurs both sporadically as well as in the form of small outbreaks.

JE is a viral disease caused by an enveloped single-stranded positive-sense RNA virus of the genus flavivirus family flaviviridae. It is a mosquito-borne disease transmitted by culicine mosquitoes, most notably by Culex tritaeniorhynchus and Culex vishnui and occasionally caused by Culex gelidus, Culex fuscocephala, Culex annulatus, and Culex annulirostris. It is a zoonotic disease, i.e. infecting mainly animals and incidentally man. It is transmitted mainly by pig to mosquito to pig cycle or aridied bird (herons, egrets) to mosquito to aridied bird cycle. Pigs are amplifiers of the virus. Birds are the reservoir of JE virus but are asymptomatic.

**Aim of Study**

This study aims to find out the diagnostic efficacy of serum immunoglobulin M (IgM) assay in JE patients within 5 days (early) and after 9 days of onset of symptoms.

**MATERIALS AND METHODS**

The study was done from February 2014 to January 2015 after obtaining ethical clearance from the institutional ethics committee. As isolation of JE virus from clinical specimens is difficult due to low level of viremia and rapid development of neutralizing antibodies against it, the confirmation of a suspected case of JE requires the detection of JEV specific IgM by IgM capture ELISA in clinical samples. This assay distinguishes between JE and Dengue virus, which are serologically cross-reactive. Cerebrospinal fluid (CSF) and serum samples were collected on day 4 from patients admitted with AES by lumbar puncture and venepuncture respectively from patients admitted to Paediatric and Medicine wards. Another serum sample was collected on the 10th day of fever. The collected samples were analyzed for JEV-specific IgM antibody by IgM antibody capture enzyme-linked immunosorbent assay (MAC-ELISA) using kits from NIV (Pune). Optical density value was taken by ELISA reader. A positive test in CSF sample was taken to be gold-standard for our study.

**RESULTS**

During this period, 276 suspected patients were tested of which 31 (11%) patients were reactive in CSF tested.

Among the 31 reactive patients, 15 (48%) were female and 16 (52%) were male (Figure 1).

Of 31 patients, 13 (42%) were in the pediatric age group (0-12 years). Out of the 18 adults (>12 years) 16 patients (52%) were <60 years of age while rest 2 patients (6%) were >60 years (Figure 2).

The percentage of IgM positive JE was found to be high during the months of September and October. Among 29 cases, 11 cases occurred in September (38%), and 9 cases occurred in October (31%) (Figure 3).

Out of 31 patients, only 20 (64.5%) patients were reactive in 4th day serum sample. Out of 31 patients, 26 (83.8%) patients were reactive in 10th day serum sample (Figure 4).

The positive predictive value of both 4th day and 10th day serum sample were 100% but negative predictive value of 4th day and 10th day serum sample were 95% and 98%, respectively (Figure 5).

**DISCUSSION AND CONCLUSION**

Between February 1, 2014, and January 31, 2015, 276 patients with clinical features of AES were tested for JE by IgM MAC-ELISA at Bankura Sammilani Medical College and Hospital.

Figure 1: Distribution of reactive and non-reactive patients

Figure 2: Distribution of patients according to sex
Among 276 patients, 31 (11%) were reactive for JE IgM MAC-ELISA in CSF sample, which was corroborative with the findings of the study conducted by Bandyopadhyay et al. at Virology Laboratory at the Calcutta School of Tropical Medicine and Chakraborty et al. at Swasthya Bhavan.7,8 IgM positivity was 16 (52%) in males and 15 (48%) in females. Hence, there is no gender predilection which is similar to other studies.7,8

In this study, the sensitivity of 4th day serum sample was 64.5% whereas sensitivity of 10th day serum sample was 84%. In a study from 1987 to 1989 by Chow et al. showed that positive rate was 65.7% in serum sample collected within the first week.9 Hence, there is a marked increase in sensitivity of second serum sample. A single serum sample collection in the early stage of disease missed almost one-third of cases. In many rural hospitals where CSF collection facility is not available, collection of paired sera is a good alternative for diagnosis of JE. Furthermore, paired serum sample has immense epidemiological value if we collect sera on 4th day or 10th day on onset of fever. Many cases which are undiagnosed at early stage of disease by single serum ELISA can be detected by paired serum sample. Hence, paired serum sample has immense epidemiological value if we collect sera on 4th day or 10th day on onset of fever.

REFERENCES

Comparative Study of Functional Outcome Analysis and Extent of Paraspinal Muscle Damage between Lumbar Spinous Process Splitting Decompression and Conventional Midline Decompression for Lumbar Canal Stenosis

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Abstract

Introduction: It occurs in middle- and old-age people with back pain and lower extremity pain precipitated by walking and standing lumbar canal stenosis causes signs of intermittent neurogenic claudication. Conservative management provides only short-term relief. Surgical option includes midline decompression by laminectomy. This method involves damage to the integrity of posterior complex of spine and elevation of paraspinal muscles from the spinal process which results in paraspinal muscle atrophy, spine extensor weakness, and iatrogenic instability of the spine.

Aim: The aim of this study was to find the functional outcome and the extent of paraspinal muscle damage between lumbar spinous process splitting decompression and conventional midline decompression (CMD) by laminectomy.

Methods: Twenty patients with degenerative lumbar canal stenosis are randomly divided into two groups such as CMD (laminectomy) and lumbar spinous process splitting decompression.

Results: In our study, among the patients who underwent lumbar spinous process splitting decompression, 40% had an excellent recovery rate according to the Japanese Orthopaedic Association score in contrast to 30% who underwent conventional decompression.

Conclusion: Lumbar spinous process splitting decompression provides minimal exposure for decompression in lumbar canal stenosis while preserving musculoligamentous attachments of the posterior elements of the spine and good post-operative results.

Key words: Conventional decompression, Lumbar canal stenosis, Spinous process splitting decompression

INTRODUCTION

Lumbar spinal canal stenosis is a clinical syndrome of back or leg pain with characteristic provocative and palliative features, which occurs due to narrowing of the spinal canal, nerve root canal, and the intervertebral foramen. Lumbar spinal canal stenosis has been regarded as “the forgotten spinal disease” for more than 100 years. This neglect occurred because of the association between herniated intervertebral discs and sciatica that received most of the attention after it was discovered by Barr and Mixter in the year 1934. However, lumbar spinal canal stenosis was not widely understood until Verbiest in 1954 described the classic finding of this syndrome. It occurs in middle-aged and older adults with back pain and lower extremity pain precipitated by standing and walking and aggravated by hyperextension. The secondary degenerative changes that further narrow the lumbar spinal canal precipitated...

symptoms. Lumbar spinal canal stenosis now is an accepted clinical entity. The degenerative lumbar spinal canal stenosis is due to thickening of interspinous ligament, ligamentum flavum, and facet joint hypertrophy. Lumbar spinal canal stenosis causes signs of intermittent neurogenic claudication, and it can lead to decreased quality of life. Conservative measures provide relief from symptoms for a shorter period only, but finally surgical decompression of the neurovascular structures will be needed. At present, various surgical options are available. The surgical options include midline decompression by laminectomy, different kinds of unilateral and bilateral fenestrations, and partial or full hemilaminectomies. Nowadays, it is not very clear which of the techniques is the most favorable and their long-term results are inconclusive. Moreover, the elderly patients have associated comorbid conditions compared to younger generation problems regarding various surgical procedures need to be addressed. Such choices of procedure are important because greater invasiveness associated with higher mortality, greater complications but generally similar clinical benefits use. Hence, the risk versus benefit ratio was carefully weighed before choosing the surgical procedure. Standard conventional laminectomy is the commonly performed surgical treatment for degenerative lumbar canal stenosis. This method involves damage to the integrity of posterior complex of spine and elevation of paraspinal muscles from the spinous processes which results in paraspinal muscle atrophy, spine extensor weakness, iatrogenic instability of spine, and possibly, “Failed back syndrome.” Lumbar spinal stenosis decompression by spinous process splitting laminectomy method was thought to avoid paraspinal muscle damage and extensor weakness by preserving muscle and ligamentous attachments to the spinous processes. We present a prospective randomized control study comparing the outcome of lumbar spinous process splitting decompression and conventional midline decompression (CMD) by laminectomy in 20 patients who underwent surgery for lumbar spinal canal stenosis.

Aim
The aim of the study was to analyze the functional outcome and the extent of paraspinal muscle damage between lumbar spinous process splitting decompression and CMD by laminectomy to preserve the posterior musculoligamentous complex.

MATERIALS AND METHODS
This is a prospective study conducted in the Department of Orthopaedics, Tirunelveli Medical College Hospital. Institutional Ethics Committee approval and informed consent from the patients were obtained. Patients meeting the following inclusion criteria were enrolled for the study; 20 patients with degenerative lumbar canal stenosis are randomly divided into two groups such as CMD (laminectomy) and lumbar spinous process splitting decompression.

Inclusion Criteria
1. Degenerative LCS affecting 3 or less levels,
2. Typical neurogenic claudication symptoms,
3. Magnetic resonance image demonstrating good clinical correlation, and
4. Failure of conservative methods of treatment for a minimum period of 6-month.

Exclusion Criteria
1. Spondylolisthesis with slip Grade 2 or greater (Meyerding grade),
2. Instability at the level of stenosis (as defined by >3 mm translation or >10° angular change on flexion-extension lateral radiographs),
3. Associated symptomatic cervical or thoracic stenosis,
4. Multiple-level canal stenosis,
5. Spinal canal stenosis due to congenital, traumatic, and iatrogenic causes,
6. Presence of spinal disorders (ankylosing spondylitis and neoplasms),
7. Comorbidities (such as cardiopulmonary insufficiency, peripheral neuropathy, peripheral vascular disease, prior lumbar spine surgery, and severe hip or knee disease).

RESULTS
Twenty patients were followed up for 6-18 months with a mean average follow-up of 11.4 months. Data of 10 patients (5 men and 5 women) in the lumbar spinous process splitting decompression group and 10 patients (4 men and 6 women) in the CMD group were included in the final analysis. The mean age was 58.9 (range: 54-65) years for the lumbar spinous process splitting decompression group and 60.4 (range: 55-65) years for CMD group. The mean number of decompressed levels was 1.30 for CMD group and 1.20 for lumbar spinous process splitting decompression (Table 1). Average ambulation time of Lumbar spinous process splitting decompression was 4.45 days, lesser than CMD group (Table 2).

Japanese Orthopaedic Association Score (JOA Score)
In the lumbar spinous process splitting decompression group, JOA score improved from pre-operative mean 5.4-12.50 at the last follow-up. In the CMD, the score improved from pre-operative mean 5.3-11.3 at the last follow-up. The mean JOA recovery rate was 73.96% for the lumbar spinous process decompression group and 61.86%
for the CMD group. There was no statistically significant difference between the two groups.

Notably, 70% of CMD group had good or excellent outcome while 100% of unilateral decompression group had good or excellent outcome (Table 3).

**Neurogenic Claudication Outcome Score (NCOS)**
NCOS score improved from a mean pre-operative score of 28.30-66.10 at last follow-up in the lumbar spinous process decompression group and from 27.60-65.10 in the CMD group. Statistical analysis did not reveal any significant difference between groups (Table 4).

**Visual Analog Scale for Back Pain (BPVAS)**
At the last follow-up, the mean BPVAS score for the lumbar spinous process decompression group was 2.7 and for CMD group, it was 3.70. Statistical analysis revealed a significant difference between the two groups (Table 5).

**Neurogenic Claudication VAS (NCVAS)**
Mean NCVAS score at the last follow-up was 2.10 for lumbar spinous process decompression group and 2.0 for the CMD group. There was no significant difference between the two groups.

**DISCUSSION**
With 20 patients, we have presented the prospective, randomized control study comparing the short-term functional outcome of lumbar spinous process splitting decompression with CMD by laminectomy. The two groups of our study were comparable to each other in terms of patient characteristics such as age and sex. Degenerative canal stenosis affects more females than males. In our study, the complications were few and were comparable between groups. Other complications such as dural tear (one patient 10%) and wound dehiscence (one patient 10%) were observed equal in frequency in both the groups. The average ambulation time in lumbar spinous process splitting decompression (4.45 days) was less when compared to CMD by laminectomy (6.52 days). Post-operative radiological evaluation to assess the instability was not routinely performed and when the clinical symptoms and signs of back pain and claudication persist, X-rays of lateral view, flexion, and extension view were taken to rule out post-operative instability. One patient developed instability in the last follow-up in CMD group, later posterior fusion and pedicle screw instrumentation were done. The complications are in the expected frequency. No case of new neurological deficit was observed following surgery in both the groups. Hence, lumbar spinous process...
splitting decompression appears to have safety profile comparable with CMD regarding early mobilization and decreases back pain VAS due to preservation of posterior musculoligamentous complex.6

CONCLUSION

In our study, lumbar spinous process splitting decompression provides minimal exposure for decompression in lumbar canal stenosis while preserving musculoligamentous attachments of the posterior elements of the spine and good post-operative results after 1 year with favorable outcomes of at least 70% on the JOA score and NCOS. With both these surgical techniques, a significant improvement in the outcome after surgical decompression could be demonstrated. There was no significant difference between the lumbar spinous process splitting decompression and midline decompression by laminectomy techniques regarding the later outcome. However, the minimal invasive procedure seems to be more favorable in elderly patients in the early post-operative period. However, long-term results still need to be evaluated further.

REFERENCES


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External versus Endonasal Dacryocystorhinostomy: A Comparative Study

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Abstract

Introduction: In past years, external dacryocystorhinostomy has been considered the gold standard in terms of functional outcome for treatment for nasolacrimal duct obstruction. In comparison, interest in the use of the recently developed endonasal dacryocystorhinostomy procedure has been rekindled because of advances in instrumentation.

Materials and Methods: This clinical study was conducted at the Department of ENT, KBN Medical College and Department of Ophthalmology, MR Medical College, Kalaburagi during the period between June 2015 and November 2015.

Results: A total of 50 patients were included in the study which were respectively selected by the authors for the procedure. 30 patients (60%) underwent external dacryocystorhinostomy and the remaining 20 (40%) underwent endonasal dacryocystorhinostomy.

Conclusion: However, there is not much to compare between the two approaches as far as a primary surgery is concerned in terms of success rate as both of them give equally good results in good hands.

Key words: Dacryocystorhinostomy, Endonasal endoscopy, Epiphora, Nasolacrimal duct obstruction

INTRODUCTION

Nasolacrimal duct obstruction inhibits the flow of tears from the eye to the nose, leading to symptoms of epiphora. The clinical spectrum of epiphora ranges from the occasional trickle to chronically irritating overflow of tears. Epiphora results from a disruption in the balance between tear production and drainage.¹

The usual causes of stenosis of the nasolacrimal drainage system include chronic or acute inflammation, trauma, and congenital malformations.²⁴ Tears form the conjunctival sac pass through the lacrimal puncta in the upper and lower lids to the upper and lower lacrimal canaliculi and then to the common canaliculi to empty into the lacrimal sac located in the lacrimal fossa. From the lacrimal sac, tears pass to the nasolacrimal duct along the lateral wall of the nose into the inferior meatus.

Females are affected more than males, probably due to smaller anatomical dimensions of the nasolacrimal system in the former. This nasolacrimal duct obstruction was typically treated using external dacryocystorhinostomy (DCR). Also with the advent of nasal endoscopy, the endonasal approach has also become a good treatment option. A review is made here from the literature as well as personal experience on the possible outcomes and complications of these surgical techniques and is discussed and compared.

Patient Selection and Evaluation

Patients with a history of epiphora, dacryocystitis, or both should be treated through a standard clinical workup that includes the documentation of the tearstrip level, examination of the eyelids for punctual malpositioning, compression over the lacrimal sac to observe mucoid or purulent reflux and irrigation through the canaliculi to document the patency of the lacrimal outflow tracts, along with examination of the nasal cavity.⁵⁶ Obstructions observed with on syringing and probing, or lacrimal scintigraphy are used for the diagnosis of nasolacrimal duct obstruction.⁷ Lacrimal scintigraphy is a physiological test⁷ that is likely to yield abnormal results in patients with functional nasolacrimal duct obstruction.
Treatment
DCR involves the creation of an alternative route for the drainage of tears between the lacrimal sac and nasal cavity, bypassing the nasolacrimal duct. This can be achieved either by an external approach or through the nasal cavity using an endoscope (endonasal approach).

External DCR
A small incision made 1 cm from the medial canthus to reduce the risk of scars and avoid the angular vessels. The peristomeum at the anterior lacrimal crest is incised, and subsequently, the lacrimal fossa is entered (Figure 1). The lacrimal and maxillary bones are removed using Kerrison Rongeurs to create a large rhinostomy. The lacrimal sac and nasal mucosa are opened longitudinally, the sac contents are examined, and a silicon stent is routinely inserted and tied loosely to prevent cheese wiring of the canaliculi.

Endoscopic Endonasal DCR
A 0-degree nasal endoscope is used to visualize the anatomy of the lacrimal area just anterior to the middle turbinate in the lateral wall of the nose. The mucosa elevated from the lacrimal bone (Figure 2). Kerrison punch is used to remove the lacrimal bone to identify the nasolacrimal duct which is followed superiorly to the sac. Then the sac is incised and contents evacuated. Silicon stents can be placed from the punctum into the nasal cavity to maintain the patency.

MATERIALS AND METHODS
This clinical study was conducted at the Department of ENT, KBN Medical College and Department of Ophthalmology, MR Medical College, Kalaburagi between June 2015 and November 2015. The standard protocol as mentioned above to diagnose and select patients for surgery was followed including syringing of the sac. The fitness for surgery was established for all the patients. The external approach was done by the ophthalmologist at MR Medical College and the endoscopic approach by the ENT surgeon at KBN Institute of Medical Sciences. The age groups of the patients ranged from 10 years to 70 years. Of the patients female: male ratio was found to be 4:1.

RESULTS
A total of 50 patients were included in the study which were respectively selected by the authors for the procedure. 30 patients (60%) underwent external dacryocystorhinostomy, and the remaining 20 (40%) underwent endonasal dacryocystorhinostomy. The results were evaluated for 6 months depending on the symptom improvement and patients’ quality of life.

The aim of the study was to compare the outcomes and complications involving both groups.

Of the 30 patients who underwent an external DCR, 2 patients (6.6%) had troublesome intraoperative bleed, 4 patients (13.33%) had a recurrence of epiphora suggesting a stenosis of the ostomy, 1 patient (3%) had a bad scar formation. The remaining patients (76%) had a good improvement in terms of symptom-free life.
In the next group who underwent an endonasal approach, 5 patients (25%) had a high location of the sac which resulted in poor visualization. 2 patients (10%) had recurrence of symptoms in form of epiphora, and another 1 patient (5%) had nasal obstruction postoperatively as a result of synechiae (Table 1).

REFERENCES


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Evaluation of Non-contiguous Spine Fractures and Extraspinal Injuries in Spine Fracture Patients: A Prospective Study

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Abstract

Introduction: A prospective study undertaken at a tertiary level (level 1 trauma center) hospital in India.

Purpose: This study was undertaken with a view to evaluate patients of spine fractures (cervical, dorsal, and lumbar spine) and describe commonly occurring associated additional non-contiguous spine fractures and associated extraspinal injuries in these patients. Spine fractures commonly occur following significant trauma, and these patients present with other non-contiguous additional spine fractures at a different level and also with extraspinal injuries. This association is not well documented.

Materials and Methods: This ongoing prospective study involves all patients \( n = 50 \) received at the casualty with traumatic spine fracture. These are evaluated with whole spine computed tomography (CT) scans with proper consent. The fractures were classified with AO classification, and neurological assessment was done. Extraspinal injuries and fractures (head, thoracic, abdominal/pelvic, and non-spinal orthopedic disorders) with the mechanism of injury were documented.

Results: A total of 50 patients were enrolled and their CT scan studied. The primary spine fractures were cervical = 26, lumbar = 12, and dorsal = 12. AO classification revealed type A = 19, type B = 16, and type C = 15. The number of patients with associated additional spine injuries was 12 with cervical-dorsal, dorsal-dorsal, and dorsal-lumbar having a common association. The number of patients with extraspinal (head, chest, abdominal, and other orthopedic) injuries was 20 (cervical 16/20 and lumbar 4/20). All cervical spine injuries (100%) presented with neurological involvement; however, 75% of lumbar and dorsal spine injuries were associated with neurological involvement. Twenty-seven patients had fall from height and 23 patients met with road traffic accident, 90% patients of fall from height had associated other spine and extraspinal involvement, while only 30% of road traffic accident patients presented with other injuries.

Conclusion: The study helps us to understand the associated spine and extraspinal injuries in traumatic spine fracture. This prompts for a thorough evaluation of spinal fracture patients for non-contiguous spine fractures and other extraspinal injuries. The results highlight the mechanism of injury as a predictor for associated injuries and that cervical spine fracture patients were commonly associated with extraspinal and additional non-contiguous spine injuries.

Key words: Extraspinal injuries, Mechanism of injury, Non-contiguous spine fracture, Spine fractures

INTRODUCTION

Spine injuries are a result of high-velocity trauma, in which high forces cause spine fractures with or without neurological involvement, these forces may also lead to multiple trauma.¹² The overall mortality in such cases is around 17%. Most common mechanism of injury in these cases is road traffic accidents and fall from height though uncommon causes such as sports injuries and gunshot injuries also have been reported.³⁵

Non-contiguous spine fractures and extraspinal injuries are commonly associated with spine injuries.¹³ In the emergency department, diagnosis of associated injuries becomes difficult and challenging due to reduced level of consciousness and sensory impairment due to neurologic deficit. These injuries get overlooked.
Cervical injuries are accompanied by non-contiguous thoracolumbar spine fractures or other extraspinal injuries, namely, extremities, intrathoracic, intra-abdominal, pelvic, oral maxillofacial, and intracranial. The incidence of non-contiguous spinal fractures varies from 1.6% to 16.7%, ranging from 3% to 8%, and that of extraspinal injuries in almost 50%-52%.

Thorough evaluation of patients in the emergency department with a spine fracture is mandatory for early detection and treatment, and also evaluation for associated non-contiguous spine and extraspinal injuries in terms of examination for crepitus, wound, hematomas, deformity, neurological charting, and appropriate diagnostic imaging such as trauma series radiographs, computed tomography (CT) scan, and magnetic resonance imaging (MRI).

We undertook this study to understand the association of non-contiguous multiple level spine fractures and extraspinal injuries [extremity fractures, head, thoracic, abdominal, and pelvic] in spine fracture patients at a level 1 trauma center, with an aim to sensitize the trauma team to not miss any associated fractures in a spine fracture patient (depending on the location, type, and mechanism of injury). Missing such an injury may result in major neurological complications or subsequent pain, instability, and/or deformity.

**MATERIALS AND METHODS**

This prospective study was undertaken at a level 1 trauma center from June 2015 to May 2016 (1 year). Ethical approval was taken at the commencement of the study. The study enrolled all the patients in the emergency department with a primary spine fracture. Diagnoses were made with plain radiograph using the lateral and anteroposterior views.

All patients underwent plain radiograph, CT scan of whole spine, neurological charting, and classification as per the AO classification.

Patient data included age, sex, mechanism of injury, primary spine fracture, non-contiguous spine fracture, and extraspinal injury [head and intracranial injury, intrathoracic, intra-abdominal, pelvic, and orthopedic extremity injury]. Number of patients enrolled were 50.

For the purpose of this study, primary spine fracture was the fracture with which patient presented and the neurological deficit could be attributed to it. The secondary or the non-contiguous spine injury was one which was evident on CT scan or MRI, the one to which neurological deficit could not be attributed completely and separated by at least three normal intervening vertebra from the primary spine fracture or subluxation/dislocation.

The mechanism of injury was grouped into road traffic accident, fall from height, and others. All spine fractures were classified as per the AO classification, and neurological charting was done in all patients. Extraspinal injuries were head and intracranial, intrathoracic, intra-abdominal, pelvic, and extremity orthopedic fractures. This study forms part of the larger ongoing study to understand the association.

**RESULTS**

A total of 50 patients were enrolled and their CT scan studied. The primary spine fractures were cervical = 26, lumbar = 12, and dorsal = 12. AO classification revealed type A = 19, type B = 16, and type C = 15 (Figure 1). The number of patients with associated additional -non-contiguous spine injuries was 12 with cervical-dorsal and dorsal-dorsal, having a common association. Only one case of lumbar with sacral association was found (Figure 2). The number of patients with extraspinal (head, thoracic, abdominal, and other orthopedic extremity) injuries was 20 (cervical 16/20 and lumbar 4/20) (Figure 3). All cervical spine injuries (100%) presented with neurological involvement; however, 75% of lumbar and dorsal spine injuries were associated with neurological involvement. Twenty-seven patients had fall from height and 23 patients met with road traffic accident, 90% patients of fall from height had associated other spine and extraspinal involvement, while only 30% of road traffic accident patients presented with other injuries (Figure 4). Statistical test applied was Chi-square test, and no significance ($P > 0.05$) was found between non-contiguous spine injury or extraspinal injury vis-a-vis primary spine fracture or mechanism of injury.

**DISCUSSION**

Saboe et al. in their series of 508 spine trauma patients classified associated injuries by anatomic site and its content. Associated injuries were 248 (head [26%], chest [24%], and long bone [23%]). Motor vehicle accidents and occupational injuries (falls account for a substantial portion) were the most common etiology of injury. Persons with thoracic and lumbar fractures had more associated injuries compared with those having cervical fractures. Age, gender, and type of neurological deficit were not significantly related to the occurrence of associated injuries. Motor vehicle accidents lead to high-velocity trauma and impacts thus posing greater risks for associated injuries.
When the vehicle decelerates, the inertia of the body continues to move the body forward; the chest impacts the steering wheel, the head impacts the windshield, and the legs hit the dashboard, which leads to multiple injuries. Falls from a height, the second leading cause of associated fractures, often involve a feet first landing. This axial loading contributes to lumbar spine, long bone, and pelvic injuries.

Wang et al.\textsuperscript{16} in their study showed that among the younger patients, the most common region suffering multiple level non-contiguous spine fracture (MLNSF) was the thoracic + lumbar region (35.9%), followed by the cervical + thoracic region (23.9%), whereas among the elderly patients, the thoracic + lumbar region (52.9%) followed by the thoracic + thoracic region (35.7%) were the most commonly injured. Fall from high heights were the most common accident mechanism in their study.

Korres et al.\textsuperscript{11} noted that the cervical + cervical region was the main region suffering MLNSF (28.4%), followed by the thoracic + lumbar region (24.7%); these regions are the most commonly affected, most likely because motor vehicle accidents were the main mechanism of these fractures (58.0%).

Hadden and Gillespie\textsuperscript{13} reported an incidence of 24% and Henderson et al.\textsuperscript{12} have reported that 15.2% of multilevel spinal fractures of the entire column contained non-contiguous injuries. Qaiyum et al.\textsuperscript{17} have reported a high incidence of non-contiguous spinal injuries (18 in a group of 110 spinal injury patients). Gupta and el Masri\textsuperscript{9} have found that multilevel injuries most commonly involved the lower cervical and cervicothoracic levels.

Chu et al.\textsuperscript{15} stated that the prevalence of associated injuries was as follows: Head trauma, 17.2%; chest injury, 2.9%; abdominal trauma, 1.5%; pelvic injury or fracture, 2.5%; upper limb fracture, 4.4%; and lower limb fracture, 5.9%.

Martin et al.\textsuperscript{18} showed that risk factors for the presence of cord injury in the pediatric trauma population are...
RTC, presence of head, chest, or multiple injuries, and depressed level of consciousness. The prevalence of multilevel fractures (7.4% of all fractures) is sufficiently high to warrant whole spine radiography in the presence of a fracture. Clinicians from all specialties involved in the care of the injured child should be aware of these findings to reinforce the need for careful assessment in the management of those at highest risk of spinal injury.

Choi et al. 19 reported that 28% patients of cervical spine injuries were accompanied with non-contiguous cervicothoracic junction or upper thoracic spinal injuries. The most common mechanism of injury in these patients was axial compression injury, Shear et al., 20 Ryan and Henderson, 21 and Qaiyum et al. 17 also reported a higher incidence of non-contiguous thoracic spine injuries in patients with cervical spine injuries.

In our study, patients with cervical spine injuries were associated with a maximum number of non-contiguous spine injury (dorsal, 4) and extraspinal injury (16 out of 20), the most common injury was fall from height, and these were associated with non-contiguous spine and extraspinal injury, which was similar to findings of Miller et al. 22

Limitations of our study were that the study had 50 enrolled patients of spine injury, which may be small number. However, this forms part of the continuous ongoing study in our center, enrolling more patients.

In the emergency trauma unit, management of patients of spine injury mandates thorough quick assessment for A, B, and C and search for all possible spine and extraspinal injuries. After initial resuscitation, all potentially injured extremities need to be splinted to immobilize the limb and prevent further complications. All potentially fractured area should be screened by imaging including the adjacent proximal and distal joints. Patients should be monitored in the intensive care trauma unit closely for blood loss, respiratory compromise, and pulmonary contusion may not be apparent on initial examination but may become evident within a few hours of rib and/or sternum fractures. Similarly, subdural or epidural bleeding may evolve after an initially lucid interval. Spine injuries and dislocations of hip and knee demand priority treatments as any delay can affect the management and overall rehabilitation of the patient. An unrecognized secondary fracture may result in pain or extension of the neurological deficit, if distal to a primary fracture, causing an incomplete neurological deficit. High suspicion of such fractures, in patients with spinal fractures, particularly those with an impaired level of consciousness is warranted and should ensure detailed clinical and radiographic examination of the entire spine. Knowledge of mechanism of injury, type of primary spine fracture may be useful predictors in early recognition of multiple-level non-contiguous spine and extraspinal injuries, and possible prevention of their complication.

CONCLUSION

The study helps us to understand the associated non-contiguous spine and extraspinal injuries in traumatic spine fracture. This prompts for a thorough evaluation of spinal fracture patients for non-contiguous spine fractures and other extraspinal injuries. Mechanism of injury and level of spine fracture (cervical spine) are certain predictors for associated injuries.

REFERENCES


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Distal Tibial Fractures Managed with Locking Compression Plate using Minimally Invasive Plate Osteosynthesis Technique: A Case Study

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Abstract

Introduction: The fractures of distal tibia fixed with open reduction and internal fixation with plate osteosynthesis lead to skin necrosis and infection, eventually leading to malunion and implant failure. Minimally invasive methods are an alternative to these complications.

Aim: The aim of this study was to evaluate clinical, functional, and radiological outcomes after minimally invasive plate osteosynthesis using distal tibial locking compression plates (LCPs).

Materials and Methods: In this prospective study, unstable fractures of the distal tibia, Grade I and II compound distal tibia fractures, and fractures in which acceptable closed reduction can be achieved were included in the study.

Results: The results of our study are much in favor of minimally invasive plate osteosynthesis for distal tibia fractures. The post-operative pain was minimal, and ankle function was very good. Although we had marginal skin necrosis in four cases, none of the cases went for skin and soft-tissue procedures.

Conclusion: The minimally invasive plate osteosynthesis using LCP proves to be a safer technique in the management of distal tibial fractures without intra-articular comminution by providing good fracture healing, enabling rapid functional recovery, and avoiding major skin complications.

Key words: Distal tibia fractures, Locking compression plating, MIPPO technique

INTRODUCTION

Increased incidence of road traffic accidents claims most of the human mortality and morbidity in the current age. Hence, it forms the major epidemic of the modern world. Of these, fractures of distal tibia have been difficult to treat. In this era of increasing life expectancy, there is a rise of elderly population which increases the incidence of these fractures in osteoporotic bones, adding to the morbidity.¹-³ Due to the proximity of these fractures to the ankle, regaining full ankle movement may be difficult. Soft-tissue damage, comminution, and fracture extension into the ankle joint lead to unsatisfactory results in many cases regardless of the treatment modality. A better understanding of the injury patterns, availability of better implants, the concept of early surgical fixation, and early post-operative mobilization⁴⁵ of joint all have convincingly improved the functional outcome of the patient to a large extent. Main challenges encountered in the treatment of distal tibia fractures are:

- These are high energy fractures
- Associated with extremely damaged soft-tissue envelope
- Increased incidence of compound injuries
• Increased skin complications following surgery
• Comminution of the metaphysis and articular surface makes anatomical reduction difficult.

The resulting incongruence of articular surface leads to early secondary osteoarthritis. Open reduction and internal fixation (ORIF) with plate osteosynthesis lead to skin necrosis and infection in >40% of patients, eventually leading to malunion and implant failure. Intramedullary devices give inadequate stability due to wide medullary cavity leading to implant failure and screw breakage. For compound fractures, initial treatment with an external fixator for wound care followed by a definitive mode of internal fixation was advocated. This involves multiple procedures which increased economical and mental stress for the patients.

Aim
The aim was to study the clinical, functional, and radiological outcomes after minimally invasive plate osteosynthesis using distal tibial locking compression plates (LCPs).

MATERIALS AND METHODS

This is a prospective study conducted in the Department of Orthopaedics, Tirunelveli Medical College Hospital. The Institutional Ethics Committee approval and informed consent from the patients were obtained.

Inclusion Criteria
Age >20 years with closed, unstable fractures of the distal tibia, Grade I and II compound distal tibia fractures, and fractures in which acceptable closed reduction can be achieved were included in the study.

Exclusion Criteria
Grade III open fractures, irreducible fracture deformity, compartment syndrome/poor local skin conditions, and AO type C3 fractures (articular comminution) were excluded from the study.

Procedure
General measures
All the patients were received in the casualty department and were resuscitated. After the general condition improved, X-rays anteroposterior and lateral views were taken. A detailed pre-operative workup was done. All the cases were taken for surgical procedure as soon as possible. Those cases which were compound were initially treated with an external fixator.

Post-operative protocol
Limb elevation is recommended for the first 2-5 post-operative days. Physiotherapy with active assisted exercises is started immediately after the operation. Immobilization is not necessary. Clinical and radiological follow-up is advised after 2, 6, and 12 weeks. Based on the fracture consolidation, weight-bearing can be progressively increased from 6 to 8 weeks with full weight-bearing usually after 3 months. Supervised rehabilitation with intermittent clinical and radiographic follow-up is advisable every 6-12 weeks until recovery reaches a plateau, typically 6-12 months after injury. Weight-bearing radiographs are preferable to assess articular cartilage thickness. Angular stable fixation may obscure signs of non-union for many months.

Implant removal
Implant removal may be necessary in cases of soft-tissue irritation by the implant (plate and screws). The best time for implant removal is after complete remodeling, usually at least 12 months after surgery. In our study, all the patients were followed up carefully looking for any complication every fortnightly till fracture healing; and thereafter, every month up to 6 months; and every 6 months up to 2 years.

RESULTS

The overall results of our study are much in favor of minimally invasive plate osteosynthesis for distal tibia fractures. Eighty percent of the patients were between 30 and 50 years. Both male and female were included, the majority being males. The right side was common, and no bilateral cases were studied. Forty-four percent of the fractures were compound injuries. Forty-four percent of patients had associated injuries.

The mean duration between injury and surgery was 1 week. The average time for bone union was 18 weeks. Average ankle dorsiflexion was 20°. The results were excellent in 54%, good in 29% and fair in 17% of patients. The post-operative pain was minimal, and the post-operative ankle function was very good. Although we had marginal skin necrosis in four cases, they healed with regular dressings, and none of the cases went for skin and soft-tissue procedures.

The age groups of patient chosen for the study varied from 21 years to 51 years with the mean age of 36.5 years. The incidence of fracture was observed maximum between 30 and 40 years of age (Figure 1).

Eight among the eighteen cases had associated injuries which include four cases of patellar fracture, two cases of head injury, a case of supracondylar femur fracture and a distal radius fracture (Figure 2).

In our study, of the eighteen cases, there were eight cases of compound fractures (Figure 3). There were 10 cases of...
simple soft-tissue injuries forming 56% study population, 5 cases of Grade I compound fractures (28%), 3 cases of Grade II compound fractures (16%).

The time interval between the date of admission to fixation varied from 1 day to more than 2 weeks. Among these, six cases were operated within 1 day (34%), eight cases operated within less than a week (45%), and four cases operated after 2 weeks (21%). There was a mean delay of 1 week for surgery (Figure 4).

Patients were serially followed and evaluated both radiographically and clinically for signs of union. Eleven cases (66%) had signs of union within 16 weeks, four cases (23%) had signs of union within 16-24 weeks, and two cases (11%) had union of more than 2 months. The mean time for the bone union was 18 weeks (Figure 5).

Of the 18 patients included in the study, one patient died in the late post-operative period due to comorbid medical conditions. Other patients are evaluated and studied for the functional outcome (Table 1).

**DISCUSSION**

Ruedi and Allgower were the pioneers in ORIF of pilon fractures. They changed the outlook of management of distal tibia fractures in the early twentieth century. They achieved 74% good functional results following ORIF for distal tibia fractures. However, it was later recognized that all their cases were results of low-velocity injuries. They could not reproduce similar results following the principles of open reduction internal fixation in high-velocity injuries.

Helfet et al. introduced a two-stage minimally invasive plate osteosynthesis (MIPO) for distal tibia fractures. Stage 1 – fibular internal fixation and spanning external fixation of tibia, Stage 2 – limited ORIF for the distal tibia. 40% of their cases were intra-articular fractures, 60% were extra articular fractures. They had a 10% incidence of >5° valgus deformity and a 10% incidence of >10° recurvatum deformity. The average ankle dorsiflexion achieved was 14° and plantar flexion was 42°. Our study is a prospective study of 18 cases of distal tibial fractures treated with MIPO using specially designed distal tibial LCP. We did medial plating in all cases. The age group of our patients varied from 21 years to 51 years with the mean age of 36.5 years. 95% of our patients were males. Fifty percent of our cases were extra-articular and 50% intra-articular fractures. Forty-four percent of the fractures were compound in nature. Forty-four percent of our cases

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<td>Deep infection</td>
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![Figure 1: Age distribution of study patients](image1)

![Figure 2: Associated injuries in study patients](image2)

![Figure 3: Fracture types in study patients](image3)
Senthilkumar, et al.: MIPO with Locking Plates for Distal Tibia Fractures

had associated injuries. We did not perform preliminary external fixation as in the Helfet et al.’s series. We selected patients with apparently good soft-tissue condition. Thus, a single-stage MIPO protocol was followed, thereby providing a shorter duration of treatment. This single-stage procedure reduced the surgical insult, thus preventing complications such as wound dehiscence, sepsis, delayed or non-union. The MIPO technique enables a bridging fixation without disturbing the comminuted segments and the surrounding soft tissue. We used an anatomically prebent plate unlike Helfet et al., thus achieving stronger fixation in the metaphyseal region as it permitted insertion of 2 or 3 cancellous 6.5 mm screws in the small distal segment. The mean duration between injury and surgery in our study was 1 week. The average time for the bone union was 18 weeks. We achieved 54% excellent, 29% good, and 17% fair results. The average ankle dorsiflexion was 20°. All our cases were followed for a mean period of 14.2 months averaging from 28 months to 4 months. Of the 18 cases, bony union was obtained in 17 cases (one patient died during follow-up). Two cases had delayed union. The prime reason for the delayed union in both the cases was intact fibula which made the fracture site to distract. There was no case of implant failure. The average time of bony union was 18 weeks compared to 18.5 weeks by Shrestha et al. and 21.2 weeks by Hasenboehler et al. There were two cases that were complicated by ankle stiffness. Both the patients had poor compliance in the post-operative period which was the result of ankle stiffness. Shortening of <2 cm was seen in two patients, both of which had highly comminuted distal tibial fractures with diaphyseal extension. They were managed with heel raise. Although we had marginal skin necrosis in four cases, they healed with regular dressings, and none of the cases went for skin and soft-tissue procedures. Thus, with regard to functional outcome, our results are comparable to those of Shrestha et al. These results were possible because of proper case selection, perfect articular reconstruction, and meticulous soft-tissue handling.

CONCLUSION

Thus, minimally invasive plate osteosynthesis using LCP proves to be a safer technique in the management of distal tibial fractures without intra-articular comminution by providing good fracture healing, enabling rapid functional recovery, and avoiding major skin complications.

REFERENCES


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Clinical Profile of Renal Involvement in Acute Gastroenteritis Patients

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Abstract

Background: In India, acute kidney injury (AKI) due to diarrhea is not uncommon in adults and elderly people. Therefore, understanding of the clinical spectrum of the disease is needed to devise methods to improve the final outcome due to this problem.

Materials and Methods: We studied 100 patients admitted to medical wards who met the inclusion and exclusion criteria after obtaining the informed consent. The clinical and laboratory data were collected at admission and then on daily basis. All patients were followed up during the hospital stay and outcome of the patient was recorded (survivors/non survivors).

Results: Majority of patient in the present study are above fifth decade of age with a mean age of 53.50. The most common presenting manifestation in the patient with AKI following gastroenteritis is oliguria (30%). The common comorbid conditions noted in the present study are hypertension 7% and diabetes mellitus 6%. Hemodialysis was required in 30% of patients in the present study. The rest 70% were managed conservatively and had complete recovery. Mortality rate in our study was 4%.

Conclusion: AKI following acute gastroenteritis is not uncommon in developing country like ours. General improvement in standard of living, early use of oral rehydration therapy and fluid therapy to correct dehydration, and creating awareness in primary care physicians about the high incidence of AKI following gastroenteritis will solve this problem. Early detection and referral of these patients will bring down mortality in these patients. Hemodialysis plays an important role in improving the prognosis.

Key words: Acute kidney injury, Gastroenteritis, Hemodialysis

INTRODUCTION

Acute kidney injury (AKI), previously known as acute renal failure (ARF), characterized by sudden impairment of kidney function resulting in retention of nitrogenous and other waste products normally cleared by kidneys. AKI is not a single disease but, rather a heterogenous group of condition that share a common diagnostic features, especially increase in the blood urea nitrogen concentration and/or increase in plasma or serum creatinine concentration, often associated with reduction in urine volume. AKI can range in severity from asymptomatic and transient changes in laboratory parameters of glomerular filtration rate to overwhelming and rapidly fatal derangements in effective circulating volume regulation and electrolyte and acid-base composition of the plasma.\textsuperscript{1}

AKI complicates 5-7\% of acute care hospital admissions and up to 30\% of admissions to Intensive Care Unit (ICU). AKI is associated with a markedly increased risk of death in hospitalized individuals, particularly in those admitted to the ICU where inhospital mortality rates may exceed 50\%.

AKI is one of the most common clinical conditions encountered by physicians and nephrologists throughout the world. Due to the climatic conditions, overcrowding and poor socioeconomic factors, AKI in India differs from the world. There is no clear-cut data on the incidence, causes, and recovery from the disease. Most common causes of AKI in India are acute diarrheal disease, malaria, leptospirosis, snakebite, insect stings, intravascular hemolysis due to septicemia, chemical poisoning such as...
copper sulfate, vasmol, and pregnancy. Overall, these causes constitute 40% ARF in India.²

**MATERIALS AND METHODS**

**Source of Data**
The present study will be descriptive or exploratory in nature.

Patients who were diagnosed to have AKI following diarrheal disease and fulfill inclusion and exclusion criteria getting admitted to KR Hospital, Mysore, during December 2012 to September 2014.

**Method of Collection of Data**
a. Study design: Descriptive, non-interventional study in a tertiary care hospital
b. Sample size: 100
c. Sampling method: Purposive random sampling
d. Duration of study: December 2012 to September 2014.

**Inclusion Criteria**
1. All individual subjects above 18 years presenting with acute Gastroenteritis
2. Patients with progressive elevation serum creatinine >0.3 mg/dl or 50% higher than baseline within a 24-48 h period or reduction in urine output to 0.5 ml/kg/h for longer than 6 h.¹

**Exclusion Criteria**
1. Age younger than 18 years
2. Patients with chronic renal insufficiency
3. Patients who are initially considered as AKI but subsequently found to be suffering from long-standing renal disease.

**Method of Study**
Data will be collected using a pretested pro forma meeting the objectives of the study. Detailed history and necessary investigations will be undertaken. The purpose of the study will be explained to the patient, and informed consent obtained.

Patients are selected for study who satisfied all inclusion and exclusion criteria.

patients with progressive elevation of serum creatinine >0.3 mg/dl or 50% higher then baseline within a 24-48 h period or reduction in urine output to 0.5 ml/kg/h for longer then 6 h. Hyperkalemia is defined when sr. potassium >5.5 mEq/L with suggestive electrocardiogram changes.

The clinical and laboratory data are collected at admission and then on daily basis. Data recorded include patients’ characteristics, comorbid medical conditions, dialysis requirement, total duration of hospital stay, and final outcome.

To all patients necessary investigations are carried out.

**Statistical Analysis**
Data analysis and interpretation:
- Data was entered into Microsoft Excel and analyses were done using the Statistical Package for Social Sciences (SPSS) for Windows software (version 18.0; SPSS Inc., Chicago, USA)
- The level of significance was set at 0.05.

**RESULTS**
The age of patients with AKI following gastroenteritis in our study ranged from 18 to 80 years with mean age 53.50 years. Majority of patients were after the fifth decade with peak incidence in the age group of 51-60 (28%) followed by 61-70 (25%).

AKI following gastroenteritis was more common among males (54%) when compared to females (46%).

Diarrhea, nausea and vomiting were present in all patients. Other common complaints were fever (33%) followed by oliguria (30%), pain abdomen (20%), dyspnea (13%). Neurological manifestation such as altered sensorium was present in 6% of cases. Uncommon manifestations are anuria (2%), abdominal distension (2%), and bleeding manifestations (1%).

In our study, 18% of AKI patients had associated comorbid conditions. Hypertension and diabetes were common with an incidence of 7% and 6%, respectively. Other comorbid conditions found were ischemic heart disease (IHD) (2%), pulmonary tuberculosis (TB) (1%), HIV (1%), malignancy (1%). Hypovolemic shock was the most common complication found in 61% of cases. Other frequent complications observed were anemia (19%), pulmonary edema (14), hyperkalemia (7%), and metabolic encephalopathy (7%). Other complications encountered in our study were volume overload (2%) and bleeding manifestation (1%).

Hb <12 g/dl was found in 19% of cases. The most common electrolyte abnormality observed in the present study is hyponatremia (22%), and hyperkalemia was noted in 7% of cases.

Urinalysis revealed albuminuria in 13% of cases and glucosuria in 6% of cases.
Out of 100 cases studied, 70 cases were treated conservatively and 30 cases required hemodialysis.

Most of the patients (52%) were discharged within 1 week, while 37% of patients were discharged between 1 and 3 weeks. 11% of patients were treated for more than 3 weeks.

Out of 100 cases studied, 96 patients were completely recovered and death occurred in 4%.

DISCUSSION

AKI is one of the most common clinical conditions encountered by physicians and nephrologists throughout the world. It is associated with significant mortality and morbidity. The incidence of in hospital AKI is difficult to estimate as there is no registry of its occurrence exists and because up to recently there was no standardized definition.

- The epidemiology of AKI differs tremendously between developed and developing countries owing to difference in demographics, economics, geography, and comorbid disease burden. Diarrheal illness, infections such as malaria and leptospirosis, envenomation from snake are common medical causes in developing countries including India. Complications of major surgeries, hemolytic uremic syndrome are common in developed countries
- The spectrum of renal failure in the adult population and the factors predicting poor outcome is not well defined in literature. Identification of risk factors and poor prognostic markers in these patients help in planning strategies to prevent AKI and to prioritize the utilization of sparse and expensive therapeutic modalities, especially in developing countries like ours
- There is very little data in the incidence of AKI in India due to the lack of central registry. The etiology, course, and outcome differ in various parts of India
- Prakash et al., noted that the main etiological factor for ARF encountered was volume depletion secondary to gastrointestinal fluid loss (35.2%). Similar results were found in Mahajan et al., where in it was noted that the volume depletion was the most common precipitating factor for ARF and in Jayakumar et al., study it was found that among the medical causes of ARF acute diarrheal disease was the most common
- AKI following volume depletion due to gastrointestinal fluid loss is common in India. Diarrheal diseases are common in India due to poor socioeconomic conditions, poor access to treatment, ignorance about personal hygiene, overcrowding, and climatic conditions which supports the propagation of infection. Lack of health-care facilities in rural areas and delay in correction of dehydration are probably responsible for AKI following gastroenteritis
- The present study consisted of 100 patients in the age group between 18 and 80 years with the mean age of 53.50 with 54% being male and 46% female. Majority of patients were >50 years of age. The similar age distribution is seen in Mahajan et al., and Kumar et al., studies. Sex distribution was different in Mahajan et al. study with males being 70.5%. This is probably due to varied etiology of the study; we have considered only one etiology that is gastroenteritis. Jayakumar et al., had similar sex distribution
- The clinical features observed in our study apart from diarrhea, nausea and vomiting which were present in all patients were fever 33%, oliguria 30%, pain abdomen 20%, dyspnoea 13%, altered sensorium 6%, anuria 2%, abdominal distension 2%, and bleeding manifestations 1%. The observations in Prakash et al. study were oliguria 47%, anuria 27%, central nervous system (CNS) manifestations 27%, bleeding diathesis in 10.3%, edema 12.9%, and pulmonary edema in 4.2%. The disparity in clinical features among the two studies may be due to varied etiology considered by Prakash et al.
- The comorbid conditions observed in the present study are hypertension-7%, diabetes mellitus-6%, IHD-2%, pulmonary TB-1%, HIV-1%, malignancy-1%. In Prakash et al. study, comorbidity was seen in 24 (52%) patients; hypertension (34.7%), diabetes mellitus (28.3%), and coronary artery disease (30.4%). The difference was probably because the study was done in ICU setting only
- The major complications noted in our study were hypovolemic shock-61%, volume overload-2%, pulmonary edema-14%, anemia-19%, bleeding manifestations-1%, hyperkalemia-7%, and metabolic encephalopathy-7%. The complications noted in his study were CNS manifestations in 27%, bleeding diathesis in 10.3%, edema in 12.9%, hyperkalemia in 2.7%, and pulmonary edema in 4.2%
- Out of 100 patients studied, 70 were treated conservatively and 30 required hemodialysis. The indication for dialysis is the presence of uremic symptoms, persistant extracellular volume expansion, and hyperkalemia unresponsive to conservative measures. The dialysis requirement was similar to other studies. In Mahajan et al., dialysis requirement was 33.5% and in study by Liano et al., it was 36%. Contrary to our study, dialysis requirement in Jayakumar et al. was 69% in the Program to Improve Care in Acute Renal Disease (PICARD) study was 64% and Shivakumar et al., was 83%. This was probably due to indications for dialysis considered and
### Table 1: Correlation between the line of management and different parameters

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SBP: Systolic blood pressure, DBP: Diastolic blood pressure, SD: Standard deviation, RR: Relative risk

### Table 2: Correlation between the line of management and different parameters

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<tr>
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<td>0</td>
<td>6</td>
<td>&lt;0.001 (F)</td>
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<td>70</td>
<td>94</td>
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<td>Oliguria</td>
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<td>66</td>
<td>94</td>
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<td>IHD</td>
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<td>0.51 (F)</td>
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<tr>
<td>Dehydration</td>
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<td>66</td>
<td>94</td>
<td>0.58 (F)</td>
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<tr>
<td>Absent</td>
<td>2</td>
<td>4</td>
<td>6</td>
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</tr>
<tr>
<td>X-ray</td>
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<tr>
<td>Congestion</td>
<td>14</td>
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<td>15</td>
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<tr>
<td>Normal</td>
<td>16</td>
<td>69</td>
<td>85</td>
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</tr>
</tbody>
</table>

IHD: Ischemic heart disease

Inbanathan and Lavanya: Clinical Profile of Renal Involvement in Acute Gastroenteritis Patients

- The prognosis of patients with AKI is directly related to cause of renal failure and, to great extent, to the duration of renal failure before therapeutic intervention. In our study, 70% recovered with conservative management and 26% recovered with hemodialysis. Mortality was 4%. Prognostic factors are older age, multiorgan failure (i.e., the more the organ that fails, the worse is prognosis), circulatory failure, vasopressor support, and need for renal replacement therapy (RRT).
- Our mortality rate was much lesser compared to other studies. In Shivakumar et al. study, the mortality rate was 53.7%. The most significant factor for high mortality was the time interval from the onset of ADD to the diagnosis of ARF. The difference in mortality rate was probably due to the increasing percentage of patients needed RRT (83%) in this study and varied indications for dialysis. Mortality in Mahajan et al., the study was 41.2%. Among the survivors, 22.7% had complete renal recovery, 31.1% had partial renal recovery while 8.6% remained dialysis dependent. The factors which were found to be associated with + increased mortality were; age ≥70 years, presence of previous chronic illness, ARF precipitated by cardiac failure and infection, need for RRT, oliguria, and increasing numbers of failed organs.

On comparing the groups taken up for medical management and hemodialysis it was found that there was no statistically significant difference between the groups with regards to age, gender, co-morbid conditions, blood pressure (both systolic and diastolic) at presentation and presence of dehydration. However statistically significant difference was found with regards to parameters like respiratory rate, blood urea, serum creatinine levels and with presence of oliguria, dyspnoea, altered sensorium and congestion in chest X-ray. This shows that the parameters which showed statistically significant difference were among the ones which influenced the line of management-patients were taken up for hemodialysis (Tables 1 and 2). This distinction of studying parameters which influence the line of management was not done in other studies reviewed.

### CONCLUSION

AKI following acute gastroenteritis is not uncommon in developing country like ours. General improvement in standard of living, early use of oral rehydration therapy, and fluid therapy to correct dehydration, and creating awareness in primary care physicians about the high incidence of AKI following gastroenteritis will solve this problem. Early detection and referral of these patients will bring down mortality in these patients. Hemodialysis plays an important role in improving the prognosis.
ACKNOWLEDGMENT

We express our gratitude to the HOD, department of medicine, faculty members, department of medicine of Mysore Medical College and Research Institute, Mysore for their immense help in conducting this study.

REFERENCES


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Glue versus Staples versus Sutures in Elective Wound Closures: A 3 years Comparative Study

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However, in the modern era alternative techniques of staples and glue are increasingly used as they are easy to perform, consuming less time and most importantly no additional bandaging/removal required.

The most widely used tissue adhesives nowadays come from homologs of alkyl cyanoacrylates. Initial attempts at cyanoacrylate-based tissue adhesive development have been associated with handling problems and histotoxicity. Octyl-2-cyanoacrylate (Dermabond, Ethicon, Inc.) is a recent cyanoacrylate derivative with eight alkyl constituents of the carboxyl group, which slows down degradation and by product release into the surrounding tissues. In addition, plasticizers have been added which make the adhesive bond stronger, durable, and allows full flexion of the skin. Its usage as a skin adhesive was first described by Quinn et al. and Toriumi et al. Cyanoacrylates have a number of advantages over conventional sutures such as their fast...
and painless application, rapid setting which reduces the total operating time and their antibacterial properties. Cyanoacrylate itself acts as a waterproof dressing and helps in reduction in the number of follow-up visits. As they do not require any needles, accidental needle stick injuries are prevented. The cyanoacrylate adhesive has suitable features for wound closure such as proper strength, tissue barrier capability, and binding ability in moist environment. However, there are certain disadvantages of cyanoacrylates such as their less tensile strength and chances of adhesive seepage if edges are not properly approximated. Multiple studies have shown equivalence of octyl cyanoacrylate to 5-0 skin sutures in esthetic facial surgery and repair of traumatic facial wounds. As the flexibility of octyl cyanoacrylate is better than conventional cyanoacrylate, it can also be used on irregular surfaces. Octyl-2-cyanoacrylate (Dermabond) use has been associated with a reduction in wound infection and it has been thought to act as a physical barrier to bacteria accessing the wound especially the Gram-positive bacteria.

MATERIALS AND METHODS

A 3 year prospective randomized controlled study was conducted on 180 patients comparing tissue glue (octyl-2-cyanoacrylate) with staplers and sutures in primary wound closures following elective groin surgeries in the Department of General Surgery in SRM Medical College AND Research Centre from May 2013 to May 2016. 180 patients in good general health undergoing open inguinal hernioplasty were selected for the study. Following these surgeries, after subcutaneous approximation patients were randomly selected to three groups, Group A, B, and C. In Group A, incisions were closed with octyl-2-cyanoacrylate using propen. Octyl-2-cyanoacrylate was applied in a thin layer over the entire wound, extending 5-10 mm beyond wound edge using propen as shown in Figure 1. The wound was allowed to dry for 20-30 s and the second layer and third layer was applied. No additional bandaging was done. In Group B, incisions were closed with nonabsorbable skin staples. In Group C, incisions were closed with nonabsorbable nylon subcuticular sutures (ethilon 3-0).

In all 3 groups, once the procedure is finished, the wound was dried and the time of start and finish of skin closure was noted using a stopwatch timer. The time taken for skin closure was noted. The post-operative pain was assessed at 12 h, 24 h, 48 h, and 7th day using visual analog scale of 0-100. 0 being no pain and 100 is worst pain possible as rated by patient themselves. The outcome of wound was assessed at 3rd, 5th, 7th post-operative day (OPD) using the standard wound asepsis scoring system from 0 to 10. The wound was assessed for cosmesis on the 7th OPD using modified Hollander cosmesis scale of 1-6. A score of 6 was considered as optimal while 5 or less as suboptimal. Any complications/infections, if the present were also observed in both the groups. On the follow-up, 1st and 3rd month, wound cosmesis is assessed by independent blinded observer and wound scoring done using visual analog scale of 0-100.

RESULTS AND DISCUSSION

Out of 180 patients, in any group, no irritation to skin or hypersensitivity reaction was observed. No generalized reaction or toxicity was noted either. The patients were randomly included in either of the three groups and analyzed using Chi-square test, Pearson’s correlation test, NPAR, and Kruskal–Wallis test, and the results were formulated.

Time Taken for Skin Closure
Quinn et al., in a series of 130 patients (220 s vs. 744 s; P < 0.001) and Matin (150 s vs. 360 s) found cyanoacrylate closures faster to perform than suture closures. Similarly, in this study, in Figure 2, mean time taken for skin closure in tissue glue group was 112.33 s when compared

Figure 1: Adhesive glue application

Figure 2: Time taken for skin closure in seconds
Post-operative Pain
Earlier studies by Zempsky et al., Arunachalam et al., and Quinn et al. have compared the post-operative pain using a visual analog scale and shown less post-operative pain following adhesive glue closures but had failed statistical significance. In our study, the mean postoperatively pain score as in Table 1, was less in tissue glue group with a highly significant $P = 0.000***$ compared to staplers and sutures at all specified time intervals.

Wound Asepsis and Complications
Data from five well-known trials contributed to the meta-analysis (Cheng and Saing, 1997; Dowson et al., 2006; Shamiyeh et al., 2001; Sinha et al., 2001; Switzer et al., 2003) found that there was an overall significant difference detected between the proportion of wounds with dehiscence, relative risk 4.29 95% confidence interval 1.45-12.73, favoring closure by suture with no evidence of heterogeneity ($\chi^2 = 0$). However, Blondeel et al., in 2007, in a series of 209 patients treated with octyl-2-cyanoacrylate and commercially available devices following closure of long surgical incisions concluded that the new tissue adhesive formulation provides epidermal wound closure equivalent to commercially available devices with a trend to decreased incidence of wound infection. In our study series, the results were in favor of tissue adhesives over staplers and sutures with a significant $P = 0.026*$ on POD-3, highly significant $P = 0.008**$ on POD-5 and an insignificant $P = 0.107$ on POD-7 as shown in Table 2. The overall wound complication rate (WCR) following tissue glue closures was 13.3% (8/60 cases), stapler closures were 23.3% (14/60 cases), and suture closures was 35% (21/60 cases) proving 2-octylcyanoacrylate closures less infective than staplers and sutures and with least WCRs.

Wound Cosmesis
Keng and Bucknall, in 1989, in a randomized series of 43 patients (46 wounds) whose operations involved a groin incision found that the glued wounds had consistently better cosmetic scores (mean score 4.71 at 4 weeks) compared to subcuticular wounds (mean score 4.00 at 4 weeks) with a $P < 0.05$. Although, Maartense et al., in 2002, and Dowson et al., in 2006, found no statistical difference on the use of tissue adhesives for laparoscopic port site closure incisions. In our study, the mean post-operative WCs as shown in Table 3, at POD-7 was 5.85 for glue, 5.45 for staplers, and 5.13 for sutures, at 1st month of follow-up, WCs was 80.00 for glue, 72.33 for staplers, and 66.33 for sutures and during 3rd month of follow-up, WCs was 95.83 for glue, 91.50 for staplers, and 84.83 for sutures with a highly significant $P = 0.000***$ favoring tissue glue closures with the best cosmetic results over staples and sutures.

CONCLUSION
Tissue glue (octyl-2-cyanoacrylate) application is easier, simple to perform and consumes significantly less time than staples and sutures. Octyl-2-cyanoacrylate gives, the best results in terms of less post-operative pain, wound asepsis, and cosmetic results. The concept of tissue glue is a safe, attractive, and effective alternate over other conventional methods of wound closures following elective surgical

Table 1: Post-operative pain score using VAS at specific time interval in each study group

<table>
<thead>
<tr>
<th>VAS</th>
<th>Glue</th>
<th>Mean</th>
<th>SD</th>
<th>Staplers</th>
<th>Mean</th>
<th>SD</th>
<th>Sutures</th>
<th>Mean</th>
<th>SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 h</td>
<td>63.83</td>
<td>10.75</td>
<td>67.50</td>
<td>09.50</td>
<td>78.50</td>
<td>08.19</td>
<td>0.000***</td>
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<td></td>
</tr>
<tr>
<td>24 h</td>
<td>41.67</td>
<td>13.04</td>
<td>43.33</td>
<td>12.17</td>
<td>55.50</td>
<td>09.46</td>
<td>0.000***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48 h</td>
<td>22.17</td>
<td>09.58</td>
<td>26.33</td>
<td>12.48</td>
<td>33.67</td>
<td>11.19</td>
<td>0.000***</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>POD-7</td>
<td>06.67</td>
<td>08.77</td>
<td>10.00</td>
<td>09.21</td>
<td>14.17</td>
<td>07.67</td>
<td>0.000***</td>
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Table 2: Post-operative wound asepsis score at specific time interval in each study group

<table>
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<th>WAS</th>
<th>Glue</th>
<th>Mean</th>
<th>SD</th>
<th>Staplers</th>
<th>Mean</th>
<th>SD</th>
<th>Sutures</th>
<th>Mean</th>
<th>SD</th>
<th>P value</th>
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</thead>
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<tr>
<td>POD-3</td>
<td>0.17</td>
<td>0.76</td>
<td>0.80</td>
<td>1.92</td>
<td>1.10</td>
<td>2.66</td>
<td>0.026*</td>
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<tr>
<td>POD-5</td>
<td>0.20</td>
<td>0.88</td>
<td>1.02</td>
<td>2.05</td>
<td>1.13</td>
<td>2.21</td>
<td>0.008**</td>
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<tr>
<td>POD-7</td>
<td>0.60</td>
<td>1.70</td>
<td>1.15</td>
<td>2.26</td>
<td>1.20</td>
<td>2.25</td>
<td>0.107</td>
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Table 3: Post-operative wound cosmesis score at specific time interval in each study group

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<th>WC</th>
<th>Glue</th>
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<th>SD</th>
<th>Staplers</th>
<th>Mean</th>
<th>SD</th>
<th>Sutures</th>
<th>Mean</th>
<th>SD</th>
<th>P value</th>
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</thead>
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<tr>
<td>POD-7</td>
<td>5.85</td>
<td>0.44</td>
<td>5.45</td>
<td>0.87</td>
<td>5.13</td>
<td>0.81</td>
<td>0.000***</td>
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<td></td>
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<tr>
<td>1 month</td>
<td>80.00</td>
<td>12.76</td>
<td>72.33</td>
<td>10.95</td>
<td>66.33</td>
<td>9.91</td>
<td>0.000***</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>3 months</td>
<td>95.83</td>
<td>8.69</td>
<td>91.50</td>
<td>9.17</td>
<td>84.83</td>
<td>7.92</td>
<td>0.000***</td>
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situations with a trend to decreased incidence of surgical wound infections.

REFERENCES


Source of Support: Nil. Conflict of Interest: None declared.
Clinical and Bacteriological Profile of Neonatal Sepsis in a Tertiary Care Hospital

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Introduction: Neonatal sepsis is defined as an invasive bacterial infection occurring in the first 4 weeks of life. The incidence of neonatal sepsis varies in different countries. It varies from 2.7/1000 live birth in developed countries to 10-15/1000 live birth in developing countries.

Aim: To determine the clinical and bacteriological profile of neonatal septicemia and the antibiotic susceptibility of organisms.

Materials and Methods: This is a retrospective study. All the case records meeting the eligibility criteria were analyzed for 1 year.

Results: The incidence of Gram-negative sepsis was more than Gram-positive sepsis. Klebsiella was the most common organism isolated. The Gram-negative isolates showed good sensitivity to piperacillin-tazobactam and ciprofloxacin and showed high resistance to ampicillin. The Gram-positive organisms showed high sensitivity to vancomycin.

Conclusion: Klebsiella and Staphylococcus aureus were the most common organisms isolated. The Gram-negative organisms showed good sensitivity to piperacillin-tazobactam and ciprofloxacin, while the Gram-positive organisms showed good sensitivity to vancomycin.

Key words: Antibiotics, Neonates, Sensitivity, Sepsis

INTRODUCTION

Neonatal sepsis is the most common cause of neonatal mortality. It is responsible for 30-40% of neonatal deaths in developing countries. The incidence of sepsis is 30 per thousand live births according to the National Neonatal Perinatal Database. Newborn babies develop sepsis due to various maternal and neonatal risk factors. Maternal risk factors are prolonged rupture of membranes, febrile illness in the mother during or within 2 weeks of delivery. Neonatal risk factors include prematurity, low birth weight, and asphyxia; neonatal sepsis is caused by various microorganisms such as Gram-positive and Gram-negative bacteria and yeasts. Neonatal sepsis can be divided into early onset sepsis (EOS) or late onset sepsis (LOS) depending on the onset is during the first 72 h or later. EOS occurs due to ascending infection following rupture of membranes or during the passage of the baby through the infected birth canal. EOS is mainly caused by group B streptococci and Escherichia coli. LOS occurs as nosocomial infection from the nursery or lying in ward. It is mainly caused by Gram-negative bacilli. The organisms causing neonatal sepsis differ in different places and the antibiotic susceptibility also varies. Antibiotic resistance has become a major concern worldwide. Early institution of antibiotic therapy based on rational protocol will go a long way in reducing mortality and morbidity in cases of neonatal sepsis. Hence, this study was undertaken to study the bacteriological profile and their antibiotic susceptibility pattern. The clinical profile of neonatal sepsis was also studied.

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Phone: +91-9941477367. E-mail: roshnii1997@gmail.com
Aim
To determine the clinical and bacteriological profile of neonatal septicemia and the antibiotic susceptibility of organisms.

MATERIALS AND METHODS
The retrospective observational study was performed in the Department of Pediatrics and Department of Microbiology at Government Kilpauk Medical College, Chennai, Tamil Nadu. Case records of babies who were admitted with features suggestive of neonatal sepsis during the period of January 2015 to December 2015 were analyzed. Babies, who had received antibiotics already, were excluded from the study. A detailed history including the risk factors, mode of delivery, gestational age, and clinical presentation was taken from the case records. Physical examination findings, as documented in the case records, were recorded. Blood samples were taken before starting the babies on antibiotics. Antimicrobial susceptibility was performed as per the CLSI guidelines.

