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Evaluation of Role of Magnetic Resonance Imaging in Knee Joint Injuries in Correlation with Arthroscopy

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Abstract

Introduction: Internal derangement of knee is common after injury. In acute stage, clinical examination of painful knee may be difficult and frequently the imaging studies are required to assess the injuries of the menisci, cartilage ligaments or bone.

Materials and methods: A prospective study was conducted at the department of orthopedic. A total of 50 patients (50 knees) were examined, 42 patients were males and 11 patients were females, their ages ranging from 16 to 61 years, presented with various knee joint injuries.

Results: Our evaluation between these two procedures in knee injuries concludes certain points which are in line with previous studies. Anterior cruciate and medial meniscal injuries more common than the posterior cruciate and lateral meniscal injuries. Description of the type of ACL and PCL tears by MRI helps the orthopaedic surgeon to decide the further course of treatment of either by conservative or definitive reconstruction by arthroscopy.

Conclusion: Ligamentous and meniscal injuries occur frequently in patients with trauma to the knee. It is noted that ACL and MM are more commonly torn when compared to PCL and LM. While ACL and medial collateral ligament tears show predilection toward MM tear, lateral collateral ligament tear showed a strong relationship with LM tear.

Key words: Arthroscopy, Correlation, Knee injuries, Magnetic resonance imaging (MRI)

INTRODUCTION

Trauma to the knee may result in injury to the menisci, cartilage, ligaments, or bone. Physical examination of the painful knee in the acute phase may be difficult, and frequently, imaging studies are required to aid in the assessment of these injuries.¹ Arthroscopy has a diagnostic accuracy of 64-94% but is an invasive procedure and is associated with complications. Anterior cruciate ligament (ACL) is commonly injured ligament in knee² and usually associated with meniscal injuries.³ In 1980's, used magnetic resonance imaging (MRI) in the knee.⁴ The accuracy of

MRI is very high in diagnosing knee lesions and has a sensitivity of 80-100%.⁵ MRI of the knee is currently the diagnostic procedure of choice for the diagnosis of injuries to the menisci, ligaments, and tendons as well as bone bruises and occult fractures in the knee,⁶ and in most centers, it has replaced arthrography and diagnostic arthroscopy.⁷

Failure to recognize and properly manage knee injuries can result in diminished lifestyle, time of work, and premature osteoarthritis. Accurate assessment of the nature of these injuries is a prerequisite for appropriate therapy.

MRI is noninvasive, has proved reliable, safe, and offers advantages over diagnostic arthroscopy, which is currently regarded as the reference standard for the diagnosis of internal derangements of the knee. Arthroscopy is an invasive procedure with certain risks and discomfort to the patient. MRI provides superior anatomical and pathological definition of soft tissues,

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ligaments, fibrocartilage, and articular cartilage. Fast spin echo and fat suppression MRI techniques have extended the sensitivity and specificity of MRI in the detection of articular cartilage, meniscal, and cruciate ligament injuries.

MRI detects bone contusions, marrow changes, and tibial plateau fractures. MRI has unique ability to evaluate internal structure as well as the surface of the ligaments. The most significant advances in knee imaging have been made in MRI, which has clearly emerged as a primary tool, to guide the management of knee pain. With the development of new sequences, improved signal to noise ratio, higher resolution, reduced artifacts, shorter imaging times, and improved accuracy, MRI has changed the traditional algorithm for workup of meniscal and cruciate ligamentous tears. MRI has made it possible to look into the injured knee noninvasively, thereby avoiding invasive procedures and further morbidity.

METHODOLOGY

Patient and Methods

A prospective study was conducted at the Department of Orthopedic. A total of 50 patients (50 knees) were examined, 42 patients were males and 11 patients were females, their ages ranging from 16 to 61 years, presented with various knee joint injuries.

MRI Examination: Instrument

The examination is done using 1.5 Tesla GE Signa HDxt scanner, with dedicated extremity coils (surface coils) as both transmitter and receiver of radio frequency waves were applied. The imaging system is enclosed in a radio frequency room.

Inclusion Criteria

Patients of the adult population (16-61 years) willing to undergo MRI scanning with clinically suspected injuries of the knee and consenting for the same were included in the study.

Exclusion Criteria

- All patients who present with pain and/swelling at the knee joint without any history of injury and inflammatory, degenerative, neoplastic, infective etiologies causing pain, and swelling at knee joint were excluded from the study. Patients who had previously undergone arthroscopy with repair of menisci and ligaments.
- Patients not consenting for the study
- Patients on cardiac pace maker
- Patients on metal implants
- Patients on neurostimulators.

Data Acquisition

Once a patient satisfied the inclusion criteria for this study, he or she was administered the study pro forma. The patients were briefed about the procedure. The noise due to gradient coils (heard once the patient was inside the bore of the magnet) and the need to restrict body movements during the scan time was explained to the patient.

Patient is placed in supine position with the knee in a closely coupled extremity coil. The knee is externally rotated 15-20° (to facilitate visualization of the ACL completely on sagittal images) and is also flexed 5-10° (to increase the accuracy of assessing the patellofemoral compartment). MRI scan was done using sagittal (T2 FSE, PDFATSAT, short-tau inversion recovery [STIR], T2 FRFSE FATSAT) Coronal PD FATSAT and axial STIR sequences using the standard imaging protocol.

Image Interpretation

The ACL was evaluated on sagittal, coronal, and axial images and categorized as intact or torn. It was considered normal when a hypointense band like structure was seen.



Figure 1: Sag proton density fat suppressed image showing non-visualization of anterior cruciate ligament - complete tear

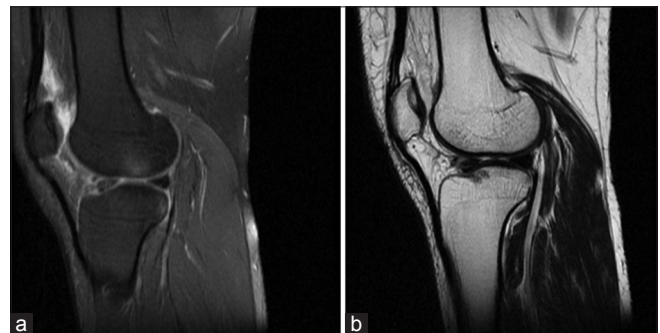


Figure 2: (a and b) Sag proton density fat suppressed and sag T2 images showing tear of anterior horn of medial meniscus

The presence of focal discontinuity or complete absence of ligament, abnormal signal intensity of the ligament, wavy contour, or poor definition of its ligamentous fibers were all considered as ACL tear (Figure 1). A hypointense meniscus without any altered signal intensity was considered normal. The presence of an intrameniscal high-signal intensity was regarded as a tear, and its grading was done according to whether it reaches to the articular surface or not (Figure 2a and b).

Arthroscopic Examination

Arthroscopy is an operative technique to allow the visualization and ideal treatment of structures within the knee joint. It is most commonly performed under a short general anesthesia. The arthroscope is a fiber-optic instrument which is put into the knee joint through two small incisions. A camera is attached to the arthroscope, and the image is viewed on a TV monitor. The arthroscope allows to fully evaluate the entire knee joint including the patella, cartilage surfaces, meniscus, ligaments, and joint lining.

RESULTS

In our study, MRI examination was performed on 50 patients with the complaints of knee injury. Regarding the most common age group, the affected were between 21 and 39 and this is explained by the fact that this age group being the most active group. From 50 patients examined in this study, 42 patients (76%) were males, and 8 of them were females. Of them, 36 (76%) had ACL tears, 3 (6%) had posterior cruciate ligament (PCL) tears, 17 (34%) had medial meniscus (MM) tears, and 11 (22%) had lateral meniscus (LM) injuries as shown in Table 1.

MRI diagnosis was placed into one of the four categories after arthroscopic evaluation as follows:

1. True positive: MRI diagnosis of tear confirmed on arthroscopic evaluation

Table 1: Various injuries in knee joint trauma in study population

| Type of tear | Number of cases n (%) |
|----------------|-----------------------|
| ACL | 38 (76) |
| PCL | 3 (6) |
| MM | 17 (34) |
| LM | 11 (22) |
| MCL | 14 (28) |
| LCL | 9 (18) |
| BC | 21 (42) |
| Fractures | 7 (14) |
| Joint effusion | 25 (50) |

ACL: Anterior cruciate ligament, PCL: Posterior cruciate ligament, MCL: Medial collateral ligament, LCL: Lateral collateral ligament

2. True negative: MRI diagnosis of no tear was confirmed on arthroscopy
3. False positive: MRI showed a tear, but arthroscopy was negative
4. False negative: If MRI images were negative, but arthroscopy showed a tear.

| Test | True positive | False positive | False negative | True negative |
|------------------|---------------|----------------|----------------|---------------|
| ACL MRI findings | 35 | 2 | 1 | 12 |
| PCL MRI findings | 3 | 0 | 0 | 47 |
| MM MRI findings | 13 | 4 | 27 | 6 |
| LM MRI findings | 9 | 2 | 35 | 4 |

ACL: Anterior cruciate ligament, PCL: Posterior cruciate ligament, MRI: Magnetic resonance imaging

Based on the above categories, sensitivity, specificity, positive predictive value, and negative predictive value (NPV) were calculated to assess the reliability of the MRI results.

DISCUSSION

Imaging of the knee presents a special challenge because of its complex structure. A variety of imaging modalities are currently used to evaluate knee abnormalities. These modalities include standard radiography, scintigraphy, computed tomography, MRI, and arthrography. MRI has

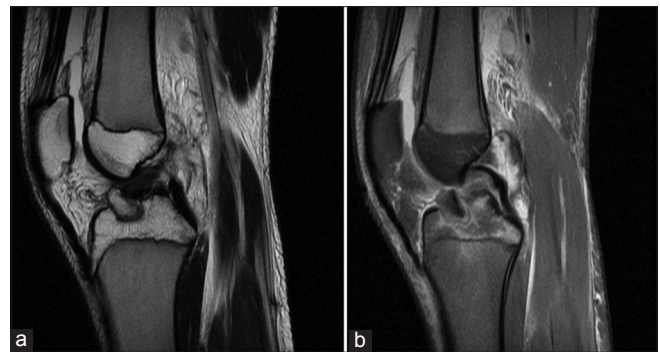


Figure 3: (a and b) Sag T2 and sag proton density fat suppressed images showing avulsion fracture of anterior cruciate ligament at tibial attachment site and buckling of posterior cruciate ligament

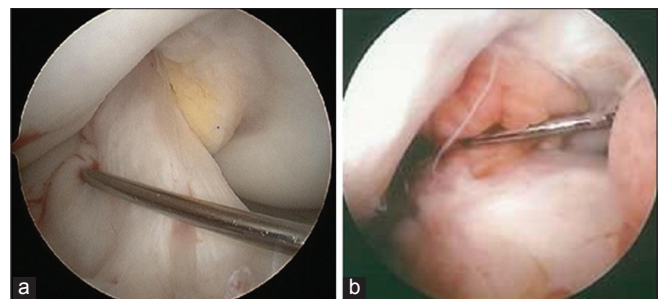


Figure 4: Arthroscopic images showing (a) normal anterior cruciate ligament and (b) torn anterior cruciate ligament

Table 2: Accuracy of MRI findings using arthroscopic findings as the reference data

| Tears | Sensitivity (%) | Specificity (%) | PPV (%) | NPV (%) | Accuracy (%) |
|-------|-----------------|-----------------|---------|---------|--------------|
| ACL | 94.59 | 80.00 | 94.50 | 80.00 | 94 |
| PCL | 100 | 100 | 100 | 100 | 100 |
| MM | 68.42 | 86.66 | 76.47 | 81.20 | 80 |
| LM | 69.23 | 94.10 | 81.81 | 88.88 | 88 |

ACL: Anterior cruciate ligament, PCL: Posterior cruciate ligament, PPV: Positive predictive value, NPV: Negative predictive value, MRI: Magnetic resonance imaging

Table 3: Comparison of ACL tears with other studies

| Observation | Singh <i>et al.</i> IJRI 2004 n=173 (%) | Taryn <i>et al.</i> AJR 170/ MAY 1998 n=217 (%) | Present study n=50 (%) |
|-------------|---|---|------------------------|
| Sensitivity | 98.72 | 96.00 | 97.2 |
| Specificity | 98.94 | 98.00 | 85.7 |

ACL: Anterior cruciate ligament

Table 4: Comparison of ligament and meniscal tears with other study

| Type of injury | Present study n=50 (%) | Singh <i>et al.</i> 2004 n=173 (%) |
|----------------|------------------------|------------------------------------|
| ACL | 38 (76) | 78 (45.09) |
| PCL | 3 (6) | 10 (5.78) |
| MM | 17 (34) | 57 (32.95) |
| LM | 11 (22) | 28 (16.18) |
| MCL | 14 (28) | - |
| LCL | 9 (18) | - |

ACL: Anterior cruciate ligament, PCL: Posterior cruciate ligament, MCL: Medial collateral ligament, LCL: Lateral collateral ligament

Table 5: Comparison of MM tears of the present study with other study

| Observation | Taryn <i>et al.</i> RSNA 1997 n=293 (%) | Present study n=50 (%) |
|-------------|---|------------------------|
| Sensitivity | 89.00 | 68.42 |
| Specificity | 84.00 | 86.66 |

Table 6: Comparison of LM tears of the present study with other study

| Observation | Taryn <i>et al.</i> RSNA 1997 n=293 (%) | Present study n=50 (%) |
|-------------|---|------------------------|
| Sensitivity | 72.00 | 69.23 |
| Specificity | 93.00 | 94.10 |

revolutionized knee imaging. It has been compared by various studies between MR and arthroscopic findings Table 2. These studies validate the role of MRI in the clinical arena, especially for the evaluation of knee injuries.

The study population consisted in the age group of 16-61 years. A maximum number of patients who underwent MRI of the knee for injuries belonged to the age group of 18-28 years. Out of total 50 patients, ACL

tear was the most common finding affecting 38 patients (76%), and among which, 30 (79%) had complete tear and 8 patients (21%) had partial tear, followed by MM tear in 17 (34%) and LM tear seen in 11 patients (22%) Graph 1. In a similar study by Singh *et al.*, 45.08% showed ACL tear, and among which, 66.67% were partial and 21.13% were complete ACL tear. The authors concluded ACL tears to be more common than other ligamentous injuries Table 3.⁸

There was a preponderance of MM over LM in our study which was again correlated with the study done by Singh *et al.*⁸ Out of 173 they found, 57 (32.9%) patients showed MM tear, and 28 (16.1%) patients showed LM tear.

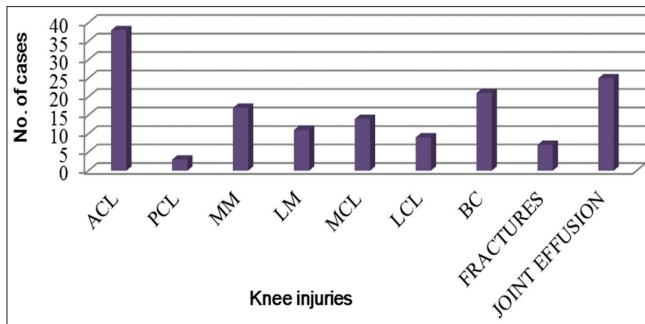
Sensitivity, specificity, and accuracy of MRI in detecting ACL tear were reported to be 98.7%, 98.9%, and 98.8%, respectively, in a study by Singh *et al.*⁸ Table 4. Ha *et al.*⁹ reported the sensitivity, specificity, and accuracy of MRI to detect ACL tears to be 96%. Sensitivity, specificity and accuracy of MRI in detecting ACL tear were reported to be 91.6%, 95.2%, and 94.4%, respectively, in a study by Yaqoob *et al.*¹⁰ Sensitivity was 88.5%, specificity was 71.4%, and positive and NPVs were 85.2% and 76.9%, respectively, in a study. which are in concordance with our study Graph 2.

Lower specificity is because of suboptimal selection of imaging planes and partial volume averaging effect.

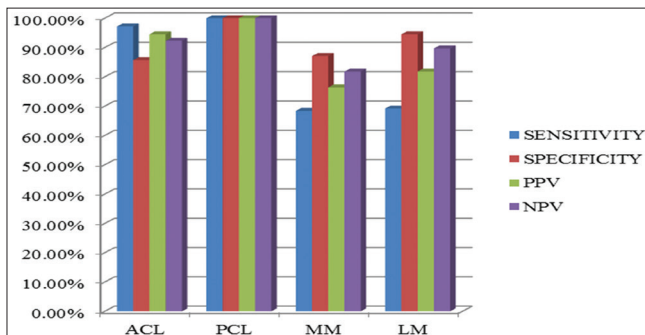
Singh *et al.*, IJRI 2004, studied on cruciate ligaments and menisci in twisting injuries, and in the present study, ACL tears are more because most of the injuries are road traffic accidents.

PCL injuries are less common than ACL injuries, and reported rates vary from 3% to 20%. The PCL being a stronger ligament has a low incidence of tears. The sensitivity, specificity, and accuracy of MRI in identifying PCL tear is 100% which is similar to a study by Manoj *et al.*¹¹ in which the accuracy of MRI in detecting PCL tears is 100%.

MRI of the knee has been found to be highly accurate in the diagnosis of meniscal tears. All the medial meniscal tears are associated with ACL tears in the present study.



Graph 1: Various injuries in knee joint trauma in study population



Graph 2: Sensitivity, specificity, positive predictive value, and negative predictive value of various ligament and meniscal injuries of knee joint in study population

The biomechanical forces that result in the ACL tear also result in medial meniscal tear. Due to multiple tears, the sensitivity of the medial meniscal tear is reduced. Due to the presence of multiple tears, one peripherally located meniscal tear was over looked on MRI in two patients. The sensitivity of medial meniscal tear is reduced in the presence of ACL tears.¹² The medial meniscal tears are usually peripheral tears when associated with ACL tears.

One patient interpreted as a MM tear on MRI was found to be normal at arthroscopy. That the posterior horn of the MM is an, especially, difficult area to visualize and the arthroscopic diagnosis of meniscal tears in this region is difficult. This misinterpreted MM tear was located in posterior horn Tables 5 and 6. It could likely that this tear was missed on arthroscopy. One patient had peripheral vertical tear of MM along with ACL tear, and PCL tear was over looked on MRI.

Lower sensitivity for MM tears in the present study is because of associated multiple injuries.

The sensitivity and specificity of the present study are comparable with the study of Taryn *et al.* RSNA 1997.

The results of this study are in accordance with the literature which suggests an accuracy of 68-88% for the meniscal tears¹³ and 80-94% for the cruciate ligament tears.¹⁴

CONCLUSION

- Ligamentous and meniscal injuries occur frequently in patients with trauma to the knee. It is noted that ACL and MM are more commonly torn when compared to PCL and LM. While ACL and medial collateral ligament tears show predilection toward MM tear, lateral collateral ligament tear showed a strong relationship with LM tear.
- MRI is highly sensitive and accurate at the identification of both anterior cruciate and PCL tears (Figure 3). A close agreement was obtained between MRI and arthroscopic diagnosis. The diagnostic yield is increased with the appropriate use of sequences and proper analysis of images in all planes.
- Misinterpretations are more likely to happen in the case of partial ACL tear where it can be missed or it can be over diagnosed on MRI (Figure 4).
- Description of the type of ACL and PCL tears helped the orthopedic surgeons as a conservative approach was indicated in partial tears while a reconstruction was indicated in a complete tear.

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Correlation of Homocysteine Levels with Birth asphyxia

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Abstract

Introduction: Despite major advances in monitoring technology and knowledge of fetal and neonatal pathologies, perinatal asphyxia, remains a serious condition that causes significant mortality and long-term morbidity.

Aims and Objectives: To measure the plasma homocysteine levels in neonates with asphyxia and their mothers. To determine the correlation between plasma homocysteine and occurrence of asphyxia.

Materials and Methods: Before the beginning of the study Ethics Committee permission was taken. Informed consent was taken from mothers enrolled in the study. For all the babies in the study and control groups and their mother's thorough history were taken and detailed clinical examination was done.

Observations and Results: Twenty-four asphyxiated neonates and their mothers, 26 normal neonates and their mothers were included in the study. Of the asphyxiated babies 17 (70.8%) were males and 7 (29.2%) were females. Out of 26 control group babies, 13 (50%) were males, and 13 (50%) were females.

Key words: Homocysteine, Neonate, Asphyxia, New born

INTRODUCTION

Despite major advances in monitoring technology and knowledge of fetal and neonatal pathologies, perinatal asphyxia, remains a serious condition that causes significant mortality and long-term morbidity.

The incidence of perinatal asphyxia is approximately 1-1.5% of live births (varies between 1% and 10% in different studies) and is usually related to gestational age and birth weight. It occurs in 0.5% of live born infants >36 weeks gestation and accounts for 20% of perinatal deaths (50% of stillborns are included).

A higher incidence is noted in term infants of diabetic mother (or) toxemic mothers, infants with intrauterine growth restriction, breech presentation, and postdates.

Aims and Objectives of the Study

1. To measure the plasma homocysteine levels in neonates with asphyxia and their mothers.
2. To determine the correlation between plasma homocysteine and occurrence of asphyxia.
 - a. Design: Cross-sectional study.
 - b. Setting: CKM maternity hospital.
 - c. Period of study: February 2011-September 2011.
 - d. Number of subjects:
 - 24 neonates with birth asphyxia and 26 normal neonates and their mothers, all of them being hospital deliveries were selected at random. Cases of asphyxia were diagnosed according to the following clinical criteria.
 - Need for assisted ventilation for the establishment of adequate spontaneous respiratory effort.
 - Neonates were selected irrespective of their sex.

Inclusion Criteria

Term babies with asphyxia were included in this study.

Exclusion Criteria

- Babies with dysmorphic features.

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- Babies with family h/o of inborn errors of metabolism.
- Preterm babies.
- Babies born to mothers with chronic systemic illness.
- Babies born to mothers with malnutrition.
- Babies born to mothers on antenatal steroid or drugs.

MATERIALS AND METHODS

- Before the beginning of the study, Ethics Committee permission was taken.
- Informed consent was taken from mothers enrolled in the study.
- For all the babies in the study and control groups and their mother's thorough history were taken and detailed clinical examination was done.
- Samples were collected from mothers and neonates with birth asphyxia and gestation matched controls and their mothers within 8-48 h after delivery.
- Blood samples were drawn from each one of them into vacutainers and within 30 min of collection, vacutainers were centrifuged at 1000 rpm for 10-15 min to separate serum for homocysteine levels which was stored in a deep freezer at -20°C till analysis.

Plasma Homocysteine Measurement

- Plasma samples were treated with tri-N-butyl phosphine and incubated at 40°C for 60 min before precipitation with trichloroacetic acid and centrifuged for 10 min to separate proteins. The supernatant fluid was incubated with borate and EDTA-sodium hydroxide buffer, and fluorescent 7-benzo-2-oxa-1,3-diazole-4 sulfonic acid solution for 60 min at 60°C . The solution was cooled to room temperature, filtered and injected into solution was cooled to room temperature, filtered and injected into high-performance liquid chromatography (HPLC), agilent 1100 series, and fluorescence intensities were measured with excitation at 385 nm and emissions at 515 nm. Agilent chemstation software was used for quantitation of total homocysteine (tHcy). Supelcosil TMLC-18-DB HPLC column (150 mm \times 4 mm \times 6 mm) was used for the separation, and an isocratic mobile phase of potassium dihydrogen phosphate buffer (10 mm, pH 2.1) containing 4% acetonitrile was used with a flow rate of 2.0 ml/min. After spiking the sample with the standard the recovery of tHcy was 104.5%. Plasma homocysteine levels were done by HPLC fluorescence detection at the Biochemistry Department of National Institute of Nutrition, Hyderabad.

Data Analysis

- Mean and standard deviation values are calculated for continuous variables.

- Prevalences were calculated for categorical variables.
- Mean values were compared across groups using Students *t*-test.
- Relationships among variables of homocysteine of mother and offspring were calculated using Pearson correlation coefficient level of significance was considered as 0.05.

OBSERVATIONS AND RESULTS

- 24 asphyxiated neonates and their mothers, 26 normal neonates and their mothers were included in the study.
- Of the asphyxiated babies 17 (70.8%) were males and 7 (29.2%) were females. Out of 26 control group babies, 13 (50%) were males, and 13 (50%) were females.

Categorization According to Socioeconomic Status

- Out of 24 mothers of cases, 20 (83.3%) belong to lower class and 4 (16.7%) to middle class.
- Of the 26 mothers of control group 18 (69.2%) were from the lower class and 8 (30.8%) were from the middle class (Table 2 and Figure 2).

Categorization According to Parity

- Out of 24 mothers of cases, 15 (62.5%) were Para 1, and 9 (37.5%) were Para 2 or more.
- Of the 26 control group mothers 6 (23.1) were Para 1 and 20 (76.9%) were Para 2 or more (Table 3 and Figure 3).

Mode of Delivery

- Of the mothers of case group 16 (66.6%) delivered by spontaneous vaginal delivery (SVD), 5 (20.8%) by outlet forceps, and 3 (12.5%) by lower segment Cesarean section (LSCS).
- In control group mothers 23 (88%) were delivered by SVD, 1 (4%) by OF and 2 (8%) by LSCS (Table 4 and Figure 4).

Mode of Delivery in Hypoxic Ischemic Encephalopathy (HIE) Stages

- In HIE Stage 1, SVD was more (85.6%) when compared to of (7.2%) and LSCS (7.2%).
- Of (50%) deliveries were more when compared to SVD (37.3%) and LSCS (12.7%) in HIE Stage 2.
- In HIE Stage 3 50% deliveries were due to SVD and 50% due to LSCS (Table 5 and Figure 5).

Categorization Depending on Presence of Meconium Aspiration Syndrome

- In our study, out of 24 asphyxiated cases, meconium aspiration syndrome (MAS) was found in 8 cases (33.3%) with 4 cases (50%) in Stage 1, 3 cases (37.5%) in Stage 2, and case (12.5%) in Stage 3 (Table 6 and Figure 6).

Plasma Homocysteine Concentration in Mothers

- Plasma homocysteine cutoff higher limit taken was 15 $\mu\text{mol/l}$.
- Out of 24 samples of mothers of the case group analyzed 24 (100%) were within normal range (mean - 6.4 ± 2.80).

Table 1: Categorization of babies according to sex

| Cases | Sex | Controls |
|-------|---------|----------|
| 17 | Males | 13 |
| 7 | Females | 13 |
| 24 | Total | 26 |

Table 2: Categorization according to socio economic status

| Social status | Cases | Controls |
|---------------|-------|----------|
| Lower | 20 | 18 |
| Middle | 04 | 08 |
| Total | 24 | 26 |

Table 3: Categorization according to parity

| Parity | Cases | Controls |
|----------|-------|----------|
| Para 1 | 15 | 6 |
| Para 2/> | 9 | 20 |
| Total | 24 | 26 |

Table 4: Mode of delivery

| Type | Cases | Controls |
|-------|-------|----------|
| SVD | 16 | 23 |
| Of | 5 | 1 |
| LSCS | 3 | 2 |
| Total | 24 | 26 |

SVD: Spontaneous vaginal delivery, LSCS: Lower segment cesarean section

Table 5: Mode of delivery in HIE stages

| Type of delivery | HIE Stage 1 | HIE Stage 2 | HIE Stage 3 |
|------------------|-------------|-------------|-------------|
| SVD | 12 | 3 | 1 |
| of | 1 | 4 | 0 |
| LSCS | 1 | 1 | 1 |
| Total | 14 | 8 | 2 |

HIE: Hypoxic ischemic encephalopathy, SVD: Spontaneous vaginal delivery, LSCS: Lower segment cesarean section

Table 6: Categorization depending on presence of meconium aspiration syndrome

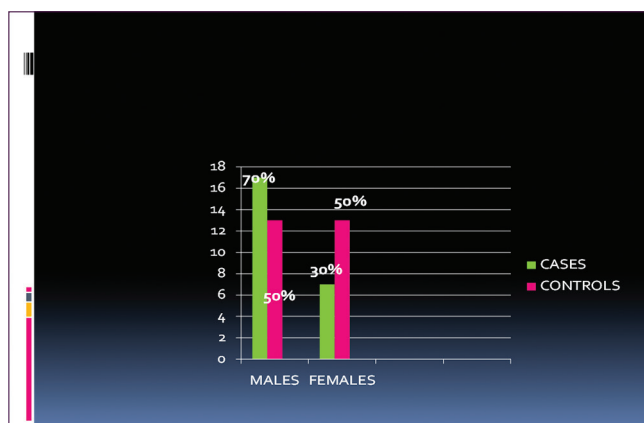
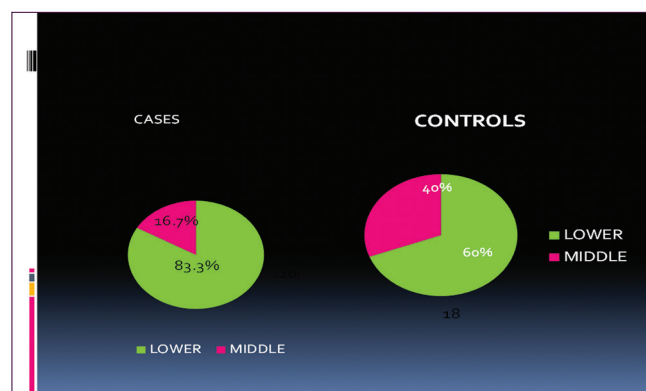
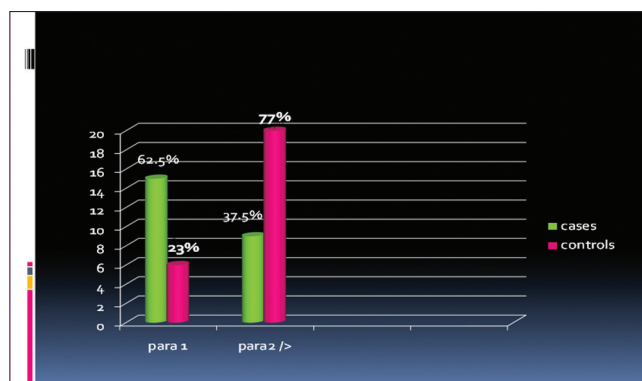
| MAS | Cases | Controls |
|---------|-------|----------|
| Present | 8 | 0 |
| Absent | 16 | 26 |

MAS: Meconium aspiration syndrome

- Of the 26 samples of mothers of control group analyzed 26 (100%) were within normal range (mean - 6.1 ± 2.07) (Table 7).

Plasma Homocysteine Concentration in Babies

- Of the 24 samples of asphyxiated babies analyzed 20 (83%) were within normal range, and 4 (17%) had an excess of homocysteine (mean - 11.6 ± 8.72).
- Of the 26 samples of the control group babies analyzed 21 (81%) were with in normal range, and 5 (19%) had excess homocysteine (mean - 11.7 ± 5.37) (Table 8 and Figure 7).

**Figure 1: Categorization of babies according to sex****Figure 2: Categorization according to socioeconomic status****Figure 3: Categorization according to parity**

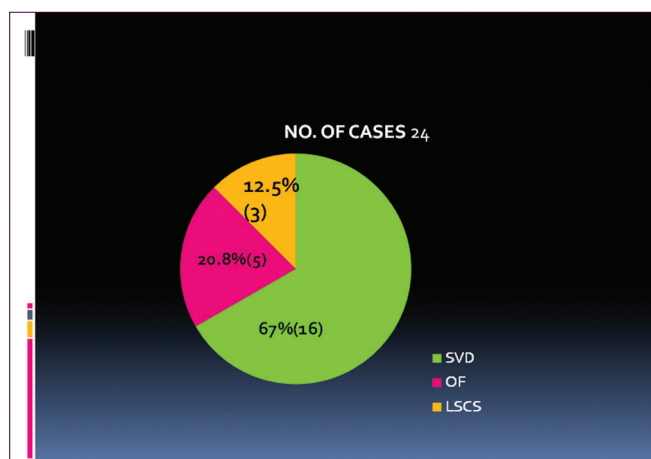


Figure 4: Categorization according to mode of delivery

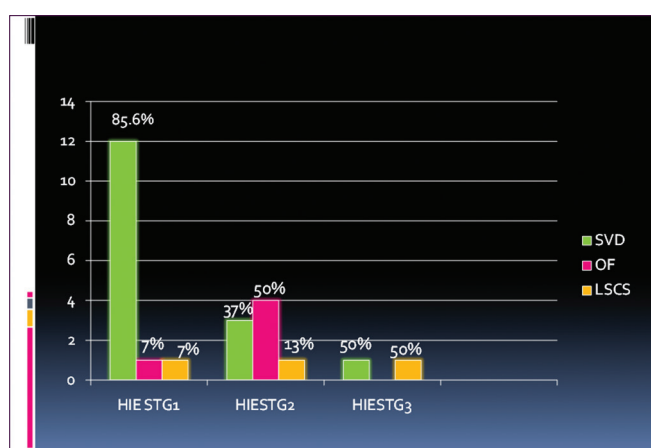


Figure 5: Mode of delivery in hypoxic ischemic encephalopathy stage

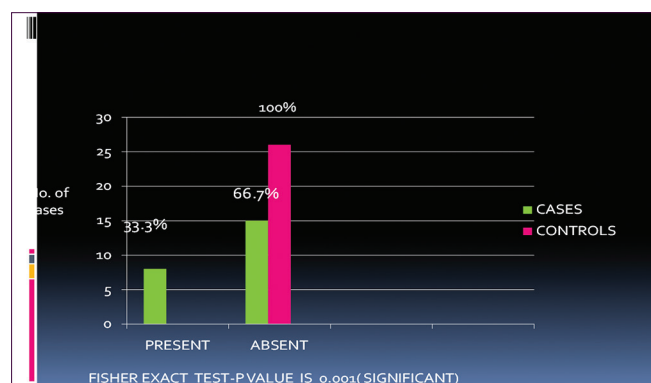


Figure 6: Categorization depending on presence of meconium stained liquor

DISCUSSION

1. Out of 24 samples of mothers of the case group analyzed 24 (100%) were within normal range (mean - 6.4 ± 2.80). Of the 26 samples of mothers of control group analyzed 26 (100%) were within normal

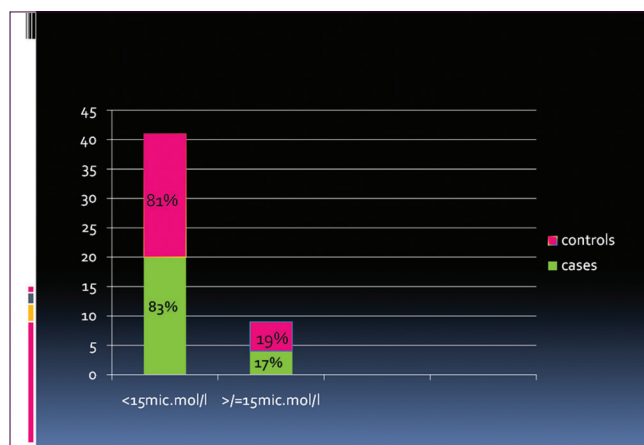


Figure 7: Plasma homocysteine levels in babies

Table 7: Plasma homocysteine concentration in mothers

| Homocysteine mothers | Cases | Controls |
|---------------------------|-------|----------|
| <15 $\mu\text{mol/l}$ | 24 | 26 |
| $\geq 15 \mu\text{mol/l}$ | 0 | 0 |
| Total | 24 | 26 |

Table 8: Plasma homocysteine concentration in babies

| Homocysteine babies | Cases | Controls |
|---------------------------|-------|----------|
| <15 $\mu\text{mol/l}$ | 20 | 21 |
| $\geq 15 \mu\text{mol/l}$ | 4 | 5 |
| Total | 24 | 26 |

Table 9: Mean plasma homocysteine concentrations in $\mu\text{mol/l}$

| Homocysteine concentrations | Mean \pm SD |
|-----------------------------|------------------|
| Neonates | |
| Cases (n=24) | 11.61 \pm 8.72 |
| Controls (n=26) | 11.73 \pm 5.37 |
| Mother | |
| Cases (n=24) | 6.44 \pm 2.80 |
| Controls | 6.18 \pm 2.07 |

$P > 0.05$ (not significant). SD: Standard deviation

range (mean - 6.1 ± 2.07). There is concentration between mothers of case and control groups.

2. Of the 24 samples of asphyxiated babies analyzed 20 (83%) were within normal range, and 4 (17%) had an excess of homocysteine (mean - 11.6 ± 8.72) of the 26 samples of the range, and 5 (19%) had excess homocysteine (mean - 11.7 ± 5.37). There is no statistically significant difference in plasma homocysteine levels between asphyxiated and control neonates in our study.

3. In Mi *et al.* study serum homocysteine levels were significantly higher in the asphyxia group than in the control group (mean - $14.66 \pm 2.61 \mu\text{mol/l}$ vs. $7.55 \pm 0.50 \mu\text{mol/l}$).¹
4. In our study of the control group, neonates mean homocysteine was high ($11.7 \pm 5.37 \mu\text{mol/l}$) compared to Devi *et al.* study group ($6.99 \pm 0.26 \mu\text{mol/l}$).
5. The mean homocysteine in Japanese² and Italian newborn³ was found to be $2.5 \mu\text{mol/l}$ and $2.92 \mu\text{mol/l}$ (dried blood spot method). The mean homocysteine in Indian newborns is higher than Japanese and Italian newborns.
6. In our study, there were no significant differences in plasma homocysteine between either in the asphyxia group or the control group comparable to Mi *et al.*¹ study and Devi *et al.* study,⁴ gender differences were not observed in the mean plasma homocysteine concentration among newborns. Gender differences becoming prominent after puberty probably indicate the role of reproductive hormones⁵ and body mass index.⁶
7. In our study, mean plasma homocysteine concentrations were higher in neonates ($11.7 \pm 2.44 \mu\text{mol/l}$); this could be due to increased maternal estrogen and increased renal clearance.
8. Maternal plasma homocysteine concentrations were positively correlated ($r = 0.567$, $P < 0.001$) to neonatal plasma homocysteine by Pearson correlation coefficient comparable to study of Bohles *et al.* who reported a positive correlation between homocysteine concentrations in mother and newborn.
9. In our study, male babies with asphyxia were 17 in number (70%), and female babies were 7 (30%) cases with male:female of 2:1.
In Chandra *et al.*,⁷ there were 25 males (49%) and 26 females (51%) with male:female ratio of 0.96:1
In Brown *et al.* study⁸ there were 52 males (55.32%) and 42 female babies (44.68%) with male:female ratio of 1.24:1. Brown *et al.* study were comparable with this study.
10. Primiparas constituted 62.5% (15) of cases in this study. Even in Brown *et al.* study who studied 94 cases of HIE the results were comparable with this study with 62.8% cases being primiparas (59 cases).
11. PROM constituted 3 (12.5%) cases in our study. In Batra *et al.*⁹ there were 22 cases ($n = 109$) (20.2%) which was higher than our study. There were 4 cases of cord around neck (16.6%) in our study.
12. In this study, mode of delivery was SVD in 16 (67%) cases, outlet forceps in 5 (21%) cases, and cesarean in 3 (12%) cases. Chanadra *et al.* showed cesarean sections in 12 cases (25.53%) and outlet forceps in 2 cases (3.9%). Batra *et al.* showed SVD in 74 cases (67.9%)

comparable to our study.

HIE staging - Mode of delivery - comparative table. Table 5 summarize that cesarean deliveries were¹⁰ forceps deliveries were more in Stage 2 (50%) but in Stage 3 no forceps delivery in this study when compared to Deorari *et al.*¹⁰ group (8.33%).

Vaginal deliveries were comparable in Stage 2 in both studies but in stage vaginal deliveries were more (50%) compared to Deorari *et al.* study.

13. MAS was found in 8 cases (33.3%) in our study with 3 cases (37.5%) in Stage 2 and 1 case in Stage 3 (12.5%) Deorari *et al.* study showed 2 cases (6.25%) of MAS in Stage 2 which is less compared to this study and 10 cases (27.78%) in Stage 3 which is more when compared to this study.

CONCLUSION

1. We conclude that mothers of babies with birth asphyxia have not shown hyperhomocysteinemia. There is no statistical correlation between homocysteine and birth asphyxia.
2. There is no correlation between homocysteine and gender of the baby.
3. Maternal plasma homocysteine concentrations were positively correlated to neonatal plasma homocysteine.
4. In our study mean plasma homocysteine concentrations were higher in neonates compared to mothers.
5. In our study asphyxia was found to be more common in primi mothers belonging to the low socioeconomic group.
6. The mode of delivery in the majority of asphyxiated babies was SVD.
7. Asphyxia is more common in males and majority of cases had HIE Stage 1.

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Reconstruction of Bone Defects with Non-vascularized Fibular Graft

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Abstract

Background: The most common problems involving the bone and soft tissues are bony defects caused due to fractures, infections, and tumors. These defects can be due to various causes such as post-traumatic bone loss, post-infective bone loss, and defect resulting due to excision of tumors.

Aim: The aim is to study the outcome of reconstructing the bony defects due to removal of benign tumors with non-vascularized fibular graft.

Methods: This is the prospective study conducted to determine the outcome of reconstruction of bony defects in benign tumors using non-vascularized fibular graft pre-operative workup was done to exclude metastatic tumors. Clinical and radiological review was done at periodical interval for all our patients.

Result: Functional outcome was analyzed according to Mankin *et al.* criteria such as excellent - 18 cases, good - 5 cases, fair - 5 cases, and failed - 7 cases.

Conclusions: Our overall experiences with non-vascularized fibular graft for reconstructing bony defects are encouraging; however, we are aware that this is a short-term study and would require further evaluation and more inputs.

Key words: Benign tumors, Non-vascularized fibular graft, Segmental bony defects

INTRODUCTION

Defects in long bones pose a great challenge to orthopedic surgeon. These can arise in long bones due to malignancy, high-energy trauma, and atrophic non-unions. If untreated, these can lead to unacceptable shortening and may render extremity unfit for use. Autograft, allograft, prosthetic replacement, or allograft-prosthetic composite are established methods for reconstructions.^{1,2} Among the autograft and allograft reconstructions,^{3,4} it can be done either as vascularized or non-vascularized graft. The advantage of using vascularized graft⁵ is rapid biological incorporation, good growth potential, and the ability to

thrive in compromised soft tissue. However, these require technical expertise. The long-term follow-up of non-vascularized fibular graft also gives good result. Hence, we made an attempt to study the outcome of reconstructing the bony defects due to removal of benign tumors with non-vascularized fibular graft.