Table 1: Distribution of neonates as per gender

<table>
<thead>
<tr>
<th>Distribution</th>
<th>Suspected cases</th>
<th>Culture positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of babies</td>
<td>398</td>
<td>143</td>
</tr>
<tr>
<td>Number of male babies (%)</td>
<td>247 (62)</td>
<td>86 (60)</td>
</tr>
<tr>
<td>Number of female babies (%)</td>
<td>151 (38)</td>
<td>57 (40)</td>
</tr>
</tbody>
</table>

Table 2: Distribution of neonates according to mode of delivery

<table>
<thead>
<tr>
<th>Type of delivery</th>
<th>Suspected cases</th>
<th>Culture positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of babies</td>
<td>398</td>
<td>143</td>
</tr>
<tr>
<td>Vaginal delivery (%)</td>
<td>167 (42)</td>
<td>66 (46)</td>
</tr>
<tr>
<td>LSCS (%)</td>
<td>231 (58)</td>
<td>77 (54)</td>
</tr>
</tbody>
</table>

LSCS: Lower segment cesarean section

Table 3: Distribution of neonates according to gestational age

<table>
<thead>
<tr>
<th>Gestational age (weeks)</th>
<th>Suspected cases (%)</th>
<th>Culture positive (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;37</td>
<td>227 (57)</td>
<td>87 (61)</td>
</tr>
<tr>
<td>&gt;37</td>
<td>171 (43)</td>
<td>56 (39)</td>
</tr>
</tbody>
</table>

Table 4: Distribution of neonates according to birth weight

<table>
<thead>
<tr>
<th>Birth weight (g)</th>
<th>Suspected cases (%)</th>
<th>Culture positive (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;2550</td>
<td>211 (53)</td>
<td>83 (58)</td>
</tr>
<tr>
<td>&gt;2500</td>
<td>187 (47)</td>
<td>60 (42)</td>
</tr>
</tbody>
</table>

Table 5: Clinical features

<table>
<thead>
<tr>
<th>Clinical feature</th>
<th>Suspected cases (%)</th>
<th>Culture positive cases (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor feeding</td>
<td>310 (78)</td>
<td>100 (70)</td>
</tr>
<tr>
<td>Respiratory</td>
<td>223 (56)</td>
<td>86 (60)</td>
</tr>
<tr>
<td>Seizures</td>
<td>28 (7)</td>
<td>20 (14)</td>
</tr>
<tr>
<td>Jaundice</td>
<td>48 (12)</td>
<td>13 (9)</td>
</tr>
<tr>
<td>Hypothermia</td>
<td>139 (35)</td>
<td>40 (28)</td>
</tr>
</tbody>
</table>

Table 6: Distribution of organisms isolated from blood culture

<table>
<thead>
<tr>
<th>Microorganism</th>
<th>n (%)</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Gram-positive isolates</td>
<td>46 (32.16)</td>
<td></td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>26 (18.18)</td>
<td></td>
</tr>
<tr>
<td>CONS</td>
<td>20 (13.98)</td>
<td></td>
</tr>
<tr>
<td>Gram-negative isolates</td>
<td>93 (65.03)</td>
<td></td>
</tr>
<tr>
<td>Klebsiella</td>
<td>53 (37.06)</td>
<td></td>
</tr>
<tr>
<td>Acinetobacter</td>
<td>21 (14.68)</td>
<td></td>
</tr>
<tr>
<td>Escherichia coli</td>
<td>12 (8.39)</td>
<td></td>
</tr>
<tr>
<td>Pseudomonas</td>
<td>7 (4.89)</td>
<td></td>
</tr>
<tr>
<td>Candida</td>
<td>4 (2.79)</td>
<td></td>
</tr>
</tbody>
</table>

CONS: Coagulase negative staphylococci

Table 7: Organisms causing EOS and LOS

<table>
<thead>
<tr>
<th>Organism</th>
<th>EOS</th>
<th>LOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Klebsiella</td>
<td>38</td>
<td>15</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>19</td>
<td>7</td>
</tr>
<tr>
<td>Acinetobacter</td>
<td>14</td>
<td>7</td>
</tr>
<tr>
<td>CONS</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>Escherichia coli</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>Pseudomonas</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Candida</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Total (%)</td>
<td>89 (62.2)</td>
<td>54 (37.8)</td>
</tr>
</tbody>
</table>

LOS: Late onset sepsis, EOS: Early onset sepsis, CONS: Coagulase negative staphylococci

RESULTS
A total of 398 babies were enrolled during the study period. In both suspected cases of sepsis as well as culture positive cases majority of the babies were male babies (Table 1). The incidence was more in babies delivered by cesarean section as compared to vaginal delivery (Table 2). Prematurity and low birth weights were major risk factors in both the groups (Tables 3 and 4).

Poor feeding, respiratory distress, and hypothermia were the major clinical features associated with both the groups (Table 5).

Blood culture was positive in 143 cases (35.9%). Among the culture positive cases, EOS was found in 62% of cases while LOS was found in 38% of the cases. Gram-
negative bacteria (65.03%) were more frequently isolated than Gram-positive bacteria (32.16%) Klebsiella pneumoniae (37.06%) was the most commonly isolated organism followed by Staphylococcus aureus (18.18%) and Acinetobacter (14.68%) EOS was caused by Klebsiella followed by S. aureus and Acinetobacter. LOS was caused by Klebsiella followed by coagulase-negative staphylococci (CONS). Candida was isolated in 4 cases (Tables 6 and 7).

Antibiotic sensitivity, in 43 Klebsiella cases; 76.74% cases are sensitive to piperacillin-tazobactam, 22% are sensitive to ciprofloxacin (Table 8).

### DISCUSSION

Sepsis is an important cause of neonatal morbidity and mortality. The incidence and the causative organisms of sepsis vary from place to place. A number of male babies were found to be affected as compared to the female babies in our study. Similar male preponderance has been reported in other studies also. The incidence of sepsis was found to be more in preterm babies and low birth weight babies. This is in accordance with other studies that have been done previously. Presentation of sepsis varies depending on the severity of disease process and the immune status of the baby. Poor feeding, respiratory distress, and hypothermia were the major presentations in our study. Jain et al. have reported respiratory distress and lethargy as the predominant features in their study. Blood culture is the gold standard for the diagnosis of neonatal sepsis. The culture positivity rate varies in different places. In our study, the culture positivity rate was 35.9%. This is similar to other studies which have shown a similar culture positivity rate. EOS was found in 62.2% of the cases while LOS was found in 37.7% of the cases in our study. Chugh et al. have also reported number of EOS in their study than LOS. Other studies have reported a higher incidence of EOS than LOS. Other studies have reported Respiratory distress and hypothermia as the predominant features in their study. Blood culture is the gold standard for the diagnosis of neonatal sepsis. The culture positivity rate varies in different places.

Los was caused by Klebsiella followed by S. aureus. LOS was caused by Klebsiella followed by CONS. Overall, the incidence of Gram-negative sepsis (65.03%) was more than Gram-positive sepsis (32.16%) in our study. This is similar to another study done by Joshi et al. The most common organism isolated in our study was Klebsiella. The National Neonatal Perinatal Database also states that Klebsiella is the most common organism causing neonatal sepsis. However, a study by Marwah et al. found S. aureus as the most common organism. The Gram-negative organisms showed good sensitivity to piperacillin-tazobactam and ciprofloxacin and high resistance to ampicillin. This finding is similar to another study done by Rao et al. The Gram-positive organisms showed very high sensitivity to vancomycin. Another study was done by Shah et al. also showed similar findings.

### CONCLUSION

In our study, Gram-negative organisms were the predominant organisms causing neonatal sepsis. Klebsiella was the predominant Gram-negative organism causing neonatal sepsis. S. aureus was the predominant Gram-positive organism causing sepsis. Organisms causing neonatal sepsis and their antibiotic susceptibility vary from place to place. Each neonatal unit should have its own antibiotic policy based on antibiotic susceptibility studies. This will help the pediatricians to choose appropriate empirical treatment for the management of neonatal sepsis. This will also avoid the use of irrational drugs and help in reducing drug resistance.

### REFERENCES


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Prevalence of Glucose-6-Phosphate Dehydrogenase Deficiency among Sickle Cell Patients of Chhattisgarh Region

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Abstract

Background: About 50% of world population of sickle cell disease (SCD) is found in India, predominant among the tribal population of central India. Sickle cell (SC) hemoglobinopathy and glucose-6-phosphate dehydrogenase (G6PD) enzyme deficiency are important genetic and public health problems in central-eastern part of India. This study aims to determine the prevalence of G6PD deficiency in SCD patients.

Materials and Methods: The study was carried out prospectively over a period of 1 year from September 2010 to August 2011 in the Department of Pathology at our institute. The material for the present study consisted of 100 cases including 76 patients with SCD and 24 of control group. Solubility test for sickling followed by hemoglobin (Hb) electrophoresis and qualitative dye decolorization test for G6PD deficiency were performed on all the samples.

Results: A total of 100 patients were studied, 76 were of SCD including 38 patients each of SC trait (AS) and SC anemia (SS) and remaining 24 patients were of the control group. The majority of AS patients were females (69.4%) while the SS and control patients had almost equal number of males and females. The prevalence of G6PD deficiency was observed to be 5%, primarily in males i.e. 4 (9.1%) with only one female (1.79%). The prevalence of G6PD deficiency in SC patients (5.26%) was almost similar to that of control group (4.17%).

Conclusion: G6PD deficiency should be looked for in all subjects with SC anemia. Individual with HbSS is uniquely unfit to tolerate increased hemolysis and when the two problems coexist, particular care should be exercised in the administration of drugs known to initiate hemolysis in patients with G6PD deficiency.

Key words: Central India, Drugs, Hemoglobin electrophoresis, Hemolysis, Qualitative, Solubility test

INTRODUCTION

Glucose-6-phosphate dehydrogenase (G6PD) and sickle cell disease (SCD) are two inherited red blood cell (RBC) disorders which could be encountered in the same person due to the following features common to both these disorders:

1. More commonly seen in certain geographical areas and ethnic groups
2. In stable conditions, both these disorders do not alter the hemoglobin (Hb) levels, RBC count, and indices
3. Patients usually remain asymptomatic in both.

Hence, detailed clinical history and screening tests are necessary to detect these RBC disorders.¹

The interaction between SCD and G6PD has been studied in different populations. Many studies have suggested the higher incidence of G6PD deficiency in SCD patients as compared to general population. However, other studies do not confirm this association.²
The prevalence of sickle Hb varies from 15% to 30%, affecting nearly 3 million people of Chhattisgarh. Hence, we performed this study to know the association and prevalence of G6PD in SCD patients so that to judiciously administer drugs during the general treatment or episodes of crisis.

**MATERIALS AND METHODS**

The present study was carried out in the Department of Pathology at our institute. The study was spread over a period of 1 year from September 2010 to August 2011.

The material for the present study consisted of 100 cases including 76 patients with SCD and 24 of control group.

With all standard aseptic precautions, blood was collected from anti-cubital vein using 21 or 22-gauge needle from each individual, after obtaining informed and written consent. Blood was delivered into ethylene diamine tetraacetic acid pilot, and solubility test for sickling was performed on all the samples, followed by Hb electrophoresis. In the entire cases, qualitative dye decolorization test for G6PD deficiency had been performed adjusting for the Hb content of the patient.

**RESULTS**

Of the total 100 patients studied, 76 were of SCD including 38 patients each of AS and SS. The 24 control patients selected had anemia but found to be negative for solubility test and Hb electrophoresis, of which 11 cases were of malaria, 8 cases of neonatal jaundice, 2 of β-thalassemia, and 3 cases of miscellaneous group. Of the 100 patients, 5 were found to be G6PD deficient showing the prevalence rate of 5%. In the individual group studied the prevalence was found to be 2 (5.3%), 2 (5.3%), and 1 (4.2%) in control, AS and SS patients, respectively (Table 1).

Most of the patients of AS were in age range of 11-20 years and 21-30 years, whereas most patients of SS were in between 0 and 10 years of age. Of the control patients, majority were in between 0 and 10 years. Both the patients of AS with G6PD deficiency were in age range of 11-20 years while both the SS patients in 0-10 years and the only control patient was above 40 years of age (Table 2).

Of the AS patients, females were more than males while among the SS patients equal number of males and females were present. Both the SS patients and the one control patient with G6PD deficiency were males (100%) while of the AS patients with G6PD deficiency one each (50%) was male and female (Table 3).

**DISCUSSION**

In the present series of 100 patients studied, the prevalence of G6PD deficiency was observed to be 5% (Table 1), predominantly in males i.e., 4 (9.1%) with only one female (0.79%) (Table 3).

Different studies conducted in the past indicate that the incidence of G6PD deficiency in India ranges from <1% to 27.94% (Table 4). The prevalence rate observed in the present study were similar to those of Swaroop et al, Kalra et al, Da Costa et al, Meera Khan, Choubisa et al, Reddy et al, and Pant et al. Discrepancies found with other may have resulted from different techniques used. The G6PD enzyme deficiency in the present study was detected using dichlorophenol indophenol dye as described by Bernstein.

| Table 1: Distribution of patients with and without G6PD deficiency according to pattern on hemoglobin electrophoresis |
|-----------------|-----------------|-----------------|
|                | Patients without G6PD deficiency | Patients with G6PD deficiency |
| Haemoglobin pattern | n | % | n | % |
| AA              | 22 | 22 | 2 | 5.3 |
| AS              | 38 | 38 | 2 | 5.3 |
| SS              | 38 | 38 | 1 | 4.2 |
| Thalassemia (HbA2) | 2 | 2 | 0 | 0 |
| Total           | 100 | 5 |

G6PD: Glucose-6-phosphate dehydrogenase

| Table 2: Age-wise distribution of patients with and without G6PD deficiency |
|-----------------|-----------------|-----------------|
| Age range       | Patients of AS | Patients of SS |
|                 | Without G6PD deficiency | With G6PD deficiency | Without G6PD deficiency | With G6PD deficiency | Without G6PD deficiency | With G6PD deficiency |
|                 | n | % | n | % | n | % | n | % | n | % |
| 0-10            | 3 | 8.3 | - | - | 14 | 42.1 | 2 | 100 | 9 | 39.1 | - | - |
| 11-20           | 13 | 36.1 | 2 | 100 | 9 | 25 | - | - | 4 | 17.4 | - | - |
| 21-30           | 12 | 33.3 | - | - | 8 | 22.2 | - | - | 5 | 21.7 | - | - |
| 31-40           | 4 | 11.1 | - | - | 4 | 11.1 | - | - | 3 | 13.0 | - | - |
| 41-onwards      | 4 | 11.1 | - | - | 1 | 2.8 | - | - | 2 | 8.7 | 1 | 100 |
| Total           | 36 | 100 | 2 | 100 | 36 | 100 | 2 | 100 | 23 | 100 | 1 | 100 |

G6PD: Glucose-6-phosphate dehydrogenase
In the present study, the prevalence of G6PD deficiency in sickle cell (SC) patients (5.26%) was almost similar to that of control group (4.17%). Similar findings of equal prevalence of G6PD deficiency among SC and control group was observed in studies by Heller et al.,43 Naylor and associates36 in Chicago, observed 14.3% G6PD deficiency in 56 SS males, as compared to 15% of 54 AA Afro-American males; Bouanga et al.,2 also found equal prevalence in HbSS patients (22.2%) and in HbAA (22.5%) (Table 5).

However, an increase in the prevalence of G6PD deficiency among SC patients as compared to control patients was observed in the studies by Lewis et al.37 in Ghana; Beutler et al.,39 Bienzle,40 Piomelli et al.38 (33.3% among SC patients and 10.8% among controls); Diop et al.46 (21.6%...
in SC patients and 12.3% in normal subjects); Andoka et al.\textsuperscript{42} (25.8% of in AA, 31.8% in AS and 45.2% in SS); Mohammad et al.\textsuperscript{43} (47% in HbS and 19% in HbA). Nouraie et al.\textsuperscript{41} studied 261 children and adolescents with HbSS and found that the prevalence of G6PD to be 13.6% in males and 3.3% in females with an overall prevalence of 8.7%.

Gibbs et al.\textsuperscript{42} found the prevalence of G6PD deficiency was higher in males and lesser in females as compared to the general population, but the differences were not significant.

On the contrary, Nhonoli et al.\textsuperscript{41} observed higher prevalence of 19.5% in AA and 14.0% in AS but this difference was not found to be significant.

Prahraj et al.\textsuperscript{15} found 11% patients to be G6PD deficient, of which 10 were of SC anemia and 2 of SC trait. Kar et al.\textsuperscript{38} screened 60 cases of malaria and observed that sickle Hb was found in 7 (11.5%) patients and G6PD deficiency in 3 (5%) cases. One patient with falciparum malaria had both SC trait and G6PD deficiency. Balgir\textsuperscript{45} observed 12 cases showing compound heterozygosity for SC hemoglobinopathy and G6PD deficiency. The author demonstrated an inverse relationship of SC allele with G6PD deficiency and beta thalassemia in a cross-section of malaria endemic (Plasmodium falciparum) tribal communities in Orissa. Balgir\textsuperscript{45} found 52.2% patients with SCD to be G6PD deficient in hemizygous/heterozygous/homozygous condition in Dhelli Kharia tribal community of Orissa (Table 6).

Variations in the results can also be due to racial, ethnic, and geographic distribution. Variable prevalence of erythrocyte G6PD enzyme deficiency can also be explained by the fact that Indian population is composed of many heterogeneous religion and caste groups.

A difference in the frequency of G6PD deficiency among SCD patients can occur by post-zygotic selection, indeed

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### Table 5: Prevalence of G6PD deficiency in patients with and without sickle cell disease in various studies outside India

<table>
<thead>
<tr>
<th>Name of author</th>
<th>Year</th>
<th>Place</th>
<th>Total number patients of SCD</th>
<th>Total number of G6PD deficient patients with SCD</th>
<th>Total number of patients without SCD</th>
<th>Total number of G6PD deficient patients without SCD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naylor et al.</td>
<td>1960</td>
<td>Chicago</td>
<td>56</td>
<td>8</td>
<td>4.3</td>
<td>54</td>
</tr>
<tr>
<td>Lewis et al.</td>
<td>1966</td>
<td>Ghana</td>
<td>95</td>
<td>41</td>
<td>43.1</td>
<td>109</td>
</tr>
<tr>
<td>Piemelli et al.</td>
<td>1972</td>
<td>New York</td>
<td>15</td>
<td>5</td>
<td>33.3</td>
<td>102</td>
</tr>
<tr>
<td>Beutler et al.</td>
<td>1974</td>
<td>Los Angeles</td>
<td>21</td>
<td>4</td>
<td>19.1</td>
<td>167</td>
</tr>
<tr>
<td>Bienzle et al.</td>
<td>1975</td>
<td>Nigeria</td>
<td>100</td>
<td>16</td>
<td>16</td>
<td>1451</td>
</tr>
<tr>
<td>Nhonoli et al.</td>
<td>1978</td>
<td>-</td>
<td>93</td>
<td>13</td>
<td>14</td>
<td>543</td>
</tr>
<tr>
<td>Gibbs et al.</td>
<td>1980</td>
<td>Jamaica</td>
<td>5072</td>
<td>566</td>
<td>11.16</td>
<td>62331</td>
</tr>
<tr>
<td>Heller et al.</td>
<td>1979</td>
<td>Illinois</td>
<td>5072</td>
<td>566</td>
<td>11.16</td>
<td>62331</td>
</tr>
<tr>
<td>Andoka et al.</td>
<td>1988</td>
<td>Congo</td>
<td>AS-44</td>
<td>14</td>
<td>31.8</td>
<td>128</td>
</tr>
<tr>
<td>Bouanga et al.</td>
<td>1998</td>
<td>Congo</td>
<td>SS-42</td>
<td>19</td>
<td>45.2</td>
<td>-</td>
</tr>
<tr>
<td>Mohammad et al.</td>
<td>1998</td>
<td>Bahrain</td>
<td>125</td>
<td>59</td>
<td>47</td>
<td>185</td>
</tr>
<tr>
<td>Diop et al.</td>
<td>2005</td>
<td>France</td>
<td>319</td>
<td>69</td>
<td>21.6</td>
<td>318</td>
</tr>
<tr>
<td>Nouraie et al.</td>
<td>2010</td>
<td>USA</td>
<td>261</td>
<td>8.7</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

G6PD: Glucose-6-phosphate dehydrogenase, SCD: Sickle cell disease

### Table 6: Prevalence of G6PD deficiency in patients with sickle cell disease along with controls in various studies in India

<table>
<thead>
<tr>
<th>Name of author</th>
<th>Year</th>
<th>Place</th>
<th>Total number patients of SCD</th>
<th>Total number of G6PD deficient patients with SCD</th>
<th>Total number of patients without SCD</th>
<th>Total number of G6PD deficient patients without SCD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prahraj et al.</td>
<td>1977</td>
<td>Orissa</td>
<td>12</td>
<td>200</td>
<td>22</td>
<td>11</td>
</tr>
<tr>
<td>Kar et al.</td>
<td>1990</td>
<td>Western Orissa</td>
<td>1</td>
<td>60</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Balgir\textsuperscript{45}</td>
<td>2006</td>
<td>Orissa</td>
<td>12</td>
<td>-</td>
<td>-</td>
<td>4.3-17.4</td>
</tr>
<tr>
<td>Balgir\textsuperscript{45}</td>
<td>2008</td>
<td>Bhubaneswar, Orissa</td>
<td>29</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Balgir\textsuperscript{45}</td>
<td>2010</td>
<td>Sundargarh, Orissa</td>
<td>23</td>
<td>12</td>
<td>52.2</td>
<td>24</td>
</tr>
<tr>
<td>Present study</td>
<td>2012</td>
<td>Raipur, Chhattisgarh</td>
<td>76</td>
<td>4</td>
<td>5.26</td>
<td>-</td>
</tr>
</tbody>
</table>

SCD: Sickle cell disease, G6PD: Glucose-6-phosphate dehydrogenase
by postnatal selection, since the phenotypic expression of the homozygous S condition is not significant until at least a few months after birth.

CONCLUSION

The present study has been conducted in the tertiary care hospital, which may or may not represent a true cross-section of the normal population. Yet in a preliminary study of this nature, the observation of 5% could be taken to consider that the problem of G6PD deficiency exists in this region and should be of concern as the enzyme deficiency remains obscure, there being no overt clinical manifestation. It would be important to keep in mind that an intrinsic anomaly of enzyme would make these deficient subjects vulnerable to some of the common drugs, which in therapeutic doses are harmless for persons with normal enzyme; hence, the detection of this enzyme deficiency is important for protecting such individuals.

The number of patients screened in the present study is not sufficiently large to make the observation of the enzyme G6PD deficiency highly significant, and it would be proper to screen a larger and representative sample of this region to know the exact nature and magnitude of the problem.

ACKNOWLEDGMENT

I am highly obliged to my institute and all faculty members of the department especially Dr. Pratima Kujur for co-guiding me in this study.

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34. Shanthala Devi AM, Helen R, Vanamala A, Charitha V, Karuna R. Screening
Dry Eye in Diabetes Mellitus Patients and its Relationship with Diabetic Retinopathy

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Abstract

Introduction: Diabetic mellitus is a clinical syndrome characterized by hyperglycemia caused by absolute or relative deficiency of insulin. The term diabetes was 1st coined by Arashes Cappodocia (81-133 AD). Later, the word mellitus was added by Thomas Willis in 1675. Clinical features similar to diabetes mellitus (DM) were described 3000 years ago by the ancient Egyptians. Diabetes is one of the leading causes of blindness in 20-70-year-old person.

Materials and Methods: Descriptive study consisting of 100 diabetic patients who attended Ophthalmology Department. Type I and Type II DM of either sex were screened for dry eye and diabetic retinopathy over a period of 18 months. Detailed ocular and diabetic history recorded and clinical examination with slit-lamp for anterior segment was done. Schirmer’s test (SchT), tear breakup time (TBUT), and tear meniscus height (TMH) test were performed, and results noted. The stage of diabetic retinopathy was determined using direct and indirect ophthalmoscopy.

Results: In this study, 100 diabetic patients participated, of which 20 were Type I and 80 were Type II DM. Dry eye prevalence was maximum in patients who were 50 years of age (53.6%) and above. It was more common in females (60.9%) compared to males (39.1%). SchT showed 15% and 82.5% of Type I and Type II diabetics had dry eye. The TBUT was found to be ≤10 s in 65% of Type II DM. 49% of Type II diabetics had thin TMH. Moderate non-proliferative diabetic retinopathy (NPDR) (33%) was significantly more common in diabetic patients with dry eyes. There were no patients with very severe NPDR. A statistically significant ($P \leq 0.001$) association was found between diabetic retinopathy and dry eye.

Conclusion: DM and dry eyes appear to have common association. Statistically significant correlation was found between dry eye and diabetic retinopathy. Hence, examination of dry eye should be an integral part of assessment of diabetic disease as early detection will help to prevent further progression.

Key words: Diabetes mellitus, Diabetic retinopathy, Dry eye, Schirmer’s test, Tear breakup time, Tear meniscus height

INTRODUCTION

Diabetic mellitus is a clinical syndrome characterized by hyperglycemia caused by absolute or relative deficiency of insulin.¹

The term diabetes was 1st coined by Arashes Cappodocia (81-133 AD). Later, the word mellitus was added by Thomas Willis in 1675. Clinical features similar to diabetes mellitus (DM) were described 3000 years ago by the ancient Egyptians.²

Diabetes is one of the leading causes of blindness in 20-70-year-old person.

DM is associated with ocular complications such as chronic inflammation of the lid, acute orbital infection ptosis, hordeolosis, cataract, refractory deviation, neovascular glaucoma, diabetic retinopathy, and palsy of oculomotor nerve.³⁴

Nearly 47-64% of diabetic patients have primary corneal lesions, during their lifetime like epithelial fragility microcystic edema and bleb formation, persistent...
epithelial defect, recurrent corneal erosion, delayed epithelial healing.

Recently, problem involving the ocular surface is dry eye, and many diabetic patients complain of typical dry eye symptoms, such as burning and foreign body sensation.\(^5\)

The mechanism responsible for dry eye in DM is unclear, but autonomic dysfunction may be responsible.\(^6\)

The importance of tears has long been recognized. In the fifth to fourth century B.C, Hippocrates classified ophthalmic condition as dry or humid.\(^7\)

Hormonal support conditions in the complex interaction of the tear film, larimal gland, and ocular surface and this was consider as a cause for deficiency of tear fluid in dry eye in earlier days.\(^8\)

Dry eye is defined as a clinical condition characterized by deficient tear production or excessive tear evaporation resulting in ocular discomfort. It characterized by ocular irritation resulting from an alteration of tear film.\(^9\)

The present study was undertaken to find out the association of dry eye with DM as its early detection would prevent further progression.

**MATERIALS AND METHODS**

**Study Design**

A descriptive study consisting of 100 diabetic patients was undertaken to study dry eye in DM patients and its relationship with diabetic retinopathy.

**Source of Data**

A total of 100 diabetic patients attending KIMS Ophthalmology OPD Type I and Type II DM of either sex were screened for dry eye in DM and diabetic retinopathy over a period of 18 months.

**Sample Size**

100 (54% prevalence, 10% precision sample size - 99, round off to 100).

Sampling method: Purposive method.

**Inclusion Criteria**

1. Both male and female patients with DM willing to participate in study
2. All age group diagnosed to have DM
3. Written consent of parents for those <13 years and from patients more than 13 years.

**Exclusion Criteria**

1. Patients who have undergone ocular surgery in the past
2. Patients who wear contact lens
3. Patients who are on local or systemic medication which are known to cause dry eye
4. Patient with other ocular surface disease and systemic disease which known to cause dry eye other than diabetic mellitus.

**Method of Data Collection**

Initially, informed consent was taken, and patient data regarding dry eye was collected in terms of age, sex, locality, presenting symptoms, duration, progression, and associated conditions. Furthermore, history of DM, treatment duration and blood reports of random blood sugar, fasting blood sugar, postprandial blood sugar level was recorded.

**Examination**

All patients presenting with DM were subjected to complete ophthalmologic examination and brief general systemic examination. Ophthalmic examination by assessing the visual acuity with Snellens chart, detailed anterior segment examination with slit-lamp to know the condition of eyelid, meibomian gland, conjunctival surface, and cornea.

Tear film evaluation was done in the following order.

Tear meniscus height (TMH) was recorded as normal or low under slit lamp; precorneal tear film was observed for debris.

**Tear Breakup Time (TBUT) Measurement**

A dry fluorescein strip is touched to the inferior fornix with patient instructed to look up.

The corneal surface is seen under slip lamp with low magnification using a cobalt blue filtered light. The patient is asked to blink ones and look straight without blinking. The time of appearance first small black spot within blue field (dry spot) from the last blink measures the tear film BUT. <10 s are taken as abnormal.

**Schirmer’s Test (SchT)**

Filter paper is placed in the inferior cul-de-sac from outer one-third and inner two-third and the amount of wetting of the paper strip after 5 min was measured. Normal value of Schirmer I test are more than 15 mm. Wetting of 5-10 mm was taken as moderate and <5 mm is severe.

Based on Schirmer’s I, TBUT, TMH grading of dry eye was done into 3 types mild, moderate, and severe.
Mild dry eye - Patients who have a SchT of <10 mm in 5 min.

TBUT <10 s with TMH thin or absent.

Moderate dry eye - Patients who have a SchT of <5-10 mm in 5 min.

TBUT <10 s with TMH thin or absent.

Severe dry eye - Patients who have a SchT of <5 mm in 5 min.

TBUT <10 s with TMH thin or absent.

Detailed fundus examination done under direct and indirect ophthalmoscopy under mydriasis.

Retinopathy if present is classified as per Early Treatment of Diabetic Retinopathy Study class such as non-proliferative diabetic retinopathy (NPDR), mild, moderate, and severe NPDR, PDR, early PDR, high-risk PDR.

Statistical Method
Descriptive and inferential statistical analysis has been carried out in this study. Results on continuous measurements are presented on mean ± standard deviation D (min-max) and results on categorical measurements are presented in number (%). The significance is assessed at 5% level of significance. The following assumptions on data are made, assumptions: 1. Dependent variables should be normally distributed, 2. Samples drawn from the population should be random, cases of the samples should be independent.

Chi-square/Fisher exact test has been used to find the significance of study parameters on categorical scale between two or more groups.

Significant figures:
* Suggestive significance \( (P: 0.05 < P < 0.10) \)
* *Moderately significant \( (P: 0.01 < P \leq 0.05) \)
** **Strongly significant \( (P: P \leq 0.01) \).

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

RESULT

Study Design
Descriptive study consisting of 100 diabetic patients.

In this study, 100 diabetic patients participated, of which 20 were Type I and 80 were Type II DM. Dry eye prevalence was maximum in patients who were 50 years of age (53.6%) and Table 1 shows age distribution of patients. Most of the Type 1 diabetic patients were between 0 and 20 years (65%), and most of the Type II patients were between 51 and 60 years (48.8%).

A prevalence of 38% of dry eye was seen in patients having DM for ≥6-10 years.

Type I and type II DM patients were females with 60% and 53.3%, respectively. The majority of patients (87%) had gritty sensation in the eye suggestive of dry eye (Table 3).

It was more common in females (60.9%) compared to males (39.1%) (Table 4). This Table 4 shows females had dry eye more compare to male but it is not significant statistically.

SchT showed 15% and 40% of Type I and Type II diabetics had dry eye (Table 6). Table 6 shows 40% with Type II DM had moderate dry eye and among Type I DM 15% had mild dry eye. The TBUT was found to be ≤10 s in 65% of Type II DM (Table 7). Table 7 shows 65% of Type II diabetes had low TBUT. 49% of Type II diabetics had thin TMH (Table 5). Table 5 shows 49% of diabetes with Type II had thin TMH (49%) and 13% of Type II had absent TMH. Moderate NPDR (33%) was significantly more common in diabetic patients with dry eyes. There were no patients with very severe NPDR. A statistically significant \( (P \leq 0.001) \) association was found between diabetic retinopathy and dry eye (Table 8). Table 8 shows association of retinopathy with dry eye, significant association was found between retinopathy and dry eye of which 47.8% of dry eye patients with DM had moderate NPDR.

Table 2 shows significant retinopathy changes of moderate NPDR was seen in 33% of Type II diabetics.
Table 2: Fundus findings of patients studied

<table>
<thead>
<tr>
<th>Fundus findings</th>
<th>Type I (%)</th>
<th>Type II (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-No retinopathy</td>
<td>18 (90)</td>
<td>16 (20)</td>
<td>34 (34)</td>
</tr>
<tr>
<td>1-Mild NPDR</td>
<td>2 (10)</td>
<td>15 (15)</td>
<td>14 (14)</td>
</tr>
<tr>
<td>2-Moderate NPDR</td>
<td>0 (0)</td>
<td>33 (41.3)</td>
<td>33 (33)</td>
</tr>
<tr>
<td>3-Sever NPDR</td>
<td>0 (0)</td>
<td>16 (20)</td>
<td>16 (16)</td>
</tr>
<tr>
<td>4-PDR</td>
<td>0 (0)</td>
<td>3 (3.8)</td>
<td>3 (3)</td>
</tr>
<tr>
<td>Total</td>
<td>20 (100)</td>
<td>80 (100)</td>
<td>100 (100)</td>
</tr>
</tbody>
</table>

P < 0.001**, significant, Fisher exact test. NPDR: Non-proliferative diabetic retinopathy, PDR: Proliferative diabetic retinopathy

Table 3: Dry eye distribution of patients studied in DM

<table>
<thead>
<tr>
<th>Dry eye</th>
<th>Type I (%)</th>
<th>Type II (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No dry eye</td>
<td>17 (85)</td>
<td>14 (17.5)</td>
<td>31 (31)</td>
</tr>
<tr>
<td>Dry eye</td>
<td>3 (15)</td>
<td>66 (82.5)</td>
<td>69 (69)</td>
</tr>
<tr>
<td>Total</td>
<td>20 (100)</td>
<td>80 (100)</td>
<td>100 (100)</td>
</tr>
</tbody>
</table>

P < 0.001**, significant, Chi-square test. DM: Diabetes mellitus

DISCUSSION

There exists a considerable discrepancy between the subjective complaints of patients and the clinical tests available to assess dry eye. It is difficult to correlate test results of TMH, TBUT, SchT in clinical trials.

Each form of dry eye has certain global features which include ocular surface damage, reduced tear hyperosmolarity and tear film stability. Diagnosis of dry eye depends on patients’ symptoms, recognition of tear film instability and ocular surface damage. Tear film instability appears to be a component of all forms of dry eye disease, and tear hyperosmolarity is a key mechanism of ocular surface damage. Although these elements are present in most cases of dry eye, clinicians will sometimes encounter patients who have symptoms but minimal ocular surface damage or signs of surface damage in the absence of symptoms.

In this study, we have made the diagnosis of dry eye based on symptoms, signs and diagnostic tests which included TBUT, TMH and Schirmer’s test. We observed in our study that a large number of patients had no symptoms or signs of ocular surface damage had abnormal TBUT, TMH, and Schirmer’s test values.

Table 4: Gender distribution of patients studied according to incidence of dry eye

<table>
<thead>
<tr>
<th>Gender</th>
<th>No dry eye (%)</th>
<th>Dry eye (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>15 (48.4)</td>
<td>42 (60.9)</td>
<td>57 (57)</td>
</tr>
<tr>
<td>Male</td>
<td>16 (51.6)</td>
<td>27 (39.1)</td>
<td>43 (43)</td>
</tr>
<tr>
<td>Total</td>
<td>31 (100)</td>
<td>69 (100)</td>
<td>100 (100)</td>
</tr>
</tbody>
</table>

P = 0.244, Not significant, Chi-square test

In the present study, the prevalence of dry eyes was found to be 69%. In Type 1 diabetes, it was 15%, and in Type II, it was 82%. Seifart and Strempel,11 found 57% of dry eye in Type I and 70% in Type II.

Certain aspects of tear physiology change with age, such as tear volume, tear film stability, and reflex secretion by the
tear film and lipid layer thickness appears to be constant for different age groups. In the present study, age did not influence the prevalence of dry eyes in Type I patients, but the significant influence was seen in Type II patients after 50 year of age. The majority of Type II DM patients in the age group of 51-60 years had dry eyes (53.6%). In the beaver dam eye study, the ageing effect was significant after 65 years of age. Kaiserman et al. have reported that the prevalence of dry eye increases with age. Therefore, in the present study, higher prevalence of dry eye in age group 51-60 could be because of DM.

Lee et al., in a population study in Indonesia, showed the prevalence of dry eye was 1.4 times higher for men than women. Moss et al., reported a higher incidence of dry eyes in diabetic women 16.7% compared with 11.4% in men. In the present study, 60.9% of dry eye in diabetic patients were females and 39% were males, but the prevalence of dry eyes was not statistically associated with sex when both Type I and Type II combined. The duration of diabetes was statistically associated with the prevalence of dry eye in DM.

Comparable findings were reported by Seifart and Strempel, Nepp et al., showed that the severity of keratoconjunctivitis sicca (KCS) correlate with the severity of diabetic retinopathy.

Dry eye symptoms tend to be more reliable and accurate than clinical test for dry eye. Often symptoms do not correlate with signs of dry eye.

In the present study, total number of symptoms positive was 69%. Participants complained of gritty sensation most often (87%) followed by symptoms of burning sensation (64%), redness (33%). These symptoms were reported more frequently compared with the other dry eye symptoms and were significantly related with clinical dry eyes.

One of the common objective tests used to make a diagnosis of dry eye is TBUT. Theoretically, TBUT shorter than the blink interval of 5 s could result in surface damage and very short TBUT <2 s indicates KCS.

In the present study, TBUT was found to be ≤10 s in 65%. Tear film breakup time is supposed to be a diagnostic technique in detecting mucin deficient dry eye. Sukul et al. found the mean value of TBUT to be 9.67 s in the Indian populations.

A study done by Whitcher found a scanty or absent tear meniscus is an indication of aqueous tear deficiency. In this study, TMH was thin in 49% and absent in 13%.
Lin et al.\textsuperscript{20} study showed the SchT was shown to be incapable of detecting meibomian gland disease. However, a low Schirmer result (62.5\%) was significantly associated with dry eye symptoms in this elderly Chinese population.

The total tears secretion measured by Schirmer I was \(\leq 10\) mm in 19\%.

Nepp \textit{et al.}\textsuperscript{17} were able to correlate the severity of retinopathy with the severity of dry eyes. Kyung-Chulyoon \textit{et al.}, suggest that poor metabolic control, presence of DR stages is risk factors for tear film and ocular surface disorder in DM. In the present study, statistically significant association was found between retinopathy and dry eye (\(P \leq 0.001\%\)). Therefore, further studies can be undertaken with larger sample size to clarify the association between dry eye and diabetic retinopathy.

**CONCLUSION**

- Association exists between diabetes and dry eye
- Prevalence of dry eye was more in patients with longer duration of diabetes
- Type I showed mild grade of dry eye and Type II showed mild to moderate grade of dry eye
- In Type II between 50 and 60 years had higher prevalence of dry eye
- Dry eye was more in female patients with diabetes
- Statistically significant correlated was found between dry eye and retinopathy.

Examination of dry eye should be integral part of assessment of diabetic eye disease as early detection will help to prevent further progressions.

**REFERENCES**

Is Lipid Tetrad Index a Promising Atherogenic Index in Acute Coronary Syndrome?

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Abstract

Introduction: Coronary heart disease (CHD) is expected to be the most important cause of death in India by 2020. Increased concentration of atherogenic lipoprotein plays an important role in the development of atherosclerosis leading to premature myocardial infarction. Etiology of CHD is multifactorial; a single biomarker is unlikely to provide information for coronary artery disease occurrence. Hence, the present study is on the calculation of lipid tetrad index (LTI) in acute coronary syndrome (ACS).

Aims and Objectives: To estimate lipoprotein(a) (Lp[a]), lipid parameters, to calculate LTI, and to explore the diagnostic importance of LTI as a risk factor in ACS.

Materials and Methods: Study group comprised 50 subjects admitted in the intensive coronary care unit (ICCU) with ACS which includes 38 ST-elevation myocardial infarction (STEMI), 2 non-ST STEMI, and 10 unstable angina patients. Fifty healthy gender- and age-matched subjects were taken as control group. The fasting venous sample was collected. plasma Lp(a), total cholesterol (TC), triglycerides (TGL) and high density lipoprotein (HDL) estimated. LTI was calculated by the product of TC, TGL, and Lp(a) divided by high-density lipoprotein and compared between two groups.

Results: The mean Lp(a), LTI were significantly elevated in study group compared to control group (P = 0.0001).

Conclusion: Elevated LTI depicts it as a risk factor in ACS and a promising atherogenic index for assessment in ACS compared to other lipid parameters.

Key words: Acute coronary syndrome, Coronary artery disease, Lipid parameters, Lipid tetrad index, Lipoprotein (a)

INTRODUCTION

The acute coronary syndrome (ACS) is the clinical manifestation of the critical phase of coronary artery disease (CAD). ACS describes the spectrum of clinical manifestations which follow disruption of coronary arterial plaque, complicated by thrombosis, embolization, and varying degrees of obstruction to myocardial perfusion. The myocardial ischemia occurs when oxygen supply does not meet the myocardial demand, usually seen in atherosclerotic disease of the epicardial coronary artery. When ischemia is severe, prolonged necrosis or infarction occurs. The clinical features depend on extent and severity of myocardial ischemia. ACS refers to a range of myocardial ischemic states which includes patient with ST-segment elevation myocardial infarction (STEMI), non-STEMI, and unstable angina.

It has been predicted that CAD might become the most prevalent disease in India by the year 2020. CAD is a chronic process that begins during adolescence and slowly progresses throughout life. CAD evolves often unnoticed over decades, often culminating in myocardial infarction. The myocardial infarction and its complications are the principal cause of death in patients with CAD.

The prevalence of CAD is 4-fold higher in urban India and...
Senthilkumari, et al.: Lipid Tetrad Index in Acute Coronary Syndrome

2-fold higher in rural India than in the USA. This is again high in South Indians compared to North Indians, 7% in rural and 14% in urban areas. The CAD rates in urban India are similar to more affluent overseas Indians.\(^5\)

Several factors appear to have contributed to the acceleration of CAD epidemic in India in recent times such as demographic transition to the older population, as a result of increasing life expectancy and confluence of both conventional and non-conventional risk factors. Conventional risk factors such as hypertension, diabetes mellitus, hypercholesterolemia, and smoking are increased in Indians due to urbanization and Western acculturation. Non-conventional factors such as hyperinsulinemia, insulin resistance, and lipoprotein(a) (Lp[a]) are determined by genes, and their high prevalence among Indians probably explains the precocious nature of CAD that typically affects Indians. These multiplicative effects of conventional and emerging risk factors appear to provide an explanation for excess burden of CAD among Indians.\(^6\) The increased concentration of atherogenic lipoproteins plays an important role in the development of atherosclerosis leading to premature myocardial infarction and stroke. Lp(a) is an atherothrombogenic lipoprotein that is inherited as a genetic quantitative trait and is an important emerging risk factor for premature coronary heart disease (CHD).\(^7\)

Lp(a) is an enigmatic lipoprotein, discovered by Berg in human plasma in 1963,\(^7\) also called as deadly cholesterol. Lp(a) contains a lipoprotein moiety that is highly similar to low-density lipoprotein (LDL) both in lipid composition and presence of apolipoprotein B (apoB) and contains unique glycoprotein apo(a). Lp(a) particles contain apo(a) and apoB100 in a 1:1 molar ratio. Lp(a) has also been identified as a risk factor for a variety of atherosclerotic disorders such as ischemic stroke and myocardial infarction.\(^7,9\) Lp(a) is synthesized in the liver. The metabolism of Lp(a) is independent of other lipoproteins. Lp(a) concentration in plasma varies 1000-fold in human population ranging from undetectable to >100 mg/dl and difference is primarily due to production rather than catabolism of the particle.\(^9\) Plasma levels of Lp(a) do not vary with the age of the subjects and fully expressed in the first year of life.\(^10\)

Since the underlying etiology of CHD is multifactorial, it is, therefore, unlikely that a single biomarker will provide accurate information for CAD occurrence. Hence, the present study is on simultaneous measurement of several lipid biomarkers and calculation of lipid tetrad index (LTI). This index eliminates the need for numerous ratios and cutoff points that are confusing and frustrating for the clinicians. The LTI is derived by multiplying three lipids which are directly associated with CAD and dividing the product by high-density lipoprotein (HDL) which is inversely associated with CAD.

\[
\text{Lipid tetrad index} = \frac{\text{Total cholesterol} \times \text{Triglycerides}}{\text{Lipoprotein (a)}}
\]

\[
\text{Lipid tetrad index} = \frac{\text{Total cholesterol} \times \text{Triglycerides}}{\text{High density lipoprotein}}
\]

**MATERIALS AND METHODS**

The study was conducted at a tertiary care hospital in South India after getting approval from the Ethical Committee. In the present study, the age group of both study and control groups ranged from 30 to 65 years, males and females were included, and informed consent obtained from them. Fifty subjects (30 males and 20 females) who were admitted in the intensive coronary care unit with clinical findings suggestive of STEMI \((n = 38)\), non-STEMI \((n = 2)\), and unstable angina \((n = 10)\) were included in the study group. Fifty gender- and age-matched individuals without any history or clinical evidence of ACS from the general population were taken as control group.

**Inclusion Criteria**

1. Patients admitted with a history of chest pain, electrocardiogram changes showing ST elevation or ST depression exceeding 2 mm, T wave inversion, presence of Q waves more than 1 mm
2. Based on elevated creatine kinase-MB (CK-MB) levels.

**Exclusion Criteria**

Patients with nephrotic syndrome, chronic renal failure, hypothyroidism, diabetes mellitus, previous history of ACS, on drugs such as steroids, lipid-lowering drugs (statins, fibrates), and hormone replacement therapy were excluded from the study.

**Blood Collection**

Fasting venous blood samples (the day after the admission with ACS) were collected under aseptic conditions. Five milliliters of blood was drawn by the intravenous route. Two milliliters of blood was transferred to ethylenediaminetetraacetic acid (EDTA) tubes for Lp(a) estimation, and 3ml was transferred to plain vacutainers for estimation of total cholesterol (TC), triglycerides (TGL), HDL, fasting blood sugar, urea, creatinine, and CK-MB. The samples in the EDTA tube were centrifuged, plasma diluted (1:8000), and stored at \(-20^\circ C\) in a deep freezer for Lp(a) estimation. Human Lp(a) assay was done using ELISA kit (assay maximum human Lp[a] kit-Assaypro). The estimation of TC, TGL, and HDL was done using enzymatic kits in XL 300 auto analyzer. Friedewald’s formula was used to calculate LDL values. LTI was calculated using the formula:
Senthilkumari, et al.: Lipid Tetrad Index in Acute Coronary Syndrome

**Lipid tetrad index**

\[
\text{Lipid tetrad index} = \frac{\text{Total cholesterol} \times \text{Triglycerides}}{\text{Lipoprotein (a)}} \times \frac{1}{\text{High density lipoprotein}}
\]

**Statistical Analysis**

Data were entered in IBM SPSS version 20 software. The analysis was done using Student's t-test. Pearson correlation was done between LTI and lipid parameters. Descriptive statistics like percentage used. The significance of various parameters is expressed by means of \( P \) values as per \( P < 0.05 \) – significant, \( P < 0.001 \) – highly significant, and NS – Not significant.

**RESULTS**

Table 1 shows general descriptive of control and study groups, age and sex were matched between study and control groups, and there was no significant difference between two groups. Sixty percent were males, and 40% were females in both control and study groups.

Table 2 shows that the mean plasma Lp(a), TC, TGL, VLDL, and LTI are higher in study group compared to control group and HDL is lower in study group compared to control group which is statistically highly significant \( (P = 0.0001) \).

Table 3 shows there is no statistically significant gender difference in mean plasma Lp(a) and LTI in control and study groups.

Table 4 shows plasma Lp(a), and LTI values in study group are higher compared to control group for their respective age distribution and are statistically significant.

From Table 5, Pearson correlation analysis in the study group shows that there is a highly significant positive correlation between LTI and Lp(a) \( (r = 0.699, P < 0.01) \), TC \( (r = 0.650, P < 0.01) \), TGL \( (r = 0.670, P < 0.01) \) levels. There is a negative correlation between LTI and HDL which is statistically significant \( (r = -0.395, P < 0.01) \).

**DISCUSSION**

CAD in Indians has been rising steadily over the past 40 years affecting mainly younger age group in the absence of traditional risk factors. Elevated Lp(a) concentration is related to atherothrombogenesis and may be a key link between lipid and CAD occurrence. Rising affluence, sedentary and stressful lifestyle are additional risk factors for CAD at a younger age group. LTI is calculated to assess the total burden of dyslipidemia\(^ {11,12} \) in patients with ACS.

In Indian population, Enas et al. suggested Lp(a) of 20 mg/dl as the upper limit of normal.\(^ {13} \) Lp(a) is higher in African population compared to Caucasians and Asians. For risk categorization, Lp(a) levels are desirable <14 mg/dl, borderline risk: 14-30 mg/dl, high risk: 31-50 mg/dl, and very high risk: >50 mg/dl.\(^ {14} \)

In the present study, the mean plasma Lp(a) of study group is higher than the control group which is statistically significant \( (P = 0.000 < 0.05) \). Higher mean plasma Lp(a) levels in study group correlated with mean Lp(a) levels in CAD group was observed by Rajasekhar et al.\(^ {15} \) and Isser et al.\(^ {16} \) There is no gender difference in plasma Lp(a) values in our study and control groups. A study done by Pedreno et al. has shown no gender difference in Lp(a) levels in both patients and controls. However, Rajasekhar et al. have reported higher Lp(a) values in females compared to males. Higher levels are seen in post-menopausal women.

Although influence on sex on Lp(a) is not yet established in literature, the lowering effect of testosterone could be the cause of lower Lp(a) levels in males.\(^ {13} \)

Lp(a) is categorized as an emerging lipid risk factor by Adult Treatment Panel III of National Cholesterol Education Programme, elevated Lp(a) level, increases the individual risk to a higher level. High levels of Lp(a) correlate with prematurity, severity, extent, and progression of coronary atherosclerosis as well as occurrence and recurrence of CAD.

**Table 1: General descriptive of study and control groups**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Control (( n=50 ))</th>
<th>Study (( n=50 ))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>51.18±9.26</td>
<td>52.1±9.250</td>
</tr>
<tr>
<td>Sex (male/female)</td>
<td>30/20</td>
<td>30/20</td>
</tr>
<tr>
<td>BMI (kg/m(^2))</td>
<td>25.48±1.75</td>
<td>25.51±3.35</td>
</tr>
<tr>
<td>Systolic BP (mmHg)</td>
<td>120.12±7.33</td>
<td>131.48±19.78</td>
</tr>
<tr>
<td>Diastolic BP (mmHg)</td>
<td>79.52±3.78</td>
<td>83.96±11.08</td>
</tr>
</tbody>
</table>

Data were expressed as means±SD. BMI: Body mass index, BP: Blood pressure, SD: Standard deviation

**Table 2: Plasma Lp(a), lipid parameters, and LTI in control and study groups**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Control (( n=50 ))</th>
<th>Study (( n=50 ))</th>
<th>( P )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lp(a) (mg/dl)</td>
<td>10.37±2.96</td>
<td>23.43±7.40</td>
<td>0.0001**</td>
</tr>
<tr>
<td>TC (mg/dl)</td>
<td>181.62±14.20</td>
<td>215.68±33.88</td>
<td>0.0001**</td>
</tr>
<tr>
<td>TGL (mg/dl)</td>
<td>133.86±17.34</td>
<td>208.00±36.8</td>
<td>0.0001**</td>
</tr>
<tr>
<td>HDL (mg/dl)</td>
<td>42.94±3.50</td>
<td>37.54±3.64</td>
<td>0.0001**</td>
</tr>
<tr>
<td>VLDL (mg/dl)</td>
<td>27.64±5.97</td>
<td>41.96±7.30</td>
<td>0.0001**</td>
</tr>
<tr>
<td>LDL (mg/dl)</td>
<td>111.98±14.76</td>
<td>134.74±32.33</td>
<td>0.0001**</td>
</tr>
<tr>
<td>LTI</td>
<td>6046.44±2257.65</td>
<td>29.624.63±16.295.62</td>
<td>0.0001**</td>
</tr>
</tbody>
</table>

Data were expressed as means±SD, **\( P<0.001 \) - HS: Highly significant.

Lp(a): Lipoprotein (a), TC: Total cholesterol, TGL: Triglycerides, HDL: High-density lipoprotein, VLDL: Very low-density lipoprotein, LDL: Low-density lipoprotein, LTI: Lipid tetrad index, SD: Standard deviation
Table 3: Mean plasma Lp (a) and LTI values in males and females

<table>
<thead>
<tr>
<th>Variables</th>
<th>Control</th>
<th>Study</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male (n=30)</td>
<td>Female (n=20)</td>
</tr>
<tr>
<td>Lp (a) mg/dl</td>
<td>10.42±3.02</td>
<td>10.30±2.96</td>
</tr>
<tr>
<td>LTI</td>
<td>5971.00±2193.57</td>
<td>6159.59±2403.78</td>
</tr>
</tbody>
</table>

Data were expressed as mean±SD. NS: Not significant, Lp (a): Lipoprotein (a), LTI: Lipid tetrad index, SD: Standard deviation

Table 4: Lipoprotein (a), lipid tetrad index in different age groups

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>Variables</th>
<th>Control</th>
<th>Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;40</td>
<td>Lp (a) (mg/dl)</td>
<td>7</td>
<td>10.11±2.14</td>
</tr>
<tr>
<td></td>
<td>LTI</td>
<td>7</td>
<td>11.68±4.40</td>
</tr>
<tr>
<td>41-50</td>
<td>Lp (a) (mg/dl)</td>
<td>17</td>
<td>11.68±4.40</td>
</tr>
<tr>
<td></td>
<td>LTI</td>
<td>17</td>
<td>7224.60±3038.74</td>
</tr>
<tr>
<td>51-60</td>
<td>Lp (a) (mg/dl)</td>
<td>19</td>
<td>9.70±1.585</td>
</tr>
<tr>
<td></td>
<td>LTI</td>
<td>19</td>
<td>5318.60±1697.47</td>
</tr>
<tr>
<td>&gt;60</td>
<td>Lp (a) (mg/dl)</td>
<td>7</td>
<td>9.27±0.58</td>
</tr>
<tr>
<td></td>
<td>LTI</td>
<td>7</td>
<td>5341.13±1108</td>
</tr>
</tbody>
</table>

*P<0.05, S: Significant. **P<0.001, HS: Highly significant. Lp (a): Lipoprotein (a), LTI: Lipid tetrad index

Table 5: Pearson correlation between LTI and lipid parameters in study group

<table>
<thead>
<tr>
<th>LTI (mg/dl)</th>
<th>Correlation value</th>
<th>Statistical inference (P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lp (a)</td>
<td>0.699</td>
<td>&lt;0.01*</td>
</tr>
<tr>
<td>TC</td>
<td>0.650</td>
<td>&lt;0.01*</td>
</tr>
<tr>
<td>TGL</td>
<td>0.670</td>
<td>&lt;0.01*</td>
</tr>
<tr>
<td>HDL</td>
<td>-0.395</td>
<td>&lt;0.01*</td>
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</table>

*P<0.05, S: Significant. Lp (a): Lipoprotein (a), TC: Total cholesterol, TGL: Triglycerides, HDL: High-density lipoprotein, LTI: Lipid tetrad index

myocardial infarction among Asian Indians. The risk for CAD increases 3-fold in the absence of other risk factors, increases 8-fold with low HDL, 12-fold with high LDL, 16-fold with diabetes, 25-fold with high TC/HDL ratio when associated with increase in plasma Lp(a) levels.

The mean cholesterol level in the study group is higher than the control group which is statistically significant (P < 0.05). This level is slightly higher than the mean level of cholesterol observed in a study done by Singh et al. in North Indian population, is due to difference in nature of fat intake.

In this study group, the mean TGL level is higher than the control group which is statistically significant (P < 0.05). An increase of TGL from 90 mg/dl to 180 mg/dl is associated with doubling of the incidence of CAD. An increase in TGL by 90 mg/dl and increase in age by 10 years have the same effect on the occurrence of coronary atherosclerosis.

The mean HDL level in the study group is lower than the control group which is statistically significant (P < 0.05). Similar values are observed in Singh et al.’s study and demonstrated that low HDL increases the risk of CAD.

LDL cholesterol of study group is higher than the control group which is statistically significant. Raised cholesterol is recognized as a primary risk factor for CAD by the National Cholesterol Education Programme and Adult Treatment Panel III groups.

TC and LDL levels are similar in Indians and American counterparts, but Lp(a), TGL levels are higher and HDL are lower, even when adjusted for the presence of the presence of diabetes and metabolic syndrome in Indians. When combined with the concomitant elevation of TC, LDL and decreased HDL cholesterol, the pathophysiological effects of Lp(a) are increased exponentially. This is “deadly lipid quartet” commonly seen in Asian Indians. The comprehensive LTI is proposed by Enas et al., is designed to magnify the subtle abnormalities of various atherogenic and antiatherogenic lipoproteins, and described as a single best predictor for CAD risks in diverse population, especially Asian Indians (India, Pakistan, Bangladesh, and Sri Lanka). When measurements are made in mg/dl, an index of <10,000 is desirable, 10,000-20,000 is borderline-high, >20,000 is high. An index of more than 100,000 is usually associated with marked prematurity and severity of CAD, poor outcome from mechanical vascularization including recurrence restenosis after angioplasty and rapid thrombosis of the coronary stent.

The mean LTI in the study group is higher than the mean LTI of control group which is statistically highly significant (P = 0.000 < 0.05). In the study group, 78% had LTI above 20,001 (high risk), 14% had LTI between 10,001 and 20,000 (borderline), 8% had LTI below 10,000 (desirable). In the control group, 94% had LTI below 10,000 (desirable) index and 6% between 10,001 and 20,000 (borderline risk).
CONCLUSION

This study on evaluation of LTI in ACS shows that it is a promising atherogenic index in risk factor assessment when compared to other lipid parameters. LTI facilitates in early identification of individuals with high risk for premature CAD as a result of their genetic predisposition. Since no well-established Lp(a) lowering drugs are available at present, there is a need to create awareness for early detection and modification of other risk factors in young individuals. Early intervention like lipid lowering drugs helps preventing the progression of atherosclerosis and in reducing the morbidity and mortality from ACS.

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Anatomical Variations in Origin, Number, Course, and Relations of the Roots of Median Nerve and the Low-level Formation of Median Nerve Trunk

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²Assistant Professor, Department of Anatomy, Great Eastern Medical School & Hospital, Ragolu, Srikakulam, Andhra Pradesh, India

Abstract

Introduction: Normally, the median nerve (MN) is formed by the union between medial and lateral roots of MN in relation to the third part of axillary artery in the axilla. The anatomical variations of origin, number, course, and relations of the roots of MN and the level of formation of MN trunk are most common.

Materials and Methods: On routine dissection of pectoral, axillary, and arm regions of 40 adult embalmed cadavers in the dissection hall, Department of Anatomy, Great Eastern Medical School, Ragolu, Srikakulam, Andhra Pradesh, India, during 2015-2016, the various anatomical variations in origin, the number, course, and relations of the roots of MN and the level of formation of MN trunk in both upper limbs in four cadavers and in left upper limb in one cadaver were observed and photographed.

Results: We observed the variations in origin, the number, course, and relations of the roots of MN and the level of formation of MN trunk in both upper limbs in four cases and in left upper limb in one case during routine dissection of 40 adult embalmed cadavers.

Conclusion: The knowledge of these anatomical variations is of utmost important for the general surgeons, traumatologists, neurovascular surgeons, and radiologists to avoid complications.

Key words: Axillary artery, Coracobrachialis, Lateral cord, Medial cord

INTRODUCTION

The brachial plexus is formed by the ventral primary rami (VPR) of C5 to T1. It presents five stages of formation, namely root stage, trunk stage, division stage, cord stage, and branch stage in the cervical region and axilla. The VPR of C5 and C6 join to form upper trunk, the VPR of C7 is continued as the middle trunk, and the VPR of C8 and T1 join together to form lower trunk. Each trunk divides into anterior and posterior divisions. The anterior divisions of upper and middle trunks join to form lateral cord. The anterior division of lower trunk is continued as medial cord. The posterior divisions of all trunks join to form posterior cord. The lateral cord gives rise to lateral root of median, musculocutaneous nerve, and lateral pectoral nerve. The medial cord gives rise to medial root of median, medial pectoral nerve, medial cutaneous branch of arm, medial cutaneous branch of forearm, and ulnar nerve. The posterior cord gives rise to upper and lower subscapular nerves, thoracodorsal nerve, axillary nerve, and radial nerve. The cords of brachial plexus are related with the 1st and 2nd parts of brachial plexus in the axilla, but the branches of cords are related with the 3rd part of axillary artery in the axilla. The lateral and posterior cords lie lateral to 1st part of axillary artery whereas the medial cord lies posterior to 1st part of axillary artery. The three cords are related with 2nd part of axillary artery with their respective locations. The lateral root of median, musculocutaneous nerve, coracobrachialis, and short head of biceps brachii lie lateral to 3rd part of axillary artery. The medial root of median lies in front of the 3rd part of axillary artery. The medial cutaneous
nerve of forearm and ulnar nerve lie in between 3rd part of axillary artery and axillary vein. The axillary and radial nerves lie posterior to 3rd part of axillary artery. Usually, there are two nerve communications in front of axillary artery – one communication between medial and lateral pectoral nerves in front of 1st part of axillary artery and another between medial and lateral roots of median in front of 3rd part of axillary artery.\cite{1,7}

**MATERIALS AND METHODS**

On routine dissection of pectoral, axillary, and arm regions of 40 adult embalmed cadavers in the dissection hall, Department of Anatomy, Great Eastern Medical School, Ragolu, Srikakulam, Andhra Pradesh, India, during 2015-2016, the various anatomical variations in origin, the number, course, and relations of the roots of median nerve (MN) and the level of formation of MN trunk in both upper limbs in four cadavers and in left upper limb in one cadaver were observed and photographed.

**RESULTS**

We observed the following variations in origin, the number, course, and relations of the roots of MN and the level of formation of MN trunk in both upper limbs in four cadavers and in the left upper limb in one cadaver out of 40 adult embalmed cadavers during routine dissection.

In both the upper limbs of four (2 male and 2 female) cadavers, the normal relation of cords of brachial plexus with the first and second parts of axillary artery was observed. An additional lateral root of MN originating from lateral cord lying to lateral to the first part of axillary artery, crossing in front of the second part of axillary artery was found to join with medial root of median (originating from medial cord lying posterior to the first part of axillary artery) medial to the second part of axillary artery. Normally, originating lateral root of MN from lateral cord lying lateral to the third part of axillary artery, crossing in front of third part of axillary artery was found to join with the medial root of median from medial cord to form MN trunk medial to third part of axillary artery (Figures 1 and 2). It was observed that the MN was formed by the union of two lateral roots and one medial root in 10% of cases. The further course, relations, and distribution of branches of MN distal to its formation were found normal. No vascular anomalies were observed.

In the left upper limb of one male cadaver, an addition lateral root of MN and long lateral root of MN originating from lateral cord, lying in relation to lateral aspect of the first and third parts of axillary artery, respectively, crosses in front of the second and third parts of axillary artery, respectively, to join with long medial root of MN from medial cord to form the trunk of MN medial to the second part of axillary artery and upper part of brachial artery, respectively (Figure 3). The further course, relations, and distribution of branches of MN distal to its formation were found normal. No vascular anomalies were observed.

![Figure 1: Formation of median nerve by two lateral roots and one medial root in right axilla (Additional lateral root of median originating from lateral cord lying lateral to 1st part of axillary artery, crossing in front of 2nd part of axillary artery, joins with medial root of median (originating from medial cord lying posterior to 1st part of axillary artery) lying medial to 2nd part of axillary artery. The lateral root of median crossing in front of 3rd part of axillary artery joins with medial root of median to form trunk of median nerve medial to 3rd part of axillary artery in the right axilla)](image1)

![Figure 2: Formation of median nerve by two lateral roots and one medial root in left axilla (Additional lateral root of median originating from lateral cord lying lateral to 1st part of axillary artery, crossing in front of 2nd part of axillary artery, joins with medial root of median (originating from medial cord lying posterior to 1st part of axillary artery) lying medial to 2nd part of axillary artery. The lateral root of median crossing in front of 3rd part of axillary artery joins with medial root of median to form trunk of median nerve medial to 3rd part of axillary artery in the left axilla)](image2)
Kumar and Teja: Anatomical Variations in Origin, Number, Course, and Relations of the Roots of Median Nerve and the Low-level Formation of Median Nerve Trunk

Eglseder and Goldman (1997)
Chauhan and Roy (2002)
Seedi and Rufai (2003)
Satyanarayana and Guha (2008)
Sargon et al. (2003); Meshram et al. (2012)

Table 1: Variations in number of median nerve roots

<table>
<thead>
<tr>
<th>S. No.</th>
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<th>Total number of roots of median nerve</th>
<th>Total number of lateral roots</th>
<th>Total number of medial roots</th>
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<tr>
<td>1</td>
<td>Anrkooli et al. (2007)</td>
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<td>2</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Eglseder and Goldman (1997)</td>
<td>2</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Arquez and Hurtado (2016)</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Chauhan and Roy (2002)</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
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<td>Satyanarayana and Guha (2008)</td>
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<td>2</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Seedi and Rufai (2003)</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Meshram et al. (2012)</td>
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<td>1</td>
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<tr>
<td>9</td>
<td>This study</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Figure 3: Low-level formation of median nerve by three roots in left axilla and upper arm (Additional lateral root of median originating from lateral cord lying lateral to 1st part of axillary artery, crossing in front of 2nd part of axillary artery, joins with long medial root of median lying medial to 2nd part of axillary artery. The long lateral root of median crossing in front of 3rd part of axillary artery joins with long medial root of median to form trunk of median nerve medial to upper part of brachial artery in left axilla and upper part of left arm)

DISCUSSION

The anatomical variations in origin, the number, course, and relations of the roots of MN and the level of formation of MN trunk are common. The variations of the lateral cord of brachial plexus regarding composition of fiber bundle and the absence or communication between its branches are common and being reported by several authors. Satyanarayana and Guha, Uzun and Seelig, and Meshram et al. found a four rooted MN with three lateral and one medial root. Pandey and Shukla have found in 4.7% cases that the roots of MN joined on medial side of axillary artery, and in 2.3% cases the roots did not join but continued separately. Eglseder and Goldman found that the MN nerve was formed of two lateral roots in 14% of their specimens. Sargon et al., Chauhan and Roy, Saeed and Rufai, Anrkooli et al., Satyanarayana et al., and Arquez and Hurtado reported the formation of MN by two lateral and one medial root. In this study, two lateral roots were found joining with one medial root to form MN in 10% of cases (Figures 1-3, Table 1).

Meshram et al. reported that the right MN was formed by four roots; three were coming from lateral cord and one from medial cord of brachial plexus. The uppermost or highest root was noted to be at the level of the first part of axillary artery where it gave origin to superior thoracic artery. The second root was found to be 2 cm below the first one and the third root was found 3 cm below the second root. The highest root of MN crossed the axillary artery from lateral to medial side and joined with medial root immediately on medial side of artery. The remaining two roots were found to be passing obliquely in front of the second and third part of axillary artery and joining individually with the medial root of MN and forming the main trunk of MN in front of third part of axillary artery. Devi et al. (2011) found the formation of MN at the junction of middle and the lower 1/3 of arm. In this study, an addition lateral root and medial root were seen originating from the corresponding lateral and medial cords, respectively, lying in relation to the first part of axillary artery in both upper limbs of four cadavers and in the left upper limb of a male cadaver (Figures 1-3).

The incidence of distal formation of MN was more common (8.5%, Uysal et al. (2003); 12%, Matejcik (2003); 2.1%, Mohammed and Badawoud (2003) than that of high level formation. Uysal et al. reported the variations of the brachial plexus to be more common in females and on the right side. Rajendran and Nivedha (2004) noted that the MN in addition to its formation in the middle of arm, gave off muscular branches to arm muscles and musculocutaneous nerve. In this study, the low-level formation of MN lying medial to the upper part of brachial artery was observed in the left upper limb of a male cadaver (Figure 3).

According to Hollinshead, anomalies of nerves are accompanied by abnormalities of vessels. The variations of brachial plexus were associated with those of subclavian,
axillary, and brachial arteries. However, in this study, such vascular abnormalities were not present.

Embryologically, the muscles of the upper limb develop from the migration of mesenchyme of the myotomes of somites from paraxial mesoderm during the 5th week of embryonic life and local mesenchyme. Spinal nerves are derived from two sources, the motor nerve from the neural tube and the sensory nerves from the neural crest cells. The axons of neurons penetrating into the mesenchyme in different directions enter into the limb buds and establish an intimate contact with the differentiating mesodermal condensations which develop into muscles of limbs. This early contact between the nerve and muscle cells is a prerequisite for their complete functional differentiation. According to Sannes et al., the guidance of the developing axons is regulated by expression of chemorepellants and chemorepellants in a highly coordinated site-specific pattern. Any alterations in signaling between mesenchymal cells and neuronal growth cones can lead to significant variations. Once formed, any developmental differences would persist postnatally.

In this study, as the muscles are developed, the neuronal signaling of these muscles would have gained nerve fibers from the lateral cord of brachial plexus by an alternate route in the form of additional lateral root to join with medial root to form MN trunk.

CONCLUSION

Variations in the roots of MN and level of formation of MN are the most common. The knowledge of these anatomical variations is essential for surgeons and radiologists to prevent complications during diagnostic and therapeutic procedures.

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Glycated Hemoglobin Level is Associated with Neurological and Functional Outcome in Acute Ischemic Stroke

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Abstract

Introduction: Among all the neurologic diseases of adult life, stroke ranks first in frequency and importance. Stroke is one of the leading causes of mortality and morbidity worldwide. Approximately 20 million people each year will suffer from stroke and of these 5 million will not survive.

Materials and Methods: An observational study of 90 acute ischemic stroke (AIS) patients, presenting within 24 h of onset, was undertaken. Patients were divided into three groups, non-diabetic (glycated hemoglobin [HbA₁c] <5.7%), pre-diabetic (HbA₁c 5.7-6.4%), and diabetic (HbA₁c ≥6.5%) on the basis of HbA₁c levels. Neurological status was assessed by NIHSS (National Institutes of Health Stroke Scale) score on admission and on day 7/discharge which ever was earlier. Post-stroke functional impairment was assessed by Modified Rankin Scale (MRS) on day 7/discharge whichever was earlier. Neurological outcomes were neurological improvement defined as four-point decrease in NIHSS during hospitalization or a 0 point status on NIHSS on day 7 or at discharge and neurological deterioration defined as ≥1 point increase in NIHSS during hospitalization. A poor functional outcome was defined as death (MRS 6) or dependency (MRS 2-5).

Results: The average age of the patients was 55.88 ± 11.67 years. The average HbA₁c level of AIS patients on admission was 6.61% ± 2.06%. Neurological improvement was noted in non-diabetic group as there was decrease in mean NIHSS score from admission to day 7. Neurological deterioration was noted in pre-diabetic and diabetic groups as there was increase in mean NIHSS score from admission to day 7. Poor functional outcomes as defined by higher MRS score on discharge, were noted in prediabetic and diabetic patients.

Conclusion: HbA₁c level is an important tool to know the prognosis in AIS. Both diabetes and pre-diabetes are associated with poor neurological and functional outcome as compare to non-diabetes in AIS.

Key words: Acute ischemic stroke, Glycated hemoglobin level, MRS, NIHSS

INTRODUCTION

Among all the neurologic diseases of adult life, stroke ranks first in frequency and importance. The common mode of expression of stroke is a relatively sudden occurrence of a focal neurologic deficit. Strokes are broadly categorized as ischemic or hemorrhagic. Ischemic stroke is due to the occlusion of a cerebral blood vessel and causes cerebral infarction.¹ Stroke is one of the leading causes of mortality and morbidity worldwide. Approximately 20 million people each year will suffer from stroke and of these 5 million will not survive.² Developing countries account for 85% of global deaths from stroke.³ Stroke is also a leading cause of functional impairments, with 20% of survivors requiring institutional care after 3 months and 15%-30% being permanently disabled.⁴ Diabetes is an established risk factor for the development of cardiovascular diseases, including stroke. The risk of stroke in diabetic patients is twice as high as in non-diabetic
people in a general population. Furthermore, if stroke occurs in diabetic patients, their outcomes are less favorable than in non-diabetic patients. A large number of studies have demonstrated residual neurological deficits and functional outcome to be worse compared with non-diabetics; consequently, hospital and long-term mortality were worse in diabetic patients compared with non-diabetes.

Pre-diabetes is an intermediate metabolic state between normal glucose metabolism and type 2 diabetes, representing a high risk of developing type 2 diabetes in the future. Up to 70% of the patients with pre-diabetes may develop type 2 diabetes. Pre-diabetes comprises impaired fasting glucose and/or impaired glucose tolerance and/or impaired glycated hemoglobin (HbA1c). The risk of developing type 2 diabetes is approximately 0.7% per year in normoglycemic individuals, whereas patients with impaired fasting glucose or impaired glucose tolerance have a yearly risk of 5-10%. The transition from pre-diabetes to type 2 diabetes usually takes several years but may also be more rapid. Patients with pre-diabetes do not only have an increased risk of type 2 diabetes but also of cardiovascular diseases, including stroke and recurrent stroke. There is a growing recognition that patients with pre-diabetes should be treated more aggressively.

HbA1c level reflects the mean glucose control range for the previous 2-3 months in patients with or without diabetes mellitus. HbA1c level is widely recommended as the therapeutic guideline for the prevention of cardiovascular complications in patients with diabetes. Recently, published clinical practice recommendations from the American Diabetes Association advocate the use of a HbA1c level greater than 6.5% for the diagnosis of diabetes, largely on the basis of the established association between HbA1c level and microvascular complications. Compared with fasting glucose, HbA1c has higher repeatability, can be tested in a non-fasting status, and is a relatively stable marker for glucose level. The following levels of HbA1c were used to diagnose diabetes: normal: <5.7%, pre-diabetes: 5.7-6.4%, diabetes: 6.5% or higher.

The role of HbA1c in the prediction of ischemic stroke in non-diabetic subjects is not clear. Different HbA1c levels in patients with acute stroke have different neurological impairment on admission and on discharge, prognosis are also different, showing that a higher blood HbA1c levels have a more serious neurological impairment and the prognosis is worse. The aim of the present study was to investigate the association between HbA1c on admission, and neurological and functional outcomes after acute ischemic stroke (AIS).

**MATERIALS AND METHODS**

This was an observational study done in the Department of Medicine, Dr. B.R.A.M. Hospital Raipur on 90 patients of AIS admitted in Wards, MICU and ICCU between August 2014 and September 2015. Patients were selected based on the inclusion criteria which included, all AIS patients irrespective of diabetic status, presented within 24 h from onset, confirmed by non-contrast computed tomography (NCCT) head, not confirmed by NCCT but having neurological symptoms. All AIS patients, presented after 24 h from onset, with hemorrhagic stroke, previous history of stroke, cerebellar/brain stem infarction, with cardioembolic ischemic stroke, transient ischemic attack defined as, focal neurologic deficit that lasts for <24 h, is presumed to be of vascular origin and is confined to an area of the brain or eye perfused by a specific artery, were excluded from study. Patients in whom stroke was clinically diagnosed, repeat CT was performed after 3 days to confirm ischemic stroke, if scan was negative for ischemic stroke, then the patient was excluded from the study group. The study was approved by the Ethical Committee of Institute. Written informed consent was taken from all patients. A complete history, physical examination, and systemic examination were done in all patients. Five milliliters venous blood was taken at the time of hospital admission for subsequent measurement of admission blood glucose level, HbA1c level, and other routine examinations. After taking blood samples, all patients were sent for urgent NCCT head. Diabetic status was assigned on the basis of the history of diabetes or treatment with hypoglycemic agents or elevated HbA1c or persistent/marked hyperglycemia. Patients were divided into three groups on the basis of HbA1c levels. Group I having HbA1c values <5.7%, i.e., (non-diabetic); Group II having HbA1c values 5.7-6.4% (pre-diabetic), and Group III having HbA1c values ≥6.5% (diabetic). The severity of neurologic impairment was evaluated by the National Institutes of Health Stroke Scale (NIHSS) score, on admission and after day 7/during discharge whichever was earlier. The functional status was evaluated by Modified Rankin Scale (MRS) on day 7/discharge which ever was earlier. Neurological outcomes were neurological improvement defined as four-point decrease in NIHSS during hospitalization or a 0 point status on NIHSS on day 7 or at discharge and neurological deterioration defined as ≥1 point increase in NIHSS during hospitalization. A poor functional outcome was defined as death (MRS 6) or dependency (MRS 2-5).

All continuous variables were expressed as mean ± standard deviation; all data were analyzed using t-test or the Chi-square test by the SPSS 13.0 software package. $P < 0.05$ was considered statistically significant. The HbA1c level was
determined by high-performance liquid chromatography method.

RESULTS

The average age of the patients was 55.88 ± 11.67 years. 58 (64.4%) patients were males and 32 (35.6%) patients were females. The male to female ratio was 3:2. A total of 72 (80%) patients were present in 40-69 years age group. Out of this, maximum (28) were in 60-69 years age group. 42 (46.7%) patients were diabetic and 48 (53.3%) were non-diabetic. 18% patients were newly diagnosed and 21% were pre-diabetics out of total patients. The average HbA1c value of AIS patients on admission was 6.61% ± 2.06%. 46.7% patients had HbA1c value ≥6.5% (diabetic), 32% had <5.7% (non-diabetic), and 21% patients had 5.7-6.4% (pre-diabetic). There was no significant effect of gender on HbA1c level in AIS patients (P > 0.05). HbA1c level increased with increase in age of patients. There was no significant (P > 0.05) effect of gender on severity of stroke as assessed by NIHSS score on admission and day 7 and prognosis after 7 day of stroke. The severity of stroke (assessed by increase in mean NIHSS score) and poor prognosis and dependency (assessed by higher mean MRS score) increased for older age patients. On admission, severe stroke was present in diabetic patients, as there was significant (P < 0.05) increase in mean NIHSS score, and pre-diabetics had non-significant (P > 0.05) increase in mean NIHSS score, as compare to non-diabetic patients. On day 7 discharge, severe stroke was present in both diabetic and pre-diabetic patients as there was significant (P < 0.05) increase in mean NIHSS score as compared to non-diabetic patients. Both diabetic and pre-diabetic patients had significant (P < 0.05) higher mean MRS score as compared to non-diabetic patients. Neurological improvement was noted in non-diabetic group, as there was decrease in mean NIHSS score from admission to day 7. Neurological deterioration was noted in pre-diabetic and diabetic groups as there was increase in mean NIHSS score from admission to day 7. Poor functional outcomes as defined by higher MRS score on discharge were noted in pre-diabetic and diabetic patients. Higher admission HbA1c levels were associated with raised blood pressure, dyslipidemia and raised blood sugar levels.

DISCUSSION

The mechanism by which poor glycemic control before onset is associated with unfavourable outcome of ischemic stroke is unclear. There is possible hypothesis regarding the association between HbA1c level and outcomes. Persistent hyperglycemia is thought to be associated with the expansion of infarct volume and worse functional outcome.10 Admission hyperglycemia has been independently associated with outcome both in patients with and without diabetes.11 One of the proposed mechanisms is that hyperglycemia itself probably results in neurotoxicity and induces a procoagulant state.12 Our study showed, a significant association between glycated hemoglobin level and neurological and functional outcomes. As the HbA1c level increased from non-diabetic to diabetic, neurological improvement decreased and neurological deterioration increased. Similarly, poor functional outcomes were noted for higher HbA1c levels. After adjusting age and sex, neurological severity, blood sugar, dyslipidemia and hypertension, in HbA1c level increased from nondiabetic to diabetic groups. Other studies also support our results. A study done in Japan,4 patients were categorized into four groups based on their pre-stroke glycemic control (PSGC) status defined by glycated hemoglobin level: Excellent (HbA1c on admission <6.2%), good (6.2–6.8%), fair (6.9-8.3%), and poor (≥8.4%). The age- and sex-adjusted odds ratios for neurological improvement decreased substantially as PSGC status became poorer. In contrast, signs of neurological deterioration increased with poorer PSGC status. The probability of achieving neurological improvement was significantly lower, and the risk of a neurological deterioration was significantly higher in both the fair and poor PSGC groups than in the excellent PSGC group. In other study,13 HbA1c, but not glyemia was significantly correlated with acute stroke severity. In a Chinese study,14 a higher blood HbA1c levels were found to have more serious neurological impairment and the prognosis was worse after 3 months. In one of the Indian study from Baroda,15 most patients with a better prognosis as determined by their lower NIHSS score had a lower HbA1c level, and most with a worse prognosis as per their higher NIHSS score had a higher HbA1c level. Tables 1 and 2, shows the significance of neurological and functional outcomes in our study and other similar studies. In contrast to other studies, our study had more number of diabetic (HbA1c ≥6.5) patients, i.e., 42 (46.7%). This higher number in diabetic patients may be due to the fact that our institute is the only tertiary care center for Chhattisgarh state. Limitation of our study is short term (7 days) follow-up after AIS.

CONCLUSION

Diabetes is a known risk for poor neurological and functional outcomes, which was again confirmed by this study but pre-diabetics had also poor neurological and functional outcomes as compared to non-diabetes in AIS patients. Hence, HbA1c level should be determined in every AIS patients to know the prognosis and for further treatment plan after stroke.
Table 1. HbA\textsubscript{1c} level and mean NIHSS score on admission & on day 7/discharge and mean MRS score on discharge in Acute Ischemic Stroke (AIS) patients

<table>
<thead>
<tr>
<th>Group</th>
<th>HbA\textsubscript{1c} level (%)</th>
<th>Mean NIHSS score on admission</th>
<th>Standard deviation</th>
<th>T test</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>I (Non diabetic) N=29</td>
<td>&lt;5.7</td>
<td>6.51</td>
<td>± 3.9</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>II (Prediabetic) N=19</td>
<td>5.7-6.4</td>
<td>7.52</td>
<td>± 2.8</td>
<td>1.46</td>
<td>0.164</td>
</tr>
<tr>
<td>III (Diabetic) N=42</td>
<td>≥6.5</td>
<td>10.66</td>
<td>± 4.2</td>
<td>4.15</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mean NIHSS score on day 7/discharge</th>
</tr>
</thead>
<tbody>
<tr>
<td>I (Non diabetic) N=29</td>
</tr>
<tr>
<td>II (Prediabetic) N=19</td>
</tr>
<tr>
<td>III (Diabetic) N=42</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mean MRS score on discharge</th>
</tr>
</thead>
<tbody>
<tr>
<td>I (Non diabetic) N=29</td>
</tr>
<tr>
<td>II (Prediabetic) N=19</td>
</tr>
<tr>
<td>III (Diabetic) N=42</td>
</tr>
</tbody>
</table>

*Group I patients (non-diabetic) were taken as reference for comparing group II (prediabetic) and group III (diabetic) patients.

Table 2. Several studies with P values of neurological and functional outcome

<table>
<thead>
<tr>
<th>Studies</th>
<th>P value of Neurological outcome by NIHSS score</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Masahiro Kamouchi, et al,</td>
<td>&lt;0.001</td>
<td>Highly significant</td>
</tr>
<tr>
<td>Clara Hjalmarsson et al,</td>
<td>0.042</td>
<td>Significant</td>
</tr>
<tr>
<td>Guo Shuangxi, et al,</td>
<td>0.019</td>
<td>Significant</td>
</tr>
<tr>
<td>Suresh Hirani et al,</td>
<td>0.018</td>
<td>Significant</td>
</tr>
<tr>
<td>Our study</td>
<td>&lt;0.001</td>
<td>Highly significant</td>
</tr>
</tbody>
</table>

P value of Functional outcome by MRS score

<table>
<thead>
<tr>
<th>Studies</th>
<th>P value</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Masahiro Kamouchi, et al,</td>
<td>&lt;0.001</td>
<td>Highly significant</td>
</tr>
<tr>
<td>Clara Hjalmarsson et al,</td>
<td>0.024</td>
<td>Significant</td>
</tr>
<tr>
<td>Guo Shuangxi, et al,</td>
<td>0.028</td>
<td>Significant</td>
</tr>
<tr>
<td>Our study</td>
<td>&lt;0.001</td>
<td>Highly significant</td>
</tr>
</tbody>
</table>

REFERENCES

Quality of Indicators for Effectiveness of Care in Diabetes in Tertiary Care Hospital

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Abstract

Introduction: Diabetes mellitus, commonly called diabetes, is a condition that makes many people worry about the quality and longevity of their life after being told that they have diabetes. About 18 million people in India are suspected to have diabetes.¹

Aim: The aim of this study to check the quality of care for diabetic patients and its effectiveness and to assess the extent of knowledge in patients regarding diabetes and its complications.

Materials and Methods: This cross-sectional study done in all type of diabetic patients who all diagnosed with diabetes at least 1 year before are eligible to participate in the study. The study methodology comprised an audit to assess the quality of care provided to the diabetic patients using the quality indicators for diabetes care.

Results: Fifty type 2 diabetes patients were enrolled in the study; 52% of patients are not monitoring the blood sugar level. Seventy percent of patients are not monitoring the glycated hemoglobin (HbA1c) value once in 6 months. Random blood sugar levels of poor knowledge patients were normal (110.83 mg/dl) when compared with good knowledge patients (130.52 mg/dl) which is abnormal. There is no difference in HbA1c and low-density lipoprotein level in respect to knowledge of the patients. Patients with poor knowledge of diabetes are better controlled their blood sugar level than patients known about diabetes.

Conclusion: Regular monitoring of diabetes patients is more important in achieving the goals. Hence, health-care provider must create local standards of care and clinical practice guidelines for the management of diabetes which are easily affordable and available.

Key words: Awareness, Diabetes, Knowledge, Quality indicators

INTRODUCTION

Diabetes is a disorder of the chemical reactions that are necessary for proper utilization of carbohydrates, fats, and protein from the diet along with inadequate or lack of insulin. In other words, diabetes results when the body cannot use some foods because of inadequate production of insulin. Insulin is a hormone produced in the pancreas to regulate the amount of blood. Diabetes mellitus, commonly called diabetes, is a condition that makes many people worry about the quality and longevity of their life after being told that they have diabetes. Anyone can get diabetes, but almost all of them can lead a full, active life with regular control of their diet and medicines. Global report of the WHO revealed that 422 million adults are living with diabetes.¹ In 2030, it may increase to very big number nearly 700 million.² Type 2 diabetes occupy 80-90% in that all cases. Type 2 diabetes is more common in developed and developing countries, which predicts that Asia may have large number of diabetic prevalence in 2030.³ The increase in incidence in developing countries follows the trend of urbanization and lifestyle changes, including increasingly sedentary lifestyles, less physically demanding work, and the global nutrition transition, marked by increased intake of foods that are high energy-dense but nutrient-poor. The risk of getting type 2 diabetes has been widely found to be associated with lower socioeconomic position across countries.⁴ According to the Indian Heart
Association predicted in India by 2035, there would be around 109 million diabetes.\(^5\) The high incidence is attributed to a combination of genetic susceptibility plus adoption of a high-calorie, low-activity lifestyle by India’s growing middle class.\(^6\)

**Aim**
The aim of this study was to check the quality of care for diabetic patients and its effectiveness and to assess the extent of knowledge in patients regarding diabetes and its complications.

**MATERIALS AND METHODS**

This cross-sectional study will be done in diabetic patients visiting outpatient department of the hospital over the period of 1 month. All type of diabetic patients who all diagnosed with diabetes at least 1 year before are eligible to participate in the study. The purpose of the study will be explained to the patients, and informed consent will be taken with each patient. Basic demographic details for all patients will be collected primarily. The study methodology comprised an audit to assess the quality of care provided to the diabetic patients using the quality indicators for diabetes care. The process indicators consist of basic tests that are required to be done in a patient with diabetes. The proximal outcome measures laid down criteria for HB1Ac, blood pressure (BP), lipid profile, foot examination in the context of evaluating the quality of care.

**RESULTS**

In our study, 50 patients with type 2 diabetes were questioned and assessed for quality indicators. Figure 1 shows the distribution of study patients in gender. This shows that males 64% are more in our study group than females 36%.

Seventy-eight percent of patients in our study are aged between 30 and 60 years, and 22% of patients are more than 61 years. Forty-two percent of patients are in 51-60 years age group followed by 41-50 years (Figure 2).

Twenty percent of study patients have one or more person in family with diabetes. In our study, 50% of patients are doing clerical jobs such as accounts, salespeople, small-scale business, driving, and 14% are doing agriculture such as farming in their own land or working in farming-associated jobs. Thirty-two percent of patients are unemployed; most of them are females. Addiction, smoking, and alcohol play an important role in causing unwanted health problems and change in sugar level in blood. Eighteen percent of male patients were smoking cigarettes and 16% were drinking alcohol. Fifty-four percent of patients are adherent to the treatment, and 46% are not adherent to the treatment. Fifty-seven percent of oral treatment patients are not taking medicine in correct time or missing the dose. Thirty-seven percent of patients in insulin therapy are non-adherent (Figure 3).

More than 50% of patients are not in regular in routine checkup, and 52% of patients are not monitoring the blood sugar level. Seventy percent of patients are not monitoring the glycated hemoglobin (HbA1c) value once in 6 months; it is more important to know the glycemic control of every 6 months that it may help in controlling the blood sugar. Seventy-eight percent of patients are not checking their foot regularly to prevent foot ulcer. In our study, 90% are not checking their eye to prevent diabetic retinopathy; more than 5 years of diabetes patients must check their eye every 6 months as per the study. Seventy-two percent of patients are felt hypoglycemic effect <1 in a week (Figure 4).

When comparing the knowledge of patients in gender, both genders have no difference in awareness of diabetes. There is difference understanding diabetes in patients went to school and colleges; patients went to school have good awareness of diabetes than patients went to colleges. Occupation of the patients does not have any role in awareness of diabetes (Table 1).

When comparing the quality indicators in relation to the patients, BP of the patients in poor knowledge group had shown high BP level (103.92 mmHg) when compared with patients in good knowledge (101.63 mmHg) \((P = 0.344)\). Random blood sugar levels of poor knowledge patients were normal (110.83 mg/dl) when compared with good knowledge patients (130.52 mg/dl) which is abnormal. Shockingly, patients with good knowledge are not controlling their blood sugar level \((P = 0.006)\). When talking about HbA1c, there is no difference in HbA1c level in respect to knowledge of the patients; hence, all patients have no difference in HbA1c level. Low-density lipoprotein level also has shown no difference in knowledge group (Table 2).

**DISCUSSION**

India is leading global diabetes epidemic; 50% of diabetes patients are living in three countries, China, India, followed by the United States.\(^7\) This is evidence that diabetes is increasing in Indian Urban area. The conventional risk factors of urbanization, unhealthy eating habits and physical inactivity, coupled with inherent genetic attributes and differences in body composition, are propelling the increase in cases of diabetes. Accordingly, diabetes-related
Table 1: Association of variables in knowledge in essential concepts in diabetes

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Category</th>
<th>Knowledge in essential concepts in diabetes</th>
<th>( P )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age groups (years)</td>
<td>30-60</td>
<td>Good 20</td>
<td>Average 40</td>
</tr>
<tr>
<td></td>
<td>&gt;61</td>
<td>Good 3</td>
<td>Average 6</td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>Good 17</td>
<td>Average 34</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>Good 6</td>
<td>Average 12</td>
</tr>
<tr>
<td>Education</td>
<td>School</td>
<td>Good 20</td>
<td>Average 40</td>
</tr>
<tr>
<td></td>
<td>College</td>
<td>Good 3</td>
<td>Average 6</td>
</tr>
<tr>
<td>Occupation</td>
<td>Agriculture</td>
<td>Good 1</td>
<td>Average 2</td>
</tr>
<tr>
<td></td>
<td>Clerical</td>
<td>Good 16</td>
<td>Average 32</td>
</tr>
<tr>
<td></td>
<td>Professional</td>
<td>Good 1</td>
<td>Average 2</td>
</tr>
<tr>
<td></td>
<td>Unemployed</td>
<td>Good 5</td>
<td>Average 10</td>
</tr>
<tr>
<td>Diabetes duration (years)</td>
<td>&lt;5</td>
<td>Good 5</td>
<td>Average 10</td>
</tr>
<tr>
<td></td>
<td>5-10</td>
<td>Good 7</td>
<td>Average 14</td>
</tr>
<tr>
<td></td>
<td>&gt;10</td>
<td>Good 11</td>
<td>Average 22</td>
</tr>
</tbody>
</table>

Table 2: Association of knowledge scores with outcome indicators

<table>
<thead>
<tr>
<th>Quality indicators</th>
<th>Knowledge</th>
<th>Mean</th>
<th>SD</th>
<th>Minimum</th>
<th>Maximum</th>
<th>( P )</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP</td>
<td>Poor</td>
<td>103.92</td>
<td>1.88</td>
<td>100</td>
<td>106</td>
<td>0.344</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>102.73</td>
<td>4.28</td>
<td>93</td>
<td>106</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>101.65</td>
<td>5.20</td>
<td>93</td>
<td>108</td>
<td></td>
</tr>
<tr>
<td>RBS</td>
<td>Poor</td>
<td>110.83</td>
<td>11.10</td>
<td>98</td>
<td>138</td>
<td>0.006</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>132.80</td>
<td>22.61</td>
<td>96</td>
<td>172</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>130.52</td>
<td>18.61</td>
<td>96</td>
<td>160</td>
<td></td>
</tr>
<tr>
<td>HbA1c</td>
<td>Poor</td>
<td>7.30</td>
<td>0.70</td>
<td>6.4</td>
<td>8.6</td>
<td>0.078</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>8.04</td>
<td>0.81</td>
<td>6.8</td>
<td>9.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>7.83</td>
<td>0.93</td>
<td>6.5</td>
<td>9.2</td>
<td></td>
</tr>
<tr>
<td>LDL</td>
<td>Poor</td>
<td>125.17</td>
<td>11.98</td>
<td>98</td>
<td>146</td>
<td>0.363</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>132.07</td>
<td>18.56</td>
<td>98</td>
<td>165</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>133.52</td>
<td>17.26</td>
<td>98</td>
<td>180</td>
<td></td>
</tr>
</tbody>
</table>

SD: Standard deviation, BP: Blood pressure, RBS: Random blood sugar, LDL: Low-density lipoprotein, HbA1c: Glycated hemoglobin

complications are also on the rise and contribute significantly to overall morbidity and mortality. The low levels of education and poor awareness of the disease in the country are enhancing its impact on health of the population. While comprehensive data are not available, smaller studies have been performed in various states of India to study the prevalence of diabetes. Based on these studies, the highest prevalence reported is from Ernakulam in Kerala (19.5%) and the lowest from Kashmir Valley (6.1%). Most other areas have prevalence above 10%. While most prevalence studies in India have been regional, there has been a recent effort supported by the Indian Council of Medical Research (ICMR) to estimate the nationwide prevalence of diabetes (urban and rural). The first phase
of the ICMR-India study (involving three states and one union territory) has been completed. In this study, around 13,000 subjects were studied using a stratified multistage sampling design. The rural and urban population was equally represented. The prevalence rates of diabetes and pre-diabetes were assessed by measurement of fasting and 2 h post-glucose load capillary blood glucose. This study projects a likely national estimate of 62.4 million patients with diabetes and 77.2 million with pre-diabetes. Prevalence of diabetes was reported ranging from 5.3% to 13.6% in different areas in this study. There is limited information on the incidence of diabetes in India. One such data source is the New Delhi Birth Cohort study, which reported an annual incidence of 1.0% for males and 0.5% for females, even though this population was in the fourth decade of life. In a longitudinal cohort from Chennai, the incidence of diabetes was calculated as 20.2 per 1000 person-years among subjects with prior normal glucose tolerance and 64.8 per 1000 person-years in those with pre-diabetes.

CONCLUSION

This study helps to health-care providers to know the quality of health of diabetes patients. This may reconsider their policy to achieve the management goals of a good quality care provided to the diabetes patients. Regular monitoring of diabetes patients is more important in achieving the goals. Hence, health-care provider must create local standards of care and clinical practice guidelines for the management of diabetes that are easily affordable and available. Patients must be alerted by awareness program to increase the frequency of visiting health-care providers to monitor their health.

REFERENCES


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Early Surgical Management of Appendicular Mass: A Retrospective Analysis

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Abstract

Introduction: For decades the management of appendicular mass has been of initial conservative treatment followed by interval appendectomy. Early surgical intervention is an effective alternative to the conservative management. In our hospital, we follow early surgical management, usually laparoscopic appendectomy for all the cases of appendicular mass, laparotomy and procedure if the same cannot be done laparoscopically. By doing so, there is no need of the second admission. The purpose of our study is to do the retrospective analysis and assess the outcome of early surgical management in appendicular mass.

Materials and Methods: A retrospective analysis was performed for all the patients who were treated laparoscopically for appendicitis and appendicular mass. A total of 45 patients were treated for appendicitis from September 2015 to October 2016. A retrospective review of these patients demonstrated that 14 patients had appendicular mass in which 11 cases were managed laparoscopically, and 3 were converted to open. Postoperatively, all the patients were recovered satisfactorily with no significant morbidities noted. Masses which were not inflammatory or due to neoplasms were not included in this study.

Results: A total of 45 patients were treated for appendicitis from September 2015 to October 2016. A retrospective review of these patients demonstrated that 14 patients had appendicular mass in which 11 cases were managed laparoscopically and 3 were converted to open. The ages of the patient were in the range of 12-67 years. 9 patients were male and 5 patients were female. The average operative time was 1 h 40 min. The length of hospital stay was in the range of 6-8 days. No morbidities were noted.

Conclusion: The results of our study suggests that early surgical management in the form of laparoscopic appendectomy is safe and feasible for the patient with appendicular mass as it not only reduces the hospital stay but also eliminates the need of the second admission.

Key words: Appendicitis, Appendicular mass, Early laparoscopic surgery

INTRODUCTION

Acute appendicitis is the most common surgical pathology which a surgeon notices in his daily practice. For decades open appendectomy was the standard treatment for all form of appendicitis.¹ In today’s era laparoscopic appendectomy is the treatment of choice for appendicitis.²

Laparoscopic appendectomy was first performed by Semm in 1983 and initially was performed incidental to other pelvic procedures.³ As the operative techniques were refined, the indications were extended to patients with suspected appendicitis.⁴,⁵

Laparoscopic appendectomies have reported minimal morbidity and a shortened recovery period which demonstrates its superiority over open procedures.

Appendicular mass is usually seen in patients presenting late to the hospital in the course of appendicitis. The initial conservative management followed by interval appendectomy was the traditional approach for the treatment of appendicular mass. With recent advances in
minimally invasive surgical procedures, the management of appendicular masses has seen a tilt towards early surgical intervention.\textsuperscript{5,6,7}

Early surgical management in the form of laparoscopic appendectomy is an effective alternative to the conventional conservative management as it not only confirms the diagnosis and in a single go offers complete treatment in a single sitting thereby eliminating the need of the second admission.\textsuperscript{8}

In our set up, lot of patients belong to the poor socio-economic background where the follow-up of the patient is always difficult and once the symptoms subsides many patients do not turn up for the interval appendectomy. In such scenario, early surgical management is always better as it is cost effective, reduces the hospital stay and eliminates the need of the second admission.

**MATERIALS AND METHODS**

A retrospective analysis was performed for all the patients who were treated for appendicitis and appendicular mass from September 2015 to September 2016 in SIII unit, Department of General Surgery, St. Martha’s Hospital, Bengaluru (Table 1). A total of 45 patients were treated for appendicitis and a retrospective review of these patients demonstrated that 14 patients had appendicular mass in which 11 cases were managed laparoscopically and 3 were converted to open. The ages of the patient were in the range of 12-67 years, 9 patients were male and 5 patients were female. All the patients at the time of admission presented with fever, pain abdomen and mass in right iliac fossa. All the patients had leukocytosis (>11000/mm\(^3\)) (Table 2).

11 patients underwent laparoscopic appendectomy, and 3 patients were converted to open appendectomy (Table 3). The reason for conversion was dense interbowel loops adhesions due to which the appendix could not able to be localized. In two cases there was perforation of the base of the appendix with interbowel adhesions and abscess formation. The average operative time 1 h 40 min. The length of the hospital stay was in the range of 6-8 days. Perioperatively, there were no complications.

Postoperatively, all the patients recovered well. No morbidities were noted.

![Table 1: Total number of cases of appendicitis and appendicular mass](image)

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Number of cases (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appendicitis</td>
<td>31 (68.88)</td>
</tr>
<tr>
<td>Appendicular mass</td>
<td>14 (31.11)</td>
</tr>
</tbody>
</table>

![Table 2: Preoperatively the patients went following investigations](image)

<table>
<thead>
<tr>
<th>Investigation</th>
<th>Number of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>USG abdomen and pelvis</td>
<td>45 (100)</td>
</tr>
<tr>
<td>CT abdomen</td>
<td>10 (22.22)</td>
</tr>
<tr>
<td>MRI abdomen</td>
<td>1 (2.22)</td>
</tr>
</tbody>
</table>

USG: Ultrasonic sonography, CT: Computed tomography, MRI: Magnetic resonance imaging

![Table 3: Surgeries for appendicitis and appendicular mass](image)

<table>
<thead>
<tr>
<th>Surgeries</th>
<th>Number of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lap. appendectomy</td>
<td>31 (68.88)</td>
</tr>
<tr>
<td>Lap. appendectomy for mass</td>
<td>11 (24.44)</td>
</tr>
<tr>
<td>Open appendectomy for mass</td>
<td>3 (6.66)</td>
</tr>
<tr>
<td>Total</td>
<td>45 (100)</td>
</tr>
</tbody>
</table>

![Table 4: Perioperative findings in appendicular mass](image)

<table>
<thead>
<tr>
<th>Findings</th>
<th>Total number of cases (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bowel adhesions</td>
<td>14 (100)</td>
</tr>
<tr>
<td>Appendicular abscess</td>
<td>5 (35.71)</td>
</tr>
<tr>
<td>Perforated appendix</td>
<td>2 (14.28)</td>
</tr>
<tr>
<td>Gangrenous appendix</td>
<td>3 (21.42)</td>
</tr>
<tr>
<td>Loculated pus collection</td>
<td>3 (21.42)</td>
</tr>
</tbody>
</table>
DISCUSSION

The management of patients with appendicular mass is controversial. The controversies exist regarding conservative management, surgical management, duration of antibiotic therapy, drain usage and skin closure. Recently, performing laparoscopic appendectomy for appendicular mass has been added to the list of controversies.

Appendicular mass develops in 2-6% of cases following acute appendicitis. Pathologically, this may represent a spectrum ranging from phlegmon to abscess. It is always difficult to distinguish between the appendicular mass and appendicular abscess.

Immediate appendectomy has the advantages of being safe, cost effective, eliminates the risk of recurrent appendicitis and thereby the need of the second admission for the interval appendectomy. In our study, all the patients underwent an immediate appendectomy.

Jordan et al., in 1974-1979 performed 42 open appendectomies in palpable masses and recommended early surgery in patients with appendicular mass. However, he also reported that it has a high complication rate (36%), almost comparable to that for perforated appendicitis. It may also lead to dissemination of infection and fistula formation. In this study, all the cases of appendicular mass underwent early surgical intervention, and we did not come across any such complication.

Nonoperative management has been proposed for the management of patients with localized abscess formation due to perforated appendicitis. Antibiotic therapy is successful in about 93% of these patients; in about 20% of them, image guided percutaneous drainage of the abscess will eventually be required. In our study, 5 patients had appendicular abscess in which laparoscopic appendectomy and pus drainage was done. Postoperatively, patient did not have any complication and was discharged satisfactorily.

The average length of hospital stay in conservative approach is a little more compared to one time early surgical approach, with a further second admission required for interval appendectomy. The length of hospital stay in our study was 6-8 days.

Horwitz et al., and others have reported increased risk of post-operative intraabdominal abscesses in laparoscopically approached complicated appendicitis. In our study, none of our patients developed such complications. In all the cases, collection in the peritoneal cavity was aspirated and a through saline wash was given followed by drain in situ. Valla et al., suggested open approach in appendicular masses. In our study, out of 14 cases 11 were treated laparoscopically and 3 were converted to open due to dense adhesions. Hence, we suggest laparoscopic approach is more safe and feasible for the patients with appendicular mass.

Richards et al., reported that laparoscopic appendectomy resulted in less complications, a shorter hospital stay, and cost-effective compared to open appendectomy in patients with perforated appendicitis. Tirabassi et al., reported a high conversion rate (36%) after laparoscopic operation for perforated appendicitis. We had 6% of conversion rate in our study. The reasons for conversion was dense inter bowel adhesions due to which the appendix was not localized.

The laparoscopic approach has lot of advantages in cases with complicated appendicitis. It allows the surgeon to have a panoramic view of the abdominal cavity, easy accessibility, and feasibility to give a thorough peritoneal lavage in compare with the open cases where atypical localization of the appendix may require an extension of the incision. Furthermore, laparoscopic approach allows the patient early mobility, less pain and less hospital stay compare to open cases.

CONCLUSION

Early surgical intervention in the form of laparoscopic appendectomy in cases of appendicular mass is safe and feasible option.

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Learning Style among Undergraduate Medical Students of Different Phases

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Abstract

Introduction: Knowing the learning style of our students will enable the facilitators for a better curriculum planning. We are not aware, whether there is a difference in the learning style of students across different regions and countries. As this gap in our knowledge exists, this study was planned.

Objective: To identify the learning style of undergraduate medical students from Phases I to III.

Materials and Methods: Study design: This was an observational study. Study setting: This study was conducted at Government Medical College, Kottayam. Data collection: Visual, auditory, read/write, and kinesthetic questionnaire-7.8 and a peer reviewed set of questionnaire were collected.

Results and Conclusion: Students generally prefer polymodal learning. Auditory is the most preferred mode. There is no gender difference in learning styles. Students are interested to learn psychomotor, affective, and communication skills.

Key words: Learning style, Visual; auditory; read/write; and kinesthetic, Auditory, Polymodal, Skills

INTRODUCTION

Styles of thinking and learning are as important as intellectual ability and ignoring it will put teaching and learning to jeopardy. Learning style is an individual’s unique approach to learning based on strength, weaknesses, and preferences. It is an overall pattern providing direction to teaching and learning. Styles influence how students learn, teachers teach, and how the two interact. Learning style is defined as the composite characteristic, cognitive, affective, and physiological characters that serve as stable indicators of how a learner perceives, interacts with, and responds to the learning environment.¹,² Educational researchers supposed that everyone had different learning styles, and if the method of information delivery to them conforms to their particular learning style, they will learn better. Students’ learning style is one of the most important factors for academic and career success. Learning style could be a set of factors, behaviors, and attitudes facilitating learning for an individual in a given situation. Style can be considered as a contextual variable because what the learner brings to the learning experience is as much a part of the context as are the important features of the experience itself.

An important quality of a successful doctor is his/her ability to be a lifelong learner. Thus, for both academic achievement and career, medical students should be lifelong learners. Identifying learning styles leads to most effective teaching-learning methods. Self-learning also will become more effective if learning style is identified. Knowing the learning style of our students will enable the facilitators for a better curriculum planning. We are not aware, whether there is a difference in the learning style of students across different regions and countries. As this gap in our knowledge exists, this study was planned.

Objective

The aim of this study is to identify the learning style of undergraduate medical students from Phases I to III.
MATERIALS AND METHODS

Study Design
This was an observational study.

Study Setting
This study was conducted at Government Medical College, Kottayam.

Sampling
Convenient sampling - Participation in the study was voluntary and anonymous. Verbal consent was taken.

Study Period
1-month after getting IRB Clearance (August 2016).

Data Collection
VARK questionnaire-7.8. (VARK - An acronym for visual, auditory, read/write, and kinesthetic) international validated version containing 16 questions and an additional 8 questions which are peer validated were used for collecting data from 100 undergraduate medical students; one-third from each phase. The respondents were permitted to omit a question or choose more than one response. They had the freedom of not to hand back the questionnaire.

Data Analysis
Data from VARK responses were decoded into visual, auditory, read/write, and kinesthetic or mixed. VARK score was calculated by dividing the number of responses in a mode by the number of students.

Responses of peer-validated questionnaire were handled by simple summation statistics.

RESULTS

Pro forma and questionnaires were distributed to 100 students, and 94 students responded. The responses obtained were decoded to VARK, and VARK score was calculated. After calculating the VARK score, it was observed that there is no gender difference between the students (Tables 1 and 2).

<table>
<thead>
<tr>
<th>Table 1: VARK score phase wise</th>
</tr>
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<tbody>
<tr>
<td>Students</td>
</tr>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>Phase I</td>
</tr>
<tr>
<td>Phase II</td>
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<td>Phase III</td>
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</table>

VARK: Visual, auditory, read/write, and kinesthetic

DISCUSSION

Students’ approach to learning has been a topic of interest for medical educators for quite some time. Although everybody uses all learning modes, depending on the circumstances, the relative ease and interest for a given learning challenge or discipline will differ according to the predominant learning mode involved. Learning style is a term used to the methods of gathering, processing, interpreting, organizing, and thinking about information.

The ability to visit all learning modes is important to medical students. They have to master the basic sciences for which conceptualization and reflection are required as well as the interpersonal relationships that promote the ability to connect empathetically with the patient, effectively and efficiently in critical circumstances.

Shetty analyzed the learning pattern of 1st year medical students by VARK test and found that majority preferred to learn by multiple modalities - trimodal for 5% and quadruple modal for 95%. Findings in this study are different, bimodal, trimodal are less, and quad modal does not exist in the first phase.

Slater et al. addressed the question of gender difference and learning style preference of 1st year medical students using VARK questionnaire and reported both male and female students preferred multiple modes of information presentation, and there was no statistically significant difference between the two groups. The present study agrees with this.

Bitran et al. using Kolbe’s learning style inventory found that medical students changed their preferred way of learning, evolving from abstract passive, reflexive learners to abstract active learners. This shows an adaptation to the
curriculum evolving from lecture-based teacher-centered approach to problem-based student-centered approach. This is indirectly reflected in our study, where the students of second and final phase were preferring bi and trimodal which aids in problem solving. This method is different from first phase approach.

Anu et al. assessed the learning style of students of various medical colleges in Tamil Nadu and they also found similar results, in a group of 450 first year and second year students, where about 70.6% preferred multiple learning styles by a different inventory of VAK questionnaire.

Renganath and Priya found that though majority were multimodal learners, most preferred kinesthetic method study. Of the 128 preclinical medical students, 61% were multimodal, 29% quad modal; among unimodal, kinesthetic forms the majority of 56.8%. We found that the majority were multimodal, but auditory ranked first in almost all the phases and quad modal is the least common.

Samarakoon compared first year, final years and residents and found both first and final years have multimodal learning preferences, of 69.9% and 67.5%, respectively. They found that multimodal with auditory preference is seen in preclinical, which is the similar finding in this study also. They have also found that the fundamental learning style do not change over the years.

Prithishkumar and Michael also found multimodal learning preferences than unimodal, 79 versus 12 in first year medical students.

In the present study, analysis of VARK questionnaire reveals that in the first phase of studies, visual and polymodal learning are less. The majority of them learn by auditory, reading, and kinesthetic modes. As the students climb up the phases, visual and polymodal are increasing. Auditory and kinesthetic are remaining almost at the same level. No difference was found between boys and girls as far as learning styles were concerned. All the studies referred here are showing similar results as far as gender difference is concerned. Studies done by authors like Prithishkumar and Michael, Lujan and DiCarlo, and Kharb et al. found that first-phase medical students prefer polymodal style of learning.

In the present series, in the first phase, though the students (no-32) were having polymodal preference, they belong to the Type-1 polymodal group, meaning that they used all the modalities, but only a single preference was noticeable to a specific situation. On taking the VARK score, auditory preference was standing out with 6.15, followed by kinesthetic and the least was for visual with read/write in between. In the first phase, polymodal should be encouraged for making the learning easier.

In the second phase, of 31 students, auditory ranked very high of 9.25 score followed by kinesthetic of 6.23; next came read/write (4.13) and the least preferred mode was visual (3.29).

In the final or third phase, of 24 students, score was highest for kinesthetic of 6.16, followed by auditory of 6, visual preference of 5.29, and last came read/write. For bimodal, the score was 4.71 in VR, followed by VA of score 4.25. Trimodal was 0.45 and quad modal 0.21. This shows the importance of lecture classes for the students even though their preference when asked for is less for lectures.

When duration of daily reading was considered, it was observed that in the first phase, majority of students are reading for more than 2 h daily. Duration of reading is declining thereafter. Early morning and late night are the preferred timings for reading, and majority are interested to read alone. Single text is the preferred reading material.

It is worth mentioning that for more than 50% of students, learning is not happening during lecture classes. This is their perception which is not in line with findings of VARK. This direct response against lecture is a biased response. Learning happens whenever a skill is imparted. Similarly, students are concentrating whenever an affective domain is stressed by the teacher or when communication skill is addressed in the classes. Learning happens in such situations. These opinions are nearing 90%. These observations show that students are interested in learning psychomotor, affective, and communication skills.

**CONCLUSIONS**

- The medical students of all phases use polymodal style for leaning. Students of Phase-1 are Type-1 multimodal and students of other two phases are Type-2 multimodal.
- Among the different modes, auditory is the most preferred one in all phases. This shows the importance of teacher-assisted small and large group learning opportunities.
- This fact is contradicted using the peer-reviewed questionnaire which may be a biased response as it is directly asked.
- Almost 90% of students are learning when a skill is taught or whenever affective domain is addressed. About 90% learning is happening when communication is taught.
ACKNOWLEDGMENTS

We would like to acknowledge the help rendered by the MCI Nodal center for faculty development at Government Medical College Kottayam for doing this project. Also, we acknowledge Dr. Sajith Kumar, Convener, Dr. T R Radha, Co-Convener, The Faculty, FIME fellows of this center and the medical students who participated in the study requires special mention.

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Role of Adenoids in Children with Retracted Ear Drum

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Abstract

Introduction: Adenoid enlargement has traditionally been considered a factor in otitis media with effusion (OME). It is one of the common health problems seen in children and, when inadequately treated or left untreated, it may lead to sequelae and complications. Negative middle ear pressure is also an important and common condition in pediatric age group that can result from adenoid hypertrophy (AH). Since AH produces ear block in children, the study is formulated to estimate the level of its effects in such individuals.

Purpose of the Study: Although some literature associates enlarged adenoid with OME and negative middle ear pressure, there are some studies questioning this relationship. The purpose of this study is to find the association between AH in children and negative middle ear pressure.

Materials and Methods: This study was performed in children from 5 years of age up to 13 years of age attending our outpatient department. Around 593 children who attended the outpatient department for (clinical complaints) were screened for AH and negative middle ear pressure-type c-curve. AH was assessed by X-ray nasopharynx and negative middle ear pressure by impedance audiometry.

Results: A total of 70 patients complied with the study protocol. 10 candidates did not report after the pre-operative assessment (n = 70). A significant correlation between AH and negative middle ear pressure was obtained with a value of 0.001 which indicated that higher the level of AH lower is the middle ear pressure level.

Conclusion: We conclude that AH has a significant effect on middle ear pressure causing negative pressure in the middle ear in children. The occurrence of bilateral negative middle ear pressure is a more reliable indicator that AH is the cause than unilaterally occurring negative middle ear pressure.

Key words: Adenoids, Middle ear pressure, Otorhinolaryngology, Tympanometry, X-ray

INTRODUCTION

Santorini described the nasopharyngeal lymphoid aggregate as Luschka’s tonsil in 1724. Wilhelm Meyer coined the term “Adenoid” to describe what he described as “nasopharyngeal vegetations” in 1870. Adenoid hypertrophy (AH) is common in occurrence in the pediatric age group. It has been associated with negative middle ear pressure by displacement of the Eustachian tube orifice and its obstruction. In addition, some consider that together with the tonsils, the adenoids constitute reservoir of infection. In children, the adenoids are invariably enlarged and there is little evidence to suggest that large adenoids are more frequently associated with otitis media with effusion (OME) than with normal ears.¹²

The size of adenoids varies from child to child and also in the same individual as the child grows. In general, it attains maximum size between the ages of 3 and 7 years and then regresses.³ However, there is a significant growth of the soft tissue of the nasopharynx between the age of 3 and the age of 5 years, which leads to the narrowing of
the nasopharyngeal airway. Subsequently, the growth of the nasopharynx increases while the soft tissues remain relatively unchanged, and thus, the airway increases.

Although some literature associates enlarged adenoid with OME and negative middle ear pressure, there are some studies questioning this relationship. Although there are a large number of prevalence studies of OME in general population of children, there has been less research on its prevalence in children having adenoidal obstruction and its association with negative middle ear pressure.

The vast majority of both clinical and basic studies on middle ear pressure have been based on measurements by tympanometry. Since AH produces ear block in children, the study is formulated to estimate the level of its effects on middle ear pressure using tympanometry in such individuals.

**MATERIALS AND METHODS**

This prospective randomized comparative study was conducted from August 2014 to June 2016 in the Department of Otorhinolaryngology at Saveetha Medical College and Hospitals. This study was performed in children from 5 years of age up to 13 years of age attending our outpatient department. Around 593 children, who attended, the outpatient department for (clinical complaints) were screened for AH and negative middle ear pressure-type c-curve. AH was assessed by X-ray nasopharynx and negative middle ear pressure by impedance audiometry. The study was approved by institutional review board, and the Institutional Ethics Committee held at our college which was conducted in accordance with ethical standards established by declaration of Helsinki (2000). 80 candidates were positive around which 10 candidates did not give consent for the study. An informed consent was taken from the parents of the candidates.

The patients with AH with relevant radiological correlation with X-ray nasopharynx, patients with negative middle ear pressure recorded by impedance audiometry as type c-curve and patients above 5 years of age and below 13 years of age were included in the study.

All children >13 years of age (or) <5 years of age, with cleft palate (or) submucosal cleft palate, coagulation disorders, sinusosal polyposis, choanal atresia, tumors of nose and nasopharynx, thornwaldt's cyst, cervical instability (e.g.) Down syndrome, with tympanic membrane perforation in one or both ears, without relevant X-ray findings, with secretory otitis media, acute otitis media, chronic otitis media, congenital malformations in the ear such as microtia, congenital atresia, with primary ciliary dyskinesia, children whose parents or caregivers who declined to give consent and children presenting with other comorbidities (e.g: Cor pulmonale, renal disease, neurological disease, and malnutrition) were excluded from the study.

The patient’s data included age, sex, and presenting symptoms (recurrent upper respiratory tract infection (URI); sore throat; fever; nose block; snoring and/or mouth breathing); all the patients underwent ear, nose, and throat examination, including otoscopic examination. If present the wax was carefully removed.

Suspecting negative middle-pressure subjects underwent impedance audiometry test. The impedance audiogram was performed by the audiologist in our institution. The readings were classified as Type A (400 and + 200 daPa) with Score 3, Type B (no pressure peak) with Score 2, and Type C (−400 daPa and 0 daPa) Score 1. Further investigation was performed, which included X-rays of nasopharynx to assess adenoid size. AH was recorded as per the radiological grading which was based on the study done by Ehab et al. such as the AH was considered small if it causes 25% obliteration of nasopharynx and was categorized as Grade 1 and was scored as 1, the AH was considered moderate if it causes 50% obliteration of nasopharynx and was categorized as Grade 2 and was scored as 2, and the AH was considered large if it causes 75% and more obliteration of nasopharynx and was categorized as Grade 3 and was scored as 3 (Tables 1 and 2).

Based on the prevalence study conducted by Chinawa et al. and Santos et al., we arrived at our sample size. Simple random sampling was done for all patients with AH with relevant radiological correlation with X-ray nasopharynx having negative middle ear pressure recorded by impedance audiometry as type C-curve and those who were above 5 years of age and below 13 years of age.

Data recorded in the preformatted data sheets were analyzed using the statistical product and service solutions (SPSS) 22. Means and percentages were calculated. Pearson correlation method was used to calculate the statistical significance of AH with relation to negative middle ear pressure. Data representation done in the form of tables and respective graphs. A statistical value for probability of error, i.e., a $P < 0.05$ was considered significant.

**RESULTS**

A total of 80 patients enrolled for the study. Since the study was a pre-operative and post-operative comparative study,
the subjects themselves were controls \((n = 80)\). All patients underwent X-ray nasopharynx and impedance audiometry. 70 patients complied with the study protocol. 10 candidates did not report after the pre-operative assessment \((n = 70)\).

Among the 70 patients, 37 patients were males and 33 patients were females. The average male percentage in the group was 52.9% and female percentage of the group was found to be 47.1%. This gave a male to female sex ratio of 0.53:0.48, respectively (Figure 1).

<table>
<thead>
<tr>
<th>Gender</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>37 (52.9)</td>
</tr>
<tr>
<td>Female</td>
<td>33 (47.1)</td>
</tr>
<tr>
<td>Total</td>
<td>70 (100.0)</td>
</tr>
</tbody>
</table>

Among the given sample 27 patients had of sore throat with an average of 38.6%, 22 patients had nose block with an average of 31.4%, 11 patients were given a history of snoring by the parents with an average of 15.7%, 5 patients had mouth breathing with an average of 7.1%, 3 patients had fever with an average of 4.3%, and 2 patients had recurrent URIs with an average of 2.9%, respectively (Table 3 and Figure 2).

Around 33 patients were found to have Grade 3 AH, 28 patients were found to have Grade 2 AH and 9 patients were found to have Grade 1 AH, with an average percentage of 47.14% for Grade 3 AH, 40% showed Grade 2 AH, and 12.86% showing Grade 3 AH (Figure 3).

About 28 patients had Type C impedance audiograms in both ears with an average of 40%, whereas 42 patients had unilateral Type C impedance audiometry with an average of 60% in single ear alone.

Nearly 9 patients had Grade 1 tonsillar hypertrophy, 25 patients presented with Grade 2 tonsillar hypertrophy, 28 patients had Grade 3 tonsillar hypertrophy, and 8 patients had Grade 4 tonsil hypertrophy. Figure 4 shows the percentage of the various grades of tonsil hypertrophy.

About 65 patients were found to have congested nasal mucosa and 5 patients were found to have normal nasal mucosa. Pearson correlation method was used to determine the association between AH and negative middle ear pressure. The significance level was 0.01 obtained by negative coefficient parameters, which showed that greater the AH lesser is the middle ear pressure (Table 4).

**DISCUSSION**

In this study, it is found that AH significantly causes negative middle ear pressure leading to retracted ear drum in children. In Gunel et al.'s study, AH was associated
with increased negative pressure in the middle ear. Enlarged adenoids lead to Eustachian tube displacement or obstruction.

AH causes negative middle ear pressures by Type C impedance audiometry than Type B. Nwosu et al.7 stated that the incidence of OME among patients with AH was 55.9% in this study with more Type B (29.4%) than Type C (26.5%). When compared with control, there was about a 4-fold increase in the incidence of OME. This establishes the significance of AH as a risk factor in the pathogenesis of OME.

Retracted tympanic membrane was more commonly associated with AH in our collected data. Satish et al.13 found that on otoscopy, dull, and amber-colored tympanic membrane was the common finding seen in 94% of cases. Retraction of tympanic membrane was seen in 64%. Air bubbles were seen only in 16%. According to their studies, negative middle ear pressure was more common than ears with OME.

Orji et al. showed from their prospective clinical study, the incidence of OME among adenoidal patients was compared with its incidence in normal control. The degree of nasopharyngeal obstruction among the adenoidal subjects was evaluated with an adenoidal-nasopharyngeal ratio parameter obtained from soft tissue radiograph of nasopharynx and was related to the results of tympanometric evaluation of the adenoidal subjects. It was concluded that adenoid obstruction is a significant risk factor for negative middle ear pressure in children which in turn increases with the increasing degree of nasopharyngeal obstruction.14

Adenoid enlargement is negatively related to middle ear pressure according to our study, implying that the larger, the adenoid mass that obliterates the airway in the nasopharynx lower is the middle ear pressure. Pan et al.15 found that the middle ear pressures were negatively related to the adenoidal nasopharyngeal ratio ($r = 0.41, P < 0.05$). The Eustachian tube function of the children with AH was worse than the normal.

Wormald et al. reported that, in doubtful cases, nasal endoscopy under local anesthesia provides a definitive evaluation of the nasal cavity and nasopharynx state. Difficulties involved in submitting noncollaborative young children to endoscopy are a disadvantageous feature of this procedure.16

Linder-Aronson et al. stated that lateral radiographs provide a simple method of assessing the outline of nasopharynx and the soft tissue in relation to airway.17 Kurien et al. stated that lateral X-rays of the neck, besides being a noninvasive procedure, still remains a very reliable and valid diagnostic test in the evaluation of hypertrophied adenoids.18 Hence, the measurement of AH can be done adequately with X-ray nasopharynx, and the corresponding variations in middle ear pressure can be elucidated with impedance audiometry.

**CONCLUSION**

AH has a significant effect on middle ear pressure causing negative pressure in the middle ear. Impedance audiometry is the standard diagnostic tool available for measuring middle ear pressures and functional status. The occurrence of bilateral negative middle ear pressure is a more reliable indicator that AH is the cause than unilaterally occurring negative middle ear pressure. Gender, duration of symptoms, and symptomatology are not significant risk
factors for negative middle ear pressure in children with obstructive adenoid disease. Children with negative middle ear pressure may not present with a history of hearing loss. When comparing children with moderate to gross adenoid enlargement of adenoid tissue, the relative size of adenoid to that of nasopharynx does not increase the risk of developing OME significantly but causes changes in middle ear pressure. Hence, children with features of obstructive adenoid disease should be carefully examined for the possible existence of negative middle ear pressure. The role of adenoid enlargement in the pathogenesis of negative middle ear pressure can be determined by conducting further studies on adenoid enlargement and its effect on middle ear pressure.

REFERENCES


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Oral and Maxillofacial Biopsy Reports of Children in South Kerala Population: A 20-year Retrospective Study

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Abstract

Aim: To determine the frequency of distribution of various oral lesions biopsied in children 12 years and below in a tertiary health-care center in south Kerala.

Materials and Methods: The archives of department of oral pathology and microbiology were retrospectively analyzed. Biopsy records of all oral lesions from pediatric patients, aged 0-12 years, in the files of the Department of oral Pathology and Microbiology, Government Dental College, Thiruvananthapuram, from 1995 to 2015. Descriptive statistical analysis was performed using the computer software, Statistical Package for Social Sciences (SPSS) IBM SPSS Software version 16.

Results: Fifteen thousand five hundred and forty-one biopsy specimens were received, of which 540 (3.47%) were from the pediatric population. Prevalence was observed between females (52.4%) and males (47.6%). Mandible was the most commonly affected site for intraosseous lesions, followed by lower lip or soft tissue lesions. The most common conditions diagnosed individually were mucocele (17.4%), dentigerous cyst (12%), and radicular cyst (11.5%). Regarding the diagnostic categories, the largest number of cases was from inflammatory followed by cystic and odontogenic tumor category.

Conclusions: This study showed similar as well as contradictory results compared to other studies, probably due to geographical and ethnic variations which are yet to be corroborated.

Key words: Dentigerous cyst, Mucocele, Odontogenic tumor, Radicular cyst

INTRODUCTION

Children are a distinct part of the general population, having different types of diseases. Despite the vast literature reporting the prevalence of oral and maxillofacial diseases in the last decades, few studies have focused on biopsied lesions in the pediatric population. When comparing the occurrence of lesions in the pediatric population, variations in relation to the age, prevalence, and geographic distribution have been found.

Reviews on oral lesions in children are very few to quote. Some reviews reported are by Lima Gda et al.,¹ Skinner et al.,² Dhanuthai et al.,³ and Saxena et al.⁴ The review reported by Saxena et al. from Meerut, India is on pediatric tumors seen in jaws.⁴ Literature reveals very few studies involving all pediatric pathologies from India and none from Kerala. This study will throw some light regarding the prevalence and characteristics of the lesions prevailing in the pediatric population in this geographic area, which in turn will be useful for the general dentist and pediatric dentist in diagnosing and managing these lesions appropriately.

MATERIAL AND METHODS

Sample Selection and Collection of Clinical Data

After the Institutional Ethics Committee clearance, archives of biopsy request of pediatric patients were retrieved from...
the Department of Oral Pathology and Microbiology, Government Dental College, Thiruvananthapuram, during the time period from January 1995 to December 2015. For the oral and maxillofacial lesions detected, data regarding to age, gender, location, and histopathological diagnosis were evaluated. Biopsies were grouped under 6 categories. Recurrent lesions were counted as a single case to avoid reduplication. Children were categorized into 3 age groups, i.e., 0-6, 7-9, and 9-12, respectively.

**Hyperplastic/reactionary lesions**
Pyogenic granuloma, inflammatory fibrous hyperplasia, mucocele, pulp polyp, granulation tissue, and gingival hyperplasia.

**Cystic lesions**
Periapical cyst, odontogenic keratocyst, residual cyst, dentigerous cyst, eruption cyst, lateral periodontal cyst, and soft tissue cyst.

**Odontogenic tumors**
Odontoma, ameloblastoma, adenomatoid odontogenic tumor, calcifying epithelial odontogenic tumor, odontogenic myxoma, odontogenic fibroma, and malignant tumors.

**Soft tissue neoplasms**
Fibroma, neurofibroma, hemangioma, squamous papilloma, lipoma, lymphangioma, and salivary gland neoplasms.

**Bone pathologies**
Central giant cell central granuloma, peripheral giant cell granuloma aneurysmal bone cyst, traumatic bone cyst, fibrous dysplasia, central ossifying fibroma, peripheral ossifying fibroma, osteoma, cherubism, and osteosarcoma.

**Others**
Pericoronal follicle, natal tooth, supernumerary teeth, autoimmune diseases, and tooth-related pathologies.

**Statistical Analysis**
Data were recorded and analyzed by descriptive statistics using the Statistical Package for Social Sciences statistical package.

**RESULTS**

In the study period of 20-year, 15541 biopsy specimens were received, of which 540 (3.47%) were from pediatric population. Figure 1 shows the patient distribution for age groups. Prevalence was observed between females (52.4%) and males (47.6%). Mandible was the most commonly affected site for intraosseous lesions, followed by lower lip or soft tissue lesions (Figure 2). The most common conditions diagnosed individually were mucocele (17.4%), dentigerous cyst (12%), and periapical cyst (11.5%). Regarding the diagnostic categories, the largest number of cases were from inflammatory followed by cystic and odontogenic category.

Mucocele was also the most common condition in the reactionary lesion category. Dentigerous cyst was the most common condition in the cystic lesion group, followed by periapical cyst. Odontoma was the most common in odontogenic tumor category. Fibroma was the most prevalent lesion in the benign neoplasm group, followed by squamous papilloma, followed by hemangioma. Odontoma accounted for 51.3% of the odontogenic tumors. Malignant lesions comprised only 0.5% of the total sample size.

**DISCUSSION**

Previous\textsuperscript{5,7} studies on oral and maxillofacial lesions in pediatric patients showed that the number of pediatric biopsies accounts for <10% of all cases referred to histopathology services. Similar prevalence was observed, in the present study as well, since 4.4% of the total number of biopsies was conducted in children aged 0-12 years. One of the most important variables in any study concerning pediatric patients is age. The oral cavity undergoes extensive significant changes in children during development as they age. It is difficult to determine the age interval, in which pediatric oral and maxillofacial lesions occur most frequently because of the different age ranges used in different studies. For instance, some studies recruited children up to 15 years of age, whereas others accepted older children as well as into their studies. To compare and contrast the data, in the present study, pediatric population of children 12 years and below was subdivided into 3 age groups, and majority of the lesions occurred in children in 10-12 age groups. The number of cases reported was higher in the age group of 10-12 years compared to the other two
groups. Many studies showed an almost equal distribution between both genders as reported by Das and Das \(^8\) and Jones and Franklin. \(^9\) However, in this study, the pathologies were more common in females. Studies of Maia et al.\(^{10}\) and Lima Gdá et al.\(^1\) reported maxilla as the most common site, but in the present study, mandible was found to be more affected than maxilla. Both gender and site predilection was similar to a study done by Krishnan et al.\(^{11}\) in a neighboring state in South India suggesting an ethnic and geographical predilection for the disease distribution.

**Inflammatory and Reactive Lesions**

The major category represented in the present study was inflammatory and reactive lesions. The largest group within this category as well as the most common lesion in this study was the mucocele similar to the studies reported by Skinner et al.\(^2\) and Das and Das et al.\(^8\) Mucocele formation is still unclear although it is known to be flavored by a traumatic etiology. Psychological stress is thought to be an initiating factor for the biting trauma in children. In our study also lower lip was the most common site with female predilection. The lower lip, a trauma-prone site also supports the role of trauma as an etiologic factor either in the form of sharp tooth cusp or biting habit in children. The greater number and density of salivary glands in the lower lip combined with downward forces of gravity, may also play a role in the predilection for mucocele development in the lower lip.\(^{12}\) The second most common inflammatory or reactive lesion in our study was pyogenic granuloma. This incidence is comparable to that reported by Krishnan et al.\(^{11}\) in South India. The unmastered toothbrushing techniques in children may be considered as a significant cause of microtrauma and inflammation to the gingiva. Trauma to deciduous teeth, aberrant tooth development, and occlusal interferences may also be other precipitating factor in children. According to Mo Mouchrek et al.\(^{13}\) inflammatory fibrous hyperplasia was the commonest lesion. According to Gulteklin et al.\(^5\) peripheral giant cell granuloma was the most common lesion.

**Cystic Lesions**

In the present study, we found the incidence of pediatric jaw cysts to be predominated by cysts of developmental origin (dentigerous cyst 41.1%) compared to that of inflammatory origin (periapical cyst 39.5%). This was in confirmation with findings of Dhanuthai et al.\(^3\) Similarly, Bodner et al. in 2012 also showed that 45% of cystic lesions seen in children were dentigerous cyst while radicular cyst represented only 13.3% of such lesions. Our findings, however, were not in accordance with the distribution of cysts in the general population in Southern India as reported by Donoghue et al.\(^{14}\) which showed a predominance of inflammatory cysts. As suggested in previous literature, this difference in the distribution of developmental and inflammatory cysts in children may probably be attributed to the state of
dynamism of dentoalveolar complex. There is interplay of several factors including the development and eruption of the succedaneous dentition and the simultaneous skeletal growth of the maxilla and mandible in this age. In addition, we also suggest that the incidence of inflammatory jaw cysts in the pediatric population is probably underreported owing to the fact that exfoliation/loss of primary teeth may result in the resolution of certain cystic lesions that are limited in size and are asymptomatic, particularly when they do not involve the underlying tooth follicles of permanent teeth. The increased number of developmental cysts also suggests a probable role of genetic factors in its formation whereas inflammatory cysts have obviously more of an environmental etiology. Odontogenic keratocysts (10.8%) were the third most common odontogenic cysts seen. According to literature, occurrence of OKCs was reportedly around the second or third decade, or age approaching adulthood. Only lesser number of cases are diagnosed in the first decade of life. This may be because of the intramedullary growth of the cyst without obvious facial asymmetry. Since our study group was children below 12 years, may be considered as one reason for the lesser number of cases recorded. Other cysts such as lateral periodontal cyst and fissural cyst were also seen. Right mandible was the most common site of involvement of these cysts with a male predilection.

Odontogenic Tumors

Among the odontogenic tumors in our study, odontoma was the most common tumor. Odontoma accounted for 51.3% of the odontogenic tumors. Since odontomas are mostly asymptomatic and most lesions are found only in routine radiographic examination, increased awareness of people in this region about pediatric oral health and increased number of referral cases may be a reason for increased number of reported cases compared to other cases in this category. Although the etiology of odontoma is unclear, infections or local traumas may be a cause. Most lesions were found left anterior maxilla with a male predilection. Odontoma was the most common odontogenic tumor as reported by Dhanuthai et al., Saxena et al., and Arotiba. The second and third being ameloblastoma and calcifying epithelial odontogenic tumor. The study done by Krishnan et al. from Tamil Nadu shows ameloblastoma as the most common lesion. Three cases of odontogenic myxoma, two case of odontogenic fibroma, and one case of ameloblastic fibro-odontoma was also noted in the present study.

Soft Tissue Neoplasms

Fibroma was the most prevalent diagnosed condition, followed by squamous papilloma and hemangioma. It is important to know the fact that hemangiomas may not always be biopsied. Therefore, hemangioma occurrence might be even higher than the number of cases reported herein. Of the three salivary gland tumors reported two were mucoepidermoid carcinomas and one pleomorphic adenoma.

Malignant lesions seen were only one case of osteosarcoma and two cases of mucoepidermoid carcinoma. Similar results have been reported by Jones and Franklin, who detected malignancy in 1% of the all analyzed biopsies. In addition, the most commonly affected sites were the buccal mucosa, mandible, lower lip, and gingival, and a male predilection was observed. Maaita et al. mentioned mandible and lip as the most prevalent sites, while Das and Das found a higher prevalence in the periodontium and lip.

Bone Pathologies

Among the fibro-osseous lesions, fibrous dysplasia was the most common. Since craniofacial fibrous dysplasia is commonly seen in the second and third decades of life and the present study included only children 12 years and below may be one reason for lesser number of fibrous dysplasia cases reported in this study. Saxena et al. studied pediatric jaw tumors and have reported 9 cases of fibrous dysplasia. Central ossifying fibroma, osteoma, peripheral giant cell granuloma, and central giant cell granuloma stand next showing a female predilection with right posterior mandibular region commonly involved.

Others

Few of pediatric biopsies were also formed by the pericoronal follicle also. Four cases of autoimmune diseases were also reported in children, of which three were pemphigus and one was lichen planus.

CONCLUSION

It is important to note that the overall and relative frequency of individual pediatric oral lesions differ from region to region. The difference in reported frequency could be due to geographic or ethnic differences although it remains to be proved. Therefore, studies from India could contribute additional knowledge to the literature and serve as a potential source of information to understand the role of regional or geographic variations. Because the populations in India are ethnically diverse and defined by their linguistics and caste linkages, more studies are required to contribute additional data. The present hospital-based study is designed to provide demographic data on pediatric lesions from the Southern Indian population in the state of Kerala, which is ethnically (Australoid) and linguistically (Dravidian) different from the central, northern, western, and eastern Indian populations, for comparison among pertinent series from other geographic regions. This study will also give general dentists and pediatric dentists of this
area, a solid background for diagnosis and treatment of these entities.