Aim

The aim is to study the outcome of reconstructing the bony defects due to removal of benign tumors with non-vascularized fibular graft.

METHODS

This is the prospective study conducted in the Department of Orthopedics at Government Royapettah Hospital. A total of 35 cases of various tumorous conditions which satisfy the inclusion criteria were selected. Inclusion criteria are benign tumors, bony defects <10 cm, and tubular bony involvement, after epiphyseal closure. The benign tumors which required anything less than wide resections

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were excluded since that defect was not significant. Among the benign tumors, giant-cell tumor was the most commonly encountered one comprising 49%, which most commonly involves the distal radius. These cases were either aggressive type or late presentation necessitating wide resection. Hence, also in case of aneurysmal bone cyst, we encountered presentation with extensive involvement of the humerus not amenable for curettage or bone grafting. In the case of fibrous dysplasia, one presented with pathological fracture and the other case was a recurrence after an initial treatment of curettage and bone grafting. Thus, in our study, upper limb was involved in 19 cases, and lower limb was involved in 16 cases. Humerus and distal radius put together constitute more than 50% of cases (Table 1).

Pre-operative evaluation done were complete hemogram, serum calcium, serum phosphorus and serum alkaline phosphatase, radiography of appropriate parts, skeletal survey, and histopathological study; computed tomography and magnetic resonance imaging of the lesion and nearby joint were also done. It is that, with these investigations, we identified the exact of the lesion, cortical/articular breach, etc. Based on this, wide resection was planned along with reconstructions.

The patients were selected only if pre-operative imaging had shown that a satisfactory surgical margin could be achieved. Patients with expected defects >10 cm were excluded from the study because vascularized fibular graft in a better option in such condition. All patients were given pre-operative intravenous antibiotics.

Results were based on functional outcome which was analyzed according to Mankin *et al.* criteria.⁶

The follow-up period ranged from 11 months to 7 years. All our patients were analyzed in terms of graft incorporation, oncological evaluation, and functional outcome. Graft incorporation was assessed radiographically.

RESULTS

The patients selected were aged between 15 and 52 years. The average age of our study group is 28 years. Out of 35 cases, 12 were female and 23 were male. 17 cases of osteoclastoma, 9 cases of aneurysmal bone cyst, 7 cases of fibrous dysplasia, and 2 cases of chondromyxoid fibroma were done (Table 2).

To decrease the time of surgery and to avoid contamination, we had two operation teams: One for tumor resection and another for graft harvesting. Under anesthesia, without

using tourniquet, incision was made such that it includes the biopsy scar. The tumor was resected en bloc with wide margin. The margin of clearance ranged from 2.5 to 5 cm. At most care was taken to avoid contamination to nearby tissues. The resected segment was measured, to plan the length of the graft to be harvested. Graft harvested through posterolateral approach (Henry approach) skin incised depending on the requirement. If proximal third of fibula is to be resected, identified and protected the common peroneal nerve along the posteromedial aspect of the biceps tendon in the proximal part of the wound. The fascial plane between soleus muscle and peroneus longus muscle is located, and the dissection is deepened to reach the fibula. Subperiosteal stripping was started distally and progressed proximally to protect the anterior tibial vessel that passes between the neck of fibula and the tibia. The fibula was resected according to the length of the bony defect. After resection was completed, the bicep femoris tendon and fibular collateral ligament were sutured to the adjacent soft tissues.

As per the above technique, the proximal fibula was harvested in 11 cases (distal radius reconstruction), and shaft of the fibula was harvested in rest of the cases. After bony reconstruction, the soft tissue reconstruction was done to enhance union rigid fixation with plate and screws or with lag screw if a step cut osteotomy was performed or with Kirschner wire (Figures 1-3).

All our patients received 5 days of post-operative intravenous antibiotics. Sutures were removed 10-12 days after surgery and sent home with plaster cast. This was maintained usually for 6-8 weeks. Then, the extremities were taken out passive movements only. In case of lower limb, partial weight bearing was allowed after 12 weeks, and in case of upper limb, gentle mobilization was started after 6 weeks. All our patients were reviewed clinically and radiologically at regular interval of 1 month up to 6 months. After 6 months, they were followed up at 2-month interval till union or incorporation.

Our results were as follows:

| Excellent | 18 cases |
|-----------|----------|
| Good | 5 cases |
| Fair | 5 cases |
| Failed | 7 cases |

In our study, the graft united in 28 out of 35 patients between 4 to 12 months. Average time for graft incorporation was 7.2 months. 6 months in case of wrist and 8-12 months in case of other bones. In the remaining seven cases, the graft did not incorporate due to various reasons that are discussed in later of this text giving a poor result.

Table 1: Distribution of site of reconstruction

| Site of reconstruction | No. of patients |
|-------------------------------|-----------------|
| Humerus | 11 |
| Distal part of radius | 11 |
| Supracondylar region of femur | 7 |
| Tibial plateau | 2 |
| Distal part of tibia | 2 |
| Shaft of tibia | 1 |
| Meta tarsal | 1 |

Table 2: Distribution of diagnosis

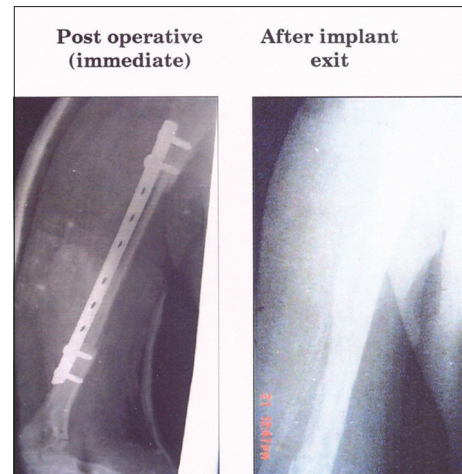
| Diagnosis | No. of cases | | |
|-----------------------|--------------|--------|-------|
| | Male | Female | Total |
| Fibrous dysplasia | 7 | - | 7 |
| Aneurysmal bone cyst | 4 | 5 | 9 |
| Osteoclastoma | 10 | 7 | 17 |
| Chondromyxoid fibroma | 2 | - | 2 |

Out of 35 tumor cases, 34 remained free from disease till date and one patient was operated for recurrences of giant-cell tumor. In our study, we had few post-operative complications. One case of stitch abscess and one case of early post-operative infection treated appropriately. One case of recurrence was encountered with distal radius giant-cell tumors for which excision and centralization of the ulna were done. We had three cases of persistent infection which resulted in necrosis of the graft and failure. Regarding donor-site morbidity, one patient had transient peroneal nerve palsy which recovered on physiotherapy and splinting. Another patient had permanent peroneal nerve palsy planned for tendon transfer.

DISCUSSION

The goal of treatment is to cure the patient while preserving as much function, anatomical, and quality of life as possible. Thus, every effort should be made to totally eradicate the primary lesion during the initial surgical treatment itself. Thus, *en bloc* resection is strongly recommended for aggressive/recurrent benign lesions and for some of the low-grade malignant tumor. Reconstruction is necessary after adequate resection of tumor to preserve the function and alignment. Many reconstructive options are available after resection.

Autograft, allograft, prosthetic replacement, or allograft-prosthetic composite are established methods for reconstruction.⁷ Although the use of allograft has shown encouraging results, there are many associated problems. Selection of suitable donors, the method of obtaining and preserving the graft, and the technique of allograft reconstruction deserve particular attention. The surgeon

**Figure 1: Shaft of humerus with reconstruction with fibula graft and plate****Figure 2: GCT of distal radiu****Figure 3: Shaft of radius with asian DCP**

must consider the risks of infection, graft rejection, delayed healing, and function of the concern part. Custom-made prosthetic devices have been used with early success, but problems with late loosening and metal fatigue have not been solved.

Among the autograft and allograft reconstructions, it can either with non-vascularized or vascularized graft. Vascularized fibular autograft is technically more demanding with the use of microsurgical techniques. Non-vascularized fibular graft incorporation as an autograft is more rapid and predictable than an allograft.^{4,8} Moreover, it is easily accessible without significant donor-site morbidity.^{3,9} It is also a biological solution, and the most of orthopedic surgeons can perform this surgery in an average setup.^{10,11} They are associated with relatively low rate of complication, and they survive for a longer duration, whereas metal implants are difficult to design and have shortcut life span.

In our study, non-vascularized fibular graft was used for reconstructing defects in humerus, distal femur, metatarsal shaft, and proximal tibia that raised due to resection of tumors conditions. We had 35 cases of benign tumors which were resected and reconstructed with non-vascularized fibular strut graft.

Out of 35 cases, 11 cases were giant-cell tumors involving the distal radius which was reconstructed with the proximal fibula giving excellent results because of their structural similarity except one case of recurrence.^{12,13}

In another 9 cases, the defects were near large joints (distal femur and proximal tibia). In these cases, the fibular graft was augmented either with bone cement or bone grafting. Even though we could clear the disease and achieve anatomical alignment, there was some impairment of joint movements. Thus, the functional outcome was good-to-fair in cases of large joint involvement.

In case of distal tibia giant-cell tumor after resection, the reconstruction was done by arthrodesis of tibia and calcaneum with fibular graft augmented with Kuntscher nail. Here, the functional outcome was fair because the patient developed calcaneus deformity.

We could eliminate the tumors in 34 out of 35 cases (97.14%); one case of giant-cell tumor recurred. This case was further treated by excision and centralization of ulna.

In all these cases of failure, the graft did not incorporate probably due to inadequate fixation even after 1½ years, which was subsequently managed by bone grafting and replating.

In our study, 65% (23 of 35) had stable, painless extremity, and resumed active use of the involved extremity without

protective device after 1 year. The fair results in 5 patients were because of painful extremity and they required assistive devices; four patients with distal femur reconstruction had knee stiffness and flexion deformity. The other patient with distal tibia reconstruction had calcaneus deformity. The seven patients with failure were due to infection, non-union, and recurrence. In summary, considering the problems for which the reconstruction was done 23 out of 35 patients (18 excellent and 5 good) had satisfactory results.

CONCLUSION

The bony defects arising out of wide resection of the benign tumor can be successfully reconstructed with fibular graft-giving good functional outcome. However, these bony defects can be successfully managed with fibular reconstruction when they present early to the surgeon. Our overall experiences with non-vascularized fibular graft for reconstruction bony defects are encouraging; however, we are aware this is a short-term study and would require further evaluation and more inputs.

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Dexamethasone versus Dexmedetomidine as Adjuvant to Ropivacaine 0.2% in Caudal Analgesia in Pediatric Infraumbilical Surgeries: A Prospective, Randomized, and Double-Blind Study

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Abstract

Background: Caudal analgesia is a good, reliable, and safe technique commonly used for intra- and post-operative analgesia in pediatric patients undergoing infraumbilical surgeries. Various adjuvants are being used to improve the quality and duration of single-shot local anesthetic injection. We aimed to compare the analgesic efficacy of dexamethasone versus dexmedetomidine added as an adjuvant to ropivacaine 0.2% in pediatric caudal blocks.

Methods: After approval from the institutional ethics committee and written informed consent of the parents, 60 children of age group 2-8 years, the American Society of Anesthesiologists Grade I and II, scheduled for elective infraumbilical surgeries were divided into two equal groups in a prospective, randomized, and double-blind study. Group A ($n = 30$) received ropivacaine 0.2% 1 mL/kg with 0.1 mg/kg of dexamethasone and Group B ($n = 30$), received ropivacaine 0.2% 1 mL/kg with 2 µg/kg of dexmedetomidine. Post-operative pain was assessed by modified objective pain scale score and face, legs, activity, cry, consolability score, and sedation by Ramsay sedation scale.

Results: The mean duration of analgesia was 478.04 ± 61.22 min in Group A, whereas in Group B, it was 724.81 ± 36.30 min ($P = 0.0001$). Sedation scores between the two groups were comparable. Group B shows increased sedation score (III or IV) significantly in the first 2 h when compared to Group A. No significant difference was observed in the incidence of hemodynamic changes or side effects.

Conclusion: We conclude that dexmedetomidine is a better adjuvant to ropivacaine in single-shot caudal anesthesia for pediatric infraumbilical surgeries with significant post-operative pain relief, resulting in a better quality of sleep and a prolonged duration of arousable sedation with unremarkable side effects when compared with dexamethasone.

Key words: Adjuvant, Caudal analgesia, Dexamethasone, Dexmedetomidine, Ropivacaine

INTRODUCTION

Pediatric surgical procedures are followed by pain that leads to fear, agitation, anxiety, restlessness, and hemodynamic

instability in children. To overcome these effects of pain and to improve the quality of analgesia, various regional anesthetic techniques have gained popularity.

Caudal block is one of the most reliable and commonly used regional analgesic techniques to provide intra- and post-operative analgesia in pediatric infraumbilical surgeries. It can be given as single-shot injection or continuous infusion through a caudal epidural catheter. Single-shot caudal was the most commonly preferred technique as the latter is associated with increased incidence of infection due to high risk of fecal contamination of catheter.¹

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However, the disadvantage of single-shot caudal is less duration of action of local anesthetics. Hence, to increase the efficacy of caudal analgesia, various adjuvants such as opioids, steroids, neostigmine, and α_2 agonists²⁻⁴ have been added to local anesthetics to provide prolonged post-operative analgesia.

Ropivacaine a long acting, S-enantiomer of the amide local anesthetic structurally related to bupivacaine, is considered safe in pediatric population as it produces differential neural blockade, with less motor blockade with reduced cardiovascular and neurological toxicity.⁵

Epidural steroids produce analgesia by their property of anti-inflammatory action, edema reduction, and shrinkage of the connective tissue.⁶ Dexamethasone is a high potency, long-acting glucocorticoid with powerful anti-inflammatory as well as analgesic properties.⁷ It potentiates analgesia of the caudal block by regulating transcription factor nuclear factor-kB and inhibits central sensitization after surgery.^{8,9}

Dexmedetomidine is a highly selective α_2 -adrenoreceptor agonist with sedative and analgesic effects. It enhances local anesthetic effect without producing side effects,^{10,11} which makes it a good adjuvant to local anesthetics. When compared to other sedatives, it produces sedation without significant respiratory compromise even at high doses.¹²

There are studies demonstrating that the use of dexmedetomidine as adjuvant in caudal block could prolong post-operative pain relief children in successfully.^{13,14}

This study was designed to compare the analgesic efficacy of dexamethasone (0.1 mg/kg body weight) versus dexmedetomidine (2 μ g/kg body weight) added as adjuvants to ropivacaine 0.2% (1 ml/kg) in caudal analgesia in pediatric infraumbilical surgeries, in terms of the duration of post-operative analgesia, post-operative sedation, quality of surgical anesthesia, and to monitor the side effects if any.

MATERIAL AND METHODS

Design and Sampling

Design

This was a prospective, randomized, and double-blind study.

Study period

The duration of the study period was 7 months (between January 2017 and July 2017).

Sampling

Pediatric patients in the age group of 2-8 years scheduled for infraumbilical surgeries under general anesthesia in the Department of Pediatric Surgery, Government General and Teaching Hospital, Kakinada, were selected for the purpose of the study.

Sampling procedure

Pediatric patients selected for lower abdominal surgeries were identified in the pediatric surgery ward, and information regarding the diagnosis, data of child, and type of surgery was collected from the inpatient case record.

Study population

Eligible children of the American Society of Anesthesiologist Physical Status I and II of either sex, in the age group of 2-8 years, undergoing elective infraumbilical surgical procedures were included in this study.

Exclusion criteria

Participants with parents refusal, infection at sacral region, bleeding diathesis, pre-existing neurological/spinal diseases, mental retardation, congenital anomaly of lower spine, known allergy to steroids, local anesthetic drugs, sepsis, and cardio-respiratory or other systemic diseases were excluded from the study.

Justification of sample size

The primary outcome of this study was the mean time to first analgesic request. The sample size estimation was determined based on the primary outcome of the study. A pilot study was done with 10 patients per group in which clinically significant difference in the meantime to first request of analgesia between the two groups was 257.85 min which was >25% variation between the groups. In this pilot study, mean duration of analgesia for dexmedetomidine group was 692.39 ± 34.09 min and dexamethasone group was 409.16 ± 59.47 min using $\alpha = 0.05$, $\beta = 0.20$, and power of study being 80%, the sample size was calculated to be 25 per group (using power analysis and sample size software, power and sample size software.com). Hence, we recruited 30 in each group to compensate for dropouts. The subjects included in the pilot study were not taken for the original study.

Ethical issues

The hospital ethics committee approval was sought. All parents/legal guardians were explained about the anesthetic technique and its merits and demerits, and written informed consent was obtained.

Double blinding

An anesthesiologist not involved in the study kept the table of random numbers and prepared and coded the sample drugs according to patients body weight in equal volumes in syringes of either ropivacaine 0.2% with dexamethasone (0.1 mg/kg) making the volume to 1 ml for dexamethasone group or ropivacaine 0.2% with dexmedetomidine (2 µg/kg) making the volume to 1 ml for dexmedetomidine group. As it was a double-blinded study, the anesthesiologist administering anesthesia and doing data collection was blinded to the drug administered.

Group allocation

60 children were randomly allocated into two groups of 30 patients each by a computer generated randomization method, and the group identification slip was put in serially numbered, sealed envelopes to hide allocation.

- Group A ($n = 30$): Received caudal 0.2% Ropivacaine (1 ml/kg) + dexamethasone (0.1 mg/kg) making the volume to 1 ml.
- Group B ($n = 30$): Received caudal 0.2% Ropivacaine (1 ml/kg) + dexmedetomidine (2 µg/kg) making the volume to 1 ml.

Patients were kept fasting as per the guidelines before surgery. In the operating room, all the standard monitors (non-invasive blood pressure [NIBP], pulse rate, and blood oxygen saturation level [SPO₂]) were connected. Baseline cardio-respiratory parameters were recorded. After securing an IV access, the children were premedicated with injection glycopyrrolate 0.005-0.01 mg/kg IV, injection ondansetron 0.1 mg/kg, and injection midazolam 0.05 mg/kg IV, induction was done with sevoflurane using Jackson Rees circuit, and intubation was facilitated with injection suxamethonium 2 mg/kg IV. Patients were intubated and kept on controlled ventilation on oxygen 50% + nitrous oxide 50%, sevoflurane 1%, and injection atracurium 0.5 mg/kg as an initial dose, followed by maintenance dose of 0.1 mg/kg.

After securing endotracheal tube in place, patients were placed in left lateral position with hips and knees flexed. Under strict aseptic precautions and after identifying sacral hiatus, a 22G short-beveled needle was inserted in the caudal space using loss of resistance technique and confirmed by whoosh test.¹⁵ The injection was made after negative aspiration for blood or cerebrospinal fluid. The caudal drug was given according to the group assigned by an anesthesiologist, who was blinded to the drug administered. The vitals were recorded every 15 min for 1 h, every 1 h for 4 h, and then every 2 h for up to 12 h.

The time of caudal block was noted and surgical incision was allowed after 10 min after administering the caudal block. Block considered failed if increase in heart rate and mean blood pressure more than 15% compared with the baseline values obtained just before surgical incision. On the completion of surgery, the residual effect of muscle relaxant was reversed with injection neostigmine 0.05 mg/kg and injection glycopyrrolate 0.01 mg/kg, and patients were extubated, when fully awake.

Patients were shifted to the post-operative anesthesia care unit (PACU), for further monitoring of SPO₂, pulse rate, respiratory rate (RR), and NIBP. The quality of analgesia and sedation was assessed every 15 min till 2 h, every 2nd hourly till 12 h, and every 6th hourly till 24 h until the first dose of rescue analgesia was given. The intensity of pain was measured using the pediatric observational face, legs, activity, cry, consolability (FLACC) pain score with its 0-10 score range and modified objective pain scale (MOPS).¹³ The duration of analgesia is defined as the time period between administration of block until FLACC score reached >4.¹⁶ Patients were administered rescue analgesia with paracetamol 15 mg/kg IV on evidence of pain, i.e., if the MOPS score reached a value of >4.

Motor block was assessed in the PACU on awakening by modified Bromage scale.¹⁷ The duration of motor block was calculated from the time of administration of the drug to the time when modified Bromage scale reached the value of 1.

Level of sedation was assessed by Ramsay sedation scale¹⁸ at 30 min and 60 min after extubation and thereafter hourly up to 12 h or until score became I in all patients. Ramsay score of V or VI indicates excessive sedation.

Any adverse events such as hypotension, bradycardia, nausea, vomiting, and respiratory depression were monitored for 24 h and treated accordingly. Post-operative respiratory depression was defined as RR <10/min or decrease in SPO₂ <95% and required supplemental oxygen.

Statistical Analysis

Statistical analysis was performed using GraphPad.com software. Data were analyzed and compared using student's *t*-test, Fisher's exact test, and Chi-square test. Data were represented as a mean and standard deviation. $P < 0.05$ was considered statistically significant and $P < 0.001$ is considered to be highly significant.

Face, legs, activity, cry, consolability behavioral pain assessment

| Categories | Score | | |
|---------------|--|---|--|
| | 0 | 1 | 2 |
| Face | No particular expression or smile | Occasional grimace or frown; withdrawn, disinterested | Frequent to constant frown, clenched jaw, quivering chin |
| Legs | Normal position or relaxed | Uneasy, restless, tense | Kicking or legs drawn up |
| Activity | Lying quietly, normal position, moves easily | Squirming, shifting back and forth, tense | Arched, rigid, or jerking |
| Cry | No cry (awake or asleep) | Moans or whimpers, occasional complaint | Crying steadily, screams or sobs; frequent complaints |
| Consolability | Content, relaxed | Reassured by occasional touching, hugging, or being talked to; distractible | Difficult to console or comfort |

Modified objective pain scale¹³

| Criteria | Findings | Points |
|-----------|--------------------------------|--------|
| Crying | None | 0 |
| | Consolable | 1 |
| | Not consolable | 2 |
| Movements | None | 0 |
| | Restless | 1 |
| | Thrashing | 2 |
| Agitation | Asleep | 0 |
| | Calm | 0 |
| | Mild | 1 |
| Posture | Hysterical | 2 |
| | Normal | 0 |
| | Flexed | 1 |
| Verbal | Holds injury site | 2 |
| | Asleep | 0 |
| | No complaints | 0 |
| | Complaints but cannot localize | 1 |
| | Complaints and can localize | 2 |

Modified Bromage scale

| Criterion | Score |
|--|-------|
| No motor block, child moves limbs freely | 0 |
| Inability to raise legs | 1 |
| Inability to flex knees | 2 |
| No movement possible in legs | 3 |

Six point sedation score was assigned as follows:

Ramsay sedation score

| Score | Clinical description |
|-------|---|
| I | Anxious, agitated |
| II | Cooperative, oriented, tranquil |
| III | Responds only to verbal commands |
| IV | Asleep with brisk response to light stimulation |
| V | Asleep with sluggish response to stimulation |
| VI | Asleep without response to stimulation |

RESULTS

A total of 60 patients in the age group of 2 - 8 years were enrolled in the study. Caudal block was successful in all the patients.

Demographic data of patients in both the groups in terms of age, sex, weight, and duration of surgery were similar and comparable (Table 1).

There was no significant difference in the hemodynamic parameters between the two groups in pre- and post-operative periods.

The mean duration of analgesia in Group B was significantly more than in Group A, i.e., 724.81 ± 36.30 min and 478.04 ± 61.22 min ($P < 0.0001$), respectively (Table 2).

When pain scores (FLACC and MOPS) were compared between two groups, it was observed that during the first 4 h after surgery all patients in Group A and Group B had adequate analgesia (FLACC score <4 and MOPS score <4). In Group A, the FLACC and MOPS score reached 4 at 6th h in most of the patients with mean analgesic duration of 478.04 ± 61.22 min (8.9 h). In Group B, the FLACC and MOPS score reached 4 at 12 h in most of the patients with mean analgesic duration of 724.81 ± 36.30 min (12.68 h). Rescue analgesia was administered when MOPS and FLACC ≥ 4 (Figures 1 and 2).

There was no significant prolongation of motor blockade after the surgery in both the groups (Table 2).

Table 1: Demographic characteristics of the studied patients

| Data | Mean \pm SD (n=30) | | P |
|------------------------------|----------------------|-------------------|--------|
| | Group A | Group B | |
| Age (years) | 3.68 \pm 1.46 | 3.70 \pm 1.3 | 0.955 |
| Weight (kg) | 13.96 \pm 3.16 | 14.42 \pm 2.8 | 0.520 |
| Sex (%) | | | |
| Male | 22 (82.5) | 25 (87.5) | 0.532* |
| Female | 8 (17.5) | 5 (12.5) | |
| ASA (I/II) | 20/10 | 22/8 | 0.566† |
| Duration of surgery (in min) | 44.12 \pm 14.89 | 45.35 \pm 13.71 | 0.740 |

Values are expressed as mean \pm SD, SD: Standard deviation, or ratio or absolute numbers, Student: t-test, *Fischer's exact test, †Chi-square test used ASA status, $P < 0.05$ statistically significant, ASA: American society of anesthesiologists

Table 2: Surgical procedures

| Surgical procedures | Group A n=30 (%) | Group B n=30 (%) |
|---------------------|------------------|------------------|
| Inguinal herniotomy | 13 (43.33) | 11 (36.66) |
| Hypospadias | 15 (50) | 18 (60) |
| Orchiopexy | 02 (6.66) | 01 (3.33) |

Data expressed in absolute numbers (%)

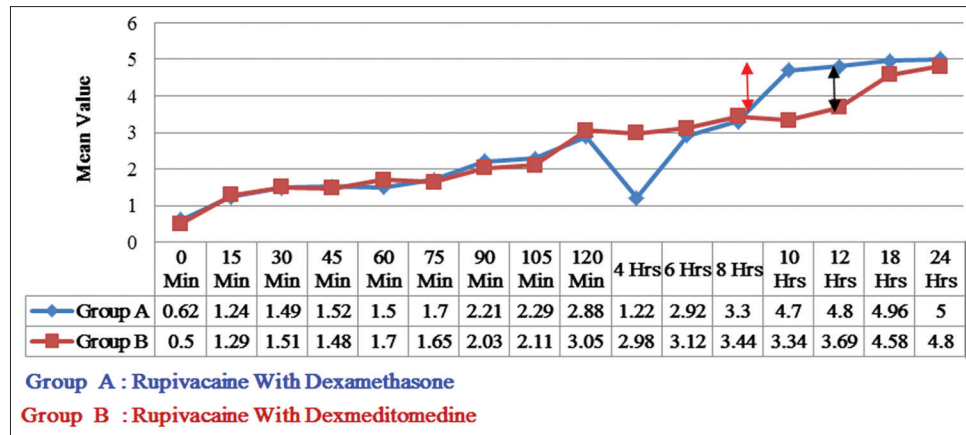


Figure 1: Face, legs, activity, cry, consolability score (mean) pain scores at different time intervals in both groups (adequate analgesia is score <4). *Statistically significant compared with group ropivacaine with dexamethasone

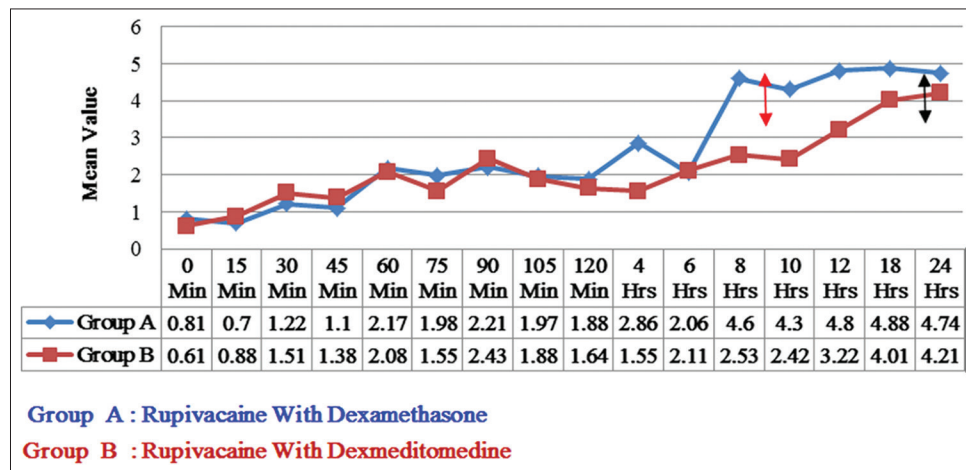


Figure 2: Modified objective pain scale (mean) pain scores at different time intervals in the both group. (Adequate analgesia is score <4). *Statistically significant compared with group ropivacaine with dexamethasone

Sedation scores between the two groups were comparable at 30 min, 1st h, 2nd h, 3rd h, 6th h, and 12th h after surgery. Group B shows increased sedation score (III or IV) significantly in the 1st 2 h when compared to Group A. No patient had sedation score of V or VI (Table 3).

There was no significant difference between the two groups as regard to the incidence of side effects (Table 4). Although one child in Group B developed bradycardia that was managed with injection atropine 0.01 mg/kg IV, one child in Group A had vomiting and treated with injection Ondansetron 0.1 mg/kg IV (Table 4).

DISCUSSION

Pediatric caudal analgesia has gained importance nowadays because, in addition to providing adequate post-operative analgesia, it also reduces the requirement of anesthetics intraoperatively without significant side effects¹⁹ and also

Table 3: Caudal block characteristics (min)

| Outcome parameters | Mean±SD (n=30) | | P |
|-------------------------------|----------------|--------------|---------|
| | Group A | Group B | |
| Duration of analgesia (min) | 478.04±61.22 | 724.81±36.30 | 0.0001* |
| Duration of motor block (min) | 129.42±27.13 | 143.02±23.58 | 0.486 |

*Values are expressed as mean±SD, SD: Standard deviation, Student: t-test, $P < 0.05$ statistically significant, Group A: Ropivacaine with dexamethasone, Group B: Ropivacaine with dexmedetomidine

helps in improving the outcome after surgery. The use of various additives to local anesthetics improves the quality of block by enhancing the duration of block and provides good quality of surgical conditions with hemodynamic stability and minimal side effects.

In this study, we found that caudal administration of dexmedetomidine 2 µg/kg when added to ropivacaine 0.2% in caudal epidural analgesia achieved good quality of intra- and post-operative analgesia, better quality of

Table 4: Ramsay sedation score during observation period

| Time | Median (range) | |
|----------------|----------------|---------|
| | Group A | Group B |
| End of surgery | 2 (1-3) | 4 (3-4) |
| 30 min | 2 (1-3) | 4 (3-4) |
| 1 h | 1 (0-1) | 3 (2-3) |
| 2 h | 1 (0-2) | 2 (2-2) |
| 3 h | 1 (0-1) | 1 (0-2) |
| 6 h | 0 (0-0) | 0 (0-0) |
| 12 h | 0 (0-0) | 0 (0-0) |

Data expressed in absolute numbers, Group A: Ropivacaine with dexamethasone, Group B: Ropivacaine with dexmedetomidine

Table 5: Side effects

| Side effects | Group A n=30 | Group B n=30 |
|------------------------|--------------|--------------|
| Bradycardia | 0 | 1 |
| Hypotension | 0 | 0 |
| Respiratory depression | 0 | 0 |
| Vomiting | 1 | 0 |

Data expressed in absolute numbers

sleep, significant post-operative pain relief with lesser pain score, and without remarkable side effects in children undergoing infraumbilical surgeries when compared with caudal dexamethasone 0.1 mg/kg.

We preferred ropivacaine, in our study, because it is better tolerated and less toxic compared to bupivacaine,²⁰ we selected 2-8-year-old children and the dosage of ropivacaine, and we used in our study 1 ml/kg of 0.2% which was considered as safe in this age group and this was consistent with the study done by Wulf *et al.*²¹ who evaluated the pharmacokinetics of ropivacaine 0.2% in children and documented as safe dose.

Perineural injection of steroids is reported to influence post-operative analgesia. In our study, addition of dexamethasone to ropivacaine increased the analgesic duration of caudal block, reduced severity of pain without inducing any significant respiratory, and hemodynamic effects.

Kim *et al.*²² evaluated the analgesic efficacy of caudal dexamethasone combined with ropivacaine and found that post-operative pain scores at 6 and 24 h were significantly lower in dexamethasone group. The findings of their study were similar to our study.

Choudhary *et al.*,²³ in their study, proved that the mean duration of analgesia in ropivacaine with dexamethasone group was significantly more than in ropivacaine group, i.e., 478.046 ± 104.57 min and 248.4 ± 54.1 , respectively. In our study, also mean duration of analgesia in ropivacaine

with dexamethasone was 478.04 ± 61.22 min, and our value coincides with their value.

Dexmedetomidine is selective α_2 adrenergic receptor agonist which prolongs the duration of analgesia when added to caudal ropivacaine. This effect is due to local vasoconstriction, increased potassium conductance in A δ and C fibers.

Anand *et al.*²⁴ administered caudal dexmedetomidine 2 μ g/kg with 0.25% ropivacaine 1 ml/kg for pediatric lower abdominal surgeries and achieved significant post-operative pain relief up to 15 h. We used the same dose of dexmedetomidine 2 μ g/kg with 0.2% ropivacaine 1 ml/kg and achieved mean duration of analgesia of nearly 13 h. The observations of Anand *et al.* study correlated with our study.

Afonso and Reis.¹² found that sedation caused by dexmedetomidine can be easily reversed with slight stimulation and do not cause respiratory depression even at high doses. In our study, also no child had respiratory depression in the post-operative period which is in agreement with his study.

As regard to sedation score, there was a significant increase in the 1st 2 h in sedation score with prolonged duration of sedation in dexmedetomidine group compared to dexamethasone group which is acceptable to the parent's as the child remains calm.

CONCLUSION

We conclude that dexmedetomidine is a better adjuvant to ropivacaine in single-shot caudal anesthesia for pediatric infraumbilical surgeries with significant post-operative pain relief, resulting in a better quality of sleep and a prolonged duration of arousable sedation with unremarkable side effects when compared with dexamethasone.

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Role of Magnetic Resonance Imaging Fistulography in Preoperative Evaluation of Perianal Fistulas

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Abstract

Introduction: As per definition, a perianal fistula is any abnormal passage connecting two epithelial surfaces of anal canal and the skin of the perineum. **Objective:** The objective of this study is to study the various types of perianal fistulas, delineating the primary track and complications of perianal fistula with magnetic resonance imaging (MRI) and evaluate the accuracy of MRI in the pre-operative classification. **Materials and Methods:** A retrospective study included 44 patients referred for MRI by 1.5T Magnetom Avanto MRI unit (Siemens Medical Systems) with clinical suspicion of perianal fistulae between January 2016 and July 2017, for evaluation of the extent of disease. Out of these 26 patients underwent surgery in our hospital and were included in the study. Imaging was performed with multiplanar T1-weighted (T1W), T2-weighted (T2W), and proton density fat saturation (PDFS) sequences. Fistulas were classified according to St. James's University Hospital MRI based classification system (which correlates the Parks surgical classification to anatomic MRI findings) into five grades. Then, the interrelation between surgical and MRI findings was statistically analyzed. **Results:** A total of 26 patients were studied, MRI revealed fistulae in 21 (80.7%) patients while 5 (19.2%) patients had only perianal sinuses. Out of total 21 fistulae seen, 10 (47.6%) were intersphincteric, 9 (42.8%) were transsphincteric, and 2 (9.5%) were suprasphincteric. No extrasphincteric fistula noted. Out of these fistulae, 14 (66.6%) were simple, whereas 7 (33.3%) showed associated abscess formation, inflammation, and branching course. Statistical parameters showed that MRI has a sensitivity of 100% and specificity of 83.3% in determining type and extent of perianal fistula. **Conclusion:** MRI is a reliable noninvasive diagnostic modality for pre-operative assessment of perianal fistulae and guide for surgical planning by giving a correct assessment of the extent of disease, thereby reducing the chances of recurrence.

Key words: Intersphincteric, Magnetic resonance imaging, Perianal fistula, Suprasphincteric, Transsphincteric

INTRODUCTION

As per definition, a perianal fistula is any abnormal passage connecting two epithelial surfaces of anal canal and the skin of the perineum.¹ They are thought to be a result of anal gland obstruction, with secondary abscess formation and external rupture of the abscess.²

Anal fistulae have been known ever since the times of Hippocrates and have been described through centuries. In

1835, Frederick Salmon performed a successful operation in London on the writer Charles Dickens. Goodsall describes the fistulous passage in details, and Parks' Classification shows the most practical significance until nowadays.

The incidence of perianal fistula ranges from approximately 1 to 2 per 10,000 individuals with an approximate 2:1 male to female predominance.¹ The most common presenting symptom is discharge, discomfort, and fever but local pain due to inflammation is also common.³ However, fistulas may be completely asymptomatic.⁴

Treatment of this condition includes surgical exploration and removal of the fistulous track.⁵ However, in 25-30% of cases, the condition has a tendency to recur.^{5,6} This is most often because surgical exploration can easily miss secondary tracks and abscesses, resulting in recurrent infection requiring re-exploration. Surgeons have traditionally used

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digital rectal examination and examination under anesthesia to detect the fistulous track and their internal opening. However, this method fails to identify complex fistulas and their branches, leading to wrong classification and incomplete treatment.^{6,7}

Conventional fistulograms has two main disadvantages: First, the primary track and its extensions do not fill with contrast if they are plugged with pus or debris and, second, the sphincter muscle anatomy is not imaged; hence, the relation between the track, the internal/external sphincter, and the levator ani muscle is not revealed.⁶ Transrectal ultrasound better depicts fistulae and their relation to the anal sphincter muscles. The operator dependence, limited field of view and absence of a coronal plane of imaging; however, are its disadvantages.⁶ Computed tomography (CT) fistulography is limited by the fact that attenuation values of the fistula track, the areas of fibrosis, and sphincter muscles are similar to each other.⁶ Researches have shown that techniques used for imaging perianal fistulas including fistulography, anal endosonography, and CT, have proved no better than clinical examination and are uncomfortable to the patient on one hand and or lack the ability to demonstrate secondary tracks and relationship of the fistulous tracks with the sphincter complex.⁶⁻⁸

MATERIALS AND METHODS

Totally, 44 patients with clinical suspicion of perianal fistulae were referred to the Radiology Department of tertiary care rural hospital from January 2016 and July 2017. Out of these 26 patients underwent surgery in our hospital and were evaluated retrospectively. Magnetic resonance imaging (MRI) imaging was done with a 1.5T Magnetom Avanto MRI unit (Siemens Medical Systems) with parameters and protocol described in Table 1, using a phased array body coil. There was no special patient preparation. MRI fistulogram was performed with instillation of contrast (gadolinium) or saline through the external opening.

The following items were assessed for each of the used MRI sequences: The type of the fistula, location of the internal opening, the presence or absence of sinus tracks, abscesses and a horseshoe component as well as coexisting inflammation. The type of the fistula was evaluated according to the St. James's University Hospital MRI classification system (Table 2)⁹ which correlates Parks surgical classification¹⁰ to anatomical MRI findings in the axial and coronal planes (Table 3 and Figure 1). The location of the internal opening was identified on axial images using the "anal clock" with the 12 o'clock position located anterior and the 6 o'clock position located posterior (Figure 2).¹¹ A fistula with a track medial to the levator plate or puborectalis muscle is supralelevator, while a fistula lateral to these muscles is infralevator. Complicated primary tracks with secondary tracks, extensions or abscesses were defined by their anatomical location: Ischio-anal, intersphincteric, or supralelevator and they were considered horseshoe if crossing the midline to the contralateral side.¹² Fistulous tracks were differentiated from abscesses using the criteria of Laniado *et al.*¹³ in which fistulas were defined as being

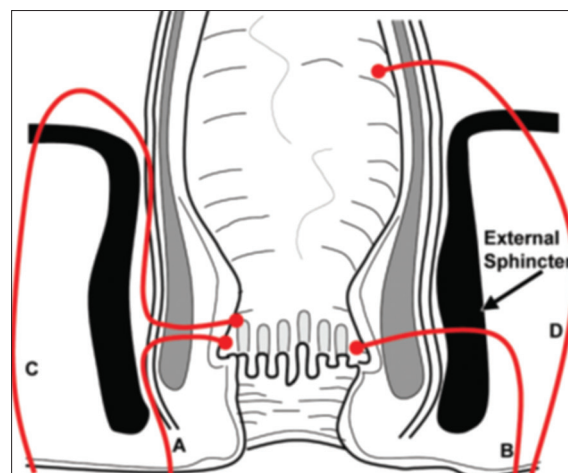


Figure 1: Parks classification. Drawing of the anal canal in the coronal plane shows the Parks classification of perianal fistulas. A = Intersphincteric, B = Transsphincteric, C = Suprasphincteric, D = Extrasphincteric. The external sphincter is the keystone of the Parks classification

Table 1: Protocols and parameters used for MRI fistulography

| Imaging plane | MRI sequences | | | |
|-----------------------|-------------------|-----------------------------|----------------------------------|-----------------------------|
| | Non-contrast scan | | Non-contrast fat suppressed scan | |
| | T1W FSE | T2W FSE | FS T1W FSE | FS T2W FSE |
| | Axial and coronal | Sagittal, axial and coronal | Axial and coronal | Sagittal, axial and coronal |
| TR/TE (ms) | 450/14 | 4500/110 | 560/14 | 4500/110 |
| FOV (cm) | 26 × 26 | 24 × 24 | 26 × 26 | 24 × 24 |
| Section thickness | 4.0 | 4.0 | 4.0 | 4.0 |
| Intersection gap (mm) | 0.8 | 0.8 | 0.8 | 0.8 |
| Matrix | 384 × 224 | 320 × 256 | 384 × 224 | 320 × 256 |

MRI: Magnetic resonance imaging, T1W: T1-weighted, T2W: T2-weighted, FS: Fat suppression, FOV: Field of view, FSE: Fast spin echo

Table 2: MRI grading of ano-rectal fistula⁹

| Grade | Description |
|-------|---|
| 1 | Simple linear inter-sphincteric fistula |
| 2 | Inter-sphincteric fistula with inter-sphincteric abscess or secondary fistulous track |
| 3 | Trans-sphincteric fistula |
| 4 | Trans-sphincteric fistula with abscess or secondary track within the ischioanal or ischiorectal fossa |
| 5 | Supralevator and translevator disease |

MRI: Magnetic resonance imaging

Table 3: Parks classification of ano-rectal fistula¹⁰

| Fistula type | Description |
|-------------------|---|
| Inter-sphincteric | Confined to inter-sphincteric plane, does not cross external sphincter or levator muscles |
| Trans-sphincteric | Track passes radially through external sphincter |
| Supra-sphincteric | Track passes upward within inter-sphincteric plane over puborectalis muscles and descends through levator muscles to the ischioanal fossa |
| Extra-sphincteric | Course is completely outside external sphincter |

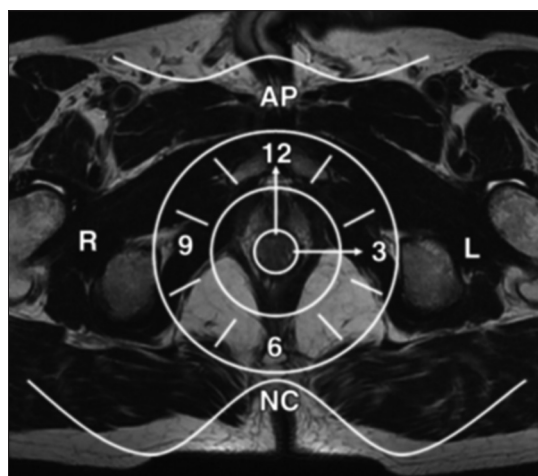
Quoted from Crido *et al.*⁹

Figure 2: Anal clock. Axial T2-weighted magnetic resonance image of the male perineum shows the anal clock diagram used to correctly locate anal fistulas with respect to the anal canal. AP = Anterior perineum, L = left aspect of the anal canal, NC = Natal cleft, R = Right aspect of the anal canal

fluid–fluid tubular structures with a diameter smaller than 10 mm and abscesses were larger than 10 mm. Air pockets within the fluid collection also suggested the presence of an abscess. MRI findings were then correlated with the operative findings. Surgical findings were accepted as the gold standard and were recorded independently by the surgeon.