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Role of Multidetector Computed Tomography in the Evaluation of Intestinal Obstruction

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INTRODUCTION

Intestinal obstruction is responsible for approximately 20% of surgical admissions for acute abdominal conditions. The small bowel is involved in 60-80% of cases of intestinal obstruction. In spite of advances in imaging and a better understanding of the pathophysiology of the small bowel, its obstruction is still frequently misdiagnosed.² Computed tomography is being increasingly used for the evaluation of patients with vague abdominal symptoms and may provide the initial opportunity to detect and characterize tumors of small bowel. Multidetector-row computed tomography (MDCT) provides high-resolution imaging and help in precise localization and characterization of lesions.² The purpose of this study was to assess the efficacy of MDCT for the diagnosis of nonocclusive mesenteric ischemia (NOMI) by analyzing multi-planar reconstructed (MPR) images of all NOMI cases which showed irregular narrowing of the superior mesenteric artery (SMA), spasm of the arcades of SMA, and poor demonstration of intramural vessels. MPR images of two patients who had angiography were discordant with their angiograms.

Abstract

Background: Intestinal obstruction is responsible for approximately 20% of surgical admissions for acute abdominal conditions. Multidetector computed tomography (MDCT) plays an important role in revealing the site, level, and cause of obstruction and demonstrating threatening signs of bowel inviability.

Materials and Methods: This was a prospective study conducted on 40 patients with suspected intestinal obstruction, in the Department of Radiodiagnosis at Maharishi Markandeshwar Institute of Medical Sciences and Research, Mullana (Ambala) in collaboration with the Department of Surgery. Computed tomography (CT) scan was done in all the patients suspected of intestinal obstruction with ingenuity CT (64 MDCT, Philips Medical Systems). The study was done with oral contrast (wherever required) and intravenous contrast agents.

Results: Out of 40 patients, 27 were males and 13 were females. The most frequently encountered symptom was pain abdomen. The majority of the patients showed markedly dilated gut loops. The level of obstruction was diagnosed in large bowel in 2 patients. Terminal ileum was the most common site of obstruction followed by proximal ileum, jejunum, I-C junction, and rectosigmoid. Adhesion was the most common cause of obstruction followed by abdominal tuberculosis, malignancy, intussusceptions, malrotation, ischemia, and intra-abdominal collections. The final diagnosis was confirmed by laparotomy or histopathological examination.

Conclusion: MDCT by using its multiplanar and three-dimensional capabilities is highly accurate and specific in detecting the presence of intestinal obstruction. It can demonstrate the exact site of obstruction in a high percent of cases. It is highly sensitive and specific in diagnosing the cause of obstruction. In addition to primary gut pathology, MDCT can detect various associated and incidental findings which are not suspected clinically.

Key words: Abdomen, Computed tomography, Intestine, Obstruction
The mean diameter of SMA of NOMI patients was 3.4 ± 1.1 mm, which was statistically smaller than that of 13 control patients, 6.0 ± 1.5 mm (P < 0.05). In patients with nonstrangulating small bowel obstruction (SBO), the presence of a transition point on CT scan should alert the surgeon to the increased likelihood that operative management may be required. Transition point was the only significant factor predictive of operative management for SBO on multivariable logistic regression analysis (OR: 19, 95% confidence interval 1.8-201, P = 0.014).

**MATERIALS AND METHODS**

This prospective study was conducted in the Department of Radiodiagnosis and Imaging at Maharishi Markandeswvar Institute of Medical Sciences and Research, Mullana (Ambala) in collaboration with the department of Surgery. The study was conducted on 40 patients with the evidence of intestinal obstruction. A total of 40 patients were selected on the basis of CT findings suggestive of intestinal obstruction were included in the study. Patients with pregnant female, allergic to contrast media to be injected, in which emergency laparotomy was indicated, were excluded. Informed consent was obtained from the patients or from the nearest kin of the patients included in this study. A complete history of patient's present/past illness was taken, and detailed clinical examination was performed in all the cases and findings were recorded in the pro forma attached. Routine laboratory investigations such as Hb, TLC, and DLC were carried out in all patients. X-ray chest (PA view) and X-ray abdomen supine and erect (AP view) were also done, and findings were duly recorded on the attached pro forma.

Ultrasound examination was done on all the patients on HD-6 (Phillips Medical Systems) USG machine, and detailed findings were recorded in the proforma attached. Technique of CT scan: CT scan was done in all the patients suspected of intestinal obstruction with Ingenuity CT (64 MDCT, Philips Medical Systems). The study was done with oral contrast (wherever required) and IV contrast agents. From the topogram, the long spiral was made with the area of examination from domes of diaphragm to the pelvis. Scanning was done by using a pitch of 0.797, collimation of 64 × 0.625 reconstructed slice thickness of 5 mm, and increment of 5 mm. Factors selected were 120 kV and 300 mAS. Contrast enhanced CT scan of abdomen was obtained after intravenous (IV) administration of 80 ml of non-ionic contrast (iohexol/water) was given wherever required. CT findings were recorded as per the pro forma for the degree, level, cause, and complication of obstruction. The CT findings were correlated with surgical/clinical follow-up.

**OBSERVATIONS AND RESULTS**

The maximum number of patients presenting with intestinal obstruction were in the age group of <20 years, i.e., 8 patients (20%). The youngest patient in the present series was 4 years old, whereas the oldest patient was 75 years old. On X-ray abdomen (Erect), air-fluid levels were seen in 25 (62.50%) patients. Whereas no air-fluid levels were seen in 11 patients (27.50%). X-ray abdomen was not done in 4 patients (10%). In this study on 40 patients with intestinal obstruction, the provisional cause of intestinal obstruction was determined on ultrasonography (USG) in 12 (30%) patients. Provisional cause of obstruction could not be determined in 27 (67.50%) patients. USG was not done in one patient (2.50%) (Table 1). MDCT was done in all 40 patients with intestinal obstruction. Out of the 40 patients, the majority of the patients, i.e., 31 (77.50%) showed markedly dilated gut loops. Moderately dilated gut loops were seen in 8 patients (20%). Mild dilatation of gut loops was seen in one patient (2.50%) (Table 2 and Figure 1).

In this study on intestinal obstruction, the level of obstruction was diagnosed in the small bowel in 38 (95%)

<table>
<thead>
<tr>
<th>Table 1: Site of obstruction determined on USG</th>
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<tbody>
<tr>
<td>Site of obstruction</td>
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<td>---------------------</td>
</tr>
<tr>
<td>Determined</td>
</tr>
<tr>
<td>Indeterminate</td>
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<tr>
<td>USG not done</td>
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USG: Ultrasonography

<table>
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<tr>
<th>Table 2: MDCT based grading of bowel dilatation in patients with intestinal obstruction</th>
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<tbody>
<tr>
<td>Findings</td>
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<td>-----------------------------------</td>
</tr>
<tr>
<td>Markedly dilated gut loops (&gt;3.5 cm)</td>
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<tr>
<td>Moderately dilated gut loops (3-3.5 cm)</td>
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<tr>
<td>Mildly dilated gut loops (2.5-3.0)</td>
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MDCT: Multidetector computed tomography

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<th>Table 3: Diagnosis of level of obstruction by MDCT</th>
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<tr>
<td>Level of obstruction</td>
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<td>--------------------</td>
</tr>
<tr>
<td>Small bowel</td>
</tr>
<tr>
<td>Large bowel</td>
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<tr>
<td>Total</td>
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MDCT: Multidetector computed tomography
patients. The level of obstruction was diagnosed in large bowel in 2 (5%) patients (Table 3). Ileum was the most common site of obstruction in this study. Out of the total 40 patients, 15 (37.50%) had distal ileal obstruction. Proximal ileal obstruction was seen in 12 (30%) patients. Jejunal obstruction was seen in 6 (15%) patients and ileo-cecal obstruction was also seen in 4 (10%) patients. Rectosigmoid was the site of obstruction in 2 (5%) patients. No definite site of obstruction was seen in one patient who had ischemic dilatation of small gut (Table 4).

On MDCT, out of total 40 patients, adhesion was found to be the cause of obstruction in 13 (32.50%) patients (Figure 2). Abdominal tuberculosis was the cause in 9 (22.50%) patients. Intussusception was the reason of obstruction in 4 (10.00%) patients. Malignancy was the cause of obstruction in 6 (15%) patients. Malrotation and ischemia were the cause of obstruction in 3 (7.50%) patients each. Intraabdominal collections were the cause in 2 (5.00%) patients (Table 5). Loculated fluid collections were seen in 4 patients (10%). No evidence of any loculated collection was seen in 36 (90%) patients. The small bowel feces sign (SBFS) was seen in 12 patients (30%). SBFS was not seen in 28 patients (70%) (Figure 3). Abdominal lymphadenopathy was seen in 14 patients (35%) presenting with intestinal obstruction. No significant abdominal lymphadenopathy was seen in 26 patients (65%). Pneumatosis intestinalis was seen in 3 (7.5%) patients who presented with intestinal obstruction. Rest of the 37 (92.5%) patients did not have pneumatosis intestinalis. Gangrenous gut was seen in 5 (12.50%) patients. No evidence of gut gangrene was seen in 35 (87.50%) patients. Other findings seen in patients with intestinal obstruction include liver SOLs which were seen in 4 patients (10%). Pleural effusion was also seen in 4 patients (10%). Three patients had cholelithiasis, i.e., (7.5%). 2 patients had hepatosplenomegaly, lung nodules, and nephrolithiasis each, i.e., (5%). Liver parenchymal disease, pericardial effusion, and pneumobilia were seen in 1 patient each (2.50%), respectively.

This study depicted that 13 patients had intestinal obstruction due to adhesions (Figure 4). Out of 13 patients 9 patients underwent surgery. 4 patients were treated conservatively with NPO, IV fluids, antibiotics, and other
supportive measures. 2 patients in which adhesion was given as a cause of intestinal obstruction were found to have bands on surgical intervention. Nine patients were diagnosed with abdominal tuberculosis. 7 patients had raised erythrocyte sedimentation rate and symptoms such as weight loss, decreased appetite and two even had consolidation and nodular lesions on chest X-ray. 2 patients were also known case of pulmonary Koch’s. 5 patients of these were operated and had tubercular stricture/thickening. 4 patients were managed conservatively with NPO, IV fluids, antibiotics, and other supportive measures and started on antitubercular therapy (ATT). These patients had clinical improvement after commencement of ATT.

Three patients were diagnosed with intestinal ischemia. They had gut ischemia due to SMA thrombosis leading to gangrenous gut which was removed surgically in one patient. One of these patients died, and one was referred to higher center for further management. Two patients were found to have intra-abdominal collections. One patient had intra-abdominal collection after abdominal surgery. This patient was operated with drainage of collection and peritoneal lavage. The other patient had appendicular perforation with intra-abdominal collections. In this case appendicectomy with peritoneal lavage was done to relieve intestinal obstruction. Four patients were diagnosed with intussusception on MDCT. Two patients had ileo-ileal intussusception; one had ileo-cecal intussusception and one had jejunojejunal intussusception. Three patients were operated and findings were confirmed surgically. In two of the surgically managed patients, lymph nodes were seen as the lead point, and lipoma was seen as the lead point in one patient. One patient was managed conservatively in which lymph nodes were seen at the lead point and the symptoms resolved (Table 6).

<table>
<thead>
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<th>Table 4: Diagnosis of site of obstruction by MDCT</th>
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<tr>
<td>Site of obstruction</td>
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<td>---------------------</td>
</tr>
<tr>
<td>Jejunum</td>
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<tr>
<td>Proximal ileum</td>
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<tr>
<td>Distal ileum</td>
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<tr>
<td>Ileo-cecal junction</td>
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<tr>
<td>Rectosigmoid</td>
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<tr>
<td>Indeterminate</td>
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<tr>
<td>MDCT: Multidetector computed tomography</td>
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<th>Table 5: Diagnosis of cause of obstruction by MDCT</th>
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<tr>
<td>Cause of obstruction</td>
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<td>---------------------</td>
</tr>
<tr>
<td>Adhesions</td>
</tr>
<tr>
<td>Tubercular</td>
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<tr>
<td>Intussusception</td>
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<tr>
<td>Malrotation</td>
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<td>Malignancy</td>
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<tr>
<td>Ischemia</td>
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<tr>
<td>Intra-abdominal collections</td>
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<td>MDCT: Multidetector computed tomography</td>
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</table>
DISCUSSION

This study was conducted in 40 patients with a clinical diagnosis of intestinal obstruction to confirm the diagnosis, evaluate the site, and cause of obstruction. The MDCT findings were correlated with the operative findings where patients were subjected to laparotomy, and the final diagnosis was made on the basis of operative findings or by follow-up of conservatively managed patients. SBO accounts for a considerable proportion of emergency room visits, inpatient admissions, and surgical interventions in the United States. MDCT plays a key role in imaging patients presenting with acute symptoms suggestive of SBO, which helps in establishing the diagnosis, elucidating the cause of obstruction, and detecting complications such as ischemia or frank bowel necrosis and perforation.

Chang et al. conducted a study on 151 patients. The most common presenting complaint in their study was pain abdomen which was seen in 134 (89%) patients. Saini et al. studied 40 patients with intestinal obstruction and found that air-fluid levels were seen in 57.50% patients. In this study, air-fluid levels were seen in 25 (62.50%) patients. No evidence of air fluid levels was seen in 11 (27.50%) patients.

Malik et al. in their study on 229 patients with intestinal obstruction concluded that 194 patients (85%) had SBO and 35 patients (15%) had a large bowel obstruction. They found post-operative adhesions accounted for 41% (n = 95) of the total cases, followed by abdominal tuberculosis (25%, n = 58), obstructed/strangulated hernias of different types (18%, n = 42). The most common cause of intestinal obstruction was postoperative adhesions. In this study, 38 patients (95%) were diagnosed with SBO and 2 patients (5%) had a large bowel obstruction. The most common cause of intestinal obstruction was adhesions (32.50%). The result of this study matched with studies done by Oladele et al. in which most common cause of obstruction was adhesions comprising 44%, Malik et al. 41%.

Chang et al. conducted a retrospective study on 151 patients with intestinal obstruction and evaluated the presence of SBFS in 61 (40.40%) patients. They conducted a study on 151 patients with intestinal obstruction and found that pneumatosis intestinalis was present in 4 (2.64%) patients. In this study on 40 patients with intestinal obstruction, pneumatosis intestinalis was seen in 2 (5%) patients. In this study, SBFS was seen in 12 patients (30%) patients and rest of the patients with intestinal obstruction did not show SBFS.

Nowadays, MDCT is the new imaging technique employed in blunt trauma patients of abdomen and pelvis. It easily detects the solid organ injuries with associated bowel or mesenteric injuries and decreases the morbidity and mortality. But challenges still continue in abdominal and pelvic CT images of trauma cases. Adhikari et al. conducted a retrospective study on 367 patients with intestinal obstruction. 288 (78.50%) patients were operated and 79 (21.50%) patients were managed conservatively. The results of this study showed that MDCT using three multiplanar and three-dimensional (3D) evaluations of these isotropic data sets had allowed improved depiction and characterization of bowel pathology. Confirmation of the presence, site and exact cause of obstruction can be better evaluated on MDCT which considerably alters the management of such patients.

CONCLUSION

MDCT by using its multiplanar and 3D capabilities is highly accurate and specific in detecting the presence of intestinal obstruction. It can demonstrate the exact site of obstruction in a high percent of cases. MDCT is highly...
sensitive and specific in diagnosing cause of obstruction. In addition to primary gut pathology, MDCT can detect various associated and incidental findings which are not suspected clinically.

REFERENCES


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Results of Adjuvant Chemoradiotherapy in Operated Gastric Cancer Patients at a Tertiary Cancer Center in Kashmir

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Abstract

Background: Gastric cancer (GC) is the second most common cancer among men and the third most among females in Asia and worldwide. The prognosis of GC remains poor despite the improvement in interventions during the last years.

Materials and Methods: The study was a nonrandomized retrospective analysis. 52 patients with gastric adenocarcinoma treated with combined surgery and chemoradiotherapy with available clinical data were eventually included in this study. During the follow-up period, any suspected relapse was confirmed by biopsy, if possible. The site and date of the first relapse were recorded. The patients were evaluated for treatment-related toxicity, local recurrences, and distant metastases.

Results: The median age of patients was 60 years (34-80), and the male/female ratio was 4.2 (42 males and 10 females). 25 (48.1%) patients had disease in distal stomach. In terms of gastrointestinal complications, nausea and diarrhea were the most common toxicity, and the most common hematological toxicity was Grade 3 leukopenia with few patients having cardiac toxicity in the form of bradycardia. Within a median follow-up of 12 months (range 6-40 months), out of 52 patients, 1 patient died of treatment-related toxicity, 36 out of 51 patients (70.6%) developed relapse at the end of the study and 29.4% patients were disease free at the end of study. 1 year disease free survival (DFS) and 2 years DFS was 45.09% and 19.60%, respectively. The median time to recurrence from surgery was 12 months (95% confidence interval: 8.118-15.112). Of these patients, 5 (13.9%) patients developed a local recurrence, 22 (61.1%) patients developed distant metastases and 9 (25%) patients developed both local and systemic metastasis.

Conclusion: Our results with McDonald’s protocol in our analysis were not encouraging possibly due to a small patient cohort, higher stage at presentation, aggressive histological variant and probably nonavailability of conformal radiotherapy techniques. With continued progress in improving radiotherapy techniques, developing more effective systemic regimens, and identifying biomarkers of treatment response, the role of adjuvant chemoradiotherapy will likely become better defined.

Key words: Chemoradiotherapy, Gastric cancer, Recurrence, Surgery

INTRODUCTION

Cancer is one of the most dreaded diseases in the world and recognized as the second killer disease in humans.¹ It is predicted that by 2020, up to 70% of the 20 million new cases annually will occur in the developing countries² and over 10 million people will die annually by the year 2020 due to cancer.¹,³,⁴ There are approximately 2-2.5 million cases of cancer in India at any given point of time, with around 7-9 lakh new cases being detected each year and nearly half of these cases die each year⁵ and the burden is going to be double in 2026.⁶

Gastric cancer (GC) is an important social and health problem worldwide, with nearly one million new patients diagnosed annually⁷ representing 24% of all malignancies on a global scale.⁷ It remains a significant cause of worldwide cancer-related mortality, resulting in an
estimated 7 lakh deaths and ranking as the second leading cause of cancer-related deaths.9

Worldwide GC is the second most common cancer among men and third most among females.7 In India, it is the 5th most common cancer among males and 7th most common cancer among females.9 Kashmir valley is a high prevalence zone for GC.10,11 The incidence of GC in Kashmir has been reported to exceed all cancers by about 40%, and there is three to fourfold increased incidence compared to various metropolitan cancer registries across India.10,11 Dietary factors are implicated as a main reason for the high incidence of this cancer. Consumption of high salt content food (including salted tea), and infection with Helicobacter pylori bacteria may be possible reasons for high incidence of this cancer in this population.11

The symptoms and signs of the GC are often reported late when the disease is already in advanced stages with developed and developing countries reporting a 5 years survival of around 30% and 20% respectively.12 The prognosis of GC remains poor despite improvements in diagnostic and therapeutic modalities over the last few years.13,14 Complete tumor removal with sufficient resection margin plus extended lymph node dissection are considered to be important determinants of loco-regional disease control and improved survival. Although surgery remains the mainstay of potentially curative treatment for early stage GC, it is curative in <40% of cases15 and the long-term survival even in patients with complete resection and negative surgical margins is guarded.13,14 In patients with deep invasion of the gastric wall or regional lymph node metastases the relapse and death rates from recurrent GC exceed 70-80%. Loco-regional recurrences in the tumor bed, anastomotic site or regional lymph nodes occur in 40% to 65% of patients after curative-intent resection;16 the frequency of this relapse makes regional radiotherapy an attractive possibility for adjuvant therapy.

Positive results with radiotherapy and/or chemotherapy in patients with locally advanced or unresectable gastric adenocarcinoma were reported by several studies,17,19 but the benefits of radiotherapy in adjuvant setting after a curative gastric resection was controversial until the U.S. Intergroup study (INT-0116) which demonstrated that combined chemo-radiation following complete gastric resection improved median relapse-free survival (30 vs. 19 months, P < 0.0001) and overall survival (OS) (36 vs. 27 months, P = 0.01).20 An updated report of this trial has confirmed that this benefit is still maintained in the long term.21 These results have changed the standard of care in many countries following potentially curative resection of GC from observation alone to adjuvant combined chemoradiotherapy.

The aim of this study was to analyze the possible benefit of postoperative adjuvant chemoradiotherapy after curative resection in GC patients, to assess relapse rate and disease-free survival (DFS), incidence and patterns of relapse and toxicity profile.

MATERIALS AND METHODS

The present study was a nonrandomized retrospective analysis. The medical records of patients treated with postoperative chemotherapy and radiotherapy for histologically confirmed adenocarcinoma of the stomach between January 2011 and August 2014 were reviewed and 52 patients were taken for analysis. All patients had a complete preoperative clinical and laboratory staging that included a detailed clinical examination and blood measurements including carcinoembryonic antigen levels, a computed tomography (CT) scan of the thorax, abdomen and pelvis, upper GI endoscopy and a gastric biopsy. A complete GC resection with curative intent was performed (total or subtotal gastrectomy). Patients were staged according to the tumor, node, metastasis (TNM) AJCC cancer staging system. All patients had recovered sufficiently from their surgery before adjuvant therapy and had adequate organ function assessment at the commencement of treatment (including cardiac, hepatic, renal and bone marrow function). Patients with metastatic disease were excluded from the analysis. Also excluded from the study were patients whose detailed clinical data could not be found or was remotely informative. Patients received combined adjuvant chemoradiotherapy if they had at least one of the following criteria: (a) Serosal invasion, (b) extension to adjacent organs, (c) metastases to the regional lymph nodes and (d) positive surgical margins. Chemotherapy was administered on an outpatient basis. All patients had received a 5-day cycle of bolus 5-fluorouracil at 425 mg/m² and leucovorin at 20 mg/m² followed 4 weeks later by radiotherapy concomitant with the administration of fluorouracil on the first 4 and the last 3 days of radiotherapy. 4 weeks after completion of radiotherapy, two more 5-day cycles of chemotherapy had been administered with a 4-week interval. External beam radiotherapy was delivered by a Cobalt60 unit (due to non-availability of linear accelerator and conformal radiotherapy facilities at our center). Two parallel-opposed (antero-posterior and postero-anterior) radiation portals were used. Both the fields were treated on each treatment session. Oral barium contrast was given to the patients during the simulation procedure for better target volume delineation. The tumor bed, the anastomotic site, the stump, and the loco-regional lymph nodes were treated. Antiemetics were administered orally 1 h before irradiation. The treatment was given for 5 days a week for 5 weeks.
The daily radiation dose ranged from 1.8 to 2.0 Gy and the median total radiation dose was 45 Gy. All patients were followed up in an outpatient basis, after the end of radiotherapy, every 3 months for the first 2 years, every 6 months for the 3rd and 4th year and annually thereafter. Their evaluation included a physical examination, blood count and biochemical analyses. A chest radiograph, CT scans of the pelvis and abdomen was done every 6 months for the first 2 years and endoscopic examination was performed once a year. Bone scans were obtained on indication. Patients were evaluated for treatment-related toxicity, local recurrences, and distant metastases. The treatment-related toxicity was graded according to world health organization classification.

During the follow-up period, any suspected relapse was confirmed by biopsy, if possible. Typical nodules in liver or lung with imaging studies and typical lesions in the radioisotope bone scan were accepted as relapse without histological confirmation. The site and date of the first relapse were recorded. The site of relapse was classified as follows: The relapse was coded as locoregional if the tumor was detected within the radiation fields (including surgical anastomosis, remnant stomach or gastric bed) and regional lymph nodes; and distant metastasis was defined as lymph node recurrence outside the radiation field, peritonal seeding, liver metastasis, or metastasis of other extra-abdominal sites.

Statistical Analysis
DFS was defined as the time from completion of surgery to the last date the patient was known to be disease-free. The Kaplan-Meier product limit method was used to estimate survival rates. To assess the importance of potential prognostic factors, univariate and multivariate analyses using log-rank test and Cox's proportional hazards regression model was used. A $P < 0.05$ was considered significant. All analyses were performed using SPSS for Windows 10.0 software.

RESULTS
A total of 52 patients with gastric adenocarcinoma treated with combined surgery and chemoradiotherapy with available clinical data were eventually included in this study. The median age of patients was 60 years (range 34-80) and the male/female ratio was 4.2 (42 males and 10 females). 25 (48.1%) patients had disease in distal stomach. A distal gastrectomy was performed in 22 patients (42.3%) while 13 patients (25%) underwent a subtotal gastrectomy. 47 (90.4%) patients underwent D1 lymphadenectomy, 29 (55.8%) patients had disease beyond serosa and 49 (94.2%) patients had palpable regional lymph nodes intraoperatively. 25 (48.1%) patients had intestinal type and 27 (51.9%) patients had diffuse type of adenocarcinoma according to Lauren classification. Tumor size (the largest diameter defined in millimeters, measured in a pathological specimen) ranged from 25 mm to 90 mm (mean 51.2 mm; median 57.5 mm). According to tumor histology, there were 5 (9.6%) well differentiated tumors, 23 (44.2%) moderately differentiated tumors, and 24 (46.2%) poorly differentiated tumors. 41 (78.8%) patients had T3 disease. The mean number of resected lymph nodes was 13.26 (1-37). The mean nodal ratio (i.e. the number of dissected metastatic lymph nodes divided by the total number of removed nodes) was 0.397. Over 42% patients exhibited a nodal ratio $\geq 0.4$. 43 (82.7%) had positive LNs, while in 9 (17.3%) patients no LN infiltration was detected. 41 (78.8%) patients had R0 resection. According to the TNM staging system, 21 patients were Stage II, 13 Stage IIIA, 14 patients were Stage IIIB, and 1 patient was Stage IIIC. The median interval between surgery and start of chemoradiation was 40 days (21-98 days). The main patient characteristics and tumor characteristics are presented in Tables 1 and 2.

### Table 1: Patient characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Number of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>60</td>
</tr>
<tr>
<td>Median</td>
<td>34-80</td>
</tr>
<tr>
<td>Male sex</td>
<td>42 (80.8)</td>
</tr>
<tr>
<td>Location of primary tumor</td>
<td></td>
</tr>
<tr>
<td>Proximal</td>
<td>12 (23.1)</td>
</tr>
<tr>
<td>Body</td>
<td>15 (28.8)</td>
</tr>
<tr>
<td>Distal</td>
<td>25 (48.1)</td>
</tr>
<tr>
<td>Interval between surgery and the start of treatment (days)</td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>40</td>
</tr>
<tr>
<td>Range</td>
<td>21-98</td>
</tr>
<tr>
<td>Type of operation</td>
<td></td>
</tr>
<tr>
<td>Total gastrectomy</td>
<td>10 (19.2)</td>
</tr>
<tr>
<td>Subtotal gastrectomy</td>
<td>13 (25)</td>
</tr>
<tr>
<td>Proximal gastrectomy</td>
<td>7 (13.5)</td>
</tr>
<tr>
<td>Distal gastrectomy</td>
<td>22 (42.3)</td>
</tr>
<tr>
<td>Lymph node dissection</td>
<td></td>
</tr>
<tr>
<td>D1</td>
<td>47 (90.4)</td>
</tr>
<tr>
<td>D2</td>
<td>5 (9.6)</td>
</tr>
<tr>
<td>Lauren classification</td>
<td></td>
</tr>
<tr>
<td>Intestinal</td>
<td>25 (48.1)</td>
</tr>
<tr>
<td>Diffuse</td>
<td>27 (51.9)</td>
</tr>
<tr>
<td>Stage</td>
<td></td>
</tr>
<tr>
<td>IA</td>
<td>1 (1.9)</td>
</tr>
<tr>
<td>IB</td>
<td>2 (3.8)</td>
</tr>
<tr>
<td>IIA</td>
<td>9 (17.3)</td>
</tr>
<tr>
<td>IIB</td>
<td>12 (23.1)</td>
</tr>
<tr>
<td>IIIA</td>
<td>13 (25)</td>
</tr>
<tr>
<td>IIIB</td>
<td>14 (26.9)</td>
</tr>
<tr>
<td>IIC</td>
<td>1 (1.9)</td>
</tr>
<tr>
<td>Margin status</td>
<td></td>
</tr>
<tr>
<td>R0</td>
<td>41 (78.8)</td>
</tr>
<tr>
<td>R1</td>
<td>11 (21.2)</td>
</tr>
</tbody>
</table>
Toxicity
In terms of gastrointestinal complications, nausea was the most common toxicity and 7 patients (13.5%) experienced nausea graded as 3 or higher. Diarrhea graded as 3 or higher occurred in 6 patients (11.5%). The most common hematological toxicity was Grade 3 leukopenia seen in 9 (17.3%) patients. 6 (11.5%) patients had cardiac toxicity in the form of bradycardia. One (1.92%) patient died due to this treatment-related toxicity (bradycardia) (Table 3).

Survival and Relapse
Within a median follow-up of 12 months (range 6-40 months), out of 52 patients, 1 patient had died of treatment-related toxicity, 36 out of 51 patients (70.6%) had developed relapse at end of study and 29.4% patients were disease free at the end of study. 1 year DFS and 2 years DFS was 45.09% and 19.60%, respectively. The median time to recurrence from surgery was 12 months (95% confidence interval: 8.118-15.112) (Figure 1). Of these patients, 5 (13.9%) patients developed a locoregional recurrence, 22 (61.1%) patients developed distant metastases, and 9 (25%) patients developed both local and systemic metastasis. The most common site of metastasis was the liver (23 patients). Peritoneal carcinomatosis with ascites, bone metastasis, splenic metastasis, anterior abdominal wall metastasis, and nonregional nodal metastasis (right axillary node, supraclavicular node, inguinal node) metastases were also reported (Table 4).

Prognostic Factors for Recurrence
To evaluate the prognostic factors of recurrence, variable clinicopathological factors - sex, age, type of surgery, location of tumor, histological type (WHO classification, grade, Lauren type), invasion to more than the serosa, number of involved lymph nodes, TNM stage, grade, lymphovascular invasion (LVI), perineural invasion (PNI), and margin status were analyzed; but sex, age, type of operation, location of tumor, histological type, number of involved lymph node, grade, PNI, and margin were unrelated to recurrence rate and median DFS. The TNM stage and the invasion to more than the serosa, LVI +ve

Table 2: Tumor characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Number of patients (n) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tumor size (mm)</td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>57.5</td>
</tr>
<tr>
<td>Range</td>
<td>25-90</td>
</tr>
<tr>
<td>T-stage</td>
<td></td>
</tr>
<tr>
<td>T1</td>
<td>1 (1.9)</td>
</tr>
<tr>
<td>T2</td>
<td>8 (15.4)</td>
</tr>
<tr>
<td>T3</td>
<td>41 (78.8)</td>
</tr>
<tr>
<td>T4</td>
<td>2 (3.8)</td>
</tr>
<tr>
<td>N-stage</td>
<td></td>
</tr>
<tr>
<td>N0</td>
<td>9 (17.3)</td>
</tr>
<tr>
<td>N1</td>
<td>13 (25)</td>
</tr>
<tr>
<td>N2</td>
<td>16 (30.8)</td>
</tr>
<tr>
<td>N3</td>
<td>14 (26.9)</td>
</tr>
<tr>
<td>Nodal ratio</td>
<td></td>
</tr>
<tr>
<td>&lt;0.4</td>
<td>30 (57.7)</td>
</tr>
<tr>
<td>≥0.4</td>
<td>22 (42.3)</td>
</tr>
<tr>
<td>Stage</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>3 (5.7)</td>
</tr>
<tr>
<td>II</td>
<td>21 (40.4)</td>
</tr>
<tr>
<td>III</td>
<td>28 (53.8)</td>
</tr>
<tr>
<td>IV</td>
<td>0</td>
</tr>
<tr>
<td>Grade</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>5 (9.6)</td>
</tr>
<tr>
<td>2</td>
<td>23 (44.2)</td>
</tr>
<tr>
<td>3</td>
<td>24 (46.2)</td>
</tr>
<tr>
<td>LVI</td>
<td></td>
</tr>
<tr>
<td>+ve</td>
<td>27 (51.9)</td>
</tr>
<tr>
<td>−ve</td>
<td>25 (48.1)</td>
</tr>
<tr>
<td>PNI</td>
<td></td>
</tr>
<tr>
<td>+ve</td>
<td>33 (63.5)</td>
</tr>
<tr>
<td>−ve</td>
<td>19 (36.5)</td>
</tr>
</tbody>
</table>

Table 3: Major toxic effects of chemoradiotherapy

<table>
<thead>
<tr>
<th>Type of toxic effect</th>
<th>Number of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nausea</td>
<td>7 (13.5)</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>6 (11.5)</td>
</tr>
<tr>
<td>Leucopenia</td>
<td>9 (17.3)</td>
</tr>
<tr>
<td>Neutropenia</td>
<td>9 (17.3)</td>
</tr>
<tr>
<td>Thrombocytopenia</td>
<td>4 (7.6)</td>
</tr>
<tr>
<td>Bradycardia</td>
<td>6 (11.5)</td>
</tr>
</tbody>
</table>

Table 4: The recurrent sites of 36 patients

<table>
<thead>
<tr>
<th>Recurrent sites</th>
<th>Number of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locoregional</td>
<td>5 (13.9)</td>
</tr>
<tr>
<td>Systemic</td>
<td>22 (61.1)</td>
</tr>
<tr>
<td>Both</td>
<td>9 (25)</td>
</tr>
<tr>
<td>Liver</td>
<td>23 (63.8)</td>
</tr>
<tr>
<td>Peritoneal metastasis</td>
<td>2 (5.5)</td>
</tr>
<tr>
<td>Bone metastasis</td>
<td>1 (2.8)</td>
</tr>
<tr>
<td>Splenic metastasis</td>
<td>1 (2.8)</td>
</tr>
<tr>
<td>Anterior abdominal wall metastasis</td>
<td>2 (5.5)</td>
</tr>
<tr>
<td>Non regional nodal metastasis (axillary, supraclavicular, inguinal)</td>
<td>3 (8.3)</td>
</tr>
</tbody>
</table>
and Stage 3 versus Stage 1 and 2 were found to be risk factors for relapse rate and DFS (Figures 2-4).

**DISCUSSION**

The prognosis of patients with locally advanced GC who undergo surgery alone is poor, with 5 years OS of around 20-30% in node-positive disease.\(^{25,26}\) The high recurrence rates even after curative resection makes it important to consider postoperative adjuvant therapy for patients with GC.\(^{27,28}\) Several studies such as GITSG, 1982; Moertel *et al.*, 1984; Allum *et al.*, 1989; Regine and Mohiuddin, 1992\(^{17,19,29}\) show positive effects of radiotherapy and/or chemotherapy in patients with locally advanced or unresectable gastric adenocarcinoma, but the benefit of adjuvant treatment after curative resection remains controversial. Intergroup trial\(^{20}\) showed that adjuvant chemoradiotherapy reduced recurrences and increased survival of patients with gastric adenocarcinoma. Undoubtedly, a renewed interest in GC treatment arose after the US Intergroup trial (0116), which demonstrated a clear survival advantage of adjuvant chemoradiotherapy and strongly supported the integration of this treatment as part of standard care for patients who have undergone curative resection for high-risk adenocarcinoma of the stomach and gastroesophageal junction.\(^{20}\) The 3 years survival rates were 41% and 50%, respectively \(P = 0.005\). Following these results, post-operative adjuvant chemo-radiation as per the INT-0116 trial, -called “Macdonald regimen,” became the new standard of care. An updated report of this trial has confirmed that this benefit is still maintained at the long term.\(^{21}\) No adjuvant regimen has definitively supplanted fluorouracil-based chemoradiotherapy. However, this result does not apply to all cases of resected gastric adenocarcinoma because most of the patients (approximately 90%) in this study had undergone limited (D0 or D1) lymph node dissection, which might be associated with increased risk of residual positive nodes. The study reported that 19% of the patients in the chemoradiotherapy arm had relapsed locally, whereas 29% had relapsed in the control arm, and the sites of relapse were mainly lokoregional. This result may suggest the possibility of inadequate local control with limited (D0 or D1) lymph node dissection.\(^{20}\)

Comparison of patient profile, tumor characteristics as well as treatment results, in terms of toxicity and efficacy were carried out between the INT-0116 trial and the current analysis. Although number of patients in both groups were not comparable (556 vs. 52), the patient populations in both studies were very similar, with a median age of 60 years.
with male preponderance (72% and 80.8%). Similarly, type of lymphadenectomy was D1 in approximately 90% of patients in both studies. In both studies most tumors were classified as T3-4 and/or N+ although in the current one there was slightly higher proportion of T3-4 tumors (82.6% vs. 68%). There were certain differences between two studies like high percentage of diffuse histology in our study population compared to INT-0116 trial (51.9% vs. 30.23%) and bad prognostic features like LVI (51.9%), PNI (63.5%) which were not mentioned in reference study. Multivariate analysis showed that tumor invasion beyond serosa or lymph node metastasis is risk factors for total recurrence. That is, patients with T3, T4 and/or lymph node metastasis could be candidates for adjuvant radiotherapy or chemoradiotherapy.\textsuperscript{30} The relapse rate in our study is high (70.6% vs. 43%) and DFS is low (12 vs. 36 months) compared to INT-0116 trial probably because of very less number of patients in our study; short median follow-up (1 vs. 5 years); high proportion of T3/T4 tumors; diffuse histology and lymphovascular invasion which are known bad prognostic and independent risk factors for local recurrence in GC. The toxicity pattern was also very similar, with most toxicities being hematological and gastrointestinal with comparable rates of severe (Grade ≥3) toxicities and toxicity-related treatment discontinuations. Hughes, 2004\textsuperscript{31} reported almost similar relapse rates (68%) as our study as all parameters were comparable to ours like number of patients (45), T3/T4 (85%) and node positivity (82.7%) and toxicity profile.

Some results report that not only the pN stage but also the number of resected lymph nodes inversely correlates with lower survival rates.\textsuperscript{32,33} Marchet et al.\textsuperscript{32} reported a correlation between the resection of 16 or less lymph nodes and the lower 5 years OS rate in comparison with patients where 16 or more lymph nodes were resected. Wydmanski\textsuperscript{34} reported that a nodal ratio of <0.6 correlated with a better prognosis; the 5 years OS in a group of patients with a nodal ratio <0.6 was 45% compared with 19% in cases where the nodal ratio was >0.6. In this study, not only the pN stage but also the number of dissected metastatic lymph nodes divided by the total number of removed nodes (defined as a nodal ratio) was correlated with a decrease in DFS and relapse rate. It appears that the nodal ratio is a more precise prognostic factor than the absolute number of dissected metastatic lymph nodes. Another prognostic factor is tumor size.\textsuperscript{32,33} Together with growth of tumor volume, the risk of distant metastases and locoregional recurrence is increased as seen in our study. After the publication of the INT0116 study, a change in everyday practice has been made and more patients received fluorouracil-based chemotherapy in addition to radiotherapy.\textsuperscript{35}

Our results with McDonald’s protocol in our analysis were not encouraging possibly due to a small patient cohort, higher stage at presentation, aggressive histological variant and probably nonavailability of conformal radiotherapy techniques.

One possible way to improve the efficacy of INT-0116 in our setting might be to integrate newer chemotherapy agents, such as the taxanes, oxaliplatin and oral fluoropyrimidines, in the treatment. Another promising way would be to combine chemotherapy with biological agents like trastuzumab, which has been shown to improve substantially the results of chemotherapy in advanced GC with overexpression of HER2.\textsuperscript{36} A second approach to enhance the efficacy of INT-0116 chemotherapy would be to modify the timing of its delivery, like in the “MAGIC” trial.\textsuperscript{37} Based on the current data from the decades of studies on adjuvant therapy for GC and particularly from the updated data from the “ARTIST” trial,\textsuperscript{38} the benefit of adjuvant chemoradiotherapy appears to outweigh the risks in patients with node-positive disease and intestinal-type histology, so these pathologic factors should be taken into account when considering adjuvant therapy in fit patients after gastric resection.

With the introduction of more advanced radiotherapy techniques, including the use of CT simulator and a more conformal delivery of radiotherapy, the potential for toxicity from abdominal radiotherapy has decreased and the precision of radiotherapy delivery has improved the accuracy of delineating areas at risk in the abdomen for patients receiving adjuvant radiotherapy for GC while minimizing the volume of normal tissue irradiated.

“The chemoradiotherapy after induction chemotherapy of cancer in the stomach” trial is currently investigating perioperative treatment with epirubicin, cisplatin, and capecitabine chemotherapy alone versus epirubicin, cisplatin, and capecitabine chemotherapy followed by concurrent chemoradiotherapy with cisplatin and capecitabine in patients with GC after D1 or greater resection.\textsuperscript{39} The results of these, and other, large randomized trials will continue to lead us further along the path of refining our management of GC and further defining the role of radiotherapy in this disease.

CONCLUSION

With continued progress in improving radiotherapy techniques, developing more effective systemic regimens, and identifying biomarkers of treatment response, the role of adjuvant chemoradiotherapy will likely become better defined.
REFERENCES


A Single Center Study of 80 Cases of Fistula-in-ano

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Abstract

Background: Anal fistulae, especially the complex and the high ones, are a challenge to treat even for an experienced surgeon. Hence, there is a need to preoperatively evaluate anal fistula to reduce the rate of recurrence.

Objective: This study was embarked on to evaluate the natural course of anal fistula and its management. Goodsall’s rule, which predicts the course of fistulous tracts, was also validated in this study.

Materials and Methods: A total of 80 patients, who were diagnosed to have fistula-in-ano clinically, were included in this study. All patients underwent conventional or magnetic resonance (MR) fistulogram. The fistulous tracts were preoperatively assessed and compared with the fistulograms. The tracts were sent for histopathological examination and their cause identified.

Results: In our study, 90% were <60 years of age with a very high male preponderance (82.5%). A perianal abscess is the major cause of development of anal fistulae with tuberculosis causing 7.5% of the fistulae in our study. Goodsall’s rule was found to be accurate in only about 66% of anterior fistulae and 29% in posterior fistulae.

Conclusion: With Goodsall’s rule being inaccurate in predicting the course of fistula, we propose that every case of anal fistula should be evaluated with conventional or MR fistulogram.

Key words: Anal fistula, Fistulogram, Goodsall’s rule, Tuberculosis

INTRODUCTION

A fistula-in-ano is a granulation tissue lined tract, which connects an opening on the perianal skin (external) to another opening inside the anal canal or the lower rectum (internal). Internal openings are single in number while external openings can be single or multiple. Fistulas have been described since the last 200 years, being described by Hippocrates as early as 430 BC, with the application of seton being his recommended treatment.¹ The late 19th and early 20th centuries saw substantial research and the treatment options being developed in this subject by the likes of Milligan–Morgan, and Goodsall.²,³ Sir James Parks introduced his classification system in 1976, which is still in use.⁴ David Henry Goodsall in 1900 described a rule named after him, which predicts the position of the external opening of the fistula-in-ano in relation to its internal opening.⁵ Many new techniques such as the mucosal advancement flap, the Gore Bio-A fistula plug, and the ligation of intersphincteric fistulous tract procedure have seen recent acceptance.⁶,⁷

Fistula-in-ano can be broadly classified into simple and complex fistula. Simple fistulae can be broadly classified into subcutaneous and submuscular (intersphincteric and low transsphincteric).

Complex fistulae include those which are high transsphincteric, suprasphincteric, extrasphincteric, multiple tracts, and recurrent.

Goodsall’s rule states that if the perianal skin opening is posterior to the transverse anal line, the fistulous tract will open into the anal canal in the midline posteriorly, sometimes taking a curvilinear course. A perianal skin opening anterior to the transverse anal line is usually associated with a radial fistulous tract. An exception to the rule are anterior fistulas lying more than 2.5 cm from the...
anus, which may have a curved track (similar to posterior fistulas) that opens into the posterior midline of the anal canal.\textsuperscript{3}

Data regarding the positive predictive value have been inconsistent with different studies showing a wide variance in results.

**Objectives**
1. To study presentation, age, and sex distribution of fistula-in-ano
2. To identify predisposing factors for the development of fistula-in-ano
3. To study the accuracy of Goodsall’s rule in cases of fistula-in-ano with external opening within 2.5 cm from the anal verge
4. To propose a suitable workup protocol for patients suffering from fistula-in-ano.

**MATERIALS AND METHODS**

All the patients suffering from fistula-in-ano admitted to Sri Ramachandra Hospital, Chennai, India, between January 2015 and January 2016. Patients were from either sex and belonged to all age groups.

A detailed history and a thorough examination were done for all the patients. All patients underwent digital rectal examination and fistulogram (conventional/magnetic resonance imaging [MRI]). If history suggested the presence of a predisposing factor, relevant investigations were done.

**RESULTS**

According to our study, it is quite evident that fistula-in-ano is a disease of the young and the middle-aged rather than the elderly. 90% of our study group was below the age of 60 (Table 1). There is a definite male preponderance to developing fistula-in-ano with 82.5% of our patients being male (Table 2). The predominant history was that of a previous/recurrent perianal abscess (77.5%) that had either ruptured spontaneously or had been surgically drained (Table 4). One of the patients had a history of perineal injury due to a road traffic accident, six were tuberculous (either on treatment or proven by operative biopsy), three were also suffering from a concomitant fissure, and one patient had a history of colonic carcinoma (Table 5).

A majority of our cases presented with simple rather than complex fistula (85% vs. 15%) with no age relation to the simplicity or complexity of the fistula (Table 3). When dealing with simple fistulas, it was found that Goodsall’s rule was accurate in only 66% of 68 cases with an anterior external opening and accurate in only 29% of the cases with posterior openings (Tables 6-9). Conversely, it was also found that in complex fistulae, straight tracts were more common than curved tracts in anterior opening fistulae, which goes against the exception of the rule (Table 10).

**DISCUSSION**

Fistula-in-ano while easy to diagnose, require a minimum of a conventional fistulogram to map out the type and course of the tracts. As the study revealed such a vast discrepancy in the findings related to Goodsall’s rule, the authors recommend that all cases of fistula-in-ano be thoroughly

---

**Table 1: Age distribution of patients**

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Number of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-40</td>
<td>36 (45)</td>
</tr>
<tr>
<td>41-60</td>
<td>36 (45)</td>
</tr>
<tr>
<td>61-80</td>
<td>8 (10)</td>
</tr>
</tbody>
</table>

**Table 2: Sex distribution of patients**

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-40</td>
<td>30</td>
<td>6</td>
</tr>
<tr>
<td>41-60</td>
<td>29</td>
<td>7</td>
</tr>
<tr>
<td>61-80</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>Total (%)</td>
<td>66 (82.5)</td>
<td>14 (17.5)</td>
</tr>
</tbody>
</table>

**Table 3: Age-wise classification of types of Fistula**

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Simple fistula</th>
<th>Complex fistula</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-40</td>
<td>32/36</td>
<td>4/36</td>
</tr>
<tr>
<td>41-60</td>
<td>29/36</td>
<td>7/36</td>
</tr>
<tr>
<td>61-80</td>
<td>7/8</td>
<td>1/8</td>
</tr>
<tr>
<td>Total (%)</td>
<td>68/80 (85)</td>
<td>12/80 (15)</td>
</tr>
</tbody>
</table>

**Table 4: Relationship to past anal abscess**

<table>
<thead>
<tr>
<th>H/o past anal abscess</th>
<th>Male (66)</th>
<th>Female (14)</th>
<th>Total number of patients (80) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>54</td>
<td>8</td>
<td>62 (77.5)</td>
</tr>
<tr>
<td>No</td>
<td>12</td>
<td>6</td>
<td>18 (22.5)</td>
</tr>
</tbody>
</table>

**Table 5: Predisposing factors leading to Fistula in ano**

<table>
<thead>
<tr>
<th>Predisposing factor</th>
<th>Number (80)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trauma</td>
<td>1</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>6</td>
</tr>
<tr>
<td>Crohn’s disease</td>
<td>0</td>
</tr>
<tr>
<td>Fissure-in-ano</td>
<td>3</td>
</tr>
<tr>
<td>Malignancy</td>
<td>1</td>
</tr>
<tr>
<td>Perianal sepsis</td>
<td>62</td>
</tr>
<tr>
<td>No previous significant history</td>
<td>7</td>
</tr>
</tbody>
</table>
investigated preoperatively with either a conventional or a MR fistulogram. These findings were consistent with the published papers regarding the same.

Cirocco and Reilly in 1992 (216 cases) showed in their study that Goodsall’s rule was proved to be accurate in 90% cases of posterior openings and as low as 49% in regard to anterior openings.8 Barwood et al. in 1997 (107 cases) showed in their study that Goodsall’s rule was proved to be accurate in 91% cases of posterior openings and as low as 69% in regard to anterior openings.8 Gunawardhana and Deen in 2001 (35 cases) showed in their study that overall only 59% of the cases of fistula-in-ano followed the Goodsall’s rule.10 Hiranyakas et al. in 2005 (21 cases) showed in their study of efficacy of endoanal ultrasound, that overall only 58.82% of the cases of fistula-in-ano followed the Goodsall’s rule.11 Mallick and Kamil (71 cases) showed in their study that Goodsall’s rule was proved to be accurate in 53% cases of posterior openings and 54% in regard to anterior openings.12

In our study, we found that Goodsall’s rule was accurate in 66% of cases with anterior opening and 29% of cases with the posterior opening. As regards predisposing factors, previous perianal sepsis was the overwhelming factor in patients developing fistulae - 77.5%.

As the study proves that the Goodsall’s rule is not completely accurate in establishing the tract of the fistulae, the authors recommend that all cases without exception should undergo either a conventional fistulogram, which has an accuracy of 16-48%,13 or MR fistulogram, which has a high accuracy of 80-90%.14,15

CONCLUSION

This study proves beyond doubt that in fistula-in-ano with external openings <2.5 cm from the anal verge, the Goodsall’s rule is only accurate in approximately two-thirds of the cases of those presenting with anterior external openings, while in posterior external openings, it is accurate in less than one-third of the cases.

It also proves that perianal sepsis is the leading factor for the development of future fistula-in-ano.

The study also proves that a suitable imaging study should be done to map out the course of the fistulous tract preoperatively to avoid difficulty during surgery, due to the large deviation from the accepted Goodsall’s rule.

REFERENCES


Source of Support: Nil, Conflict of Interest: None declared.
Comparative Evaluation of Intrathecal Dexmedetomidine and Fentanyl as Adjuvant to Bupivacaine for Lower Abdominal Surgery

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Abstract

Objectives: The study is aimed to compare intrathecal dexmedetomidine and fentanyl as adjuvant to hyperbaric bupivacaine in terms of: (a) Evaluation of sensory and motor blocks in regards to, onset, duration, and quality of spinal anesthesia. (b) Duration of post-operative analgesia and requirement of rescue analgesics within 24 h after surgery. (c) Perioperative hemodynamic stability. (d) Side effects and complication.

Materials and Methods: All selected patients will be randomly divided into three groups as follows: Group A: Patients will be given only hyperbaric bupivacaine 12.5 mg (2.5 ml) and will serve as control group. Group B: Patients will be given hyperbaric bupivacaine 12.5 mg (2.5 ml) with 5 µg dexmedetomidine. Group C: Patients will be given hyperbaric bupivacaine 12.5 mg (2.5 ml) and 25 µg (0.5 ml) fentanyl to make final volume 3 ml. We will use 50 µg/ml concentration of fentanyl. Groups C and B will comprise the study group.

Results: Onset time for dexmedetomidine or fentanyl with bupivacaine was shorter than bupivacaine alone. The overall duration of analgesia was significantly longer in dexmedetomidine group than fentanyl group showing significant difference between the two groups (P < 0.001). The mean effective analgesia as assessed by visual analog scale ≥ 4 was: (i) 193.24 min with bupivacaine and normal saline. (ii) 373.24 min with bupivacaine and dexmedetomidine. (iii) 302.56 min with bupivacaine and fentanyl.

Side effects: No significant difference was observed among different groups for any of the side effects. Hypotension, bradycardia more in study Group B followed by study Group C and then control group. Sedation was more in study Group B than study Group C, respiratory depression more in study Group C followed by control group. There was no respiratory depression in study Group B. Nausea and vomiting were observed in three patients in control group, in four patients in study Group B and in six patients in study Group C.

Conclusion: The duration of sensory and motor block were more prolonged with dexmedetomidine than fentanyl. Duration and effectiveness of analgesia was significantly better in dexmedetomidine group than fentanyl group.

Key words: Analgesia, Intrathecal bupivacaine, Lower abdominal surgery

INTRODUCTION

Spinal anesthesia is a type of regional anesthesia technique and has got many advantages such as rapid in onset, easy to perform, and without risk of local anesthetic toxicity. Bupivacaine is the most commonly used drug in spinal anesthesia. Various additive drugs have been tried with bupivacaine to look for the improvement in the quality and extending the duration of blockade such as opioid analogs, neostigmine, benzodiazepines, ketamine, and α₂-agonist. Fentanyl is a partial agonist on μ-opioid receptors and dexmedetomidine is an α₂-agonist. Intrathecal dexmedetomidine when combined with spinal bupivacaine prolongs the sensory block by depressing the release of C-fibers transmitters and by hyperpolarization of postsynaptic dorsal horn neurons. Intrathecal fentanyl
when combined with bupivacaine prolonged the duration of bupivacaine-induced sensory block and reduced the analgesic requirement in the early post-operative period following bupivacaine spinal block.

**Aims and Objectives**

It is aimed to compare effects of adding dexmedetomidine and fentanyl with bupivacaine in spinal anesthesia by evaluating onset of sensory and motor blockade, duration of block, post-operative analgesia, and side effects in lower abdominal surgeries.

**MATERIALS AND METHODS**

The study was conducted in the Department of Anaesthesiology, M.L.B. Medical College, Jhansi, following approval of hospital ethical committee. Our study included 150 healthy cases, between the age group of 18-50 years, of either sex (M/F) and belonging to ASA Grade I and II, admitted for lower abdominal surgery.

- **Group A**: 12.5 mg (2.5 ml) hyperbaric bupivacaine + 0.5 ml normal saline. This served as control group.
- **Group B**: 12.5 mg (2.5 ml) hyperbaric bupivacaine + 5 mcg (0.5 ml) dexmedetomidine.
- **Group C**: 12.5 mg (2.5 ml) hyperbaric bupivacaine + 25 mcg (0.5 ml) fentanyl. Total volume injected intrathecally was 3.0 ml.

After taking detailed history and thorough systemic examination and necessary laboratory investigation, the patients were excluded from the study on the basis of below mentioned criteria:

1. Uncontrolled diabetes mellitus
2. Cardiac disease
3. Uncontrolled hypertension
4. Chronic obstructive respiratory disease
5. Coagulation abnormalities
6. Spinal deformities
7. Patient on beta blocker therapy
8. High degree of heart block.

**RESULTS**

The sensory onset (T10) was faster in Group B (3.72 ± 0.50 min) followed by Group C (3.80 ± 0.53 min) and Group A (6.14 ± 0.61 min), the difference between dexmedetomidine and fentanyl groups was not significant; both of these are equally effective in reducing the time of onset of sensory block when compared to bupivacaine alone.

While onset of motor block (Grade III) in Group B was 5.76 ± 0.43 min followed by Group C 5.80 ± 0.40 min and Group A 9.0 ± 0.00 min. The difference was statistically significant in the case of comparison of Groups A and B and Groups A and C, but not in Groups B and C. Duration of sensory block was maximum in Group B (306 ± 13.32 min) then Group C (206 ± 16.69) and least in Group A (187.94 ± 8.32 min).

Duration of sensory regression to S1 level was 187 ± 8.32, 306.0 ± 13.32, 206.14 ± 16.69 min in control Group A and study Groups B and C, respectively. Duration of motor blockade was also maximum in Group B (257 ± 14.61) followed by Group C (178.54 ± 14.23 min) and Group A (160.18 ± 7.44 min). The sensory and motor block were more prolonged in dexmedetomidine group than fentanyl group showing significant difference among the two groups (P value).

The mean effective analgesia as assessed by visual analog scale (VAS) ≥ 4 was 193.24 min in Group A, 373.24 min with Group B, and 302.56 min with Group C.

In relation to hemodynamic instability, in control Group A, the mean arterial pressure (MAP) ranged from 76.32 ± 6.08 (at 45 min) to 102.76 ± 43.89 mmHg just after spinal anesthesia, whereas in study Group B, it ranged from 73.80 ± 6.53 (45 min) to 95.56 ± 8.66 mm Hg (baseline) and in study Group C the mean value ranged from 73.0±5.36 (45 min) to 98.80 ± 7.21 mmHg (baseline). None of the subjects in any group had pruritus, hypotension, and sedation were the most common side effect. Bradycardia and respiratory depression were less commonly reported side effects. For all the complications, the proportion of control Group B subjects was minimum while that of study Group F subjects was maximum. Statistically, no significant intergroup difference was observed for any of the complications (P > 0.05) (Figure 1).

**DISCUSSION**

In this study, we compared dexmedetomidine and fentanyl with bupivacaine in spinal anesthesia for lower abdominal surgeries.
abdomen surgeries through randomized control trial and findings.

**Onset of Sensory Block**
The mean time to achieve sensory block up to T10 level was 6.14 ± 0.61 min in control Group A, 3.72 ± 0.50 min in study Group B and 3.80 ± 0.53 min in study Group C, showing statistically significant intergroup difference ($P < 0.001$), but no significant difference between study Group B and C ($P = 0.440$). We have seen that onset time for dexmedetomidine or fentanyl with bupivacaine was shorter than bupivacaine alone.

**Onset of Motor Block**
The mean time to achieve Grade III motor block was 9.0 ± 0.00 min in control Group A, 5.76 ± 0.43 min in study Group B, and 5.80±0.40 min in study Group C. The mean time to achieve Grade III motor blockade was minimum in study Group B, and maximum in control Group A showing a significant intergroup difference ($P < 0.001$). There was no significant difference in the meantime to achieve Grade III motor blockade between the study Group B and study Group C ($P > 0.05$).

**Duration of sensory block**
Duration of sensory block was assessed by period for sensory regression to S1 level after intrathecal injection of drug. The period for sensory regression to S1 level was 187.94 ± 8.32, 306.0 ± 13.32 and 206.14 ± 16.69 min in control Group A, study Groups B and C, respectively.

**Duration of motor block**
Duration of motor block was assessed by period of regression to Bromage - 0 after intrathecal injection of drug. The period for regression to Bromage - 0 were 160.18 ± 7.44, 257.70 ± 14.61 and 178.54 ± 14.23 min in control Group A, study Groups B and C, respectively.

**Duration of Analgesia**
**Complete analgesia**
It refers to the time from intrathecal injection to the first complaint of pain by the patient.

**Effective analgesia**
It refers to the time from intrathecal injection to the administration of analgesic supplement, i.e., IM tramadol (VAS ≥ 4).

The mean time for both complete and effective analgesia was found to be maximum in study Group D and minimum in Group D showing a statistically significant intergroup difference ($P < 0.001$). Control Group B had significantly shorter duration of complete as well as effective analgesia as compared to study Groups D and F ($P < 0.001$).

However, a significant difference was observed between study Groups D and F for effective analgesia time ($P < 0.001$) with study Group D showing significantly longer duration as compared to study Group F.

The mean complete analgesia was found to be 156.74 ± 10.19, 324.60 ± 16.81, and 256.80 ± 20.65 min in the control group, study Group D and F, respectively.

The mean effective analgesia was found to be 193.56 ± 12.43, 373.0 ± 16.26, and 302.40 ± 16.01 min in the control group, study Group D and F, respectively.

It means that the longest duration of both complete and effective analgesia was experienced by the patients receiving dexmedetomidine, followed by the patients receiving fentanyl.

Singh et al.¹ used intrathecal fentanyl with bupivacaine to prolong sensory blockade and they concluded that fentanyl prolonged the duration of bupivacaine-induced sensory block and reduced the analgesic requirement in the early post-operative period following bupivacaine spinal block.

Shende et al.² studied the influence of intrathecal fentanyl on subarachnoid block for cesarean section, and they concluded that adding fentanyl to hyperbaric bupivacaine for spinal anesthesia markedly improves intraoperative anesthesia for cesarean section.

Various studies have shown the time for onset of sensory block to be governed by the type of local anesthetic solutions and its concentration and its site of administration. Increasing the concentration of local anesthetic shortens the time required for the onset of effect. Lignocaine by its nature has a faster onset of action than bupivacaine, but due to known toxicity and shorter duration of action of lignocaine, we used bupivacaine. Bogra et al.³ studied the synergistic effect of intrathecal fentanyl and bupivacaine in spinal anesthesia for cesarean section and they concluded that fentanyl potentiate and reduce the dose of bupivacaine.

Biswas et al.⁴ compared the effects of adding 12.5 mcg fentanyl to 2.0 ml bupivacaine and concluded that duration
of effective analgesia was prolonged to 248 min in comparison to 150 min when bupivacaine was used alone.

**CONCLUSION**

From this study, it can be concluded that the onset of sensory and motor blockade in both dexmedetomidine and fentanyl group were comparable. The duration of sensory and motor block were more prolonged with dexmedetomidine than fentanyl showing significant difference among the two groups \((P < 0.001)\). Overall duration and effectiveness of analgesia were significantly better in dexmedetomidine group than fentanyl group showing significant difference between the two groups \((P < 0.001)\). Fall in systolic blood pressure, diastolic blood pressure, and MAP were more in fentanyl group which was easily controlled with small bolus dose of ephedrine.

Adding dexmedetomidine 5 mcg to single shot spinal blockade with bupivacaine 12.5 mg not only provide rapid onset, profound analgesia with good relaxation for surgery but also prolongs the duration of sensory and motor blockade and extends the duration of post-operative analgesia without significant side effect. The overall effect and duration are superior to addition of 25 mcg of fentanyl.

**REFERENCES**


Source of Support: Nil, Conflict of Interest: None declared.
Comparative Assessment of Dental Anxiety among General Population of Varying Socioeconomic Strata of Mumbai and Navi Mumbai: A Cross-Sectional Study

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Abstract

Introduction: Ranked fourth among common fears and ninth among intense fears, dental anxiety (DA) is a major issue not only for the patients but also for dental professionals, and sometimes it prevents from rendering dental treatment more effectively.

Purpose: To assess the prevalence of DA among the population of Mumbai and Navi Mumbai and to relate socioeconomic scale (SES measured by Kuppuswamy scale) with DA measured with modified DA scale (MDAS).

Materials and Methods: A cross-sectional questionnaire-based study was conducted among 1987 people belonging to varying SES measured DA aged 15-75 years, who have undergone dental treatment. Mode of administration was English, Hindi, and Marathi. Around 2050 questionnaire copies were distributed of which 1987 answered with a response rate of 96.92%.

Results: Of 1987 total participants, 1057 were men and 930 were females. Comparison of mean overall score with SES shows that DA is higher for upper class (2.62) of socioeconomic status as compared to lower class (1.62), which was found to be statistically highly significant (P < 0.001). The mean MDAS score for the six questions was higher in females as compared to males (P < 0.001), with mean overall MDAS score 2.38 ± 1.21 in females and 2.01 ± 1.15 in males. 6% of the total population suffers from DA.

Conclusion: The upper class in the socioeconomic status is more anxious than the lower class. Furthermore, the female population is more anxious than males. A significant number of the population is suffering from DA.

Key words: Dental anxiety, Kuppuswamy’s socioeconomic status scale, Modified dental anxiety scale

INTRODUCTION

Anxiety may be defined as a reaction to an unknown danger. It is in the unconscious. Anxiety is psychological phenomenon which is difficult to measure because patients may hide their feelings regarding their perceptions about dental treatment, needles, and instruments. Despite the technological advances in modern dentistry fear of pain associated with dentistry are widespread. DA is fear of dentistry or related to receiving dental treatment. DA is a major issue with respect to provisions of dental care and the access to it. It is ranked fourth among common fears and ninth among intense fears. The prevalence of DA has been studied among various socioeconomic classes and cultures. It is a frequent problem among dental patients. The presence of DA is not a predicament for the patients alone but also for the dental experts themselves; and sometimes it causes a hindrance in the treatment to be accomplished successfully. Oral diseases are chief public health concerns, and their prevalence could be promoted by DA. The etiology of DA is poorly understood. The onset of DA is thought to emanate in childhood, peak in early...
adulthood, and decline with age.\textsuperscript{5} DA is based on several factors such as family and social environment, general fearfulness, pain and traumatic, and unpleasant experiences. The patient perceptions regarding attitudes of dentists can affect DA and could dominate his or her decision to access dental care. It is therefore becomes imperative to assess the DA quantitatively and qualitatively and its associated factors. Various researchers have conducted surveys in populations of different countries and reported various types of DA ranging from mild and moderate to severe. Very few focus on the effect of independent variables such as age and gender on DA.\textsuperscript{6}

One of the possible factors could be socioeconomic status (SES) which is a combination of variables such as education, occupation, and income reflects the patient's affordability of health services, necessities, and purchasing power. High level of reliability and validity of Kuppuswamy's socioeconomic status scale \textsuperscript{7} becomes an important tool in measuring SES.\textsuperscript{8}

The modified DA scale (MDAS) was used to quantify the participant's levels of DA and to confirm their connectional levels of high anxiety concerning dental treatment. This was modified from the original Corah's DA scale (CDAS). The advantage of the MDAS is because of its crispness, it is simple, easy to complete, and can be used as a practical instrument for population-based research. It has been found to be reliable and is valid cross-culturally and has been translated into different languages. This scale consists of a set of five questions to be presented to the participants, and they are asked to estimate the level of anxiety they would feel if they were in particular dental situations.\textsuperscript{9} An MDAS score of 19 and above indicates a strong plausibility of the respondent being dentally phobic.

With this background, a need for felt to investigate the association of socioeconomic status effect on DA, hence this study was planned with the ambitions to assess the prevalence of DA among the population of Mumbai and Navi Mumbai, and to relate SES measured by Kuppuswamy scale with DA measured with MDAS.

**Objectives**
1. To assess the prevalence of DA among general population of Mumbai and Navi Mumbai
2. To relate SES measured by Kuppuswamy scale with DA measured with MDAS.

**MATERIALS AND METHODS**

This study being a cross-sectional questionnaire-based survey and it was conducted in the Months of February - May 2016, at Y.M.T Dental College and Hospital in Kharghar, Navi Mumbai among 1987 participants, aged between 15 and 75 years.

Before the start of the study, ethical clearance, and all the necessary permissions were taken from the Institutional Ethics committee, Y.M.T Dental College by submitting the study proposal which was blinded and reviewed by two reviewers.

The patients within the age limit were selected for the study. It was essential for the patient to have taken prior dental treatment. The patients who refused to give consent and those who were undergoing psychiatric treatment or were suffering from any generalized anxiety disorders were excluded from the study. Those patients who were uneducated and were unable to read were helped by the primary investigator for the study purpose.

The sample size was determined using single proportion formula.

\[
N = \left[ Z_\alpha \frac{p(1-p)}{d}\right]^2
\]

Where \( Z_\alpha \) is Z variate of \( \alpha \) error fixed at 1.96, \( p \) is the proportion of population expected having the disease or condition. \( d \) is expected error in the study fixed at 5%. Substituting the values sample size was obtained as 384.

Since the study involves comparison of DA among five classes of SES. Total sample size estimated is \( 384 \times 5 = 1920 \). Selection of subject/participants was performed as per convenience sampling.

The instrument for data collection was a self-devised pretested questionnaire, the validity and reliability of which was checked in a pilot study was conducted among 15-20 randomly selected patients, and corrections were performed in the questionnaire, and those patients were excluded from this study. The instrument to record responses was self-designed, pretested questionnaire or data recording sheet which had three sections. (Annexure 1). This form was administered in English, Marathi, and Hindi. Translation was performed according to forward and backward blind translation process.

For testing, the validity and reliability of the questionnaire a pilot survey was conducted. This was carried out on 15 patients from the outpatient department of Y.M.T Dental College. The patients were asked for their feedback and necessary changes were performed. These patients were not included in the main study.

**Statistical Analysis**

Data were compiled on MS Excel Sheet (version 2010). Data were subject to statistical analysis using statistical package...
for social sciences (SPSS, v 22.0, and IBM). Percentage and frequency of number of males and females, education, occupation, income, duration of last treatment, response to MDAS Q1-6, overall score, and number and percentage of people belonging to each SES, agewise distribution with SES, comparison of Kuppuswamy score between gender was done by independent t-test, MDAS Q1-6, and overall score was done using independent t-test. One-way Analysis of variance was used to compare means of overall anxiety score with Kuppuswamy SES scores. For all tests, \( P < 0.05 \) was considered statistically significant.

**RESULTS**

A total number of participants were 1987. 2050 questionnaire copies were distributed of which 1987 answered with a response rate of 96.92%. 1057 were male and 930 were females. Mean age of the participants were 39.8 ± 13.57 (Minimum 15-Maximum 72). Distribution of age with respect to SES shows that the mean age was higher for lower class (48.12) and least for upper middle class (32). The majority of the participants were graduates/post graduates (601 out of 1987), whereas the minority of the population has passed primary school certificate (42 out of 1987). 927 participants were unemployed, 392 were professionals, 245 were semiprofessionals, 194 were skilled workers, 115 were unskilled workers, 97 were clerical/shop owners, and 17 were semiskilled workers. The majority of the participants monthly family income was ≥36017 (617), whereas only 90 earned ≤1802. Out of the total 5 SES classes upper middle class had the highest frequency of 412 whereas upper class, upper lower and lower class had a frequency of 393 each and lower middle had a frequency of 396. Duration since the last dental treatment shows that around 33% population had undergone treatment in the last 6 months and 21% population in the last 1-2 years. The frequency of answers for MDAS Q1 TO Q6 is depicted in Table 1. The frequency for the overall MDAS score shows that 729 out of the total participants are not anxious (36.7%), whereas 125 were extremely anxious (6.3%). The mean Kuppuswamy score versus gender shows that the mean Kuppuswamy score was higher in males (15.80) than in females (13.16) and was statistically highly significant (\( P < 0.01 \)). Table 2 shows that there was a nonsignificant difference between the duration of dental treatment among males and females (\( P > 0.05 \)). However, for each of the MDAS Q1 to Q6, there was a highly significant difference with mean anxiety score for each question higher for females as compared to males (\( P < 0.01 \)). Furthermore, mean overall MDAS score in females was 2.38 ± 1.21 as compared to 2.01 ± 1.15 in males and was statistically highly significant (\( P < 0.01 \)). Comparison of SES versus duration of treatment shows that lower class (157) has undergone treatment in the last 6 months and the \( P < 0.01 \) which is highly significant. Table 3 shows comparison of SES and MDAS Q1-Q6. It depicts the anxiety level of each class against each MDAS question. Anxiety provoking questions such as drilling, extraction, and injecting in gums incited anxiety in ascending order.

### Table 1: Frequency table for MDAS Q1 to Q6

<table>
<thead>
<tr>
<th>MDAS</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td></td>
</tr>
<tr>
<td>Not anxious</td>
<td>938 (47.2)</td>
</tr>
<tr>
<td>Slightly anxious</td>
<td>656 (33.0)</td>
</tr>
<tr>
<td>Fairly anxious</td>
<td>202 (10.2)</td>
</tr>
<tr>
<td>Very anxious</td>
<td>111 (5.6)</td>
</tr>
<tr>
<td>Extremely anxious</td>
<td>80 (4.0)</td>
</tr>
<tr>
<td>Total</td>
<td>1987 (100.0)</td>
</tr>
<tr>
<td>Q2</td>
<td></td>
</tr>
<tr>
<td>Not anxious</td>
<td>872 (43.9)</td>
</tr>
<tr>
<td>Slightly anxious</td>
<td>692 (34.8)</td>
</tr>
<tr>
<td>Fairly anxious</td>
<td>220 (11.1)</td>
</tr>
<tr>
<td>Very anxious</td>
<td>128 (6.4)</td>
</tr>
<tr>
<td>Extremely anxious</td>
<td>75 (3.8)</td>
</tr>
<tr>
<td>Total</td>
<td>1987 (100.0)</td>
</tr>
<tr>
<td>Q3</td>
<td></td>
</tr>
<tr>
<td>Not anxious</td>
<td>638 (32.1)</td>
</tr>
<tr>
<td>Slightly anxious</td>
<td>662 (33.3)</td>
</tr>
<tr>
<td>Fairly anxious</td>
<td>380 (19.1)</td>
</tr>
<tr>
<td>Very anxious</td>
<td>188 (9.5)</td>
</tr>
<tr>
<td>Extremely anxious</td>
<td>119 (6.0)</td>
</tr>
<tr>
<td>Total</td>
<td>1987 (100.0)</td>
</tr>
<tr>
<td>Q4</td>
<td></td>
</tr>
<tr>
<td>Not anxious</td>
<td>649 (32.7)</td>
</tr>
<tr>
<td>Slightly anxious</td>
<td>674 (33.9)</td>
</tr>
<tr>
<td>Fairly anxious</td>
<td>400 (20.1)</td>
</tr>
<tr>
<td>Very anxious</td>
<td>161 (8.1)</td>
</tr>
<tr>
<td>Extremely anxious</td>
<td>103 (5.2)</td>
</tr>
<tr>
<td>Total</td>
<td>1987 (100.0)</td>
</tr>
<tr>
<td>Q5</td>
<td></td>
</tr>
<tr>
<td>Not anxious</td>
<td>510 (25.7)</td>
</tr>
<tr>
<td>Slightly anxious</td>
<td>518 (26.1)</td>
</tr>
<tr>
<td>Fairly anxious</td>
<td>483 (24.3)</td>
</tr>
<tr>
<td>Very anxious</td>
<td>278 (14.0)</td>
</tr>
<tr>
<td>Extremely anxious</td>
<td>198 (10.0)</td>
</tr>
<tr>
<td>Total</td>
<td>1987 (100.0)</td>
</tr>
<tr>
<td>Q6</td>
<td></td>
</tr>
<tr>
<td>Not anxious</td>
<td>506 (25.5)</td>
</tr>
<tr>
<td>Slightly anxious</td>
<td>505 (25.4)</td>
</tr>
<tr>
<td>Fairly anxious</td>
<td>445 (22.4)</td>
</tr>
<tr>
<td>Very anxious</td>
<td>271 (13.6)</td>
</tr>
<tr>
<td>Extremely anxious</td>
<td>260 (13.1)</td>
</tr>
<tr>
<td>Total</td>
<td>1987 (100.0)</td>
</tr>
</tbody>
</table>

\( \text{MDAS: Modified dental anxiety scale} \)
Mean age is the lowest for upper middle class 32.00 ± 11.81 and highest for lower class 48.12 ± 13.34. When we compare SES and overall anxiety score, we conclude that anxiety is least in lower class (1.62) and most in upper class (2.62) (Table 4).

**DISCUSSION**

Undeterred by the technological advances made in modern dentistry, anxiety about dental treatment remains prevalent. The impact that DA can have on an individual’s life is extensive and influential, leading to the avoidance of dental care and unwanted effects, such as low self-esteem, and psychological problems. Fear of visiting the dentist is common, even among adults.⁵

In our study, results showed that 6.3% of the population was extremely anxious which was more than the study conducted by Deva et al.,³ in which 3% of their patients were dentally phobic.

Mean anxiety score for each question is higher for females as compared to males (P < 0.01). Mean overall MDAS score in females was 2.38 ± 1.21 as compared to 2.01 ± 1.15 in males, similar to the results achieved by Mohammed et al. (2014) who conducted a study on the prevalence of DA and its relation to age and gender in Coastal Andhra Pradesh population. It was a randomized controlled study among 340 individuals including 180 females and 160 males using CDAS. Mean CDAS score levels were significantly higher in females (10.88) than in males (9.96) (P < 0.0001).³

Comparison between genders showed that female subjects were more anxious than male counterparts. A credible explanation for such observation could be attributed to the fact that women usually admit their fears readily than men. Females have lower tolerance to pain and exhibit higher level of neuroticism.⁵

Anxiety keeps decreasing with age, 2.34 was the mean anxiety score for mean age of 32.00 in and 1.62 for mean age of 48.12. Other studies conducted by Patil et al.,¹⁰ Kulkarni et al.,² Corah,¹¹ Ayise and Heikki,¹² Vijaya and Ravikiran,¹³ and Kumar et al.¹⁴ showed similar reading with mean CDAS scores high in young age group. However, study conducted by Nirmala et al.,¹⁵ Tunc et al.,¹⁶ and Nair et al.¹⁷ refute this claim. Decline in anxiety with age could be due to cerebral deterioration which occurs with age, factors such as habituation, adaption toward the inevitable, increased ability to cope with experience aging process itself, and more exposure to debilitating diseases and treatment.⁵

Upper class in which subjects were better educated, employed, and financially affluent and can even rationalize a situation better scored higher on the anxiety scale (2.62) as compared to lower class which scored the least (1.62) (Table 4), contradictory to the results found by Kumar et al.,¹⁸ and Appukuttan et al.⁹ One reason for this would be that the mean age in upper class was 45.15 ± 9.67, whereas for lower class was 48.12 ± 13.34.

Findings of studies from different states in India like Gujarat and Haryana indicate that there is a prevalence of DA among the Indian population. This could be attributed to multiple factors such as poor oral health awareness, ignorance about treatment procedures, superstitions and false beliefs about dental treatment, and cultural differences and views.⁵
It was concluded that the patients with DA are more difficult to treat. If dentist is aware of DA levels among their patients, they can anticipate patient’s behavior and can be prepared to take behavioral or pharmacological measures to reduce DA.5

There are certain limitations of this study. Being cross-sectional in design, it involves data collected at a definite time including events that occurred in the past. There is difficulty in recalling past question. Furthermore, convenience sampling was performed and self-administered questionnaire was
administered. There are chances that the individuals over or underestimated their responses with respect to actual income, educational qualification, and occupation.³

CONCLUSION

From this study, we can conclude that DA is prevalent in our population, with the upper class in the socioeconomic status being more prone to anxiety. Even, females are more anxious as compared to males. A significant quota of the population is tormented by DA. This information can be crucial for dental practitioners and can help them in better anxiety management.

ACKNOWLEDGMENT

The authors would like to acknowledge the efforts and contributions of all participants in this study, also Dr. Renu Taywade and Mrs. Sharma who helped in administering the questionnaire in Hindi and Marathi, all our friends, colleagues and family members who gave their endless support and encouragement at various stages during the whole project.

REFERENCES

ANNEXURE 1

Section A
Age-______________years Sex Male □ Female □

Education-___________________ Occupation __________________ Income- __________/month

Section B
Kuppuswamy socioeconomic status scale

Education:
- Education of the head
- Profession or honors
- Graduate or Post-graduate
- Intermediate or post high school dip
- High school certificate
- Middle school certificate
- Primary school certificate
- Illiterate

Occupation:
- Occupation of the head
- Profession
- Semi profession
- Clerical, shop owner
- Skilled worker
- Semi-skilled worker
- Unskilled worker
- Unemployed

Total Kuppuswamy score:

<table>
<thead>
<tr>
<th>Socio-economic class</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper class (I)</td>
<td>26-29</td>
</tr>
<tr>
<td>Upper middle (II)</td>
<td>16-25</td>
</tr>
<tr>
<td>Lower middle (III)</td>
<td>11-16</td>
</tr>
<tr>
<td>Upper lower (IV)</td>
<td>5-10</td>
</tr>
<tr>
<td>Lower (V)</td>
<td>&lt;5</td>
</tr>
</tbody>
</table>

Total Kuppuswamy Score:___________

Section C
Q1: Details of previous dental visit:

Q2: Duration since the last dental visit
- Within last 6 months
- 1 year back
- Before 1-2 years back
- More than 2 years back

Modified dental anxiety scale:

Q1: If you were to go to your dentist for treatment tomorrow how would you feel?
- Not anxious
- Slightly anxious
- Fairly anxious
- Very anxious
- Extremely anxious

Q2: If you were sitting in the waiting room waiting for treatment how would you feel?
- Not anxious
- Slightly anxious
- Fairly anxious
- Very anxious
- Extremely anxious

Q3: If you were about to have your tooth drilled how would you feel?
- Not anxious
- Slightly anxious
- Fairly anxious
- Very anxious
- Extremely anxious

Q4: If you are about to have your teeth scaled and polished how would you feel?
- Not anxious
- Slightly anxious
- Fairly anxious
- Very anxious
- Extremely anxious
Q5: If you were about to have a local anesthetic injection in your gum, above and upper back tooth, how would you feel?

<table>
<thead>
<tr>
<th>Anxiety Level</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not anxious</td>
<td>1</td>
</tr>
<tr>
<td>Slightly anxious</td>
<td>2</td>
</tr>
<tr>
<td>Fairly anxious</td>
<td>3</td>
</tr>
<tr>
<td>Very anxious</td>
<td>4</td>
</tr>
<tr>
<td>Extremely anxious</td>
<td>5</td>
</tr>
</tbody>
</table>

Q6: How anxious would you be if you were about to have your tooth extracted?

<table>
<thead>
<tr>
<th>Anxiety Level</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not anxious</td>
<td>1</td>
</tr>
<tr>
<td>Slightly anxious</td>
<td>2</td>
</tr>
<tr>
<td>Fairly anxious</td>
<td>3</td>
</tr>
<tr>
<td>Very anxious</td>
<td>4</td>
</tr>
<tr>
<td>Extremely anxious</td>
<td>5</td>
</tr>
</tbody>
</table>

Total modified dental anxiety scale score:

<table>
<thead>
<tr>
<th>Anxiety Level</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not anxious</td>
<td>1</td>
</tr>
<tr>
<td>Slightly anxious</td>
<td>2</td>
</tr>
<tr>
<td>Fairly anxious</td>
<td>3</td>
</tr>
<tr>
<td>Very anxious</td>
<td>4</td>
</tr>
<tr>
<td>Extremely anxious</td>
<td>5</td>
</tr>
</tbody>
</table>
Comparative Study of Closure of Duodenal Perforations with Omental Plugging Versus Graham’s Patch

V Srinivas Goud¹, N Vinay Babu², P Bharath Kumar²
¹Associate Professor, Department of General Surgery, Mahatma Gandhi Memorial Hospital, Warangal, Telangana, India, ²Assistant Professor, Department of General Surgery, Mahatma Gandhi Memorial Hospital, Warangal, Telangana, India

Abstract

Background: Peritonitis following perforation of duodenum is a common abdominal emergency. In spite of modern advances in surgical, anesthetic and ancillary facilities, it still assumes threatening dimensions. A variety of surgical techniques have been advocated for the management of duodenal perforations.

Materials and Methods: Patients getting admitted in Mahatma Gandhi Memorial Hospital Warangal, with complaints of pain abdomen, vomiting, fever, clinically and on investigations diagnosed as perforative peritonitis from September 2006 to April 2008.

Results: The surgical management of acute perforated duodenal ulcer has been evaluated in 61 patients. Graham’s patch was done in 30 patients, with a mortality of 13.3%, biliary fistula of 30%, a wound infection of 60%, and an average hospital stay of 12.80 days.

Conclusion: Omental plugging is better than the Graham’s patch for closure of duodenal perforations.

Key words: Duodenal perforation, Graham’s patch, Omental plugging

INTRODUCTION

During the 19th century, peptic ulcer perforation was a rare disease that occurred mainly in young women, with perforations located near the cardia of the stomach. During the first decades of the 20th century, ulcer perforation incidence increased greatly, and there was an epidemic of ulcer perforations situated in the duodenum of middle-aged men. Today ulcer perforation incidence is stable or tends to decline, and most patients with ulcer perforations are elderly men and women. Ulcer perforation was a lethal disease until surgical treatment was introduced at the turn of the century. Mikulicz sutured a perforated gastric ulcer for the first time in 1880, and suture is still the most common treatment for ulcer perforation.

The revolution in ulcer treatment that occurred with the discovery of the role of Helicobacter pylori has not yet led to any detectable changes in incidence or treatment of ulcer perforation. Thus, ulcer perforation is still a surgical disease for which the possibility for improvement in prognosis lies with the general advances of acute surgery.

Many operations have been proposed to compensate for duodenal perforation/tissue loss. None have gained wide acceptance nor appear to be the best solution to the problem. The reasons cited for disruption of duodenal closures are (1) high intraluminal pressure, (2) the tendency of duodenal mucosa to extrude through closures, adding to the leakage, and (3) breakdown from autodigestive enzymes of pancreas and bile. Perforation is one of the most catastrophic complications of peptic ulcer. In spite of modern advances in surgical, anesthetic and ancillary facilities, it still assumes life-threatening dimensions. A variety of surgical techniques have been
advocated for the management of peptic perforation. However, these techniques are not without the drawbacks, especially while managing large perforations, delayed presentation, advanced age, etc., mortality rates of up to 18% have been reported while managing patients with risk factors by standard techniques. Thus, there is a need to find, evaluate and apply methods of managing the catastrophes.

**Aims and Objectives**
To compare between omental plugging versus Graham’s patch, for closure of duodenal perforation and its outcome.

**MATERIALS AND METHODS**
A study of 61 patients admitted with perforations in Mahatma Gandhi Memorial Hospital Warangal were undertaken from July 2006 to June 2008. These 61 cases were studied thoroughly according to the proforma. The details of 61 patients were arranged in the master chart for the convenience of presentation.

The patients with perforated duodenal perforations admitted to our hospitals were treated as follows:

A detailed history of the patient was taken when the condition of the patient is stable. In critically ill patients, the patients were resuscitated and history was taken after the patient is stabilized.

The hospital records were also reviewed to obtain appropriate epidemiological information regarding age, sex, occupation, and clinical presentation, duration of symptoms, past history of chronic duodenal ulcer, investigations, and mode of treatment. These data were essential to evaluate the condition of the patient at the time of admission, duration between perforation and surgery, mode of treatment patient received and post-operative complications and follow-up of the patients for 1 month.

The data were also essential to evaluate the efficacy of Graham’s patch and omental plugging in the case of duodenal perforation closure. The patients were also followed up to know whether they develop recurrence of ulcer symptoms to know the effectiveness of the operation. The data were also compared with other series to see their conclusion were also true in our patients.

**Examination**
All the patients with suspected duodenal perforations were examined thoroughly and baseline findings are recorded, repeated examination of the patients was done during resuscitation and till the diagnosis is confirmed.

**Investigations**
Plain X-ray of abdomen (Erect), blood grouping and Rh typing, hemoglobin%, total count, differential count, erythrocyte sedimentation rate, blood urea, serum creatinine, blood sugar, hepatitis B surface antigen, human immunodeficiency virus, and urine routine. In plain X-ray abdomen of erect posture, gas under diaphragm indicated hollow viscus perforation. I have done four-quadrant abdominal paracentesis in all patients. Fluid drawn was found to be turbid and bile stained indicating upper gastrointestinal tract perforation. A dry tap will not rule out perforation. The variables studied and analyzed are:
- Age
- Sex
- Duration of (problem prior to admission) perforation
- General condition of the patient at the time of admission
- Site of perforation
- Size of perforation
- Type of surgery
- Post-operative complications
- Duration of hospital stay
- Outcome of the patient.

**RESULTS**
From July 2006 to June 2008, a total of 61 patients with duodenal perforation were studied from surgical units of Mahatma Gandhi Memorial Hospital Warangal.

**Age**
There is a gradual increase in incidence of duodenal perforation in old age group (Tables 1 and 2).

**Table 1: The age incidence**

<table>
<thead>
<tr>
<th>Age group (in years)</th>
<th>Number of cases (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11-20</td>
<td>3 (4.92)</td>
</tr>
<tr>
<td>21-30</td>
<td>10 (16.39)</td>
</tr>
<tr>
<td>31-40</td>
<td>13 (21.31)</td>
</tr>
<tr>
<td>41-50</td>
<td>10 (16.39)</td>
</tr>
<tr>
<td>51-60</td>
<td>7 (11.48)</td>
</tr>
<tr>
<td>&gt;60</td>
<td>18 (29.51)</td>
</tr>
</tbody>
</table>

**Table 2: Age related morbidity and mortality**

<table>
<thead>
<tr>
<th>Age group (in years)</th>
<th>Good recovery</th>
<th>Morbidity</th>
<th>Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>11-20</td>
<td>3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>21-30</td>
<td>10</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>31-40</td>
<td>13</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>41-50</td>
<td>10</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>51-60</td>
<td>7</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>&gt;60</td>
<td>18</td>
<td>12</td>
<td>6</td>
</tr>
</tbody>
</table>
Sex
Perforation is a more common in males with male:female ratio in this study is 7.7:1.

Occupation
Perforation is more common in farmers in this study (Table 3).

Relation with Smoking and Alcohol
In this series of study, there was an obvious relationship between the smoking, alcohol and tobacco, when compared with nonsmokers and nonalcoholics, the incidence is convincingly high in case of smokers and alcoholics (Table 4).

Previous History of Peptic Ulcer
In our series, 59.02% of patients had previous history of peptic ulceration symptoms (Table 5 and 6).

Mode of Presentation
The common mode of presentation of these patients was abdominal pain, vomiting, distension, fever, and shock (Table 7).

Radiological Investigations
Plain X-ray abdomen in erect position was done in all 61 patients, and pneumoperitoneum (gas under the diaphragm) was found in 61 cases.

Abdominal Paracentesis
Four-quadrant abdominal paracentesis was done in all 61 cases and in 45 cases it revealed bile stained turbid fluid and in 16 cases it was a dry tap. In the present series, the accuracy is about 73.77%.

Anesthesia
General anesthesia was most commonly employed. General anesthesia was used in 46 patients and Spinal anesthesia in 15 patients.

Incisions
Access to the perforation site was gained through the following abdominal incisions.

Site of Perforation
In this series, all perforations were found on the anterior aspect of the first part of duodenum.

Size of the Perforation
The size of the perforation is directly proportional to quantity of peritoneal fluid. This finding is directly related to presentation with shock at the time of admission (Table 8).

Treatment
Two groups of 30/31 each selected on random basis, one group treated with omental plugging and other with Graham’s patch (Table 9).

Post-operative Complications
In this series, 48 cases had smooth recovery and 23 cases were suffered from various complications of which

---

Table 3: Occupation incidence

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Number of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmer</td>
<td>29 (47.54)</td>
</tr>
<tr>
<td>Coolie</td>
<td>9 (14.75)</td>
</tr>
<tr>
<td>Housewife</td>
<td>8 (13.11)</td>
</tr>
<tr>
<td>Teacher</td>
<td>6 (9.84)</td>
</tr>
<tr>
<td>Student</td>
<td>4 (6.56)</td>
</tr>
<tr>
<td>Driver</td>
<td>3 (4.92)</td>
</tr>
<tr>
<td>Business</td>
<td>2 (3.28)</td>
</tr>
</tbody>
</table>

Table 4: Relation of smoking to incidence of perforation

<table>
<thead>
<tr>
<th>H/o smoking and alcohol</th>
<th>Number of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present</td>
<td>42</td>
</tr>
<tr>
<td>Absent</td>
<td>19</td>
</tr>
</tbody>
</table>

Table 5: Previous history of peptic ulcer

<table>
<thead>
<tr>
<th>Previous history of peptic</th>
<th>Number of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ulcer</td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>36</td>
</tr>
<tr>
<td>Absent</td>
<td>25</td>
</tr>
</tbody>
</table>

Table 6: Impact of duration on the outcome

<table>
<thead>
<tr>
<th>Duration (in hours)</th>
<th>Number of cases</th>
<th>Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of cases</td>
<td>Good</td>
</tr>
<tr>
<td>0-6</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>6-12</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>12-24</td>
<td>22</td>
<td>17</td>
</tr>
<tr>
<td>&gt;24 h</td>
<td>32</td>
<td>16</td>
</tr>
</tbody>
</table>

Table 7: Mode of presentation

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Number of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain abdomen</td>
<td>61</td>
</tr>
<tr>
<td>Distension of abdomen</td>
<td>30</td>
</tr>
<tr>
<td>Vomiting</td>
<td>45</td>
</tr>
<tr>
<td>Fever</td>
<td>35</td>
</tr>
</tbody>
</table>

Table 8: Relation of size of perforation to quantity of peritoneal contamination

<table>
<thead>
<tr>
<th>Size (cm)</th>
<th>Total cases</th>
<th>Peritoneal fluid</th>
<th>In shock</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;2 L</td>
<td>&gt;2 L</td>
<td></td>
</tr>
<tr>
<td>&lt;0.5</td>
<td>4</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>0.6-1.0</td>
<td>37</td>
<td>19</td>
<td>18</td>
</tr>
<tr>
<td>&gt;1.0</td>
<td>20</td>
<td>6</td>
<td>14</td>
</tr>
</tbody>
</table>
4 cases were expired. The most common post-operative complication was wound infection in about 21 and biliary fistula 10 cases, which was one of the definitive reasons for prolonged hospital stay (Table 10).

In 4 patients two died 3-5th post-operative period, two patients died after 14th post-operative day. These patients presented with severe shock and septicemia and died because of multiorgan failure.

Duration of Hospital Stay
The average hospital stay in our series was 12.48 days for omental plugging and 18.20 days for Graham's patch with a P = 0.0001. In this present study of 61 patients, 4 patients died and follow-up done in 57 patients for 1 month. These patients were advised proton pump inhibitor with anti H. pylori therapy.

DISCUSSION
Duodenal perforation is one of the most common surgical emergencies requiring hospitalization and early management.

Although perforated duodenal ulcer remains a dramatic surgical emergency, nowadays, it seldom results in death. The surgical mortality has decreased steadily and is about 5% (Steiger and Avram, 1976).

Age
Duodenal perforation is common in the age group of more than 60 years in our study, but the age is no bar for perforation to occur.

Sex
Perforation is a more common in males than females. In this series, the male: Female ratio is 7.71:1. The explanation for this high incidence in the male was that they were subjected to more stress and strain of life and female sex hormone offers some security with them against perforation as claimed by Debakey (1940). The incidence of smoking and alcohol association also may be contributory factory for males.

Duration of Symptom before Presentation to Hospital
Tsugawa et al. reviewed those three risk factors: Pre-operative shock, delay to surgery over 24 h and medical illness, was shown by the progressive rise in the mortality rate with the increasing number of risk factors (Hepatogastroenterology, 2001).

Barazynski et al. reported age, presence of three or more coexisting diseases, delay in surgical treatment over 24 h and septic shock as risk factors for the outcome of the perforated duodenal ulcer (1992). Boey et al. revealed concurrent medical illness, pre-operative shock and delayed operation (more than 48 h) as significant risk factors that increase mortality in patients with perforated duodenal ulcers (1982). In this study, we reported that the age, site of perforation, size of perforation, duration of perforation, and pre-operative shock are the risk factors for the outcome of perforated peptic ulcers.

In the presence of gross contamination, late exploration (after 48 h) carried a high mortality, i.e., 50% (Boey et al., 1982). The importance of the peritoneal soilage and duration of perforation I mentioned as a risk in the outcome of the perforation of duodenal ulcer (Donaldson and Jarrett, 1970). Bharti et al. reported that 12% of patients reached the hospital within 12 h, 40% reached hospital within 25-48 h and 24% after 48 h. Barazynski et al. reported that 48.15% patients presented to hospital after 2 h of perforation. Deus Fombellida et al. (1998) revealed three risk factors of immediate mortality in old age, elapsed time (>24 h), and the existence of a situation of preoperative hemodynamic shock. Lawel et al. revealed 20% mortality rate in patients of late presentation and the presence of bacterial peritonitis at admission (1998). In this series, 52.5% patients presented to hospital after 24 h and the mortality in patients who presented to hospital after 24 h is found to be 9.4%.

Surgical Management
Jani et al. revealed that omental plugging is a safe and reliable method of treatment for large sized perforations. Ramesh et al. (1996) quote that complication rate with Graham’s patch was 20% and mortality was 4%. In this study, we have done closure of duodenal perforation with Graham’s patch in 30 patients and omental plugging in 31 patients. We found 13.33% mortality in patients treated with Graham’s patch and no mortality in patients treated with omental plugging.

<table>
<thead>
<tr>
<th>Size (cm)</th>
<th>Total cases</th>
<th>Graham's patch</th>
<th>Omental plugging</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0.5</td>
<td>4</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>0.6-1</td>
<td>37</td>
<td>21</td>
<td>16</td>
</tr>
<tr>
<td>&gt;1.0</td>
<td>20</td>
<td>8</td>
<td>12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Complications</th>
<th>Number of cases (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wound infection</td>
<td>21 (34.42)</td>
</tr>
<tr>
<td>Biliary fistula</td>
<td>10 (16.4)</td>
</tr>
<tr>
<td>Death</td>
<td>4 (6.6)</td>
</tr>
</tbody>
</table>
Mortality
Svanes has reported that the lethality is higher in the elderly.\(^\text{10}\) Wysochi and Beben\(^\text{11}\) reported that the age of a patient, rather than a type surgery, influences the mortality rate in a perforated duodenal ulcer and he reported the mortality rate of 0.6% in <50 years age group, 15% in 50-60 years age group and 45.2% in >60 years age group (1998), in the present series (2009), the mortality in >50 years group is 16.67%.

CONCLUSION
A series of 61 cases of duodenal perforations were studied and analyzed. In 61 patients, 31 patients underwent closure of duodenal perforation by omental plugging and 30 patients underwent Graham’s patch. The cases were followed for 1 month. The following observations were made:

- The peptic perforations more common in the age group of more than 60 years
- Male: Female ratio is 7.7:1 (54 male, 7 female patients)
- Most of the patients were farmers with a history of smoking, chewing tobacco, and alcohol consumption
- In this series, we found 30% of duodenal fistula (6 patients), 60% of wound infection (18 patients) in patients treated with Graham’s patch and 3.23% of duodenal fistula (1 patient), 9.68% wound infection (3 patients) in patients treated with omental plugging
- In this series, we found 13.33% mortality in patients treated with Graham’s patch and no mortality in patients treated with omental plugging
- The average hospital stay in our series was 12.48 days for omental plugging and 18.20 days for Graham’s patch.

In our study, omental plugging was found to be better over Graham’s patch for the closure of duodenal perforations measuring more than 0.5 cm.

REFERENCES
Risks of Cataract in Metal Arc Welders in Kishanganj, Bihar

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Abstract

Background: It is believed that welders are at a greater risk of developing cataract. In this study, we have endeavored to look for definite evidence for this issue.

Materials and Methods: A study was conducted on male welders and control subjects (not engaged in welding) from construction companies and welding workshops in Kishanganj, Bihar. A questionnaire was used to gather information about their work and lifestyle, as also their occupational, medical, and ocular histories. Cataract was identified by external examination and ophthalmoscopy.

Results: The study was conducted on 37 welders and 100 controls. The study showed that the welders were at the higher risk of developing cataract.

Conclusions: Our study shows that the incidences of cataract were higher in welders than in controls. However, the exact cause behind this increased prevalence of cataract in welders could not be elucidated in this study. Yet, it can be suggested that the welders need more rigorous eye protection.

Key words: Cataract, Metal arc welding, Ultraviolet radiation

INTRODUCTION

Manual metal arc welding (MMAW) is a process whereby two metal parts are joined together. The more common welding processes can be classified as arc welding, gas welding, resistance welding, energy beam welding, and solid-state welding.¹ Our focus, in this study, is on MMAW only.

Ultraviolet (UV) and other visible radiations are supposed to be the main factors causing eye damage.² UV radiation is absorbed by the cornea and lens, but maximally by the crystalline lens of the eye because it absorbs maximum radiation at wavelengths around 400 nm. Eventually, this absorption leads to cataract formation causing some chemical changes in the lens.² ³

On a global scale, cataract is one of the leading causes of blindness, accounting for 48% of blindness worldwide.⁴ Although cataract is said to be a disease of the old age, yet in developing countries, cataract does occur at an earlier age.⁵

Unoperated cataract, still today is the globally largest cause of blindness.⁶ It is, therefore, relevant to earmark the common etiological factors for cataract and find a process of prevention. Welding is supposed to be one preventable cause and needs attention. The other causes include age, sex, family history, lifestyle (smoking and alcohol), nutrition, diabetes, corticosteroid use, and severe dehydration.⁷ The occupational causes are UV radiation,⁸ infrared radiation, ionizing radiation,⁹ wood smoke,¹⁰ and trauma.¹¹

Earlier studies on welders focused on the respiratory health effects and relatively little work has been done on the welder’s risk of developing cataract. However, one
study was done in Nigeria, which however, was not a very elaborate one and therefore, this effort of ours.

**MATERIALS AND METHODS**

The proposed subjects, materials and methods are as follows:

**Study Setting**
The study was conducted in the Department of Ophthalmology, MGM Medical College and L.S.K. Hospital, Kishanganj, Bihar, involving persons working as welders in various construction industries and welding workshops in Kishanganj. Proper approval from Ethical Committee of the institution was obtained before starting the actual study.

**Time Lines**
The study was done between January and October, 2016.

**Description of Population**
The study was conducted on male metal arc welders working for at least 1 year in the occupation as case, and normal adult male healthy subjects as control—all aged between 18 and 60 years. The study was conducted only after explaining the purpose and the procedure of the study to both cases and controls and obtaining written consent from each of them.

**Inclusion Criteria**
1. Normal male healthy adult subjects (18-60 years age) as controls
2. Welders of the above age group and male sex without any notable diseases such as essential hypertension, cardiac diseases, pulmonary diseases, and diabetes mellitus.

**Exclusion Criteria**
1. Persons below 18 years
2. Old aged persons above 60 years age
3. Persons with essential hypertension, cardiac diseases, pulmonary diseases, and diabetes mellitus
4. All females.

**Sample Size**
A total of 100 male subjects as controls and 37 welders as cases.

**Study Design**
It was both community and institutional based, observational, and cross sectional study.

**Parameters to Re Studied**
1. Detailed history including duration of working as welders
2. Relevant clinical examination
3. Anthropometry (body weight and height)
4. Detailed eye examination.

**Study Stools**
1. Consent form
2. Questionnaire including pro forma for history and clinical examination
3. Clinical record book
4. Instruments for clinical examination, viz,
   a. Snellen chart
   b. Jaeger chart
   c. Humphrey's visual field analyzer
   d. Streak retinoscope
   e. Ophthalmoscope: Direct and indirect
   f. Fundus lens
   g. Fundus fluorescent angiography instrument.

History of the participants was collected in a semi-structured questionnaire followed by an eye examination, both done in the institution. The questionnaire sought information on smoking status, medical and family history, eye symptoms and injuries, and particulars of occupation, and work environment. A cataract was defined as lens opacity ≥5% of the lens “surface” on retro-illumination.

In statistics, only a comparison between the numbers of cataract-affected persons in the two groups was performed.

**RESULTS**

The final result of our study is shown in Figure 1. The study was done on 37 welders (mean age: 39.7 ± 9.6 years) and 100 controls (36.2 ± 7.8 years). All participants were male. Particulars about their occupation are detailed in Table 1. There was no difference in terms of age, smoking habits, prevalence of diabetes, daily working hours and habitats between welders and controls, except history of eye injury which was more common in welders (17% vs. 3%).

![Figure 1: Comparison of cataract prevalence between welders and controls. Category 1 = Welders; Category 2 = Control](image_url)
incidences of different eye symptoms - such as eye-ache, excessive tears, sensation of foreign bodies in the eye, and photophobia - were significantly higher among welders compared with controls (all \( P < 0.001 \)). Examination of their eyes revealed that cataract was more prevalent among welders compared to controls (9% vs. 1%; \( P < 0.05 \)).

**DISCUSSION**

In our study, it has been shown that cataract was more prevalent among welders, compared to controls although both the groups were almost similar in all other respects. However, our study was not so designed as to understand the physico-chemical principles behind such findings, nor could it be used as an evidence to say that increased UV radiation is the cause behind increased number of cataracts in welders.

A study by Davies et al.\(^{12}\) was done to compare the ocular side effects between welders and controls in Nigeria. Their study also showed a significant difference between welders and controls for cataract (2.5% vs. 0%) and was comparable to ours. However, their study was not very elaborate either. Some other studies have reported cataracts among arc welders also, and the number of cases of cataract has been observed to increase with years in welding. In 1986, a Bulgarian study reported radiation cataract in 24% of arc welders who had been welders for at least 10 years.\(^{14}\) A more recent study by the same authors\(^{15}\) reported a cataract prevalence of 38% among 522 workers exposed to different sources of non-ionizing radiation, which included welding. This prevalence is much higher than ours.

**CONCLUSION**

It has been conclusively proved by our study that welders from Kishanganj have an elevated risk of developing cataracts. However, the role of UV radiation in cataract formation in welders cannot be proved from this study, as increased incidences of ocular injury could also be a precipitating factor. However, this can at least be inferred from our study that since both cataract and ocular injuries are more common in welders, the welders should take much more protections while working. For this, a more rigorous training and legislation might be necessary.

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Role of Mucin Histochemistry in Gastric Mucosal Lesions

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Abstract

Introduction: Intestinal metaplasia (IM) refers to the progressive replacement of the gastric mucosa by epithelium having the characteristics of the intestinal mucosa. IM has been observed in various gastric lesions.

Aims and Objectives: To determine the mucin histochemistry of various gastric mucosal lesions and the possible relationship of various epithelial mucins with gastric tumors.

Materials and Methods: This study was conducted on 105 endoscopic gastric biopsy specimens and 15 gastrectomy specimens. The sections were stained with routine haematoxylin and eosin stain and histochemical stains for mucin such as Alcian blue (AB) pH 2.5/periodic acid-Schiff (PAS) and AB pH 1.0/PAS to detect neutral mucins and acidic mucins. Sections were further stained with aldehyde fuchsin/AB pH 2.5, for subtyping of IM.

Results: We observed that the normal glands stained predominantly for neutral mucin, whereas in chronic inflammation, there was a predominance of mixture of acidic and neutral mucins. The cases of IM stained predominantly for sialomucin, while sulfomucin positivity was seen mostly in carcinoma.

Conclusion: We conclude that mucin histochemistry helps in identifying the specific subtype of mucin secretion in various gastric mucosal lesions and subsequent typing of IM.

Key words: Alcian blue, Aldehyde fuchsin, Intestinal metaplasia, Mucin, Sialomucin, Sulfomucin

INTRODUCTION

Intestinal metaplasia (IM) refers to the progressive replacement of the gastric mucosa by epithelium having the light and electronic microscopic features of intestinal epithelium of either small or large bowel type. Based on the cell differentiation and mucin secretion, three types of IM can be recognized in the stomach, i.e., Type 1, Type 2, and Type 3.¹ IM has been observed in various gastric lesions such as gastric cancer, gastric ulcer, and atrophic gastritis. Demonstration of different mucins in gastrointestinal tract (GIT) carcinomas may assist in their classification and predicting prognosis and behavior of the tumor.²

Aims and Objectives

To determine the mucin histochemistry of various gastric mucosal lesions and the possible relationship of various epithelial mucins with gastric tumors.

MATERIALS AND METHODS

This study was conducted on 105 endoscopic gastric biopsy specimens and 15 gastrectomy specimens at Shree Balaji Medical College and Hospital, Chennai, from September 2012 to February 2015. All the sections were stained with routine haematoxylin and eosin (H and E) stain, and histochemical stains for mucin such as Alcian blue (AB) pH 2.5/periodic acid-Schiff (PAS) and AB pH 1.0/PAS to detect neutral mucins, acidic mucins – sialomucins, and sulfomucins. Sections were

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Einstien, et al.: Role of Mucin Histochemistry in Gastric Mucosal Lesions

OBSERVATIONS AND RESULTS

In this study, the distribution of cases was as in Table 1:
In this study, 42 cases (35%) of IM were observed out of 120 cases. Out of the 103 benign cases, IM was observed in 31 cases (30.1%) - 14 cases of chronic gastric ulcer, 5 cases of chronic gastritis, 8 cases of gastric polyp, and 4 cases of dysplasia. Among the 17 malignant cases, IM was observed in 11 cases (64.7%) - 3 cases of well differentiated adenocarcinoma, 4 cases of moderately differentiated adenocarcinoma, and 1 case of poorly differentiated adenocarcinoma.

Mucin Histochemistry in IM

In normal gastric mucosa, neutral mucins were predominant. The surface epithelium, pits, pyloric glands, cardiac glands, and mucous glands (mucous neck cells) were neutral mucin (PAS) positive.

Among the 29 benign lesions with IM, the goblet cells in 10 cases of chronic gastric ulcer, 3 cases of gastritis, and 3 cases of hyperplastic polyps showed sialomucin (PAS/AB 2.5 pH) positivity (Figures 1-3). 4 cases of gastric ulcer, 2 cases of chronic gastritis, 4 cases of polyps (2 hyperplastic polyps, 1 Peutz-Jeghers polyps, and 1 fundic gland polyps), and 2 cases of dysplasia showed strong sialomucin positivity in goblet cells, along with PAS positivity (PAS/AB 2.5 pH) in adjacent columnar epithelium.

Among the 11 cases of adenocarcinoma with IM, 1 case of well differentiated adenocarcinoma (Figure 4) and 3 cases of moderately differentiated adenocarcinoma showed strong sialomucin positivity in goblet cells, along with PAS positivity (PAS/AB 2.5 pH) in adjacent columnar epithelium. Goblet cell sialomucin positivity was seen in all the cases of IM was associated with gastric adenocarcinoma.

Sulfomucin positive columnar cells (PAS/AB 1.0 pH and AF/AB 2.5 pH) were seen in 1 adenomatous polyp, 2 cases of dysplasia (Figure 5), 1 case of well differentiated adenocarcinoma, 4 cases of moderately differentiated adenocarcinoma (Figure 6), and 1 case of poorly differentiated adenocarcinoma. Weak sulfomucin positivity was seen in one case of well differentiated adenocarcinoma.

Type I (complete) IM was observed in 16 cases (38.1%), which showed sialomucin positivity in goblet cells. Type II (incomplete) IM was seen in 17 cases (40.47%), which showed strong sialomucin positivity and sulfomucin weak positivity in goblet cells, with PAS positivity of neutral mucin in adjacent columnar epithelium. Type III (incomplete) IM was seen in 9 cases (21.43%), showing sulfomucin positive columnar cells. One case of well differentiated adenocarcinoma showed weak sulfomucin positivity, but the adjacent areas showed Type II IM.

DISCUSSION

The distribution and amount of mucins varies in different regions of the GIT. The mucosa of the stomach has been found to have some qualitative as well as quantitative changes in the non-neoplastic and neoplastic lesions compared to normal mucosa by mucin histochemistry. Neutral mucins present in normal mucosa gradually decrease during the initial development of IM, while sialomucins appear and become predominant. In more advanced stages, sulfomucins appear and may become predominant. O-acetyl sialomucin presence provides tumor cells several attributes, which contributes to tumor progression and metastasis. Simultaneous assessment of clinicopathological and mucin characteristics at the time of initial diagnosis can provide a beneficial role in individual therapeutic strategies. This study was therefore undertaken to study the role of mucin histochemistry in gastric mucosal lesions.

In this study, 105 cases of endoscopic biopsy and 15 gastrectomy specimens sections were stained with H and E and AB/PAS at pH 2.5, AB/PAS at pH 1.0 to identify the various types of mucins, and with AF/AB to subtype IM.

We observed that the normal glands stains predominantly for neutral mucin, whereas in chronic inflammation, there was a predominance of mixture of acid and neutral mucin. The cases of IM stained predominantly for sialomucin, while sulfomucin positivity was seen mostly in carcinoma.

The goblet cells in complete IM (Type 1), secrete sialomucins. In incomplete IM (Type 2), columnar

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**Table 1: Histopathological diagnosis wise distribution of gastric mucosal lesions**

<table>
<thead>
<tr>
<th>Histopathological diagnosis</th>
<th>Number of cases (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic gastric ulcer</td>
<td>55 (45.83)</td>
</tr>
<tr>
<td>Chronic gastritis</td>
<td>27 (22.5)</td>
</tr>
<tr>
<td>Gastric polyp</td>
<td>14 (11.67)</td>
</tr>
<tr>
<td>Xanthelasma</td>
<td>1 (0.83)</td>
</tr>
<tr>
<td>Dysplasia</td>
<td>6 (5.00)</td>
</tr>
<tr>
<td>WDADC</td>
<td>3 (2.50)</td>
</tr>
<tr>
<td>MDADC</td>
<td>9 (7.50)</td>
</tr>
<tr>
<td>PDADC</td>
<td>3 (2.50)</td>
</tr>
<tr>
<td>Squamous cell carcinoma</td>
<td>1 (0.83)</td>
</tr>
<tr>
<td>Neuroendocrine carcinoma</td>
<td>1 (0.83)</td>
</tr>
<tr>
<td>Total</td>
<td>120</td>
</tr>
</tbody>
</table>

WDADC: Well differentiated adenocarcinoma, MDADC: Moderately differentiated adenocarcinoma, PDADC: Poorly differentiated adenocarcinoma
mucous cells secrete neutral mucin, acid sialomucin, and occasionally sulfomucins. The goblet cells secrete sialomucin and occasionally sulfomucin. In Type 3, the columnar mucous cells secrete predominantly
sulfomucins and goblet cells contain sialomucins and/or sulfomucins. Studies in different population from various centers have indicated a close relationship between sulfomucin secreting Type 3 IM and intestinal type gastric carcinoma. Type 1 and Type 2 sialomucin secreting intestinal metaplasia are prevalent in both benign and malignant conditions. Inflammatory lesions show neutral mucins and mixture of acidic and neutral mucins. Dysplasia in adenomatous polyp in the stomach often shares mucin profiles with incomplete sulfated IM. Hyperplastic polyp, which has low malignant potential, secretes only traces of sulfomucin or more frequently none at all. Hyperplastic polyps that occasionally undergo malignant change show sulfomucin secretion in areas of IM within the polyp.

These techniques are particularly suitable for countries like India as they can substantially contribute in the definite classification of gastric IM and carcinoma.

CONCLUSION

We conclude that mucin histochemistry helps in identifying the specific subtype of mucin secretion in various gastric mucosal lesions and subsequent typing of IM.

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Inguinal Hernia and Comparison between Mesh Repair and Conventional Repair of Hernia with Respect to Hernia Recurrence: A Clinical Study

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Abstract

Introduction: Inguinal hernia is one of the most common problems of mankind. Since the period of Hippocrates (4th century BC), the disease has been known and various palliative treatment methods were adopted. Historically the development of hernia surgery is one of the most interesting chapters in the field of surgery since hernias have always been the most common applications of man amenable to surgical treatment.

Materials and Methods: The study has been made of 60 cases of inguinal hernia who were admitted in various surgical units of Mahatma Gandhi Memorial Hospital, Warangal. This however does not include all the inguinal hernias admitted during the said period.

Results: General incidence of inguinal hernia Mahatma Gandhi Memorial Hospital, Warangal is 8.3%. The majority of the patients were in the age group of 40-69 years. Males are commonly affected by inguinal hernia (sex ratio: M: F - 19:1). Smoking is associated with increased incidence of inguinal hernia.

Conclusion: Lichtenstein mesh repair has significantly reduced complications, less hospital stay, low recurrence rate, less duration of surgery, and early return to work when compared to the conventional repair.

Key words: Bassini’s repair, Direct hernia, Indirect inguinal hernia, Mesh repair, Scrotal haematoma, Scrotal edema, Urinary tract infection

INTRODUCTION

Inguinal hernia is one of the most common problems of mankind. Since the period of Hippocrates (4th century BC), the disease has been known and various palliative treatment methods were adopted.

Hernia is the word derived from Greek word “Herons” means “offshoot” or “bulge” or “budding.” In Latin, it means “tear” or “rupture.” It is defined by Sir Astley Cooper as “a protrusion of any viscus from its proper cavity.”

Histologically the development of hernia surgery is one of the most interesting chapters in the field of surgery since hernias have always been the most common applications of man amenable to surgical treatment. Although there are so many methods in repair of hernia, no one is exempted from complications hence surgery on hernia is still a challenging subject. Watson said “in the entire history of surgery, no subject has been so controversial as the repair of groin hernias.”

This study is an attempt to evaluate certain well known anatomical, physiological and surgical concepts of inguinal hernia, with special reference to its surgical management with mesh repair.

Objectives

- To study the general incidence and different modes of presentation of inguinal hernia
- To compare between mesh repair and Bassini’s repair in relation to hernia recurrence.
MATERIALS AND METHODS

In this series, the study has been made of 60 cases of inguinal hernia who were admitted in various surgical units of Mahatma Gandhi Memorial Hospital, Warangal, attached to the Kakatiya Medical College, Warangal, during the year January 2008 to July 2009. This however does not include all the inguinal hernias admitted during the said period. All complicated inguinal hernias were excluded from the study.

Mode of Selection
A total of 60 cases of inguinal hernia (30 mesh repair, 30 Bassini’s repair) were randomly selected and studied in detail. After the admission to the hospital, all the patients were examined systematically as per the pro forma approved by the guide. The necessary and routine investigations were done preoperatively. Tone of the abdominal muscle was noted, respiratory and cardiovascular system was also evaluated.

Routine investigations were carried out in all the patients. Investigations were carried out like hemoglobin %, bleeding and clotting time, urine for albumin, sugar, microscopy, blood: Fasting sugar, urea, electrocardiogram screening, X-ray of chest to rule out lung pathology. Ultrasonography abdomen to rule out benign prostatic hyperplasia (BPH).

During the operation, the type of hernia and contents of the sac were noted down. 30 cases were operated by Lichtenstein tension-free mesh repair and other 30 cases by modified Bassini's repair.

The mesh repairs were done in:
• Recurrent cases
• Inpatients who belongs to older age
• In whom tone of the abdominal muscles were poor
• In whom high risk of recurrence is present like BPH, chronic lung diseases. During their stay in the hospital post-operative complications like urinary retention, Urinary tract infection (UTI), wound infection, scrotal hematoma were noted and treated properly.

All the cases were followed up for 6 months to 2 years for hernia recurrence and chronic groin pain. Long standing follow-up was not possible because patients did not come for checkup inspite of persuasion.

The data were analyzed using mean values, standard deviation, standard error, Chi-square test, and contingency table analysis.

RESULTS

In this study, 60 cases of inguinal hernia who were admitted and treated at K.R. Hospital, Mysore during January 2008 to July 2009 were included and studied. The following data were obtained.

Age Distribution
In this study, the maximum incidence of inguinal hernia was observed among 40-69 years age group (55%). Comparatively less among <30 years age group and above 70 years. The youngest was 18 years and eldest age was 87 years.

The study made by Mills et al. clearly shows that mean age group having inguinal hernia was 61 years.

Sex Incidence
In this series, 3 female cases were studied. Sex ratio M: F - 19:1.

The total number of hernia cases admitted during the study period were 537, among which male were 495 and female were 42 cases, average was 91.26% male and 8.74% female.

In the study made by Lafferty et al., the sex ratio was 92:8 (Male: Female) and mean age in female was 61.5 years.

Occupational Incidence
In this series among 60 cases, most of them were agriculturists (41.7%), laborers (33.3%), sedentary workers (16.7%), business persons (5%), and students (3.3%). This shows that inguinal hernia is commonly present in agriculturists and laborers who were commonly involved in hard labor work.

The study made by Laue et al. presence of hernia was associated with a higher work activity index and a higher total activity index.

Incidence among Religion
In this study, incidence of inguinal hernia among Hindus was 83.3%, Muslims 15% and Christians 1.7%.

Habit Incidence
In this study among 60 cases, 43 patients were smokers (71.7%) and remaining 17 cases were non-smokers (28.3%). This study clearly shows incidence of inguinal hernia is more among smokers when compared with nonsmokers group.

The study made by Laue et al., smoking and chronic obstructive pulmonary disease were associated with higher incidence of hernia.

Type of Hernia
In this study, the majority of the patients had indirect type of inguinal hernia about 70%, direct inguinal hernia about 28.3%, and least was recurrent hernia about 1.7%.
Side of inguinal hernia
In this study of 60 cases, most of the cases (55%) presented with right sided inguinal hernia, about 35% presented with left sided inguinal hernia and 10% cases presented with bilateral inguinal hernia. This indicates that right sided inguinal hernia is common.

Mode of operation
The study conducted by Mills et al. study in British Journal of Surgery, 1998, shows that the mean age was 61 years. In this study, the mean age was 54 years in mesh repair and 43 years in Bassini’s repair. Overall, the mean in the study group was 48.3 ± 16.8 years. In this study, although the number of indirect hernia was larger in number, the number of cases subjected to mesh repair were of the direct type. In the above quoted studies, the incidence of the number of indirect hernias is higher and hence the case who underwent surgery for this type is also higher.

Content of the sac
This study shows that most of the inguinal hernia patients had small intestine as a content of hernial sac (65%) and least was omentum (13.3%) and about 20% of the cases had both small intestine and omentum. 1.7% patients had omentum and fluid.

Management
In this study, 60 cases of inguinal hernia were taken up for the study, in which 30 cases were operated by Lichtenstein mesh repair and other 30 cases by Bassini’s repair.

In Lichtenstein repair – prolene mesh was used to strengthen posterior wall, and fixed by onlay technique using prolene No. 2-0, interrupted stitches, mesh size was used depending on size of the defect.

In Bassini’s repair, prolene No. 1 used to put interrupted stitches to strengthen posterior wall of inguinal canal.

Complications
This study of mesh repair, 2 patients had wound infection, 2 had scrotal hematoma, 5 urinary retention and 1 had UTI. Other complications such as pulmonary embolism, ileus, deep vein thrombosis, and recurrence were nil. Although the difference in complication rates between mesh and Bassini’s repair is not statistically significant (P < 0.007), when compared with conventional repair mesh repair has got less complications.

In a study conducted by Miller et al. in Mayo’s Clinic between 1974 and 1988 clinical data of 659 patients clearly shows that urinary retention was the most common complication following surgery.

Duration of the hospital stay
In conventional repair, 90% of the patients hospital stay was 5-10 days and 10% of the patients had hospital stay from 11 to 15 days. Mean duration of hospital stay among patients who underwent Bassini’s repair were 6.8 days.

In mesh repair group, 57% patients had <5 days of hospital stay and 43% patients had hospital stay of 5-10 days. Mean hospital stay was 5.6 days.

This study shows that mean hospital stay is less in mesh repair when compared to Bassini’s repair (P < 0.001). In a study by Prior et al. concluded that Lichtenstein repair requires a marginally shorter hospital stay when compared to Bassini’s repair.

Duration of follow-up and recurrence
In this study, 80-85% of patients were followed up for 6 months to 2 years and 10-15% did not turn up for follow-up. One recurrence was recorded during this period of 2 years in Bassini’s repair group and no recurrence was noted in mesh repair group.

In a study by Vrijland et al. recurrence rate for non-mesh repair was 7%.

According to study made by Martin, the recurrence rate after inguinal hernia repair using mesh.

Chronic Groin Pain
In this study, 13% of patients developed chronic groin pain following mesh repair whereas 23% of patients developed chronic pain following Bassini’s repair (P = 0.317).

In a review article by Aasnang and Kehlet concluded that chronic groin pain is less after mesh repair when compared with non-mesh repair of hernia.

DISCUSSION
In this study, 60 cases of inguinal hernia were selected randomly and studied them in detail.

Out of 60 cases, 30 patients underwent conventional (Bassini’s) repair and 30 patients were treated with mesh repair using prolene mesh.
A total number of surgical admissions during January 2008 to July 2009 were 6244. Out of which, total number of inguinal hernias were 537 comprising 8.6% of total surgical admissions.

**Age Incidence (Table 1)**
In this study of 60 cases, the maximum incidence of inguinal hernia was seen in the age group of 40-69 years. The youngest patient was 18 years and the eldest patient was 87 years. The total percentage of patients between the age group of 40-69 years was 55%.

**Sex Ratio (Table 2)**
In this series, 3 female cases were present. Ratio being M: F - 19:1.

**Occupational Incidence (Table 3)**
In the present series of 60 cases, 25 patients were agriculturists, 20 patients were laborers, 10 patients were sedentary workers, 3 were business pupil, and 2 were students. From this observation, we can see that the inguinal hernia is occurring more commonly in agriculturists and laborers who does hard work.

**Incidence among Religion (Table 4)**
In the present series, 50 patients (83.3%) were Hindus, 15% were Muslims and 1.7% were Christians. No definite conclusion can be drawn from this observation.

**Habit Incidence (Table 5)**
Smoking is known to be an indirect risk factor for the development of inguinal hernia leading to lung diseases. In the present series of 60 cases, 43 patients (71.7%) were smokers and 17 patients (28.3%) were non-smokers. In this regard, we can observe that hernia is occurring more in smokers compared to non-smokers.

Longer the duration of hernia more the damage to the inguinal musculature which results in high incidence of recurrence and also causes difficulty in selecting the operative technique (Table 6).

### Comparative study of duration of hernia

<table>
<thead>
<tr>
<th>Duration of hernia (months)</th>
<th>Merseden series</th>
<th>Present series (60 cases)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of cases</td>
<td>Number of recurrence</td>
</tr>
<tr>
<td>0-3</td>
<td>665</td>
<td>34</td>
</tr>
<tr>
<td>4-12</td>
<td>398</td>
<td>20</td>
</tr>
<tr>
<td>Above 12 months</td>
<td>525</td>
<td>51</td>
</tr>
</tbody>
</table>

### Table 1: Age distribution

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>Number of cases (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20</td>
<td>4 (6.7)</td>
</tr>
<tr>
<td>21-29</td>
<td>5 (8.3)</td>
</tr>
<tr>
<td>30-39</td>
<td>11 (18.3)</td>
</tr>
<tr>
<td>40-49</td>
<td>9 (15.0)</td>
</tr>
<tr>
<td>50-59</td>
<td>12 (20.0)</td>
</tr>
<tr>
<td>60-69</td>
<td>12 (20.0)</td>
</tr>
<tr>
<td>&gt;70</td>
<td>7 (11.7)</td>
</tr>
<tr>
<td>Total</td>
<td>60 (100.0)</td>
</tr>
</tbody>
</table>

### Table 2: Sex distribution

<table>
<thead>
<tr>
<th>Sex</th>
<th>Number of cases (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>57 (95)</td>
</tr>
<tr>
<td>Female</td>
<td>3 (5)</td>
</tr>
<tr>
<td>Total</td>
<td>60 (100)</td>
</tr>
</tbody>
</table>

### Table 3: Occupational incidence

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Number of cases (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculturist</td>
<td>25 (41.7)</td>
</tr>
<tr>
<td>Business</td>
<td>3 (5.0)</td>
</tr>
<tr>
<td>Laborer</td>
<td>20 (33.3)</td>
</tr>
<tr>
<td>Sedentary worker</td>
<td>10 (16.7)</td>
</tr>
<tr>
<td>Student</td>
<td>2 (3.3)</td>
</tr>
<tr>
<td>Total</td>
<td>60 (100.0)</td>
</tr>
</tbody>
</table>

### Table 4: Incidence among religion

<table>
<thead>
<tr>
<th>Religion</th>
<th>Number of cases (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hindu</td>
<td>50 (83.3)</td>
</tr>
<tr>
<td>Muslim</td>
<td>9 (15.0)</td>
</tr>
<tr>
<td>Christian</td>
<td>1 (1.7)</td>
</tr>
<tr>
<td>Total</td>
<td>60 (100.0)</td>
</tr>
</tbody>
</table>

### Table 5: Habit incidence

<table>
<thead>
<tr>
<th>Habits</th>
<th>Number of cases (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonsmokers</td>
<td>17 (28.3)</td>
</tr>
<tr>
<td>Smokers</td>
<td>43 (71.7)</td>
</tr>
<tr>
<td>Total</td>
<td>60 (100.0)</td>
</tr>
</tbody>
</table>

### Table 6: Type of hernia

<table>
<thead>
<tr>
<th>Type of hernia</th>
<th>Number of cases (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct</td>
<td>16 (28.3)</td>
</tr>
<tr>
<td>Indirect</td>
<td>43 (70)</td>
</tr>
<tr>
<td>Recurrent</td>
<td>1 (1.7)</td>
</tr>
<tr>
<td>Total</td>
<td>60 (100)</td>
</tr>
</tbody>
</table>
Side of inguinal hernia
In this study, 33 patients (55%) had hernia on right side, 21 (35%) had on left side and bilateral inguinal hernia was seen in 10% from this observation we can notice that the incidence of hernia is higher on right side.

Content of the sac
In this series of 60 cases inguinal hernia, 39 patients (65%) had intestine in the hernial sac (enterocele), 8 patients (13%) had greater omentum and both intestine and omentum were the contents in 20% of cases. Hence, in this study, enterocele was the most common.

Management
Regarding anesthesia
Among 60 cases, 3 cases were done under general anesthesia, 2 cases under local anesthesia and all other cases were done under spinal anesthesia. The cases operated under spinal anesthesia, 5 cases developed spinal headache and treated symptomatically.

In the present series of 60 cases, 30 patients underwent Bassini’s repair and another 30 patients were repaired with prolene mesh. The size of the prolene mesh selected according to the size of the defect. The technique was Lichtenstein on lay repair. The mesh was fixed with superiorly and inferiorly with interrupted stitches. For Bassini’s repair, prolene No. 1 suture material was used.

As per present study, 30 cases taken for Bassini’s repair, 30 cases taken for Lichtenstein mesh repair.

Duration of the hospital stay
In 30 cases, who underwent Bassini’s repair 90% of the patients had hospital stay of around 5-10 days. Another 10% patients had hospital stay between 10 and 15 days. The mean duration of hospital stay among the patients who underwent Bassini’s repair was 6.8 days.

In another 30 patients who underwent prolene mesh repair, 57% patients had a maximum hospital stay <5 days and 43% patients had hospital stay of 5-10 days. Hence, the mean hospital stay was 5.6 days (P < 0.001).

Complications
Among 30 patients, who underwent mesh repair, 2 patients had operative wound infection, 2 had scrotal hematoma, 5 patients had urinary retention and 1 patient had UTI.

In conventional repair, 13 patients had urinary retention, 6 patients had scrotal hematoma, 7 patients had wound infection, UTI was seen in 2 patients and combined complications were seen in majority of patients.

Compared to conventional (Bassini’s) repair, the mesh repair had relatively less complications in the present study (P < 0.007).

Follow-up and recurrence
About 85% of patients were followed-up from 6 months to 2 years. 15% of patients did not turn up for follow-up. One recurrence was seen in the Bassini’s repair group but no recurrence noted in mesh repair group.

The Lichtenstein tension free inguinal hernia is becoming increasingly popular nowadays. It offers the effective repair that overcomes many of the problems. It is relatively easier and less technically depending than other anatomical repairs like Bassini’s/Shouldice’s repairs and easy to learn. Median length of operation is almost 10 min shorter than the other techniques reduced operating time. Infection rate in mesh repair is comparatively less compared to the Bassini’s repair. Length of the hospital stay is lesser than anatomical repair. All (mesh repair) patient return to work normally very early. Nowadays, staples are used to fix the mesh instead of interrupted prolene stitch which is time consuming, mortality in both study is nil.

According to the study done by Laffery et al. (1998), the Lichtenstein Institute in Los Angeles, the Shouldice in Toronto and London Hernia Clinic, have made study in 100 cases of inguinal hernia and reported Lichtenstein repair was (1) recurrence rate <1%, (2) number of days in hospital shortened, and (3) less of infection. The study has indicated that the present day “Gold standards can be reproduced safely and effectively highly motivated and dedicated hospital/health centers.” Lichtenstein tension-free mesh repair has become the standard method of hernia repair and is easier to learn that take less time and results in fewer recurrences.

CONCLUSION

Lichtenstein mesh repair has significantly reduced complications, less hospital stay, low recurrence rate, less duration of surgery and early return to work when compared to the conventional repair. For surgeons in training the Lichtenstein open mesh technique is a better method of inguinal hernia repair than other conventional hernia repairs and is cost-effective for the patients also.
Although Bassini’s principle of posterior wall reinforcement remains valid in surgical practice, his operation lost its popularity. Open suture repair of hernia has higher recurrence rate and postoperative pain and disability is high. It is only recommendable in the repairs of pediatric hernias and in selected cases in which use of prosthetic materials is contraindicated.

REFERENCES


Source of Support: Nil, Conflict of Interest: None declared.
Dexmedetomidine 5 Mcg and Clonidine 75 Mcg Comparison when Added to 12.5 Mg of 0.5% Heavy Bupivacaine for Spinal Anaesthesia in Lower Abdominal Surgeries

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Abstract

Background: Spinal anesthesia is commonly used for lower abdominal surgeries. Various adjuvants have been used to prolong the analgesic effect of bupivacaine.

Materials and Methods: A total of 50 adult patients of American Society of Anesthesiology Grade I-II were divided into two groups randomly in a group of 25 each. Groups clonidine (A), and dexmedetomidine (B) had given hyperbaric bupivacaine 0.5% 2.5 ml intrathecally with clonidine 75 µg and dexmedetomidine 5 µg, respectively.

Results: Motor block was delayed with Group A as compared to Group B. The difference was statistically insignificant (192.13 ± 97.04 s in Group B vs. 172.85 ± 67.85 s in Group A, P = 0.001). Onset of sensory block was delayed with Group B as compared to Group A (83 ± 32.42 s in Group A vs. 115 ± 39.35 s in Group B. Regression time of sensory block was 374.34 ± 44.54 min for Group A as compared to 302.5 ± 29.18 min for Group B. Regression time to reach Bromage 1 was 317 ± 32 min for Group A as compared to 220 ± 48 min for Group B patients remained hemodynamically stable in both dexmedetomidine and clonidine groups.

Conclusion: Dexmedetomidine is better in terms of longer duration of action though both clonidine and dexmedetomidine prolonged the duration of sensory and motor block of bupivacaine.

Key words: Adrenoreceptor agonist, Dexmedetomidine, Spinal anesthesia

INTRODUCTION

An adjuvant (from Latin, adjuvare: To aid), is a pharmacological or immunological agent that modifies the effect of other agents, such as a drug or vaccine. Local anesthetics (LA) are the most common agents used for spinal anesthesia but have short duration of action.¹⁻³ Opioids are one of those commonly used as intrathecal adjuvants to prolong it in the post-operative period without significant motor or autonomic blockade. There are side effects such as nausea, vomiting, urinary retention, pruritus, and delayed respiratory depression. Because of these side effects, further research toward non-opioid analogics with less serious side effects is been done.⁴ α-2 adrenergic agonists like dexmedetomidine is an agonist with an affinity of 8 times greater than clonidine.⁵

MATERIALS AND METHODS

A randomized double-blinded study was carried out in 50 American Society of Anesthesiology I and II patients age between 20 and 60 years. Approval of Ethics Committee and written informed consent from study participants was
taken. Patients for lower abdominal surgeries were divided into two groups of twenty each, and they were placed in Group A or Group B.

Patients were shifted to operation theater. After that intravenous (IV) were fluids started. All essential parameters such as systolic and diastolic blood pressure (BP), SpO₂, respiratory rate (RR) and pulse rate (PR) was recorded. The time for intrathecal injection was considered as 0, and the following parameters were observed - onset of sensory blockade was taken as loss of sensation to temperature by spirit swab at L2 level. The onset of motor block was taken as Bromage scale 1. RR, sedation, and any other complications were observed.

The PR, systolic and diastolic BP, SpO₂, and RR were recorded preoperatively, 0 min, 5 min, 15 min, 30 min, 60 min, and 90 min and at the end of surgery. Hypotension was defined as fall in systolic BP >30% from baseline or mean arterial pressure <60 mmHg. This was managed with injection ephedrine 6 mg increments. Bradycardia was defined as heart rate (HR) <50/min, and this was managed with injection atropine 0.01 mg/kg IV respiratory depression defined as RR <8/min and or SpO₂ <85%. This was planned to be managed with bag and mask ventilation or intubation and invasive positive-pressure ventilation if necessary. Blood loss more than the allowable loss was replaced with blood. The occurrence of sedation was assessed using Ramsay sedation scale.

The patient was shifted to the recovery room after completion of surgery; the vital signs were recorded, every 30 min interval. Sensory and motor block assessments were done every 15 min till recovery of pinprick sensation to L1 and Bromage scale of 1, respectively. Patients were shifted to post-operative ward after complete resolution of motor blockade. In the recovery room, pain assessment using visual analog scale (VAS) was done every 15 min. At the end of surgery, the degree of pain was assessed using VAS scale till VAS score >4 was reached. Whenever the patient complained of pain and rescue analgesic injection diclofenac, 75 mg i.m was given. Duration of effective analgesia was defined as time interval between onset of subarachnoid block (SAB) and the time to reach VAS ≥4.

Patients were monitored for 24 h to detect the occurrence of side effects - respiratory depression, nausea, vomiting, dry mouth, and pruritus. Patients were also enquired about the occurrence of Transient neurological symptoms which was described as pain/paresthesia in the buttocks, legs or pain radiating to lower extremities after initial recovery from SAB within 72 h.

### RESULTS

**Statistical Analysis**

All recorded data were entered using MS Excel software and analyzed using SPSS software for determining the statistical significance. The analysis of variance was used to study the significance of mean of various study parameters between the two groups. Student’s t-test was used to compare the two groups on mean values of various parameters. The P < 0.05 is considered statistically significant.