RESULTS

Out of the 26 patients included in the study group with age ranging from 20 to 67 years. MRI revealed fistulae

Table 4: MRI findings compared to surgical findings

| Abnormality classifications | MRI findings | Surgical findings |
|-----------------------------|--------------|-------------------|
| Primary track | | |
| Intersphincteric | 10 | 9 |
| Transsphincteric | 9 | 9 |
| Suprasphincteric | 2 | 2 |
| Extrasphincteric | 0 | 0 |
| Fistula detection total | 21 | 20 |
| Sinus track | 5 | 6 |
| Total (fistula+sinus) | 26 | 26 |
| Abscess | 6 | 6 |
| Horseshoe fistula | 3 | 3 |

MRI: Magnetic resonance imaging

Table 5: Accuracy of MRI for detection of primary track, abscess, horseshoe fistula, and internal opening

| MRI finding | Sensitivity | Specificity | PPV | NPV |
|-------------------|-------------|-------------|--------------|--------------|
| Primary track | 100 (20/20) | 83.3 (5/6) | 95.2 (20/21) | 19.2 (5/26) |
| Fistula | 83.3 (5/6) | 100 (20/20) | 100 (5/5) | 95.2 (20/21) |
| Abscess | 100 (6/6) | 100 (6/6) | 100 (6/6) | 100 (6/6) |
| Horseshoe fistula | 100 (3/3) | 100 (3/3) | 100 (3/3) | 100 (3/3) |

MRI: Magnetic resonance imaging, PPV: Positive predictive value, NPV: Negative predictive value

Table 6 : Comparison of sensitivity and specificity of our study with international literature

| Study | Sensitivity | Specificity |
|--|-------------|-------------|
| Beckingham <i>et al.</i> ¹⁵ | 97% | 100% |
| Regina <i>et al.</i> ¹⁸ | 100% | 86% |
| Our study | 100% | 83.3% |

in 21 (80.7%; 17 males and 4 females) patients while 5 (19.2%; 3 males and 2 females) patients had only perianal sinuses. Out of total 21 fistulae seen, 10 (47.6%) were intersphincteric, 9 (42.8%) were transsphincteric, and 2 (9.5%) were suprasphincteric. No extrasphincteric fistula noted (Graph 1). Out of these fistulae, 14 (66.6%) were simple, whereas 7 (33.3%) showed associated abscess formation, inflammation, and branching course. Grade 1 was the most frequent (47.6%) type of anorectal fistula. The most common location of the internal opening of the fistula was at 6 o'clock position.

The MRI findings were in accordance with surgical findings in 25 out of 26 patients regarding type and extent of fistula-in-ano. One intersphincteric fistula misdiagnosed on MRI proved to be a sinus (Table 4).

Statistical parameters showed that MRI has a sensitivity of 100% and specificity of 83.3% in determining type and extent of perianal fistula (Table 5).

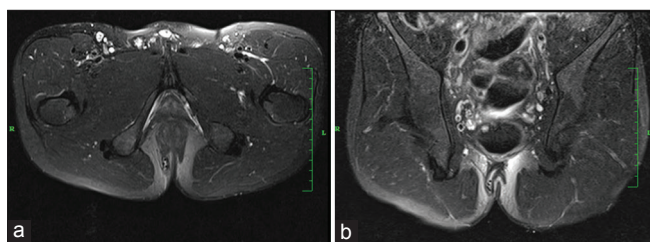


Figure 3: (a and b) T2-weighted FS axial and coronal: Inter-sphincteric fistula in ano with external opening at 7 o' clock position in right buttock and internal opening at 11 o' clock position of anal canal

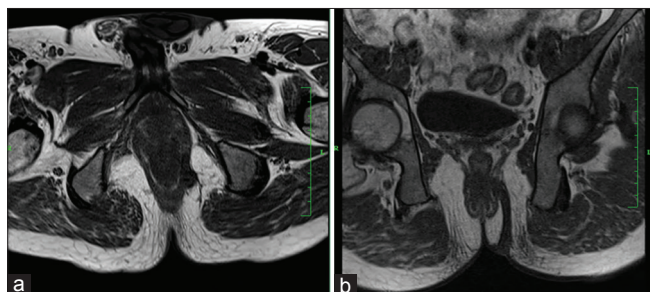


Figure 4: (a and b) T1-weighted axial and coronal: Trans-sphincteric fistula in ano with external opening at 5 o' clock position in left buttock and internal opening at 3 o' clock position of anal canal on the left side

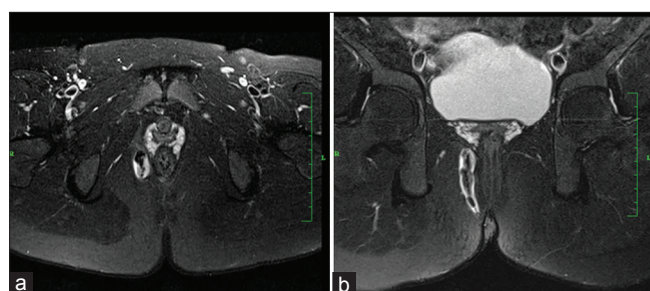


Figure 5: T2-weighted fat suppression axial and coronal: Suprasphinteric fistula in right buttock with external opening at 7 o' clock position and internal opening at 6 o' clock position

DISCUSSION

This is a retrospective comparative study between surgery and preoperative MRI, aiming to precisely evaluate the value of preoperative MRI examination. Until recently, imaging had very little role to play in the preoperative evaluation of perianal fistulas. The advent of MRI with its excellent soft tissue contrast and multiplanar capabilities makes it an ideal choice in the preoperative assessment of perianal fistulas. A detailed assessment of the anatomic relationship between the fistula and the anal sphincter complex allows surgeons to choose the best surgical treatment thus significantly reducing recurrence of the disease or possible secondary effects of surgery, such as fecal incontinence.^{9,14,15}

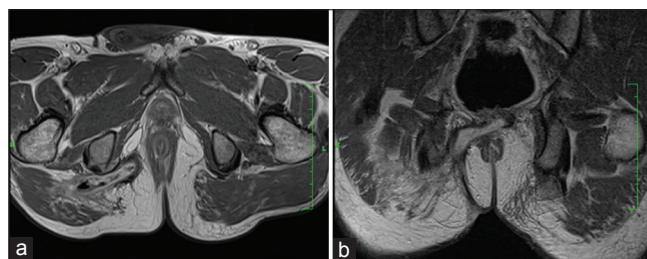


Figure 6: T1-weighted post-contrast axial and coronal: Trans-sphincteric Y shaped recto-cutaneous fistula with external opening at 7 o' clock position with right ischiorectal and gluteal abscess formation as described above

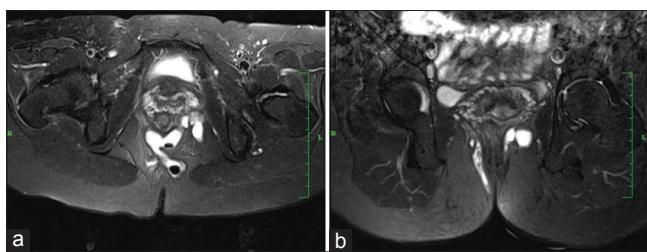
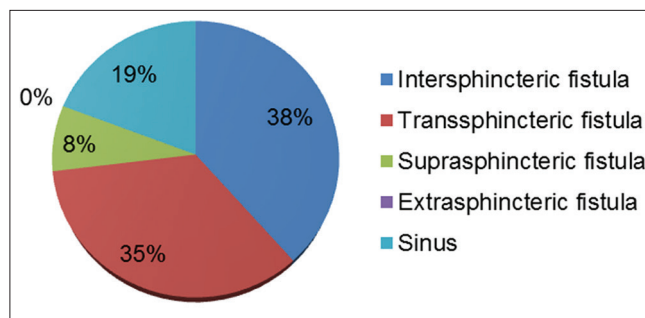


Figure 7: T2-weighted fat suppression axial and coronal: Perianal sinus track with external opening at 7 o' clock position in right buttock with horseshoe shaped abscess involving bilateral ischiorectal fossa



Graph 1: Magnetic resonance imaging findings

The results of our study indicate that MRI is highly accurate for determining the type and extent of perianal fistulae. Sensitivity of 90% and specificity of 100% seen in our study is comparable to international literature Tables 6.

MRI Appearance

T1-weighted (T1W) images give an excellent anatomic overview of the sphincter complex, levator plate, and ischiorectal fossa. Fistulous tracks, inflammation, and abscesses appear as areas of low to intermediate signal intensity on T1W imaging. T2-weighted (T2W) images provide good contrast between the high signal intensity fluid in the track and the low signal fibrous wall of the fistula and allow adequate differentiation of the boundaries of the internal and external anal sphincters. Active fistulous tracks and extensions have high signal intensity on T2W images, while the sphincters have low

signal intensity. Chronic fistulous tracks or scars appear hypointense on both T1W and T2W images. Abscesses appear hyperintense on T2W images due to the presence of pus and fluid in the center. Gadolinium-enhanced T1W images are useful to differentiate a fluid-filled track from an area of inflammation. The track wall enhances, whereas the central portion is hypointense. Abscesses are also very well depicted on post-gadolinium images.¹⁶

The exact location of the primary track (ischioanal or intersphincteric) is most easily visualized on axial images; the presence of disruption of the external anal sphincter differentiates a transsphincteric fistula from an intersphincteric one. The internal opening of the fistula is also best seen in this plane. As mentioned earlier, coronal images depict the levator plane, thereby allowing differentiation of supralelevator from infralevator infection. In our experience, axial T2W fat-suppressed images were the most useful for locating the fistulous track (Figure 3-7).

CONCLUSION

Our study supports that, MR fistulography precisely demonstrate the anatomy of the perianal region, show the anal sphincter complex and clearly identify the relationship of fistulas to the pelvic diaphragm and ischiorectal fossa which has important implications for surgical management and outcome. Pre-operative MRI can help recognize the unidentified infection, accurate in the detection of the secondary extension and abscess formation and markedly decreasing the incidence of recurrence and allowing side effects such as fecal incontinence to be avoided.

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Brain Stem Evoked Response Audiometry Responses in Tinnitus Patients - A Study on Auditory Evaluation in a Tertiary Teaching Hospital of Hyderabad

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Abstract

Background: The cause of tinnitus is theorized as due to abnormal spontaneous nerve activity somewhere along the auditory pathway. Majority of the causes of such neuronal activities are unknown. Auditory evaluation is done in all patients with tinnitus to rule out organic brain diseases which may also cause tinnitus. Brain stem evoked response audiometry (BERA) is one such test in the armamentarium of audiological evaluation laboratory.

Aim: The aim of the study is to study the results of BERA performed in all patients undergoing audiological evaluation for tinnitus.

Materials and Methods: Patients were divided into two groups; 78 patients with tinnitus and 34 normal individuals as control group. Total audiological evaluation was done in individuals of both groups. Absolute latencies of Wave I, III, and V, inter peak latencies (IPLs) as well as the interaural latency difference of Wave V (ILD-V) was recorded.

Observations and Results: There was no statistical significant difference between both groups. Few tinnitus patients showed abnormal prolonged absolute latencies, IPLs, and increased ILD-V. There was some asymmetry in results between different study subgroups.

Conclusions: BERA results can be variable in tinnitus patients. Few patients have normal results while others showed prolonged absolute or IPLs or increased ILD-V difference.

Key words: Tinnitus, BERA, Audiometry and wave I, III and V

INTRODUCTION

Tinnitus is one of the main aural symptoms with which patients attend the Outpatient Department (OPD) of ear, nose, and throat (ENT) department. After excluding the common causes of tinnitus patients are subjected to a battery of audiological evaluation tests mainly to rule out organic brain lesions. Once the organic brain lesions are ruled out as the cause of tinnitus further establishment of

pathogenesis and actual site of neuronal activity remains a dilemma to the practicing ENT surgeons as they are duty bound to explain to the patients the real problem for the tinnitus. Primarily tinnitus is a symptom associated with primary ear disease but may also occur in people with normal hearing.

Although the initial involvement of auditory end organs is the inducing factor in producing tinnitus, sustained plastic changes, and abnormal neuronal activity within the subcortical and cortical structures of the auditory and non-auditory pathways remain dominant in the causation of tinnitus.¹ Until recently, (1980) tinnitus was believed to be generated in cochlea alone.^{2,3} However, later the involvement of not only cochlea but also auditory pathways and cerebral cortex were found to be the source

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of neuronal activity for tinnitus; with actual abnormality underlying tinnitus evading the human studies.⁴ Another theory put forward for the chronicity of tinnitus is lack of habituation in tinnitus patients who have frequent negative associations which reinforce its perception.⁵ Brain stem evoked response audiometry (BERA) has been used by many authors in an attempt to understand the pathophysiology of tinnitus.

Such potentials recorded are used to understand the synchronous discharge of fibers in the auditory pathway and identify the presence of abnormal neuronal activity; long latency auditory evoked potentials (P1, N1, P2, and P3) studies revealed abnormal response in tinnitus patients.² Recently, an auditory evoked magnetic field study taking a different approach reported significant differences in cortical frequency organization and positron emission tomographic study described abnormally asymmetric activity in the auditory cortices of tinnitus individuals.⁶ BERA can be used in evaluating tinnitus patients for a number of reasons, including its objectivity in evaluating the cochlea, and the brainstem auditory pathways. It remains the test of choice when patients present with symptoms that suggests a cochlear or retrocochlear organic lesion.⁷ In addition, some BERA findings are thought to be indices of central tinnitus. These indices included: Abnormal morphology of auditory brainstem response (ABR) waveform, fluctuation of Wave III and V and prolonged transmission time.⁸ Thus, ABR may contribute to clarify tinnitus origin and this is very important for managing following up such patients.⁹

MATERIALS AND METHODS

Aim of the Study

The aim of the study is to study and evaluate the results of BERA performed in all patients undergoing audiological evaluation for tinnitus.

Study Period

The study period is November 2016 - July 2017.

Institute of Study

Owaisi Hospital and Research centre attached to Deccan College of Medical Sciences, Hyderabad.

112 individuals were included in the present study. Among them, 78 were patients with tinnitus, attending the ENT OPD of Deccan Medical College a tertiary teaching institute of Hyderabad. Another 34 individuals with normal hearing were included as a control group. An institutional ethical committee clearance was obtained before the commencement of the study. All the individuals were given

a formal consent letter approved by the ethical committee for filling up and recorded.

Inclusion Criteria

1. 34 individuals with normal hearing were included as a control group.
2. Patients with tinnitus as the main complaint were included.
3. Patients aged between 30 and 70 years were included.
4. Patients with loss of hearing without middle ear pathology were included.

Exclusion Criteria

1. Patients with chronic suppurative otitis media were excluded.
2. Patients with diabetes mellitus, hypertension, cervical disorders, and other neurological disorders were excluded.
3. Patients with thyroid functional disorders were excluded.
4. Patients with anemia and nutritional disorders were excluded.
5. Pregnant women were excluded.
6. Patients with allergic disorders were excluded.
7. Patients with malignancies or on immuno suppressants were excluded.
8. Patients with psychological disorders were excluded.
9. Patients with noise exposure, acoustic trauma, or previous ototoxic medication.
10. Patients with retrocochlear organic lesions requiring further computerized tomography scan evaluation were excluded.

The age and sex of the patients recorded. All patients were submitted to Otologic examination, basic audiological evaluation (pure tone audiometry, speech audiometry, and impedance audiometry). The subjective nature of the tinnitus matched by the patients was noted in the categories of pure tone, narrow band, or uncertain and tabulated. Frequencies of 3 and 6 kHz were also tested to avoid inclusion of individuals with audiograms that displayed minor dips. Tinnitus matching for intensity and frequency were also done. BERA was done using Smart-EPs of intelligent hearing system. This was done through two-channel recording using four disposable electrodes applied according to the Smart-EP manual specification as the following sites: High frontal Fz (positive electrode), low frontal Fpz (ground electrode). The last two electrodes were placed on the left and right mastoids as negative or reference electrodes depending on the recording side. All electrodes were connected to the pre-amplifier of the Smart-EP equipment. ABR was recorded ipsilaterally in response to click stimuli presented at 90 dBnHL and traced down to threshold in 10 dB steps using alternating polarity

and 19.3 s₁ repetition rate. Stimuli were delivered through ER3A-insertphone. The absolute latencies of Wave I, III, and V, inter peak latencies (IPLs) I0-III, III-V, and I-V as well as the interaural latency difference of Wave V (ILD-V) was calculated. Standard statistical methods were used to analyze the data in the study.

OBSERVATIONS AND RESULTS

The present study included two groups. In Group A, control group 34 individuals without hearing abnormality were included. There were 24 males and 10 females in this group. The patients were aged from 30 to 63 years with a mean age of 53.60 ± 1.2 . In Group B, 78 patients with tinnitus were included consisted of 56 males and 22 females. The patients were aged from 30 to 69 years with a mean age of 56.42 ± 1.6 . There was a sex age match statistically which was significant with *P* value at 0.498 (*P* value significant at < 0.05) (Table 1).

The duration of tinnitus, laterality, and bilateral involvement was recorded. The subjective nature of the tinnitus matched by the patients was noted in the categories of pure tone, narrow band, or uncertain and tabulated in the patients of Group B. As there were patients with hearing loss included in Group B, subgroups of patients with or without hearing loss developed which was also recorded and tabulated (Table 2).

Absolute and IPLs of Wave I, III, V, and ILD-V were calculated and compared at 90dBHL between both Group A and B as well as subgroups of B (with and without hearing loss). They were considered prolonged if they increased by more than 2 standard deviation from absolute and IPLs in control. BERA values in terms of absolute and IPLs in normal hearing tinnitus patients were not significantly different from control group in general. On the other hand, ILD-V was abnormally prolonged in 40% (24/46) of normal hearing tinnitus patients of Group B and was significantly prolonged when compared with control Group A. All the values were statistically significant as the *P* value was below 0.05 (Table 3).

DISCUSSION

Tinnitus is a frequent and often causes devastating effect on the social life of the patients. It is a symptom of auditory system disorders and a variety of other non-auditory system pathological conditions. The sensation of tinnitus may be associated with auditory perception defects at various levels of the auditory processing. The only clinical available measure of tinnitus is the psychoacoustical description of pitch and loudness which

Table 1: Showing the age, sex incidence, and mean and SD values of the study (n=112)

| Observation | Group A-34 | Group B-78 |
|----------------|------------|------------|
| Male | 24 | 56 |
| Female | 10 | 22 |
| Mean age | 53.60 | 56.42 |
| SD | 1.2 | 1.6 |
| <i>P</i> value | 0.498 | 0.498 |

SD: Standard deviation

Table 2: Showing the laterality, nature of tinnitus, and duration of tinnitus (n=78)

| Observation | Male-56 | Female-22 |
|-------------------------------|---------|-----------|
| Unilateral | 26 | 08 |
| Bilateral | 30 | 14 |
| Duration of tinnitus (years) | | |
| <1 | 18 | 06 |
| 1-3 | 21 | 17 |
| >3 | 15 | 09 |
| Patients with hearing loss | 22 | 10 |
| Patients without hearing loss | 34 | 12 |
| Pure tone (%) | 36.40 | 38.24 |
| Narrow band (%) | 32.80 | 36.35 |
| Uncertain (%) | 30.80 | 25.41 |

is based on subjective match between tinnitus and external sounds. Electrophysiological evidences were tried to explain the pathophysiology of tinnitus as many workers thought tinnitus due to impaired brain process [9]. In the present study, BERA was used to evaluate the auditory pathway at the brainstem level. In general, there was no significant difference between normal hearing tinnitus patients and normal hearing individuals. This result was similar to the study of Kamal *et al.*¹⁰ and Barnea *et al.*¹¹ and McKee and Stephans.¹² However, BERA absolute and IPLs were prolonged in some tinnitus patients, and this agreed with Kehrle *et al.*¹ and Rosenhall and Axelsson¹³ who reported the presence of BERA values abnormality in patients complaining of tinnitus. They showed two types of abnormalities; (1) prolongation of Wave I accompanied by a prolongation of Waves III and V. These findings were consistent with a lesion in the peripheral auditory system, (2) lengthening of the IPLs reflecting the increased neural conduction time in the brainstem. These two patterns occurred most often in tinnitus patients with normal hearing or slight hearing loss.¹⁴ In the present study, different patterns of BERA values were found in normal hearing tinnitus patients suggesting central auditory pathway affection. The first type was the abnormal prolongation of Wave V absolute latency which occurred in 46.65% of cases suggesting lower brainstem affection. The second type was the increased ILD-V which was found in 53.35% of patients. This is consistent with Kehrle *et al.*¹ who reported prolonged ILD-V in three of their tinnitus patients. Another type of abnormal value was

Table 3: Showing the mean and SD values of Absolute and IPLs of I, III, and V Waves and ILD-V (n=112)

| Observation | Control Group-34 | Group B (normal hearing)-32 | Group B (with hearing loss)-46 | P |
|-------------|------------------|-----------------------------|--------------------------------|-------|
| Wave I | 1.76±0.04 | 1.7±0.14 | 1.9±0.12 | 0.179 |
| Wave II | 3.3±0.06 | 3.6±0.18 | 3.7±0.17 | 0.237 |
| Wave III | 5.40±0.13 | 5.8±0.12 | 5.60±0.18 | 0.312 |
| IPL-I-III | 2.09±0.11 | 2.2±0.16 | 2.0±0.13 | 0.456 |
| IPL-III-V | 2.0±0.19 | 2.3±0.11 | 2.4±0.10 | 0.490 |
| IPL-I-V | 4.30±0.16 | 4.90±0.21 | 4.50±0.11 | 0.471 |
| ILD-V | 0.12±0.003 | 0.21±0.004 | 0.22±0.14 | 0.043 |

IPLs: Inter peak latencies, SD: Standard deviation, ILD-V: Interaural latency difference of Wave V

of BERA was prolonged Wave III in 34.42% and Wave I in 27.30%. The patterns of IPLs abnormalities included prolonged I-V in 28.80%, III-V in 10.60% and finally 09.48% patients. This could be due to permanent changes in auditory system by electrical activity (tinnitus) which might have changed the central transmission of electrical impulses which in turn might be modifying external stimuli transmission. This might give us an idea about the disturbances caused by tinnitus. BERA abnormalities could be also due to abnormal brainstem activity either at the level of the inferior colliculus (IC), cochlear nuclei, or medial superior olivary complex. For example, IC activity could be normal but it receives abnormal input activity from lower centers (e.g., dorsal cochlear nucleus, medial superior olivary complex) or higher centers (e.g., medial geniculate body).¹⁵ Alternatively, input to the IC may be entirely normal; however, the IC itself has an intrinsic abnormality like membrane alterations that raise the resting potential of IC neurons.¹⁶ A combination of extrinsic and intrinsic abnormalities is also possible. These entire abnormalities can result in tonotopic organization of auditory maps.¹⁷ Tinnitus is caused by abnormal spontaneous hyperactivity in the auditory pathways²³ and that the absence of abnormal BERA parameters in tinnitus patients might be due to the masking effect of the stimulus that masks the abnormal activity in the central pathways.¹⁸⁻²⁰ Shulman and Goldstein²¹ hypothesized the tinnitus dys-synchrony-synchrony theory which considers tinnitus to be an abnormal, conscious, auditory percept occurring as a result of an initial dys-synchrony in pre- or post-synaptic neuronal transmission within the peripheral or central nervous system (cortical or subcortical). This dys-synchronized activity interferes with brain homeostasis and acts as an aberrant auditory stimulus expressed through the auditory system as tinnitus.

CONCLUSIONS

BERA values in normal hearing tinnitus patients are different from patients with tinnitus and hearing loss. Few have normal response while others have prolonged absolute latencies, prolonged IPLs or increased ILD-V

suggesting impaired neural firing synchronization and transmission in the auditory pathways in tinnitus patients. At the same time, the pathology causing tinnitus may not be identical in all patients with possible brainstem involvement in some cases.

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Versatility and Modifications of the Cross-finger Flap in Hand Reconstruction

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Abstract

One of the most common soft-tissue defects encountered in hand surgery is the soft-tissue defect on the volar aspect of the finger. There are many reconstructive options for such a defect. Starting from full-thickness grafts, which may not be very reliable in providing a stable skin cover, to microvascular flaps such as arterialized venous flap, superficial palmar branch of the radial artery flap, posterior interosseous perforator flap, and ulnar artery perforator free flap, groin flap, venous flap, and toe pulp transfers exist. Need for expertise, inherent technical problems, and unpredictability of survival of these flaps have restricted the use of these microvascular flaps in reconstruction of such defects on the fingers. In such situations, the cross-finger flap still remains as the workhorse flap. The cross-finger flap is an established method of reconstruction of defects on the volar aspect of the fingers. The reason it became popular was because of the technical ease and safety in the harvest and reliability of the flap. However, defects on the finger were not confined only to the volar aspect. Dorsal defects, defects on the stump of the fingers, and defects on the radial and ulnar borders of the fingers were encountered frequently in hand surgery. Furthermore, the adjoining finger was always not available for the harvest of the cross-finger flap. In an effort to make the flap suitable for cover of many different sites of defects on the fingers, many modifications have been made. The modifications included changes in the donor finger, changes in the technique, and changes in the design. This review paper analyzes the different uses of the flap and the modifications made in the technique.

Key words: Cross-finger flap, Distally based cross-finger flap, Jumping cross-finger flap, Multiple cross-finger flaps, Proximally based cross-finger flap, Reverse dermis cross-finger flap

INTRODUCTION

The cross-finger flap^{1,2} was first described by Gurdinin 1950 and Pangman in 1951. They originally described it for soft-tissue cover for defects on the volar aspects of single fingers either at the middle phalangeal level or the terminal phalangeal levels. A very robust and safe flap, the cross-finger flap,³ however, cannot be used in certain situations the way it was originally described. Hence, modifications in the flap were necessary⁴ to cover different types of defects on the fingers. These modifications have been classified according to the alterations in

design, alterations in technique, and alterations in the donor's finger. We present our experience and make an algorithm for the different modifications and their indications.

MATERIALS AND METHODS

At the Institute for Research and Rehabilitation of Hand, and Department of Plastic Surgery at Government Stanley Hospital, Chennai, from May 2011 to April 2012, all the patients who had a cross-finger flap were included in the study. A total number of 153 patients had a cross-finger flap done. Of these, 94 patients underwent a classical cross-finger flap, and 59 were modifications of the classically done cross-finger flap.

The 59 patients who had modifications of the cross-finger flap were analyzed, according to the type of flap done and the modification involved.

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RESULTS

There were a total of 47 males and 12 females. Age group analysis (Figure 1) showed that most of the patients were in the age group of 20-40 years, which is the productive age group and typically the group of patients getting injured in industrial injuries. The youngest patient was 2 years of age, a child who had injuries on the thumb when she touched a domestic motor machine in her house. The oldest in the group was a 75-year-old male who had an injury in a kitchen mixie machine.

The cause of the injury was analyzed (Figure 2) in these 59 patients. The most common cause was occupational injury (occurring in 35.5%), but there was almost an equal number of patients with injuries on the finger following road traffic accidents (30.5%). Household injuries formed the third largest group with 13.6%. Other causes included electrical injuries, defects following removal of benign lesions, and defects following release of skin contractures.

Analysis of the size of the modified cross-finger flaps (Figure 3) done in the 59 patients, it was found that the size ranged from 1.8 cm to 6 cm. The maximum number of patients had flaps ranging from 2 to 4 cm size.

The most common site of soft-tissue defect requiring a modified cross-finger flap was analyzed (Figure 4). The most common site was the dorsum of the finger (56.9%). There were some volar defects too (21.6%), requiring some modification of the cross-finger flap. The other sites of the defects were on the ulnar side of the fingers, radial side of the fingers and stumps.

Table 1 showing the various modifications of the cross-finger flap in the study.

Table 1: Types of modified cross-finger flaps done

| Name | Number |
|--|--------|
| Modifications in design | |
| Proximally based cross-finger flap | 12 |
| Distally based cross-finger flap | 4 |
| Cross reverse dorsal digital artery flap | 3 |
| Cross-finger adipofascial flap | 3 |
| Modifications in technique | |
| Folded cross-finger flap | 10 |
| Innervated cross-finger flap | 4 |
| Reverse dermis cross-finger flap | 6 |
| Modifications in the donor finger | |
| Multiple cross-finger flap | 6 |
| Filletted cross-finger flap | 3 |
| Hugging cross-finger flap | 5 |
| Jumping cross-finger flap | 3 |

The total healing time for the flaps was analyzed and it was found to be 5-8 weeks. There were no major complications such as total flap loss. There were minor complications in 3 patients (5%), who had a marginal necrosis, and all these flaps were managed with dressings, and they went on to heal well. There were minor complications of partial graft loss on the donor site in 4 patients (6.7%), and these were also managed with dressings alone.

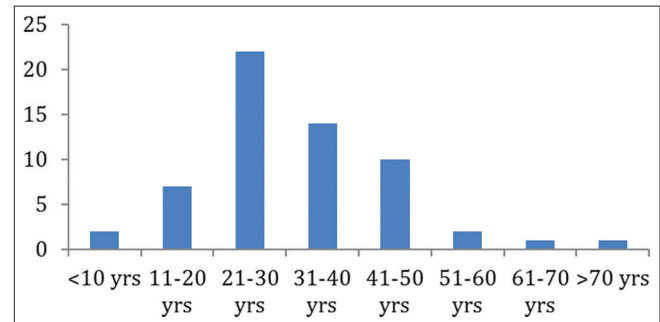


Figure 1: Age group analysis of patients who underwent modified cross-finger flaps

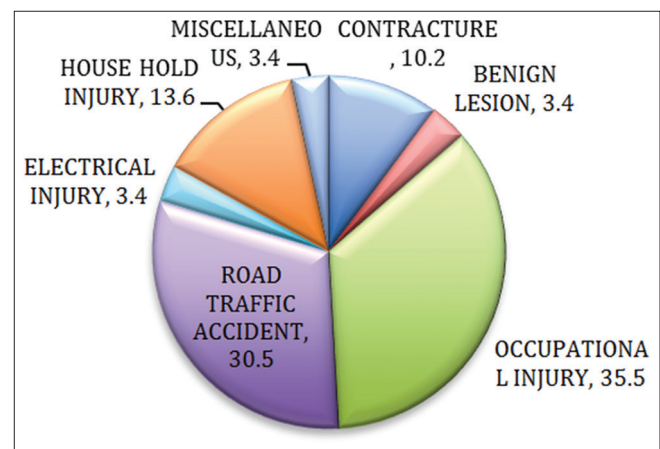


Figure 2: Analysis of cause of soft-tissue defect

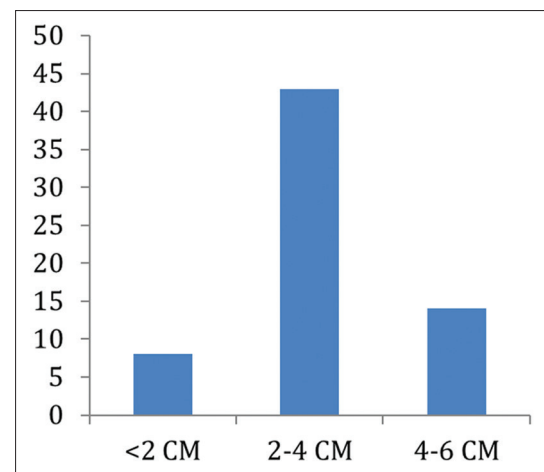


Figure 3: Analysis of size of modified cross-finger flaps

The sensation on the flap was analyzed after 6 months. The 2 PD was found to be 6-10 mm in the 30 patients who were available for follow-up.

DISCUSSION

The Classical Cross-finger Flap

The cross-finger flap was first described by Gurdin and Pangman. Classically, defects on the volar aspect of the finger, in the position of the middle phalanx or the distal phalanx are covered with the cross-finger flap harvested from the dorsal aspect of the adjoining finger. Although the adjoining fingers can be used as donor fingers for the cross-finger flap, when there is a defect on the middle finger, the flap can be harvested from the ring finger or the index finger. We customarily avoid harvesting a flap from the index finger, as it is prudent to avoid any scarring on the index finger.

The flap is usually designed as a rectangular flap, which is raised on 3 sides and is classically planned on the dorsal aspect of the middle phalangeal region. The base of the flap is designed on the neutral line of the donor finger, and is usually on the side adjacent to the finger that is injured. This base acts such as a hinge, which provides the vascularity of the flap. The flap is raised superficial to the extensor paratenon, taking care to preserve this delicate, filmy tissue over the extensor tendon, to ensure a good take of skin graft applied over the donor site.

1. Indications of the classical cross-finger flap:

- Defect on the fingers on the volar aspect over the middle phalangeal and distal phalangeal regions, arising after trauma, burns or after the release of contractures (Figure 5), and excision of tumors.

2. Advantages of the classical cross-finger flap

- Easy to perform.
- Reliable flap with large margin of safety. Can be harvested even from injured fingers, where the dorsal skin appears intact (Figure 6).
- Negligible donor-site morbidity.
- Can be performed under regional block anesthesia.
- Can be used even for coverage of thumb defects.
- Can be performed in children safely and reliably (Figure 7).
- The contour reconstruction when given for tip and pulp defects is satisfactory. (Figure 8a and b).
- Can be combined with other flaps when there are other injuries to the adjoining fingers (Figure 9).

3. Disadvantages

- It is a two-staged procedure.
- Skin color match may not be perfect.
- May not be suitable for a variety of defects such as defects on the dorsum of the fingers, radial or ulnar borders, stumps of fingers, or proximal defects on fingers.

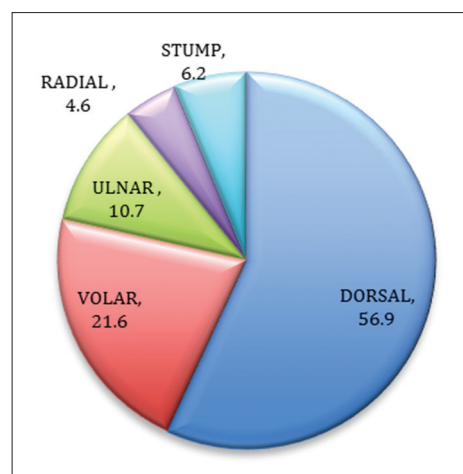


Figure 4: Analysis of site of modified cross-finger flaps



Figure 5: Classical cross-finger flap for coverage of defect after contracture release

Modifications of the Cross-finger Flap Done

Modifications of design

Proximally based cross-finger flap (Figure 10)

In total, 12 patients had a proximally based cross-finger flap done. The proximally based flap⁵ design was used for defects on the dorsal aspects of the fingers. Of these defects, 4 defects were on the radial aspect of the middle finger, for which a proximally based flap from the dorsum of index finger was used. 3 defects were on the ulnar aspect of the middle finger for which flaps were taken from the dorsal aspect of the ring finger. 4 on the index finger ulnar aspect, for which proximally based cross-finger flaps were taken from the middle finger dorsum, and there was 1 defect on the radial aspect of the little finger, for the coverage of which, a proximally based flap was harvested from the ring finger. All the flaps survived fully, and the donor sites healed well with complete recovery of range of motion of the donor finger.



Figure 6: Cross-finger flap raised from PPX region of an injured finger



Figure 7: Use of cross-finger flap for a child

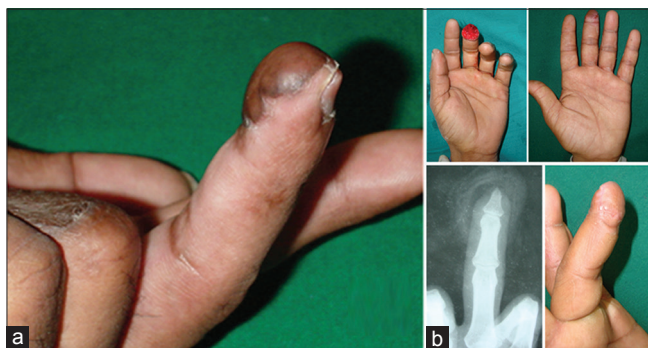


Figure 8: Contour cosmesis after reconstruction of pulp (a) and tip defects (b) with cross-finger flaps

The flap was designed with the base extending from the neutral line to the neutral line (Figure 11). The length of the flap was made such that it would transpose comfortably to the recipient defect on the adjoining finger.

After dressings are done, a volar POP is to be applied to the hand.



Figure 9: Cross-finger flap to the index finger, and step ladder abdominal flaps to ring and little fingers



Figure 10: Proximally based cross-finger flap

1. Indications

- The indication for this flap was a defect on the dorsal/dorsolateral aspects of the middle or ring fingers or the ulnar or radial aspects of the index and little fingers, respectively. The defect was classically at the level of the proximal interphalangeal joint or proximal to it, as the distal

most edge of the proximally based cross-finger flap was the distal interphalangeal joint crease on the dorsal aspect.

2. Advantages
 - This modification of the classical cross-finger flap covers defects on the proximal aspect of the fingers.
3. Disadvantages
 - A longer flap will have to be raised to allow it to transpose comfortably to cover the defect.
 - The bridging segment is longer than in the classical cross-finger flap.

Distally based cross-finger flap (Figure 12)

Four patients had a reconstruction of defects on the dorsum of the fingers with distally based cross-finger flaps.⁶ All the defects were on the middle fingers. This flap was ideal for patients who had distal soft-tissue defects mainly on the dorsolateral aspect of the finger, requiring a good quality skin cover, which would allow the future reconstruction or surgery. For such similar defects, reverse dermis cross-finger flap or cross-finger adipofascial flap may be indicated, but these flaps need a skin graft over them, and hence the quality of skin cover is reduced.

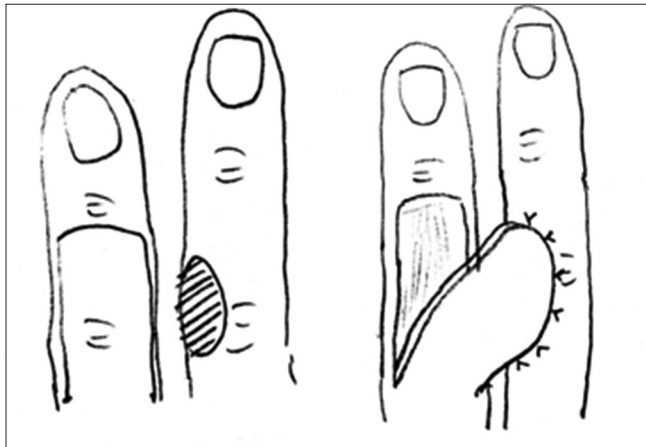


Figure 11: Design of the proximally based cross-finger flap



Figure 12: Distally based cross-finger flap from index finger to middle finger

The distally based cross-finger flap is raised with the base oriented distally (Figure 13). The flap must be long enough to allow transposition to the defect; hence, dorsolateral defects are safely covered with such flaps. The donor site is skin grafted and after dressings are done, a volar POP slab is applied.

Indication

1. Soft-tissue defects on the dorsolateral aspect of the finger requiring good quality skin cover.
2. Advantage
 - Provides good quality skin cover.
3. Disadvantages
 - Can be used only for dorsolateral aspect of the fingers.

Can be used only for distal defects, distal to the proximal interphalangeal joint level.