Motor block was delayed with Group A as compared to Group B. The difference was statistically insignificant (192.13 ± 97.04 s in Group B vs. 172.85 ± 67.85 s in

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Group A (n=25)</th>
<th>Group B (n=25)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographic data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>40.8±9.1</td>
<td>39.5±11.4</td>
<td>0.62</td>
</tr>
<tr>
<td>Sex (female/male)</td>
<td>12/18</td>
<td>13/17</td>
<td>1.00</td>
</tr>
<tr>
<td>Onset and duration of sensory and motor blockade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration of surgery (min)</td>
<td>116±64.7</td>
<td>161±70</td>
<td>0.66</td>
</tr>
<tr>
<td>Onset of sensory blockade (s)</td>
<td>83±32.4</td>
<td>115±39.3</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Onset of motor blockade (s)</td>
<td>192.13±97.04</td>
<td>141.7±51.7</td>
<td>0.01</td>
</tr>
<tr>
<td>Duration of analgesia (min)</td>
<td>374±44.5</td>
<td>302±29.1</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Duration of motor block (min)</td>
<td>317±32</td>
<td>220±48</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Maximum sensory level achieved</td>
<td>T6±1.2</td>
<td>T6±1.2</td>
<td>1.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time (min)</th>
<th>PR</th>
<th>RR</th>
<th>Mean arterial BP</th>
</tr>
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<tr>
<td></td>
<td>Group A</td>
<td>Group B</td>
<td>P</td>
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<td>Pre-operative</td>
<td>81.7±18.6</td>
<td>75.3±10.3</td>
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<tr>
<td>0</td>
<td>85.1±20.9</td>
<td>78.2±12</td>
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<td>5</td>
<td>77.6±22.7</td>
<td>67.2±29.8</td>
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<td>15</td>
<td>71.6±17.4</td>
<td>63.3±8.9</td>
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<td>30</td>
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<tr>
<td>60</td>
<td>66.1±14.2</td>
<td>62.3±7.5</td>
<td>0.16</td>
</tr>
<tr>
<td>90</td>
<td>65.6±14.5</td>
<td>62.3±7.1</td>
<td>0.22</td>
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<tr>
<td>EOS</td>
<td>68.9±11.8</td>
<td>63.5±7.4</td>
<td>0.03</td>
</tr>
</tbody>
</table>

PR: Pulse rate, RR: Respiratory rate, BP: Blood pressure
Group A, \( P = 0.001 \). Onset of sensory block was delayed with Group B as compared to Group A (83 ± 32.42 s in Group A vs. 115 ± 39.35 s in Group B). Regression time of sensory block was 374.34 ± 44.54 min for Group A as compared to 302.5 ± 29.18 min for Group B. Regression time to reach Bromage 1 was 317 ± 32 min for Group A as compared to 220 ± 48 min for Group B patients remained hemodynamically stable in both dexmedetomidine and clonidine groups (Tables 1 and 2).

**DISCUSSION**

Dexmedetomidine and clonidine are alpha-2 adrenoceptor agonist agents initially prescribed for hypertension and IV sedation. Gradually, the role of these two agents extended beyond wards to operation theater for the provision of intraoperative and post-operative analgesia and sedation. Although there are sufficient studies on addition of clonidine to LA both epidurally and intrathecally, intrathecal and epidural characteristics of dexmedetomidine have been studied mainly in animals, and there is a scarcity of literature about intrathecal use of dexmedetomidine in humans.

When we compared the dexmedetomidine and clonidine with each other, we found that onset of motor block was delayed with dexmedetomidine as compared to clonidine. The onset of sensory block was delayed with clonidine as compared to dexmedetomidine. Dexmedetomidine produced a significantly longer duration of sensory and motor block as compared to clonidine. Regression time of sensory block was 374.34 ± 44.54 min for dexmedetomidine as compared to 302.5 ± 29.18 min for clonidine. Regression time to reach Bromage 1 was 317 ± 32 min for dexmedetomidine as compared to 220 ± 48 min for clonidine. When we searched the literature, we found that very few authors have compared intrathecal dexmedetomidine to clonidine.

Singh and Shukla\(^{6}\) compared the effects of intrathecal clonidine and dexmedetomidine on sensory analgesia and motor block of hyperbaric bupivacaine. Regression time of sensory block to S1 dermatome was significantly higher. Regression time to reach Bromage 1 was significantly high in group dexmedetomidine and clonidine groups as compared to bupivacaine. They concluded that though both clonidine and dexmedetomidine prolonged the duration of sensory and motor block of bupivacaine, dexmedetomidine is better in terms of longer duration of action.

Bajwa \textit{et al.}\(^{7}\) compared dexmedetomidine and clonidine in epidural anesthesia. Dexmedetomidine to ropivacaine as an adjuvant resulted in an earlier onset of sensory analgesia at T10 level as compared to the addition of clonidine dexmedetomidine not only provided a higher dermatomal spread but also helped in achieving the maximum sensory anesthetic level in a shorter period compared to clonidine modified Bromage scale 3 was achieved earlier in patients who were administered dexmedetomidine as adjuvant. Kanazi \textit{et al.}\(^{9}\) studied the effect of low-dose dexmedetomidine or clonidine on hyperbaric bupivacaine they opined that dexmedetomidine (3 mcg) or clonidine (30 mcg) when added to intrathecal Bupivacaine, produces a similar prolongation in the duration of the motor and sensory block with preserved hemodynamic stability and lack of sedation.

In this study, patients remained hemodynamically stable in both dexmedetomidine and clonidine groups. Patients in clonidine group had a greater fall in HR than in dexmedetomidine groups, and the difference was statistically significant. There was no much fall in BP and HR when compared to the baseline values.

Al-Mustafa \textit{et al.}\(^{9}\) added dexmedetomidine to spinal bupivacaine for urological procedures. They opined that dexmedetomidine has dose-dependent effect on onset and regression of sensory and motor block. Al-Ghanem \textit{et al.}\(^{10}\) evaluated the onset and duration of sensory and motor block as well as operative analgesia and adverse effects of dexmedetomidine (5 μg) or fentanyl (25 μg) given intrathecally with plain 0.5% bupivacaine (10 mg) for spinal anesthesia. Patients in dexmedetomidine Group (D) had significant longer sensory and motor block as compared to patients in fentanyl Group (F). Hypotension was mild to moderate in both groups except one patient in Group F, who had a BP <90 mmHg and required 36 mg ephedrine to restore his BP. They concluded that 10 mg plain bupivacaine supplemented with 5 μg Dexmedetomidine produces prolonged motor and sensory block compared with fentanyl.

**CONCLUSION**

On the basis of the observations made during this study and their analysis, the following conclusion was drawn: Addition of dexmedetomidine 2 μg to 0.5% heavy bupivacaine intrathecally produced the faster onset of sensory blockade, longer duration of analgesia and motor blockade and better hemodynamic stability than clonidine 50 μg.

**REFERENCES**

Neeraj, et al.: Spinal Anaesthesia in Lower Abdominal Surgeries


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Assessment of Practice of Endodontic Treatment Protocols among Dental Practitioners in Mumbai and Navi Mumbai: A Questionnaire-based Survey

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Abstract

Introduction: Although endodontics is a speciality field, a dental practitioner who is not endodontists also performs endodontic treatment routinely in his practice making it fundamentally essential to follow the APT protocols and keeps himself updated for delivery of efficient treatment.

Aim: The aim of this study was to assess the knowledge and the endodontic treatment protocols followed by dental practitioners.

Materials and Methods: The study design was a cross-sectional questionnaire-based survey. The study was conducted among 386 dental practitioners in Mumbai and Navi Mumbai who were selected through block randomization. Data were collected through a self-designed pretested questionnaire. Descriptive statistical analysis and Chi-square test were conducted.

Results: Of the 386 dental practitioners, 58.29% of practitioners always obtained consent and 76.68% always took a pre-operative radiograph. 53.88% of dental practitioners used digital radiography. 52.95% practitioners used an autoclave to sterilize their endodontic files. 68.65% dental practitioners never used a rubber dam. 87.82% practitioners used a combination of cotton rolls and suction tip for isolation. Working length was determined using apex locater and radiograph by 45.07% practitioners. 63.73% used a combination of hand files and rotary system and step back was the choice of technique by 45.59% practitioners. Sodium hypochlorite was the commonly used irrigant, and zinc oxide eugenol was the commonly used sealer along with gutta-percha for obturation using cold lateral condensation.

Conclusions: The study infers a need for knowledge upgradation and reinforcement of the protocols being followed by dental practitioners.

Key words: Continuing dental education, Dentists, Endodontics, Endodontic skills, Root canal therapy, Treatment protocols

INTRODUCTION

Endodontics is a dynamic field that helps in successfully treating a pulpal or periradicular disease without resorting to an ultimate need for extraction. Several studies have been conducted to evaluate the outcome of an endodontic treatment.¹-⁵ It has been concluded as a long lasting and conservative therapy due to its long-term survival.² A plethora of factors such as age, sex, pre-operative vitality, and periapical pathology determine the prognosis of an endodontically treated tooth.³ Factors governed by the dental practitioner such as method of canal preparation and position of the apical seal also dramatically influence the outcome.⁴ The survival of teeth following an endodontic treatment is higher when performed by specialists as compared to general dentists.⁵ Dental practitioner stumbles across plentiful cases that entail an endodontic treatment, making it vital for him to follow the correct protocols and stay updated with contemporary endodontics for delivering a treatment as efficiently as a specialist in the field.

Aim and Objectives

This study was conducted with an aim to study the attitude and to explore the materials and techniques employed
during an endodontic treatment by the dental practitioners in Mumbai and Navi Mumbai.

The primary objectives of this study were as follows:
1. To study the attitude of the dental practitioners in Mumbai and Navi Mumbai toward an endodontic treatment.
2. To explore the materials and techniques employed by the dental practitioners during an endodontic treatment in Mumbai and Navi Mumbai.

The secondary objectives of this study were as follows:
1. To come to a conclusion as to how the dental practitioners can upgrade themselves for the provision of a more efficient treatment.

MATERIALS AND METHODS

The present cross-sectional questionnaire-based survey was conducted among 386 dental practitioners in Mumbai and Navi Mumbai who were selected through block randomization by dividing the area into the following four blocks: Central Mumbai, Western Mumbai, South Mumbai, and Harbor Line. Lottery Method was adopted for selection of practitioners from each block to ensure a simple random sampling and equal representation of dental practitioners from each area. The inclusion criterion was set to include the dental practitioners who were willing to participate in the present survey and giving a written informed consent. The study excluded those practitioners who were not present on the day of the survey and up to two rounds of follow-up and those who were qualified specialist in the field of endodontics and quacks. A sample size of minimum 384 dental practitioners was determined using the single proportion formula as follows:

\[ N = \left( \frac{Z_{\alpha}p(1-p)}{d} \right)^2 \]

In the above formula that was used, \( N \) was the sample size that was estimated, \( Z_{\alpha} \) was the variant of type one error; \( p \) was the proportion of good practice of endodontics assumed at 50% and \( d \) was the estimated error in this study fixed at 5%.

Before the start of the study, clearance and permissions were obtained from Institutional Ethics Committee after the study protocol was sent and reviewed by 2 blinded reviewers (letter dated 13th January 2016).

Data were collected using the selfdesigned, pre-tested questionnaire by hand delivery. It comprised of two sections; Section A comprised questions to extract demographic details, and Section B comprised 17 questions to evaluate the attitude and the protocols adopted by the dental practitioner during endodontic treatment. The questionnaire was collected on completion with minimum two rounds of follow-up. Data collected by questionnaire was coded and entered onto a M.S. Office Excel Sheet (V. 2010). Descriptive statistics in the form of frequency and percentage were calculated using Statistical Package for Social Sciences (SPSS, V.22.0, IBM). Comparison of responses which varied based on years of practice, age, and gender of the dental practitioners was done using Chi-square test where \( P < 0.05 \) was considered to be statistically significant.

RESULTS

The result obtained through a descriptive statistical analysis of the collected data was formulated in the form of frequency and percentage. Of the 386 participating dental practitioners, 38.6% practitioners were male and 61.4% of the practitioners were female. 78% of the practitioners were in the age group of <34 years, 16.1% practitioners were between 35 and 44 years and 6% of the participants aged more than 44 years. The participants were also grouped according to the years of experience. 57.8% of the participants had an experience of 1-5 years, 22.8% of the participants had an experience of 5-10 years, 8.3% of the participants had an experience of 10-15 years, and 11.1% possessed an experience of more than 15 years of practice in the dental field.

Section B revealed that a majority of the practitioners responded positively for obtaining a pre-operative radiograph and for routinely getting a signed consent from the patient (Graph 1). The use of digital technique surpassed the use of conventional radiography (Graph 1). The choice of treatment for an emergency case differed among the practitioners where 63.98% of the participants favored access opening along with a prescription of analgesics and antibiotics while 36.26% favored access opening only once acute symptoms subsided following the use of analgesics and antibiotics (Graph 1).

The evaluation of isolation protocols revealed that alarming 68.65% practitioners never adopted the use of rubber dam (Graph 2), and combination of the use of cotton rolls along with suction tip was the technique of isolation adopted by 87.82% practitioners (Graph 2). The results revealed that autoclave was the most commonly used technique by 52.95% for sterilization of endodontic files (Graph 2).

The results inferred that apex locator followed by radiographic confirmation was used by 45.07% of the participants to determine working length (Graph 3). The
use of Gates-Glidden drill was sometimes adopted during an endodontic treatment by 68.13% of the practitioners (Graph 3). Among the many available instruments, the use of a combination of hand file and rotary system was favored by a majority of 63.73% of the practitioners (Graph 3), and step back technique was followed by a majority of 45.59% of the practitioners for the biomechanical preparation of canals (Graph 3).

Assessment of the protocols followed for irrigation of canals revealed that sodium hypochlorite was the most commonly used irrigant by 88.34% practitioners and only 32.90% reported warming sodium hypochlorite sometimes for the purpose of irrigation (Graph 4). The majority used sodium hypochlorite within the concentration range of 0.5-2.5% and activated the irrigant by hand files (Graph 4).

The questionnaire concluded with the assessment of protocols followed during obturation of canals. Cold lateral condensation of gutta-percha with zinc oxide eugenol as the sealant was most commonly used by the practitioners (Graph 5).

There was no statistically significant difference seen with gender ($P > 0.05$), but a statistically significant difference was seen when age and experience were compared with responses ($P < 0.05$) (Tables 1 and 2).

**DISCUSSION**

In this study, 76.68% of the practitioners obtained a pre-operative radiograph which is in accordance to the study conducted by Mehta et al. which states that 81%
practitioners always obtained pre-operative radiograph.\textsuperscript{6} Iqbal \textit{et al.} in their study also mention that 51\% of the practitioners always obtained a pre-operative radiograph.\textsuperscript{7} Thus, the fundamental necessity of obtaining a pre-operative radiograph cannot be ignored for appropriate case selection, studying the number of canals and canal morphology and also for maintaining the dental record.

This study indicated that 58.29\% of the practitioners always got a consent form signed from the patient, whereas only 8.54\% did not do so which contradict the values stated by Mehta \textit{et al.} where 52\% of the practitioners did not get a consent form signed.\textsuperscript{6} Every patient before undergoing any procedure must be made aware of the success rates and drawbacks of it thus making a signed consent of utmost importance.

The key to the success of an endodontic treatment lies solely in the accurate appraisal of the pulpal disease. Thus the conventional radiographic technique evolved to a more proficient digital radiographic technique that allows accurate detection of caries and assessment of the health of periarticular tissue.\textsuperscript{8} This study indicated that majority of the practitioners used digital radiography while in a
study conducted by Mehta et al., 89% practitioners follow the conventional technique of radiography and only 11% took real time images. In this study, 63.98% of the practitioners performed access opening along with prescription of analgesics and antibiotics during an emergency case. However, 36.26% practitioners performed access opening after the acute symptoms subsided. These values are in agreement to those in the study by Mehta et al., where 80% practitioners preferred root canal opening with analgesics and antibiotics. Local anesthesia takes longer to act when the tissues are inflamed. This could be the reason why some practitioners preferred carrying out the access opening after the acute symptoms subsided.
Table 2: Comparison of responses to questions with years of experience

<table>
<thead>
<tr>
<th>Questions</th>
<th>Experience groups (years):</th>
<th>Responses</th>
<th>( P ) value of Chi-square test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Getting a consent form signed</td>
<td>A: Always</td>
<td>140 97 17</td>
<td>0.008</td>
</tr>
<tr>
<td></td>
<td>B: Sometimes</td>
<td>124 54 10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C: Never</td>
<td>34 16 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D: More than 15</td>
<td>34 18 10</td>
<td></td>
</tr>
<tr>
<td>Treatment of emergency cases</td>
<td>A: Access opening along with analgesics and antibiotics</td>
<td>139 84</td>
<td>0.012</td>
</tr>
<tr>
<td></td>
<td>B: Access opening once acute symptoms subside</td>
<td>58 30 4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C: Access opening</td>
<td>23 8 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D: More than 15</td>
<td>25 17 4</td>
<td></td>
</tr>
<tr>
<td>Sterilization of endodontic files</td>
<td>A: Autoclave</td>
<td>120 69 29 0</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>B: Cold sterilization</td>
<td>27 3 26 4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C: Glass bead sterilization</td>
<td>10 2 11 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D: Discard after each use</td>
<td>25 3 8 3</td>
<td></td>
</tr>
<tr>
<td>Determining the working length</td>
<td>A: Radiograph</td>
<td>70 27 87 13 0</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>B: Apex locator</td>
<td>18 12 33 7 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C: Apex locator followed by radiograph</td>
<td>4 3 14 1 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D: Tactile sensation</td>
<td>9 8 14 4 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>E: Others</td>
<td>54 17 14 2</td>
<td></td>
</tr>
<tr>
<td>Technique of biomechanical preparation of canals</td>
<td>A: Step back</td>
<td>129 33 4 0 54</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>B: Crown down</td>
<td>57 8 5 0 17</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C: Hybrid</td>
<td>15 5 1 0 7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D: Others</td>
<td>17 8 0 2 14</td>
<td></td>
</tr>
<tr>
<td></td>
<td>E: No activation</td>
<td>7 8 2 1 14</td>
<td></td>
</tr>
<tr>
<td>Concentration of sodium hypochlorite used</td>
<td>A: &lt;0.5%</td>
<td>49 101 61 8</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>B: 0.5-2.5%</td>
<td>11 27 41 8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C: 2.5-5%</td>
<td>0 14 14 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D: &gt;5%</td>
<td>5 12 23 1</td>
<td></td>
</tr>
<tr>
<td>Technique to activate irrigant</td>
<td>A: Hand files</td>
<td>122 44 23 21 0</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>B: Ultrasound or sonic activation</td>
<td>30 21 3 24 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C: Negative pressure</td>
<td>10 9 5 7 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D: Laser</td>
<td>17 13 2 4 1</td>
<td></td>
</tr>
<tr>
<td>Sealer used</td>
<td>A: Zinc oxide eugenol</td>
<td>129 33 4 0 54</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>B: Epoxy resin</td>
<td>57 8 5 0 17</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C: Calcium hydroxide</td>
<td>122 44 23 21 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D: Combination of ZOE and Epoxy resin</td>
<td>20 24 2 1 14</td>
<td></td>
</tr>
<tr>
<td></td>
<td>E: Others</td>
<td>8 2 1 1 14</td>
<td></td>
</tr>
</tbody>
</table>

In this study, 52.9% practitioners sterilized their files by autoclave and 50.77% used a glass bead sterilizer. Very few practiced cold sterilization or discarding the file after each use. Similar results were concluded by Shrestha et al., in their study where 48.18% practitioners autoclaved their endodontic files, 50% used a glass bead sterilizer and 20.9% preferred chemical sterilization. Similar results were observed by Mehta et al. while studying the endodontic trends. Studies have been carried out to weigh the efficiency of various sterilization techniques in killing microorganisms which have concluded that files sterilized by autoclave were completely sterile. Sterilization of endodontic files is indispensable as it reduces the chances of cross infection making it necessary to adopt a technique that efficiently sterilizes the files.

Every dental procedure requires an isolated environment in which it can be efficiently carried out. 68.65% of the practitioners in the present study never used a rubber dam and 87.82% preferred the use of a combination of cotton rolls and suction tip. The study conducted by Mehta et al. had similar results and stated that only 4.33% of the
dentists reported using rubber dam. Similar response was observed in a study conducted by Iqbal et al., where 9% of practitioners used rubber dam and 91% opted for cotton rolls for isolation. These values were also in accordance with a study conducted by Shrestha et al.

The results state that 45.07% practitioners use apex locator followed by radiographic confirmation for determining working length while 18.13% relied on tactile sensation and 37.04% used only a radiograph. In contrast to the present study, Mehta et al. state in their study that only 38% use radiograph along with apex locator but majority rely on radiograph for determining the working length and only 8% rely on tactile sensation. The study conducted by Shrestha et al. also gave contrasting results. Their study stated that 80% of general dental practitioners in Kathmandu used radiograph with the instrument in the canal for determining the working length and only 40% of the practitioners use an apex locator. Iqbal et al. in their study also state that 86.5% of the dental practitioners use only radiographs to determine the working length and only 13.5% of them adopted a combination of apex locator and radiograph.

Accurate determination of working length is fundamental in the success of an endodontic treatment. Shanmugaraj et al. evaluated the different techniques to determine the working length and concluded that electronic apex locators gave the most accurate working lengths followed by radiographic technique and the least accurate being tactile sensation.

The use of Gates-Glidden drill during an endodontic treatment is fundamental for widening the canal orifice so as to obtain a straight line access. The study revealed that 68.13% of the practitioners incorporated its use only sometimes during an endodontic treatment and 1.8% never did so which is in contrast to the values mentioned in the study conducted by Mehta et al. where 66% of practitioners never used Gates-Glidden drill.

In this study, 63.73% dental practitioners used a combination of hand and rotary files and 13.47% practitioners use only stainless steel hand file for canal preparation. In contrast to these values, Mehta et al. in their stated that 56% of the practitioners use stainless steel hand files and only 15% opted for the use of rotary nickel titanium (NiTi) instruments. Iqbal et al. in their study also stated that 82.5% of the dental practitioners in North of Saudi Arabia use stainless steel hand files and only 17.5% used NiTi hand and rotary instruments. Shrestha et al. also mentioned that 88.18% of the dental practitioners in Kathmandu use stainless steel hand files and only 12.72% use rotary NiTi hand files. NiTi files have proven to be highly efficient especially when preparing a canal with a complex anatomy.

Gluskin et al. stated that when canals were prepared using NiTi rotary files; there were lesser canal transportations and grater conservation of tooth structure with minimum time required to prepare canals. Pettiette et al. reported a higher success value when NiTi files were used for they were able to maintain the canal’s original shape. Since no two canals ever share a similar morphology, the appropriate selection of the instrument used for canal preparation can significantly affect the treatment outcome.

Adopting an APT technique for canal preparation is as important as selecting an APT instrument. This study states that 45.59% dental practitioners followed the step back technique and only 19.68% used the hybrid technique for biomechanical preparation of canals. Mehta et al. similarly stated that 59.66% practitioners followed the step back technique and 23.66% followed the crown down technique. Similar results were concluded by Iqbal et al., where 41% of the dental practitioners followed step back technique and 12.5% followed the crown down technique. In a study conducted by Shrestha et al., 90.9% practitioners followed the step back technique.

The presence of microorganisms and accessory canals makes it imperative to irrigate the canals. The majority of the practitioners in the present study reported using sodium hypochlorite of concentration in the range of 0.5-2.5%, whereas only 4.92% practitioners use a concentration of more than 5% in their routine practice. Due to its high efficiency in dissolving pulpal tissue and due to its microbial activity, its used has gained popularity worldwide. Sodium hypochlorite of 0.5% concentration is a more effective irrigant than saline. The efficacy of sodium hypochlorite solution can be maximized by increasing its concentration, temperature, flow and surface tension. Sodium hypochlorite of 5.25% concentration has superior antimicrobial activity when compared to other irrigants and decreasing its concentration concomitantly decreases its antimicrobial efficacy.

In this study, 32.9% of dental practitioners warmed hypochlorite solution only sometimes and very few adopted irrigation techniques such as negative pressure ultrasonic and sonic. These values contradict the results obtained in a study conducted among the endodontists in America by Dutner et al., where the endodontists were well versed with various techniques of activating the irrigants. Although direct comparison was not possible, these were the differences in irrigation protocols seen among the endodontists in America and dental practitioners in India.

In this study, 58.29% of the practitioners used cold lateral condensation and 51.29% used zinc oxide eugenol as the sealer. Similar values were obtained in the study by...
Mehta et al. where 91% obturated canals using cold/warm lateral condensation with a root canal sealer and only 9% opted for techniques like silverpoint system Thermafil, Obtura ll injectable. Zinc oxide eugenol was the choice of sealer by 55% of the practitioners and resin based sealer was used by 13% as compared to 26.94% in the present study. Similarly, lateral condensation was the most popular technique among 81% practitioners in North of Saudi Arabia. The study conducted in Kathmandu also gave similar results where lateral condensation was most popular among 91.81% general dental practitioners and ZOE was the most commonly used sealer by 63.63% of the practitioners. Canal obturations performed using cold lateral condensation of Gutta-percha and within 2 mm of radiographic apex of tooth gave the best outcomes. A well condensed obturation with an excellent apical seal concludes an efficiently performed endodontic treatment.

One possible limitation of this study is that the data collected is from a single geographical area, which may be further improved by inclusion of a larger area for future comparisons, also the comparison of protocols between endodontists and dental practitioners may be included in future studies, but taking into consideration the sources of information, the participants gather to update their knowledge and the contemporary technologies available. We hence assume the extrapolation of the results of this study to be generalized to all the dental practitioners of the country.

CONCLUSION

This study thus concludes that there are certain protocols that have been religiously followed by the dental practitioners of Mumbai and Navi Mumbai but yet the knowledge of the advanced techniques has been over shadowed. Many of the dental practitioners are aware of the protocols followed at the institutional levels but have not inculcated them in their routine practice. This knowledge can be best upgraded through continuing dental education for the benefit of both the practitioner and the patient.

ACKNOWLEDGMENT

The authors of this study would like to acknowledge all the participating dental practitioners for their valuable time and inputs.

REFERENCES

Comparative Study of Post-operative Complications in Third Molar Surgery with and without Sutures: A Prospective Study

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Abstract

Objective and Background: The objective of this study is to evaluate the post-operative complication in third molar surgery with and without suture.

Materials and Methods: A total of 50 healthy subjects belonging to both the sexes in the age group 20-40 years with bilateral impacted third molar underwent surgical removal under local anesthesia in a single sitting. The post-operative pain was recorded on visual analog scale for 7 days, and swelling was measured on day 3, 5, and 7 with reference to four anatomical landmarks.

Results and Observations: Both the statistical analysis and clinical observation showed that both pain and swelling were more on the sutured side compared to sutureless side. However, there were some complications related to the socket left open to the oral cavity without suture.

Conclusion: The study concludes that post-operative complications such as pain and swelling were less without suture placement. The decision of placing sutures may depend on the category of the impacted tooth and patient compliance.

Key words: Post operative complication, Primary healing, Secondary healing, Third molar surgery

INTRODUCTION

Impaction is defined as a cessation of the tooth eruption caused by a clinical or radiographically detectable physical barrier in the eruption path or by an ectopic position.¹ The follicle of the third molar becomes apparent at the age of 6-7 years, and the most of the molar follicles can be diagnosed by the age of 8-9 years. The ages 14-16 years appear to be the latest for the radiographic appearance of the third molar after which the tooth is considered to be impacted or missing tooth.³

The etiology of mandibular third molar impaction has focused on a number of factors including local and systemic.² An impacted third molar is indicated for surgical extraction either due to as a prophylactic procedure or for the pathologic transformation of hard and soft tissue damage caused by the impacted tooth.⁵ Various techniques are available for the surgical extraction of the impacted third molar, of which bur technique is considered to be one of the techniques with minimal patient discomfort in the removal of mandibular third molar under local anesthesia.¹ Post-operative pain and swelling following surgical procedures is a matter of considerable consequence to most patients, and clinical strategies are aimed to reduce its incidence and severity.⁴,⁵ Factors contributing to the occurrence of pain and edema after third molar extraction are complex but are related to the inflammatory process that is initiated by surgical trauma. Injury to tissue during surgical procedure results in the release of chemical mediators of inflammation. More rarely, hemorrhage or sepsis may occur. Most surgeons agree that increased surgical time, trauma, and difficulty in tooth removal are important factors in post-operative complication.¹,⁶ One of the factors most closely
linked to intensity of post-operative pain and swelling is the type of healing of surgical wound. A clean surgically created wound that is approximated by sutures, staples, or tapes, the wound heals by the process termed primary healing. The major biological mechanism responsible for wound healing with primary closure is matrix deposition, which is needed to provide the disrupted tissue with new strength and integrity. The process of healing that takes place when the flap is not approximated is by secondary healing.

**MATERIALS AND METHODS**

This study was conducted at the Department of Oral and Maxillofacial Surgery, Subbaiah Dental College and Hospital, Shimoga. The patients, with bilaterally impacted mandibular third molars who required removal, either for prophylactic reasons or because of pain, participated in this study and have given their consent. Routine hematological investigation and radiographs-intraoral periapical radiographs orthopantomograph.

All the 50 patients who had bilateral impacted mandibular third molars were selected, and both the sides were surgically removed in a single sitting, primary closure was adapted on right quadrant and secondary closure on left quadrant. All the patients underwent surgical removal of bilaterally impacted mandibular third molar under local anesthesia. Inferior alveolar, lingual and long buccal nerve block was administered first on right side and next on left side.

The small “V” shaped incision was made with one point at the distobuccal line angle of the second molar. One distal limb, which follows the external oblique ridge, and anterior limb avoids the gingival sulcus of the second molar and extends downward to the mucogingival junction (Figure 1).

Mucoperiosteal flap was reflected and retracted with Austin’s retractor. Bone was removed with rose head bur and tapered fissure bur no. 702 adapting guttering technique. Constant irrigation using sterile isotonic saline solution was used to reduce the heat generated. The teeth were removed by odontectomy or into to. The wound was irrigated with sterile isotonic saline solution.

The flap was repositioned, and sutures were placed on the distal arm of the right quadrant for primary healing, using non-resorbable 3-0 black braided silk and over the left quadrant the mucoperiosteal flap was only repositioned and approximated and left open to the oral cavity. The entire procedure was completed in about 40-50 min. Postoperatively, all patients received amoxicillin 500 mg TID and diclofenac sodium 50 mg TID for 3 days. Patients were advised to use chlorhexidine mouthwash (0.12%) thrice daily postoperatively for 7 days postoperatively. The sutures were removed on the seventh post-operative day.

**DISCUSSION**

Surgical removal of impacted third molars is one of the most frequent procedures in Oral and Maxillofacial Surgery. The procedure is performed in following steps, diagnosis of the category of impacted tooth, anesthesia, raising of mucoperiosteal flap, bone removal by guttering, tooth removal and closure of socket. Suturing of the surgical wound is one of them that facilitate uneventful healing of the socket. Over a period of time, surgical procedures have been modified to minimize common intraoperative and post-operative complications such as bleeding, pain, swelling and alveolar osteitis. The purpose of placing suture is to achieve an intimate contact of gingival tissue around second molar, control of hemorrhage, to avoid food lodgment, wound dehiscence and to prevent infection of socket.

The extent of swelling and the severity of pain are the chief indicators of patients comfort during the post-operative period after third molar removal. Factors affecting pain and swelling are mainly attributed to the flap design operative trauma, type of wound healing and individual response to the surgical trauma. When there is an inflammatory reaction, there will be collection of inflammatory fluids within the tissue spaces, which leads to diffuse swelling in the affected area. This may also aggravate the pain and cause trismus, by its pressure effect within the tissue spaces post-operative complications most commonly seen after third molar removal are pain, swelling, trismus and infection (alveolar osteitis) may be related to the surgical technique, difficulty in tooth removal and wound closure procedure. Literature shows the use of either suture
or sutureless techniques that lead to a primary intention healing or secondary intention.\textsuperscript{9,10}

Other factors affecting pain and swelling are individual pain tolerance, body response, and type of wound healing.\textsuperscript{11,12} Hence, there may be a chance of error to occur when case and control are in different individuals. But in this study, each case of similar impaction was selected, both case and control extraction site were in the same individual, performed at the single appointment and operated by one operating surgeon. The surgical procedure for removal of 38 followed 48, where one socket was closed primarily with sutures, and the other was left open to the oral cavity. In this study, we tried to manage the problem of accumulation of inflammatory fluid in tissue space by facilitating constant drainage using “V” shaped incision.

This provided adequate soft tissue reflection. The incision was smaller than that described by syndrome. During the healing phase in the posterior region of the dental arch, the anatomy of the ramus, tuberosity, gingival, and buccal mucosa will fall passively together, if this incision is used and the mucoperiosteal flap could be approximated without any sutures. Wait and Cherala in 2006\textsuperscript{13} studied the post-operative complications with “V” shaped incision. The study shows a result of a decreased incidence of post-operative complications such as pain, swelling, trismus with the secondary type of wound healing.

This study determined secondary healing to be comfortable for patients with regard to two parameters-swelling and pain. They were evaluated with visual analog scale (VAS), which is considered to be an efficacious tool to evaluate clinical parameters that influence the subjective experience of an individual such as pain. VAS scale a reliable method as proposed by Henrikson \textit{et al.} measurement taken with reference to anatomical landmarks and swelling (Figure 2) was analyzed by measurement taken with reference to anatomical landmarks. According to our study the feedback from the patients and clinical reviews, almost all of them experienced more swelling and pain on sutured side. When they were reviewed on the 3\textsuperscript{rd} day postoperatively, swelling was more obvious on the sutured side and relatively less on the side where sutures were not placed. The severity of swelling pain on the sutured side postoperatively was maximum on the 3\textsuperscript{rd} day most of the patients, reduced on the 5\textsuperscript{th} day and was almost normal on the 7\textsuperscript{th} day in most of the post-operative day. Secondary closure technique facilitated escape of inflammatory fluid and allows escape of food debris from socket and removed chemical mediators may be the reason for comparatively less significant pain and swelling that was noticed.

\begin{figure}
\centering
\includegraphics[width=\textwidth]{figure2.png}
\caption{Swelling measurement reference points. S1 - ear lobe, S2 - corner of the mouth, S3 - lateral canthus of the eye, S4 - angle of the mandible}
\end{figure}

\textbf{RESULTS}

In this study of 50 patients with bilateral impacted tooth, 31 male 19 female participated. According to statistical analysis, the mean value for pain immediately after 6 h in group 1 (with suture) was 4.88, group 2 (without suture) 4.98. The mean values on group 1 side on day 1 - 4.28, day 2 - 3.60, day 3 - 2.94, day 4 - 2.38, day 5 - 1.82, day 6 - 1.42, and day 7 - 1.20; mean values in group 2 (without suture) day 1 - 3.96, day 2 - 2.48, day 3 - 2.30, day 4 - 1.64, day 5 - 0.70, day 6 - 0.22, and day 7 - 0.10. These values give an inference that the amount of pain experienced by the patient on group 1 was less for immediate 6-8 h compared to group 2, but during subsequent days pain was more on group 1 than group 2. Mean values for swelling in group 1 on day 1 on day 3-11.7840, day 5-3920, day 7-10.9780 and group 2 on day 3-11.4000, day 5-11.0920, day 7-8580. Discomfort of swelling was less in group 2 compared to group 1. Complications like postoperative sensitivity to thermal changes in 3 cases were noted. Bilateral mandibular nerve block was administered which was acceptable; all these patients maintained fairly good oral hygiene and chlorhexidine rinse was advised even then 6 patients had to suffer from food accumulation in the wound in secondary healing technique.

\textbf{CONCLUSION}

These results are in agreement with many of those reported in literature. Since this study is a single operator study, a multi-operator study is needed for a clear guidance of wound closure. Further studies are needed to assess long-term post-operative complication like periodontal defects and sensitivity in relation to the second molar. The results obtained in this study enable us to conclude that, in cases of equal intraoperative difficulty, open healing of surgical wound after removal
of impacted third molars produces less postoperative swelling and pain than that occurs with closed healing by hermetically sealed socket.

REFERENCES


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Periumbilical Incision Versus Intraumbilical Incision for Laparoscopic Appendectomy: A Randomized Comparative Study

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Abstract

Introduction: The periumbilical (PU) incision is more commonly used for single incision laparoscopic surgery than the intraumbilical (IU) incision. Till now, no study on Indian population has compared the adverse outcomes of PU and IU incisions on the post-operative outcome in patients. We observed the wound complication rates of patients undergoing appendectomy according to the types of laparoscopic surgical approach.

Materials and Methods: A randomized prospective observational study was conducted on 320 patients presenting for laparoscopic appendectomy. 155 patients in group IU were operated with the IU incision and 165 patients in group PU were operated with the PU incision. We compared the post-operative outcomes according to the type of laparoscopic incision.

Results: In both the groups operation time, post-operative hospital stay and post-operative analgesic requirement were similar. Two cases (1.2%) in the IU group IU and five cases (3%) in the PU group PU developed wound infections. The umbilical complications rate was comparable (P > 0.05).

Conclusion: The IU incision being relatively easier to perform and has better cosmetic results and seems to be a safe and feasible alternative for the PU incision for single port laparoscopic appendectomy.

Key words: Intraumbilical incision, Periumbilical incision, Single port laparoscopy

INTRODUCTION

Laparoscopic surgery has become increasingly popular with the various fields of general surgery.¹⁻³ The creation of pneumoperitoneum requires an periumbilical (PU) incision or intraumbilical (IU) incision to introduce the needle into the abdomen. The PU incision is a commonly used method for the initial approach of the laparoscope into the abdomen.⁴⁻⁵ It is often U-shaped placed below or above the umbilicus and it cuts through the skin, the subcutaneous fat, and the fascia. In contrast for the IU incision a vertical linear incision dividing the skin and fascia are needed to reach abdominal cavity. Since for IU incision less fascial tissue needs to be separated so it is easier to perform, less traumatic and has gained popularity for use in the single incision laparoscopic surgery, which has been proven to be a feasible alternative for conventional laparoscopic surgery with better cosmetic merit.⁶⁻⁷ The umbilicus has long been considered as a store house of bacteria contributing to post-operative abdominal port wound infection for laparoscopic surgery.⁵ There are no studies which has compared the complication rates of the IU and PU incisions for single port laparoscopic appendectomy. We hypothesized that with adequate cleaning and preparation of the umbilical ring it becomes devoid of its excess bacterial flora like the skin surrounding the umbilicus after cleaning and preparation and that the wound infection rate will show no difference. To test our hypothesis, we designed a randomized prospective study to compare the post-operative wound complication rates.
of patients treated with laparoscopic appendectomy using the IU and the PU approach.

MATERIALS AND METHODS

After institutional ethical clearance and departmental permission, this prospective observational study was conducted concurrently in the various medical colleges of Assam, among the patients presenting for laparoscopic appendectomy by a total of 12 surgeons from January 2012 to December 2015. The patients age, weight, and other relevant demographic data were recorded patients having severe systemic disease were excluded from the study group. The patients were familiarized with the study procedure and consent was obtained from all patients. A total of 343 patients were enrolled into this study who presented for elective and emergency appendectomy (Figure 1). 23 patients were excluded due to demand for open surgery and due to associated severe systemic disease. A total of 320 patients were observed after exclusion. Patients were then assigned to the group IU or the group PU based computerized randomization.

Outcome variables studied were wound complication rate, duration of hospital stay and amount of tramadol consumption on post-operative day 1. All complications were recorded and reviewed. Post-operative umbilical complications included any cases of wound infection and/or hematoma formation. Any case of internal organ injury related with the insertion of the umbilical trocar were recorded. All patients received antibiotics intravenously at induction of anesthesia as per hospital protocol. In group IU, the umbilicus was cleaned thoroughly preoperatively with cotton swabs, using alcohol. Intraoperative routine manual cleaning was also performed in both the Groups IU and PU. After cleaning the umbilicus retroperitoneally, skin preparation was done in both the groups using 10% betadine. In group IU, a midline incision was made inside the umbilicus. With slight retraction of the skin on both sides of the umbilicus using tissue forceps the fascia lying below the umbilicus was visualized and with further dissection the peritoneal cavity was easily entered. Whereas in group PU, a U-shaped incision below the umbilicus was made. The subcutaneous fat was dissected, and the exposed fascia was opened using electrocoagulation. After opening of the fascia, either direct trocar insertion or insertion after insufflation with a Veress needle was done. We used an 11 mm trocar for

Figure 1: Consort flow diagram
the umbilical port. Laparoscopic appendectomy using conventional technique was done. To avoid contamination of the fascia or skin, the appendix was retrieved from the peritoneal cavity within a Lap-bag through the umbilical port in all of our study patients. Postsurgery in group IU, a single full layer suture at the midpoint using absorbable suture material (Vicryl, Ethicon Inc., Somerville, NJ, USA) was used for wound closure, without the need for any additional sutures for the subcutaneous fat or skin. A piece of rounded dry gauze was placed in the umbilicus and adhesive bandage was applied. In group PU, after appendectomy wound closure was done in a layers, with separate closure for the fascia, the subcutaneous fat, and the skin. An abdominal drain was placed through a separate pelvic incision if required in both the groups. For post-operative pain control opioid analgesic Tramadol 50 mg slow IV was given to patient on request and repeated if necessary. Post-operative injection tramadol consumption was recorded up to the first 24 h. Postoperatively, the patients were administered two or more further doses of antibiotics. Patients were observed in surgical ward postoperatively and every 24 hourly wound dressing was done to observe for any signs of wound infection. Patients were discharged as per hospital protocol and asked to come for review at the outpatient department after 7 days or immediately if they had any wound discharge. The study was done as a pilot study hence sample size calculation was not done. The data obtained from these patients was analyzed using SPSS version 21.0. The data were tested for normality and compared using appropriate statistical tests. Any P value > 0.05 was considered statistically significant.

**RESULTS**

In our study, the IU incision was used for 155 patients and the PU incision was used for 165 patients for laparoscopic appendectomy. There was no statistically significant difference in the demographic parameters of the patients in both groups (Table 1).

The mean age of the IU group was 48.35 years, and the mean age of the PU group was 46.6 years. The IU group consisted of 98 males (63.2%) and 57 females (36.8%), and the PU group consisted of 102 males (61.8%) and 63 females (38.2%). The mean body mass index of the IU and PU groups was 24.65 kg/m² and 23.89 kg/m², respectively. Their operation time between the two groups (64.52 min for IU vs. 63.78 min for PU) was comparable (Table 2).

Duration of post-operative hospital stay was 5 days in both the IU and PU groups. The mean post-operative tramadol consumption was 220 mg in the IU group and 228 mg in the PU group. There were 2 cases of umbilical infection in the IU group (0.13%) compared with 5 cases of umbilical infection in the PU group (3%), with no statistical significance (P = 0.32). There were no incidences of internal organ injury caused by trocar insertion in any group.

**DISCUSSION**

The search for better surgical cosmetic results led to the invention of laparoscopic key hole surgery. Laparoscopy used for appendectomy has significantly increased with the introduction of single port laparoscopic surgery. This method left virtually no scar after surgery. Similarly, Vidal et al. used a single-incision laparoscopic surgery performed with a suprapubic approach which left no apparently visible scar due to the pubic hair. In spite of these newer advances the PU incision for laparoscopy is still being widely used in our country. Lee et al. reported that single incision laparoscopic appendectomy performed with an IU incision had lower incidence of complications compared to open appendectomy and that infection rates were actually lower in the single incision group. Based on this observation, we compared laparoscopic single port appendectomy using the IU and PU approaches for our study, to observe which approach gave better postoperative results. In our study, the wound complication rates of the PU and IU approach did not show any significant difference. Wound infection was observed for 2(1.3%) patients in the IU group and 5(3%) patients in the PU group. All the patients were followed up at the outpatient clinic 7 days after.

| Table 1: Demographic parameters between the IU and PU groups |
|-----------------|-----------------|-----------------|
| Variable | IU group (n=155) | PU group (n=165) | P |
| Age (years) | 48.35±6.75 | 46.63±8.25 | 0.39 (t) |
| Sex ratio (male/female) | 98/57 | 102/63 | 0.35 (c) |
| Body mass index (kg/m²) | 24.65±3.23 | 23.89±4.53 | 0.08 (t) |
| Operation time (min) | 64.52±8.5 | 63.78±5.34 | 0.38 (t) |
| Systemic disease | 68 | 72 | |

PU: Periumbilical, IU: Intraumbilical

| Table 2: Post-operative outcomes in both IU and PU groups |
|-----------------|-----------------|-----------------|
| Variable | IU group (n=155) | PU group (n=165) | P |
| Duration of hospital stay (days) | 5 | 5 | 1 (C) |
| Postoperative tramadol consumption (mg) | 220±35 | 228±45 | 0.07 (t) |
| Wound infection (%) | 2 (1.3%) | 5 (3%) | 0.32 (C) |
| Major organ injury (%) | 0 | 0 | - |

PU: Periumbilical, IU: Intraumbilical
discharge. Of the 5 patients in the PU group, 3 patients had experienced mild serous wound discharge and 2 patients had dehiscence of the wound postoperatively, requiring suturing under local anesthesia. All our study patients had complete healing of the laparoscopy wound within 30 days. The lower incidence of complication observed in the IU incision could be because in this approach the subcutaneous layer of the abdomen is not penetrated, hence there is a less potential for seroma or hematoma formation, which mainly leads to postoperative wound infection. The PU incision on the other hand leaves an obvious scar close to the umbilicus, where healing may not always take place perfectly. For the IU incision, the entire incision is contained within the umbilical ring which itself contains many skin folds making the scar virtually invisible. The IU incision is easy to perform as the fascia lies directly beneath the umbilical skin with virtually no subcutaneous fat hence the peritoneal cavity is entered with minimal dissection. Second, the close proximity of the layers also allows for a much faster closure of an IU wound. In most of our patients, a single full layer suture was sufficient for port closure. In comparison, the PU incision needed a more laborious process of closure, meaning the fascia, the subcutaneous fat, and the skin all had to be separately closed. In the case of an obese patient with a thick layer of subcutaneous fat, the opening and closure of the PU trocar site is often quite difficult. In contrast by using the IU approach and with lateral retraction of the skin on both sides of the umbilicus, the umbilical ring is easily exposed in even obese patients. All types of laparoscopic surgeries may benefit from applying the IU incision. This study was somewhat limited in that it was a prospective study, and we did not evaluate the incidence of incisional hernia which may occur in our patients after few years. Effects of systemic disease on the wound healing, such as perioperative glycemic status and body oxygen levels, were not assessed.

CONCLUSION

The IU incision is a safe and feasible alternative for the PU incision that can be easily performed with better cosmetic results. Our results have shown that despite the widespread belief that an IU incision will cause more wound infection actual wound complication rates are lower compared with PU incision.

REFERENCES


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Evaluation of the Functional Outcome of Total Knee Arthroplasty Posterior Cruciate Ligament Retaining Versus Sacrificing

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Abstract

Introduction: The role of posterior cruciate ligament (PCL) into total knee replacement is controversial. Theoretically, it has been suggested that PCL retaining can produce femoral rollback, which increases the range of flexion and prevents posterior translation. This in effect, reduces loosening and excessive polyethylene wear by decreasing the shear stresses at the fixation surfaces.

Aim: The aim of the study is to prospectively compare the functional outcome of primary total knee replacement between patients in whom PCL was retained with those in whom it was sacrificed using the Knee Society knee scoring and functional knee score (FKS) and Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) questionnaires.

Materials and Methods: This is a prospective study in which 26 patients were randomly selected, and PCL retaining surgery was done for some patients and PCL sacrificing surgery was done in the remaining patients. WOMAC score, total knee score, and FKS were used to assess outcome.

Conclusion: Total knee arthroplasty inpatient in which PCL was sacrificed was found to have a better functional outcome as compared to the retaining group, which can be mainly attributed to the persistence of flexion deformity in cruciate retaining group.

Key words: Arthroplasty, Osteoarthritis knee, Posterior cruciate ligament retaining, Posterior cruciate ligament sacrificing

INTRODUCTION

The role of posterior cruciate ligament (PCL) in total knee replacement is controversial.¹ Theoretically, it has been suggested that PCL retaining can produce femoral rollback, which increases the range of flexion and prevents posterior translation.²³ This in effect, reduces loosening and excessive polyethylene wear by decreasing the shear stresses at the fixation surfaces. We conducted a prospective study to compare resection with retention of PCL using a standard PCL retaining cemented total knee replacement and assessed the functional outcome using functional knee scores (FKSs) and Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) score during the period between January 2 flexion/extension, the axis for this movement can be simplified as a horizontal line passing through the femoral medial and lateral epicondyles. Although the transepicondylar axis represents the axis of flexion and extension, this axis is not truly fixed but keeps shifting during range of motion which is because of the incongruent large articular surface of femur and small tibial condyle creating a problem when the femur flexes on the fixed tibia.⁴

Aim

The aim of the study is to prospectively compare the functional outcome of primary total knee replacement between patients in whom PCL was retained with those in whom it was sacrificed using the Knee Society Knee Scoring and FKS and WOMAC questionnaires.
MATERIALS AND METHODS

This is a prospective study conducted in the Department of Orthopaedics, Tirunelveli Medical College Hospital. The Institutional Ethics Committee approval and informed consent from the patients were obtained. Inclusion criteria: Osteoarthritis (OA) and rheumatoid arthritis, this includes varus as well as valgus knees, age >50 years, Kellgren and Lawrence Grade 3 and 4. Exclusion criteria: Age <50 years, minimal degenerative changes (KL I and II), poor skin conditions, posttraumatic arthritis, varicose veins.

Criteria for retaining PCL:
- Structurally intact PCL
- Fixed flexion deformity of <15°
- Varus of <10°
- Valgus of <10°

Criteria for sacrificing PCL:
- Fixed flexion deformity of more than 15°
- Valgus or varus more than 10°
- Structurally contracted PCL
- Technical inability to properly balance PCL.

Surgical Technique

For a successful total knee replacement, meticulous planning and evaluation is a must, and a neatly performed surgery has a better outcome (25,27). Pre-operative detailed history of the patient's complaints is obtained regarding the duration of pain, the daily activities affected out of the disease. Any infective focus, varicose vein, deep vein thrombosis must be ruled out. Clinical evidence for any ligamentous instability is also checked. Blood investigations were performed to rule out any inflammatory pathology with the patient in the supine position. Two bolsters were fixed using plaster to the table for allowing knee flexion of 30° and 90°. Surgery was done under epidural anesthesia. The most commonly used skin incision for total knee arthroplasty is anterior midline incision. Skin incision extends from 4 cm above the patella to 4 cm below the patella. Medial parapatellar approach is used commonly as this approach can be easily extended or converted to a more extensive traditional approach when additional exposure is necessary. Arthrotomy is performed about 1-2 cm above the superior pole of the patella, and extended to the level of the tibial tubercle. Soft tissue release, femoral sizing, extramedullary tibial resection femoral preparation, A-P femoral resection, trail femoral component is applied to the resected distal femur, and the femoral lock punches are made. Attach a quick-connect handle to a stemless trial one size below the femoral component size and place on the cut tibia to assess coverage. As needed, additional sizes should be template using the stemless trials. Once the appropriate size is determined, pin the medial size of the selected stemless trial with a short-headed pin.

RESULTS

All the 20 cases which had regular follow-up were taken into the study, and the average follow-up was from a minimum of 3 months to 18 months. We had the following observations: and in the rest, it was sacrificed. The functional outcome between the posterior CR and the cruciate sacrificing (CS) groups were compared using the American knee society scoring and the FKS and WOMAC questionnaire and the following observations were made.

Overall all the patients, in both the groups, had great improvement in the knee scores. The pain score (including stair climbing) in the posterior CS was on average 42.6 (out of 50) and that of CR group was 37. Stair climbing score was 11.3 (out of 15) and 9 in the PCL sacrificing and retaining groups, respectively, as compared to the pre-operative score of 4.6 and 5 (Table 1).

The mean range of movements in the CS and CR groups had a great improvement with post-operative scores 19.5 (max 25) and 18.4 in PCL sacrificing and retaining groups, respectively. The overall average knee score was 85.8 for posterior CS and 75.6 for the CR patients as compared to the pre-operative score of 43.4 and 38 (Table 2). FKS was 99.6 and 91.6 for CS and CR groups, respectively. The pre-operative FKS was 37.8 and 38 in these groups. The WOMAC score also showed a marked improvement.

<table>
<thead>
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<th>Category</th>
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<th>P value</th>
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<tr>
<td></td>
<td>CR</td>
<td>5</td>
<td>34.00±2.236</td>
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<tr>
<td>Stairs</td>
<td>CS</td>
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<td></td>
<td>CR</td>
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<td>14.00±2.236</td>
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<tr>
<td>Total pain score</td>
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</tr>
<tr>
<td></td>
<td>CR</td>
<td>5</td>
<td>48.00±4.472</td>
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</tr>
</tbody>
</table>

CS: Cruciate sacrificing, CR: Cruciate retaining

Table 1: Walk, stairs, and total pain score for CS shows more score which is significantly more which indicate that CS surgery gives more functional result

<table>
<thead>
<tr>
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<th>Type</th>
<th>n</th>
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<th>P value</th>
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</tr>
<tr>
<td></td>
<td>CR</td>
<td>5</td>
<td>75.00±6.124</td>
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</tr>
</tbody>
</table>

CS: Cruciate sacrificing, CR: Cruciate retaining

Table 2: Total knee score analyzed for CS and CR revealed that highly significant total knee score is for CR

The mean range of movements in the CS and CR groups had a great improvement with post-operative scores 19.5 (max 25) and 18.4 in PCL sacrificing and retaining groups, respectively. The overall average knee score was 85.8 for posterior CS and 75.6 for the CR patients as compared to the pre-operative score of 43.4 and 38 (Table 2). FKS was 99.6 and 91.6 for CS and CR groups, respectively. The pre-operative FKS was 37.8 and 38 in these groups. The WOMAC score also showed a marked improvement.
from 66.3 to 24.6 in CS groups and 27.4 for CS and CR, respectively.

**DISCUSSION**

Analyzing the total knee scores, the average knee society score for the CS group was 85.80 and that of CR group was 75.60 and statistical analysis revealed a significant difference in the $P$ value in favor of CS prosthesis signifying that CS prosthesis has better functional outcome. Total knee score in a study conducted by Bolanos et al., was 84 and 76 for CS and CR groups, respectively, which shows comparable results.\(^5\)

Total knee replacement is a surgical procedure to replace the weight-bearing surfaces of the knee joint to relieve pain and disability. It is most commonly performed for OA and also for other knee diseases such as rheumatoid arthritis and psoriatic arthritis. In patients with severe deformity from advanced rheumatoid arthritis, trauma, or longstanding OA, the surgery may be more complicated and carry higher risk. Analyzing the functional outcome, it was found that all the patients in both the groups had significant improvement in their knee score and the FKS. On the comparison between the two groups, in those patients in whom the cruciate ligament was sacrificed had an average knee score of 85.8 and a FKS of 99.6, whereas in whom the PCL was retained the knee score was 75.6 and functional score was 91.6. A similar prospective study conducted by Dorr et al., in 1998, has similar results.\(^6,7\)

We were able to achieve a flexion of 100-110° in all our patients, and statistically, there was no much difference between CR and CS groups. The range of motion in a study conducted by Becker et al., in 1991, revealed similar flexion results in both studies. The pain score showed a marked improvement in all the patients with an average of 42.6 in CS group as compared to 37 in CR group. Statistical analysis revealed a significant difference in $P$ value for all the variables of pain score (walking and climbing) which was in favor of the CS group signifying that they had a better improvement in pain score.\(^8\)

The functional knee society score also showed a marked improvement in all patients, for CS group, FKS was 99.6, and for CR group, it was 91.6. Statistically, there was no significant difference. The WOMAC score also showed a marked improvement. In CS groups, it was 24.6; in CR groups, it was 27.4. Statistical analysis showed a highly significant difference in favor of CS prosthesis. WOMAC scoring in an international study by Borque et al. showed WOMAC score for 25 and 28.2 for CS and CR, respectively, which are comparable.\(^7\)

**CONCLUSION**

Total knee arthroplasty in patients in whom PCL was sacrificed was found to have a better functional outcome as compared to the retaining group, which can be mainly attributed to the persistence of flexion deformity in CR group. In Indian scenario here knee replacement is done at a late stage of OA, sacrificing the contracted PCL has better outcomes as compared to retaining it.

**REFERENCES**

Anesthetic Experience with I-Gel in Pediatric Patients by Residents in a Tertiary Care Hospital: An Observational Study

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Abstract

Introduction: The objective of this study was to demonstrate and determine the depth of insertion of I-gel in pediatric patients undergoing short surgical procedures and to tabulate the experience of using I-gel by the residents.

Methods: As there was no horizontal line in the pediatric I-gel sizes 1, 1.5, 2, and 2.5 (representing the correct position of the level of tooth after insertion), so the ideal depth of I-gel insertion could not be elucidated. Hence, this study was conducted. In this randomized prospective single hospital study 200 children, aged 1-12 years, the American Society of Anesthesiologists score I-II, weighing 5-35 kg undergoing minor surgical procedures, were observed. I-gel sizes used were 1.5, 2, and 2.5, respectively, as per body weight. The following characteristics were evaluated: I-gel placement time, the distance from the connector wing to the teeth level of patient post placement, success rate of the I-gel airway and gastric tube placement, oropharyngeal leak pressure and any associated complications. Statistical data was analyzed using appropriate statistical tests and any \( P < 0.05 \) was considered statistically significant.

Results: I-gel placement was 100% successful for sizes 2 and 2.5 and 95.4% for I-gel size 1.5. The overall I-gel placement success rate and the success rate at first attempt were 99% and 95%. The insertion distance from the connector wing to the teeth was estimated to be 4.4-6 cm for 1.5 size, 5.2-6.4 cm for 2 size, 4.5-6.9 cm for 2.5 size I-gel, respectively.

Conclusion: These results show that the I-gel is a safe and effective airway device for use by residents who probably do not have enough experience with the use of I-gel.

Key words: I-gel, Pediatric airway, Supraglottic airway device

INTRODUCTION

The I-gel™ (Intersurgical, UK) is a second generation single use, supraglottic airway device, made up of thermoplastic elastomer. The device is transparent and latex free and has a gel like cuff made of styrene ethylene butadiene styrene which provides a noninflatable anatomical seal of the pharyngeal and perilaryngeal structures.¹ Compared to the adult variants, the pediatric variants of I-gel size 1, 1.5, 2, and 2.5 lack a depth insertion marker. Hence, identification of proper placement of these pediatric variants of I-gel is difficult. The safety and efficacy of I-gel in Indian pediatric and adult population has been proved by anesthesiologist experienced in placing supraglottic airway devices,²³ but the safety and efficacy of the I-gel at the hands of inexperienced anesthesia residents has not been evaluated neither has been the adequate depth of I-gel placement ever evaluated in the Indian pediatric population. Hence, we designed an observational study to document the experience of residents while using the I-gel sizes 1.5, 2, and 2.5 in pediatric patients. Our aim was to determine the success rate, ease of insertion, insertion time, and insertion depth of I-gel. Furthermore observed were the oropharyngeal leak pressure, ease of placement of
gastric drain tube through I-gel and complications during insertion if any.

**MATERIALS AND METHODS**

After approval from the institutional ethics committee and departmental permission, this prospective observational study was conducted jointly under the Department of Anaesthesiology and Critical Care and the Department of Paediatric Surgery, Gauhati Medical College, Guwahati Assam, India. For our study, 200 children were observed over a period of 4 months. Informed consent was obtained from the parents before the start of this study. Children of the American Society of Anesthesiologists (ASA) I or II, aged between 1 and 12 years, weighing between 5 and 35 kg undergoing elective procedures in supine position of <90 min duration such as hypospadias repair, colostomy closure, herniotomy, orchiopexy, circumcision, rectal polyp etc. Removal were included in our study population. Exclusion criteria included patients having anticipated difficult airway, oropharyngeal pathology, at risk of aspiration and patients undergoing thoracic, neurosurgical, spine or otolaryngological procedures. They were divided into three groups based on body weight, Group 1: 5-12 kg (N = 42), Group 2: 12.25 kg (N = 98), and Group 3: 25-35 kg (N = 60). All patients were premedicated with nasal midazolam 0.3 mg/kg 20 min before the start of the operative procedure. Standard perioperative monitoring was performed as per ASA guidelines. Patients were administered injection fentanyl 2 mcg/kg intravenous (IV) before induction. Inhalational induction with sevoflurane in oxygen or IV with propofol 2 mg/kg was done. Muscle relaxant injection atracurium 0.5 mg/kg was used at the time of induction followed by divided doses if required intraoperatively. When the patient was in an adequate plane of anesthesia a lubricated I-gel of appropriate size was inserted into the oral cavity, directed posteriorly against the hard palate and advanced with gentle pressure until the resistance was felt. To aid I-gel placement jaw thrust or slight twisting of device in the oropharynx were performed. Correct placement of I-gel was assessed by a visible chest expansion, the absence of audible leak and a square-shaped capnogram observed during ventilation. After proper fixation of the I-gel, lubricated gastric tube of appropriate size was placed through the gastric channel in all the patients. Anesthesia was maintained with O₂ and N₂O in (1:1) ratio with sevoflurane 2% using a circle absorber with controlled ventilation. All patients were ventilated with a tidal volume of 6-8 ml/kg to maintain an end-tidal carbon dioxide between 30 and 40 mmHg. The following parameters were noted ease and success rate of I-gel insertion, number of insertion attempts, insertion distance (ID), I-gel insertion time (IT), oropharyngeal leak pressure, ease of I-gel, and gastric tube insertion, any complications associated.

**Ease of I-gel placement** was evaluated as per Tandale et al.³ and further graded as:
- **Very easy:** No resistance to insertion in the pharynx in a single maneuver
- **Easy:** When insertion into the pharynx required maneuver like jaw thrust
- **Difficult:** When more than two manoeuvres were needed such as device rotation and jaw thrust.

**Insertion Distance (ID) of I-gel**
Distance from the connector wing of I-gel to the teeth position marked after fixing the I-gel.

**Insertion Time (IT) of I-gel**
Time between pick up of device and establishment of adequate ventilation.

**Oropharyngeal leak pressure** was determined by closing the expiratory valve of the circle system at a fixed gas flow of 3 L/min and observing the airway pressure at which an audible leak and/or an audible noise with stethoscope placed just lateral to thyroid cartilage was heard.

Failure of I-gel airway placement was defined as failing to achieve adequate ventilation with two attempts of I-gel insertion. In the case of failure to achieve adequate ventilation with two attempts of I-gel, endotracheal intubation was done, and it was considered as a failure of I-gel airway. At the end of surgery, stomach was aspirated with the help of the gastric tube and neuromuscular blockade was adequately reversed in patients. Clinical judgment was used to determine the best time for removal of the I-gel after appearance of airway reflexes. All the I-gel placement in our study, patients were done under the supervision of experienced anesthesiologist by anesthesia residents having very less experience with the use of I-gel in pediatric patients.

Ease of I-gel placement was evaluated as per Tandale et al.³ and further graded as:
- **Very easy:** No resistance to insertion in the pharynx in a single maneuver
- **Easy:** When insertion into the pharynx required maneuver like jaw thrust
- **Difficult:** When more than two manoeuvres were needed such as device rotation and jaw thrust.

The ease of placement of gastric drainage tube through I-gel was recorded as per Tandale et al.³ and further graded as:
- **Easy:** Passage of gastric drainage tube without resistance and confirmed by auscultation over epigasrium
- **Difficult:** Resistance to placement of gastric drainage tube requiring manipulation of I-gel.

**Statistical Analysis**
The statistical analyses was done using “GraphPad InStat-version 21.0” software. Data obtained as per predesigned proforma (Annexure 1) was entered into Microsoft Excel spreadsheet and assessed using appropriate statistical methods using two-tailed t-test, Chi-square test and Mann–Whitney test wherever applicable. Data was expressed as mean and standard deviation, proportion. As no previous data regarding insertion depth of I-gel was available in the
Indian pediatric population, our study was a pilot study conducted to obtain data on the depth of insertion needed for pediatric I-gel, based on which future trials could be conducted.

RESULTS

Demographic parameters and mean surgical time of our study patients are represented in Table 1.

The ID of I-gel in Groups 1, 2, and 3 varied as 4.4-6, 5.2-6.4, and 4.5-6.9 cm, respectively (Figure 1). The mean ID of I-gel was greatest in Group 2 patients and the lowest in Group 1 patients.

The overall I-gel placement success rate was highest in Groups 2 and 3 patients with the highest first attempt success rate observed in Group 3 patients (Table 2). Successful placement of I-gel at first attempt was possible in overall 95% of the patients (Table 3).

The mean insertion time of I-gel was highest in Group 2 and lowest in Group 1 patients, the insertion time observed in Groups 1, 2, and 3 patients varied as 15-19, 15-23, and 16-20 s, respectively (Figure 2).

I-gel placement was very easy in 92%, easy in 6%, and difficult in 1% of the patients (Table 2). Highest ease of insertion of I-gel was noted in Group 2 patients, insertion was most difficult in Group 1 patients. In 2 patients of Group 1 (1%), I-gel could not be inserted (Table 2).

Nasogastric tube placement through I-gel was successful in our study patient. Gastric tube placement through I-gel was easiest among Group 3 patients and most difficult among Group 1 patients (Table 4).

The mean airway leak pressure was highest in Group 2 and lowest in Group 3 patients (Figure 3).

Higher incidence of complication was observed in Group 1 patients compared to Group 2 and 3, I-gel displacement being the most common complication observed in our study patients (Table 5).

DISCUSSION

The study was conducted to evaluate the safety and efficacy of the I-gel supraglottic airway device in children across a wide spectrum of age and various I-gel sizes. We successfully evaluated the various sizes of I-gel in pediatric patients in a large study population. Our study results showed that I-gel had provided an effective airway in 198 (99%) children. The ID for 1.5, 2, and 2.5 size I-gel was observed to be 4.4-6, 5.2-6.4, and 4.5-6.9 cm, (95% confidence interval) respectively, which was similar to study

### Table 1: Patient demographic and clinical profile

<table>
<thead>
<tr>
<th>Demographic variables</th>
<th>Group 1 N=42</th>
<th>Group 2 N=98</th>
<th>Group 3 N=60</th>
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<tr>
<td>Age (months)</td>
<td>14±5</td>
<td>60±8</td>
<td>108±10</td>
</tr>
<tr>
<td>Gender (M/F)</td>
<td>30/12</td>
<td>64/34</td>
<td>38/20</td>
</tr>
<tr>
<td>Weight (kg) (M/F)</td>
<td>5±2/6±1</td>
<td>12±3/14±5</td>
<td>23±6/29±7</td>
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<tr>
<td>Inhalation/IV induction</td>
<td>32/10</td>
<td>74/24</td>
<td>42/18</td>
</tr>
<tr>
<td>Surgical time (min)</td>
<td>56±16</td>
<td>68±14</td>
<td>58±24</td>
</tr>
</tbody>
</table>

IV: Intravenous

### Table 2: Ease of placement score for I-gel

<table>
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<th>Parameters</th>
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<th>Group 2 N=98 (%)</th>
<th>Group 3 N=60 (%)</th>
<th>Overall success (%)</th>
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</thead>
<tbody>
<tr>
<td>Very easy (1)</td>
<td>35 (83.3)</td>
<td>93 (94.9)</td>
<td>56 (93.33)</td>
<td>92</td>
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<tr>
<td>Easy (2)</td>
<td>3 (7)</td>
<td>5 (5.1)</td>
<td>4 (6.67)</td>
<td>6</td>
</tr>
<tr>
<td>Difficult (3)</td>
<td>2 (4.7)</td>
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### Table 3: Success rate of I-gel

<table>
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<tr>
<th>Parameters</th>
<th>Group 1 N=42 (%)</th>
<th>Group 2 N=98 (%)</th>
<th>Group 3 N=60 (%)</th>
<th>Overall success %</th>
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<tr>
<td>Insertion attempts 1</td>
<td>38 (90.4)</td>
<td>93 (94.89)</td>
<td>59 (95)</td>
<td>95</td>
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<tr>
<td>Insertion attempts 2</td>
<td>2 (4.7)</td>
<td>5 (5.11)</td>
<td>1 (5)</td>
<td>4</td>
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<tr>
<td>Overall</td>
<td>95.1</td>
<td>100</td>
<td>100</td>
<td>99</td>
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</table>
done by Abukawa et al.5 to evaluated the safety and efficacy of I-gel in African pediatric population. Two patients in our study had failure of I-gel placement, requiring endotracheal intubation. I-gel placement was 100% successful for I-gel sizes 2 and 2.5 and 95.4% for I-gel size 1.5. The overall I-gel placement success rate and the success rate at first attempt were 99% and 95%, similar to the results obtained by Abukawa et al.5 Beringer et al.6 who had prospectively observed the use of I-gel sizes 1.5, 2, and 2.5, had also obtained similar I-gel placement success rate, in spite of the fact that there experienced anesthesiologist had performed I-gel placement compared to inexperienced residents in our study. Overall I-gel insertion time observed in our study ranged from 15 to 20 s. I-gel insertion time of 11-19 s in adult and pediatric patients has been reported as per available literature.7,8 Abukawa et al.5 had reported a higher mean I-gel insertion time of 24 s which was probably due to operator inexperience. The oropharyngeal leak pressure observed in other studies varied between 18 and 28 cm of water.5-9 Gastric tube placement through I-gel was difficult in 1.5% of the patients for sizes 1.5 and 2 compared to Tandale et al.4 where <1% of patients had difficult gastric tube placement through 1.5 size. Saran et al.10 had compared the use of I-gel and ProSeal laryngeal mask airway among pediatric patients and had obtained similar success rate for I-gel. The fact that in the study by Saran et al.10 I-gel placement was done by an anesthesiologist experienced in placing supraglottic airways compared to inexperienced residents in our study; further validates our study results. Complications such as displacement, hypoxia, and trace bleeding were observed in few of our study patients and were mostly observed with the size 1.5 of I-gel. Higher incidence of I-gel placement failure, difficulty in gastric tube insertion, and complications were mostly observed with the 1.5 size of I-gel.