Cross-finger reverse dorsal digital artery flap (Figure 14)

The cross-finger reverse dorsal digital artery flap was done in 3 patients. This flap is very similar to the distally based cross-finger flap except for a small modification in the design. The base of the distally based cross-finger flap must extend from one mid-axial line to the other, and as a result, the flap must be longer to allow transposition to cover the defect on the adjacent finger. However, this carries a little risk of compromised vascularity of

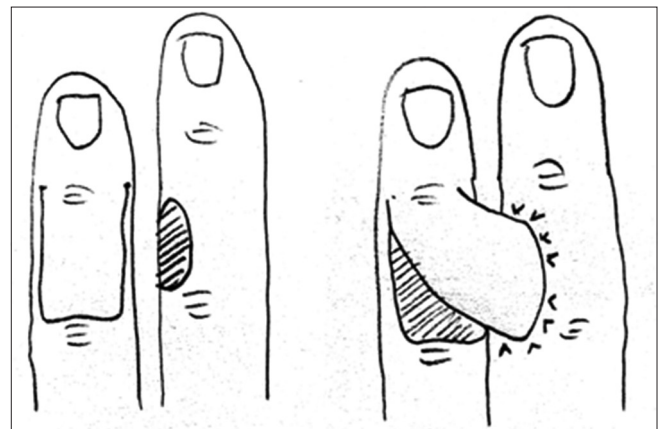


Figure 13: Design of the distally based cross-finger flap



Figure 14: Cross-finger reverse dorsal digital artery flap

the flap and also limited arc of rotation. There is a system of arterial communications⁷ between the volar aspect and dorsal aspect of the finger, which occurs at designated levels, such as the neck and base of the middle and proximal phalanges (Figure 15). While the distally based cross finger is being planned, the communication mentioned above can be marked, and the flap can be almost islanded (Figure 16). The incision would be on almost all 4 sides, with a skin bridge protecting the vascular pedicle. It is not essential to skeletonize the vessel. This technique will improve the arc of rotation of the flap, and at the same time, will not compromise the vascularity.

1. Indication

- For the coverage of soft-tissue defects with good quality skin cover on the dorsum of the fingers distal to the proximal interphalangeal joint.

2. Advantages

- A better play of the flap movements and ability to cover more distal defects. Lesser length will be required of the flap from the donor finger.

3. Disadvantage

- Needs more meticulous dissection at the site of vascular pedicle.

Cross-finger adipofascial flap (Figure 17)

Three patients underwent a cross-finger adipofascial flap cover. 2 of the defects were on the dorsal aspect of

the proximal phalangeal region of the index finger, and 1 patient had a defect on the dorsal aspect of the middle phalangeal region of the middle finger. When the defect is on the dorsum of the finger, a reverse dermis cross-finger flap can be done, but the disadvantages that a larger skin graft will be required to cover both the donor defect and the undersurface of the flap, and the possibility of inclusion cysts occurring following de-epithelialization.

The flap is marked just like a classical cross-finger flap, with the base of the flap on the contiguous side with the injured finger and close to the defect. Another marking is made of a similar size with the base on the opposite side neutral line. This marking denotes the dermal flap that is to be raised, at a plane just deep to the dermis, preserving the subdermal plexus. Once the dermal flap is raised and opened like a book, opposite to the site of the defect, the soft tissues covering the extensor paratenon are raised as an adipofascial flap in the same way that a classical cross-finger flap is raised. This adipofascial tissue is then used to cover the defect on the injured finger (Figures 18-20). The dermal flap is repositioned to cover the donor site of the flap, and a skin graft is needed to cover only the soft tissues of the adipofascial flap on the recipient finger. After application of dressings, the POP slab must be applied on the volar aspect of the hand.

The second stage of division is done as for the classical cross-finger flap.

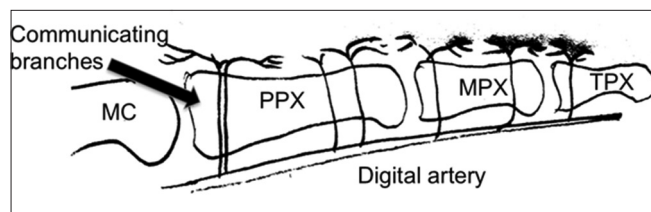


Figure 15: Schematic diagram showing the arterial communications to the dorsum of the finger

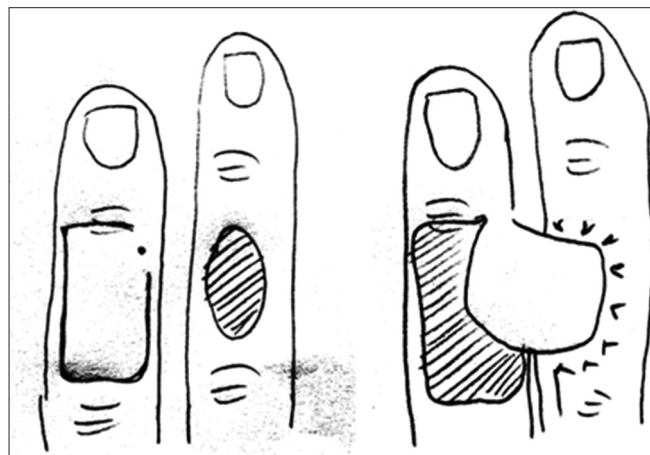


Figure 16: Design of the cross finger reverse dorsal digital artery flap



Figure 17: Cross-finger adipofascial flap

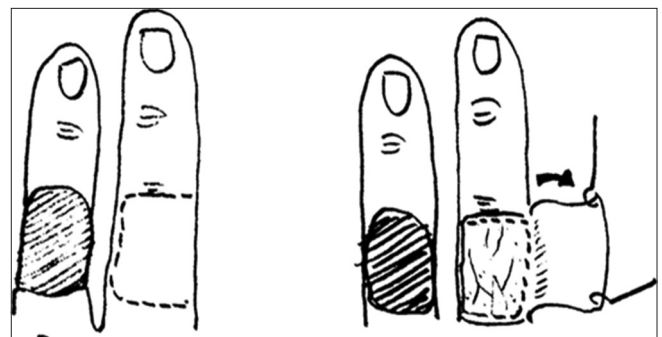


Figure 18: Marking of the dermal flap on the donor finger and raised dermal flap

1. Indication
 - Soft-tissue defects on the dorsal aspect of the fingers.
2. Advantages
 - Skin graft is required only to cover the adipofascial tissue over the defect.
 - Cosmesis is better as there is no skin graft over the donor finger as in a reverse dermis cross-finger flap, which can be used for such defects.
 - No possibility of inclusion cysts.
3. Disadvantages
 - The adipofascial tissue is a delicate layer which barely covers the defect.
 - Requires careful elevation of the dermal flap over the donor finger.
 - Possibility of partial necrosis of the dermal flap.
 - Graft take is not optimum over the adipofascial flap.

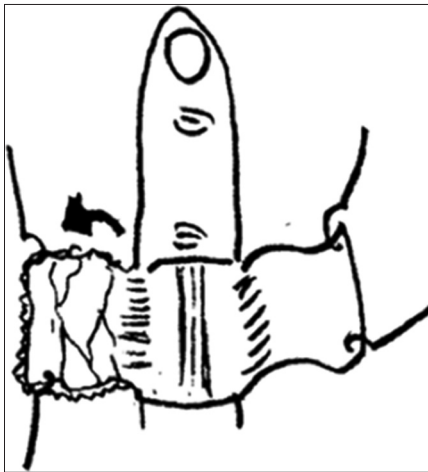


Figure 19: Adipofascial flap raised and used to cover the defect



Figure 20: Adipofascial flap after inset ready for skin graft and the dermal flap repositioned and sutured on donor finger

Modifications of technique

Folded cross-finger flap (Figure 21)

Ten patients had injuries on the tips of the fingers, involving both the dorsal aspect and the volar aspect. 6 patients had injuries on the index finger, 2 had injuries on the ring finger, and 1 each had injuries on the little finger and thumb. The patient with the thumb injury refused a Littler's neurovascular island flap, and hence a folded cross-finger flap with innervation was planned. When the classical flap is expected to fold over the stump, a small modification is done in the design. A back cut is made in the flap to allow the distal end of the flap to fold over to cover the stump and the dorsal aspect (Figures 22-24). Since this entails a back cut, it is important to remember that this may cut into the blood supply of the flap. Hence, it must be done carefully.

1. Indication

- This modification of the flap is useful when covering the tips of the finger or end stumps of the fingers.



Figure 21: Folded cross-finger flap for coverage of tip and pulp of thumb

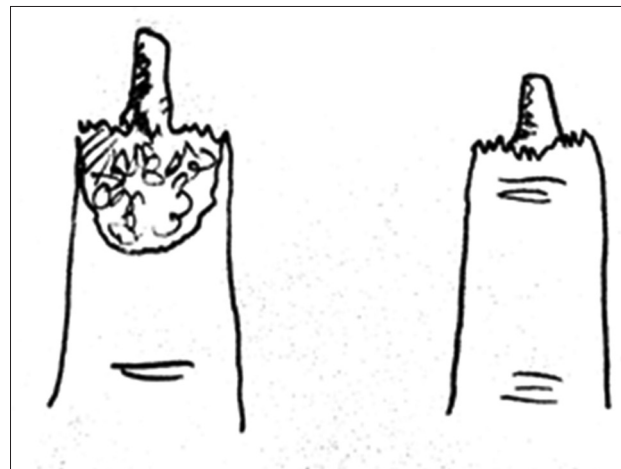


Figure 22: Typical defect for a folded cross-finger flap

2. Advantage
 - Covers both the volar and dorsal aspects with a single flap.
3. Disadvantage
 - The back cut can compromise the vascularity of the flap and result in partial necrosis of the dorsal aspect of the flap.

Innervated cross-finger flap (Figure 25)

Four patients had an innervated cross-finger flap for reconstruction of soft-tissue defects on the tip of the finger. Three of the patients had injuries on the index finger and one patient had an injury on the ring finger.

These flaps were done to ensure a good return of sensation to the tip of the finger.⁸⁻¹⁰ When the debridement of the wound was done, the cut digital nerve stump was identified and tagged. While the flap was being raised, the sensory

twigs on the dorsal aspect of the finger were identified and tagged (Figure 26). At the time of flap inset, the tagged digital nerve at the edge of the defect was coapted to the tagged sensory nerve twig on the flap with 10.0 polyamide suture. The second stage of the division was carried out as usual.

The sensation achieved in these 4 patients was analysed after 6 months and showed a 2PD of 6-7.5 mm.

1. Indications
 - For coverage of soft-tissue defects on the terminal phalangeal region of the fingers, to achieve improved sensation.
2. Advantage
 - Improved sensation can be achieved on the tips of the fingers.
3. Disadvantage
 - Needs more expertise in microneural coaptation.



Figure 23: Flap raised, back cut given, and flap folded over

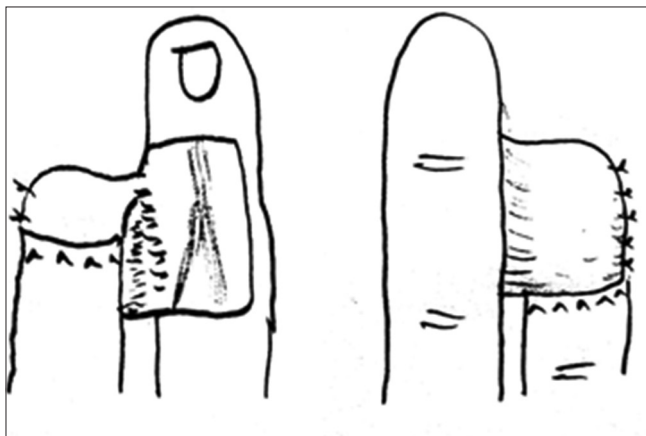


Figure 24: After final flap inset of the folded cross-finger flap



Figure 25: Innervated cross-finger flap

Reverse dermis cross-finger flap (Figure 27)

In our series, there were 6 patients who had a reverse dermis cross-finger flap¹¹⁻¹⁴ done. The defects were on the dorsal aspect of single fingers. 3 patients had a defect on the terminal phalangeal region of the index fingers with loss of nail complex, 2 patients had similar defects on the ring fingers and on the middle finger.

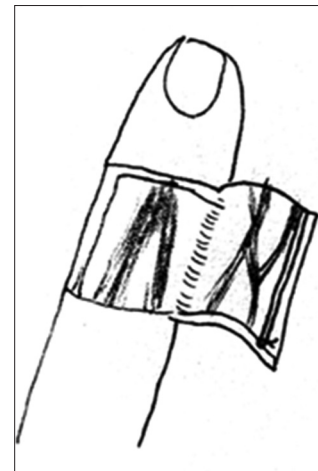


Figure 26: Tagged proximal end of the sensory nerve twig on the flap

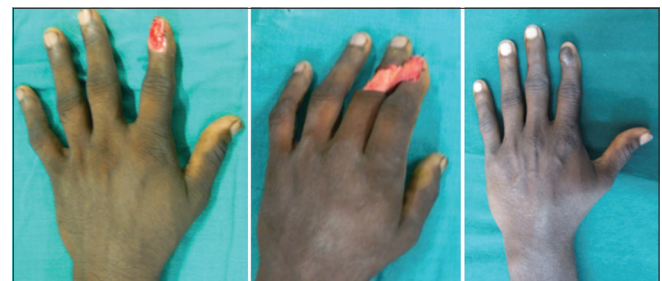


Figure 27: Reverse dermis cross-finger flap

The technique of this flap was to de-epithelialize the skin on the proposed area of the cross-finger flap which is planned on the dorsal aspect of the middle phalangeal region of the contiguous finger. After de-epithelialization, the flap is raised similar to the classical cross-finger flap, superficial to the extensor paratenon. The flap is then hinged like a book and the dermis side is laid over the soft-tissue defect on the dorsal aspect of the injured finger (Figures 28 and 29). The entire area consisting of the donor site defect, and the flap over the defect site are then covered with a split thickness skin graft. After dressings are done, the POP application must be on the volar side, to allow for quick monitoring and dressings of the flap.

The second stage of division is done just as the classical cross-finger flap.

1. Indication

- For coverage of soft-tissue defects on the dorsal aspect of the terminal phalangeal region of a single finger.

2. Advantages

- Simple procedure which is reliable, and can be done under regional block anesthesia.
- This flap contains tissue which is more robust than the adipofascial flap, as it contains the dermis.

3. Disadvantage

- There is a possibility of developing inclusion cysts from the de-epithelialized area under the flap.

Modifications in donor finger

Multiple cross-finger flaps (Figure 30)

Six patients had multiple defects on fingers, and each of the defects, required a cross-finger flap. 5 patients had defects on 2 fingers and 1 patient had defects on three contiguous fingers. When there are multiple defects on the fingers, there may be a modification necessary in the form of multiple cross-finger flaps. These flaps can be done only if the defects are only in the terminal phalangeal region, involving the pulp tissue. Defects proximal to this will preclude the use of multiple flaps, as the finger with a defect will always have to be donor site of a flap. Since the flap is harvested from the dorsum of the middle phalangeal region, if the defect involves the volar aspect of the middle phalangeal region, there is a problem of making the wound circumferential, which must be avoided.

The flaps can be raised one after the other after the debridement of the wounds is over. Similarly, flap inset can be given, and then the donor sites covered with skin grafts.

These multiple flaps may involve increasing flexion of the interphalangeal joints in contiguous fingers. These flaps may not be possible in patients who have short, stubby fingers, as they may not be pliable enough to accommodate

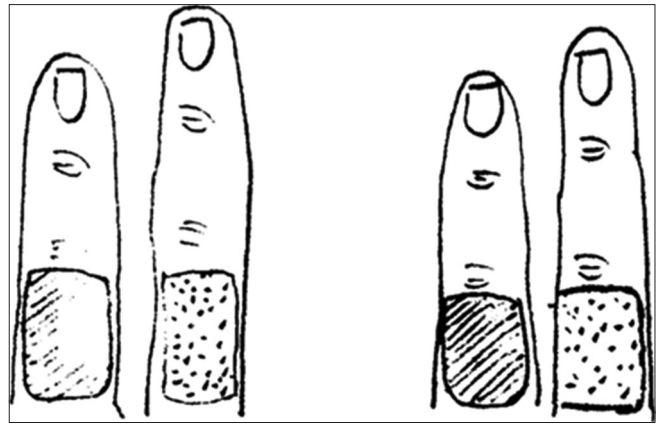


Figure 28: Deepithelialized portion on the dorsum of the donor finger and marking for raising the flap

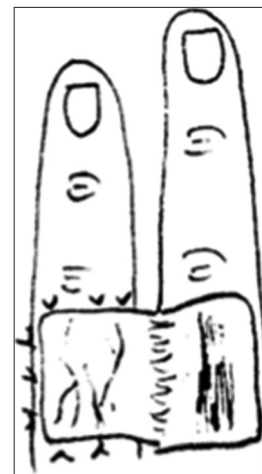


Figure 29: Reverse dermis flap raised and inset given, and ready for the skin graft to both recipient and donor areas



Figure 30: Double cross-finger flaps to ring and little fingers

the increasing interphalangeal joint flexion, when multiple flaps are harvested. Similarly, these flaps may not be ideal for elderly people with stiffness of the joints of the hand. Hence, these multiple flaps are preferably done in younger patients, and vigorous physiotherapy instituted once the flaps are divided.

1. Indication

- Multiple soft-tissue defects on 2 or three fingers involving only the pulp tissue of the

terminal phalangeal region, preferably in younger individuals with long fingers with pliable joints.

2. Advantage
 - Multiple finger defects can be treated simultaneously with the safe and reliable cross-finger flap.
3. Disadvantage
 - Involves more pliability of the finger joints, hence may not be advisable in some groups of patients.

Filletted cross-finger flap

When there are injuries to multiple fingers, as occurs in industrial accidents, a classical cross-finger flap may not be possible. If there is a defect on a finger, requiring a cross-finger flap, and when the adjoining finger has been partially amputated, with loss of the distal segment and revascularization is not possible, the injured finger can be filleted, and the filleted skin flap can be used to resurface the defect on the recipient finger (Figure 31). In 3 patients, this filleted cross-finger flap was done in our series. 2 patients had a filleted flap from an amputated ring finger to little finger, and one patient had a filleted flap from an amputated middle finger to a soft-tissue defect on the index finger.

1. Indication
 - When there are multiple injuries to fingers and there is a partially amputated finger adjoining a finger with a soft-tissue defect requiring a flap cover. This can be done only if there is no option of revascularizing the partially amputated finger, or the patient does not want reconstruction of the amputated finger.
2. Advantage
 - This modification of the cross-finger flap makes use of tissue that may have to be discarded.
3. Disadvantage
 - The partially amputated finger may by itself have a precarious vascularity and using the filleted flap from this finger to cover a defect on the adjoining finger may not be reliable. This procedure precludes reconstruction of the partially amputated finger.

Hugging cross-finger flap

In this modification of the cross-finger flap, the recipient finger placed over secondary defect (Figure 32).

In the classical cross-finger flap, the donor finger and the recipient finger lie side by side, with no overlap. However, when the defect on the finger is more on the radial side or ulnar side of the finger, the recipient finger will have to adduct toward the donor finger, so that the flap can get a comfortable inset. In this situation, the recipient finger will lie over the secondary defect on the donor finger. This flap can only be done for defects on the radial or ulnar side of the terminal phalangeal region of the finger.



Figure 31: Filleted cross-finger flap from amputated ring finger to the little finger



Figure 32: Example of the hugging cross-finger flap

Five such flaps were done in our series. 4 of them involved a defect on the ulnar side of the ring finger and one for a radial side defect on an index finger. Since the recipient finger lies over the donor finger, the bridging segment is lesser than the classical cross-finger flap.

1. Indication
 - Defects on the terminal phalangeal region of the finger involving the radial or ulnar border alone.
2. Advantage
 - It gives a comfortable inset to three sides of the defect.
3. Disadvantage
 - There is some overlapping of the recipient finger over the donor finger, which may cause soddening of the volar aspect of the recipient finger, some graft loss on the donor site and stiffness at the metacarpophalangeal joint of the recipient finger because of the deviation.

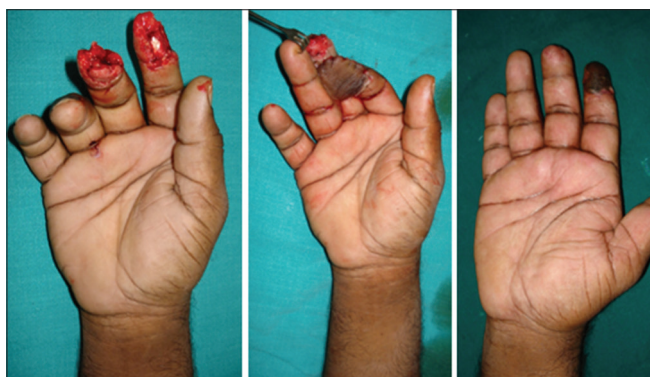
Jumping cross-finger flap

In this modification of the classical cross-finger flap, the injured adjacent finger skipped (jumped over) (Figure 33).

This flap was performed when there was an injury to the dorsal aspect of the adjoining finger and a classical

Table 2: Algorithm for use of the cross-finger flap and its modifications

| Name | Indication - location of soft-tissue defect on the finger/s |
|--|---|
| Classical cross-finger flap | Defects on the volar aspect over the middle phalangeal and/or distal phalangeal regions not extending dorsal to the midaxial lines |
| Modifications in design | |
| Proximally based cross-finger flap | Defects on the proximal aspect of the dorsum of the fingers |
| Distally based cross-finger flap | Soft-tissue defects on the dorsolateral aspect of the finger requiring good quality skin cover |
| Cross reverse dorsal digital artery flap | For the coverage of soft-tissue defects with good quality skin cover on the dorsum of the fingers distal to the proximal interphalangeal joint |
| Cross-finger adipofascial flap | For coverage of soft-tissue defects on the dorsal aspect of a single finger limited by mid-axial lines |
| Modifications in technique | |
| Reverse dermis cross-finger flap | For coverage of soft-tissue defects on the dorsal aspect of a single finger limited by mid-axial lines |
| Innervated cross-finger flap | For coverage of soft tissue defects on the terminal phalangeal region of the fingers, to achieve improved sensation |
| Folded cross-finger flap | Defects involving the tips of the finger or end stumps of the fingers requiring skin cover for the volar and dorsal aspects |
| Modifications in the donor finger | |
| Multiple cross-finger flap | Multiple soft-tissue defects on 2 or three fingers involving only the pulp tissue of the terminal phalangeal region, preferably in younger individuals with long fingers with pliable joints |
| Filletted cross-finger flap | When there is a partially amputated finger adjoining a finger with a soft-tissue defect similar to the one described in (1) |
| Hugging cross-finger flap | Defects on the terminal phalangeal region of the finger involving the radial or ulnar border alone |
| Jumping cross-finger flap | Similar to that for the classical cross-finger flap (1), but the adjoining finger is so injured that it cannot serve as a donor for a flap. The third finger from the finger requiring the cross-finger flap must be intact |

**Figure 33: Cross-finger flap from the ring finger to the index finger, bypassing the injured middle finger**

cross-finger flap could not be performed. This modification of the cross-finger flap was done in 3 patients. All three patients had an injury to the index and middle fingers, and the ring finger was intact. The flap was raised from the dorsal aspect of the ring finger and inset on to the soft-tissue defect on the volar aspect of the index finger in all three patients. The middle finger was positioned dorsal to the donor and recipient fingers. The middle finger injury was to the tip, and were covered with skin graft in 2 patients and treated conservatively in one patient.

1. Indication

- This flap is indicated when the defect of soft tissues is restricted to the volar aspect of the terminal phalanx of the finger, and the adjoining finger is so injured that it cannot serve as a donor for the classical cross-finger flap. The third finger from the finger requiring the cross-finger flap must be intact.

2. Advantage

- Can be used as a simple flap reconstruction even if the adjoining finger precludes the use of cross-finger flap.

3. Disadvantage

- Will involve slight deviation at the donor and recipient finger metacarpophalangeal joints, which can be corrected after the division of the flap at 2 weeks.

The following Table 2 sums up the various modifications of the cross-finger flap and their indications.

CONCLUSION

In spite of changes in design, technique, and modifications in the donor finger, the cross-finger flap has good outcomes and less complications. The modifications are required in situations where the classical cross-finger flap may not be ideal. These modifications also allow more types of defects to be covered. Hence, it is once again proved that the cross-finger flap is a workhorse flap for finger defects, and use of the modifications increases the armamentarium of flaps for the coverage of soft-tissue defects in the fingers.

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Comprehensive Study of Acute Pancreatitis (Diagnosis, Disease Course, and Clinical Management): A Retrospective and Prospective Study

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Abstract

Background: Acute pancreatitis is an acute inflammatory process of the pancreas with variable involvement of other tissues or remote organ systems. Acute pancreatitis has widely variable clinical and systemic manifestations, spanning spectrum from mild self-limiting episode of upper abdominal pain, nausea, vomiting to severe life-threatening multi-organ failure including sepsis, renal failure, acute respiratory distress syndrome, and death.

Materials and Methods: This retrospective and prospective study was conducted on 110 patients admitted in the various wards of Dr. S.N. Medical College and Associated Group of Hospitals, Jodhpur, with the diagnosis of acute pancreatitis.

Results: Incidence of acute pancreatitis is in the age group of 31-40 years. Biliary tract stone disease and alcohol are the most common causes of acute pancreatitis. Acute pancreatitis is more common among males (male:female - 2.23:1).

Conclusion: The most common presentation of acute pancreatitis is epigastric pain followed by nausea and vomiting. Glasgow prognostic scoring system is fair enough to categorize and predict the course of illness, thus enabling proper management of the patients.

Key words: Abdominal, Acute, Pancreatitis

INTRODUCTION

Acute pancreatitis is an acute inflammatory process of the pancreas with variable involvement of other tissues or remote organ systems. Acute pancreatitis has widely variable clinical and systemic manifestations, spanning spectrum from mild self-limiting episode of upper abdominal pain, nausea, vomiting to severe life-threatening multi-organ failure including sepsis, renal failure, acute respiratory distress syndrome, and death.

Biliary tract stone disease and alcoholism account for 80-90% of cases. Rest of the cases include trauma, surgery, drugs, hereditary, infection, toxins, hyperparathyroidism, hypercalcemia, hyperlipidemia, and mechanical obstruction.

Diagnosis is based on combination of clinical presentation and elevation of blood amylase (>3 times normal) and lipase (>2 times normal). Serum bilirubin, alkaline phosphatase, and serum aspartate transaminase/alanine transaminase are elevated in biliary acute pancreatitis. Leukocytosis, raised blood urea nitrogen, fall in hematocrit, rise in C-reactive protein (CRP), and hypoxia are the systemic markers of acute pancreatitis. ultrasonography (USG) abdomen is the initial investigation for acute abdomen, and pancreatic edema, swelling, peripancreatic fluid collection, gallstones, and extra-pancreatic ductal dilatation can be detected.

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If the biochemical markers are normal, contrast-enhanced computed tomography (CECT) scan of the abdomen can confirm the clinical impression of acute pancreatitis. Sensitivity of CECT ranges from 77-92% and specificity is 100%. CECT gives an objective assessment of disease state. System of grading the CT information (Balthazar score) is based on the degree of pancreatic swelling, amount of fluid in peripancreatic tissue, and degree of non-perfusion of pancreas.

More than 80% of cases of acute pancreatitis are mild and managed by conservative treatment. Only 20% of cases are of severe necrotizing pancreatitis that needs intensive care, multiple organ supports, and surgical interventions.

Differentiation between acute interstitial pancreatitis, necrotizing pancreatitis, pancreatic abscess, and acute pseudocyst is mandatory for the choice of surgical treatment. If the morphological evaluation by dynamic pancreatography reveals pancreatic or peripancreatic necrosis, bacteriological evaluation by CT-guided needle aspiration is the mainstay of further decision-making and should be performed if general symptoms and inflammation are not responding to conservative therapy. Basically, operative treatment may be directed against underlying pathology (e.g., cholelithiasis) and may aim to manage complication. Infected necrosis is the only clear indication of surgery. Whether the choice should be debridement and gravity drainage, continuous closed lavage of the lesser sac, staged relaparotomies/laparostomies, or open packaging depends on the extent of the process and individual situations. Peripancreatic fluid collection and acute pancreatic pseudocyst without ductal pathology rarely need operative intervention in early stage whereas abscesses resulting from infected necrosis should be dealt with by surgery rather than by percutaneous drainage.

Aims and Objectives

1. To study the etiological spectrum of acute pancreatitis
2. To study the clinical profile of acute pancreatitis
3. To evaluate the role of various imaging procedures in the management of acute pancreatitis
4. To evaluate the surgical/interventional procedures in the management of acute pancreatitis.

MATERIALS AND METHODS

This retrospective and prospective study was conducted on 110 patients admitted in the various wards of Dr. S.N. Medical College and Associated Group of Hospitals, Jodhpur, with the diagnosis of acute pancreatitis. The retrospective data (of 55 patients) were collected from the information available in bed head tickets of discharged/expired patients who were admitted with the diagnosis

of acute pancreatitis. For the prospective data, diagnosis of acute pancreatitis was based on the clinical findings and biochemical markers. Patients underwent various imaging modalities such as ultrasonography and CECT scan of the abdomen when the biochemical markers were in normal range. In all the patients, serum amylase levels were measured. Patients were thoroughly investigated, which included complete blood count, blood sugar, blood urea, serum creatinine, X-ray chest posteroanterior view, plain X-ray abdomen, electrocardiogram, and special investigations such as serum lipase, liver function tests, serum calcium, serum lactate dehydrogenase, serum protein, lipid profile, serum alkaline phosphatase, serum electrolytes, and serum CRP levels. Patients were then categorized into mild and severe acute pancreatitis according to the Glasgow scoring system. As per indications, a selected group of patients underwent CECT abdomen to stage the severity of acute pancreatitis, detect pancreatic parenchymal necrosis, and diagnose local complications. On the basis of these CT findings, Balthazar score and CT severity index (CTSI) were calculated. Various endoscopic interventions such as endoscopic retrograde cholangiopancreatography (ERCP) were done in some of the cases for the therapeutic purpose and to undergo endoscopic sphincterotomy/stenting. As per 85-90% of cases had mild disease, patients were managed conservatively with restriction of oral food and fluids with continuous nasogastric suction and replacement of fluid and electrolytes, injectable proton pump inhibitors/H₂ blockers, and antibiotics. Some of the patients with severe necrotizing pancreatitis were shifted to intensive care units and managed with antibiotics and organ support as and when required. In select group, gastroenterology opinion was sought for and whenever needed interventional procedures were done.

OBSERVATION AND RESULTS

This retrospective and prospective study was conducted in 110 patients (55 patients were studied prospectively and 55 patients retrospectively) admitted in the various wards of Dr. S.N. Medical College and Associated Group of Hospitals with the diagnosis of acute pancreatitis.

Age and Sex Distribution

Out of 110 patients, 74 were male and 36 were female (male:female ratio - 2.23:1). The mean age at admission was 44.16 years (range 15-80 years). Maximum of the cases were in the age group between 31 and 40 years, i.e., 27.27% of total number of cases, followed by 18.18% in the age group 51-60 years (Table 1).

Clinical Presentation

The most common clinical presentation was epigastric pain (98.18%) with radiation to back in 41.82% pain, followed by

nausea (75.45%), vomiting (61.82%), abdominal distention (23.64%), fever (20%), and clinical jaundice (3.64%) (Table 2).

The most common etiology of acute pancreatitis was alcohol (46.05%) among males and biliary (61.7%) among females. The etiology was idiopathic in 23.68% of males and 26.36% of females (Table 3).

Out of 110 patients, 90 (81.8%) cases had Glasgow score <2 were predicted to have mild disease and 20 (18.2%) cases with Glasgow score >2 were predicted to have severe disease (Table 4).

Serum Amylase in Acute Pancreatitis

Serum amylase was raised >3 times the normal upper limit (normal value 0-90 IU/L) in 73.5% of cases with mild disease and in 75% of cases with severe disease (Table 5).

Serum lipase was done only in 22 cases and was found raised in 20 cases (90.9%).

Complications Grouped According to Glasgow Score

Out of 90 cases predicted to have mild disease, 21.1% developed local complications and none develop systemic complications. Out of 20 cases predicted to have severe disease, 85% develop local complications. The overall complications in 110 patients were 32.7% (Table 6).

Ultrasonography Findings of Hepatobiliary System

Liver was normal in 53.64% of cases, hepatomegaly was present in 25.45% of cases, fatty changes were present in 14.55% of cases, altered echotexture was present in 4.55% of cases, and cirrhosis was present in 1.83% of cases. Cholelithiasis was present in 30% of cases, sludge in gallbladder (GB) in 3.64% of cases, and echogenic bile in 0.9% of cases. In 3 (2.73%) cases, GB was absent. Choledocholithiasis was detected in 2.73% of cases and common bile duct (CBD) was dilated in 4.55% of cases (Table 7).

Ultrasound Findings of Pancreas

Gasses obscured the USG findings of pancreas in 7% of cases. Pancreas was enlarged in 90% of cases and echotexture was altered in 83% of cases. Peripancreatic collections in 37.2% cases are shown in Table 8.

X-ray Findings in Acute Pancreatitis

Pleural effusion was present in 10.9% of cases and sentinel loop sign in 12.7% of cases, multiple air-fluid levels in 2.73% of cases, gasless abdomen in 0.9% of cases, and cutoff sign in 0.9% of cases.

CT Scan of Pancreas in Acute Pancreatitis

CT scan was done in 36 cases (25 mild and 11 severe). Most of CT scans for acute pancreatitis were done in an

Table 1: Age and sex distribution in acute pancreatitis

| Age | Male (%) | Female (%) | Total (%) |
|-------|------------|------------|------------|
| <20 | 6 (7.89) | 2 (5.88) | 8 (7.27) |
| 21-30 | 13 (17.11) | 4 (11.76) | 17 (15.45) |
| 31-40 | 23 (30.26) | 7 (20.59) | 30 (27.27) |
| 41-50 | 11 (14.47) | 5 (14.71) | 16 (14.55) |
| 51-60 | 11 (14.47) | 9 (26.47) | 20 (18.18) |
| 61-70 | 9 (11.84) | 2 (5.88) | 11 (10) |
| >70 | 3 (3.95) | 5 (14.71) | 8 (7.27) |
| Total | 76 | 34 | 110 |

Table 2: Clinical presentation of acute pancreatitis

| Symptoms/signs | No. of patients (%) |
|---------------------------|---------------------|
| Epigastric pain | 108 (98.18) |
| Radiation to back | 46 (41.82) |
| Nausea | 83 (75.45) |
| Vomiting | 68 (61.82) |
| Fever | 20 (18.18) |
| Jaundice | 4 (3.64) |
| Distention of the abdomen | 26 (23.64) |
| Associated illness | 26 (23.64) |

Table 3: Etiology (and its gender breakup) of acute pancreatitis

| Cause | Male (%) | Female (%) | Total (%) |
|---------------|------------|------------|------------|
| Alcohol | 35 (46.05) | 1 (2.94) | 36 (32.73) |
| Biliary | 21 (27.63) | 21 (61.76) | 42 (38.18) |
| Idiopathic | 18 (23.68) | 11 (32.35) | 29 (26.36) |
| Post-ERCP | 2 (2.63) | 0 (0.00) | 2 (1.82) |
| Miscellaneous | 0 (0.00) | 1 (2.94) | 1 (0.91) |
| Total | 76 | 34 | 110 |

ERCP: Endoscopic retrograde cholangiopancreatography

Table 4: Total Glasgow score of patients with acute pancreatitis

| Glasgow score | Severity | No. of cases (%) |
|---------------|----------|------------------|
| ≤2 | Mild | 90 (81.8) |
| >2 | Severe | 20 (18.2) |
| Total | | 110 |

around the 1st and 2nd week of the admission. Contrast enhancement was present in all the mild cases and 82% of cases with severe pancreatitis. Extension of peripancreatic inflammation was up to lesser sac in 44% of mild cases and 45% of cases with severe disease, up to C-loop of duodenum in 36% of mild disease and 7% in severe cases, up to lateral conal fascia in 16% of mild disease and 63.6% in severe disease, and up to anterior pararenal space in 16% of mild cases and 15% in severe cases. Single collections were detected in 24% of mild cases and 54.5% of severe cases. <30% of necrosis was present in 32% of mild disease and 16% of severe disease, 30-50% of necrosis was present in 81.8%

Table 5: Serum amylase in acute pancreatitis

| Serum amylase (normal value 0-90 IU/L) | Mild | Severe | Total |
|--|------------------------|------------------------|------------------------|
| | No. of patients N1 (%) | No. of patients N2 (%) | No. of patients N3 (%) |
| Raised (≥ 3 times normal) | 66 (73.5) | 15 (75) | 81 (73.6) |
| <3 times normal | 24 (26.5) | 5 (25) | 29 (26.4) |
| Total | 90 | 20 | 110 |

Table 6: Complications grouped according to Glasgow score in acute pancreatitis

| Glasgow score | Local complications | Systemic complications | Overall complications |
|---------------|---------------------|------------------------|-----------------------|
| | N1 (%) | N2 (%) | N3 (%) |
| ≤ 2 | 19 (21.1) | 0 (0) | 19 (17.2) |
| > 2 | 17 (85) | 5 (25) | 17 (15.5) |

N1 - Number of patients with local complications. N2 - Number of patients with systemic complications. N3 - Number of patients with overall complications

Table 7: Ultrasonography findings of hepatobiliary system in acute pancreatitis

| Ultrasound findings | No. of patients (%) |
|---------------------|---------------------|
| Liver | |
| Normal | 59 (53.6) |
| Hepatomegaly | 28 (25.5) |
| Fatty change | 16 (14.6) |
| Altered echotexture | 5 (4.6) |
| Cirrhosis | 2 (1.8) |
| GB | |
| Normal | 65 (59.1) |
| Stone | 33 (30.0) |
| Sludge | 4 (3.6) |
| Echo bile | 1 (0.9) |
| Biliary | |
| CBD | |
| Thick walled | 3 (2.7) |
| h/o cholecystectomy | 3 (2.7) |
| Normal | 102 (92.7) |
| Stone/sludge | 3 (2.7) |
| Dilated | 5 (4.6) |

CBD: Common bile duct, GB: Gallbladder

of severe disease, and none of the cases had $>50\%$ of necrosis (Table 9).

Balthazar Grading in CTSI

On the basis of CT scan findings of peripancreatic inflammation, collections, and pancreatic necrosis, Balthazar grade and CTSI were calculated. Tables 10 and 11 show that Balthazar Grade B and C and CTSI score 1-3 predominate in mild disease whereas Grade D and E and CTSI score 5-8 predominate in severe disease.

Complication Rate in Cases Grouped According to CTSI

In the current study, all the 6 patients with CTSI of 0-1 recovered without any systemic or local complications, 6 out of 11 patients with CTSI of 2-3 had local complications but no systemic complications, all the 17 patients with

Table 8: Ultrasound findings of pancreas in acute pancreatitis

| CT abnormality | Mild (%) | Severe (%) | Total |
|----------------------------|-----------|------------|-------|
| Size | | | |
| Normal | 3 (2.7) | 0 (0) | 3 |
| Enlarged | 80 (72) | 19 (17.1) | 99 |
| Obscured | 7 (6.3) | 1 (0.9) | 8 |
| Altered echotexture | | | |
| Head | 73 (65.7) | 18 (16.2) | 91 |
| Body | 74 (66.6) | 18 (16.2) | 92 |
| Tail | 28 (25.2) | 17 (15.3) | 45 |
| Peripancreatic collections | | | |
| Present | 26 (23.4) | 15 (13.5) | 41 |
| Absent | 64 (57.6) | 5 (4.5) | 69 |

Table 9: CT findings and severity of pancreatitis

| CT findings | Mild (%) | Severe (%) |
|---------------------------------------|----------|------------|
| Contrast enhancement | | |
| Present | 25 (100) | 9 (81.8) |
| Absent | 0 (0) | 2 (18.2) |
| Extent of peripancreatic inflammation | | |
| Lesser sac | 11 (44) | 5 (45.4) |
| Posterior gastric wall | 11 (44) | 6 (54.5) |
| C-loop of duodenum | 9 (36) | 2 (18.2) |
| Lateral conal fascia | 4 (16) | 7 (63.6) |
| Anterior pararenal space | 4 (16) | 4 (36.4) |
| Peripancreatic collections | | |
| None | 17 (68) | 1 (9.1) |
| Single | 7 (28) | 4 (36.4) |
| Multiple | 3 (12) | 6 (54.5) |
| Pancreatic necrosis | | |
| None | 17 (68) | 0 (0) |
| <30% | 8 (32) | 9 (81.8) |
| 30-50% | 0 (0) | 2 (18.2) |
| >50% | 0 (0) | 0 (0) |

CT: Computed tomography

CTSI of 4-6 developed local complications but no systemic complications, but all the patients with CTSI of 7-10 had local as well as systemic complications. 16 out of 17 patients with CTSI of 0-3 were discharged after uneventful recovery and one patient left against medical advice. Out of 17 patients with CTSI of 4-6, 14 patients were discharged and 3 expired, but all the patients with CTSI of 7-10 developed systemic complications and expired (Table 12).

Use of Antibiotics in Acute Pancreatitis

Quinolones along with aminoglycosides and imidazoles were the most commonly used antibiotics in acute pancreatitis in the present study. Many patients were also

started on piperacillin and tazobactam and penem group of antibiotics, but the cephalosporins were used in only few of the patients with acute pancreatitis. None of the patients were given antifungal drugs.

Another significant aspect of treatment of pancreatitis is the start of antibiotic that is much talked about in literature also, but in our setting, all our patients on landing with us were put in various antibiotics right from the day 1 onward. Antibiotics were given for a short period of <10 days in most of the cases with mild disease and for a longer duration of >20 days in most of the cases with severe disease.

Surgical Management

Out of 110 patients, 18 patients underwent various surgical procedures for the management of local complications and to prevent the recurrence of acute pancreatitis. In mild disease, cholecystectomy was done in 4 patients and ERCP with stenting/sphincterotomy was done in 5 patients as preventive measures of acute pancreatitis. CT-guided needle aspiration was done to know the status of infection in 305 of patients with severe disease and one patient with mild disease. Three patients underwent necrosectomy, and in one patient, necrosectomy with cholecystectomy was done. In four

patients, laparotomy with external drainage was done. There was one patient who developed necrosis of the transverse colon and required laparotomy with transverse colostomy. In another patient, combined procedure of laparotomy, cholecystectomy, and external drainage was done (Table 13).

ICU Care in Acute Pancreatitis

None of the patients with mild disease required ICU care. 5 out of 20 patients with severe pancreatitis needed ICU care for about 10-20 days (Table 14).

Duration of Hospital Stay

In majority of patients (75.5%) with mild disease of acute pancreatitis, the hospital stay was <10 days whereas the hospital stay was >20 days in majority of patients from severe disease of acute pancreatitis. The average duration of hospital stay in mild disease was 8.22 days, and in severe disease, it was 13.5 days.

Outcomes in Patients of Acute Pancreatitis

Out of 90 patients with mild disease, 87 (96.7%) recovered uneventfully and were discharged, only 1 patient expired, and 2 left against medical advice. Among the patients with severe disease, 50% were discharged, 45% expired, and one patient left against medical advice (Table 15).

Table 10: Balthazar grading in acute pancreatitis

| Balthazar grading | Mild N1 (%) | Severe N2 (%) | Total N3 (%) |
|-------------------|----------------|------------------|-----------------|
| A | 0 (0) | 0 (0) | 0 (0) |
| B | 9 (36) | 0 (0) | 9 (25) |
| C | 7 (28) | 1 (9.1) | 8 (22) |
| D | 6 (24) | 4 (36.4) | 10 (28) |
| E | 3 (12) | 6 (54.5) | 9 (25) |
| Total | 25 | 11 | 36 |

Table 11: CTSI of acute pancreatitis

| CTSI | Mild N1 (%) | Severe N2 (%) | Total N3 (%) |
|------|----------------|------------------|-----------------|
| 0-1 | 6 (24) | 0 (0) | 6 (16.7) |
| 2-3 | 12 (48) | 0 (0) | 12 (33.3) |
| 4-6 | 7 (28) | 9 (81.8) | 16 (44.4) |
| 7-10 | 0 (0) | 2 (18.2) | 2 (5.5) |

CTSI: Computed tomography severity index

Table 12: Complication rate in cases grouped according to CTSI

| CTSI | No. of cases | Local complications N1 (%) | Systemic complications N2 (%) | Overall complications N3 (%) |
|-------|--------------|-------------------------------|----------------------------------|---------------------------------|
| 0-1 | 6 | 0 (0) | 0 (0) | 0 (0) |
| 2-3 | 11 | 6 (24) | 0 (0) | 6 (16.67) |
| 4-6 | 17 | 17 (100) | 0 (0) | 17 (100) |
| 7-10 | 2 | 2 (100) | 2 (100) | 2 (100) |
| Total | 36 | | | |

CTSI: Computed tomography severity index

Table 13: Surgical interventions and severity of pancreatitis

| Surgical interventions | Mild disease N1 (%) | Severe disease N2 (%) |
|------------------------|------------------------|--------------------------|
| CT-guided aspiration | 1 (1.11) | 6 (30) |
| ERCP/stenting | 3 (3.33) | 0 (0) |
| ERCP/sphincterotomy | 2 (2.22) | 0 (0) |
| Cholecystectomy | 4 (4.44) | 2 (10) |
| Necrosectomy | 0 (0) | 5 (25) |
| External drainage | 0 (0) | 4 (20) |
| others | 0 (0) | 1 (5) |

CT: Computed tomography, ERCP: Endoscopic retrograde cholangiopancreatography

Table 14: Number of patients in ICU

| Period of ICU care | No. of patients (%) |
|--------------------|---------------------|
| <10 days | 1 (5) |
| 10-20 days | 4 (20) |
| >20 days | 0 (0) |

Table 15: Outcomes in patients of acute pancreatitis

| No. of days | Mild N1 (%) | Severe N2 (%) | Total N3 (%) |
|----------------|----------------|------------------|-----------------|
| Discharged | 87 (96.7) | 10 (50) | 97 (88.2) |
| Expired | 1 (1.11) | 9 (45) | 1 (9.1) |
| LAMA/absconded | 2 (2.22) | 1 (5) | 3 (2.7) |
| Total | 90 | 20 | 110 |

LAMA: Leave against medical advice

DISCUSSION

This retrospective and prospective study was conducted in 110 patients of acute pancreatitis in the Department of Surgery at Dr. S.N. Medical College and Associated Group of Hospitals.

The study revealed that the age incidence of acute pancreatitis is maximum in the age group of 31-40 years, which comprises 30.76% with a mean age of 44.16 years (range 18-80 years).

The overall male-to-female ratio is found to be 2.23:1.

Gallstones were found to be the most common etiology of acute pancreatitis followed by alcohol > idiopathic > post-ERCP > infections (mumps). In a study conducted by Imamura,¹ it was seen that the main etiological factors were gallstone disease (51%) and alcohol abuse (15%) whereas 10% of cases were idiopathic.

It was noticed that alcohol was more common etiology of acute pancreatitis among males, and biliary etiology was more common among females. A study conducted by Chang *et al.*² also showed that the major cause of acute pancreatitis in females was gallstones while alcohol is leading cause in males. A study conducted by Andersen *et al.*³ also shows that both cholelithiasis and alcohol were main etiologic factors in the more northern countries studied whereas cholelithiasis alone predominated in the more southern ones.

The symptomatology of acute pancreatitis shows that epigastric pain was the most common presentation at admission, followed by nausea > vomiting > abdominal distension > radiation of pain toward back > jaundice.

The study shows that increased level of serum lipase is more sensitive and specific than serum amylase for the diagnosis of acute pancreatitis.

Glasgow score was applied over all the patients of study group, the predicted course of the disease evaluated, through the Glasgow scoring system was found to be authentic. Thus, Glasgow scoring system is fairly reasonable method to predict the severity of acute pancreatitis and helps in the categorization of severity of illness.

Ultrasonography comes out to be a useful initial investigation in the course of acute pancreatitis and found useful to detect gallstones, CBD stones, pancreatic swellings, and peripancreatic collections.

CT scan of the abdomen remains the gold standard for differentiating the morphological features of pancreas

at an early as well as late stage of pancreatitis, and CTSI correlated well with the morbidity in acute pancreatitis in forms of systemic, local complications and duration of stay in hospital. Furthermore, CT scan was done to diagnose acute pancreatitis when clinical and biochemical parameters remain inconclusive.

The overall rate of complications in 110 patients was 32.7% (36 out of 110). The local complications were in the form of acute fluid collections, pancreatic necrosis, and pancreatic abscess, but 5 patients had systemic complications in the form of the acute renal failure and respiratory failure.

Antibiotics were started in all the patients from the very first day of admission, and the duration of antibiotics was <10 days in 85% of cases with mild disease and >20 days in 20% of cases with severe disease. Six patients with severe acute pancreatitis expired within 10 days. Hence, the course of antibiotic was prolonged (more than 20 days) in severe acute pancreatitis as compared to mild acute pancreatitis.

Gastroenterology opinion was sought in many patients, and ERCP with sphincterotomy/stenting was done in 5 cases of acute pancreatitis. Four patients with mild acute pancreatitis underwent cholecystectomy (open/laparoscopic) within 4-17 days of the attack, but cholecystectomy was done in severe necrotizing pancreatitis only as a combined procedure with necrosectomy or external drainage.

About 30% of patients with severe necrotizing disease underwent CT-guided needle aspiration to know the status of infection. Necrosectomy, open external drainage, and transverse colostomy were done to deal with the local complications.

ICU care was needed in 25% of cases with severe acute pancreatitis. A study conducted by Halonen *et al.*⁴ showed that in patients with severe acute pancreatitis, advanced age, history of continuous medication, and need for dialysis, mechanical ventilator support and pressor support predict fatal outcome and thus should be taken into account in clinical evaluation.

Average duration of hospital stay was 8.22 ± 5.82 days in mild disease and 13.5 ± 12.77 days in severe disease.

Out of the 110 patients, we studied that mild acute pancreatitis had mortality of 1.11% and severe acute pancreatitis had mortality of 45%. A study conducted by Andersen *et al.*³ revealed that mortality was high for necrotic pancreatitis, and there was no relationship between mortality and age. Furthermore, a study conducted by Gullo *et al.*⁵ showed that there is no significant difference in mortality in relation to alcohol or biliary etiology.

CONCLUSION

- Incidence of acute pancreatitis is in the age group of 31-40 years.
- Biliary tract stone disease and alcohol are the most common causes of acute pancreatitis.
- Acute pancreatitis is more common among males (male:female - 2.23:1).
- The most common presentation of acute pancreatitis is epigastric pain followed by nausea and vomiting.
- Glasgow prognostic scoring system is fair enough to categorize and predict course of illness, thus enabling proper management of the patients.
- Serum amylase and lipase are the first line of investigations to diagnose acute pancreatitis but are not useful to predict the course of disease.
- Ultrasonography of the abdomen should be the initial investigation for the patients with acute pancreatitis and can diagnose gallstones, CBD stones, pancreatic swelling, and collections. If it is doubtful or shows the signs of local complications, one should go for CT scan of the abdomen.
- CT scan remains the gold standard investigation for morphological evaluation of acute pancreatitis, and CTSI correlates well with morbidity in acute pancreatitis.
- Use of antibiotics starts at the outset in our setup and in most of the setups irrespective of diverse theoretical data being put up.
- Appropriate supportive therapy is the mainstay of management of acute pancreatitis in even those with severe acute necrotizing pancreatitis.
- Appropriate and timely help and intervention by gastroenterology colleagues serves a good purpose in overall management of these patients.
- Local complications of acute pancreatitis should be managed with appropriate surgical/interventional procedure such as CT-guided aspiration, necrosectomy, and open external drainage.
- The role of surgeries such as cholecystectomy and ERCP with stenting/sphincterotomy is useful to remove the cause and prevent the recurrence of biliary acute pancreatitis.
- ICU care requiring ventilatory support is needed in many of the patients with severe acute pancreatitis.
- Mortality in severe acute pancreatitis is as high as 45% whereas mortality in mild acute pancreatitis is low (1.1%).

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Prevalence of Different Types of Malocclusion in the Patients Visiting Government Dental College, Jammu in India

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Abstract

Aim: To determine the prevalence of different types of malocclusion based on Angle's classification in Jammu.

Materials and Methods: The sample size included 696 subjects (369 males and 327 females) in the age group of 13-14 years. The malocclusion determination was based on the Angle's classification of malocclusion.

Results: The results showed that 83% of the subjects had malocclusion. Class I malocclusion constituted the major proportion of malocclusion, which was found in 67% of the studied population. Class II Division I constituted 8% of the sample size. Class II Division II constituted 6% of the sample size. Class III constituted 2% of the total sample size.

Conclusion: Majority of the subjects had Angle's Class I malocclusion with crowded incisors. There is a need to simplify and standardize criteria for assessing malocclusion and to plan the need of orthodontic treatment among the population.

Key words: Angle's classification, Incidence, Malocclusion

INTRODUCTION

The dental malocclusion exhibits the third highest prevalence among oral pathologies, after tooth decay and periodontal disease and comes under worldwide dental priorities.¹ A well aligned dental arch is essential for the health of oral cavity and stomatognathic system and enhances the self-esteem of the individual. To have a good treatment plan for treating malocclusion, there is a necessity to find the prevalence of the condition in the particular population. To find the prevalence of malocclusion, adequate basic information is available in the developed

countries, but developing countries are still lacking this information.²⁻⁷

Occlusal traits vary among different ethnic groups, and so is the prevalence and severity of malocclusion. A large number of studies on the prevalence of malocclusion have been done in the past. The reported studies showed that prevalence of malocclusion among Indian subjects is as low as 19% to as high as 90%.⁸

Therefore, the aim of the study is to determine the prevalence of different types of malocclusion based on Angle's classification in Jammu.

MATERIALS AND METHODS

The sample size included 696 subjects (369 males and 327 females) in the age group of 13-14 years visiting the Department of Pedodontics and Preventive Dentistry, Indira Gandhi Government Dental College, Jammu.

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The inclusion criteria included that none of the subjects had previously undergone orthodontic treatment; all the subjects had first permanent molar. A single dentist trained for the specific study conducted the clinical examination. The malocclusion determination was based on the Angle's classification of malocclusion.

The malocclusion was evaluated with the help of intra-oral photographs, orthodontic models and clinically in centric occlusion position, which was attained by asking the subject to swallow and then to bite the teeth together. The subjects with properly aligned arches, minimal overbite and overjet and with Class I molar relationship was classified as normal.

The subjects with Class I malocclusion had the following characteristics - Class I molar relationship, crowded incisors or labial canines, or both (Dewey type I), protruded maxillary incisors (Dewey type II), anterior end to end occlusion or anterior cross bite or both (Dewey type III), unilateral or bilateral posterior cross bite (Dewey type IV), mesial drift of molars (Dewey type V), anterior or posterior open bite, and deep anterior overbite.

The subjects with Class II malocclusion were subdivided into Division I and Division II based on the molar relationship and inclination of incisors in the arches.

The subjects with Class III malocclusion had Class III molar relationship, crowded incisors, spacing between the incisors, reverse overjet.

Examinations were computerized and analyzed using Statistical Package for Social Sciences version 16. Chi-square test was used for computing statistical significance.

RESULTS

The results showed that 82.9% of the subjects had malocclusion. Class I malocclusion constituted the major proportion of malocclusion, which was found in 66.9% of the studied population. Class II Division I constituted 8.3% of the sample size. Class II Division II constituted 5.9% of the sample size. Class III constituted 1.8% of the total sample size. There were 369 male participants, which constituted 53.01% of the total sample size. There were 327 female participants, which constituted 46.98% of the total sample size. There was no statistically significant gender difference found ($P > 0.05$) Tables 1 and 2.

DISCUSSION

The prevalence of normal occlusion was 17.1% in this study, and other classes of occlusion constituted 82.9%

Table 1: Prevalence of various malocclusion

| Occlusal classification | N (%) |
|-------------------------|------------|
| Normal occlusion | 119 (17.1) |
| Class I | 466 (66.9) |
| Class II Division I | 58 (8.3) |
| Class II Division II | 41 (5.9) |
| Class III | 12 (1.8) |
| Total | 696 (100) |

$P=1$, $df=4$

Table 2: Gender distribution

| Occlusal classification | Male | Female |
|-------------------------|------|--------|
| Normal occlusion | 58 | 61 |
| Class I | 243 | 223 |
| Class II Division I | 38 | 20 |
| Class II Division II | 20 | 21 |
| Class III | 10 | 02 |
| Total | 369 | 327 |

$P=0.05$, $df=4$

of which Angle's Class I malocclusion was most frequent. The high incidence of malocclusion with Angle's Class I malocclusion as the most predominant among all the types in this study was consistent with the previous studies as reported by Sidhu,⁹ Prasad, and Savadi.¹⁰ However, results of few of the studies as done by Rao *et al.*¹¹ which reported a low incidence of malocclusion are in disagreement with the results of our study.

Our study shows the prevalence of Class III malocclusion to be 1.8%, which is in accordance with the results reported by the study conducted by Rao *et al.*¹¹ However, study conducted by Kharbanda¹² showed higher prevalence of Class III malocclusion in Delhi, and by Tewari¹³ in Punjab. Lower prevalence of Class III malocclusion was reported by Jacob and Mathew^{14,15} in Trivandrum.

No statistically significant gender differences were found in various as well as in total prevalence of the malocclusion which was in accordance with the results of the study conducted by Das and Reddy¹⁶ in children of Bengaluru.

CONCLUSION

Majority of the subjects had Angle's Class I malocclusion with crowded incisors. There is a need to simplify and standardize criteria for assessing malocclusion and to plan the need of orthodontic treatment among the population.

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A Comparative Study of Feto-maternal Outcomes in Pre-labor Rupture of Membrane at Term

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Abstract

Aims and Objectives: To compare feto-maternal outcomes in patients with pre-labor rupture of membrane (PROM) at term with that of patients without PROM and also compare the efficacy of three different modes of induction.

Materials and Methods: In this study, 120 patients with PROM were included as cases and 120 patients without PROM were included as controls. We divided cases and controls into three subgroups (40 patients in each group) depending upon the mode of induction, i.e., with oxytocin only, with misoprostol only, with both misoprostol and oxytocin. The data were collected prospectively and analyzed statistically.

Results: Mean gestational age of cases and controls was 38.17 ± 0.83 and 38.60 ± 0.70 weeks, respectively. There were higher chances of instrumental delivery and lower segment cesarean section in patients with PROM. Most of the cases (84.17%) were belonging to lower socioeconomic class, so their babies were having low-birth weight. More percentage of cases gave birth to babies with Apgar score <7 at 1 and 5 min. There were higher chances of neonatal intensive care unit admission of babies born to patients with PROM than patients without PROM. There were higher chances of developing fever and wound infection in cases. The chances of fetal and maternal morbidity and mortality were increased in case of PROM and as the leaking to delivery interval increased, it further increased.

Conclusion: PROM leads to increased chances of fetal and maternal morbidity and mortality. Hence, early diagnosis and prompt management is required for better outcome of mother and baby. Induction to delivery interval with misoprostol and oxytocin is lesser and more number of cases delivered normally so this mode of induction is better than other modes of induction.

Key words: Feto-maternal outcomes, Lower segment caesarean section, Misoprostol, Neonatal intensive care unit, oxytocin, Pre-labor rupture of membrane

INTRODUCTION

Spontaneous rupture of membranes at any time beyond 37 weeks of pregnancy but before the onset of labor is called pre-labor rupture of membranes (PROMs) at term. The incidence of PROM is about 10% of all pregnancies and 70% of them occur at term. Most Indian studies

document incidence of 7-12% for PROM of which 60-70% occurs at term.¹

PROM is linked to significant maternal and fetal morbidity and mortality and is one of the most common complications of pregnancy that has a major impact on neonatal outcome.² It has been shown to be the cause of 18-20% and 21.4% of prenatal mortalities and morbidity, respectively.^{3,4} The three causes of fetal death associated with PROM are sepsis, asphyxia, and pulmonary hyperplasia. Women with intrauterine infection deliver earlier than non-infected women. Maternal complications include intra-amniotic infection, which occurs in 13-60% of women with PROM, placental abruption, and postpartum endometritis.^{5,6} Whereas, neonatal complications include

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higher incidence of non-reassuring cardiotocography patterns (7.9%) due to cord compression subsequent to leaking and higher incidence of sepsis.⁷ Moreover, infants born with sepsis have a mortality rate 4 times higher than those without sepsis.⁸ The chances of complication in PROM is increased if the mother has low body mass index, concomitant infection of the gestational tissues, and longer time elapsed between the rupture of membranes and delivery.⁹

Diagnosis and prompt management is very important to limit various fetal and maternal complications, generally due to infection. Management of PROM is still controversial and involves a balance between expectant management and intervention.¹⁰ Various agents are available for induction of labor, mainly prostaglandins, and oxytocin.¹¹

The current study was conducted to compare the feto-maternal outcome in patients with PROM at term and that in patients without PROM and to compare the efficacy of three different methods of induction, i.e., misoprostol only, oxytocin only, both misoprostol and oxytocin.

MATERIAL AND METHOD

After obtaining Institutional Ethical Committee approval and patient's written informed consent, present observational prospective case - control study was conducted on 240 pregnant women in the department of Obstetrics and Gynaecology, at Government medical college and Hospital, Nagpur, Maharashtra, India. Patients were divided into two groups, Group A (cases): 120 patients with PROMs and Group B (controls): 120 patients without PROMs. All the patients who were ≥ 37 weeks of gestation with PROM, confirmed by per speculum examination and fern test and with single fetus in cephalic presentation, having no contraindication for active management, cervical dilatation of ≤ 3 cm at time of admission were included in the study as cases. The patients with features of chorioamnionitis such as fever, tachycardia, uterine tenderness, and foul smelling per vaginal discharge at the time of admission, fetal distress, and meconium stained liquor at the time of admission, active labor at the time of admission, patients with previous cesarean section, antepartum hemorrhage, maternal medical diseases such as preeclampsia, diabetes or heart disease, and fetal anomalies were excluded from the study. The cases and control groups again subdivided into three groups (40 patients in each group) depending upon the mode of induction, i.e., with oxytocin only, with misoprostol only, with both misoprostol and oxytocin.

A detailed history, examination and all relevant investigations were done for all the patients. Maternal evaluation was done by doing complete blood counts and taking vaginal

swab. Fetal evaluation was done by doing non-stress test (NST). After recording a reactive NST, patient was either induced with misoprostol only or oxytocin only or with both misoprostol and oxytocin. Patients, induced with misoprostol only were given tablet misoprostol 25 μ g every 4 hourly, maximum of 6 doses or until labor was established. Patients induced with oxytocin only were given oxytocin intravenous in drip. The oxytocin drip was formed by adding 2 IU of injection pitocin in 500 ml of ringer solution and drip started at 8 drops/min. The oxytocin drip rate was doubled after every 30 min till 60 drops/min or until adequate contractions, i.e., 3-4 contraction were obtained in 10 min. If adequate contractions were not achieved with this then we started drip of 3 IU of injection pitocin in 500 ml of ringer solution at rate of 8 drops/min and again the drip rate was doubled after every 30 min till 60 drops/min and like this we escalated the oxytocin drip till 5 IU of injection pitocin in 500 ml of ringer solution at rate of 60 drops/min or until adequate contractions, i.e. 3-4 contraction were obtained in 10 min. Patients induced with both misoprostol and oxytocin were given first misoprostol 25 μ g 4 hourly, maximum of 3 doses then oxytocin drip started in the same way as described earlier.

Maternal vitals were monitored for chorioamnionitis. Fetal well-being surveillance was done by auscultating fetal heart rate every 30 min and color of liquor and by doing NST. Progress of labor was monitored by doing 4 hourly per vaginal examinations. Patients in whom signs of chorioamnionitis was developed or fetal heart rate was < 120 /min or liquor was meconium stained or there was protracted labor, were subjected for caesarean section. Maternal outcomes were studied in terms of fever, foul smelling vaginal discharge, wound infection, hospital stay, and mortality. Fetal outcomes studied in terms of birth weight, Apgar score at one and 5 min of birth, neonatal intensive care unit (NICU) admission, cause of NICU admission and neonatal mortality.

All the patients with PROM were given antibiotic prophylaxis of injection cefotaxime 1 g BD during antenatal period and patient having leaking to delivery interval more than 12 h, antibiotic prophylaxis was continued in postnatal period for 5 days (as per institutional protocols). All the babies of patients, who had leaking to delivery interval more than 12 h, received antibiotic prophylaxis of injection cefotaxime (50 mg/kg) BD and injection amikacin (15 mg/kg) OD for 5 days (as per institutional protocols). Efficacy of three modes of induction was compared by comparing induction to delivery interval.

Statistical Analysis

Continuous variable were presented as mean \pm standard deviation. The categorical variables were expressed in

frequency and percentages. Continuous variables were compared by performing independent *t*-test and categorical variables by performing Pearson's Chi-square test. For small numbers, Fisher exact test was used wherever applicable. All the tests were two sided. $P < 0.05$ was considered as statistically significant. Statistical software STATA version 14.0 was used for statistical analysis.

RESULTS

A total of 240 pregnant women were included in the study and divided into two equal groups, i.e., cases and control group. The mean age of cases was 25.20 ± 3.65 years and that of controls was 24.97 ± 3.40 . Among the cases (120), 45.83% (55) were primigravida and 54.17% (65) were multigravida while among the controls (120), 55% (66) were primigravida and 45% (54) were multigravida. Majority of women in cases (84.17%) and control (71.67%) were belonging to lower socioeconomic class. The mean gestational age of cases was 38.17 ± 0.83 weeks and that of controls was 38.60 ± 0.70 weeks. Most of the cases (94.17%) and controls (98.33%) were belonging to 37-40 weeks of gestation group. There were higher chances of instrumental delivery and lower segment cesarean section (LSCS) in patients with PROM and the fetal distress was the common cause leading to LSCS. Table 1 shows the distribution of cases according to mode of induction and mode of delivery.

Among the cases (120), 44.17% (53) delivered babies with birth weight between 2 and 2.5 kg and 55.83% (67) delivered babies with birth weight >2.5 kg. Among the controls (120), 13.33% (16) delivered babies with birth weight between 2 and 2.5 kg and 86.67% (104) delivered babies with birth weight >2.5 kg, ($P < 0.001$, HS). Out of 120 cases, 9.17% (11) delivered babies with Apgar score <7 and 90.83% (109) cases delivered babies with Apgar score ≥ 7 at 1 and 5 min. Among the controls (120), 1.67% (2) delivered babies with Apgar score <7 and 98.33% (118) delivered babies with Apgar score ≥ 7 at 1 and 5 min, ($P = 0.019$, S).

Out of total cases (120), 11.67% (14) cases delivered the baby who required NICU admission and 2.5% (3) cases had neonatal mortality while among the controls (120), 3.33% (4) delivered the baby who required NICU admission and there was no neonatal mortality which was statistically significant ($P = 0.025$). This indicates higher chances of NICU admission of babies born to patients with PROM at term than patients without PROM. 68.33% (82) cases delivered within 12 h of leaking and among them there was no neonatal morbidity or mortality. 30% (36) cases were delivered between 12 and 24 h of leaking and among them 10% (12) required NICU admission, neonatal mortality

was 1.67% (1). 1.67% (2) cases were delivered after 24 h of leaking and all required NICU admission and all got expired. The difference was statistically highly significant ($P < 0.001$). This shows that as the leaking to delivery interval increases, the chances of neonatal morbidity and mortality increases. Table 2 shows the distribution of cases and controls according to causes of NICU admission.

There was statistically highly significant difference observed in development of neonatal pneumonia ($P = 0.006$), jaundice ($P = 0.046$), and septicemia ($P = 0.001$) requiring NICU admission and leaking to delivery interval. This shows that as the leaking to delivery interval increases, there were higher chances of NICU admission due to pneumonia, neonatal jaundice, and septicemia (Graph 1).

Table 3 shows the distribution of cases and controls according to maternal morbidity and mortality. Table 4 shows that there was no maternal mortality among cases and controls. However, the difference in distribution of cases and controls according to developing fever and wound infection was statistically highly significant, i.e., there were higher chances of developing fever and wound infection in patients with PROM than patients without PROM.

Table 1: Distribution of cases and controls according to mode of induction and mode of delivery

| Mode of induction | Mode of delivery (cases) | | |
|--------------------------------|-----------------------------|------------------|------------|
| | Normal (%) | Instrumental (%) | LSCS (%) |
| Oxtocin (40) | 35 (87.5) | 1 (2.5) | 4 (10) |
| Misoprostol (40) | 17 (42.5) | 3 (7.5) | 20 (50) |
| Misoprostol with oxytocin (40) | 39 (97.5) | 0 (0) | 1 (2.5) |
| Total (120) | 91 (75.83) | 4 (3.33) | 25 (20.83) |
| Mode of induction | Mode of delivery (controls) | | |
| | Normal (%) | Instrumental (%) | LSCS (%) |
| Oxtocin (40) | 38 (95) | 1 (2.5) | 1 (2.5) |
| Misoprostol (40) | 30 (75) | 0 (0) | 10 (25) |
| Misoprostol with oxytocin (40) | 40 (100) | 0 (0) | 0 (0) |
| Total (120) | 108 (90) | 1 (0.83) | 11 (9.17) |
| <i>P</i> | <0.0001 HS | | |

LSCS: Lower segment caesarean section

Table 2: Distribution of cases and control according to cause of NICU admission

| Cause of NICU admission | Cases (%) | Controls (%) | <i>P</i> -value |
|-------------------------|-----------|--------------|-----------------|
| Pneumonia | 5 (4.17) | 2 (1.67) | 0.446, NS |
| Neonatal Jaundice | 3 (2.5) | 2 (1.67) | 1.000, NS |
| Bronchial Asthma | 2 (1.67) | 0 (0) | 0.498, NS |
| Septicemia | 3 (2.5) | 0 (0) | 0.247, NS |
| Total | 13 | 4 | - |

NICU: Neonatal intensive care unit

Among the cases (120), 68.33% (82) delivered within 12 h of leaking and no one developed any morbidity. 30% (36) cases delivered between 12 and 24 h of leaking and among those, 13.33% (16) developed fever, 2.5% (3) developed foul smelling per vaginal discharge and 0.83% (1) developed wound infection. 1.67% (2) cases delivered after 24 h and among them 0.83% (1) developed fever and all developed foul smelling per vaginal discharge and wound infection. This difference in distribution of cases according to leaking to delivery interval and maternal morbidities was statistically significant ($P = 0.026$, S). This shows that as leaking to delivery interval increases, chances of maternal morbidities increases.

Among the 120 cases, in only 5 (4.17%) cases growth was seen on vaginal swab culture and in 115 (95.83%) cases, no growth was seen on vaginal swab culture.

Table 4 shows the hospital stay of the patients. The difference in distribution of cases and controls according to hospital stay was statistically highly significant ($P < 0.001$).

Among the cases, the mean induction to delivery interval for oxytocin only was 8.42 ± 2.34 h, for misoprostol only was 10.62 ± 3.33 h and for both misoprostol and oxytocin was 8.10 ± 2.29 h while among controls, the mean induction to delivery interval for oxytocin only was 9.52 ± 1.79 h, for misoprostol only was 10.22 ± 1.71 h and for both misoprostol and oxytocin was 8.82 ± 1.54 h. In both groups, mean induction to delivery interval for both misoprostol and oxytocin was less than that of the other two modes of induction. Graph 2 shows the distribution of cases and controls according to mode of induction and induction to delivery interval.

Table 3: Distribution of cases and control according to maternal morbidity and mortality

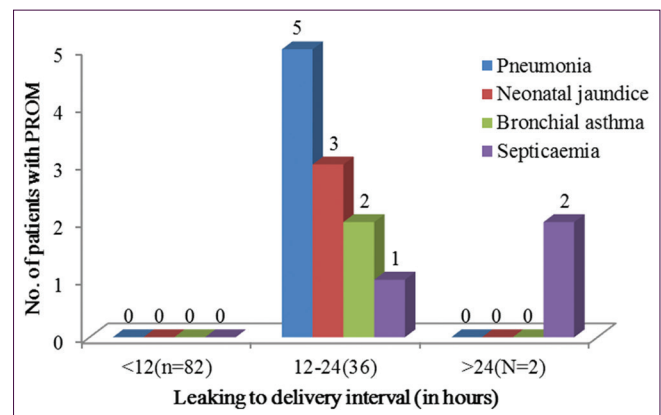
| Maternal morbidity and mortality | Cases (%) | Controls (%) | P-value |
|-------------------------------------|------------|--------------|-----------|
| Fever | 17 (14.17) | 3 (2.5) | 0.006, HS |
| Foul smelling per vaginal discharge | 5 (4.17) | 2 (1.67) | 0.446, NS |
| Wound infection | 3 (2.5) | 0 (0) | 0.003, HS |
| Mortality | 0 (0) | 0 (0) | - |
| Total | 25 (20.83) | 5 (4.17) | - |

Table 4: Distribution of cases and controls according to hospital stay

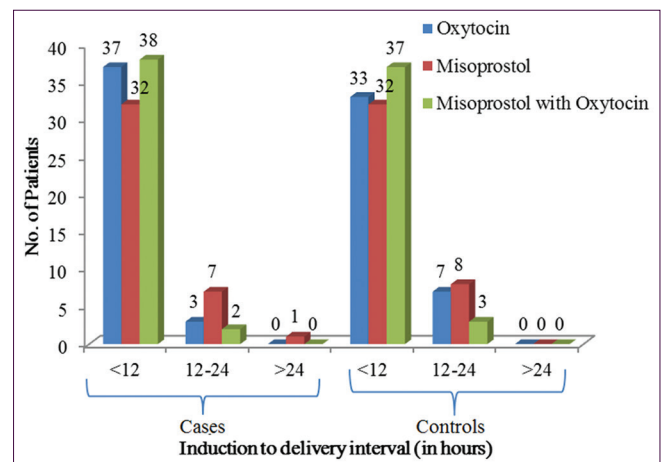
| Hospital stay days | Cases (%) | Controls (%) | P |
|--------------------|------------|--------------|------------|
| 1-3 | 73 (60.83) | 108 (90) | <0.001, HS |
| 4-6 | 22 (18.33) | 1 (0.83) | |
| >6 | 25 (20.83) | 11 (9.17) | |

DISCUSSION

In the present study, the majority of cases (52.5%) and controls (56.7%) were belonging to age group of 21-25 years and this was comparable with other studies.¹²⁻¹⁴ 45.83% cases were primigravida and 54.17% cases were multigravida. Most of the cases, i.e., 84.17% were belonging to lower socioeconomic class and 3.33% were belonging to upper class and 12.5% were belonging to middle class, this was comparable with study of Minnalkodi.¹⁴ Most of the cases, i.e., 94.17% were of gestational age between 37 and 40 weeks and 5.83% were of >40 weeks of gestation with mean gestational age of 38.17 ± 0.83 weeks. Among the controls, 98.33% were belonging to 37-40 weeks of gestation group and 1.67% were of >40 weeks of gestation with mean gestational age of 38.60 ± 0.70 weeks. As the number of patients with gestational age >40 weeks were very less so, conclusion cannot be made. Majority of cases (79.16%) delivered vaginally and 20.83% delivered by LSCS while 90.83% controls delivered vaginally and 9.17% controls



Graph 1: Distribution of cases according to cause of neonatal intensive care unit admission and leaking to delivery interval



Graph 2: Distribution of cases and controls according to mode of induction and induction to delivery interval

delivered by LSCS. This was comparable with previous studies.^{12,14,15}

Among the cases, who were induced with oxytocin only, overall 90% delivered vaginally and 10% delivered by LSCS. Among the cases, who were induced with misoprostol only, overall 50% delivered vaginally and 50% delivered by LSCS and among the cases who were induced with both misoprostol and oxytocin, 97.5% delivered vaginally, 2.5% delivered by LSCS. This shows that there were more chances of normal delivery if patients with PROM at term were induced with both misoprostol and oxytocin. In the study of Butt *et al.*,¹⁶ among the cases induced with oxytocin, 93.6% cases delivered vaginally, 6.4% cases delivered by LSCS, which was comparable. 18.33% cases were delivered by LSCS, with indication of LSCS was fetal distress and 2.5% cases delivered by LSCS, with indication of LSCS was protracted labor. In the study of Endale *et al.*,¹⁵ 7.6% cases were delivered by LSCS with indication of fetal distress and 3.2% cases delivered by LSCS with indication of protracted labor, which was comparable, as fetal distress was common indication in both studies.

Out of total cases, 44.17% gave birth to babies with birth weight between 2 and 2.5 kg and 55.83% gave birth to babies with birth weight >2.5 kg. Among the controls, 13.33% gave birth to babies with birth weight of 2-2.5 kg and 86.67% gave birth to babies with birth weight >2.5 kg. In our study, most of the cases were belonging to lower socioeconomic class and because of their nutritional status and some intrauterine stress of unknown etiology, there were higher chances of mild intrauterine growth restriction and that lead to PROM and low birth weight of babies born to them. 9.17% cases gave birth to babies having Apgar score <7 at 1 and 5 min, 90.83% cases gave birth to babies having Apgar score ≥7 at 1 and 5 min. 11.67% babies born to patients with PROM, got admitted in NICU and neonatal mortality was 2.5%. As per our institutional protocols, all the cases received antibiotic prophylaxis antenatally and babies of cases, who had leaking to delivery interval more than 12 h, also received injectable antibiotics prophylactically, so may be because of this, in our study, more percentage of cases gave birth to babies with Apgar score ≥7 at 1 and 5 min and lower percentage of babies developed morbidity and mortality as compared to other studies.^{12,14,15} In the present study, 14.17% of cases developed fever which is comparable with other studies.^{12,14} 60.83% of cases required ≤3 days of hospital stay and 39.16% cases required hospital stay for >3 days, this was comparable with the study of Endale *et al.*¹⁵ The longer duration of hospital stay among the cases was because of antibiotic prophylaxis to most of the babies and mothers

remain admitted in ward till the completion of baby's antibiotic prophylaxis, as per our institutional protocols.

Among the cases, induced with oxytocin only, 92.5% got delivered within 12 h with mean induction to delivery interval of 8.42 ± 2.34 h and among the cases, induced with misoprostol only, 80% got delivered within 12 h with mean induction to delivery interval of 10.62 ± 3.33 h. Our findings were comparable with study of Butt *et al.*¹⁶

CONCLUSION

The present study concluded that the chances of fetal and maternal morbidity and mortality increases in patients with PROM and as the leaking to delivery interval increases, the chances of fetal and maternal morbidity and mortality further increases. Hence, to decrease the feto-maternal morbidity and mortality, intervention at the earliest is must. As in our study, induction to delivery interval with misoprostol and oxytocin is lesser and more number of cases delivered normally so this mode of induction is better than other modes of induction, i.e., oxytocin only and misoprostol only.

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Epidemiology of Breast Cancer - A Hospital Based Study

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Abstract

Background: Breast cancer is the second most common cause of cancer in adult female. Breast cancer is common in affluent societies having a western lifestyle. Breast cancer is the most common form of cancer and is the leading cause of cancer death among females in the US. There is a large geographical variation in the incidence of breast cancer with an exception for Japan; the incidence ranks highest in high-income countries.

Materials and Methods: This study entailed all the patients suffering from carcinoma of breast who sought treatment in Government Medical College, Jammu. These patients were studied prospectively and detailed clinical history of each case regarding age, sex, weight, occupation, menstrual status, marital status, parity, age at menarche, age at first childbirth, breast feeding, familial history, past history of breast disease, and other malignancies if any were noted.

Result: A total of 50 patients with carcinoma breast were studied prospectively, and the incidence was studied in age, sex, marital status, parity, age at menarche and menopause, and various other variables. Diagnostic tools and treatment options were also studied. Observations were recorded and compared with those of other workers.

Conclusion: Following conclusions were drawn from this study. Majority of the patients were females (96%). Maximum incidence was observed in 40-50 years age group (40%). Majority of patients belong to Hindu community (82%). 72% of patients were from rural areas. Married patients account for 98% of the total patients studied. 43 female patients (88%) attained menarche by the age of 14-15 years and all the patients had started menstruating by the age of 16 years.

Key words: Breast, Cancer, Menarche

INTRODUCTION

Breast cancer is the second most common cause of cancer in adult female. Breast cancer is common in affluent societies having a western lifestyle. Breast cancer is the most common form of cancer and is the leading cause of cancer death among females in the US. There is a large geographical variation in the incidence of breast cancer with an exception for Japan; the incidence ranks highest in high-income countries. More than half of the incident cases in the world occur in Europe and North America.

The incidence of breast cancer increased since 1970 even in the countries reported low rates, such as Japan, Korea, India, and even Africa which lacks accurate population data.

The developed countries with a small proportion of world population account for almost 50% of breast cancer diagnosed worldwide. In 2008, breast cancer caused 458,503 deaths worldwide (13.7% of cancer deaths in women and 6.0% of cancer deaths among men and women together) "World Cancer Report."¹ International Agency for Research on Cancer 2008. The lowest incidence of breast cancer is reported from far eastern and Southeast Asian countries. In developing countries of Asia, the health-care burden on account of breast cancer had been steadily mounting. It is expected that in the coming decade, these countries would account for the majority of new breast cancer patients diagnosed globally.

Over 1 lakh new cases of breast cancer cases are estimated to be diagnosed annually in India. The age standardization

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incidence rates range from 6.2 to 39.5 per 1 lakh Indian women. The age adjusted rate vary from region, ethnicity, religion, with a high incidence reported at 48.3 per 1 lakh women in Parsi community in Mumbai. The rise in the incidence of 0.5-2% per annum has been seen across all regions of India and in all age groups but more in younger age group <40 years. In India, breast cancer is the second most common cause of cancer-related deaths with 53,592 breast cancer deaths in 2008 Ferlay *et al.*,² GLOBOCAN 2000: Cancer Incidence, Mortality, and Prevalence Worldwide.

Aims and Objectives

- A. To study the distribution of the disease.
- B. To study the determinants of the disease
 - i. Evaluation of risk factors.
 - ii. Treatment modalities offered and evaluation of prognostic factors.

MATERIALS AND METHODS

This study entailed all the patients suffering from carcinoma of breast who sought treatment in Government Medical College, Jammu.

These patients were studied prospectively and detailed clinical history of each case regarding age, sex, weight, occupation, menstrual status, marital status, parity, age at menarche, age at first childbirth, breast feeding, familial history, past history of breast disease, and other malignancies if any were noted.

All the patients were classified in clinical stages by TNM. Patients were given modalities of treatment such as surgery, chemotherapy, radiotherapy, and hormonal replacement therapy after receptor status (ER, PR, and HER2) in biopsy/surgical specimen and were followed routinely.

Inclusion Criteria

The study included all the patients admitted in the department of surgery and radiotherapy as.

1. Diagnosed case of breast cancer (fine-needle aspiration cytology (FNAC) or biopsy proved).
2. Case of breast lump (suspected for carcinoma) on whom FNAC was performed in the hospital.

Exclusion Criteria

All the patients of breast lump who were found to be benign after FNAC/Biopsy were excluded from the study.

RESULTS

In this study, out of 50 patients, majority, i.e., 48 cases (96%) were females, and there were only 2 male patients.

The study showed that highest incidence was in the age group of 41-50 (40%). The youngest patient was female of 30 years and oldest was a female of 71 years.

In this study, 41 cases (82%) of breast cancer were Hindus whereas 5 cases (10%) were Muslims and 4 (8%) cases were Sikh.

36 cases (72%) were from the rural area while rest of 14 cases (28%) was from urban areas.

49, i.e., 98% of the patients were married while only 1 (2%) female was unmarried.

Out of 48 patients in this study 10 patients had their menarche at the age of 12-13 years and 33 (68%) had their menarche at the age of 14-15 years. Menstruation had started by the age of 16 years in all the female patients.

It was observed that out of total 50 cases, 20 (41.66%) were still menstruating while 28 (58.3%) patients had attained their menopause.

Age of marriage in the patients studied varied from 12 to 35 years and majority, i.e., 44 (93%) females were married by the age of 21 years.

Age at first child birth in female patients in this study varied from 15 to 30 years and the majority is 37 cases out of 46 married females (80%) had their first child by the age of 21 years.

In this study 46 out of 47 married females were parous and only 1 patient was nulliparous. Maximum incidence was found in women with 3-4 children.

Lump in the breast was the most common symptom in this study and all the 50 cases presented with a lump in breast.

All the married parous females who had breast fed their children had malignancy.

In this study, only 10 patients (20%) had pain in their breast at some stage of presentation.

Out of total 50 cases, only 3 patients (6%) had nipple discharge as one of the complaints and nature of discharge was blood stained.

It was observed that majority of patients (42 patients) had a duration of symptoms up to 6 months.

In this study, 58% of cases, i.e., 29 patients had disease in their left breast whereas 42%, i.e., 21 cases had disease in the right breast.

It was noted that the most common histopathology component of the lump was infiltrating ductal carcinoma. And in 96% of cases, i.e., 48 cases it was scirrhus type, whereas papillary carcinoma and medullary carcinoma was seen in 2% cases each.