Limitations of our study include nonconfirmation of proper I-gel placement using a fiberscope. Our study did not estimate the ID of I-gel in infants. Neither randomisation nor blinding could be done in our study patients. Multicentric prospective studies are needed to reconfirm our study results.

CONCLUSION

Our study showed that I-gel airway is a safe and effective device for use by the resident anesthesiologist for perioperative pediatric airway management.

REFERENCES


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

ANNEXURE 1

Proforma
Name: Sex:
Age: Hospital No.:
Address: MRD No.:
Phone No.:
Weight: Height:

History
Patient having any history of the following:
• With difficult airway or anticipated difficult airway (Yes/No)
• Oropharyngeal pathology (Yes/No)
• Risk of aspiration (Yes/No)
• Undergoing thoracic, neurosurgical, spine, and ENT procedures (Yes/No)

Examination
ASA status: MET:
Pulse: Blood pressure:
Chest: CVS:
CNS:

I-gel Assessment
Correct placement of I-gel assessment:
• Symmetrically visible chest expansion (Yes/No)
• A square-shaped capnograph (Yes/No)
• Absence of audible leak during ventilation (Yes/No).

I-gel insertion time (s):
I-gel insertion distance (cm):
Number of insertion attempts:
Ease of insertion of I-gel (Very easy/Easy/Difficult):
Ease of gastric drainage tube through I-gel (Easy/Difficult)
Any maneuver done during I-gel insertion:
Insertion time of I-gel: Time between pick up of device and establishment of adequate ventilation.
Insertion distance (ID): Distance from the connector wing of I-gel to the teeth position marked after fixing the I-gel.
Failure of I-gel airway: Failure to achieve adequate ventilation with two attempts of I-gel insertion.
Oropharyngeal leak pressure: Oropharyngeal leak pressure will be determined by closing the expiratory valve of the circle system at a fixed gas flow of 3 L/min and the airway pressure at which an audible leak and/or an audible noise with stethoscope placed just lateral to thyroid cartilage was heard was noted.
Ease of I-gel insertion was recorded as:
• Very easy: No resistance to insertion of I-gel in the pharynx in a single maneuver
• Easy: When insertion of I-gel into the pharynx required maneuver like jaw thrust
• Difficult: When more than two maneuvers were needed such as device rotation and jaw thrust during I-gel insertion.
The ease of placement of gastric drainage tube was recorded as:
• Easy: Passage of gastric drainage tube without resistance and confirmed by auscultation over epigastrium.
• Difficult: Resistance to placement of gastric drainage tube requiring manipulation of I-gel.
Age-related Changes in Dry Eye Syndrome: A Retrospective Cohort Study

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Abstract

Aim: Dry eyes are a part of the natural aging process. The majority of people over the age of 65 years experience some symptoms of dry eyes. To investigate the age-related changes in dry eye syndrome (DES) and distribution of associated risk factors among a hospital-based population.

Methods: In this retrospective cohort study, we collected the detailed information of clinically diagnosed dry eye patients among a consecutive hospital-based population, including age trends, gender, and associated risk factors.

Results: Maximum number of DES cases recorded in the age group of 41-50 years. 15 eyes are shown severe range of film tear followed by 25 eyes are had moderate film tear.

Conclusion: Middle age people are more prevalent to DES. People must be educated on the quality of eye to lead a healthy lifestyle.

Key words: Dry eye, Keratoconjunctivitis sicca, Risk factors

INTRODUCTION

Dry eye syndrome (DES), also known as keratoconjunctivitis sicca or keratitis sicca, is a multifactorial disease of the tears and the ocular surface that results in discomfort, visual disturbance, and tear film instability with potential damage to the ocular surface.¹ There is no population-based study in relation to dry eye disease in India. However, there are only three published reports on the prevalence of dry eye among hospital-based population from northern and eastern regions of India, and the prevalence varies between 18.4% and 40.8%.²⁻⁵ One small study from high altitude showed a higher prevalence of 54%.⁶ The alterations in any one or more functions of the ocular surface system components with age will cause a disruption of the tear film. This will lead to drying of the ocular surface, which in turns leads to decrease in visual sharpness and subjacent epithelial injury with ensuing inflammation. Dry eye is a multifactorial disease of the ocular surface that results in symptoms of discomfort, visual disturbance, tear alterations, and tear film instability with the damage to the ocular surface.⁷ DES is essentially a clinical diagnosis, made by combining information obtained from the history and physical examination and performing one or more tests to lend some objectivity to the diagnosis. No single test is sufficiently specific to permit an absolute diagnosis of DES.⁸ Symptom questionnaires can be used to help establish a diagnosis of DES and to assess the effects of treatments or to grade disease severity. Studies that may be employed in the workup include impression cytology (e.g., to monitor the progression of ocular surface changes), measurement of tear breakup time, the Schirmer’s test, and quantification of tear components (e.g., through analysis of tear proteins or tear film osmolarity).⁹ The patients with DES were more likely to have comorbidities of ischemic heart disease, hyperlipidemia, cardiac arrhythmias, peripheral vascular disorder, migraines, myasthenia gravis, rheumatoid
arthritis, systemic lupus erythematosus, asthma, pulmonary circulation disorders, and diabetes with complications, hypothyroidism, liver diseases, peptic ulcers, hepatitis B, deficiency anemias, depression, psychoses, and solid tumors without metastasis.10

Aim
The purpose of this paper to study the changes in DES patients in relation to age and to compare the history and adverse events of the various comorbid conditions.

METHODS
A retrospective cohort study was conducted in a tertiary ophthalmic hospital in Tirunelveli. Patients interviewed for this study were already diagnosed with DES. 26 patients were interviewed for the study in all age groups. A structured questionnaire used for this study was designed and validated by concerned institutional ophthalmologist. Detailed history of the patients was recorded including details of sex, age, and other complaints. The questionnaire was developed in English, the interviewer translates the questionnaire to the patients if necessary.

RESULTS
Out of the 26 patients involved in the study, the majority of patients were in the age group of 41-50 years followed by <30 years and 61-70 years, i.e., 38%, 19%, and 19%, respectively. Associated with gender variation, 54% of male and 46% of female patients were studied (Figure 1).

Out of the 26 patients, 48 eyes were diagnosed with DES. Schirmer’s test showed that 15 eyes had <4 mm tear film which is severe and 25 eyes had 4-8 mm tear film which is moderate. Regarding comorbidity, 35% of patients were hypertensive followed by 31% of diabetic patients. The majority of the patients (50%) were taking medications for other diseases (Figures 2 and 3).

High number of patients with DES are computer users from two different age groups of <30 years and 41-50 years. 41-50 years age group patients had an equal number of smoking habit and contact lens users. Patients in the age group of 41-50 years had higher number, pain, and used artificial tears. Patients in the age group of <30 years represented the highest number in using cosmetics. Patients who had dust allergy are high in numbers in the age group of 41-50 years and 51-60 years followed by <30 years’ age group. Cataract is the highest number ocular surgery in the age group of 61-70 years, followed by 41-50 years age group (Figures 4 and 5).
DISCUSSION

In our study, the history of 26 patients with DES was recorded and analyzed. The maximum number of DES cases were recorded in the age group of 41-50 years. Sex-wise distribution of DES did not show much variation among males and females. 15 eyes showed severe range of film tear followed by 25 eyes with moderate film tear. The Schirmer’s test was used to estimate the size of tear film. The sensitivity and specificity in detecting symptomatic subjects were low. One of the major reasons for the low sensitivity and specificity is the heterogeneity of DES. Schirmer’s test yielded the highest number of false positive in one study, However, the high false-positive rate reduces the usefulness of this test in identifying asymptomatic patients. Hypertension and diabetes were the systemic diseases observed with DES. Maximum number of patients with DES are computer users, the age group of <30 years and 41-50 years shown high. 41-50 years of age group had an equal number with smoking habit and contact lens usage. More than smoking habit and contact lens usage shown high number in <30 years age group followed by 41-50 years age group. Cosmetics usage was also a notable point in <30 years age group with high numbers affected eyes. The patients undergone cataract surgery are shown maximum numbers in the age group of 61-70 years followed by 41-50 years age group, >30 years the subject to DES was increased. Dust allergies are high in 2 age groups 41-50 years and 51-60 years, followed by <30 years age group.

CONCLUSION

Our study seems to indicate the DES is the most common in all age groups with no gender variations, due to increased computers use. DES causes considerably economic impact and quality of life significantly. The patients undergo cataract surgery should be informed about the significance of DES. Preservative free artificial drops are beneficial in long-term use for all age groups. A simple method to prevent DES to increase the eye blink rate and it take long way in decreasing the symptoms.

REFERENCES


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Morphological and Histological Features of Human Fetal Thymus Gland

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Abstract

Introduction: Thymus is a primary lymphoid organ and plays a very great role in strengthening of the immune system. The aim of this study is to observe the morphometric and histological changes of thymus gland at different weeks of gestational life of human fetuses.

Materials and Methods: Fifteen human fetuses ranging from 12th to 38th weeks were studied in the Department of Anatomy, Sri Muthukumaran Medical College and Research Institute, Mangadu, Chennai. The fetuses were examined for crown rump length and body weight to assess the gestational age (GA). The length and breadth of the lobes of fetal thymus were noted, and the tissue was processed for histological examination.

Results: The length of the right lobe of thymus gland was 0.2 cm at 12 weeks of gestation and 4 cm at 38 weeks of gestation. The breadth of the right lobe of thymus gland was 0.1 cm at 12th week of gestation and 2.1 cm at 38th week of gestation. The length of left lobe of thymus gland was 0.1 cm at 12 weeks of gestation and 4.5 cm by 38th week. The breadth of the left lobe of thymus gland measured 0.1 cm at 12th week of gestation whereas at 38 weeks it was around 2.1 cm. Formation of lobules were observed during the 12th week and differentiation of cortex and medulla was clearly evident during the 14th week. The presence of Hassall’s corpuscles was observed from 15th week and found to be increased in size and number with an increase of GA.

Conclusion: Morphometry and histological observations of thymus gland show great variation at different weeks of gestation which can be considered during thymectomy and can also be used as reference value during imaging studies.

Key words: Fetal thymus, Histological differentiation, Histology of thymus, Morphometry

INTRODUCTION

The thymus gland is a primary central lymphoid organ and a key regulator of the immune system. It plays a significant role in cellular immunity of the body as T-lymphocytes develop in this organ and maturation takes place within it.¹ The name thymus is derived from the Latin derivative of the Greek word thymus meaning “warty excrescence” because of its resemblance to the flowers of the thyme plant.² The majority of the thymus is located in the middle mediastinum and it grows rapidly during the embryonic life and childhood and reaches its maximum size during the puberty. Thereafter, the growth stops and starts involuting gradually until the old age where the gland is often smaller than at birth.³ The involution of the thymus gland is shown by decrease in the weight of the organ associated with atrophy of lymphoid tissue and replacement by adipose tissue.⁴

The thymus is a bilobed structure which is divided into lobules by connective tissue septa. Each lobule consists of cortex and medulla. At 8th week of gestational life, the two advancing lobes are united at midline and the basophilic stem cell and thymocytes come to lie between the epitheliocytes which can be easily differentiated. Thymus is covered with a connective tissue capsule which is composed of collagenous connective tissue fibers.⁵ Hamilton and Mossman⁶ reported that epithelial cells of developing thymus become loosely arranged to form a reticulum in which small lymphocytes appeared at around 9th week, and soon the vascular mesodermal tissue invaded the gland to produce lobulation.
Sophia and Kalpana: Morphological and Histological Study of Human Fetal Thymus

Lobulation of thymus gland was observed to occur at 10th week by Ghali et al.7 and 12th week by Haar.8 Differentiation of cortex and medulla observed at different timings by different workers - 11th week by Ghali et al.7 and 14th week by Haar.8 Hassall’s corpuscles found to be observed ranging from 8th to 16th week at different gestational age (GA) groups.9

The thymic structures and the microarchitecture of thymus gland are mainly responsible for T-cell differentiation and development of cellular immunity. Hence a thorough understanding of the anatomical and histological features of the developing thymus gland is helpful for analyzing the pathology of the thymic neoplasia. Hence, the main aim of this study is to observe the morphometric and histological changes of thymus gland at different weeks of gestation in human fetuses.

MATERIALS AND METHODS

This study was conducted on 15 human fetuses of different GA groups ranging from 12th to 38th weeks in the Department of Anatomy, Sri Muthukumaran Medical College and Research Institute, Mangadu, Chennai. The fetuses were examined for crown rump length and body weight to assess the GA. The thorax of the fetus was opened by sternoclavicular disarticulation and resection of costal cartilage, and the lower part of the neck was also opened for complete exposure of the thymus gland in its natural location for proper recording.

The fetal specimens were categorized into three groups
- Group I - Up to 12 weeks
- Group II - 13-24 weeks
- Group III - 25-40 weeks.

The length and breadth of the thymus gland were measured, and the specimens were subjected to histological examination. After proper fixation, tissue was subjected to tissue processing and sections of 5 µ thickness were obtained and stained with hematoxylin and eosin. The tissues were examined under ×10 and ×40 magnifications using a binocular microscope. The results obtained were tabulated and analyzed.

RESULTS

Morphometry of Thymus Gland

The length and breadth of both right and left side lobes were measured (Figure 1) and tabulated for each group in Tables 1-3.

The morphometric measurements of thymus gland have been summarized in Tables 1-3. The length of the right lobe of thymus gland was 0.2 cm at 12 weeks of gestation and it is increased to a maximum of 4 cm at 38 weeks of gestation. The breadth of the right lobe of thymus gland increased gradually from 0.1 cm at 12th week of gestation to a maximum of 2.1 cm at 38th week of gestation. The length of left lobe of thymus gland was 0.1 cm at 12 weeks of gestation and increased up to 4.5 cm by 38th week. The

![Figure 1: Right and left lobes of thymus (red arrow) at 34 weeks of gestation](image)

<table>
<thead>
<tr>
<th>Table 1: Group I (up to 12 weeks) – 1 fetus</th>
</tr>
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<tbody>
<tr>
<td>GA (in weeks)</td>
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<table>
<thead>
<tr>
<th>Table 2: Group II (13-24 weeks) – 7 fetuses</th>
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<table>
<thead>
<tr>
<th>Table 3: Group III (25-40 weeks) – 7 fetuses</th>
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<td>GA (in weeks)</td>
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<td>38</td>
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</tbody>
</table>

GA: Gestational age
breadth of the left lobe of thymus gland measured 0.1 cm at 12th week of gestation whereas at 38 weeks it was around 2.1 cm. This shows that the both the right and left lobes shows a gradual increase in their morphological measurements.

**Histological Observations**

Under light microscope, the observation of the following groups at different gestational weeks was as follows:

**Group I (up to 12 weeks)**

The gland was seen to be made up of plenty of lymphocytes which are covered by a thin delicate capsule. Lobulation had just started with no distinct differentiation of cortex and medulla. Hassall's corpuscles were not seen at this stage. Trabeculae associated with blood vessels were recognizable (Figure 2).

**Group II (13-24 weeks)**

The gland was observed to be surrounded by a connective tissue capsule. The connective tissue trabeculae extended between the lobules, while the lobulation was still advancing at this stage. The number of lobules increased in number with the increase of GA. Cortex and medulla differentiation was observed from 14th week, and the peripheral part of the lobule which is darkly stained and heavily infiltrated with lymphocytes is its cortex while the central part of the lobule with few lymphocytes and lightly stained is its medulla. Hassall's corpuscles could not be seen until 14th week. Hassall's corpuscles were clearly visible in the medulla from 15th week and it also increased in size and number with an increase of GA. Blood vessels seen were extensive in between the lobules. Macrophages and monocytes were also observed at this stage (Figure 3).

**Group III (25-40 weeks)**

Each lobe seen to be surrounded by connective tissue capsule which extends into the lobe to form septa and divided the lobes into many lobules. Each lobule has an outer cortex and inner medulla. The trabeculae were seen extending into the cortex while the medulla remains undivided. The thymic tissue of each lobule is continuous with that of other lobules in the central part of each lobe. The blood vessels clearly evident at this stage.

The parenchyma of the cortex found to be made up of densely packed lymphocytes which occupy the spaces in the cytoreticulum. Lymphocytes were few in number in the medulla, and the cytoreticulum is clearly visible. The medulla of the adjoining lobules is seen to be continuous with each other. There is a clear demarcation between cortex and medulla forming a distinct corticomедullary junction.

Hassall's corpuscles were observed in various shapes and sizes as epithelial pearls and the majority of them were seen in the medulla (Figure 4). Hassall's corpuscles also found in other sites such as cortex, septa, and corticomедullary junction and also some of them seen close to blood vessels. Hassall's corpuscles in the formative stage were also noted.

**DISCUSSION**

Thymus gland develops as an epithelial outpouching from the ventral aspect of the third pharyngeal pouch. It starts to descend toward mediastinum and moves caudally forming what is known thymopharyngeal complex. Inferior parathyroid also develops from 3rd pharyngeal pouch. Ventral aspect of 4th pharyngeal pouch gives rise to very minor and rudimentary portion of thymic tissue.10 Descent of heart and caudal migration of aortic sac helps in caudal migration of thymic rudiments.11

As reported by Hollinshead,12 the upper pole of one or both lobes of the thymus extends upward into the neck or
to the level of the thyroid cartilage which is due to failure of the thymus to complete its migration into the thorax.

 Williams et al. also reported that the upper pole of thymus can extend up to inferior pole of the thyroid gland. In the study conducted by Ajita et al., one of the specimen showed the extension of the upper pole of thymus into the lower pole of the thyroid gland. In this study, in all the specimens, the entire gland was seen to be soft, lobulated, and located in superior mediastinum behind the sternum. In a study conducted by Vijayalakshmi et al., rudiments of thymus was seen at 12 weeks of gestation with the right and left lobes weighing about 0.1 g. The length of the right and left lobe measured about 0.2 and 0.1 cm, respectively, and length of the gland reached a maximum of about 5.2 cm by 40 weeks of gestation. The breadth of the gland found to be 0.1 cm at 12 weeks of gestation and reached a maximum of 4.2 cm at 40 weeks of gestation. In this study, the length of the right and left lobe observed to be 0.2 and 0.1 cm showing dissimilarity in the lobulation of the thymus gland. The length of the gland reached a maximum of about 4.5 cm at and breadth of the gland reached a maximum of about 2.1 cm at 38 weeks of gestation which showed a gradual increase in the size of the thymus gland, whereas most of the authors reported a decline in the growth rate in the third trimester.

In the study conducted by Ajita et al., lobulation started at 9th week and completed by 12th week. Padmavathy observed lobules had started formed during the 9th week and formation of lobules clearly evident after 12 weeks. In the study conducted by Vijayalakshmi et al., lobulation was reported to be observed at 16th week of gestation. In this study, lobulation was observed at 12th week of gestation but it can be clearly defined only after 14 weeks of gestation.

Differentiation of cortex and medulla was observed at 11th week of gestation by Ghali et al., 12th week of gestation by Hamilton and Mossman, 14th week of gestation by Haar, and 16th week of gestation by Vijayalakshmi et al.

In the study conducted by Padmavathy, differentiation of cortex and medulla observed from 14th week onward. In this study, differentiation of cortex and medulla found to be observed at 14th week of gestation.

The appearance of Hassall’s corpuscles was observed during the 8th week by Fawcett, 9th week by Gilhus et al., 10th week by Williams et al., reported at 10th week and Ajita et al., observed from 9th week onward. In this study, the epithelial cells observed from 12th week since fetus before 12th week were not examined in the study. Macrophages also found to be observed from 12th week onward.

Hayward reported the appearance of epithelial cells from 10th week and von Gaudecker B, Müller-Hermelink reported at 10th week and Ajita et al., observed from 9th week onward. In this study, the epithelial cells observed from 12th week since fetus before 12th week were not examined in the study. Macrophages also found to be observed from 12th week onward.

Knowledge of morphometry of thymus gland is important for clinicians to diagnose a variety of clinical (thymic hyperplasia) and congenital diseases of thymus. It is also an important for radiologists to differentiate thymus from other mediastinal structures, such as lymph nodes and superior sinus of the pericardium.

CONCLUSION

Morphometry and histological observations of thymus gland show great variation at different weeks of gestation which can be considered during thymectomy and can also be used as reference value during imaging studies in the prenatal stage. With the discovery of various intensive chemotherapy protocols and also infection with HIV leading to severe loss of T-lymphocytes has brought an importance to understand the role of human fetal thymus in building up the immune system in adults. Hence, the knowledge of embryology and anatomy of thymus is an important for clinicians to avoid unnecessary imaging and invasive procedures.

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Functional Outcome of Patients Treated with Bicolumn Fixation in Distal Humerus Fractures: A Prospective Study

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Abstract

Introduction: In young adults, most distal humerus fractures occur from high energy trauma, sideswipe injuries, motor vehicle accidents, falls from height, and gunshot wounds. In elderly persons with more osteoporotic bone; most of these injuries occur from simple falls. Even minor irregularities of the joint surface of the elbow usually cause some loss of function.

Aim: To analyze the functional outcome of patients treated with bicolumn fixation in distal humerus fractures.

Materials and Methods: A prospective study randomly selecting 21 patients of fractures of distal humerus in adults treated by open reduction and internal fixation with bicolumn fixation.

Results: All the fractures united within the study period. Elbow stiffness was encountered in four patients was due to infection, hardware prominence, and delayed union. There were no cases of nonunion.

Conclusion: Bicolumn fixation helps in achieving a good functional outcome anatomical reduction, rigid stabilization, and early mobilization that are essential features of these types of intra-articular fractures.

Key words: Bicolumn fixation, Distal humerus fracture, Dual plating, Intra-articular elbow fracture

INTRODUCTION

In young adults, most distal humerus fractures occur from high-energy trauma, sideswipe injuries, motor vehicle accidents, falls from height, and gunshot wounds. In elderly persons with more osteoporotic bone; most of these injuries occur from simple falls. So improved understanding of the complex pathoanatomy of unstable distal humerus fractures in adults has prompted a global interest in more precise treatment for this diverse group of injuries. Surgeons who treat fracture of the distal humerus frequently have realized the challenges that arise relate to poor bony quality, distal separation of the articular fragment from the columns of the distal humerus, and fragmentation of the articular surface in one or more planes. Even minor irregularities of the joint surface of the elbow usually cause some loss of function.

Aim

To analyze the functional outcome of patients treated with bicolumn fixation in distal radius fractures.

MATERIALS AND METHODS

This is a prospective study conducted in the Department of Orthopaedics, Tirunelveli Medical College Hospital. The Institutional Ethics Committee approval and informed consent from the patients were obtained. Inclusion criteria: Occupational Therapy Assistant (OTA) Class 13 A2, A3, C1, C2, and C3, intra-articular displacement >2 mm, marked supracondylar comminution and displacement, open fracture, floating elbow, and multiple injured patient. Exclusion criteria: The patients lost to follow-up, patients...
without skeletal maturity, OTA Class A1, B1, B2, and B3, the patients who were not medically fit for surgery, grossly contaminated open fractures, severe osteopenia, an insensitive or avascular arm (occurs in severe side swipes, crush or avulsion – type injuries), mangled extremity severity score >7.

Pre-operative Planning for Open Reduction and Internal Fixation (ORIF)
These fractures were frequently comminuted and this is not clearly evident on the radiographs. The exact nature, geometry, and configuration of fracture fragments are assessed and understood before surgery is performed. This was accomplished by anteroposterior and lateral radiographs. After initial work up, the operative fixation of the fractures was performed on the next elective operation list, i.e., within the next 2-3 days. Computed tomography scanning with three-dimensional reconstruction was done whenever the fracture configuration was doubtful. Before surgery, detailed instructions were given to each patient that the result of the procedure considerably depended on the patient’s own motivation to regain full function subsequently and that active motion of the joint in spite of the post-operative pain is an essential part of the treatment. Radiographs were taken at regular intervals to assess that the movements did not affect rigidity of fixation.

Implant Selection
The 3.5 mm reconstruction plates, Asian DCP, 1/3 tubular plates of appropriate size was kept ready. Pre-operative templating was done. In addition cancellous screws and k-wires are made available at the time of surgery.

- A dose of tetanus toxoid and antibiotic were given preoperatively
- Preparation of the part was done a day before surgery and above elbow plaster of paris slab was reapplied
- Instrument to be used were checked before hand and sterilized
- Surgery was performed under general anesthesia in 12 cases. While rest were operated under brachial plexus block.

Principles of Internal Fixation (Intra-articular Fractures)
1. Reconstruction of the base of the triangle, i.e., reconstruction of the trochlea, and convert into supracondylar fracture
2. Alignment and fixation of shaft, reconstruction of medial and lateral pillars complete restoration.

Post-operative Protocol
- The patient is placed in a posterior splint (i.e., above elbow slab) with a bulky dressing and neurological status checked every 4th hourly
- Check X-ray taken on 1st post-operative day (POD)
- After 48 h, the first post-operative dressing is done and drains are removed. Mobilization of the elbow joint was started when fixation was found rigid. The subsequent dressing is light and firm.
- The patients were discharged by 6th day and advised to review on 10th day for suture removal
- The patient was given injection cefotaxime 1000 mg and injection Garamycin 80 mg for 5 days and converted to oral antibiotics which are continued for 10 days
- The patient was advised at the time of discharge to continue the slab, arm pouch, oral antibiotics, and shoulder mobilization.

Follow-up
The patient comes for follow-up on 12th POD. The sutures were removed. In patients with rigid fixation, active gentle motion of involved limb several times a day in concurrence with the pain was advised. Active mobilization was encouraged. Full activity was allowed at 3-4 months as fracture consolidation occurred. Postoperatively patients were reviewed every 2 weeks for the first 2 months and monthly for the next 2 months, then every 2 months until fracture healing or full range of motion was regained.

Elbow Function
Postoperatively elbow function was evaluated using physician based elbow scoring system the Mayo Elbow Performance Index.3

RESULTS
About 19 cases in our study were operated with orthogonal plating which provided absolute stability for early mobilization. The posterolateral plate used commonly was the Asian DCP which requires little contouring whereas the medial plate required heavy contouring and the more malleable 1/3 tubular plate was used for the purpose. Several authors have documented a 20-25% rate of unsatisfactory result following orthogonal plating of distal humerus fractures. The rationale for utilization of parallel plating is that longer screws can be placed from a medial to lateral direction as opposed to a screw placed through a posterolateral plate. Based on these observations, the Mayo Clinic Group proposed the idea of parallel plating utilizing the principles of enhancing fixation of the distal fragments and achieving stability at the supracondylar level. In our study, we have not met implant failures and the orthogonal construct has enabled early mobilization in our cases (Figure 1).

Road traffic accidents (RTAs) predominated as the most common mechanism of injury, followed by accidental fall. 71% had history of RTA and 24% had accidental fall and 5% had assault as mechanism of injury (Table 1).
Males predominantly had RTAs as mechanism of injury whereas females predominantly sustained accidental fall (Table 2).

All patients in our study were classified by AO classification. There were 21 patients in all out of which 10 patients were classified as Type A, 11 patients as Type C and no patients as Type B (Type A2 - 6, Type A3 - 4, Type C1 - 1, Type C2 - 6, and Type C3 - 4) (Table 3).

In our study, fracture Types (A1, B1, B2, and B3) were excluded as their surgical management differed. A1 type fractures are fixed with screws alone and B type fractures are single column fractures fixed with single column plates and were excluded from our study. Among the included fracture Types A2 and C2 types predominated. C1 type was the least common.

Elbow stiffness was the most common complication encountered in four patients. We had infection, delayed union, hardware prominence in one case each. All fractures united within the study period. There were no cases of nonunion (Table 4).

**DISCUSSION**

The functional elbow is very essential for an individual for social and economic thriving. Fractures of the distal humerus may directly affect the functional movement of elbow especially intercondylar (intra-articular) fracture. The relationship of the radiohumeral joint and ulnohumeral joints must be perfect for a good functional outcome.

The majority of distal humerus fractures presenting to our center were resulting from RTAs (75%) compared to a majority of fall history seen by Robinson et al. This is probably reflective of the fact that several trauma cases are referred to our center which is the tertiary referral center for trauma care of this region. The high male:female ratio seen in our center (4:1) as compared to 1:1 recorded by Robinson et al. is resultant of the high number of trauma cases treated in our centre, and the fact that males are more prone for RTAs compared to females because in our society females travel less.

Fracture configuration according to the OTA type had a significant bearing on the outcome in distal humerus patients treated surgically. Group C had a poorer outcome than group A patients. This has again stressed the importance and prognostic significance of the OTA classification. Study by Robinson et al. revealed that the most common fracture type was OTA Class A and C which our study concurs.

The restoration of elbow function is dependent on three salient features: Exposure, fixation, and the post-operative rehabilitation, with later two are of primary consideration. Adequate exposure is necessary for visualization of the bone injury and fixation of the fracture fragments. The optimal exposure is provided by posterior approach with extra-articular osteotomy of the olecranon.
Olecranon osteotomy was done in 11 of our cases. Three of them were fixed with tension band wiring (TBW) and eight of our cases were fixed with cancellous screws. This allowed us complete examination of the articular surfaces of trochlea, capitellum, olecranon, and radial head. It also gives access to the medial and lateral supracondylar ridges. Full evaluation of the fragments of the fracture and reduction can then be performed. Although, nonunion of the extra-articular osteotomy may be regarded as a potential complication of this exposure, TBW of the osteotomy has provided sufficient stability of the olecranon for immediate use of the elbow through a secure range of motion without the occurrence of nonunion. 19 cases in our study were operated with orthogonal plating which provided absolute stability for early mobilization. The posterolateral plate used commonly was the Asian DCP which requires little contouring whereas the medial plate required heavy contouring and the more malleable 1/3 tubular plate was used for the purpose. Several authors have documented 20-25% rate of unsatisfactory result following orthogonal plating of distal humerus fractures. Rationale for utilization of parallel plating is that longer screws can be placed from a medial to lateral direction as opposed to a screw placed through a posterolateral plate. Based on these observations, the Mayo Clinic group proposed the idea of parallel plating utilizing the principles of enhancing fixation of the distal fragments and achieving stability at the supracondylar level. In our study, we have not met implant failures and the orthogonal construct has enabled early mobilization in our cases.

CONCLUSION

Increased incidence of distal humeral fractures is due to increasing RTA. Distal humeral fractures occurred more commonly in 2nd and 3rd decade. The predominance of males is seen in these fractures. ORIF with bicolumn plating can be considered as the treatment of choice if there is no contraindication for this, because it helps in maintaining length, opposition, axial alignment, and rotation alignment of articular fragments so that a good range of motion can be achieved. Excellent results are achieved with this method in terms of mobility and union without deformity. Bicolumn fixation helps in achieving a good functional outcome anatomical reduction, rigid stabilization, and early mobilization that are essential features of these types of intra-articular fractures.

REFERENCES

Diet, Nutrition and Prevention of Age-related Macular Degeneration

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Abstract

Introduction: Nutrition and lifestyle plays an important role in prevention and slow progression of age-related macular degeneration (ARMD). Maintaining blood pressure, cholesterol level, not smoking, and exercising can help too.

Aim: To determine the relationship of diet and lifestyle in ARMD patients.

Methods: Retrospectively 21 patients from 50 to 80 years were interviewed on diet and lifestyle using designed questionnaire.

Results: 21 patients were studied, 67% and 28% are having dry and wet ARMD, 5% have both dry and wet ARMD. No supplements were taken by the patients regards ARMD. 86% of patients are nonvegetarian and 14% were taking vegetables in their diet.

Conclusion: Dietary supplements are important to slow the progression of ARMD. Vitamin C, vitamin E, lutein, zeaxanthin, and cupric oxide supplements are warranted.

Key words: Age-related macular degeneration, Awareness, Diet, Nutrition

INTRODUCTION

Age-related macular degeneration (ARMD or AMD) is the leading cause of vision loss and blindness among both developed and developing countries. In India, the prevalence of early late ARMD (Grades 1 and 2) is similar to that observed in Western populations in the age group of 60-79 years. Because of people increasingly larger percentage of the general population, vision loss of macular degeneration is a growing problem. Age-related degeneration of the macular, which is the part of the retina responsible for the sharp, central vision needed to read or drive. Macular degeneration can make it difficult or impossible to read or recognize faces, although peripheral vision remains to allow other activities of daily life. ARMD is diagnosed as either dry (non-neovascular) ARMD or wet (neovascular) ARMD. Wet (neovascular) ARMD refers to the growth of new blood vessels in an area, such as macula, where they are not supposed to be. Dry (non-neovascular) ARMD is an early stage of disease and may result from the aging and thinning of macular tissues, depositing of pigments of pigment in the macula or a combination of the two processes. Dry (non-neovascular) ARMD is the common form and is estimated to present in 15% of eyes by 80 years of age. Nutrition plays a key role in human health with no exception to the eye. The prevention remains the best approach for addressing this public health issue and dietary modifications may provide one of the most cost-effective strategies. The role of glucose and the nutrients in age-related diseases including ARMD is now receiving considerable attention because of the potentially adverse effects of sustained high concentrations of glucose and age-related inefficiencies or improper metabolism, including the formation of advanced glycation end products and their sequelae.

Aim

The purpose of this paper was to study the relation between the nutrition and ARMD by interviewing the history of diets.
METHODS

A retrospective cohort study was conducted in a Tertiary Ophthalmic Hospital in Tirunelveli. Ethics Committee Approval and patient consent was obtained. Patients interviewed for this study are already diagnosed with ARMD. 21 patients are interviewed for the study in the age group of 50-80 years. A structured questionnaire used for this study was designed and validated by concern Institutional Ophthalmologist. A detailed history of the patient was recorded including details of sex, age, and other complaints. The questionnaire was developed in English, the interviewer translates the questionnaire to the patients if necessary.

RESULTS

A total of 21 patients involved in the study from 50 to 80 years of age, the majority of the patients are from 70 to 75 years of age group (29%) and followed by two age group 55-60 years and 60-65 years age group (19%), respectively. Association with gender variation, 52% of female and 48% of male patients are studied (Table 1).

The patients are classified, 67% of patients are dry (non-neovascular) ARMD, 28% of patients are wet (neovascular) ARMD and 5% of patients had both dry and wet ARMD. Comorbidity with ARMD, 43% of patients are hypertensive and 38% of patients are diabetes (Figures 1 and 2).

The majority of the patients are following nonvegetarian diet (86%) and high numbers of patients are following the regular meal uptake (95%). The interest of nutritional supplement was not seen in any of the patients, no patient is consumed any form of nutritional supplement (Figure 3).

DISCUSSION

In our study, the diet history of 21 patients with ARMD are recorded and analyzed. The prevalence of ARMD is comparable to that in Western countries in the age group of 70-75 years. Sex-wise distribution of ARMD did not show much variation among males and females. Snellen chart was used to find the visual acuity of the patients. The majority of the patients are recorder in dry (non-neovascular) ARMD 67%, 28% of wet (neovascular) ARMD, and 5% of patients had both the dry and wet ARMD. The systemic disease hypertension and diabetes were seen patients 43% and 38%. The majority of the patients are nonvegetarian with three meal practice daily in their life. Almost no one in this group of patients are consuming nutritional supplements in any form. This was a big drawback in the geriatrics patients where they have nutritional depletion in their body due to age factors. Egg consumption shown 38% of patients took <3 eggs per week and 14% of patients are vegetarian stick to green vegetables in their diet. Many studies observed the potential role of supplementation in prevention if progression, or even a degree reversal of the visual effects caused by the ARMD. Vitamin D levels are associated with ARMD risk in women. Metabolism of sugar plays a significant role in aging and disease. Gastrointestinal reflects the kinetics of blood glucose levels after ingesting a meal in people with and without diabetes, dietary hyperglycemia is associated with risk for major metabolic disorder such as Type 2 diabetes.

Table 1: Age distribution of study patients

<table>
<thead>
<tr>
<th>Age</th>
<th>Number of patients</th>
</tr>
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<tbody>
<tr>
<td>50-55</td>
<td>14</td>
</tr>
<tr>
<td>56-60</td>
<td>19</td>
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<tr>
<td>61-65</td>
<td>19</td>
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<tr>
<td>71-75</td>
<td>29</td>
</tr>
<tr>
<td>76-80</td>
<td>14</td>
</tr>
</tbody>
</table>

Figure 1: Distribution of ARMD in study patients

Figure 2: Distribution of comorbidities
CONCLUSION

Our study seems to indicate that the patients are not taking nutritional diet. Vitamin D levels are to be maintained in women. ARMD cause considerably economic impact and quality of life significantly. Nutritional diet is important for healthy living, dietician consult is recommended for patients with ARMD.

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Evaluation of Outcome of Correction of Clubfoot by Conventional Ponseti and Accelerated Ponseti

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Abstract

Introduction: Congenital idiopathic clubfoot is a common orthopedic condition in children. It has been associated with neuromuscular disorders and various syndromes. The Ponseti method has transformed the management of children with clubfoot producing good long-term results. The condition is more common in male childs.

Aim: To analyze the efficacy of accelerated Ponseti in the management of clubfoot and compare with the standard Ponseti.

Materials and Methods: We selected 40 children with idiopathic clubfoot <1 year and compared both standard and accelerated Ponseti methods. All were treated on outpatient basis. Each clubfoot was scored using Pirani score before cast application each week. Each foot manipulated and corrected with AK cast weekly in standard Ponseti and twice weekly in accelerated Ponseti.

Results: Out of the 20 patients corrected with standard Ponseti only 3 patients (11.5%) had relapse and only four cases among 20 patients corrected with accelerated Ponseti had relapse (20%).

Conclusion: Based on our study, we conclude that standard method of Ponseti correction is more effective than accelerated method of Ponseti correction.

Key words: <1 year, Accelerated ponseti method, Idiopathic clubfoot, Standard ponseti

INTRODUCTION

Congenital idiopathic clubfoot is a common congenital orthopedic condition occurring in children. It consists of four components: Cavus, forefoot adduction, varus, and equinus. It has been associated with neuromuscular disorders and various syndromes. Many conservative and surgical options are available for the management of clubfoot. Conservative methods involve serial manipulation and casting. If these cases are poorly treated, later on, it leads to extensive surgical procedures. After surgery, foot becomes stiff and painful.¹²

The Ponseti method has transformed the management of children with congenital talipes equinovarus (CTEV) producing good long-term results and in the last two decades has gained wide acceptance in the worldwide orthopedic community. The standard Ponseti method uses weekly foot and leg plaster changes to gradually correct the deformity, using a strictly defined sequence of molded plaster changes.³⁴

A new technique accelerated Ponseti method, in which standard weekly plaster change method was accelerated to two times a week was found to be equally effective in achieving correction. The duration, the child was in plaster was reduced and total duration of treatment was reduced to half. This is a significant advantage which can lead to better compliance.⁵⁶

It is estimated that more than 100,000 babies are born worldwide each year with congenital clubfoot. Males are more commonly affected than females (2:1). In nearly 20-40% of cases, bilateral involvement is seen. In parents already having a child affected with CTEV, there is a 10% chance of second child to be affected. In cases of monozygotic twins, if one twin has CTEV, the second twin has 30% chance of CTEV.⁷
Aim
To analyze the efficacy of accelerated Ponseti method in the management of CTEV and to compare the functional outcome between Ponseti and accelerated Ponseti in the management of CTEV.

MATERIALS AND METHODS

This is a prospective study conducted in the Department of Orthopaedics, Tirunelveli Medical College Hospital. The Institutional Ethics Committee approval and informed consent from the parents were obtained. A total of 40 children (51 feet) were treated in the period between October 2010 and October 2012. Among these 40 children, 20 children (26 feet) were treated by standard Ponseti method and 20 children (25 feet) were treated by accelerated Ponseti method. The patients were randomized by computer generated numbers to either the standard Ponseti or the accelerated Ponseti method. All children were treated on an outpatient basis to reduce any bias from altered compliance and enabling us to directly compare the efficacy of two methods in terms of correction of the deformity. Parents were clearly informed about the management protocol and informed consent was obtained. Details regarding complications need for surgery and importance of braces were explained to the parents during each visit. Inclusion criteria: Idiopathic CTEV, age <3 months. Exclusion criteria: Age >3 months, associated with neurologic abnormalities and multiple contractures. Each clubfoot was scored each week using Pirani scoring system before cast application. Children were made to sleep by giving breast milk before cast application. In the standard Ponseti group, each foot was manipulated weekly and corrective above knee casts with knee in 90° of flexion were given. Step by step correction as recommended by Ponseti was followed. First cavus is corrected followed by varus and equinus is corrected at last. In the accelerated group, each foot was manipulated twice in a week at fixed intervals. The principle of correction was the same as that of Ponseti technique. In both the groups, tenotomy was done when cavus, adductus, and varus are fully corrected but ankle dorsiflexion remained <10° above neutral. It was made certain that abduction was adequate before performing tenotomy. Percutaneous Achilles tenotomy was done as an outpatient procedure using local anesthesia. No neurovascular complications were seen. Before the application of final cast or tenotomy, measurements were taken so that when the child comes for final cast removal, brace would be ready.

Endpoint of treatment is determined by two factors:
• Foot was well corrected without any deformity
• Passive dorsiflexion of 20° was possible after final cast removal.

RESULTS

A total of 40 children (51 feet) were treated; of which 20 children (26 feet) were treated by standard Ponseti method and 20 children (25 feet) were treated by accelerated Ponseti method. In the standard Ponseti group, 6 children had bilateral clubfoot, 8 were unilateral on left side, and 6 were unilateral on right side. Among 20 children, 12 (60%) were male and 8 (40%) were female. Mean age at presentation was 28.4 days. Total mean Pirani score at presentation was 4.97. Most of the cases required six casts for correction, with a mean of 5.55. Tenotomy was performed in three cases (11.5%). The mean number of days the child was in cast was 52.8. Three cases (15%) had a relapse. All relapses were corrected by repeat casting. Mean Pirani score at 3 months follow-up was 0.075. In the accelerated Ponseti group, 5 children had bilateral clubfoot, 8 were unilateral on left side, and 7 were unilateral on right side. Among 20 children, 11 (55%) were male and 9 (45%) were female. Mean age at presentation was 28.1 days. Total mean Pirani score at presentation was 5.025. The mean number of casts required for correction was 5.95. Tenotomy was performed in six cases (24%). The mean number of days the child was in cast was 39.65. Four cases (20%) had a relapse, among which one case of equinus was treated with repeat tenotomy and others were corrected by repeat casting. Mean Pirani score at 3 months follow-up was 0.20.

In our study, idiopathic clubfoot was seen more common in male child than female child. Both standard Ponseti technique and accelerated Ponseti technique for correction of CTEV were done Table 1.

We used Pirani scoring system for comparing the correction of CTEV in both standard and accelerated Ponseti
techniques. The Pirani score was higher in accelerated Ponseti than standard Ponseti at the time of presentation Table 2.

Based on the Pirani score, the patients who had undergone standard Ponseti method of correction had lower relapse rate than patients corrected with accelerated Ponseti method Table 3.

6 months follow-up mean Pirani score showed better result in standard Ponseti method of correction than accelerated method of correction for CTEV Table 4.

**DISCUSSION**

CTEV is one of the most common congenital anomalies occurring in children.8 The method of serial manipulation and casting developed by Ponseti for congenital clubfoot was instituted in an effort to achieve a plantigrade, functional foot without the need to resort to major surgical intervention. The Ponseti method was widely accepted and practiced, giving reliably long-term results. We treated clubfoot cases by Ponseti and accelerated Ponseti method, which involves changing the plaster 2 times in a week. We conducted special clubfoot clinics and did our casting on fixed days in a week so that we gave the chance of new patient's parents to meet old patient's parents and assure them about treatment and compliance.9,10 We followed Pirani scoring system and performed tenotomy, whenever necessary. Following cast correction, a Dennis Browne splint was applied and bracing protocol followed.

In both the groups, the mean age of presentation was 28 days. Mean number of casts required for correction in accelerated group (5.95) was comparable with standard group (5.55). Mean number of days in cast was 39.6 days in accelerated group, whereas it was 52.8 days in standard group.

Even though tenotomy rate was higher in the accelerated group (24%) compared to standard group (11.5%), it was not statistically significant. This may be due to slightly higher Pirani score in accelerated group (5.025) as compared to standard group (4.97). In the accelerated group, 80% of cases remained corrected at 3 months follow-up which is comparable with 85% of standard group.

Relapse rate was 20% in accelerated group and 15% in standard group, which is statistically insignificant. In our study, most of the relapses were of forefoot adduction type and equinus type which were corrected mostly by casting. Relapses were found to be mainly due to noncompliance of bracing protocol. This could be reduced by stressing the importance of braces at every visit and having follow-up at regular intervals. We taught the parents how to wear those braces and monitored them while applying it.

If the long-term results of accelerated Ponseti method become comparable to those of standard Ponseti method, it can offer patients a number of benefits. The number of days the child was in plaster was reduced in accelerated method. This would provide the parents with the alternative of more rapid treatment. Other advantages are a reduction in the likelihood of plaster slipping and chance for more intensive education regarding the importance of braces, with more visits over a shorter period.11,12 Osteopenia after immobilization in above-knee plasters has been reported by Morcuende et al., but these findings resolved within a few months after plaster removal.13,14 It is possible that the accelerated method might reduce this problem still further.

**CONCLUSION**

Based on our study, functional outcome of clubfeet treated by conventional Ponseti method and accelerated Ponseti method is the same. Accelerated Ponseti method offers the advantages of reduced number of plaster days and more rapid correction. Our results show that results are comparable between two groups in every aspect. Based on this, we conclude that accelerated Ponseti method with plaster changes two times a week is as effective as Ponseti method in the treatment of idiopathic CTEV.
REFERENCES


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Randomized Clinical Comparison of Epidural Bupivacaine with Fentanyl and Epidural Levobupivacaine with Fentanyl in Patients Undergoing Total Abdominal Hysterectomy

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Abstract

Background: Levobupivacaine is a relatively new local anesthetic agent with minimal side effects compared to bupivacaine.

Aim: To compare the post-operative analgesic effects of epidural levobupivacaine with fentanyl and epidural bupivacaine with fentanyl in patients undergoing abdominal hysterectomy.

Materials and Methods: Single randomized study was conducted in 60 ASA Grades I or II patients undergoing elective abdominal hysterectomies using combined spinal epidural technique. All patients received subarachnoid blockade with 3 ml of 0.5% bupivacaine. Regression of sensory blockade level to T8 is noted. Now, Group A (n = 30) patients received epidural top up with 10 ml of 0.5% bupivacaine with 20 mcg fentanyl. Group B (n = 30) patients, received epidural top up with 10 ml of 0.5% levobupivacaine with 20 mcg fentanyl. The time of onset of analgesia and duration of effective analgesia are noted.

Results: Duration of complete analgesia postoperatively, in Group A patients, was 75.50 ± 23.13 min, while in Group B patients, the duration was found to be 128.00 ± 22.98 min. Effective analgesia, in Group A patients, lasted for an average duration of 134.50 ± 29.26 min, while it lasted for an increased average duration of 181 ± 23.94 min in Group B patients.

Conclusion: Levobupivacaine forms a suitable alternative and provides prolonged post-operative analgesia compared to bupivacaine.

Key words: Cardiotoxicity, Epidural, Hysterectomy, Levobupivacaine

INTRODUCTION

Total abdominal hysterectomy is a relatively common gynecological procedure, routinely done under neuraxial blockade. Epidural anesthesia will take care of the post-operative pain relief and can also be used intraoperatively to supplement anesthesia if insufficient. Racemic bupivacaine is the commonly used local anesthetic for epidural infusion. However, its prolonged or continuous use can lead to severe cardiotoxic and central nervous system (CNS) side effects. Levobupivacaine, S-enantiomer of bupivacaine has been found to be associated with a better pharmacological profile and much less side effects compared to bupivacaine.¹ The high lipid solubility and plasma protein binding of this drug results in less free fraction of the drug available to produce toxicity. Combining an opioid with the local anesthetic agent has become a widely accepted practice for epidural top up or infusion. Their combination limits the regression of the sensory block seen with local anesthetics alone and improves the quality of dynamic pain relief.² Hence, we determined to postoperatively compare the analgesic and hemodynamic effects of epidural bupivacaine-fentanyl and levobupivacaine-fentanyl solutions.
MATERIALS AND METHODS

After approval of the study by our institutional ethical committee, the study was conducted in 60 ASA Grades I or II patients undergoing elective abdominal hysterectomies using combined spinal epidural technique. The age of the patients ranged from 18 to 60 years, weighing 35-65 kg and height ranging from 155 to 160 cm. Informed written consent was obtained after explaining the procedure. Exclusion criteria included patients with coagulation disorders, cardiac failure, liver failure, renal failure, neurological and mental illness, deformity of spinal column, patients with allergy to local anesthetics, infection at the site of injection, surgeries lasting for more than 4 h duration. Visual analog scale (VAS) was explained to all patients. The patients were shown a 10 cm long scale marked 0-10 on a blank paper and told that 0 represents “no pain” and 10 represents worst possible pain. On the day of procedure, baseline hemodynamic parameters were noted. The patients were randomized into two groups by drawing of lots.

After shifting, the patient to the operating room, electrocardiograph (ECG), pulse oximetry, and noninvasive blood pressure monitors were connected. Intravenous access obtained with 18G intravenous cannula. Pre-operative vital signs: Pulse rate, systolic and diastolic blood pressure, and oxygen saturation were noted. Under sterile aseptic precautions, epidural catheterization was performed at L1-L2 space with 16G Tuohy needle by loss of resistance technique. A 20G epidural catheter was introduced and 5 cm of catheter kept inside. Subarachnoid block was performed in L3-L4 space using 25-gauge Quincke needle. After free flow of CSF, 3 ml of 0.5% hyperbaric bupivacaine injected in both groups at a rate of 0.2 ml/s. Immediately, the patients were turned on their back to supine position. The sensory blockade level is assessed at the end of 5th min and thereafter every 15 min. Regression of the sensory blockade level to T8 is noted. Now, the patients randomized to Group A, received epidural top up with 10 ml of 0.5% bupivacaine with 20 mcg fentanyl after negative aspiration for CSF or blood. The patients randomized to Group B, received epidural top up with 10 ml of 0.5% levobupivacaine with 20 mcg fentanyl after negative aspiration for CSF or blood. Hemodynamic parameters were monitored after giving the block. The onset of loss of pinprick discrimination at the level of T6 was noted as - “the time of onset of analgesia” this was monitored every 5 min up to a maximum of 25 min. The maximal level of sensory blockade at 25 min after the epidural top up was noted. “Block failure” was defined as onset of loss of pinprick sensation more than 25 min at T6 lever or inadequate blockade. These patients were excluded from the study. Intraoperative pulse rate, systolic and diastolic blood pressure, and oxygen saturation were monitored. Any intraoperative pain at the site of surgery or intraoperative increase in pulse rate or blood pressure >20% from the baseline is regarded as exclusion criteria, and these patients were excluded from the study. These patients were given general anesthesia using injection glycopyrrolate 0.2 mg/kg, injection fentanyl 2 µg/kg, injection thiopentone 5 mg/kg, and injection atracurium 0.6 mg/kg. Intraoperative complications such as hypotension, bradycardia, or ECG abnormalities were noted. After the conclusion of the surgery, immediate post-operative VAS score was noted. The patient was shifted to post-anesthesia care unit and monitored for 12 h after which they were shifted to their respective wards. In the PACU, vital parameters and VAS score were recorded. VAS score was recorded for every 15 min up to 4 h. “The duration of effective analgesia” was defined as the duration until which the patient had a VAS score ranging from 0 to 2. “The duration of complete analgesia” was defined as the duration until which the patient had a VAS score of 0. VAS score of >4 was an exclusion criteria and patients with an immediate post-operative VAS score >4 were excluded from study. Rescue analgesia for those patients were given using injection tramadol 100 mg i.v. or injection fentanyl 50 mcg, followed by 8 ml of 0.25% bupivacaine. Side effects like hypotension was managed with intravenous fluids and incremental doses of injection ephedrine 6 mg and bradycardia were managed with injection atropine 0.6 mg.

Descriptive statistics was done for all data and suitable statistical tests of comparison were done. Continuous variables were analyzed with the unpaired t-test and categorical variables were analyzed with the Chi-square test and fisher exact test. Statistical significance was taken as P < 0.05. The data were analyzed using Epi Info software (7.1.0.6 version; Center for disease control, USA) and Microsoft Excel 2010. The sample size was determined on the basis of a pilot study in which the reduction in post-operative pain score (VAS) was measured as 15%. We calculated a minimum sample size of 24 patients was required in each group, assuming a type I error (two-tailed) of 0.05, and a margin of error of 10%. Therefore, the final sample selected was n = 30 in Group A and n = 30 in Group B.

RESULTS

Group A patients (n = 30) received epidural top up of 10 ml of 0.5% bupivacaine with 20 mcg fentanyl, while Group B patients (n = 30) received epidural top up of 10 ml of 0.5% levobupivacaine with 20 mcg of fentanyl. Both groups were compared with respect to age and body mass index (BMI) distribution.
By conventional criteria, the association between the treatment groups and age was considered to be not statistically significant since $P > 0.05$.

By conventional criteria, the association between the treatment groups and BMI is considered to be not statistically significant since $P > 0.05$.

Both the groups were compared on the hemodynamic changes that occurred 5 min and 10 min after spinal blockade and every 5 min after epidural blockade up to 25 min. Statistically no significant changes in pulse rate were observed with a $P > 0.05$.

Both the groups were compared on the basis of blood pressure parameters. Statistically no significant changes in blood pressure were found with a $P > 0.05$.

The time of onset of analgesia was compared in both the groups after epidural top up. The mean onset time of analgesia in Group A was $11.33 \pm 3.46$ min, while in Group B it was $13.00 \pm 4.28$ min showing no statistical significance with a $P = 0.10$.

The duration of complete analgesia for which the patients showed a VAS score of 0 was compared in both the groups. Group A patients showed an average duration of 75.50 ± 23.13 min, while in Group B patients, the duration was found to be 128.00 ± 22.98 min. The difference was statistically significant with a $P < 0.05$.

The duration of effective analgesia for which the patients showed a VAS score of 0 to 2 was compared in both the groups. Effective analgesia in Group A patients lasted for an average duration of $134.50 \pm 29.26$ min, while it lasted for an increased average duration of $181 \pm 23.94$ min in Group B patients. This difference was statistically significant with a $P < 0.05$.

Side effects like hypotension occurred in three patients in each group and were treated with injection ephedrine 6 mg, while bradycardia occurred in three patients in Group A and were treated with injection atropine 0.6 mg. (Tables 1-6)

### Table 1: Comparison of study patients age

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean±SD</th>
<th>$P$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>45.43±6.46</td>
<td>0.822</td>
</tr>
<tr>
<td>Group B</td>
<td>45.07±6.11</td>
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</tr>
</tbody>
</table>

SD: Standard deviation

### Table 2: Comparison of study patients BMI

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean±SD</th>
<th>$P$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>30</td>
<td>24.39±1.10</td>
<td>0.432</td>
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<tr>
<td>Group B</td>
<td>30</td>
<td>24.16±1.21</td>
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</table>

SD: Standard deviation

### Table 3: Hemodynamic changes in study patients

<table>
<thead>
<tr>
<th>Pulse rate</th>
<th>Group A</th>
<th>Group B</th>
<th>$P$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>80.73±6.79</td>
<td>80.33±4.89</td>
<td>0.794</td>
</tr>
<tr>
<td>5 Min after SAB</td>
<td>68.8±4.95</td>
<td>65.37±3.48</td>
<td>0.547</td>
</tr>
<tr>
<td>10 Min after SAB</td>
<td>63.8±5.85</td>
<td>62.43±4.35</td>
<td>0.308</td>
</tr>
<tr>
<td>5 Min after epidural</td>
<td>62.77±8.65</td>
<td>62.8±8.85</td>
<td>0.988</td>
</tr>
<tr>
<td>10 Min after epidural</td>
<td>61.97±10.55</td>
<td>64.53±11.21</td>
<td>0.364</td>
</tr>
<tr>
<td>15 Min after epidural</td>
<td>62.43±13.13</td>
<td>64.07±11.72</td>
<td>0.613</td>
</tr>
<tr>
<td>20 Min after epidural</td>
<td>63.67±9.72</td>
<td>64.07±8.64</td>
<td>0.866</td>
</tr>
<tr>
<td>25 Min after epidural</td>
<td>66.43±11.52</td>
<td>65.57±11.65</td>
<td>0.773</td>
</tr>
</tbody>
</table>

SD: Standard deviation

### Table 4: Comparison of blood pressure

<table>
<thead>
<tr>
<th>Types of blood pressure</th>
<th>Mean±SD</th>
<th>$P$</th>
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</thead>
<tbody>
<tr>
<td>Systolic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>126.03±6.3</td>
<td>125.67±5.82</td>
</tr>
<tr>
<td>5 Min after SAB</td>
<td>111.77±8.01</td>
<td>114.47±10.64</td>
</tr>
<tr>
<td>10 Min after SAB</td>
<td>109.93±10.74</td>
<td>111.73±11.97</td>
</tr>
<tr>
<td>5 Min after Epidural</td>
<td>110.±10.59</td>
<td>108.27±8.78</td>
</tr>
<tr>
<td>10 Min after Epidural</td>
<td>110.43±11.64</td>
<td>106.43±10.11</td>
</tr>
<tr>
<td>15 Min after Epidural</td>
<td>109.87±11.12</td>
<td>105.27±10.9</td>
</tr>
<tr>
<td>20 Min after Epidural</td>
<td>110.87±12.62</td>
<td>104.7±10.92</td>
</tr>
<tr>
<td>25 Min after Epidural</td>
<td>107.83±11.88</td>
<td>105±10.6</td>
</tr>
<tr>
<td>Diastolic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>78.37±6.6</td>
<td>77.9±5.45</td>
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<tr>
<td>5 Min after SAB</td>
<td>73.07±7.07</td>
<td>72.7±7.63</td>
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<tr>
<td>10 Min after SAB</td>
<td>71.47±8.59</td>
<td>70.27±7.5</td>
</tr>
<tr>
<td>5 Min after epidural</td>
<td>68.07±8.4</td>
<td>67.73±8.44</td>
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<tr>
<td>10 Min after epidural</td>
<td>67.1±8.41</td>
<td>65.43±8.5</td>
</tr>
<tr>
<td>15 Min after epidural</td>
<td>64.9±9.09</td>
<td>63.33±8.08</td>
</tr>
<tr>
<td>20 Min after epidural</td>
<td>63.73±9.07</td>
<td>61.97±8.14</td>
</tr>
<tr>
<td>25 Min after epidural</td>
<td>63.9±8.16</td>
<td>64.83±8.49</td>
</tr>
</tbody>
</table>

SD: Standard deviation

### Table 5: Comparison of mean arterial pressure

<table>
<thead>
<tr>
<th>Mean arterial pressure</th>
<th>Mean±SD</th>
<th>$P$</th>
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</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>90.77±6.01</td>
<td>89.8±7.24</td>
</tr>
<tr>
<td>5 Min after SAB</td>
<td>85.96±6.56</td>
<td>86.62±7.85</td>
</tr>
<tr>
<td>10 Min after SAB</td>
<td>84.29±8.23</td>
<td>84.09±8.21</td>
</tr>
<tr>
<td>5 Min after epidural</td>
<td>82.14±8.12</td>
<td>81.24±8</td>
</tr>
<tr>
<td>10 Min after epidural</td>
<td>81.54±8.18</td>
<td>79.1±8.52</td>
</tr>
<tr>
<td>15 Min after epidural</td>
<td>79.89±8.34</td>
<td>77.31±8.34</td>
</tr>
<tr>
<td>20 Min after epidural</td>
<td>79.44±8.91</td>
<td>76.21±8.14</td>
</tr>
<tr>
<td>25 Min after epidural</td>
<td>78.55±8.36</td>
<td>78.22±8.33</td>
</tr>
</tbody>
</table>

SD: Standard deviation

### Table 6: Comparison of analgesic effect

<table>
<thead>
<tr>
<th>Analgesic effect</th>
<th>Mean±SD</th>
<th>$P$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time of onset of analgesia after epidural</td>
<td>11.33±3.46</td>
<td>13±4.28</td>
</tr>
<tr>
<td>Duration of complete analgesia</td>
<td>75.5±23.13</td>
<td>128±22.98</td>
</tr>
<tr>
<td>Duration of effective analgesia</td>
<td>134.5±29.26</td>
<td>181±23.94</td>
</tr>
</tbody>
</table>

SD: Standard deviation
DISCUSSION

Combined spinal epidural technique for abdominal hysterectomy has been found to provide adequate blockade in terms of height and duration than spinal anesthesia alone. This is in accordance with Mihic et al., who concluded that combined spinal epidural technique was the superior technique for abdominal hysterectomy.

Traditionally, racemic bupivacaine has been the most commonly used anesthetic agent in spinal and epidural anesthesia for lower abdominal surgeries. It has found to be effective for both sensory and motor blockade intraoperatively and for sensory analgesia postoperatively. However, one of the most feared side-effects of racemic bupivacaine is its cardiotoxicity. Racemic bupivacaine causes blockade of the sodium channel, prolonging the diastolic period. This can predispose to the formation of re-entrant arrhythmias. Bupivacaine also causes blockade of potassium channels, resulting in prolongation of QTc interval. It has been found, that it is pronounced more with R(+) enantiomer, hence the S(-) enantiomer (levobupivacaine) has been developed as an anesthetic agent. Levobupivacaine was found to cause smaller changes in indices of cardiac contractility and the QTc interval of the electrocardiogram and also to have less depressant effect on the electroencephalogram. The negative inotropic effect was found to be less with levobupivacaine, compared to bupivacaine. Since levobupivacaine has a lower risk of cardiovascular and CNS toxicity compared to racemic bupivacaine, we decided to compare its effectiveness in providing sensory analgesia with bupivacaine in patients undergoing abdominal hysterectomy.

Both the groups showed no statistical difference with respect to age, BMI, and ASA physical status. Hemodynamic changes with respect to pulse rate and blood pressure in both the groups were also of no clinical significance with a P >0.05 in all parameters. The time of onset of analgesia after epidural top up in Group A was around 11.33 ± 3.46 min, while in Group B, it was 13.00 ± 4.28 min, showing no statistical significance with a P = 0.10. This shows that both bupivacaine and levobupivacaine almost have same potency with regard to the time of onset of analgesia.

However, the duration of complete analgesia for which the patients showed a VAS score of 0, was prolonged in the levobupivacaine group (128.00 ± 22.98 min), while in the bupivacaine group, the duration was found to be 75.50 ± 23.13 min. Similarly, the duration of effective analgesia, for which the patients showed a VAS score of 0-2, was also prolonged in the levobupivacaine group with an average duration of 181 ± 23.94 min, while it lasted for 134.50 ± 29.26 min in the bupivacaine group patients. This difference was statistically significant with a P < 0.05. The above observation shows that levobupivacaine, prolongs sensory analgesia duration, when compared to bupivacaine.

This is in accordance with the studies conducted by Foster et al. He observed that sensory block tended to be longer with levobupivacaine than bupivacaine, amounting to a difference of 23 to 45 min with epidural administration and approximately 2 h with peripheral nerve block. With epidural administration, levobupivacaine produced less prolonged motor block than sensory block. Further, higher doses of levobupivacaine can be used to prolong duration of sensory blockade without any incidence of side effects. Foster et al. also further added that levobupivacaine had a less negative inotropic effect and at doses <75 mg, produced less prolongation of the QTc interval, when compared to bupivacaine. Further addition of fentanyl to levobupivacaine reduces the stress response to surgery, prolongs post-operative analgesia, rather than when levobupivacaine alone was used.

CONCLUSION

Our study results show that levobupivacaine is equipotent to bupivacaine in providing analgesia, with a much more prolonged duration. At the same time, it is associated with less side effects than compared to bupivacaine. We conclude that levobupivacaine is a much more suitable alternative to bupivacaine in neuraxial blockade for abdominal and lower limb surgeries.

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Nephritis and Its Outcome in Systemic Lupus Erythematosus

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Abstract

Background: Nephritis is usually the most serious manifestation of systemic lupus erythematosus (SLE). Nephritis is asymptomatic in most lupus patients and small proportion of SLE patients have nephrotic syndrome. The patient can develop end-stage renal disease within 2 years if diffuse proliferative glomerulonephritis is untreated, hence aggressive immunosuppression is required.

Materials and Methods: A total of 25 patients who were admitted and fulfilled the inclusion/exclusion criteria were evaluated by history, physical examination and lab tests.

Results: Out of 25 patients, 23 were females and only 2 were male, i.e., 92% were female which shows that this disease is more common in females than in males. The age distribution showed that the disease is more common in younger age group. 13 patients were of age group 31-40 (52%), 10 were 21-30 (40%), 1 patient <20 years (4%), and between 41 and 50, there were 2 patients (8%). Mostly the females were of child bearing age group.

Conclusion: Out of 25 patients of SLE studied, 22 developed nephritis and 3 did not. Among the 22 patients of nephritis, 12 (48%) had complete remission, 2 (8%) had multiple relapses, 1 (4%) had late onset lupus nephritis (LN), 1 (4%) had resistant LN 1 (4%) lost follow-up, 2 (8%) expired, and 1 (4%) developed end-stage renal disease.

Key words: Clinical profile, End-stage renal disease, Females, Nephritis, Systemic lupus erythematosus

INTRODUCTION

Systemic lupus erythematosus (SLE) is a disease in which organs and cells are damaged due to tissue binding autoantibodies and immune complexes. 90% of patients are women of child bearing years; people of both sexes, all ages and all ethnic groups are susceptible. In India, its prevalence is 3.2/100000 populations.

Pathogenesis and Etiology

Interactions between susceptible genes and environmental factors result in abnormal immune response. Those responses include (1) activation of innate immunity (dendritic cells) by DNA, DNA in immune complexes and RNA in RNA/protein self-antigens, (2) lowered activation thresholds of adaptive immunity cells (antigen-specific T- and B-lymphocytes), (3) ineffective regulatory and inhibitory CD4⁺ and CD8⁺ T-cells, and (4) reduced clearance of apoptotic cells and of immune complexes. Self-antigens (nucleosomal DNA-protein; RNA-protein in Sm, Ro and La, and phospholipids) are available for recognition by the immune system in surface blebs of apoptotic cells, thus antigens, autoantibodies and immune complexes persist for prolonged period of time allowing inflammation and disease to develop. Immune activation of circulating and tissue bound cells accompanied by increased secretion of proinflammatory tumor necrosis factor and Type 1 and 2 interferons (INF) and the B cell-driving cytokines B-lymphocyte stimulator and interleukin-10 (IL). Upregulation of genes induced by INF is a genetic “Signature” of SLE. However, lupus T and natural killer cells fail to produce enough IL-2 and transforming growth factor to induce regulatory CD4⁺ and inhibitory CD8⁺ T-cells. The result of these abnormalities is sustained immunological disease.
production of pathogenic autoantibodies and immune complexes, which bind to target tissues, with activation of complement and phagocytic cells that recognize Ig-coated circulating blood cells. Activation of complement and immune cells leads to release of chemotaxins, cytokines, chemokines, vasoactive peptides, and destructive enzymes. In the setting of chronic inflammation, accumulation of growth factors and products of chronic oxidation contribute to irreversible tissue damage in glomeruli, arteries, lungs, and other tissues.