In this study, 90% of patients received radiotherapy after surgical treatment.

Only 6 patients (12%) received neoadjuvant therapy.

Out of total 32 cases (64%) received adjuvant chemotherapy and 46 cases, i.e., 92% of the patients received adjuvant hormonal therapy.

Most of the patients (92%) had their follow-up in first 6 months whereas only 2 patients did not show up for follow-up.

DISCUSSION

Breast cancer is one of the most common human malignancy and it accounts for 20% of all cancers. It is the second most common cancer in adult females. More than half of the cases in the world occur in developed countries. In India, breast cancer is the second most frequent cancer in females (19.3%). According to the latest statistics, over 10 million people will die annually by 2020.

Carcinoma of female breast is one of the most topical and controversial subjects in modern oncology. Surgery, radiotherapy, chemotherapy, and hormonal therapy comprise the standard available treatments and new therapeutic strategies, and experimental approaches are awaiting further clinical trials.

In this study, the age of the patients varied from 20 to 75 years. Highest incidence occurs in the age group of 40-50 years (40%). This corresponds to the findings of Dr. Berthold (1906) who observed that a disease occurred between the age 20 and 75 years with by far the greatest number developing between 40 and 50 years. In the study conducted by Tiwari *et al.*³ the mean age was 30-40 years.

Reddy and Reddy⁴ in their study of breast cancer in South India also reported that a maximum number of patients were in age group of 30-50 years. Similar observation was reported by Paymaster⁵ that average age was 45-59 years. Baruah⁶ also reported a higher incidence of breast cancer between 35 and 45 years of age.

Breast almost has immunity to carcinoma before the age of puberty, and most of the tumour occurs in women above the

age of 30 years. Chelonky⁷ in a review of literature reported only 2% cases below the age of 30 years till 1943, and he attributed this low incidence to delayed diagnosis of early lesions. In this study, only 1 case, i.e., 2% was found below the age group of 30 years, meaning there by that incidence of breast cancer below this age is very low although the total number of cases studied in this study was small.

Out of total 50 patients of carcinoma breast, only 2 (4%) were males. However, Tyagi⁸ in his study of 92 patients observed a much higher (6.4%) incidence of male breast cancer.

Cancer of male breast usually occurs at the older age as compared to females. In this study also for both male and female counterparts, 3-5th decade was the most common.

The study covering a total of 50 cases revealed that the majority, i.e., 82% of breast cancer cases happened to belong to Hindu community whereas remaining 18% of patients are divided between Muslim (10%) and Sikh (8%). A similar study reported by Paymaster in 1964 found that half of the cancer cases in Hindu women occur in the cervix and breast is barely affected in 14% cases. Reverse is the case of Parsi women where the breast cancer is prevalent in 50% cases and cervix in only 19% cases. The higher incidence of cancer cases in Hindu community can be attributed to their preponderance in community wise distribution in Jammu region.

The study also revealed that out of 50 patients, 49 were married. Dr. Berthold's study recorded that out of total cases 72% of women were married which is further sustained by Harnett's⁹ series of 2129 cases of breast cancer, only 22.1% of female patient were unmarried while 77.8% were married. Treves and Holleb¹⁰ study showed that only 18% of patients were single.

Out of 47 married females, only 1 patient was nulliparous.

CONCLUSION

A total of 50 patients with carcinoma breast were studied prospectively, and the incidence was studied in age, sex, marital status, parity, age at menarche and menopause, and various other variables. Diagnostic tools and treatment options were also studied. Observations were recorded and compared with those of other workers. Following conclusions were drawn from this study.

1. Majority of the patients were females (96%).
2. Maximum incidence was observed in 40-50 years age group (40%).
3. Majority of patients belong to Hindu community (82%).

4. 72% of patients were from rural areas.
5. Married patients account for 98% of the total patients studied.
6. 43 female patients (88%) attained menarche by the age of 14-15 years and all the patients had started menstruating by the age of 16 years.
7. 20 (41.66%) patients were in premenopausal age group while the rest (58.3%) was postmenopausal.
8. 44 (93.6%) had been married by the age of 21 years.
9. Most of the married females were parous (97.8%).
10. 88% of patients had given birth to the first child by the age of 21 years.
11. All the patients presented with a lump in the breast.
12. Pain was present as a symptom in only 10 (20%) patients.
13. Nipple discharge was seen in 6% of patients.
14. Duration of symptoms ranged from 1 month to 1 year, and average duration was up to 6 months in 42 (84%) patients.
15. Left breast was the seat of malignancy in 29(58%) of cases.
16. In 37 patients (74%), the lesion was seen in the upper and outer quadrant of the involved breast.
17. Nipple involvement was seen in 6 (12%) patients.
18. The growth was fixed to the skin in 15 (30%) of patients, while pectoralis major muscle fixation was present in 7 (14%) of cases.
19. Ipsilateral axillary lymph nodes were involved in 34 (68%) patients with no patients having contralateral; lymph node involvement.
20. FNAC confirmed the diagnosis in 44 (88%) patients and only 6 (12%) patients required excisional biopsy for confirmation of diagnosis.
21. 28 (56%) cases were in clinical Stage II and 60% belonged to Stage I-II. Only 2 patients have evidence of metastasis at the time of presentation (4%).
22. Surgery was the mainstay of treatment of patients in this study with modified radical mastectomy done for the majority of patients 38 (88%). Only 1 patient in Stage IV refused any surgical treatment.
23. On histopathological examination of breast specimen, scirrhous carcinoma was the most common component (94%) whereas papillary carcinoma was seen in 2% and medullary in 2% of cases.
24. 45 patients (95%) received radiotherapy after undergoing surgical treatment.
25. As adjuvant therapy 64% patients (mostly premenopausal) received chemotherapy and almost 92% received tamoxifen therapy.
26. 46 patients had their follow-up to 6 months.

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Pattern of Neonatal Dermatoses in Newborns of Intensive Care Unit in a Tertiary Care Hospital

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Abstract

Background: Neonates are presenting with various skin manifestations at birth or immediately after birth. Skin lesions in neonates can be physiological or pathological. Identification of physiological and pathological skin conditions with underlying associations helps in reassuring the parents or in the initiation of earlier interventions.

Aim of the Study: To find out the prevalence of various neonatal dermatoses in newborns of neonatal intensive care unit (NICU).

Materials and Methods: All the neonates (≤ 28 days after birth) with skin manifestations admitted in NICU were registered serially for the period of 1 year. The newborns were examined and the cutaneous signs and other associated manifestations were noted. Routine blood tests and other relevant investigations were done wherever necessary.

Results: During the study period of 1 year, 55 neonates were registered. Infections were the most common dermatosis observed in 14 (25.45%) cases, followed by transient neonatal dermatosis 13 (23.63%) cases and nevus and developmental disorders 9 (16.36%) cases. Skin rashes due to sepsis were the fourth common dermatosis observed in 8 (14.54%) cases. Genodermatoses were the fifth common skin disorder noted in 6 (10.90%) neonates. Keratinization disorders were seen in 5 (9.09%).

Conclusion: Skin infections were the most common dermatoses observed in this study and the risk of acquiring infectious dermatoses was more with prolonged hospitalization. Miliaria crystallina was the most common transient dermatosis observed in this study. The prevalence of transient neonatal pustular eruptions were less in newborns with comorbid conditions. Neonatal rashes were commonly associated with sepsis. Epidermolysis bullosa was the most common genodermatosis noted in this study. Piebaldism with natal teeth observed in our study have not been reported in the literature so far. Study on neonatal skin lesions and the associated pathological conditions will help in the management of newborn in NICUs.

Key words: Genodermatoses, Nevus, Neonatal rashes, Neonate, Transient dermatoses

INTRODUCTION

Neonates present with various skin manifestations at birth or immediately after birth. Skin lesions in neonates can be physiological or pathological. Neonatal dermatoses may occur as an isolated phenomenon or they may be associated with systemic manifestations. Identification of physiological and pathological skin conditions with

underlying associations helps in reassuring the parents or in the initiation of earlier interventions.

Aim of the Study

The aim of the study is to find out the prevalence of various neonatal dermatoses and the associated conditions and its clinical significance in neonates of neonatal intensive care unit (NICU).

MATERIALS AND METHODS

All the neonates (≤ 28 days after birth) with skin manifestations admitted in NICU were registered serially for the period of 1 year. The newborns were examined and the cutaneous signs and other associated manifestations

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were noted. The other relevant data such as age in terms of days, maturity, gender, birth weight, mode of delivery, and indication for admission in NICU were recorded. Routine blood tests and other relevant investigations were done wherever necessary. This study was approved by our Institutional Ethical Committee.

Statistical Analysis

The prevalence of various skin manifestations were calculated. The clinical significance of the prevalence of dermatoses and the association between some variables were analyzed. The data were entered in the Statistical Package for the Social Sciences (Version 20). Chi-square test was used for the analysis of relevant data. The $P < 0.05$ was considered as statistically significant.

RESULTS

During the study period of 1 year, 55 neonates were registered. Among them, 31 (56.36%) were male and 24 (43.63%) were female. Of the 55 neonates studied, 29 (52.72%) were in the early neonatal period (<7 days) and 26 (47.27%) were in late neonatal period (≥ 7 days). Among the study population, 4 (7.27%) were preterm and 51 (92.72%) were term neonates and their birth weights were appropriate for gestational age in 45 (81.81%) neonates and small for gestational age in 10 (18.18%) neonates. Single dermatological diagnosis was made in 46 (83.63%) neonates and multiple skin conditions were noted in 9 (16.36%) neonates (Table 1).

Infections were the most common dermatosis observed in 14 (25.45%) neonates in this study, followed by transient neonatal dermatosis in 13 (23.63%) and nevus and developmental disorders 9 (16.36%) neonates (Tables 2-4). Skin rashes due to underlying systemic pathology were the fourth common dermatosis observed in 8 (14.54%) neonates in this study. Genodermatoses were the fifth common skin disorder noted in 6 (10.90%) and Keratinization disorders were seen in 5 (9.09%) neonates (Table 3). The other dermatoses observed were ecchymoses 2 (3.63%), birth injuries 2 (3.63%), iatrogenic skin conditions 3 (5.45%), cyanosis of skin 1 (1.81%), diaper dermatitis 1 (1.81%), and subcutaneous fat necrosis of newborn in 1 (1.81%) (Tables 2 and 4).

The most common indications for NICU admission in newborns were birth asphyxia in 14 (25.45%) and sepsis in 13 (23.63%). The other indications were meconium aspiration in 4 (7.27%) newborns, respiratory distress due to causes other than birth asphyxia in 3 (5.45%), neonatal convulsion in 3 (5.45%), congenital heart disease in 2 (3.63%), preterm births in 2 (3.63%), low birth weight in 2 (3.63%), and excessive skin peeling in 2 (3.63%)

newborns (Table 5). The other less common indications were illustrated in Table 5.

DISCUSSION

Neonatal skin conditions are commonly physiological and these physiological skin changes have to be differentiated from pathological dermatoses. Some of the physiological skin changes in neonates which need to be identified are “erythema neonatorum” due to generalized hyperemia, “acrocyanosis” due to hypothermia, reticulated bluish vascular pattern called “cutis marmorata”, “physiological scaling of newborn” with superficial cutaneous desquamation, “sucking blisters” or erosions, “neonatal

Table 1: Maturity, age, sex, birth weight, mode of delivery, and number of diagnostic conditions-wise distribution of study population

| Distribution | Number of cases (%) |
|---------------------------|---------------------|
| Maturity | |
| Preterm | 4 (7.27) |
| Term | 51 (92.72) |
| Age (days) | |
| <7 | 29 (52.72) |
| ≥ 7 | 26 (47.27) |
| Gender | |
| Male | 31 (56.36) |
| Female | 24 (43.63) |
| Birth weight | |
| AGA | 45 (81.81) |
| SGA | 10 (18.18) |
| Mode of delivery | |
| Normal vaginal delivery | 38 (69.09) |
| LSCS | 17 (30.90) |
| Number of skin conditions | |
| Single dermatosis | 46 (83.63) |
| Multiple dermatoses | 9 (16.36) |

AGA: Appropriate for gestational age, SGA: Small for gestational age, LSCS: Lower segment caesarean section

Table 2: Infections and skin rashes

| Dermatoses | Number of cases (%) |
|------------------------------|---------------------|
| Infections | |
| Neonatal herpes | 1 (1.81) |
| Pyoderma | 8 (14.54) |
| Umbilical sepsis | 2 (3.63) |
| Ophthalmia neonatorum | 2 (3.63) |
| Oral thrush | 1 (1.81) |
| Total | 14 (25.45) |
| Pathological neonatal rashes | |
| Diffuse macular rash | 5 (9.09) |
| Purpuric rash | 2 (3.63) |
| Papulopustular rash | 1 (1.81) |
| Total | 8 (14.54) |
| Ecchymoses | |
| Ecchymoses over eyelids | 1 (1.81) |
| Hematoma right elbow | 1 (1.81) |
| Total | 2 (3.63) |

occipital alopecia” due to telogen hair shedding in occipital region, diffuse alopecia of the scalp called “telogen effluvium of newborn” because of synchronous hair shedding in neonatal period, “milia”, “sebaceous gland hyperplasia” due to maternal androgens, “miniature puberty” with enlarged genitalia and withdrawal bleeding

Table 3: Nevi, developmental disorders and genodermatoses

| Dermatoses | Number of case (%) |
|-----------------------------------|--------------------|
| Nevus and developmental disorders | |
| Nevoid hypermelanosis | 2 (3.63) |
| Congenital melanocytic nevus | 2 (3.63) |
| Nevus sebaceous | 2 (3.63) |
| Port-wine stain | 1 (1.81) |
| Cystic hygroma | 1 (1.81) |
| Café au lait macules | 1 (1.81) |
| Total | 9 (16.36) |
| Keratinization disorders | |
| Collodion membrane | 1 (1.81) |
| Congenital ichthyosis | 2 (3.63) |
| Keratinization disorder | 2 (3.63) |
| Total | 5 (9.09) |
| Genodermatoses | |
| Down's syndrome | 1 (1.81) |
| Epidermolysis bullosa | 3 (5.45) |
| Piebaldism, natal teeth | 1 (1.81) |
| Aplasia cutis | 1 (1.81) |
| Total | 6 (10.90) |

Table 4: Transient neonatal dermatoses/physiological, iatrogenic, and miscellaneous skin conditions

| Dermatoses | Number of cases (%) |
|--|---------------------|
| Transient neonatal dermatoses/physiological skin conditions | |
| Transient neonatal pustular melanosis | 2 (3.63) |
| Erythema toxicum neonatorum | 2 (3.63) |
| Miliaria crystallina | 5 (9.09) |
| Milia | 1 (1.81) |
| Cutis marmorata | 1 (1.81) |
| Sebaceous hyperplasia | 1 (1.81) |
| Neonatal acne | 1 (1.81) |
| Total | 13 (23.63) |
| Birth injuries | |
| Subgaleal hemorrhage | 1 (1.81) |
| Caput succedaneum | 1 (1.81) |
| Total | 2 (3.63) |
| Iatrogenic skin conditions | |
| Irritant contact dermatitis to antiseptic | 1 (1.81) |
| Ecchymotic discoloration of toes due oxygen monitoring probe | 1 (1.81) |
| Injuries due to adhesive tape application | 1 (1.81) |
| Total | 3 (5.45) |
| Miscellaneous skin conditions | |
| Extensive cyanosis of skin | 1 (1.81) |
| Diaper dermatitis | 1 (1.81) |
| Subcutaneous fat necrosis of newborn | 1 (1.81) |
| Total | 3 (5.45) |

per vagina due to maternal and placental hormones and “Epstein’s pearls” which are 1-2 mm keratinous cysts in the alveolar ridges and at the junction of hard and soft palate.

Physiological skin changes and transient dermatoses usually disappear in the neonatal period whereas the nevus and developmental disorders may persist into adult life. Some of the nevus, developmental defects and genodermatoses have underlying systemic involvement which needs to be identified and early intervention can be initiated in relevant cases. The neonatal skin is delicate and is more prone to develop infections and iatrogenic dermatoses.

The frequency of occurrence of various neonatal dermatoses differs worldwide. There are very few studies which have been conducted among the NICU neonates.

Among the neonatal dermatoses, benign transient neonatal dermatoses were the most common skin condition noted in various studies whereas infections were the common skin condition observed in this study.¹ Pyodermas were the common infectious skin condition in 8 (14.54%) neonates. Of these 8 neonates, 7 were in late neonatal period with hospital stay more than 1 week and this association was found to be statistically significant ($P = 0.13$). It indicates that the risk of hospital acquired skin infection is more with prolonged hospital stay. Infection of scalp skin and pressure sores in occiput with secondary bacterial infection were the commonly noted pyodermas in this study. The risk of pressure sores has to be considered in newborns with prolonged hospitalization. Pyoderma was commonly seen over the scalp skin in 4 out of 8 newborns in our study. This could be due to increased moisture in the hair-covered skin which would have facilitated the bacterial invasion. The other infectious dermatoses observed were umbilical sepsis 2, ophthalmia neonatorum 2, oral thrush 1, and neonatal herpes 1 (Figure 1).

Transient neonatal pustular eruptions were the most common transient dermatosis in most of the studies.¹ However, miliaria crystallina was the most common transient neonatal dermatosis observed in this study in 5 (9.09%) neonates. This could be because of the reason that our study was conducted in a tropical country where the temperature and humidity is more in the atmosphere. Transient pustular eruptions such as erythema toxicum neonatorum and transient neonatal pustular melanosis were seen in 2 (3.63%) cases each. The prevalence of erythema toxicum neonatorum and transient neonatal pustular melanosis were very less in our study when compared to the other studies where it was up to 50% and 4.4%, respectively.²⁻⁴

In these studies, the data were collected from healthy neonates whereas this study was conducted in hospitalized newborns. The other physiological and transient skin conditions noted were milia 1 (1.81%), sebaceous hyperplasia 1 (1.81%), cutis marmorata 1 (1.81%), and neonatal acne 1 (1.81%) (Figure 2).

The common nevus and nevoid dermatosis noted were nevoid hypermelanosis 2 (3.63%), congenital melanocytic nevus 2 (3.63%), and nevus sebaceous 2 (3.63%). The other nevoid conditions observed were extensive port wine stain with multiple segmental distribution 1 (1.81%), cystic hygroma 1 (1.81%) and café au lait macules 1 (1.81%) in this study. The neonates with extensive port wine stain and multiple café au lait macules need further follow-up to identify the associated syndromes (Figure 3).



Figure 1: (a) Neonatal herpes, (b) pressure sore in occiput, (c) umbilical sepsis, (d) ophthalmia neonatorum

Skin rashes with underlying sepsis were seen in 8 neonates (14.54%) in this study. Among the 8 neonates with rashes, 5 cases were diffuse erythematous macular rash, 2 cases were purpuric rashes, and 1 case was associated with papulopustular rash. Among these neonates with rashes, clinical or microbiological evidence for sepsis was present in 6 newborns and this association was found to be statistically significant ($P = 0.002$). Hence, the underlying sepsis could be suspected in the presence of skin rashes. Among the purpuric rashes, 1 newborn showed positive serology for cytomegalovirus infection and had hepatosplenomegaly and the other neonate with purpuric rash showed clinical features of sepsis and hemorrhagic disease of newborn.⁵ The newborn with papulopustular rash and purpuric necrosis of skin in a leg in the late neonatal period was associated with *Pseudomonas* septicemia. *Pseudomonas* septicemia could be a nosocomial infection in this neonate (Figure 4).

Blood culture showed *Staphylococcus epidermidis* growth in one case with macular rash. This could be a contaminant from the venipuncture site in some cases, as the most common bacteria colonizing the neonatal skin are *S. epidermidis*. However, our newborn had signs of sepsis and the rash had completely disappeared with intravenous vancomycin indicating that the invasive infection caused by *S. epidermidis* in the setting of poor immune status of newborn⁶ (Figure 4).

Epidermolysis bullosa was the common genodermatosis found in 5.45% cases in our study which was higher than study conducted by Shehab *et al.* where it was seen in 1.5% cases.¹ Natal teeth was noted with piebaldism in one neonate (Figure 5a). We were unable to find any previous



Figure 2: (a) Miliaria crystallina, (b) milia, (c) cutis marmorata, (d) acne neonatorum, (e) erythema toxicum neonatorum, (f) transient neonatal pustular melanosis

reports of piebaldism occurring with natal teeth in the literature. A case of Down's syndrome showed dry skin with excessive skin peeling at birth and the baby was not found to be postdated (Figure 5b). Aplasia cutis congenita in scalp was noted in one case.

Among the neonates with keratinization disorders, collodion membrane was seen in one newborn in our study (Figure 5c). Two cases of congenital ichthyosis showed excessive peeling of skin with fissures in flexures at birth (Figure 5d). Of these, one neonate presented with bilateral purulent conjunctivitis within 24 h of birth and the baby was treated as ophthalmic neonatorum. One of the newborn with keratinization disorder showed excessive hyperkeratosis all over the body along with excess vernix caseosa over the hyperkeratotic plaques. Hyperkeratosis was also noted in the palmo plantar skin, periorificial regions,

and lip mucosa suggestive of Olmsted syndrome (Figure 5e and f). Another preterm neonate had hyperkeratosis all over the body with excessive scaling, palm plantar hyperkeratosis with fissuring in both feet. These neonates have to be followed up to find out the type of keratinization disorder.

Ecchymoses was noted in 2 (3.63%) term neonates. One baby showed ecchymosis and bleeding over the upper eyelids and the other neonate showed ecchymoses in right elbow region (Figure 6a and b). Birth asphyxia was the indication for hospitalization in both neonates. The causes for bleeding tendency could be severe transient deficiency in Vitamin K-dependent clotting factors, congenital defects in blood coagulation such as thrombophilia's, fragility of superficial blood vessels, and disseminated intravascular coagulation due to asphyxia, hypoxia, acidosis, shock, or infection.⁷ Another two newborns with skin rash and sepsis showed erythema and purpuric rash over the eyelids. This could be due to fragility of blood vessels or the presence of thin skin and loose connective tissue over the eyelids which are clearly revealing the dilated dermal vessels in septicemia (Figure 6c and d).

Caput succedaneum and scalp swelling due to subgaleal hemorrhage were the two birth injuries (3.63%) observed in this study. In the case of caput succedaneum, the swelling was ecchymotic involving the occipital region near the vertex (Figure 7a).

Injury due to adhesive plaster application, irritant contact dermatitis to antiseptic applied over the venipuncture site, and purpuric discoloration of toes at the site of application of pulse oximeter probes were the 3 (5.45%) iatrogenic skin conditions noted in this study (Figure 7b-d). By repeatedly changing the position of pulse oximeter probes we can avoid pressure necrosis in the digits of newborn.

Central cyanosis was noted in one neonate admitted for birth asphyxia and convulsion without underlying cardiac

Table 5: Indications for NICU admission

| Indication for NICU admission | Total cases (%) |
|--|-----------------|
| Refusal of feed, fever and vesicular rash | 1 (1.81) |
| Congenital heart disease | 2 (3.63) |
| Birth asphyxia | 14 (25.45) |
| Meconium aspiration | 4 (7.27) |
| Preterm births | 2 (3.63) |
| LSCS delivery with various skin lesions | 8 (14.54) |
| SGA/LBW | 2 (3.63) |
| Respiratory distress | 3 (5.45) |
| Sepsis | 10 |
| Rash, hepatosplenomegaly, sepsis | 1 |
| Convulsion with sepsis | 2 |
| Total | 13 (23.63) |
| Convulsion with asphyxia (hypoxic ischemic encephalopathy) | 3 |
| Convulsion with hemorrhagic disease of newborn | 1 |
| Total | 4 (7.27) |
| Neonatal jaundice | 1 (1.81) |
| Microcephaly, rigidity of limbs and skin erosions | 1 (1.81) |
| Total | 55 |

NICU: Neonatal intensive care unit, AGA: Appropriate for gestational age, SGA: Small for gestational age, LSCS: Lower segment caesarean section, LBW: Low-birth-weight



Figure 3: (a) Nevoid hypermelanosis, (b) congenital melanocytic nevus, (c) congenital melanocytic nevus, (d) nevus sebaceous, (e) cafe au lait macules, (f) port-wine stain in segmental distribution, (g) extensive port-wine stain, (h) cystic hygroma



Figure 4: (a) Rash in *Staphylococcus epidermidis* septicaemia, (b) purpuric rash is sepsis with hemorrhagic disease of newborn, (c) papulopustular rash in *Pseudomonas* septicemia, (d) macular erythematous rash in sepsis



Figure 6: (a) Ecchymosis and hemorrhage over the eyelids, (b) ecchymosis of upper limb, (c) purpura over the eyelids in sepsis, (d) erythema over the eyelids in sepsis



Figure 5: (a) Piebaldism with natal teeth, (b) skin peeling and sandal gap toes in Down's syndrome, (c) collodion baby, (d) congenital ichthyosis, (e) plantar keratoderma, (f) periorificial keratoderma in Olmsted syndrome



Figure 7: (a) Caput succedaneum, (b) skin erosion due to plaster application, (c) irritant contact dermatitis induced by antiseptic, (d) bluish-gray discoloration of toes due to pulse oximeter probes

diseases. Cyanosis in this case might be induced by hypoxic encephalopathy and its complications.⁸

Diaper dermatitis was observed in a neonate in the second week of neonatal period. The incidence of primary irritant diaper dermatitis increases after 1 week which had been reported by some studies.⁹ Subcutaneous fat necrosis of newborn was noted on the fourth day of life in a neonate with birth asphyxia and convulsion. The lesions were larger and seen over the upper back. Asphyxia¹⁰ and mechanical pressure in the back were the factors responsible for its occurrence over the back and shoulders.

CONCLUSION

The frequency of occurrence of skin lesions varies in different studies conducted in newborns. Skin infections

were the most common dermatoses observed in this study when compared to transient dermatoses and the risk of acquiring infectious dermatoses was more with prolonged hospitalization. Miliaria crystallina was the most common transient dermatosis observed in this study which could be due to the increased temperature and moisture in neonatal nursing care units. The prevalence of transient neonatal pustular eruptions was less in newborns with comorbid conditions when compared to the data from healthy neonates. Neonatal rashes were commonly associated with sepsis and the association was found to be statistically significant. Hence, rashes in newborn could serve as a marker of underlying sepsis. Epidermolysis bullosa was the most common genodermatosis noted in this study. Piebaldism with natal teeth observed in our study have not been reported in the literature so far. Whether the presence of natal teeth with piebaldism in our case is

an incidental finding or it has any clinical significance is not known. Neonatal skin lesions may serve as a marker of associated systemic problems in many newborns. Hence, study on neonatal skin lesions and the associated pathological conditions will help in the management of newborn in NICUs.

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Comparative Study of Ropivacaine with Dexmedetomidine versus Ropivacaine Alone in Supraclavicular Brachial Plexus Block for Upper Limb Surgery

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Abstract

Background and Aims: Supraclavicular plexus block, as a regional anesthesia has taken over as principal technique for upper limb surgeries. Ropivacaine is long acting local anesthetic drug considered to produce less neurotoxicity and cardiotoxicity. Dexmedetomidine has been reported as an effective adjuvant for regional anesthetic agents. The present study was conducted to compare and evaluate the effectiveness of ropivacaine with dexmedetomidine versus ropivacaine alone in supraclavicular brachial plexus block for upper limb surgeries.

Materials and Methods: Sixty patients aged between 19 and 50 years with ASA grade 1 or 2 posted for elective upper limb orthopedic surgeries were included in the study and were randomly divided into 2 groups with 30 patients in each group. Group R: 0.75% ropivacaine (30 cc) and Group RD: 0.75% ropivacaine (30 cc) + dexmedetomidine 1 µg/kg. Both groups were compared for complete onset time and total duration of sensory blockade, complete onset time and total duration of motor blockade and total duration of analgesia.

Result: The mean onset time for a complete sensory block in Group R was 20.1 ± 1.62 min, in Group R + D was 17.6 ± 1.25 min ($P = 0.001$) and the mean onset time for complete motor block in Group R was 24.5 ± 1.48 min, and in Group R + D was 22.5 ± 1.50 min ($P = 0.00001$) which was statistically significant. The mean duration of sensory block in Group R was 561.0 ± 33.87 min and in Group R + D was 790.3 ± 41.23 min and the mean duration of motor block in Group R was 508.0 ± 17.89 min, and in Group R + D was 680.7 ± 69.38 min which was statistically significant ($P = 0.00001$). The mean duration of analgesia in Group R was 298.33 ± 70.36 min and in Group R + D was 406.17 ± 73.15 min which was statistically significant ($P = 0.00001$).

Conclusion: Dexmedetomidine as an adjuvant to ropivacaine in the supraclavicular brachial block for upper limb surgery significantly shortens the onset time for sensory and motor block and prolongs the duration of sensory and motor blocks with longer duration of post-operative analgesia.

Key words: Analgesia, Dexmedetomidine, Ropivacaine, Supraclavicular brachial plexus block, Upper limb surgeries

INTRODUCTION

Regional anesthesia is an important part of the anesthesiologist's armamentarium. Regional anesthesia is particularly indicated for patients undergoing peripheral

limb surgery because it provides effective intraoperative anesthesia and post-operative pain control. Brachial plexus block is a versatile and reliable regional anesthetic technique and a suitable alternative to general anesthesia for upper limb surgical procedures. Supraclavicular approach of brachial plexus block is the most commonly used approach and provides the most complete and reliable anesthesia for upper limb surgery. For brachial plexus block, a drug that has a fast onset, long duration and minimal toxicity could be an advantage. The quest for safer local anesthetics began toward the end of the 19th century. Ropivacaine is long acting local anesthetic drug belonging to amino amide group. They are pure S(-) enantiomer, unlike

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bupivacaine which is racemate. These S enantiomers are considered to produce less neurotoxicity and cardiotoxicity than racemic mixtures or the R-enantiomers of local anaesthetics.¹ Local anesthetics alone for supraclavicular brachial plexus block provide good operative conditions but have a shorter duration of post-operative analgesia. Hence, various drugs such as opioids,² clonidine,³ dexamethasone,⁴ midazolam,⁵ and magnesium⁶ were used as an adjuvant with local anesthetics in brachial plexus block. Recently, dexmedetomidine has been reported as an effective adjuvant for regional anesthetic agents to shorten the onset time of the block, prolong the duration of the block, and increase the quality of analgesia without neurologic sequelae. Mixing dexmedetomidine as an adjuvant with local anesthetics during peripheral nerve and nerve plexus blockade has recently been practiced by anesthesiologists.⁷ The present study was undertaken to compare analgesia and effectiveness regarding onset and duration of complete motor and sensory block of 0.75% ropivacaine alone versus 0.75% ropivacaine with dexmedetomidine in patients undergoing supraclavicular brachial plexus block.

MATERIALS AND METHODS

After obtaining Institutional Ethical Committee approval and written informed consent from the close relatives of the patients, 60 patients aged between 19 and 50 years with ASA grade 1 or 2 posted for elective upper limb orthopedic surgeries were included in the study. The study patients were randomly divided into 2 groups with 30 patients in each group.

Group R: 0.75% ropivacaine (30 cc)

Group RD: 0.75% ropivacaine (30 cc) + dexmedetomidine 1 µg/kg.

Inclusion Criteria

Normal adult patients of either sex, without any comorbidity, admitted for elective upper limb orthopedic surgeries.

1. Patient age: 19-50 years
2. ASA grade: 1 or 2
3. Weight: 50-70 kg
4. Duration of surgery: 2 h.

Exclusion Criteria

1. Infection at site of block
2. H/O any previous reaction to the local anesthetic
3. Patients with injury to any of nerves of the upper limb
4. Patient with hemorrhagic disorder
5. Patient below 19 or above 50 years
6. Pregnancy
7. Patient with a neurological disorder

8. Patients with alcohol abuse
9. H/O underlying cardiovascular, psychiatric disease, renal, or hepatic disease.

Preanesthetic assessment was done on evening before surgery. A routine examination was done by assessing general condition, nutritional status, weight, airway assessment, complete examination of cardiovascular, respiratory system, site of block, and investigation in all patients. All patients were kept electively nil per oral 6-8 h before surgery, and before operation patients were explained about the procedure and a written informed consent taken. Intravenous line secured. Standard monitors such as electrocardiogram, pulse oximeter, blood pressure cuff were applied, and patient's baseline parameter such as pulse, blood pressure, respiratory rate, and SPO₂ was recorded. All patients were premedicated with (on operation table):

- Injection glycopyrrolate 0.2 mg iv
- Injection ondansetron 4 mg iv
- Injection midazolam 1 mg iv.

For performing brachial plexus blockade through supraclavicular approach, the patients were placed in the dorsal recumbent position with the head turned away from the site of brachial block, under all aseptic and antiseptic precautions midclavicular point, external jugular vein, and subclavian artery pulsation were identified. About 1 cm above the midclavicular point just lateral to subclavian artery pulsation, a 23×11/2" G needle was introduced and directed caudal, downward, and medially toward the first rib until paraesthesia was noted along radial and ulnar distribution or motor response was elicited. Here, anesthetic solution is injected before every incremental dose negative aspiration for blood was performed to avoid any intravascular injection.

Immediately after block, patients were evaluated for the assessment of onset of sensory and motor blockade. Vitals were recorded before and after the procedure, at 5 min, and there after every 10 min till the end of the procedure and postoperatively at every 1 h till 7 h. If the block was considered to be adequate, surgeons were allowed to apply tourniquet and start the surgery. If the block was considered to be inadequate for surgery, the patient was given general anesthesia. Patients were monitored for nausea, vomiting, hypersensitivity reaction, any sign of cardiovascular or central nervous system toxicity, evidence of pneumothorax, hematoma, and post block neuropathy during the study.⁸

In post-operative period, when the patient complained of pain at the operative site, injection diclofenac sodium 1.5 mg/kg intravenously and the time for rescue analgesia noted (visual analog scale ≥4).

Definitions of Study Parameters

1. Onset of sensory complete block onset of sensory block was assessed by pin prick test, in areas innervated by radial, ulnar, and median nerve. Sensory block was graded as:
Grade 0 - Normal sensation to pin prick
Grade 1 - Dull response to pin prick (onset)
Grade 2 - No response to pin prick (peak).
Onset time of complete sensory block was defined as the time taken from the end of injection of study drug to the complete development of anesthesia in all three sensory nerve of the upper limb.
2. Onset of complete motor block onset of the complete motor block was the time from the end of injection of study drug to loss of motor power at the shoulders. Motor block at shoulder was assessed by asking the patient to hand raise above head with a movement of arm and forearm.
Bromage scale for motor block:
Grade 0 - Normal motor function (no effect)
Grade 1 - Decrease motor strength compared to contra lateral limb
Grade 2 - Complete motor block.
3. Duration of motor block: It is the time from the onset of motor block to complete recovery of motor block (able to hand raise above head with a movement of arm and forearm).
4. Duration of sensory block: It is the time from onset of sensory block to onset of pain at the surgical site with a pin prick.
5. Duration of analgesia: It is the time from onset of sensory blockade (grade 1) to pain at the surgical site. Tourniquet inflation and deflation time and duration of surgery were noted.

Both groups were compared for complete onset time and total duration of sensory blockade, complete onset time and total duration of motor blockade and total duration of analgesia. All the data were filled in pro forma and were statistically analyzed by Students' *t*-test and *P* value calculated by SPSS software and *P* < 0.05 was considered statistically significant.

RESULT

Table 1 summarizes demographic profile. There was no statistically significant difference between both groups of patients in terms of age, weight and male/female ratio (*P* > 0.05) (Table 1).

The mean onset time for a complete sensory block in Group R was 20.1 ± 1.62 min and in Group R + D was 17.6 ± 1.25 min the difference was statistically significant (*P* < 0.05, Table 2).

The mean onset time for a complete motor block in Group R was 24.5 ± 1.48 min and in Group R + D was 22.5 ± 1.50 min, the difference was statistically significant (*P* < 0.05, Table 3).

The mean duration of sensory block in Group R was 561.0 ± 33.87 min and in Group R + D was 790.3 ± 41.23 min, the difference was statistically significant (*P* < 0.05, Table 4).

The mean duration of motor block in Group R was 508.0 ± 17.89 min and in Group R + D was 680.7 ± 69.38 min, the difference was statistically significant (*P* < 0.05, Table 5).

Table 1: Mean demographic data in Group R and Group R+D

| Variable | Study group | | t-test | Significance |
|--------------------|-------------|-----------|--------|--------------|
| | Group R | Group R+D | | |
| | Mean±SD | Mean±SD | | |
| Age (years) | 29.9±8.62 | 29.3±8.61 | 0.792 | >0.05 |
| Weight (kg) | 64.07±4.88 | 63.8±4.81 | 0.834 | >0.05 |
| Gender (M/F) | 26/4 | 27/3 | | |
| ASA grading (I/II) | 4/26 | 3/27 | | |

SD: Standard deviation

Table 2: Comparison of complete onset time of sensory block in patients of Group R and Group R+D

| Variable | Study group | | t-test | Significance |
|--|-------------|-----------|--------|--------------|
| | Group R | Group R+D | | |
| | Mean±SD | Mean±SD | | |
| Onset of complete sensory block (in min) | 20.1±1.62 | 17.6±1.25 | 0.001 | <0.05 |

SD: Standard deviation

Table 3: Comparison of complete onset of motor block in patients of Group R and Group R + D

| Variable | Study group | | t-test | Significance |
|--|-------------|-----------|---------|--------------|
| | Group R | Group R+D | | |
| | Mean±SD | Mean±SD | | |
| Onset of complete motor block (in min) | 24.5±1.48 | 22.5±1.50 | 0.00001 | <0.05 |

SD: Standard deviation

Table 4: Comparison of mean duration of sensory block in patients of Group R and Group R+D

| Variable | Study group | | t-test | Significance |
|------------------------------------|-------------|-------------|---------|--------------|
| | Group R | Group R+D | | |
| | Mean±SD | Mean±SD | | |
| Duration of sensory block (in min) | 561.0±33.87 | 790.3±41.23 | 0.00001 | <0.05 |

SD: Standard deviation

The mean duration of analgesia in Group R was 298.33 ± 70.36 min and in Group R + D was 406.17 ± 73.15 min, the difference was statistically highly significant ($P < 0.05$, Table 6).

Figure 1 shows the changes in mean pulse rate at a different time interval (pre-operative and intraoperative). After applying *t*-test, the difference was statistically significant most of the time ($P < 0.05$).

Figure 2 shows the changes in mean systolic blood pressure at a different time interval (pre-operative and intraoperative). After applying *t*-test, the difference was statistically significant ($P < 0.05$).

Figure 3 shows the changes in mean diastolic blood pressure at a different time interval (pre-operative and intraoperative). After applying paired *t*-test, the difference was statistically significant ($P < 0.05$).

DISCUSSION

Regional anesthesia is practiced in most developing countries. Regional nerve blocks are based on the concept that pain is conveyed by nerve fibers, which are amenable to interruption anywhere along their pathway. Supraclavicular blocks are performed at the level of the brachial plexus trunks. As with other fields, regional anesthesia has undergone major developments both in technique and drugs availability. Gradually ropivacaine was introduced into clinical practice. Local anesthetics alone for supraclavicular brachial plexus block provide good

operative conditions but have a shorter duration of post-operative analgesia. Recently, dexmedetomidine has been reported as an effective adjuvant for regional anesthetic agents. On reviewing the literature, the present study was undertaken to compare analgesia and effectiveness regarding onset and duration of complete motor and a sensory block of 0.75% ropivacaine alone versus 0.75% ropivacaine with dexmedetomidine in patients undergoing supraclavicular brachial plexus block.

Onset of Complete Sensory Block

In our study, the mean onset time for a complete sensory block in Group R was 20.1 ± 1.62 min and in Group R + D was 17.6 ± 1.25 min ($P < 0.05$).

These results are comparable to other studies:

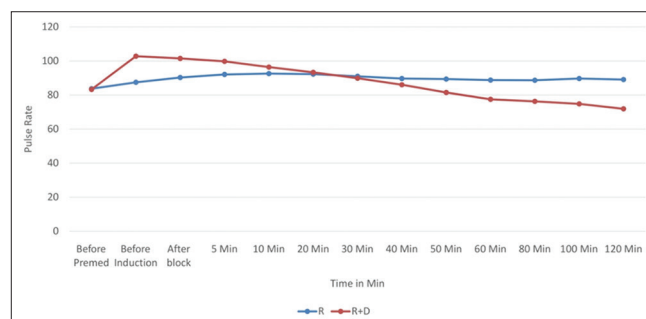


Figure 1: Comparison of perioperative mean pulse rate between the two groups

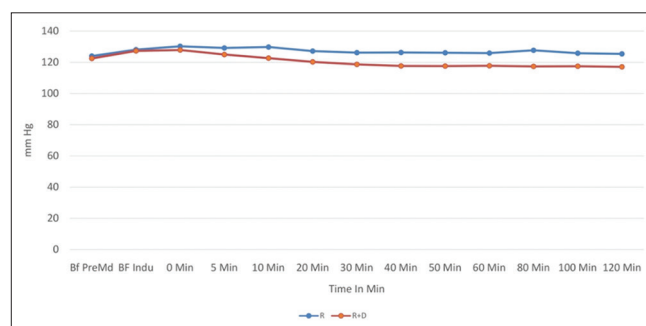


Figure 2: Comparison of perioperative mean systolic blood pressure between the two groups

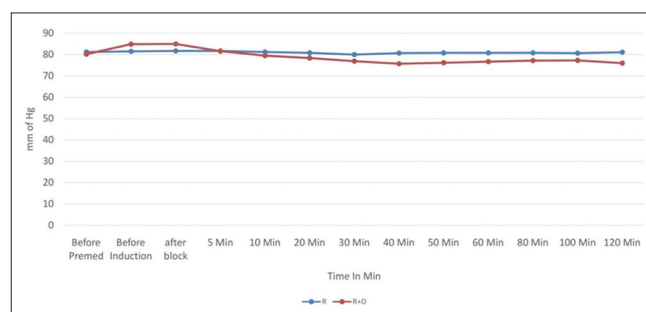


Figure 3: Comparison of perioperative mean diastolic blood pressure between the two groups.

Table 5: Comparison of duration of motor block in patients of Group R and Group R+D

| Variable | Study group | | t-test | Significance |
|----------------------------------|-------------|-------------|---------|--------------|
| | Group R | Group R+D | | |
| | Mean±SD | Mean±SD | | |
| Duration of motor block (in min) | 508.0±17.89 | 680.7±69.38 | 0.00001 | <0.05 |

SD: Standard deviation

Table 6: Comparison of duration of analgesia of patients in Group R and Group R+D

| Variable | Study group | | t-test | Significance |
|--|--------------|--------------|---------|--------------|
| | Group R | Group R+D | | |
| | Mean±SD | Mean±SD | | |
| Duration of rescue analgesia given (min) | 298.33±70.36 | 406.17±73.15 | 0.00001 | <0.05 |

SD: Standard deviation

Sudani *et al.*⁹ in their prospective, randomized and double-blinded study included total 60 patients of either sex with age between 18 and 60 years posted for various elective upper limb surgery and randomly allocated into two equal groups of 30 each. Control Group R received injection ropivacaine (0.75%) 30 ml plus 1 ml normal saline and Group RD received injection ropivacaine (0.75%) 30 ml plus dexmedetomidine 25 µg (1 ml) for supraclavicular brachial plexus block. The onset of sensory blockade was faster in Group RD than Group R. Onset of sensory block in Group R was 14.133 ± 1.676 min and in Group RD was 12.667 ± 1.213 min ($P < 0.001$).

Gurajala *et al.*¹⁰ assessed the influence of dexmedetomidine added to 0.5% ropivacaine on the characteristics of supraclavicular brachial plexus block. Patients were randomly allocated using a computer generated randomization sequence to receive either 35 mL of ropivacaine 0.5% with 0.5 mL of isotonic sodium chloride solution (Group R, $n = 18$) or 35 mL of ropivacaine 0.5% with 0.5 ml (50 µg) of dexmedetomidine (Group RD, $n = 18$). The onset of sensory blockade was faster in the RD group. However, there was no statistical significance ($P = 0.133$). The median onset time of a sensory block in Group R was 36 (20-45) min and 24 (15-30) min in Group RD.

Kwon Y, Hwang S, Lee J J *et al.*¹¹ studied sixty patients (ASA status 1 or 2, aged 20–65 years) undergoing wrist and hand surgery under supraclavicular Brachial plexus block were randomly allocated to two groups. Ultrasound-guided supraclavicular Brachial plexus block was performed with 40 ml of Ropivacaine 0.5% and 1 µg/kg of DEX (Group RD) or 0.01 ml/kg of normal saline (Group R). The median onset time of sensory block in Group RD was shorter (8.3 ± 4.4) than in Group R (13.0 ± 5.6).

Onset of Complete Motor Block

The data from our study reveals the mean time for onset of the complete motor blockade in Group R was 24.5 ± 1.48 min and in Group R + D was 22.5 ± 1.50 min ($P < 0.05$).

Sudani *et al.*⁹ their prospective, randomized and double-blinded study included total 60 patients of either sex with age between 18 and 60 years posted for various elective upper limb surgery and randomly allocated into two equal groups of 30 each. Control Group R received injection ropivacaine (0.75%) 30 ml plus 1 ml normal saline and Group RD received injection ropivacaine (0.75%) 30 ml plus dexmedetomidine 25 µg (1 ml) for supraclavicular brachial plexus block. The onset of motor blockade was faster in Group RD than Group R. Onset of motor block in Group R was 25.967 ± 2.748 min and in Group RD was 23.333 ± 3.467 min ($P < 0.05$).

Das *et al.*¹² studied a total of 84 patients (20-50 years) posted for elective forearm and hand surgery under supraclavicular brachial plexus block was divided into two equal groups (Group R and RD) in a randomized, double-blind fashion. In Group RD ($n = 42$) 30 ml 0.5% ropivacaine + 1 ml (100 µg) of dexmedetomidine and Group R ($n = 42$) 30 ml 0.5% ropivacaine + 1 ml normal saline were administered in supraclavicular block. Although with similar demographic profile they recruited 42 subjects per group, more than the calculated sample size. There were no dropouts. However, excluding subjects who failed blocks, 40 patients in the dexmedetomidine Group (RD) and 40 in the normal saline Group (R) were eligible for effective analysis. The difference in the number of valid blocks in the two groups was not statistically significant. In both groups, motor block in Group RD ($P = 0.40$) was earlier than Group R. Time taken to achieve motor blockade was 19.96 ± 1.28 min in Group RD while it was 20.26 ± 1.28 min in Group R.

Duration of Sensory Block

The data from our study reveals that duration of sensory blockade in Group R was 561.0 ± 33.87 min and in Group R + D was 790.3 ± 41.23 min ($P < 0.05$).

These results are comparable to other studies:

Nema *et al.*¹³ conducted study which was a single center, prospective, randomized, double-blinded trial, in 60 patients undergoing various elective forearm surgeries under brachial plexus block through supraclavicular approach. The patients were of ASA grade 1 and 2, of either sex, between 18 and 50 years of age were randomly divided into two equal groups of 30 patients. Group A ($n = 30$) received brachial plexus block with 30 ml ropivacaine (0.75%) and Group B ($n = 30$) received brachial plexus block with 29 ml ropivacaine (0.75%) + 1 ml dexmedetomidine (50 µg). The average duration of sensory blockade was 310.37 ± 66.359 min in Group A and 435.87 ± 102.309 min in Group B, respectively ($P < 0.05$).

Zhang *et al.*¹⁴ found similar results in their study of axillary brachial plexus block in 45 ASA I or II patients, aged 25-60 years who were scheduled for elective forearm and hand surgery. They randomly divided patients into three equal groups of Group DR1, 40 ml of 0.33% ropivacaine + 1 ml dexmedetomidine (50 µg), Group DR2, 40 ml of 0.33% ropivacaine + 1 ml dexmedetomidine (100 µg), and Group R 40 ml of 0.33% ropivacaine + 1 ml saline. The duration of sensory block was 689 ± 269 min, 804 ± 340 min, 1190 ± 456 min, respectively, in Group R, DR1, and DR2. In this study, the duration of sensory block was longer and statistically significant ($P < 0.05$) in Group DR2 when compared to Group R and DR1.

Duration of Motor Block

The data from our study, reveals that duration of motor blockade was longer in case of Group R + D (680.7 ± 69.38) compared to Group R (508.0 ± 17.89) ($P < 0.001$).

Bangera *et al.*¹⁵ studied a total of 80 patients belonging to ASA status I, II, and III, scheduled for elective forearm and/or hand surgeries were randomly allocated into one of the two groups to receive either 39 ml of 0.375% ropivacaine and 1 ml normal saline (Group R) or 39 ml of 0.375% ropivacaine and 1 µg/kg dexmedetomidine diluted to 1 ml with normal saline (Group RD), according to the group allocated by computer-generated random table. Duration of motor block in Group RD was 712.88 ± 89.32 min and in Group R was 526.25 ± 70.229 min and was clinically significant ($P < 0.0001$).

Duration of Analgesia

The data from our study reveals that mean duration of analgesia in Group R was 298.33 ± 70.36 min and in Group R + D was 406.17 ± 73.15 min ($P < 0.05$).

These results are comparable to other studies:

Gurajala *et al.*¹⁰ assessed the influence of dexmedetomidine added to 0.5% ropivacaine on the characteristics of supraclavicular brachial plexus block patients were randomly allocated using a computer-generated randomization sequence to receive either 35 mL of ropivacaine 0.5% with 0.5 mL of isotonic sodium chloride solution (Group R, $n = 18$), or 35 mL of ropivacaine 0.5% with 0.5 ml (50 µg) of dexmedetomidine (Group RD, $n = 18$). The mean duration of analgesia in Group R was 480 (420-570) min while in Group R + D it was 960 (820-1190) min ($P < 0.05$).

Bangera *et al.*¹⁵ studied a total of 80 patients belonging to ASA status I, II, and III, scheduled for elective forearm and/or hand surgeries were randomly allocated into one of the two groups to receive either 39 ml of 0.375% ropivacaine and 1 ml normal saline (Group R) or 39 ml of 0.375% ropivacaine and 1 µg/kg dexmedetomidine diluted to 1 ml with normal saline (Group RD), according to the group allocated by computer-generated random table. Duration of analgesia in Group RD was 764.38 ± 110.275 min and that in Group R was 576.88 ± 76.306 min and was clinically significant ($P < 0.0001$).

Hemodynamic Changes

In our study, blood pressure, heart rate, respiratory rate, and SPO₂ remained stable throughout the procedure and postoperatively as they did not differ clinically significant during the study period, but statistically, significant difference was observed in both groups, in heart rate and systolic blood pressure ($P < 0.05$).

Complications and Side Effects

There was no incidence of headache, nausea, vomiting, hypotension, bradycardia, chest pain, coughing, convulsion and respiratory depression, and procedure related complication. There was no CNS and CVS toxicity seen in either group in our study.

CONCLUSION

Dexmedetomidine as an adjuvant to ropivacaine in the supraclavicular brachial block for upper limb surgery significantly shortens the onset time for sensory and motor block and prolongs the duration of sensory and motor blocks with longer duration of post-operative analgesia, causes a decrease in need for rescue analgesia in patients with no side effects.

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Role of Intratympanic Dexamethasone Injection as a Treatment Choice in Patients with Immune-mediated Sensory Neural Hearing Loss - A Clinical Study

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Abstract

Background: Sensorineural hearing loss (SNHL) is not an uncommon condition encountered in ENT practice. Once developed in patients, it causes severe handicap that affects their job, family life, and social life. Therefore, once diagnosed the otologists should treat the disorder effectively to improve and/or even stabilize hearing.

Aim: To evaluate the role of intratympanic corticosteroids for the treatment of different types of SNHL.

Materials and Methods: A total of 68 patients with immune-mediated SNHL were subjected to intratympanic steroid injections under local anesthesia. Pre- and post-injection Audiological evaluation; pure tone average (PTA) was done to know the results.

Observations and Results: Hearing improvement with improved PTA of 26.20 dB by pure tone audiometry observed in 49.42% of the patients. Improved speech discrimination scores of 37.60% in 58.4% of patients.

Conclusion: In SNHL of immune-mediated pathogenesis intratympanic steroid injection remains a safe and effective tool in the armamentarium of an ENT surgeon.

Key words: Immune mediated, Intra tympanic, Dexamethasone, Hearing loss and Sensorineural

INTRODUCTION

Development of sensorineural hearing loss (SNHL) in subjects who had normal hearing, either sudden or insidious or rapidly progressing is alarming and has a devastating effect on their family and social lives. If it is sudden in onset should be considered as a medical emergency situation. The treating physician should consider appropriate diagnostic approach and initiate immediate measures to control or recover the lost acuity of hearing. According to Harris *et al.* from the physician's point of view after diagnosis SNHL is potentially treatable.¹ Review

of literature shows that most of the acquired SNHL is immune-mediated which was established with laboratory and clinical evidence.² Among the immune-mediated diseases of SNHL, the common is idiopathic sudden SNHL (ISSNHL), idiopathic progressive bilateral SNHL (IPBSNHL), and Meniere's disease.³ McCabe quoted that systemic steroids are effective in controlling the SNHL in immune-mediated diseases.⁴ However, the systemic use of steroids is fraught with systemic complications such as diabetes, gastrointestinal tract bleeding, osteoporosis, hypertension, or avascular necrosis of the head of the femur especially if patients are predisposed or have a milder form of the disease; Shea.⁵ Receptors of glucocorticoid were identified by Pitovski *et al.*⁶ and Curtis⁷ in various animal models by the former and in human cadavers by the later. The receptors were identified in the cochlear as well as labyrinth tissues with the highest concentration in the spiral ligament. Dexamethasone passes through round window membrane after being left in contact with the round window membrane for 3 h, and its concentration was

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appreciable in both the basal and apical turns of cochlear and labyrinth.^{8,9} They also noted that the concentration of dexamethasone was higher in the inner ear fluids when administered intratympanic route than a systemic route.^{8,9}

MATERIALS AND METHODS

Aim of the Study

The aim of the study was to evaluate the role of intratympanic administration of dexamethasone for the treatment of patients with primary immune-mediated SNHL.

Study Period

The study was conducted from December 2016 –to July 2017.

Institute OS Study

Owaisi Hospital and Research centre attached to Deccan College of Medical Sciences, Hyderabad.

68 patients' attending the OPD of the Department of ENT and diagnosed as ISSNHL, IPBSNHL or Meniere's diseases were included in the study. Ethical Committee Clearance was obtained before the commencement of the study. An Ethical Committee approved consent form was used for obtaining the consent from all the participants of the study.

Inclusion Criteria

1. Patients aged above 25 years and below 55 years were included.
2. Patients with immune-related SNHL were included.
3. Patients with the diagnosis of ISSNHL, IPBSNHL, or Meniere's diseases were included.

Exclusion Criteria

1. Patients below 25 years and above 55 years were excluded.
2. Patients with diabetes, hypertension and thyroid and other endocrine disorders were excluded.
3. Patients with cervical spondylosis were excluded.
4. Patients on recent treatment with vestibular sedatives were excluded.
5. Patients in the acute phase of Meniere's disease were excluded.

All the patients were elicited of the history of onset, progression and actual status of hearing loss. A thorough clinical examination of ear, nose, and throat was performed to exclude associated ENT diseases. Audiological evaluation was done to record the pure tone average (PTA) on pure tone audiometry and speech discrimination score (SDS) on speech audiometry. A loss of more than 30 dB of hearing on pure tone audiometry on consecutive three audiograms

within consecutive 3 days was defined as sudden loss of hearing. Advanced evaluation of patients with magnetic resonance imaging to exclude retrocochlear lesions, tympanometry, otoacoustic emissions, and auditory brain stem response tests were done on tests for autoimmune ear diseases. Pre-treatment counseling of patients was done alleviate the fear of complications and explain the possible side effects of intratympanic dexamethasone injections. Intra-tympanic 12 mg dexamethasone (0.5 ml of 24 mg/ml) was injected through the tympanic membrane of the patients lying in the supine position in the operation theater ambience. The patients are asked to remain without changing the position of the head for 30 min so as to allow dexamethasone to diffuse through the round window niche to the inner ear. Local anesthesia was obtained before injection by glycerin phenol 20%. A small opening in the anterior part of the drum was made to allow air to escape while injecting the drug. The procedure was repeated every 3rd day for 3 times. Post-treatment Audiological evaluation using PTA and SDS were done in all patients after 1 week after the completion of the three injections. All data were tabulated and statistically analyzed using SPSS software for windows.

OBSERVATIONS AND RESULTS

A total of 68 patients were included in this study with the definite diagnosis of immune related SNHL (ISSNHL, IPBSNHL, or Meniere's diseases). Among the 68 patients 23 were diagnosed with ISSNHL, 28 with IPBSNHL 37 were males, and 31 were females and the remaining 17 with Meniere's disease. Among the 68 patients, 37 were males, and 31 were females. The male to female ratio was 1.9:1 among the SNHL patients. In ISSNHL group (23) the males were 14 and females were 09. In the IPBSNHL group (28) males were 18 and females were 10. In the Meniere's disease group (17) males were 8 and females were 11. The mean age and standard deviations (SD) of patients of all the three groups in this study are shown in Table 1. Patient's age group among the total SNHL (68) patients ranged from 26 years to 57 years with a mean age of 36.42 ± 2.30 . Similarly, the mean age of sub groups is shown in Table 1. Mean values of age groups were compared among the sub groups using analysis of variance and found to be having no significant difference in the age or sex between the three groups (Table 1).

Comparison between pre-treatment and post-treatment Audiological evaluation in ISSNHL group showed improvement in PTA of 13 out of the 23 (56.52%) patients. The auditory gain among these patients was 39.64 dB. In IBPSNHL group showed improvement in PTA of 15 out of the 28 (53.57%) patients. The auditory gain among these

patients was 43.90 dB. In Meniere's disease 11/17 (64.70%) patients showed improvement. The auditory gain among these patients was 43.60 dB (Table 2).

The SDS results showed improvement in 14/23 (60.86%) of ISSNHL patients. The SDS gain in this group was 33.86%. 17/28 (60.71%) of IPBSNHL patients showed improvement. The SDS score improvement in IPBSNHL was 32.05%. In Meniere's group, 12/17 (70.58%) of patients showed improvement. The SDS gain was 26.89% (Table 3). The correlation between SDS and PTA results in the three patient groups as a whole and both IPBSNHL and Meniere's disease groups proved to be significant (Table 3).

DISCUSSION

Various treatment modalities are described in literature to treat patients with immune-related SNHL such as using vasodilators nicotine, papaverine, micro vasodilators betahistine hydrochloride, platelet adhesion inhibitors (dipyridamole), inhalation of carbogen, low molecular weight heparin, and systemic steroids. Intratympanic steroid injection was described and in vogue for the past one and half decades by various authors worldwide. It is an

easy and effective outpatient procedure for the treatment of Meniere's disease, ISSNHL, and IPBSNHL to avoid the side effects of systemic corticosteroids. In the present study was conducted to review the results by various authors and to establish a definite protocol in the Hospital for the management of SNHL. This study is in agreement with the protocol of Hamid.¹⁰ The author reported 90% recovery in auditory gain in his study followed up over a period of 4 years, especially in SDS scores. A new advancement in the drug delivery of dexamethasone at the round window membrane was shown by a study conducted by Li *et al.*¹¹ He demonstrated that intratympanic dexamethasone perfusion by an external electronic pump with gelatin sponge placement in a round window niche is an efficacious and safe method for the treatment of ISSNHL, showing superiority to simple injection through the drum. However, the study by Garavello *et al.*¹² reported intratympanic steroid therapy seems to confer only a certain degree of benefit as salvage but not as a primary treatment of sudden deafness. This report is actually in contradiction to results of this study that proved intratympanic dexamethasone injection was an effective primary therapy probably because of inclusion criteria used. The gain in PTA values in this study demonstrates a significant therapeutic action of the short-duration intratympanic dexamethasone therapy on moderate to severe immune-mediated SNHL. Filipo *et al.* concluded his study with similar results of auditory gain.¹³

Table 1: The gender incidence, mean age and SD (n=68)

| Observation | Males | Females | Mean age | SD |
|----------------|-------|---------|----------|------|
| ISSNHL - 23 | 14 | 09 | 33.28 | 1.80 |
| IPBSNHL - 28 | 18 | 10 | 35.64 | 2.34 |
| Meniere's - 17 | 08 | 11 | 34.80 | 2.86 |
| Total - 68 | 37 | 31 | 36.42 | 2.30 |

SD: Standard deviation

Table 2: The PTA results before and after treatment (n=68)

| Observation | Mean PTA before treatment | Mean PTA after treatment | Mean auditory gain in dB |
|----------------|---------------------------|--------------------------|--------------------------|
| ISSNHL - 23 | 72.24±2.50 | 32.60±1.09 | 39.64 |
| IPBSNHL - 28 | 74.40±1.20 | 30.50±1.08 | 43.90 |
| Meniere's - 17 | 76.30±1.90 | 32.70±1.34 | 43.60 |
| Total - 68 | 70.31±1.86 | 31.93±1.17 | 38.38 |

PTA: Pure tone average

Table 3: The SDS results before and after treatment (n=68)

| Observation | Mean SDS score before treatment-% | Mean SDS score after treatment-% | Mean SDS gain % |
|----------------|-----------------------------------|----------------------------------|-----------------|
| ISSNHL - 23 | 42.44 | 76.30 | 33.86 |
| IPBSNHL - 28 | 46.20 | 78.25 | 32.05 |
| Meniere's - 17 | 48.50 | 72.60 | 26.89 |
| Total - 68 | 45.71 | 75.71 | 30.60 |

SDS: Speech discrimination score

CONCLUSIONS

Intratympanic dexamethasone injection in the treatment of immune-mediated SNHL is an effective, easy office procedure performed under local anesthesia. It is cost effective with minimal or no side effects. If started at the earliest after the onset of symptoms could be proved as an optimal choice in the management of SNHL disorders.

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Assessment of Impacted Third Molar in Relation to Inferior Alveolar Canal: A Cross-Sectional Study to Compare Radiographic Precision of Intraoral Periapical Radiograph and Panoramic Radiograph in Relation to Cone Beam Computed Tomography

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Abstract

Introduction: Extraction of impacted third molar is a routine procedure in oral and maxillofacial surgery, either for prophylactic or for symptomatic reasons.

Objective: To compare the accuracy of intraoral periapical radiograph (IOPAR) and panoramic radiograph with that of cone beam computed tomography (CBCT) for determining the proximity of impacted lower third molar with mandibular canal.

Materials and Methods: The present study consisted of 20 participants, in age group of 20 years and above with impacted mandibular third molar visiting the department of Oral surgery, D.J. College of Dental Science and Research (DJCDSR), Modinagar, Uttar Pradesh. Relationship of impacted mandibular third molar with the mandibular canal was assessed using IOPAR and panoramic radiographic signs and CBCT findings. The seven radiographic signs, i.e., darkening of root, deflection of root, narrowing of root, dark and bifid root, interruption of white line of canal, diversion of canal, narrowing of canal on both IOPAR, and PANORAMIC Radiographic, were correlated for the proximity and involvement with CBCT findings for the same.

Results: After evaluation of seven radiographic signs seen in IOPARs with CBCT result states that darkening of root ($P = 0.025$), diversion of canal ($P = 0.022$), and interruption of white line of canal ($P = 0.021$) have significant value ($P < 0.05$) according to Pearson's chi-squared whereas only two panoramic radiographic signs, i.e., darkening of root ($P = 0.022$) and interruption of white line of canal ($P = 0.026$) have significant value.

Conclusion: This study showed the poor reliability of panoramic radiographic signs than IOPAR in predicting the proximity of mandibular third molar root with mandibular canal related to CBCT finding. Radiographic signs of IOPAR reliability with CBCT findings are found to be more precise and accurate as per for future prospects.

Key words: Cone beam computed tomography, Intra oral periapical radiograph, Orthopantomogram

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INTRODUCTION

Extraction of impacted third molar is a routine procedure in oral and maxillofacial surgery, either for prophylactic or for symptomatic reasons. Damage to the inferior alveolar nerve during mandibular third molar extraction surgery is a significant and one of the complications, which can result in postoperative paresthesia in patients. The incidence

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of inferior alveolar nerve paresthesia following surgery is reported to be between 0.4% and 8%. Permanent paresthesia may lead to functional deficits and a decreased quality of life.^{1,2} The inferior alveolar nerve can be injured directly by surgical instruments such as burs that are used for guttering, during unfavorable movements of the third molar roots during luxation of the tooth in apical, buccal, or lingual directions.³⁻⁵ To optimize surgical planning and avoid complications, precise identification of the mandibular canal is important. Both intraoral periapical radiograph (IOPAR) and panoramic radiograph are widely used techniques. Various radiographic markers are present in IOPAR and panoramic radiographs indicating close relationship between the third molar with the mandibular canal, for example, darkening of root, deflection of root, narrowing of root, bifid root apex, diversion of canal, narrowing of canal, and interruption of white line.^{6,7} IOPAR is a cost-effective and an easy technique to perform. However, there are some artifact problems such as elongation, shortening, and cone cut of lower third molar due to faulty angulation.⁸ Advancement of dental radiology includes the addition of panoramic radiology along with IOPAR. However, the buccolingual relationship between the inferior alveolar canal (IAC) and the third molar cannot be evaluated.⁹ It has certain disadvantages such as higher radiation dose, greater cost, image magnification, and reduced image resolution.⁸ Recently, cone beam computed tomography (CBCT) has been introduced as a valuable diagnostic method. It has been suggested for examination of the mandibular third molars as it provides detailed information about the position and course of the mandibular canal.⁵ As CBCT is a relatively new imaging technique and also various literature is available concerning its diagnostic value. Hence, CBCT is used as a gold standard concerning with its diagnostic value. Hence, the study aimed to compare the radiographic diagnostic resemblance in between IOPAR and panoramic radiograph considering CBCT as “gold standard” which predicts inferior alveolar nerve exposure and the buccolingual position of the third molar in relation to the mandibular canal.

MATERIALS AND METHODS

Source of Data

The study group consisted of 20 patients of either sex in the age group of 20 years or above with impacted mandibular third molar. The study participants were selected from out patients attending the Department of Oral and Maxillofacial Surgery, D.J. College of Dental Science and Research (DJCDSR), Niwari road, Modinagar, Uttar Pradesh from December 2013 to August 2015. Inclusion criteria include -Individuals with impacted mandibular third molar, good quality IOPAR showing

close relationship between root apices of an impacted mandibular third molars and mandibular canal. Whereas patients are not willing to undergo panoramic radiograph or CBCT imaging, radiograph showing displacement of the root due to pathology, such as cyst or tumor, patient with systemic diseases, and pregnant lady patients were the exclusion criteria.

Methodology - Imaging Modality

1. For IOPAR: The patient was prepared under all radiographic safety precautions. For paralleling technique, intraoral periapical Kodak ekta speed film was used. The film was centered over the impacted mandibular third molar. An X-ray exposure was made with 70 kvp, 10 mA, and 0.7 s parameters.
2. For Panoramic Radiographs: Following the IOPAR, patient was prepared for panoramic radiographic procedure under all radiographic safety precautions. The panoramic radiograph was taken using a Proline XC unit (Planmeca, Helsinki, Finland) with a 15 cm ×30 cm photostimulable phosphor receptor. An X-ray exposure parameter of 73 kv, 12 mA, and 13.9 s. was used.
3. For CBCT: The CBCT mandibular scans were acquired using Planmeca Romexis® device (Planmeca system, Finland) operated at 90 kV and 10mA; scans were completed within 15 s, after scanning contiguous sectional images in three directions, cross section, and horizontal section were reconstructed with a slice width of 400 µm.

Evaluation of IOPAR and Panoramic Radiographic Images

Both radiographs were evaluated with adequate light. The presence or absence of the seven radiographic signs was evaluated in the IOPAR and panoramic radiograph. The evaluations of both images were done for the presence and absence of seven radiographic signs accordingly.

Evaluation of CBCT Images

CBCT images were evaluated in the sagittal sections to establish if the cortical layer of the mandibular canal between the third molar and inferior alveolar nerve was still intact. The position of the mandibular canal with respect to the mandibular third molar root apex at the point of closet contact was also evaluated as buccal, lingual, between the roots and inferior. The evaluation of the CBCT images was done for the absence and presence of above-mentioned parameters.

After brief evaluation of IOPAR and panoramic radiograph images of impacted mandibular third molar and mandibular canal, seven radiographic signs were correlated and confirmed by CBCT radiographic interpretation which was used as “Gold Standard” in this study. Final data provided

confirmance about presence or absence of seven radiographic signs in between IOPAR and panoramic radiograph.

Statistical Analysis

Statistical analysis of data was done using “Pearson’s Chi-squared test” to determine whether there is a significant association between the two variables.

RESULT

In the present study, out of 20 patients 12 were male (60.0%) and 8 patients were female (40.00%).

Result of the Seven Radiological Signs as Seen in IOPAR and CBCT

- IOPAR findings shows that darkening of root was present in 12 cases (60%), deflected root in 08 (40%), narrowing of the root in 8 (40%), dark and bifid root in 11 (55%), diversion of the IAC in 10 (50%), narrowing of the IAC in 12 (60%), and interruption of the white line in 11 (55%) cases.
- CBCT findings shows that darkening of root was present in 18 cases (90%), deflected root in 7 (35%), narrowing of the root in 7 (35%), dark and bifid root in 13 (65%), diversion of the IAC in 17 (85%), narrowing of the IAC in 13 (65%), interruption of the white line in 17 (85%) cases.

Statistical data show that out of seven radiographic signs, three signs, i.e., darkening of root ($P = 0.025$), diversion of canal ($P = 0.022$), and interruption of white lines ($P = 0.021$) were significant.

Result of the Seven Radiological Signs as Seen in Panoramic Radiographs and Cone CBCT

- Panoramic radiographic finding shows that darkening of root was present in 11 cases (55%), deflected root in 3 (15%), narrowing of the root in 3 (15%), dark and bifid root in 10 (50%), diversion of the IAC in 12 (60%), narrowing of the IAC in 11 (55%), interruption of the white line in 10 (50%) cases.
- CBCT findings shows that darkening of root was present in 18 cases (90%), deflected root in 7 (35%), narrowing of the root in 7 (35%), dark and bifid root in 13 (65%), diversion of the IAC in 17 (85%), narrowing of the IAC in 13 (65%), interruption of the white line in 17 (85%) cases.

Statistical data show that out of seven radiographic signs, two signs, i.e., darkening of root ($P = 0.022$) and interruption of white lines ($P = 0.026$) were significant.

Additional CBCT findings shows that mandibular canal was present on buccal side in five cases (25%), on lingual

8 (40%), on inferior 16 (80%), in between roots 2 (10%) cases. In addition, found presence of cortication in 9 (45%) and absence of cortication in 14 (70%) cases (Figure 1-3) and (Graphs 1, 2).

DISCUSSION

Injury to inferior alveolar nerve during mandibular third molar removal is a serious complication. The reported incidence of inferior alveolar nerve injuries is range from 3.3% to 13% for temporary damage and 0.2-1% for permanent damage during third molar removal.³ Therefore to protect the nerve from damage during surgery, it is important to evaluate the topographic relationship between the mandibular canal and impacted third molar teeth. The IOPAR and panoramic radiograph are the most common imaging modality used to view impacted mandibular third molars and to assess the risk of inferior alveolar nerve injury. According to those studies, darkening of the root, interruption of the canal wall, diversion of the canal, narrowing of the root, deflected root, narrowing of the canal, and dark and bifid root were reported to indicate a close relationship between the third molar root and inferior alveolar nerve.

According to Nagaraj and Chitre, darkening of the root (65.5%) and interruption of the white line (58.0%) of the mandibular canal were observed with maximum number of percentage. Both radiographic signs were found to be most significant related to inferior alveolar nerve damage.¹⁰ According to Sinha and Pai, darkening of root and interruption of white lines on IOPAR strongly related with the absence of corticalization on CBCT findings. On contrary, patients presented with the diversion and narrowing of the canal on IOPAR showed the presence of corticalization on CBCT.⁸

In our study, we observed that darkening of the root (60%), interruption of the white line (55%) and diversion of mandibular canal (50%) are present on IOPAR with their maximum number of percentage. They are found to be significant with CBCT radiographic signs. In addition, strong relation between presence (45%) and absence (70%) of corticalization are found.

Bell reported that panoramic radiography has relatively poor diagnostic accuracy when used to examine anatomical forms and structures. There was an intimate relation between the mandibular third molar and the inferior alveolar nerve in 51% of the cases when darkening of root was observed and in only 11% of the cases when interruption of the radiopaque outline of the inferior alveolar neurovascular bundle was observed. Only 25%

surgeons consider panoramic radiographs adequate for surgery, whereas 61% of the surgeons considered CBCT scan as the ideal imaging modality.⁹

Total 20 impacted mandibular third molar teeth were included in this study, and the incidences of the signs were studied. Darkening of root and narrowing of canal were seen in 55%, interruption of white line and dark-bifid root were seen in 50% of the cases, divergence of mandibular canal was present in 60% of the cases, narrowing of the root, and deflection of root were seen with lowest incidence of 15% of the cases. In our study, darkening of root and interruption



Figure 1: Shows darkening, deflection of root, interruption of white line, narrowing, and diversion of canal

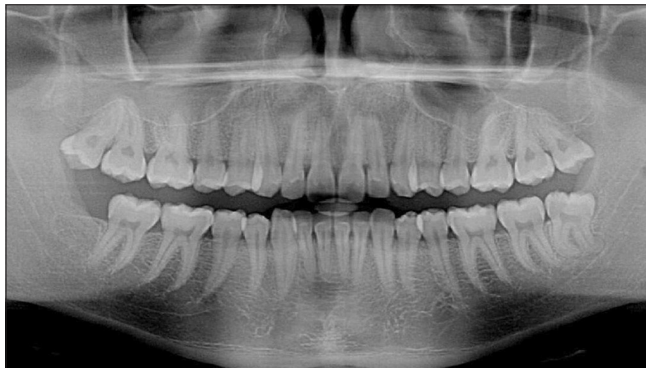


Figure 2: Shows darkening, deflection of root, and interruption of white line and narrowing of canal

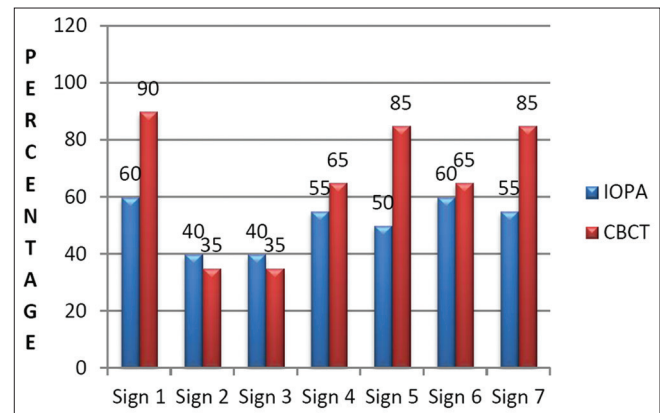


Figure 3: Cone beam computerized tomography coronal cross-sectional view showing presence of corticalization

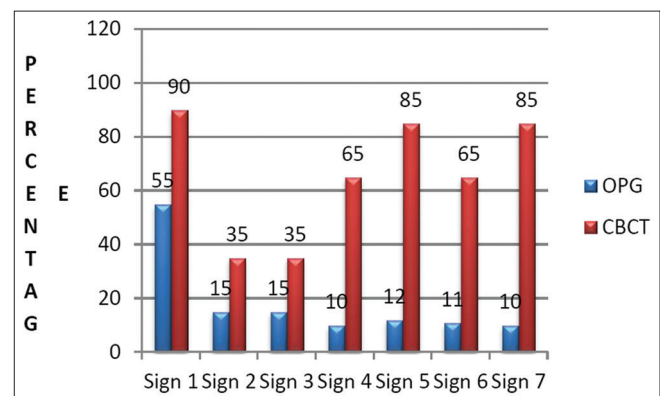
of white line were most significant which is similar to Rood and Nyssen criteria.¹¹ Deflected root, narrowing of root, dark and bifid root, divergent of canal, narrowing of canal, dark and bifid root were non-significant signs in our study. According to Bell,⁹ the incidence of darkening of root and interruption of white line were most common which is similar finding in our study in addition with diversion of canal. Other signs were very few in number.

Diagnostic radiology has undergone changes in the past 10 years. CBCT is an important development in the dental radiology. The advantages of CBCT-based systems include uniform magnification, a high-contrast image with a well-defined image layer free of blurring multiplanar views, three dimensional reconstructions, and the availability of software for image analysis.¹²

According to Weeraya and Ghaeminia, CBCT is significantly superior to panoramic images in predicting neurovascular exposure during extraction of impacted third molar and CBCT is significantly superior to panoramic images in both sensitivity and specificity. In a study by Maria Eugenia Guerrero, inferior alveolar nerve exposure at surgery was correctly predicted in 56% of



Graph 1: Comparison of radiographic signs seen in intraoral periapical radiograph and cone beam computed tomography



Graph 2: Comparison of radiographic signs seen in panoramic radiograph and cone beam computed tomography

cases using CBCT compared with 35% using panoramic radiography.¹³

In the present study, we used CBCT to evaluate the IOPAR and panoramic findings in cases where the third molar root apices were in proximity to mandibular canal with high probability of inferior alveolar nerve injury. The radiological signs in the IOPAR and panoramic radiograph most commonly associated with contact were darkening of root and interruption of white line. In our study, evaluation of CBCT revealed that the nerve was placed inferiorly in 80% of the cases followed by lingual in 40%, buccal in 25%, and between the roots in 10% of the cases.

Some studies have also revealed that the nerve may be positioned inferiorly, more than buccally or lingually. This result too was in agreement with other studies and also exposure of the inferior alveolar nerve at the time of surgical procedure frequently occurred under this conditions.³ Cortical integrity is an important predictor of paresthesia after third molar paresthesia. Various studies have proven increased incidence of inferior alveolar nerve injury and post-operative paresthesia in cases with cortical disruption seen on CBCT.¹⁴

Out of the 20 impacted mandibular third molar teeth, about 70% of them had interruption of cortical layer of the mandibular canal in the present study. Monaco investigated the relationship between the presence of Rood's criteria (interruption of the white line of the IAC, narrowing of the canal, deflection of the roots, darkness of the roots, diversion of the IAC, narrowing of the roots, and dark and bifid apex) and CT findings, and found that absence of cortication occurred in 50-80%.¹⁵ This is consistent with the current study.

In this study, we found that radiographic signs which are responsible for inferior alveolar nerve damage (i.e., darkening of the root, interruption of white lines, narrowing, and diversion of canal) present with higher percentage in IOPAR than panoramic radiograph.

CONCLUSION

The results of this study show that IOPAR has better advantage than panoramic radiograph in visualizing the correct relationship of the impacted mandibular third molar with that of inferior alveolar nerve to the tooth structure. Study concluded that both IOPAR and panoramic radiograph can be used for evaluating risk of

nerve damage along with closeness of impacted mandibular with that of impacted mandibular third molar. In addition, we can recommend a CBCT when a radiological evidence of nerve root relationship exists in IOPAR and panoramic radiograph to minimize injury to the inferior alveolar nerve during removal of impacted third molars.

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Comparative Evaluation of Antimicrobial Efficacy of Three Irrigating Solutions for Root Canal Treatment - An *In Vitro* Study

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Abstract

Background: Complete elimination of microorganisms from root canal system is one of the most important objectives in endodontic therapy. This cannot be achieved until all the pulp tissue, and bacteria's present in dentinal tubules have been removed. Use of irrigating solution plays an important role in cleaning and shaping of the root canal. Sodium hypochlorite along with various other irritants has been used successfully in the removal of debris and killing microorganisms.

Aims and Objectives: To compare the antimicrobial efficacy of three different type of irrigating solutions.

Materials and Methods: Twenty-three pairs of extracted single-rooted teeth were taken for the study. Crown was removed till cemento-enamel Junction. Each set was stored in a sterilized vials containing brain heart infusion broth. *Enterococcus faecalis* was cultured in this vial for 4 weeks. After 4 weeks, cleaning and shaping of the root canals were done followed by irrigation of 20 teeth by 3% NaOCl/BioPure MTAD and 20 teeth by 5.25% NaOCl/hydrogen peroxide. 3 pairs were kept as control. Sampling of the teeth was done and was placed in BHI agar culture where the growth of bacteria was studied.

Results/Conclusion: About 5.25% NaOCl/hydrogen peroxide had a better antimicrobial action than 3% NaOCl/BioPure MTAD.

Key words: Chemomechanical preparation, *Enterococcus faecalis*, Irrigants, MTAD

INTRODUCTION

The most important objective of endodontic therapy is the complete eradication of microbes from the root canal system.¹ Only chemomechanical preparation of root canal cannot eliminate all the microorganisms from root canal system; it may leave some areas of root canal system completely untouched by the instrument which are located deep in dentinal tubules.² According to Grossman, a thorough instrumentation and biomechanical preparation is the most important part of root canal therapy.³ Use of irrigants helps effectively in disinfecting the root canal. Many of the compounds used for irrigation have

been chemically modified for the effective disinfection of root canal. Enterococci are Gram-positive cocci which are facultative anaerobes, possessing the ability to grow in the presence or absence of oxygen. *Enterococcus faecalis* is associated with different forms of pulpal and periapical diseases.⁴ Various concentrations of NaOCl have been used as root canal irrigants for many decades because of its ability to dissolve necrotic tissues and its antibacterial properties against most microorganisms. Its main disadvantages are its unpleasant taste and its toxicity if extruded beyond the apex. BioPure MTAD- a mixture of doxycycline, citric acid and a detergent is less toxic than NaOCl, and it effectively removes a smear layer present in the root canal. Hydrogen peroxide (H_2O_2) is an irrigating solution which degrades to form H_2O and O_2 . It is effective against viruses, bacteria and bacterial spores and yeasts through hydroxyl free radicals. The purpose of this study was to compare the antimicrobial efficacy of irrigating solutions which includes 3% NaOCl/MTAD and 5% NaOCl/3% H_2O_2 .

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MATERIALS AND METHODS

Materials used in the study are:

1. 3% NaOCL
2. BioPure MTAD
3. 5.25% NaOCL
4. 3% H₂O₂.

Twenty-three pairs of mature human premolar teeth with closed apices, extracted for orthodontic treatment were collected. Teeth were soaked in 0.5% NaOCl for 24 h to remove residual loose tissue and debris. Crowns of teeth were reduced to cemento-enamel junction. Apex of each tooth was sealed with cyanoacrylate and mounted vertically in dental stone blocks. Teeth were then subjected to endodontic therapy. Access opening was prepared, and pulp was removed with barbed broach. Biomechanical preparation was done using standardized technique to a master apical file size of #40. Each tooth was steam autoclaved for 30 min under 15 psi pressure at 121°C. Each tooth was placed in sterilized vial, immersed in sterile brain heart infusion broth in which pure culture of *E. faecalis* was grown and sealed to contaminate the root canals. 3 pairs of teeth served as a negative control. 5 ml of the culture was added to the 20 ml vial containing BHI broth and sterilized tooth. The teeth were incubated with *E. faecalis* for 4 weeks under aerobic conditions at 37°. Fresh media was added every 7th day. After 4 weeks teeth were removed from the broth. Microbial samplings were taken. Aliquots of 0.1 ml suspension were plated on to the BHI agar plates and incubated at 37°C for 48 h. Colony-forming units (CFUs) per 1ml were enumerated.

RESULTS

All samples in negative control showed absence of turbidity throughout the experimental period while all the samples in positive control showed the presence of bacterial growth. The study showed a significant difference ($P < 0.01$) between total number of CFUs. Teeth treated with 5.25% of NaOCL/hydrogen peroxide produced 2-3 CFU/ml, while those treated with 3% NaOCL/BioPure MTAD produced a mean of 19 ± 8 CFU/ml. 3 of the 20 samples in Group A produced growth while 8 of 20 samples in Group B yielded growth (Table 1).

- Smallest of value is 6, Wilcoxon T statistic is 6
- Calculate: $T = n(n+1)/4 = 20(20+1)/4 = 105$.

Observed Wilcoxon T (i.e., 6) differs significantly from T (105).