In lupus nephritis (LN), most of the time there is deposition of glomerular immunoglobulin and complement component. The basic immunologic abnormality in the kidney is the accumulation or deposition of Ig and complement components in the mesangium. Such depositions depend on a variety of factors, including mesangial and mononuclear phagocyte function, size, composition, and perhaps, charge of the immune complexes or antigen, as well as other poorly defined considerations. This pattern of immune deposition represents the background on which the more severe glomerular lesions are imposed. Depending on the composition and circulatory load of immune complexes, capillary wall localization may also occur. The local glomerular reaction and cellular constituents form the circulating blood may result in varying pattern of glomerular injury seen by light microscopy. Alternatively, immune complexes may form in-situ as a consequence of circulating antibody reacting with a planted non glomerular antigen such as ssDNA or an intrinsic glomerular antigen. In addition to classification of the glomerular lesions according to general appearance on light, electron, and immunofluorescence microscopy, they are also classified into active and chronic lesion.

**Classification of LN**

International society of nephrology and renal pathology society.

Class I: Minimal mesangial LN
Class II: Mesangial proliferative LN
Class III: Focal LN
Class IV: Diffuse LN
Class V: Membranous LN
Class VI: Advanced sclerotic LN.

Nephritis is usually the most serious manifestation of SLE. Nephritis is asymptomatic in most lupus patients and small proportion of SLE patients have nephrotic syndrome. The patient can develop end-stage renal disease within 2 years if diffuse proliferative glomerulonephritis is untreated.

**Table 1: Gender wise distribution of 25 patients having systemic lupus erythematosus**

<table>
<thead>
<tr>
<th>Gender</th>
<th>Count (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>2 (92)</td>
</tr>
<tr>
<td>Female</td>
<td>2 (38)</td>
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<tr>
<td>Total</td>
<td>25 (100)</td>
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**Table 2: Age distribution**

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Count (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20</td>
<td>1 (4)</td>
</tr>
<tr>
<td>21-30</td>
<td>10 (40)</td>
</tr>
<tr>
<td>31-40</td>
<td>13 (52)</td>
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<tr>
<td>41-50</td>
<td>2 (8)</td>
</tr>
<tr>
<td>Total</td>
<td>25 (100)</td>
</tr>
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**Table 3: Presenting symptoms**

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Count (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nephritis</td>
<td>7 (28)</td>
</tr>
<tr>
<td>Swelling if face legs</td>
<td>1 (4)</td>
</tr>
<tr>
<td>Headache</td>
<td>1 (4)</td>
</tr>
<tr>
<td>Decreased micturation</td>
<td>1 (4)</td>
</tr>
<tr>
<td>SLE</td>
<td>16 (64)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>25 (100)</strong></td>
</tr>
</tbody>
</table>

SLE: Systemic lupus erythematosus

**Table 4: Pulse**

<table>
<thead>
<tr>
<th>Pulse</th>
<th>V1</th>
<th>V2</th>
<th>V3</th>
<th>V4</th>
<th>V5</th>
<th>V6</th>
<th>V7</th>
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<tbody>
<tr>
<td>N</td>
<td>25.00</td>
<td>24.00</td>
<td>24.00</td>
<td>23.00</td>
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<tr>
<td>Mean</td>
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<td>81.57</td>
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<td>66.00</td>
<td>64.00</td>
<td>66.00</td>
<td>62.00</td>
<td>64.00</td>
</tr>
<tr>
<td>Max</td>
<td>116.00</td>
<td>92.00</td>
<td>94.00</td>
<td>90.00</td>
<td>90.00</td>
<td>90.00</td>
<td>100.00</td>
</tr>
<tr>
<td>Siddev</td>
<td>11.21</td>
<td>6.61</td>
<td>6.71</td>
<td>6.74</td>
<td>6.42</td>
<td>7.16</td>
<td>7.74</td>
</tr>
<tr>
<td>P-value</td>
<td>0.233</td>
<td>0.160</td>
<td>0.084</td>
<td>0.0954</td>
<td>0.331</td>
<td>0.575</td>
<td></td>
</tr>
</tbody>
</table>

**Table 5: SBP**

<table>
<thead>
<tr>
<th>SBP</th>
<th>V1</th>
<th>V2</th>
<th>V3</th>
<th>V4</th>
<th>V5</th>
<th>V6</th>
<th>V7</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>25.00</td>
<td>24.00</td>
<td>24.00</td>
<td>23.00</td>
<td>23.00</td>
<td>23.00</td>
<td>23.00</td>
</tr>
<tr>
<td>Mean</td>
<td>129.04</td>
<td>127.50</td>
<td>124.75</td>
<td>122.65</td>
<td>121.65</td>
<td>123.39</td>
<td>124.43</td>
</tr>
<tr>
<td>Median</td>
<td>120.00</td>
<td>130.00</td>
<td>120.00</td>
<td>120.00</td>
<td>120.00</td>
<td>120.00</td>
<td>120.00</td>
</tr>
<tr>
<td>Min</td>
<td>110.00</td>
<td>120.00</td>
<td>120.00</td>
<td>110.00</td>
<td>90.00</td>
<td>90.00</td>
<td>120.00</td>
</tr>
<tr>
<td>Max</td>
<td>210.00</td>
<td>140.00</td>
<td>140.00</td>
<td>149.00</td>
<td>140.00</td>
<td>140.00</td>
<td>150.00</td>
</tr>
<tr>
<td>SIDDEV</td>
<td>19.36</td>
<td>6.08</td>
<td>6.46</td>
<td>7.31</td>
<td>9.18</td>
<td>5.51</td>
<td>7.84</td>
</tr>
<tr>
<td>P-value</td>
<td>0.812</td>
<td>0.270</td>
<td>0.104</td>
<td>0.052</td>
<td>0.148</td>
<td>0.301</td>
<td></td>
</tr>
</tbody>
</table>

SBP: Systolic blood pressure

**Table 6: Diastolic BP**

<table>
<thead>
<tr>
<th>SBP</th>
<th>V1</th>
<th>V2</th>
<th>V3</th>
<th>V4</th>
<th>V5</th>
<th>V6</th>
<th>V7</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>25.00</td>
<td>24.00</td>
<td>24.00</td>
<td>23.00</td>
<td>23.00</td>
<td>23.00</td>
<td>23.00</td>
</tr>
<tr>
<td>Mean</td>
<td>83.84</td>
<td>82.75</td>
<td>81.25</td>
<td>81.65</td>
<td>79.91</td>
<td>80.43</td>
<td>82.61</td>
</tr>
<tr>
<td>Median</td>
<td>80.00</td>
<td>80.00</td>
<td>80.00</td>
<td>80.00</td>
<td>80.00</td>
<td>80.00</td>
<td>80.00</td>
</tr>
<tr>
<td>Min</td>
<td>78.08</td>
<td>80.00</td>
<td>80.00</td>
<td>70.00</td>
<td>70.00</td>
<td>70.00</td>
<td>80.00</td>
</tr>
<tr>
<td>Max</td>
<td>110.00</td>
<td>90.00</td>
<td>90.00</td>
<td>90.00</td>
<td>90.00</td>
<td>90.00</td>
<td>90.00</td>
</tr>
<tr>
<td>Siddev</td>
<td>7.57</td>
<td>4.45</td>
<td>3.05</td>
<td>4.77</td>
<td>4.07</td>
<td>3.67</td>
<td>4.49</td>
</tr>
<tr>
<td>P-value</td>
<td>0.553</td>
<td>0.088</td>
<td>0.1687</td>
<td>0.015</td>
<td>0.012</td>
<td>0.425</td>
<td></td>
</tr>
</tbody>
</table>

BP: Blood pressure
hence aggressive immunosuppression is required. Drugs of choice in nephritis patients are mycophenolate mofetil (MMF), cyclophosphamide, and azathioprine. With all these agents glucocorticoids are used, LN tends to be an ongoing disease, with flares requiring retreatment for many years. For more people of LN, accelerated atherosclerosis becomes important after. Several years of disease, attention must be given to control of blood pressure, hyperlipidemia, and hypertension.

**Aims and Objectives**
- To study the incidence of LN in 25 patients of SLE
- To study the outcome in these cases of LN
- To study the efficacy of different immunosuppressive agents.

**MATERIALS AND METHODS**

This is a hospital based prospective observational study.

Diagnosis of systemic erythematosus on the following American College of Rheumatology (ACR) criteria is made:

1. Malar rash
2. Discoid rash
3. Photosensitivity
4. Oral ulcer
5. Arthritis
6. Serositis
7. Renal disorder
8. Neurological
9. Hematological: Anemia/leukopenia/thrombocytopenia/erythrocyte sedimentation rate (ESR)
10. Immunological: Anti-dsDNA/Anti-SM/Anti-phospholipids
11. Antinuclear antibody (ANA)

Out of above 11 criteria at least 4 are required to fulfill. All 4 may not be present at beginning but may develop sequentially.

The patients are than clinically evaluated in detail for renal involvement, urine routine and microscopy, renal function test (RFT), C3-C4 levels, 24 h urine proteins, and renal biopsy.

**Sample Size**
A total number of 25 patients attending tertiary care hospital were considered for this study.

**Inclusion Criteria**
- Patient fulfilling the ACR criteria for diagnosis of SLE are enrolled
- Newly diagnosed case of SLE.

**Exclusion Criteria**
1. Pregnancy
2. Planning for pregnancy
3. Patients on oral contraceptive pills
4. Known case of acute or chronic renal failure
5. Known case of hypertension and diabetic mellitus
6. Known case of cardiac diseases.

**Methods**
This study is conducted in a tertiary care hospital in Navi Mumbai. All patients who fulfill the ACR criteria were enrolled.

This study is prospective study of 18 months.

**Evaluation Visit Schedule**
Patients are evaluated at 3 months intervals:
- Clinically and routine laboratory investigations - 3 monthly
- Serology if required - 6 months.

**Table 7: CBC result**

<table>
<thead>
<tr>
<th>CBC result</th>
<th>Count (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved</td>
<td>20 (80)</td>
</tr>
<tr>
<td>Stable</td>
<td>2 (8)</td>
</tr>
<tr>
<td>Leukocytosis and thrombocytosis</td>
<td>1 (4)</td>
</tr>
<tr>
<td>Lost to follow-up</td>
<td>1 (4)</td>
</tr>
<tr>
<td>Death</td>
<td>1 (4)</td>
</tr>
<tr>
<td>Total</td>
<td>25 (100)</td>
</tr>
</tbody>
</table>

**Table 8: ESR result**

<table>
<thead>
<tr>
<th>ESR result</th>
<th>Count (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active disease</td>
<td>3 (12)</td>
</tr>
<tr>
<td>Disease under control</td>
<td>13 (52)</td>
</tr>
<tr>
<td>No disease activity</td>
<td>6 (24)</td>
</tr>
<tr>
<td>Lost to follow-up</td>
<td>1 (4)</td>
</tr>
<tr>
<td>Death</td>
<td>1 (4)</td>
</tr>
<tr>
<td>End-stage renal disease</td>
<td>1 (4)</td>
</tr>
<tr>
<td>Total</td>
<td>25 (100)</td>
</tr>
</tbody>
</table>

**Table 9: Urine R/M (proteinuria)**

<table>
<thead>
<tr>
<th>Urine R/M (proteinuria)</th>
<th>V1</th>
<th>V2</th>
<th>V3</th>
<th>V4</th>
<th>V5</th>
<th>V6</th>
<th>V7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absent</td>
<td>11</td>
<td>6</td>
<td>8</td>
<td>17</td>
<td>15</td>
<td>17</td>
<td>15</td>
</tr>
<tr>
<td>Mild proteinuria</td>
<td>2</td>
<td>7</td>
<td>10</td>
<td>1</td>
<td>6</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Moderate proteinuria</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Severe proteinuria</td>
<td>0</td>
<td>6</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Very severe proteinuria</td>
<td>8</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>LUP</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Death</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
</tbody>
</table>

\(P=0.005\), Not-significant (V1-7)
Shetty, et al.: A Study of Nephritis and its Outcome in SLE

**Laboratory Investigations**
Complete blood count (CBC), ESR, RFT, urine routine and microscopy, 24 h urine proteins - 3 monthly.

Blood sugar, ANA by IF, anti dsDNA, C3-C4 levels, lipid profile-6 monthly, if required.

**RESULTS**

This study studied 25 patients with systemic lupus erythematosus for LN (Tables 1-20).

Table 10 shows that 24 urine protein is more important than simple urine routine and microscopy.

Table 11 shows that even though patient has heavy proteinuria RFT can be normal.

Table 12 shows that dyslipidemia is common association with lupus nephritis

Table 13 shows that ANA is positive in all the patients of SLE.

Table 14 shows that anti-dsDNA is commonly positive in lupus nephritis.

Table 15 shows that complement levels are significantly reduced in lupus nephritis.

**DISCUSSION**

SLE is a multisystem autoimmune disease. The wide range of organ system involved in the disease includes musculoskeletal, cutaneous, hematological, neurological, cardiac, pulmonary, renal, gastrointestinal, vascular, and ocular systems. LN is one of the most serious manifestations of SLE and it usually arises within 5 years of diagnosis.  

This study is done in a tertiary center at Navi Mumbai. The patient fulfilling the ACR criteria for SLE were included.

---

**Table 10: Urine 24 h protein level**

<table>
<thead>
<tr>
<th>Protein level</th>
<th>V1</th>
<th>V2</th>
<th>V3</th>
<th>V4</th>
<th>V5</th>
<th>V6</th>
<th>V7</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>13.00</td>
<td>18.00</td>
<td>19.00</td>
<td>19.00</td>
<td>19.00</td>
<td>18.00</td>
<td>19.00</td>
</tr>
<tr>
<td>Mean</td>
<td>4.30</td>
<td>5.00</td>
<td>1.30</td>
<td>0.88</td>
<td>0.49</td>
<td>1.02</td>
<td>0.84</td>
</tr>
<tr>
<td>Median</td>
<td>3.92</td>
<td>2.00</td>
<td>1.00</td>
<td>0.55</td>
<td>0.42</td>
<td>0.39</td>
<td>0.39</td>
</tr>
<tr>
<td>Min</td>
<td>0.10</td>
<td>0.50</td>
<td>0.46</td>
<td>0.13</td>
<td>0.02</td>
<td>0.12</td>
<td>0.13</td>
</tr>
<tr>
<td>Max</td>
<td>14.70</td>
<td>4.88</td>
<td>4.29</td>
<td>4.12</td>
<td>1.20</td>
<td>6.10</td>
<td>4.73</td>
</tr>
<tr>
<td>Stddev</td>
<td>4.25</td>
<td>1.09</td>
<td>1.08</td>
<td>0.91</td>
<td>0.35</td>
<td>1.58</td>
<td>1.29</td>
</tr>
<tr>
<td>P-value</td>
<td>0.006</td>
<td>0.005</td>
<td>0.019</td>
<td>0.006</td>
<td>0.020</td>
<td>0.015</td>
<td></td>
</tr>
</tbody>
</table>

**Table 11: RFT**

<table>
<thead>
<tr>
<th>RFT</th>
<th>V1</th>
<th>V2</th>
<th>V3</th>
<th>V4</th>
<th>V5</th>
<th>V6</th>
<th>V7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>20</td>
<td>22</td>
<td>23</td>
<td>22</td>
<td>21</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>Mildly deranged RFT</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Moderately deranged RFT</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Severely deranged RFT</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>LUP</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Death</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
</tbody>
</table>

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**Table 13: ANA**

<table>
<thead>
<tr>
<th>ANA</th>
<th>V1 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homogenous</td>
<td>23 (92)</td>
</tr>
<tr>
<td>Speckled</td>
<td>2 (8)</td>
</tr>
<tr>
<td>Total</td>
<td>25 (100)</td>
</tr>
</tbody>
</table>

ANA: Antinuclear antibody

---

**Table 14: ANTI-dsDNA**

<table>
<thead>
<tr>
<th>ANTI-dsDNA</th>
<th>V1</th>
<th>V2</th>
<th>V3</th>
<th>V4</th>
<th>V5</th>
<th>V6</th>
<th>V7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>15</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Negative</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Not done</td>
<td>8</td>
<td>18</td>
<td>24</td>
<td>22</td>
<td>23</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>LUP</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Death</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
</tbody>
</table>

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**Table 15: C3-C4**

<table>
<thead>
<tr>
<th>C3-C4</th>
<th>V1</th>
<th>V2</th>
<th>V3</th>
<th>V4</th>
<th>V5</th>
<th>V6</th>
<th>V7</th>
</tr>
</thead>
<tbody>
<tr>
<td>C3-C4 mild</td>
<td>12</td>
<td>5</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>C3-C4 moderate</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>C3-C4 normal</td>
<td>1</td>
<td>10</td>
<td>9</td>
<td>12</td>
<td>14</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Note done</td>
<td>10</td>
<td>9</td>
<td>10</td>
<td>10</td>
<td>8</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>LUP</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Death</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
</tbody>
</table>

---

**Table 12: Dyslipidemia development status for nephritis patients**

<table>
<thead>
<tr>
<th>Dyslipidemia status</th>
<th>V1</th>
<th>V2</th>
<th>V3</th>
<th>V4</th>
<th>V5</th>
<th>V6</th>
<th>V7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>6</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Negative</td>
<td>16</td>
<td>14</td>
<td>21</td>
<td>20</td>
<td>19</td>
<td>20</td>
<td>19</td>
</tr>
<tr>
<td>LUP</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Death</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Not done</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
</tbody>
</table>

P=0.032, not-significant (V1-7)

---

**Table 13: ANA**

<table>
<thead>
<tr>
<th>ANA</th>
<th>V1 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homogenous</td>
<td>23 (92)</td>
</tr>
<tr>
<td>Speckled</td>
<td>2 (8)</td>
</tr>
<tr>
<td>Total</td>
<td>25 (100)</td>
</tr>
</tbody>
</table>

ANA: Antinuclear antibody

---

**Table 14: ANTI-dsDNA**

<table>
<thead>
<tr>
<th>ANTI-dsDNA</th>
<th>V1</th>
<th>V2</th>
<th>V3</th>
<th>V4</th>
<th>V5</th>
<th>V6</th>
<th>V7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>15</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Negative</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Not done</td>
<td>8</td>
<td>18</td>
<td>24</td>
<td>22</td>
<td>23</td>
<td>23</td>
<td>22</td>
</tr>
<tr>
<td>LUP</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Death</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
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</tbody>
</table>

P=0.003, Significant (V1-7)

---

**Table 15: C3-C4**

<table>
<thead>
<tr>
<th>C3-C4</th>
<th>V1</th>
<th>V2</th>
<th>V3</th>
<th>V4</th>
<th>V5</th>
<th>V6</th>
<th>V7</th>
</tr>
</thead>
<tbody>
<tr>
<td>C3-C4 mild</td>
<td>12</td>
<td>5</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>C3-C4 moderate</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>C3-C4 normal</td>
<td>1</td>
<td>10</td>
<td>9</td>
<td>12</td>
<td>14</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Note done</td>
<td>10</td>
<td>9</td>
<td>10</td>
<td>10</td>
<td>8</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>LUP</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Death</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
</tbody>
</table>

P=0.003, Significant (V1-7)
in the study. 25 patients were included in the study. Out of 25 patients, 23 were females and only 2 were male, i.e., 92% were female which shows that this disease is more common in females than in males. The age distribution showed that the disease is more common in younger age group. 13 patients were of age group 31-40 (52%), 10 were 21-30 (40%), 1 patient <20 years (4%), and between 41 and 50; there were 2 patients (8%). Mostly the females were of child bearing age group. These findings are as per with other studies that it is more common in female in child bearing age group.

Most of the LN patients present with symptoms of hypertension, proteinuria, and renal failure. Among our 25 patients, 9 patients (36%) presented with signs and symptoms related to these conditions. Common symptoms were swelling of the face and legs, decreased micturation and headache. Rest 16 patients (64%) presented with other symptoms of SLE such as on and off fever, joint pain, malar rash, photosensitivity, and alopecia. Active LN can present with such other symptoms of active SLE.

One patient had almost all the systems involved namely musculoskeletal, cutaneous, renal, central nervous system, pulmonary, hematologic, and cardiovascular. Such presentation is rare.

In the study, pallor was significant finding \((P = 0.002)\) when compared to other findings of nephritis, i.e., edema \((P = 0.308)\) which was not significant finding. Even sororities was not significant \((P = 0.143)\). \(P = 0.308\).

The patients were subjected to different tests at each follow-up. The ESR results showed significant improvement at the end of the study. 52% patients had disease activity under control, 12% had active disease, and 24% were stable. Many patients also had improved CBC results at the end of the study. 80% of patients had improved, 8% had no change, 4% leukocytosis and thrombocytosis, 4% lost follow-up, and 4% expired.

Urine routine and microscopy, and 24 h urine protein excretion are very important to diagnose LN early in the disease. The urine routine and microscopy (when compared between first and last visits) did not come out as an indicator for good prognosis. As it was hypothesized \((P = 0.905)\), but 34 h urine protein was a significant prognostic indicator during each visit \((P = 0.008)\). Bastian et al., concluded in their study that LN can be diagnosed on following dependable variables:

1. Renal biopsy
2. Proteinuria >0.5 g/24 h, or
3. One of the following features such as proteinuria >2+, serum creatinine >1.4, creatinine clearance< or = to 79 ml/min, 10 RBC or WBC per high power field.

However, in this study only renal biopsy and 24 h urine proteins were found to be significant during the follow-up.

Low C3-C4 levels are associated with active nephritis, especially focal proliferative and diffuse proliferative LN. C3 and C4 levels turned out to be significant predictors LN in this study \((P = 0.003)\).

In LN complement levels are reduced due to deposition in the renal tissue at various sites. Dolley et al. had shown that low C3. C4 levels in associated with focal and diffuse proliferative LN, renal biopsy should be considered in the disease course as early as possible. Out of 25 diagnosed cases of systemic LN, 20 patients undergone renal biopsy and 5 did not because of of poor socioeconomic condition. In country like India where renal biopsy study is costly investigation all patients could not be advised renal biopsy.

<table>
<thead>
<tr>
<th>Table 16: Renal biopsy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renal biopsy</td>
</tr>
<tr>
<td>Performed</td>
</tr>
<tr>
<td>Not performed</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Table 17: LN classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renal biopsy</td>
</tr>
<tr>
<td>Class I</td>
</tr>
<tr>
<td>Class II</td>
</tr>
<tr>
<td>Class III</td>
</tr>
<tr>
<td>Class IV</td>
</tr>
<tr>
<td>Class V</td>
</tr>
<tr>
<td>Class VI</td>
</tr>
<tr>
<td>Note done</td>
</tr>
<tr>
<td>LUP</td>
</tr>
<tr>
<td>Death</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

LN: Lupus nephritis

<table>
<thead>
<tr>
<th>Table 18: Medication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medication</td>
</tr>
<tr>
<td>Cyclophosphamide</td>
</tr>
<tr>
<td>Cyclophosphamide+MMF</td>
</tr>
<tr>
<td>Cyclophosphamide+methylprednisolone</td>
</tr>
<tr>
<td>Dialysis</td>
</tr>
<tr>
<td>MMF</td>
</tr>
<tr>
<td>Steroids</td>
</tr>
<tr>
<td>Dialysis+steroids</td>
</tr>
</tbody>
</table>

LN: Lupus nephritis, MMF: Mycophenolate mofetil
Out of five, three patients did not have proteinuria, hence renal biopsy was not advised and 2 patients, who had proteinuria, were not affording. Out of 20 biopsied patients, 12 (60%) had Class IV LN, 6 (30%) had Class III, and 2 (10%) had Class II LN. None of the patients had Class I or Class VI. Das et al., also had similar incidence, twenty-too (75.9%) patients had diffuse proliferative glomerulonephritis (Class IV), 6 (20.7%) focal proliferative glomerulonephritis (Class III), and one (3.4%) Class V.

Dyslipidemia is a common finding in LN. Nephritic syndrome leads to dyslipidemia. Which is a consistent finding in this study ($P = 0.012$), when compared between visits 1 and visit 7.

When LN is properly treated, it has a good prognosis. The first-line treatment given, for most patients, was injection cyclophosphamide 12 patients received cyclophosphamide 500 mg/m$^2$ only as the treatment. After 6 cycles of cyclophosphamide therapy, patients were given maintenance dose of cyclophosphamide every 3 months for 6 cycles. Oral azathioprine as maintenance therapy was given later. 11 out of 12 patients improved and 1 patient the follow-up. Thus at per with other studies cyclophosphamide had good response in LN. 2 patients did not respond to cyclophosphamide in these patients MMF was given as second line therapy; 1 of these 2 patients had resistant LN not controlled by MMF. We had planned to give biologics (i.e., rituximab) for this patient. Melander et al. had shown in their study of 20 patients that rituximab was effective in Class IV LN. The other patient had good response to MMF but relapses are common with LN, this patient also had relapses and the dose of MMF had to be increased.

2 patients had presented with severe flare, hence they were given cyclophosphamide and methylprednisolone as the first-line therapy. 1 patients had improved and put on azathioprine maintenance therapy:

1 patient succumbed to death due to complications.

1 patient end-stage renal disease and she was being treated with dialysis.

3 patient received MMF as the first line therapy. 1 of these patients was not compliant for the treatment and expired. This proved that patient education and compliance are very important in this disease. 1 patient had relapses and the dose had to be adjusted and 1 patient improved without any relapses.

4 patients were given only steroids for treatment of SLE. 1 among them developed nephritis later in the disease course and 3 patients did not develop nephritis.

One case needs to be emphasized. This patient presented with urinary tract infection and her RFTs were severely deranged. She was properly worked up and she was ANA positive. Tentative diagnosis of LN was made and she given dialysis and injectable steroids. Then, renal biopsy was done showing Class IV LN. When she renal functions were settled, she was put on deflazacort and now she is doing well on steroids itself.

All patient received hydroxychloroquine and steroids. Most of the patients received supportive therapy such as enalapril for proteinuria and statins dyslipidemia. Those who had hypertension were given antihypertensives and hypertension was strictly controlled.

### Incidence of LN

During this study, 22 patients developed nephritis and 3 did not develop. Thus, the incidence of nephritis is 88%.

SLE disease activity index (SLEDAI) is used to see the flares. If it is >3 and <12, it is mild to moderate flare; if it is >12, it is severe flare. SLEDAI is calculated at the presentation and at the end of the study. 18 patients (72%) had mild to moderate flare. Among these 8 had complete

<table>
<thead>
<tr>
<th>Table 19: SLEDAI score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Result</td>
</tr>
<tr>
<td>Mid/mild flare (3 and 12)</td>
</tr>
<tr>
<td>Complete remission</td>
</tr>
<tr>
<td>Multiple relapses</td>
</tr>
<tr>
<td>Death</td>
</tr>
<tr>
<td>Partial remission</td>
</tr>
<tr>
<td>Not developed nephritis</td>
</tr>
<tr>
<td>Resistant LN</td>
</tr>
<tr>
<td>Late LN</td>
</tr>
<tr>
<td>Severe flare (&gt;12)</td>
</tr>
<tr>
<td>Complete remission</td>
</tr>
<tr>
<td>Lost to follow-up</td>
</tr>
<tr>
<td>Death</td>
</tr>
<tr>
<td>End-stage renal disease</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

LN: Lupus nephritis, SLEDAI: Systemic lupus erythematosus disease activity index

<table>
<thead>
<tr>
<th>Table 20: Final result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Result</td>
</tr>
<tr>
<td>Complete remission</td>
</tr>
<tr>
<td>Partial remission</td>
</tr>
<tr>
<td>Multiple relapses</td>
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<tr>
<td>Not developed nephritis</td>
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<tr>
<td>Resistant LN</td>
</tr>
<tr>
<td>Late LN</td>
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<tr>
<td>Lost to follow-up</td>
</tr>
<tr>
<td>Death</td>
</tr>
<tr>
<td>End-stage renal disease</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

LN: Lupus nephritis
remission, 2 had partial remission, 2 had multiple relapses, 1 had resistant nephritis, 1 developed nephritis later, 1 died, and 3 did not develop nephritis.

Out of 25 patients had severe flare, 4 had complete remission, 1 expired, 1 developed end-stage renal disease, and 1 patient lost the follow-up.

**Result**

Out of 25 patients of SLE studied, 22 developed nephritis and 3 did not. Among the 22 patients of nephritis, 12 (48%) had complete remission, 2 (8%) had partial remission, 2 (8%) had multiple relapses, 1 (4%) had late onset LN, 1 (4%) had resistant LN 1 (4%) lost follow-up, 2 (8%) expired, and 1 (4%) developed end-stage renal disease.

**CONCLUSION**

The following the findings from this study:
- 23 patients were females and 2 were males.
- Maximum female patients were of child bearing age group.
- Out of 25 patients, 9 patients presented with symptoms associated with nephritis, and 16 patients presented with other symptoms of SLE.
- The incidence of LN is 88%. Out of 25 patients, 22 patients developed nephritis and 3 did not.
- Pallor was significant finding in the study on general physical examination, but not edema and serositis.
- Good response in terms of CBC is seen with treatment.
- ESR is determinant of active disease. ESR improved in 52% patients.
- ANA and anti-dsDNA are positive in SLE.
- Determination of 24 h urine proteins is the best method for early diagnosis of LN.
- Renal biopsy is indicated early in the disease. 12 patients had Class IV LN, 6 had Class III, and 2 patients Class II LN. None of the patients had Class I or Class VI LN.
- Renal biopsy and 24 h urine proteins are the important determinants in the outcome of LN.
- C3-C4 levels are significantly decreased in severe LN dyslipidemia is present in LN.

- Cyclophosphamide is cheap and effective treatment of LN. 11 out of 12 patients improved with cyclophosphamide only.
- Out of 25 patients of SLE studied, 22 developed nephritis and 3 did not. Among the 22 patients of nephritis, 12 (48%) had complete remission, 2 (8%) had partial remission, 2 (8%) had multiple relapses, 1 (4%) had late onset LN, 1 (4%) had resistant LN, 1 (4%) lost follow-up, 2 (8%) expired, and 1 (4%) developed end-stage renal disease.

**REFERENCES**

Assessment of the Effectiveness of Planned Teaching Programme on Awareness and Knowledge of Oral Cancer Among Factory Workers in Pune

N Junior Sundresh¹, G Aswathy², Jaya John³, S Gupta⁴

¹Associate Professor, Department of Surgery, Annamalai University, Raja Muthiah Medical College, Chidambaram, Tamil Nadu, India, ²Research Scholar, Department of Hospital Management, Annamalai University, Chidambaram, Tamil Nadu, India, ³Associate Professor, Department of Pediatric Nursing, Sadhu Vaswani College of Nursing, Pune, Maharashtra, India, ⁴Head, Department of Cardiac Surgery, Fabiani and Budhrani Heart Institute, Pune, Maharashtra, India

Abstract

Introduction: Oral cancer is one of the 10 leading cancers in the world. In India, it is the most common cancer among males and the third most common cancer in females. Cancer is an abnormal growth of cells which tend to proliferate in an uncontrolled way.

Aim: To assess the existing knowledge regarding oral cancer among factory workers, to develop a planned teaching programme on awareness and knowledge of oral cancer, and to assess the effectiveness of planned teaching programme.

Materials and Methods: A total of 40 samples using a semi-structured questionnaire. Conduct a pretest to assess the existing knowledge and awareness among factory workers and given a planned health teaching on oral cancer. After a week later posttest was conducted.

Results: The study shows the knowledge level and awareness regarding oral cancer among factory workers increased after the health teaching programme. During pretest, only 2.5% of people were aware about oral cancer and its early symptoms. Furthermore, 22.5% of people are not aware about oral cancer as well as 75% of people were had an average knowledge regarding oral cancer. After the health teaching programme, 47.5% of people shown excellent knowledge level and 50% of people shown a moderate level of knowledge as well as only 2.5% of people shown very poor knowledge level regarding oral cancer.

Conclusion: This survey highlights the general lack of awareness and knowledge on oral cancer among factory workers. Structured awareness program is warranted for this population.

Key words: Awareness, Oral cancer, Tobacco

INTRODUCTION

Oral cancer is a major health problem worldwide.¹ Incidence of oral cancer is increasing drastically in India. Tobacco usage, chewing tobacco, and human papillomavirus infection are the most common risk of oral cancer. The incidence of oral cancer is highest in India, South and Southeast Asian countries.²-⁴ Oral cancer will remain a major health problem, and the incidence will increase by 2020 and 2030 in both sexes, however, early detection and prevention will reduce this burden. Oral cavity is accessible for visual examination, and oral cancers and premalignant lesions have well-defined clinical diagnostic features, but oral cancers are typically detected in their advanced stages.⁵ Oral cancer can be diagnosed earlier by self-mouth examination, increase awareness in high-risk communities. Early detection has better curing rates and it will also reduce the cost for the treatment. Education campaigns are needed to raise public awareness about oral cancer and its links with tobacco and alcohol consumption.⁶
Aim
To assess the existing knowledge regarding oral cancer among factory workers, to develop a planned teaching programme on awareness and knowledge of oral cancer and to assess the effectiveness of planned teaching programme.

MATERIALS AND METHODS
This descriptive study was conducted in factory workers in Pune. The sample size of this study consists of 40 industrial workers. At first stage, the knowledge and awareness of factory workers regarding oral cancer were accessed using questionnaire. Then, oral cancer awareness training session was conducted. After a week again, the knowledge about oral cancer was assessed using the questionnaire.

RESULTS
The workers were from the secondary education which was 55%, followed by 17.5% from primary education and 27.5% from graduate and above. Among the 40 samples, 52.53% of factory workers referred newspaper as a source of information regarding oral cancer followed by 22.5% from friends and relatives and 25% of people are heard from radio regarding oral cancer and its awareness. In financial status, 52.5% of samples had their family monthly income between 8001 and 11,000 Rs., where 40% of them had family monthly income of 5000-8000 Rs. per month and 7.5% of them had their monthly income of 11,001-14,000/Rs. The study shows the majority are from joint family (65%), whereas 35% are from nuclear family. The study also illustrates among the total study people 70% of people are using tobacco and other tobacco products and rest 30% of people are nonusers.

Figure 1 shows the majority of factory workers using thambaku (39.57%) and the second most using product is cigarette (28.57%). Furthermore, 25% of factory workers are using gutka while 7.14% of people are using all the products of tobacco in different forms.

Figure 2 shows the total number of people use tobacco among the whole study population. From the total sample, 70% of people are using tobacco and tobacco products. Rest 30% of people are nonusers.

Table 1 shows the age group among the participants majority are from the age group of 21 to 30 years (40%). The second most participants are from the age group of 31 to 40 (32.5%). It also shows 15% of people are above 40 years and 12.5% of people are from the age group below 20 years old.

Table 1: The age group of participants

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 20</td>
<td>5 (12.5)</td>
</tr>
<tr>
<td>21-30</td>
<td>16 (40)</td>
</tr>
<tr>
<td>31-40</td>
<td>13 (32.5)</td>
</tr>
<tr>
<td>Above 40</td>
<td>6 (15)</td>
</tr>
</tbody>
</table>

Figure 3 analysis of overall correct knowledge score in frequency and percentage obtained from the factory workers during pretest.

Figure 4 shows that 2.5% of factory workers have good knowledge regarding oral cancer, 22.5% of factory workers have poor knowledge regarding oral cancer, while 75% of factory workers have average and adequate knowledge regarding oral cancer.

Figure 4 shows that 2.5% of factory workers have good knowledge regarding oral cancer, 22.5% of factory workers have poor knowledge regarding oral cancer, while 75% of factory workers have average and adequate knowledge regarding oral cancer.
workers have poor knowledge regarding oral cancer, while 75% of factory workers have moderate and adequate knowledge regarding oral cancer in the pretest. Posttest result shows 47.5% of excellent knowledge level among factory workers regarding oral cancer as well the poor knowledge level decreased to 2.5% only, whereas the half of the group shown moderate knowledge and adequate knowledge level.

**DISCUSSION**

Motallebnejad et al.’s study was conducted to find out the knowledge about oral cancer and effect of an education in Babol (Iran). The questionnaire was the study tool. The result of the study showed that community sample of 400 people, 76.0% had no knowledge of oral cancer. Mean knowledge score before the education intervention was 1.47 (standard deviation 3.40) out of 10. Knowledge about oral cancer was not associated with age, sex or education level. This study also shows during pretest 75% of people is having moderate level of awareness regarding oral cancer and 2.5% of people are well aware about the oral cancer. That is 2.55 people are having the excellent level of knowledge. At the same time, 22.5% of people had very poor level of knowledge regarding oral cancer.

Cancer Patient Aid Association, India, was conducted, a study about tobacco use and awareness among marginalized children. The result of the study showed that the percentage of tobacco users in urban Mumbai was quite low at 4.8% compared with rural Kasara (36%) and Assam (76%); and 74.6% of the children were aware that tobacco use was dangerous and harmful to health. The average age of initiation was 9 years. Out of the 1004 children surveyed, 253 were tobacco users and 79% were males. This study also shows 70% of samples are tobacco users and 30% were nontobacco users. Pravara Rural Hospital, Loni (2007-2011), the Department of Radiotherapy and Oncology, Rural Medical College. A cross-sectional retrospective study was conducted through case records of oral cancer patients who reported during 2007-2011 to the Department of Radiotherapy and Oncology, Rural Medical College and Pravara Rural Hospital, Loni, Maharashtra state, India. The result obtained was the 464 oral cancer patients constituted 24% of total cancer patients, 6.25% were young (<30 years), 67.24% were in 30-60 years, and 26.51% were more than 60 years. Conclusion was the prevalence of oral cancer was higher among elderly males predominantly with risk habits of betel quid/tobacco chewing and smoking for more than 10 years. This study also shows from these total tobacco users the majority group of people use tobacco in the form of thambaku that is 39.28%. The second most used tobacco product was cigarette (28.57%) and gutka (25%). At the same time, rest 7.14% of people use tobacco in the form of all these products. Among these tobacco users, half of them are using this tobacco since 1 to 5 years. Whereas, 21.42% of people are using these tobacco products since 5 years. Amrita institute of medical sciences and research Centre, Cochin, India. Elango et al. in 2009 conducted a study on factors affecting oral cancer awareness in high-risk population in India by Amrita Institute of Medical Sciences and Research Centre, Cochin, India. The questionnaire was used as tool for the study. The result of the study showed that out of 1885 persons 86% had heard about oral cancer and 32% knew someone with oral cancer. 62% of the subjects correctly identified the causes; this included 77% of the subjects who identifying smoking, 64% alcohol, and 79% paan chewing as a cause of oral cancer. This study also shows from these total tobacco users the majority group of people use tobacco in the form of thambaku, that is, 39.28%. The second most used tobacco product was cigarette and gutka. The percentage shows 28.57% and 25%, respectively. At the same time, rest 7.14% of people use tobacco in the form of all these products. Shetty and Brown oral cancer risk factors among Mexican American Hispanic Adolescents in South Texas. A study was conducted to assess the knowledge
of high school children on oral cancer risk factors. The result of the study showed that the effective response rate was 67%. 95% of the students were Hispanic American, 55% had not heard about oral cancer, also shown that the overall risk of oral cancer among the Mexican American Adolescent population is high especially among the males, and there is a great need for carefully planned health education and promotion for behavior change. This study also shows 22.5% of people are not aware about oral cancer and its causes and early symptoms. Whereas, 75% are had moderate knowledge level as well as 2.5% of people had excellent knowledge, and they are aware about oral cancer.

CONCLUSION

This study highlights the lack of awareness of oral cancer among factory workers. Recently, a trend has been observed toward increased incidence of oral cancer among young adults. This increase in incidence is only observed in patients with tongue cancer. An oral cancer awareness program with screening that should be implemented for this population.

REFERENCES

Incidence of Osteoporosis in Chronic Obstructive Pulmonary Disease Patients in a Tertiary Care Hospital: A Prospective Clinical Study

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Abstract

Background: The purpose of the present study is to know the incidence of osteoporosis in chronic obstructive pulmonary disease (COPD) patients in relation to its severity and early diagnosis of osteoporosis in COPD patients and its treatment can change quality of life of the patients.

Methods: A prospective clinical study consisted of 100 COPD patients above 40 years were undertaken to study the incidence of osteoporosis. Of which, 74 males and 26 females were included in this study. Known COPD patients were assessed by GOLD criteria of severity.

Results: The study group consisted of 100 patients, of which 74 are males and 26 are females. Incidence of osteopenia and osteoporosis among males are 16.21% and 60.81% respectively. Incidence of osteopenia and osteoporosis among females are 19.23% and 50.00% respectively (P > 0.05). Among men incidence of osteoporosis increases with an increase of grading. It increased from 9.09% for Grade 2 to 81.81% to Grade 4 (P < 0.01). Among women incidence of osteoporosis increases with increase of grading. It increased from 20.00% for Grade 2 to 70.00% to Grade 4 (P > 0.05). Incidence of osteoporosis is high among patients on oral steroids 82.97%. Incidence among oral inhaled corticosteroid patients is 51.51% and on no steroids is 10% (P > 0.05).

Conclusions: In the present study, incidence of severity of osteoporosis increases with increased grading of COPD with high use of oral steroids. Early diagnosis of osteoporosis in COPD patients with early treatment can change the quality of life.

Key words: Chronic obstructive pulmonary disease, Quality of life, Steroid therapy

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a complex disease; the initial symptoms are cough with mucus production and dyspnea. As the disease progression other symptoms may also develop. Osteoporosis might also develop possibly due to a certain number of factors related to the disease. Etiology of osteoporosis in COPD is probably complex, and various factors may contribute to its pathogenesis. The pathophysiological mechanisms in COPD are mainly due to oxidative stress, which acts as an important amplifying mechanism in copd. Biomarkers of oxidative stress (e.g. hydrogen peroxide, 8-isprostane) are increased in the exhaled breath condensate, sputum and systemic circulation of COPD patients. Osteoporosis is a systemic skeletal disease characterized by a decreased bone mineral density (BMD) and/or deterioration of the microarchitecture, resulting in increased bone fragility and hence an increased susceptibility to fractures. The preclinical state of osteoporosis is called osteopenia. World Health Organization (WHO) definition for osteoporosis is based on the measurement of BMD. Dual energy X-ray absorptiometry (DEXA) is currently the “gold standard” and the most frequently used method of BMD measurement. BMD is expressed in standard deviation (SD) of means, the T and Z-scores. The T-score is a SD compared with a
young adult sex matched control population. The Z-score is a SD compared with an age- and sex-matched control population. T-scores of $<-2.5$ are defined as osteoporosis.\(^5\)

The prevalence of osteoporosis has been found to be high in inflammatory bowel disease, sarcoidosis and COPD. The common link in these diseases might be systemic inflammation. Indeed, chronic inflammatory diseases lead to the production of cytokines that stimulate bone turnover. This increased bone turnover may increase bone fragility and hence may be associated with an increased fracture risk. Indeed, Bon \textit{et al.} found a significant correlation between C-telopeptides of Type I collagen (a marker of bone resorption) and interleukine-4 (IL-4) and tumor necrosis factor $\alpha$ (TNF-$\alpha$) in COPD patients.\(^6\) In addition, they found a significant correlation between N-terminal procollagen propeptide (a marker of bone formation) and both IL-4 and TNF-$\alpha$. Another link could be physical inactivity due to the underlying disease, which in turn gives rise to a lower BMD. Another explanation could be that osteoporosis has the same risk factors as some chronic diseases e.g. smoking. The pathogenesis of osteoporosis in chronic diseases is complicated and not fully understood.\(^7\)

About 35\% of the COPD patients had markedly low 25-hydroxyvitamin D levels (i.e., 10 ng/mL). Vitamin D deficiency may also contribute to the decreased BMD associated with COPD due to less sun exposure and poor nutrition as a result of decreased functional status. Corticosteroid use decreases luteinizing hormone and follicle stimulating hormone secretion from the pituitary gland. There is a direct effect of glucocorticoids, which decreases estrogen and testosterone production.\(^8\)

**METHODS**

A prospective clinical study consisted of 100 COPD patients, who were admitted in Government General Hospital, Kakinada during November 2012-September 2014 were undertaken to conduct this study to look incidence of osteoporosis in COPD patients. 74 males and 26 females were studied. Ethics the protocol was approved by the local committee and written informed consent was obtained from each patient.

**Inclusion Criteria**
1. Age $>$40 years
2. Known COPD patients as assessed by GOLD criteria of severity.

**Exclusion Criteria**
1. Patients not willing for follow-up
2. Patients in respiratory or cardiac distress.

Consent was taken. All patients were clinically examined, and investigated by complete blood picture, chest X-ray, and Spirometry. All patients were sent for DEXA scan and serum vitamin D$3$ estimation.

Data are presented as mean $\pm$ SD. Differences in categorical variables were analyzed using the Chi-square test. $P < 0.05$ was considered as statistically significant.

**RESULTS**

The study group consisted of 100 patients, of which 74 are males and 26 are females. Among males 14.86\% of them are in 40-50 age group, 21.62\% of them are in 50-60 age group, 31.08\% of them are in 60-70 age group and 32.43\% of them are above 70 years age group.

Among females 23.07\% of them are in 40-50 age group, 19.23\% of them are in 50-60 age group 34.61\% of them are in 60-70 age group and 23.07\% of them are above 70 years age group (Table 1).

Among males, 9.45\% were in Grade 1, 14.86\% were in Grade 2, 31.08\% were in Grade 3, 44.59\% were in Grade 4. Among females 7.69\% were in Grade 1, 19.23\% were in Grade 2, 30.76\% were in Grade 3, 34.61\% were in Grade 4 (Table 2).

**Table 1: Age distribution**

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Males</th>
<th>%</th>
<th>Females</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>40-50</td>
<td>11</td>
<td>14.86</td>
<td>6</td>
<td>23.07</td>
</tr>
<tr>
<td>50-60</td>
<td>16</td>
<td>21.62</td>
<td>5</td>
<td>19.23</td>
</tr>
<tr>
<td>60-70</td>
<td>23</td>
<td>31.08</td>
<td>9</td>
<td>34.61</td>
</tr>
<tr>
<td>Above 70</td>
<td>24</td>
<td>32.43</td>
<td>6</td>
<td>23.07</td>
</tr>
</tbody>
</table>

**Table 2: Distribution with grading**

<table>
<thead>
<tr>
<th>COPD grading</th>
<th>Males</th>
<th>%</th>
<th>Females</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 1</td>
<td>7</td>
<td>9.45</td>
<td>2</td>
<td>7.69</td>
</tr>
<tr>
<td>Grade 2</td>
<td>11</td>
<td>14.86</td>
<td>5</td>
<td>19.23</td>
</tr>
<tr>
<td>Grade 3</td>
<td>23</td>
<td>31.08</td>
<td>8</td>
<td>30.76</td>
</tr>
<tr>
<td>Grade 4</td>
<td>33</td>
<td>44.59</td>
<td>9</td>
<td>34.61</td>
</tr>
</tbody>
</table>

COPD: Chronic obstructive pulmonary disease

**Table 3: Incidence of osteoporosis with sex**

<table>
<thead>
<tr>
<th>Sex</th>
<th>Normal BMD</th>
<th>%</th>
<th>Osteopenia</th>
<th>%</th>
<th>Osteoporosis</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>17</td>
<td>22.97</td>
<td>12</td>
<td>16.21</td>
<td>45</td>
<td>60.81</td>
</tr>
<tr>
<td>Females</td>
<td>8</td>
<td>30.76</td>
<td>5</td>
<td>19.23</td>
<td>13</td>
<td>50.00</td>
</tr>
</tbody>
</table>

BMD: Bone mineral density
Incidence of osteopenia and osteoporosis among males are 16.21% and 60.81% respectively. Incidence of osteopenia and osteoporosis among females are 19.23% and 50.00% respectively ($P > 0.05$) (Table 3).

Among men incidence of osteoporosis increases with increase of grading. It increased from 9.09% for Grade 2 to 81.81% to Grade 4 ($P < 0.01$) (Table 4).

Among women incidence of osteoporosis increases with increase of grading. It increased from 20.00% for Grade 2 to 70.00% to Grade 4 ($P > 0.05$) (Table 5).

Osteoporosis incidence increases among men as age advances ($P < 0.01$). Osteoporosis incidence increases among women as the age advances ($P < 0.05$).

Incidence of osteoporosis among premenopausal women is 16.67% and among postmenopausal women is 55% ($P > 0.05$).

Incidence of osteoporosis is high among people with low body mass index (BMI). Its incidence is 75.80% among low BMI people and 36.36% among people with high BMI ($P < 0.01$).

Incidence of osteoporosis is high among patients on oral steroids 82.97%. Incidence among oral inhaled corticosteroid patients is 51.51% and on no steroids is 10% ($P > 0.05$) (Table 6).

### DISCUSSION

In the present study incidence of osteoporosis in low BMI patients is (75.80%) and overweight patients is (36.36%). This association was is statistically significant ($P < 0.05$). In the present study, majority of patients who had osteoporosis had Grade 4 COPD (81.81%) and Grade 3 COPD (73.91%). Incidence of osteoporosis increased with grading of COPD from 14% (Grade 1) to 80% (Grade 4) among males. Among females also COPD incidence increased from Grade 1 to Grade 4. Present study is on par with Jørgensen and Schwarz study. In the present study, incidence of osteopenia and osteoporosis among males are 12% and 60.81%, respectively. This is on par with the above mentioned studies.

An Indian study which recently was conducted on 37 patients showed, prevalence of osteoporosis of 21.6% and osteopenia 27%. However, this study had used calcaneal ultrasonography for the diagnosis of osteoporosis, which is not considered as standard test.

We have used DEXA scan for the diagnosis of osteoporosis, which is considered a gold standard test and the patients were classified according to the WHO criteria.  

The incidence of osteoporosis and osteopenia in patients with Grade 4 and Grade 3 severity of COPD is 81.81% and 73.91% respectively as per our study. Hence, we propose that a prophylactic treatment with calcium (1000 mg/day) and vitamin D (800 IU/day) as a standard supplementation,
considering that calcium and vitamin D have been shown to reduce fracture risk in men and women (target serum level of 25-OHD ≥30 ng/mL). An oral bisphosphonate, as alendronate and risedronate, currently considered that first-line treatment for osteoporosis in men should be recommended, with patient education regarding potential side effects. Intravenous bisphosphonates, as zoledronic acid (5 mg once yearly), offer an alternative option for men who cannot tolerate oral bisphosphonates or who fail the dosing regimen more convenient. Anabolic drugs like the human parathyroid hormone (PTH) analogue teriparatide (PTH 1-34) stimulate bone formation through effects on osteoblasts and osteocytes and may therefore more directly target the main pathophysiological mechanism in osteoclastic giant cells (OGCS)-induced osteoporosis. Teriparatide has been found to be superior to alendronate in OGCS-induced osteoporosis, both regarding change in BMD and morphometric vertebral fractures, but there is no evidence for hip fracture reduction. This agent is suitable for men with severe osteoporosis (established osteoporosis; T-scores ≤−2.5 SD in combination with at least one fragility fracture) who continue to fracture after 1 year of bisphosphonate therapy, or multiple risk factors for fracture, or failed previous treatment (those who cannot tolerate or do not have an adequate response to bisphosphonates). Treatment should be reserved for these high-risk patients because of the need for daily injection and high cost.

CONCLUSION

In this study, the incidence of osteoporosis is high in COPD patients with increasing severity and age with corticosteroids usage prophylactic use of calcium and vitamin D3 changes the lifestyle of patients.

REFERENCES

Skeletal Dysplasias: Clinico-radiological Review

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Abstract

Skeletal dysplasias constitute a broad group of hereditary disorders with abnormal growth and malformations of cartilage and bone. There is a varied spectrum of clinical severity ranging from mildly effected short stature to lethal forms. They begin during early stages of fetal development and evolve throughout life. Clinical features and radiologic assessment are crucial for narrowing the differentials of this broad group of disorders. However, molecular analysis plays the definitive role for confirmation of diagnosis. A multidisciplinary team of specialists, including radiologists, pediatricians, genetic specialists, orthopedicians, and psychiatrists, is required for management of these disorders. In this article, we describe the features of common skeletal dysplasias, illustrate cases with clinical and radiological parameters for assessment, and discuss the differentiating findings for diagnosis and management.

Key words: Achondroplasia, Mucopolysaccharidosis, Osteochondrodysplasia, Osteogenesis imperfecta, Skeletal dysplasia

INTRODUCTION

Skeletal dysplasias are a group of heterogeneous conditions with abnormalities of the skeleton, predominantly involving abnormalities of bone shape, size, and density, which manifest as abnormalities of the limbs, chest, or skull.¹ The classification of skeletal dysplasias was initially on the basis of clinical – radiologic – pathological features for over the past 30 years; however, in recent times, there has been a change with predominant role of molecular abnormality associated with many of these conditions with a genetic defect.² International nomenclature of constitutional-intrinsic bone disease was in use from 1977 which has undergone various modifications in 1983, 1997, and 2001.³ The major addition in 2001 was the inclusion of genetic dysostoses-osteochondrodysplasias.⁴ The original five categories have been expanded to 32 groups which thus constitute a wide variety of disorders.

Since both bone and cartilage are affected in this group of disorders, they are also called osteochondrodysplasias.

Osteodysplasias include disorders of altered bone density with proportionate short stature, whereas chondrodysplasias may cause deformations and malformations with short trunk or short limb short stature.⁴

DISCUSSION

Individually, the skeletal dysplasias are rare, but collectively their birth incidence is 1/5000 approximately.⁵ Many of them have autosomal dominant inheritance except enzyme deficiency. There are six entities represent 50 per million or approximately 40% of all skeletal dysplasias, which include osteogenesis imperfecta (OI), multiple epiphyseal dysplasia, spondyloepiphyseal dysplasia, achondroplasia (AC), pseudoachondroplasia (PseudoAC), and metaphyseal chondrodysplasia (MC).⁶

Dysplasia is a more diffuse abnormal growth of bones – either cartilaginous or osseous components, whereas dysostosis is an abnormal ossification of specific bones – individually or in combination.

When considering differential diagnosis of these disorders, the presence of proportionate or disproportionate short stature should be assessed. The body proportions are important clues to an exact diagnosis (Table 1).

Rubin⁸ has proposed a dynamic classification of bone dysplasias where they are classified based on the location...
within the bone and the underlying pathologic abnormality (Table 2).

When patients are suspected of dysplasias, short stature needs to be assessed as either proportionate or disproportionate. Disproportionate dwarfism due to short limb is further classified as rhizomelic (proximal portion), mesomelic (central portion), or acromelic (distal portion).

Generally, radiological examination of three body regions, particularly hand anteroposterior (AP), pelvis with hips AP, and lateral view of lumbar spine, will give a good indication of extent of skeletal involvement and the likely diagnosis.

A brief description of important and common individual dysplasias is presented.

<table>
<thead>
<tr>
<th>Gene and protein</th>
<th>Clinical phenotype</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collagen:</td>
<td></td>
</tr>
<tr>
<td>COL1</td>
<td>Osteogenesis imperfecta</td>
</tr>
<tr>
<td>COL2</td>
<td>Achondrogenesis type II</td>
</tr>
<tr>
<td>COL9</td>
<td>Multiple epiphyseal dysplasia (MED) type 2</td>
</tr>
<tr>
<td>COL10</td>
<td>Metaphyseal dysplasia (Sedmid type)</td>
</tr>
<tr>
<td>COL11</td>
<td>Stickler syndrome II</td>
</tr>
<tr>
<td>COMP</td>
<td>Pseudoachondroplasia</td>
</tr>
<tr>
<td>Matrilin-3 (MATN-3)</td>
<td>Multiple epiphyseal dysplasia type 1</td>
</tr>
<tr>
<td>Perlecanc</td>
<td>Schwartz-Jampel type 1,2</td>
</tr>
<tr>
<td>Diastrophic dysplasia sulfate transporter (DTDST)</td>
<td>Achondrogenesis 1B</td>
</tr>
<tr>
<td>Arylsulfatase E</td>
<td>X-linked chondrodysplasia punctata</td>
</tr>
<tr>
<td>ANKH (Pyrophosphate transporter)</td>
<td>Cranioectodysplasia</td>
</tr>
<tr>
<td>CIC7</td>
<td>Severe osteopetrosis</td>
</tr>
<tr>
<td>Carboanhydrase II</td>
<td>Osteopetrosis with renal tubular acidosis</td>
</tr>
<tr>
<td>Lysosomal enzymes</td>
<td>Mucopolysaccharidoses</td>
</tr>
<tr>
<td>Cathepsin K</td>
<td>Mucolipidosis</td>
</tr>
<tr>
<td>Sedlin</td>
<td>Pyknodysostosis</td>
</tr>
<tr>
<td>Fibroblast growth factor receptor 1, 2</td>
<td>Craniosynostosis</td>
</tr>
<tr>
<td>Fibroblast growth factor receptor 3</td>
<td>Achondroplasia</td>
</tr>
<tr>
<td>PTH receptor</td>
<td>Hypochondroplasia</td>
</tr>
<tr>
<td>Fibroblast growth factor receptor 23</td>
<td>Thanatophoric dysplasia I, II</td>
</tr>
<tr>
<td>X linked hypophosphatemic rickets</td>
<td>Jansen type metaphyseal dysplasia</td>
</tr>
<tr>
<td>Autosomal dominant hypophosphatemic rickets</td>
<td>Severe osteopetrosis</td>
</tr>
<tr>
<td>X-linked SED tarda</td>
<td>Osteopetrosis with renal tubular acidosis</td>
</tr>
<tr>
<td>Sox9</td>
<td>Campomelic dysplasia</td>
</tr>
<tr>
<td>G13</td>
<td>Greig cephalopolysyndactyly</td>
</tr>
<tr>
<td>TRPS1</td>
<td>Trichorhinophalangeal dysplasia 1-3</td>
</tr>
<tr>
<td>TWIST</td>
<td>Saethre-Chotzen</td>
</tr>
<tr>
<td>CBFA-1</td>
<td>Cleidocranial dysplasia</td>
</tr>
<tr>
<td>SHOX</td>
<td>Leri-Weill syndrome</td>
</tr>
</tbody>
</table>

Table 1: Molecular-pathogenetic classification of osteochondrodysplasias

SED: Spondyloepiphyseal dysplasia, MED: Multiple epiphyseal dysplasia, DTDST: Diastrophic dysplasia sulfate transporter
OI
OI is a heterogeneous group of congenital genetic disorder of collagen type 1 formation involving connective tissues and bones. Clinically, hydrocephalus, kyphoscoliosis, blue sclera, dental fragility, and hearing loss (otosclerosis) may be seen. Radiological features including osteoporosis, fragile bones that fracture easily, Wormian bones, codfish vertebral bodies, protrusion acetabuli, and elongated lumbar pedicles may be seen (Figure 1).

They are classified into following types:
- Mild: Type I (autosomal dominant with variable penetrance)
- Perinatal lethal: Type II (autosomal recessive)
- Progressive deforming: Type III (mostly sporadic)
- Types IV to VIII are variable in severity and uncommon.

AC Group
This group mainly includes thanatophoric dysplasia, AC, hypochondroplasia, PseudoAC (Table 3, Figures 2 and 3).
- Thanatophoric dysplasia - Most common lethal bone dysplasia after OI II.
  - Type I - Marked underdevelopment of skeleton, telephone handle femur.
  - Type II - Cloverleaf skull a distinctive feature, limb shortening milder, and bowing is not a feature.
- AC - Most common non-lethal skeletal dysplasia. Most cases present at birth. Rhizomelia, bullet-

Table 2: Dynamic classification of skeletal dysplasias

<table>
<thead>
<tr>
<th>Dysplasia Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epiphyseal dysplasias</td>
<td>Epiphyseal hypoplasias, failure of articular cartilage; spondylo-epiphyseal dysplasia</td>
</tr>
<tr>
<td>Physeal dysplasias</td>
<td>Cartilage hypoplasias, failure of proliferating cartilage; achondroplasia</td>
</tr>
<tr>
<td>Metaphyseal dysplasias</td>
<td>Metaphyseal hypoplasias, failure to form primary spongiosa; hypophosphatasia</td>
</tr>
<tr>
<td>Diaphyseal dysplasias</td>
<td>Diaphyseal hypoplasias, failure of periosteal bone formation; osteogenesis imperfecta</td>
</tr>
</tbody>
</table>

Table 3: Comparison between achondroplasia group

<table>
<thead>
<tr>
<th>Body part</th>
<th>Achondroplasia</th>
<th>Hypochondroplasia</th>
<th>Pseudoachondroplasia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skull and facial bones</td>
<td>Enlarged calvaria, shortened skull base, frontal bossing, midface hypoplasia</td>
<td>Normal</td>
<td>Normal</td>
</tr>
<tr>
<td>Spine (interpedicular distance)</td>
<td>Progressive reduction</td>
<td>Narrowing</td>
<td>Normal</td>
</tr>
</tbody>
</table>

Figure 1: Clinical picture of a male child showing deformed lower limb with bowing deformity (a). Blue sclera of the eyes (a) is shown in child of osteogenesis imperfecta. Radiographs of the same child showing bowing deformities of long bones of both upper and lower limbs (b) due to multiple fractures. Lateral radiograph of lumbar spine shows elongated pedicles (c). Lateral radiograph of the lower skull shows Wormian bones (d)
shaped vertebra, thoracolumbar kyphosis, shortened pedicles, posterior vertebral scalloping, tombstone iliac wings (small and squared), progressive reduction in interpedicular distance, champagne glass pelvis, enlarged calvaria with shortened skull base, frontal bossing, and midface hypoplasia are seen.

- Hypochondroplasia - Very common disorder. Difficult to distinguish severe hypochondroplasia from mild AC. Interpeduncular narrowing in lumbar spine, brachydactyly, fibular overgrowth are seen; however, the skull is normal.
- PseudoAC - Children at 2-3 years present with delay in walking. Features similar to AC, except for normal interpedicular distance and normal facial and skull bones.

Mucopolysaccharidosis (MPS) Group
It is a heterogeneous group of inheritable lysosomal storage diseases. Undegradable glycosaminoglycans lead to progressive damage to tissues. They present early in childhood. Clinical features include short stature with coarse facial appearance, mental retardation, corneal opacities, joint contractures, hepatosplenomegaly, and cardiovascular problems.

Radiological features common to most of the subtypes include oval- or hook-shaped vertebral bodies, osteoporosis, abnormal configuration of pelvis with overconstriction of iliac blades and wide flaring of iliac wings, shortened tubular bones, and dysplastic changes in proximal femoral epiphysis.

There are various subtypes of MPS group (Table 4).

Differentiation between types is mainly upon laboratory analysis particularly urine analysis, leukocytes, and fibroblastic cultures though radiographic features may help in narrowing the differentials (Figures 4 and 5, Table 5).

MC
It is characterized by dwarfing and improper mineralization of the shafts of bones in the metaphysyeal region. They are of various types which include Jansen type, Schmid type, Spahr-Hartmann type, and McKusick type (Figure 6 and Table 6).

Osteopetrosis
It is characterized by failure of bone resorption due to a deficiency of osteoclasts. It is of two types, congenita (autosomal dominant) or tarda (autosomal recessive). Clinical features may be non-specific, and few include bleeding, anemia, failure to thrive, cranial nerve, and optic nerve palsies. Often, it remains clinically silent and detected as an incidental finding. Radiologically, there is increased density of bone, os-in-os (bone within a bone) appearance (Figure 7).

Fibrous Dysplasia
It is a benign fibro-osseous pathologic entity of undetermined etiology. It is characterized by expanding fibro-osseous tissue in interior of affected bones and is predominantly a lesion of growing skeleton. It may be

<table>
<thead>
<tr>
<th>Table 4: Classification of MPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPS I</td>
</tr>
<tr>
<td>MPS IS: Scheie’s syndrome</td>
</tr>
<tr>
<td>MPS II</td>
</tr>
<tr>
<td>MPS III</td>
</tr>
<tr>
<td>MPS IV</td>
</tr>
<tr>
<td>MPS VI</td>
</tr>
<tr>
<td>MPS VII</td>
</tr>
<tr>
<td>MPS IX</td>
</tr>
</tbody>
</table>

MPS: Mucopolysaccharidosis

<table>
<thead>
<tr>
<th>Table 5: Difference between the common MPS types, Hurlsers disease (IH) and Morquio-Brailsford disease (IV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hurlsers disease (IH)</td>
</tr>
<tr>
<td>Morquio-Brailsford disease (IV)</td>
</tr>
<tr>
<td>J-shaped sella</td>
</tr>
<tr>
<td>No J-shaped sella</td>
</tr>
<tr>
<td>Oar-shaped ribs</td>
</tr>
<tr>
<td>No oar-shaped ribs</td>
</tr>
<tr>
<td>Inferior beaking of vertebrae</td>
</tr>
<tr>
<td>Central beaking of vertebrae</td>
</tr>
<tr>
<td>Tapering of ileum</td>
</tr>
<tr>
<td>No tapering of ileum</td>
</tr>
<tr>
<td>Proximal metacarpal pointing</td>
</tr>
<tr>
<td>Proximal metacarpal rounding</td>
</tr>
</tbody>
</table>

MPS: Mucopolysaccharidosis
monostotic or polyostotic. It may be asymptomatic and present incidentally or with endocrine dysfunction, almost any bone may be affected, most commonly femur, tibia, humerus, rib or facial bone. Radiograph may show typical ground glass appearance of lesions, cortex may be thinned by endosteal erosions, but there is always a thin shell of cortex (Figure 8 and Table 7).

Antenatal Evaluation
Despite recent advances in imaging, fetal skeletal dysplasias are difficult to diagnose in utero. There are various factors that lead to difficulty in intrauterine diagnosis, which include large number of skeletal dysplasias and their

Table 6: Differences between main types of metaphyseal chondrodysplasias

<table>
<thead>
<tr>
<th>Jansen’s type</th>
<th>Schmid’s type</th>
<th>McKusick type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mental retardation</td>
<td>Excessive lumbar lordosis with severe thigh and leg bowing, genu varum</td>
<td>Cartilage-hair dysplasia</td>
</tr>
<tr>
<td>Wide eyes with monkey like stance</td>
<td>Wrist swelling, elbow contractures</td>
<td>Atlantoaxial instability</td>
</tr>
<tr>
<td>Osteobulbous metaphyseal expansion of long bones</td>
<td>Splaying, irregularity and cupping of the metaphysis (similar to rickets)</td>
<td>Ankle deformity due to fibular overgrowth</td>
</tr>
</tbody>
</table>

Table 7: Differences between few common and important osteochondrodysplasias

<table>
<thead>
<tr>
<th>Body part</th>
<th>Hurlers syndrome (MPS)</th>
<th>Thanatophoric dwarfism</th>
<th>Achondroplasia</th>
<th>Osteogenesis imperfecta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skull</td>
<td>Enlarged J-shaped sella</td>
<td>Clover leaf skull, Kléblattschädel</td>
<td>Enlarged calvaria, narrow foramen magnum, vertical straight sinus</td>
<td>Basilar impression, Wormian bones</td>
</tr>
<tr>
<td>Thorax</td>
<td>Oar-shaped ribs</td>
<td>Long narrow thorax</td>
<td>Shortened ribs</td>
<td>Short thick beaded ribs</td>
</tr>
<tr>
<td>Spine</td>
<td>Inferior beaking</td>
<td>Platypondyly</td>
<td>Spinal canal stenosis, decreased interpedicular distance</td>
<td>Osteoporotic biconcave vertebra</td>
</tr>
<tr>
<td>Limbs</td>
<td>Pointing metacarpals</td>
<td>Telephone handle femur</td>
<td>Rhizomelia, champagne glass pelvis, inverted v configuration</td>
<td>Multiple fractures, bowing of long bones, zebra stripe sign</td>
</tr>
</tbody>
</table>

MPS: Mucopolysaccharidoses
CONCLUSION

Clinical manifestations and radiological investigations are crucial for the differential diagnosis in skeletal dysplasias. Systematic approach of findings helps in narrowing the differentials, and laboratory analysis may further the confirmation in few disorders. They require phenotypic variability with overlapping features, inability of ultrasonography to provide an integrated view, and variability in the time at which findings manifest in some skeletal dysplasias. The diagnosis of dysplasias in a fetus is important for many reasons. It provides the parents with an opportunity to consider pregnancy termination and also provides information regarding inheritance patterns (Figure 9).

There are various treatment options for children born with skeletal dysplasias depending on severity and type. Few patients may benefit from drugs that increase mineralization, whereas others may require surgical correction, prosthetic restorations, and length heightening operations.
management by a multidisciplinary team of specialists, including radiologists, pediatricians, genetic specialists, orthopedicians, and psychiatrists.

REFERENCES


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