DISCUSSION

Studies have demonstrated conclusively that mechanical instrumentation cannot sufficiently disinfect root

Table 1: Growth of Microorganism

| I (5.25% of NaOCL/hydrogen peroxide) | II (3% NaOCL/BioPure MTAD) | Difference (I-II) | Rank |
|--------------------------------------|----------------------------|-------------------|------|
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 17 | -17 | -6.5 |
| 0 | 12 | -12 | -4.5 |
| 0 | 0 | 0 | 0 |
| 0 | 19 | -19 | -10 |
| 0 | 0 | 0 | 0 |
| 3 | 0 | +3 | 3 |
| 0 | 21 | -21 | -11 |
| 0 | 0 | 0 | 0 |
| 2 | 0 | +2 | 1.5 |
| 0 | 0 | 0 | 0 |
| 0 | 18 | -18 | -8.5 |
| 0 | 17 | -17 | -6.5 |
| 0 | 12 | -12 | -4.5 |
| 0 | 0 | 0 | 0 |
| 2 | 0 | +2 | 1.5 |
| 0 | 26 | -26 | -12 |
| 0 | 0 | 0 | 0 |
| 0 | 18 | -18 | -8.5 |

Total number of negative values=72

Total number of positive values=6

canals, regardless of whether stainless steel⁵ or NiTi Instrumentation.⁶ Irrigation solutions are required to eradicate microbiota, and over time, a variety of chemicals have been promoted for this purpose.

The ideal irrigant or combination of irrigants kills bacteria, dissolves necrotic tissue, lubricates the canal, removes smear layer and does not irritate healthy tissues.¹ It is well established that failure of endodontic therapy and pulp and periapical diseases are due to the presence of microbes. The intent of the study was to determine whether irrigation with 3% NaOCL/BioPure MTAD was more effective than 5.25% NaOCL/Hydrogen peroxide.

E. faecalis was chosen as test organism because it has been associated with persistent apical inflammation and has found suitable for experimental penetration into the dentinal tubules. It is an unrelenting organism that, despite making up a small fraction of the flora in untreated canals, plays a major role in the etiology of persistent periradicular lesion after orthograde endodontic therapy. They have shown resistance to calcium hydroxide and number of intracanal medicaments. Thus an irrigant effective against it is desirable. 4 weeks of incubation was done to ensure adequate penetration of bacteria into the dentinal tubules.

NaOCl used in the study have been commonly used for irrigation of root canal in different concentrations. These are effective against bacterial spores and viruses and have higher tissue dissolving effect on necrotic than on vital tissues. However, it has various disadvantages including its tendency to induce an inflammatory reaction

in tissues when extruded beyond apex of the root. It may also damage the patient's clothing, a foul odor, and an unpleasant taste. Due to these biocompatibility issues, different irrigants have been tried.

BioPure MTAD (Dentsply, Tulsa Dental, Tulsa, OK, USA) was introduced by Torabinejad and Johnson in 2003.⁷ This solution contains 3% doxycycline hyclate which helps to remove smear layer, tetracycline for sustainability, 4.25% citric acid which acts as a chelating agent and a detergent 0.5% polysorbate 80 which reduces the surface tension and increases its wettability.

About 3% H₂O₂ is a clear, odorless liquid. It is easily decomposed by heat and light and rapidly dissociates into H₂O and [O]. This nascent oxygen produces a bactericidal effect by interfering with bacterial metabolism. Its action is more effective when used in combination with 5.2% NaOCl.

Lack of turbidity of BHI by negative control groups demonstrated sterilization procedures were effective; positive control group confirm the presence of *E. faecalis* within the root canal.

The apices of all samples were sealed with cyanoacrylate to prevent any contamination from outer tooth surface during the sampling procedure.

The results of this study showed that 5.25% NaOCl/Hydrogen peroxide significantly reduced intra canal bacterial levels when compared to 3% NaOCl/BioPure MTAD.

2 of the 20 samples in group A showed a growth, while 8 of the 20 samples in group B yielded growth.

It has been shown that invasion of dentinal tubules by *E. faecalis* usually occurs to a depth of 50-100 µm.

Culturing the color contents at a greater depth allowed determination of the efficacy to the test irrigant at penetrating and disinfecting deeper layers of dentin. The results of the study showed that 5.25% NaOCl/hydrogen peroxide significantly reduced intra canal bacterial levels when compared to 3% NaOCl/BioPure MTAD.⁸⁻¹¹

CONCLUSION

The results of this *in vitro* investigation showed consistent disinfection of infected root canals with 5.25% NaOCl/hydrogen peroxide. The combination of 3% NaOCl/BioPure MTAD left nearly 50% of the canals contaminated with *E. faecalis*.

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A Study of Respiratory Distress in Term Neonates in Early Neonatal Period

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Abstract

Introduction: Respiratory distress is one of the most common cause of admission in Neonatal Intensive Care Unit and results from a variety of respiratory and non-respiratory etiologies. It accounts for significant morbidity and mortality in the newborn period.

Aims and Objectives: To identify the etiology of respiratory distress in early neonatal period and its immediate outcome.

Materials and Methods: All term neonates with respiratory distress in 1st week of life in a tertiary care hospital were consecutively recruited in the study for 1 year. Etiological profile was found and outcome was analyzed along with various neonatal, maternal, and labor factors leading to the distress.

Results: Out of 2152 cases admitted 655 developed distress with an incidence of 30.4%. Transient tachypnea of newborn (242) was the most common cause of distress, followed by perinatal asphyxia (144) and meconium aspiration syndrome (MAS) (93). Incidence was more in male babies and in those delivered by cesarean section. The major cause of mortality was perinatal asphyxia (30) followed by MAS (17) and congenital heart disease (4), overall mortality was 9.01%.

Conclusion: Knowledge about the etiological pattern of respiratory distress is essential in planning therapy to reduce morbidity and mortality due to distress. Timely recognition and management of high-risk pregnancies and appropriate decision about the time and mode of delivery is needed to reduce the incidence of respiratory distress.

Key words: Meconium aspiration, Neonate, Perinatal asphyxia, Pneumonia, Respiratory distress, Sepsis, Term, Transient tachypnea of newborn

INTRODUCTION

Respiratory distress is one of the most common cause of admission (30-40%) in Neonatal Intensive Care Unit (NICU) and accounts for 20% of neonatal mortality in India.¹ Incidence of respiratory distress varies from 0.7% to 8.3% of live born babies in India.² Babies with respiratory distress are 2-4 times more likely to die than those without respiratory distress. It results from a variety of respiratory and non-respiratory causes, among them, transient tachypnea of newborn, respiratory distress syndrome, and perinatal asphyxia are the most common

causes. Although respiratory distress may represent a benign, self-limited process, it may also be the first sign of sepsis or serious cardiopulmonary disease. The overall incidence of respiratory distress in term babies is 4.2%. Early diagnosis and management can reduce the morbidity and mortality in the neonatal period.

Aims and Objectives

The aim of the study is to identify the etiological factors of respiratory distress in early neonatal period and its immediate outcome.

MATERIALS AND METHODS

Full-term (gestational age 37 weeks and above) neonates (both inborn and outborn) admitted in SNN Ward of Government Theni Medical College Hospital, within 1 year study period from August 2015 to July 2016, with respiratory distress, were consecutively recruited into this

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descriptive study after getting informed consent from the parents. Full-term neonates with respiratory distress admitted in NICU with onset of distress <7 days (early neonatal period) were studied. Cases lost to follow-up were excluded from the study. Respiratory distress was assessed using Downes score. At birth, weight was recorded and a detailed physical examination was performed to detect congenital anomalies. A special questionnaire was designed for the purpose of the study which included the name, age at admission, sex, date of admission, date of discharge or death, gestational age according to the date of last menstrual period of the mother, antenatal ultrasound or modified new ballards score, factors related to labor and delivery and maternal information such as age, parity, and illness. The final diagnosis of clinical conditions producing respiratory distress will be based mainly on careful scrutiny of the history, clinical, and radiological findings. Chest X-ray (CXR) was done in all cases. Complete blood counts, C-reactive protein, blood-culture, and sensitivity and echo in relevant cases. Appropriate management was done on individual basis as per the institutional protocol, cases were followed till death or discharge and immediate outcome was assessed.

RESULTS AND OBSERVATION

Out of 2152 cases admitted during the study period, 655 term newborns were admitted with respiratory distress with an incidence of 30.4% (Table 1).

In the 655 cases with respiratory distress, transient tachypnea of newborn (TTN) was the most common cause found in 242 cases (36.95%), perinatal asphyxia was the second common cause found in 144 cases (21.98%), followed by meconium aspiration syndrome (MAS) in 93 cases (14.2%), congenital heart diseases (CHD) in 78 cases (11.91%), sepsis and pneumonia in 73 cases (11.14%), hyaline membrane disease in 1 case (0.16%), other causes such as congenital diaphragmatic hernia, congenital lobar emphysema, and congenital malformations were found in 24 cases (3.66%) (Table 2).

Maternal age was ≤ 18 or ≥ 35 in 63 cases, and 19-34 in 592 cases, 9.62% mothers were in extreme age group. Out of the 655 newborns with respiratory distress, 328 were born to primi mothers, 286 newborns were born to G2-G4 mothers, and 41 newborns were born to grand multipara mothers ($G > 4$). Maternal illness such as GDM, pregnancy-induced hypertension, anemia was present in 197 mothers (30.08%) of babies with respiratory distress and absent in 458 mothers of babies with respiratory distress (69.92%) (Table 3).

Out of 655 newborns admitted for respiratory distress, prolonged labor was present in 107 deliveries (16.34%) and absent in 548 deliveries (83.66%). Prolonged rupture of membranes (PROM) was present in 89 deliveries (13.59%) and absent in 566 deliveries (86.41%). Meconium stained amniotic fluid (MSAF) was present in 150 deliveries (22.9%) and absent in 505 deliveries (77.10%) (Table 4).

There was a male predominance with 416 being male and 239 being females, which is also present in almost all the etiologies. Incidence of distress is more in babies delivered

Table 1: Incidence

| Variable | n |
|------------------------------|------|
| Total number of admission | 2152 |
| Respiratory distress in term | 655 |
| Incidence (%) | 30.4 |

Table 2: Etiology of respiratory distress (n=655)

| Etiology | n (%) |
|----------------------|-------------|
| TTN | 242 (36.95) |
| Perinatal asphyxia | 144 (21.98) |
| MAS | 93 (14.20) |
| CHD | 78 (11.91) |
| Sepsis and pneumonia | 73 (11.14) |
| HMD | 1 0.16 |
| Others | 24 3.66 |
| Total | 655 100 |

TTN: Transient tachypnea of newborn, MAS: Meconium aspiration syndrome, CHD: Congenital heart diseases, HMD: Hyaline membrane disease

Table 3: Maternal characteristics

| Characteristics | n (%) |
|-----------------|-------------|
| Age (years) | |
| ≤18 or ≥35 | 63 (9.62) |
| 19-34 | 592 (90.38) |
| Parity | |
| Primi | 328 (50.08) |
| 2-4 | 286 (43.66) |
| >4 | 41 (6.26) |
| Illness | |
| Yes | 197 (30.08) |
| No | 458 (69.92) |

Table 4: Labor characteristics

| Characteristics | n (%) |
|-----------------|-------------|
| Prolonged labor | |
| Yes | 107 (16.34) |
| No | 548 (83.66) |
| PROM | |
| Yes | 89 (13.59) |
| No | 566 (86.41) |
| MSAF | |
| Yes | 150 (22.90) |
| No | 505 (77.10) |

PROM: Prolonged rupture of membranes, MSAF: Meconium stained amniotic fluid

at early term (346) and in those delivered by cesarean section (341) (Table 5).

Resuscitation was required in 202 cases (30.84%) and 453 cases did not need resuscitation (69.16%). 372 cases required oxygen supplementation by nasal oxygen, 217 cases required continuous positive airway pressure, and mechanical ventilator was needed by 66 cases. Out of the 655 newborns, 197 cases had abnormal CXR findings. Most of the cases of MAS and pneumonia had findings in radiograph. 213 (32.52%) cases were either discharged or died within 3 days and 442 cases were either discharged or died after 3 days (Table 6).

Out of 655 term newborns with respiratory distress 596 were discharged, 59 died. Mortality being 9.09%. Perinatal asphyxia is the leading cause of death with maximum case fatality rate (CFR = 50.85%) followed by MAS (28.81%) (Table 7).

DISCUSSION

During the study period, a total of 2152 newborns were admitted in our SNN, of which a total of 655 term newborns were admitted with onset of respiratory distress in early neonatal period. These 655 babies were included in the study, and the clinical profile of respiratory distress and its immediate outcome were analyzed. The incidence of respiratory distress in our study was 30.43%, with more cases occurring in males (63.5%) and early term (52.8%) which is similar to the study titled “Etiology of respiratory distress in Newborn” by Haque *et al.*³ In our study TTN was the most common cause of respiratory distress, perinatal asphyxia was the second most common cause followed by MAS and CHD which is similar to “Neonatal respiratory distress in Omduran Maternity Hospital” by Abdelrahman *et al.*⁴ and Santosh *et al.*⁵ In our study, mortality rate was 9.01% with perinatal asphyxia (50.8%) being the leading cause of death followed by MAS (28.8%) and CHD (6.7%) which is similar to “Respiratory Distress in Full-Term Neonates in the first week of life in Basrah Maternity Hospital” by Wadi *et al.*⁶ CFR was least for TTN (0%) and highest for Perinatal Asphyxia (20.83%) followed by MAS (18.28%). In our study, 52.06 % of cases were delivered by lower segment cesarean section which is more than cases delivered by vaginal delivery which is similar to “Neonatal respiratory distress in early neonatal period and its outcome” by Swarnkar *et al.*⁷ Only 30.1% of babies had abnormal CXR findings which necessitates clinical and other investigations to find the etiology. Maternal illness, maternal age, parity, prolonged labor, PROM, and MSAF also influence the occurrence of

Table 5: Neonatal characteristics

| Characteristics | TTN | PA | MAS | CHD | Sep and Pn | HMD | Other |
|-----------------|-----|----|-----|-----|------------|-----|-------|
| Sex | | | | | | | |
| Male (416) | 153 | 86 | 64 | 50 | 48 | 1 | 0 |
| Female (239) | 89 | 58 | 29 | 28 | 25 | 0 | 10 |
| GA | | | | | | | |
| 37-38 (346) | 133 | 68 | 33 | 53 | 42 | 1 | 16 |
| ≥39 (309) | 109 | 76 | 60 | 25 | 31 | 0 | 8 |
| MOD | | | | | | | |
| LSCS (341) | 145 | 48 | 53 | 48 | 33 | 0 | 14 |
| Vaginal (314) | 97 | 96 | 40 | 30 | 40 | 1 | 10 |

TTN: Transient tachypnea of newborn, MAS: Meconium aspiration syndrome, CHD: Congenital heart diseases, HMD: Hyaline membrane disease, LSCS: Lower segment cesarean section, GA: Gestational age, MOD: Mode of delivery

Table 6: Therapeutic parameters

| Parameters | TTN | PA | MAS | CHD | Sep and Pn | HMD | Other |
|---------------|-----|-----|-----|-----|------------|-----|-------|
| NFR | | | | | | | |
| Yes (202) | 9 | 141 | 26 | 7 | 17 | 0 | 2 |
| No (453) | 233 | 3 | 67 | 71 | 47 | 10 | 22 |
| O2 Req | | | | | | | |
| Hood (372) | 220 | 36 | 16 | 45 | 39 | 0 | 16 |
| CPAP (217) | 22 | 73 | 58 | 30 | 31 | 1 | 2 |
| MV (66) | 0 | 35 | 19 | 3 | 3 | 0 | 6 |
| CXR | | | | | | | |
| ABN (197) | 37 | 11 | 88 | 28 | 24 | 1 | 8 |
| Normal (458) | 205 | 133 | 5 | 50 | 49 | 0 | 16 |
| Days of Rx | | | | | | | |
| ≤3 days (213) | 134 | 30 | 22 | 18 | 2 | 0 | 7 |
| >3 days (442) | 108 | 114 | 71 | 60 | 71 | 1 | 17 |

TTN: Transient tachypnea of newborn, MAS: Meconium aspiration syndrome, CHD: Congenital heart diseases, HMD: Hyaline membrane disease, CXR: Chest X Ray, CPAP: Continuous positive airway pressure, NFR: Need for resuscitation, PA: Perinatal asphyxia, MV: Mechanical ventilation, ABN: Abnormal

Table 7: Etiology-wise distribution of outcome: (n=655)

| Etiology | Total | Discharged | Death | CFR |
|----------------------|-------|------------|------------|-------|
| TTN | 242 | 242 | 0 (0) | 0 |
| Birth asphyxia | 144 | 114 | 30 (50.85) | 20.83 |
| MAS | 93 | 76 | 17 (28.81) | 18.28 |
| CHD | 78 | 74 | 4 (6.78) | 5.13 |
| Sepsis and pneumonia | 73 | 70 | 3 (5.08) | 4.10 |
| HMD | 1 | 1 | 0 (0) | 0 |
| Others | 24 | 19 | 5 (8.48) | 20.83 |
| Total | 655 | 596 | 59 (100) | 9.09 |

TTN: Transient tachypnea of newborn, MAS: Meconium aspiration syndrome, CHD: Congenital heart diseases, HMD: Hyaline membrane disease, CFR: Case fatality rate

distress which are amenable to prevention by timely obstetric management.

CONCLUSION

Respiratory distress is a common cause of newborn admission in NICU. TTN is the most common cause of respiratory distress in term newborns, followed by perinatal asphyxia, meconium aspiration, and CHD. Sepsis and

pneumonia varies in different centers. A small proportion of respiratory distress is due to other causes such as congenital diaphragmatic hernia, anemia, congenital lobar emphysema, and congenital anomalies. Although TTN is the most common cause of distress, it is usually self limited and carries good prognosis. The main causes for death are perinatal asphyxia, MAS, sepsis, and pneumonia. Hence, any measure to reduce the morbidity and mortality associated with respiratory distress should be aimed at effective management of these conditions. Various neonatal, maternal, and labor characteristics should also be addressed for better management and prevention of distress.

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Significance of Premalignant Conditions and Other Factors Associated with Oral Malignancy

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Abstract

Introduction: Oral cavity cancer is caused by various etiological factors and definite premalignant conditions are associated with it.

Aim: The aim of the study was to study the factors that play a significant role in the causation of oral cancer.

Materials and Methods: A prospective study on oral cancer conducted in the Department of General Surgery and Surgical Oncology, etc.

Results: In this study 162 patients were included, 100 were male, and 62 were female. Leukoplakia is associated with 33.95% ($n = 55$) of patients; Quid chewing is the most prevalent habit both in male and female.

Conclusions: Around 69% of the 162 patients, premalignant lesions are associated with primary cancer lesions; apart from premalignant lesions, patient's habits such as quid chewing, smoking, and alcohol consumption have a strong association with oral malignancy.

Key words: Cancer cheek, Etiology, Oral premalignant conditions

INTRODUCTION

Cancer of the oral cavity ranks among the 10 most common cancers in the world with marked geographical variation.¹ 2-6% of all cancers diagnosed in the US are oral cavity cancers which by themselves account for more than 30% of all head and neck cancers. In the US alone more than 30950 new cases of oral cavity cancer and 4000-8000 deaths are reported each year.²

Worldwide there is great variation in the incidence of oral cancer. In Western Europe and Australia, the incidence closely resembles that of the US. The highest rates of oral cavity cancers are to be found in France, India, Brazil, Central and Eastern Europe.³ Cancer of the oral cavity

ranks among the 10 most common cancers in the world with marked geographical variation. Worldwide there is great variation in the incidence of oral cancer.⁴

Aim

To ascertain the significance of premalignant conditions and other factors responsible for oral malignancy.

MATERIALS AND METHODS

This prospective observational study of 162 patients was conducted at the Department of General Surgery in association with Department of Surgical Oncology, Department of Medical Oncology, and Department of Radiation Oncology, Government Rajaji Hospital, Madurai. Patients admitted with oral cancers were included in this study. Approval of the Ethical Committee of the Institution was obtained and informed written consent was obtained from every patient with oral cancer. Elaborate history recorded from every patient including present history, past history, and personal history giving more importance to personal history; thorough examination of the patient particularly the oral cavity was done and

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recorded properly. Investigations such as a biopsy to confirm the diagnosis. The results were tabulated, assessed and a conclusion obtained.

RESULTS

The most common premalignant condition encountered in the study was leukoplakia 33.95% (55 cases). Around 30.86% (50 cases) in the study had no identifiable premalignant condition (Table 1).

The habit that was most prevalent among both males and females was quid chewing; seen in 47.53% (77 cases). In males quid chewing 15.43% (25 cases) followed by smoking combined with alcohol consumption 10.49% (17 cases) and quid chewing with smoking and alcohol, 7.41% (12 cases) were noted. In females, the most common habit was chewing quid seen in 32.10% (52 cases). Around 6.18% (10 cases) of females had no identifiable risk factors (Table 2).

Majority of the patients were overwhelmingly from a low socioeconomic (SE) stratum 99.38% (161 cases) (Table 3).

The maximum number of cases 19.75% (32 cases) studied in males was in the 51-60 age groups. In females, the maximum numbers of cases were seen in the 61-70 age group 12.35% (20 cases). Overall, in both males and females, the maximum number of cases was noted in the 6th and 7th decade 31.48 (51 cases) and 30.25 (49 cases), respectively (Table 4).

In our study out of the 162 patients, 55 were having dental caries, 33.95% were having dental caries, around 26% were having gingivitis, 9 patients had sharp tooth, and 4 with ill-fitting denture, whereas 52 patients do not have any association with dental factors (32%).

People with dental caries, plaques, inflammation of the gingivae appear to have a greater risk when compared to the general population. An ill-fitting denture could increase the risk of cancer of the tongue. Poor oral hygiene is often associated with tobacco and alcohol abuse. Oral microflora may act on ethanol and convert it to acetaldehyde a known carcinogen.

DISCUSSION

Although there are many factors responsible for the causation of oral cancer, the premalignant conditions are the ones which represent the imminence of the disease. The most common premalignant condition encountered in the study was leukoplakia 33.95% (55 cases).⁵ Around

Table 1: Association of various premalignant lesions

| Premalignant conditions | Total (%) |
|---|------------|
| Candidiasis | 7 (4.32) |
| Erythroplakia | 21 (12.96) |
| Submucosal fibrosis | 14 (8.64) |
| Leukoplakia | 55 (33.95) |
| Erythroleukoplakia | 8 (4.95) |
| Submucosal fibrosis with erythroleukoplakia | 6 (3.70) |
| No association | 50 (30.86) |

Table 2: Distribution of patients based on their habits

| Habit* | Male (%) | Female (%) | Total (%) |
|---------|------------|------------|------------|
| BT | 25 (15.43) | 52 (32.10) | 77 (47.53) |
| SA | 17 (10.49) | - | 17 (10.49) |
| BTSA | 12 (7.41) | - | 12 (7.41) |
| BTS | 10 (6.17) | - | 10 (6.17) |
| BTA | 7 (4.32) | - | 7 (4.32) |
| BS | 7 (4.32) | - | 7 (4.32) |
| BSA | 6 (3.70) | - | 6 (3.70) |
| BA | 6 (3.70) | - | 6 (3.70) |
| S | 6 (3.70) | - | 6 (3.70) |
| No risk | 4 (2.48) | 10 (6.18) | 14 (8.66) |

*B: Betel nut, S: Smoking, T: Tobacco, A: Alcohol

Table 3: Distribution of patients according to SE status

| SE status | N (%) |
|-----------|-------------|
| Low | 161 (99.38) |
| Middle | 1 (00.62) |
| Upper | - |

SE: Socioeconomic

Table 4: Distribution of patients according to age and sex

| Age | N (%) | | |
|-------|-------------|------------|------------|
| | Male | Female | Total |
| 21-30 | 1 (0.62) | 3 (1.85) | 4 (2.47) |
| 31-40 | 9 (5.56) | 7 (4.32) | 16 (9.88) |
| 41-50 | 16 (9.88) | 11 (6.79) | 27 (16.67) |
| 51-60 | 32 (19.75) | 19 (11.73) | 51 (31.48) |
| 61-70 | 29 (17.90) | 20 (12.35) | 49 (30.25) |
| >71 | 13 (8.02) | 2 (1.23) | 15 (9.25) |
| Total | 100 (61.73) | 62 (38.27) | 162 (100) |

30.86% (50 cases) in the study had no identifiable premalignant condition, and 12.96% of patients were presenting with erythroplakia.⁶ Submucosal fibrosis is one among the premalignant condition expressed by 8.64% of the patients.⁷

Quid chewing is the most prevalent habit among both men and women, smoking combined with alcohol

consumption 10.49% (17 cases) comes next in men.⁸ Around 6.18% (10 cases) of females had no identifiable risk factors.

Except for one patient all the 161 patients come under the lower SE category which comprises 99.38%. Hence, low SE group is also significant factor associated with oral cancer.⁹

Overall, in both males and females, the maximum number of cases was noted in the 6th and 7th decade 31.48 (51 cases) and 30.25 (49 cases), respectively. Older age group is one another factor associated with oral cancer.¹⁰

Out of the 162 patients, 55 were having dental caries that is 33.95% were having dental caries,¹¹ around 26% were having gingivitis, 9 patients had sharp tooth,¹² and 4 with ill-fitting denture,¹³ whereas 52 patients do not have any association with dental factors (32%). Among the dental/oral factors, caries tooth is the most common one.

CONCLUSION

Around 69% of the 162 patients, premalignant lesions are associated with primary cancer lesions; apart from premalignant lesions, patient's habits such as quid chewing, smoking, and alcohol consumption have a strong association with oral malignancy. Low SE group and old age are also having a significant association with oral cancer. Dental factors such as dental caries and gingivitis also have

a link with the carcinoma of the oral cavity as per our study.

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Evaluation of Lichtenstein's Tension-free Hernioplasty in Inguinal Hernia

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Abstract

Background: Hernia is a Greek word meaning offshoot, budding or bulge. A hernia is protrusion of a viscous or a part of viscous through abdominal opening in the wall of containing cavity. Hernia commonly develops in the area of weakness and groin is one of the natural weak areas in abdominal wall.

Aims and Objectives: Since the hernia is a very common surgical problem and there are various methods of repair available. It will be the endeavor of this study to evaluate the results of one of the simple technique "Lichtenstein tension-free hernioplasty."

Materials and Methods: This study was conducted on 50 patients admitted in the Postgraduate Department of Surgery in Government Medical College, Jammu, for inguinal hernia surgery during the period of January 2004-September 2005.

Inclusion Criteria: All patients with groin hernia.

Exclusion Hernia: Patient with serious cardiovascular or renal complications.

Result and Conclusion: Open surgery for inguinal hernia repair is safe. The recurrence rate (hernias that require two or more repairs) is low when open hernia repair is done by experienced surgeons using mesh patches. Synthetic patches are now widely used for hernia repair in both open and laparoscopic surgery. The chance of a hernia coming back after open surgery ranges from 1 to 10 out of every 100 open surgeries done.

Key words: Abdominal, Bulging, Hernia, Lichtenstein's

INTRODUCTION

Hernia is a Greek word meaning offshoot, budding or bulge. A hernia is protrusion of a viscous or a part of viscous through abdominal opening in the wall of containing cavity. Hernia commonly develops in the area of weakness and groin is one of the natural weak areas in abdominal wall.

Inguinal hernia is among the most common problems encountered by the surgeon affecting people in all age

group. Inguinal hernia usually present as a swelling accompanied by pain or dragging sensation in the groin. Most hernia can be diagnosed based on the history and clinical examination. Inguinal hernia is broadly classified as direct or indirect type depending on herniation in relation to the inferior epigastric vessels in the abdominal wall and the Hesselbach's triangle.

An indirect hernia passes lateral to inferior epigastric and is just outside the Hesselbach's triangle while a direct hernia is medial to inferior epigastric vessels and therefore within the confines of Hesselbach's triangle. Inguinal canal, following the descent of the testis into the scrotum, remains as a triangular cleft between two main musculoaponeurotic layers of the abdominal wall, i.e., superficial external oblique layer and the deep transverses abdominis layer. The inguinal canal begins at the lateral margin of deep inguinal ring and ends at the medial margin of superficial inguinal ring, averaging in an adult about 4 cm in length. Through

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the canal spermatic cord travels from a preperitoneal to a subcutaneous position.

The anterior wall at inguinal canal is mainly formed by aponeurosis of the external oblique muscle and at the lateral end by the internal oblique muscle. Inferior wall of the canal is formed by the inguinal ligament (Poupart's) ligament and the lacunar (Gimbernat's) ligament. Posterior wall of the inguinal canal is formed by the aponeurosis of transverses abdominis muscle and fascia transversalis and medially by the internal oblique aponeurosis. Roof of the canal is formed by the arched fibers of lower edge of the internal oblique muscle and transverses aponeurosis.

This vulnerable inguinal canal in the man is protected by two guards first described by Cooper in 1807. It consists inferiorly by the inguinal ligament (Poupart ligament) and superiorly by combined internal oblique and transverse abdominal muscle. When relaxed there is an interval between the muscle and the inguinal ligament, which is supported by thin fascia transversalis. This is the only weak area in the abdominal wall not supported by any musculoaponeurotic layer. During exertion these muscles approximate to the inguinal ligament thus closing the gap. This is the shutter mechanism which normally reinforces this weak anatomic area.

Much controversy surrounds the question of the causation of inguinal hernia. It is assumed that three factors are involved:

- A. The presence of preformed sac
- B. Repeated elevation of intra-abdominal pressure
- C. Weakening of body muscles and tissues with time.

Aims and Objectives

Since the hernia is a very common surgical problem and there are various methods of repair available. It will be the endeavor of this study to evaluate the results of one of the simple technique "Lichtenstein tension-free hernioplasty." Since the method is quite appealing as regard to its safety and success rate it was contemplated to analyze the result of this method in 50 patients suffering from inguinal hernia, who were admitted in the Postgraduate Department of Surgery in Government Medical College Hospital, Jammu, during the period January 2004-September 2005.

MATERIALS AND METHODS

This study was conducted on 50 patients admitted in the Postgraduate Department of Surgery in Government Medical College, Jammu, for inguinal hernia surgery during the period of January 2004-September 2005. The diagnosis of inguinal hernia was solely made on the basis of history

and clinical examination. The patients were worked up preoperatively as per pro forma. Surgery was performed under local, spinal, epidural, or general anesthesia.

Infiltration technique was used for local anesthesia. Local anesthesia consists of 0.5% lignocaine and 0.25% bupivacaine. Subcutaneous infiltration of local anesthetic was done along the length of proposed skin incision. Skin incision was deepened down to the external oblique aponeurosis. Before incising this layer, the infiltration needle tip is inserted and 5-10 ml of local anesthetic solution was injected and allowed to flood the space below the external oblique.

OBSERVATION

The age of patients varied from 18 to 70 years. The youngest age group was 18.5-year-old patients, and the oldest was 80-year-old male patient. Majority of patients were in the age group of 40-50 years (Tables 1-12).

DISCUSSION

The treatment of hernia started early with the use of trusses and bandages to control the herniation later Paul of aegina (700), described a method consisting of a mass

Table 1: Distribution of patients according to age

| Age (years) | Number of patients (%) |
|-------------|------------------------|
| 10-20 | 4 (8) |
| 20-30 | 7 (14) |
| 30-40 | 8 (16) |
| 40-50 | 14 (28) |
| 50-60 | 9 (18) |
| 60-70 | 6 (12) |
| 70-80 | 2 (4) |

Table 2: The distribution of patients according to occupation

| Occupation | Number of patients (%) |
|----------------------|------------------------|
| Manual worker | 24 (48) |
| Sedentary worker | 10 (20) |
| Retired from service | 16 (32) |

Table 3: The patient with associated comorbid condition

| Comorbid condition | Number of patients |
|------------------------|--------------------|
| Hypertension | 2 |
| Ischemic heart disease | 2 |
| DM | 1 |
| COPD | 2 |

DM: Diabetes mellitus, COPD: Chronic obstructive pulmonary disease

Table 4: Distribution of patients according to the side of hernia

| Side of hernia | Number of patients (%) |
|----------------|------------------------|
| Right side | 30 (60) |
| Left side | 13 (26) |
| Both sides | 7 (14) |

Table 5: The percentage of direct and indirect inguinal hernia

| Type of hernia | Number of patients (%) |
|-----------------|------------------------|
| Indirect | 36 (72) |
| Direct | 12 (24) |
| Direct/indirect | 2 (4) |

Table 6: Type of indirect hernia

| Types of indirect hernia | Number of patients (%) |
|--------------------------|------------------------|
| Incomplete | 30 (60) |
| Complete | 6 (12) |

Table 7: Type of anesthesia given for surgery

| Anesthesia given | Number of patients (%) |
|------------------|------------------------|
| General | 1 (2) |
| Spinal | 35 (70) |
| Epidural | 10 (20) |
| Local | 4 (8) |

Table 8: The cases done by various grades of surgeons

| Grades of surgeons | Number of patients (%) |
|--------------------|------------------------|
| Registrar and PG | 36 (72) |
| Consultant | 14 (28) |

ligature of the sac and cord at the external ring with excision of the sac, cord and testis distal to ligature. The history of hernia repair is replete with the instances of the surgeon in search of better and better techniques which could be patient friendly, easy to learn and practice. This in turn required better understanding of the anatomy and etiology of hernia.

This started practically with Bassini (1887) and continues till date. Although the concept of inguinal herniorrhaphy, described by Albert Edoardo Bassini has stood the test of time but recurrence was 8-10%^{4,6} many techniques of inguinal herniorrhaphy were known till date. It was Lichtenstein (1989) that challenged the concept of both the darn technique and should ice operation. Inguinal hernia is more common in males. Amid *et al.*,¹ in his study

Table 9: The time consumed for surgery

| Time in minutes | Number of patients |
|-----------------|--------------------|
| 25-35 | 12 |
| 35-45 | 25 |
| 45-55 | 9 |
| 55-65 | 4 |

Table 10: Ambulation of patients after surgery

| Ambulation after surgery | Number of patients (%) |
|--------------------------|------------------------|
| Immediately | 4 (8) |
| 1 st POD | 46 (92) |

POD: Post-operative day

Table 11: Distribution of cases according to the pain score

| VAS of pain | Number of patients (%) |
|----------------|------------------------|
| Mid (1-3) | 42 (84) |
| Moderate (4-6) | 8 (16) |
| Severe (7-10) | 0 (0) |

VAS: Visual analog score

Table 12: The postgraduate complication

| Complications | Number of patients (%) |
|---------------------------------|------------------------|
| Ecchymosis | 1 (2) |
| Seroma | 3 (6) |
| Wound infection | 2 (4) |
| Scrotal swelling | 1 (2) |
| Preputial edema | 0 (0) |
| Hydrocoele | 0 (0) |
| Numbness or anesthesia in groin | 2 (4) |
| Injury to bowel/bladder/VAS | 0 (0) |

VAS: Visual analog score

of 4000 patients with inguinal hernia reported that all his patients were males.

Plumbo *et al.* reported an incidence of 64% of indirect inguinal hernia, 19.2% direct hernia, and 16.3% combined inguinal hernia. Massino and Mauro³ also reported similar figures in this study. Kruzer and Kark⁷ reported the occupation of 3175 patient with inguinal hernia; 31% were office workers, 37% were manual worker, and 32% were retired. While our study showed 48% were manual workers. Nordin and Barteimess⁹ reported that mean duration of 54 min for Lichtenstein repair. Leibi and Schmedt,⁸ Bittner and Schmedt² reported 5% complication in trans abdominal pre-peritoneal (TAPP). Nordin and Barteimess,⁹ Wright *et al.* no significant difference in pain between Lichtenstein and TAPP.

Although there has been an increased incidence of complications reported in endoscopic repair in the earlier

series, this can be explained partly by the fact that it was in the early part of the learning curve of most endoscopic surgeons. As the experience grew and the techniques were standardized, the incidences of complications have also reduced and have come to be on par with open hernia surgery.

Eight controlled randomized studies were identified suitable for the analysis. The mean duration of the operation was shorter in Lichtenstein repair (SMD = 6.79 min, 95% confidence interval [CI], -0.68-14.25), without significant difference. Comparing both techniques, patients of the laparoscopic group showed postoperatively significantly less chronic inguinal pain (odds ratio = 0.42; 95% CI, 0.23–0.78). Analyses of the remaining outcome measures did not show any significant differences between the two techniques.^{10,11}

The results of laparoscopic TAPP repair are comparable with Lichtenstein repair in terms of intraoperative and post-operative complications, success and short-term recurrence rates. Although operative time was significantly higher than Lichtenstein group, laparoscopic TAPP enable the patients to return to work earlier. More practice is essential to make operative time comparable to Lichtenstein repair.

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A Radiology-pathological Correlation of Hepatocellular Carcinoma in a Tertiary Care Hospital - A Retrospective Study

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Abstract

Introduction: The study was conducted to understand the clinical algorithm of hepatocellular carcinoma (HCC). Correlation was done by clinical presentation with radiological features and histopathology of HCC. The stress on to understand the necessity for a team approach between clinician, radiologist, and pathologist and vice versa is emphasized.

Aim: To correlate histopathology of HCC with the radiological features.

Materials and Methods: The total number of liver tumors studied during the 8 years period was 38 cases among which 25 cases were diagnosed by histopathology as various types of HCC conclusively. This is a retrospective study of liver tumors, diagnosed by histopathology as various types of HCC. All the relevant clinical data of the patients were searched from the ward records. The various radiological features were collected.

Results: The total number of liver tumors studied during the 8 years period was 38 cases among which 25 cases were diagnosed by histopathology as various types of HCC conclusively. Magnetic resonance imaging (MRI) provides molecular information with regard to HCC and potentially aided in biopsy planning. The total cases reported in the department are 25 cases out of which 17 cases are attending follow-up after 3 years.

Conclusion: The Edmondson-Steiner grading system of HCC correlated the grading of HCC. Pre-operative radiological classification can be used as a supplement to the histopathological grading. HCC needs a correlation between radiologist, pathologist, and clinician. The total cases reported in the department are 25 cases out of which 17 cases are attending follow-up after 3 years.

Key words: Clear cell hepatocellular carcinoma, Computed tomography, Hepatocellular carcinoma, Magnetic resonance imaging, Node and metastasis, Treatment protocols, Tumor staging tumor

INTRODUCTION

Hepatocellular carcinoma (HCC) has become the most common primary hepatic malignancy, with average survival rates between 6 and 20 months. HCC is typically a complication of cirrhosis, although it can rarely develop in the absence of cirrhosis.¹⁻⁴ Known underlying diseases

at risk for HCC development are chronic viral hepatitis C and B, alcoholic hepatitis, non-alcoholic fatty liver disease, autoimmune hepatitis, hemochromatosis, alpha-1-antitrypsin deficiency, Wilson's disease, and Budd-Chiari syndrome (BCS). Diagnostic algorithm follows the same radiological criteria for HCC despite the different etiologies of underlying liver disease. Incidence increases with advancing age, with a median age at onset of about 70 years old in developed countries and there is a male preponderance, with a male to female ratio of about 2.4:1.^{5,6} However, an exception is HCC developing in BCS. In fact, the radiological pattern of regenerative nodules in BCS is similar to that of HCC.⁷ Moreover, as a consequence of the hindered hepatic venous outflow, radiological criteria for HCC can be altered.^{8,9} The risk of procedure-related

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bleeding is probably increased,¹⁰ generally diagnosis of HCC in BCS still needs histological confirmation.^{8,9} Overall, the incidence of HCC is increasing, not only in the general population of patients with cirrhosis,^{11,12} but also particularly in some subgroups of patients, like those with human immunodeficiency virus (HIV) infection or thalassemia. In fact, in both HIV and thalassemia, a recent significant outcome improvement due to, respectively, iron chelating drugs in the latter and highly active antiretroviral therapy in the former, has allowed the appearance of the complication of the underlying hepatic disease.¹³⁻¹⁸ The landmark study the Milan Criteria (MC) was established. The MC includes three major points an isolated malignancy ≤ 5 cm, or 2-3 tumors each < 3 cm, and that does not have any evidence of invasion into the vascular system or dissemination outside the liver. The MC became accepted for assessing individuals that have HCC as candidates for transplantation.¹⁹ Given the high mortality associated with HCC, there has been a recent discussion on expanding the current criteria to include more patients as potential transplant candidates, and, therefore, increase overall survival. In the hopes of improving disease-free survival, there may be certain ways to help incorporate more candidates with HCC. While HCC of distinctly nodular type frequently showing a typical enhancement pattern with contrast CT, HCC of vaguely nodular type tend to show an atypical enhancement pattern such as a lack of arterial hyper enhancement or venous/delayed washout.²⁰ Three-dimensional gadolinium-enhanced GRE sequences are preferred to two-dimensional GRE sequences because of the thinner sections obtained, which improves lesion detection and permit multiplanar image reconstructions for presurgical planning.²¹ Intrinsic high signal can also be demonstrated in successfully treated HCC.²² Unenhanced images can be subtracted from arterial phase gadolinium-enhanced images to assess for arterial enhancement in nodules.²³ Diffusion weighted imaging increases the detection rate of HCC, particularly for small tumors.²⁴⁻²⁶ HCC by capitalizing on evidence that poorly differentiated HCC do not contain functioning hepatocytes and bile ducts, and therefore demonstrate hypointense signal relative to the surrounding liver parenchyma.^{27,28} Combining contrast-enhanced magnetic resonance imaging (MRI) features and hepatobiliary phase imaging has demonstrated sensitivities and specificities of $>90\%$.²⁹ Computed tomography (CT) and MRI are useful in identifying tumor extent and extrahepatic spread. They also provide secondary evidence of portal hypertension, including the presence of splenomegaly and portosystemic collaterals. Imaging of the chest is also recommended as part of the initial workup, given that lung and bone are common sites for HCC metastasis. A bone scan can also be performed if there is a suspicion for osseous metastasis, or if the patient is being considered for liver transplantation.

Edmondson-Steiner Grading System of HCC

Histopathological grading system for HCC was first proposed in 1954. Grade I - minor differentiation between tumor cells and hyperplastic liver cells; diagnosis of carcinoma is made by more aggressive growth patterns elsewhere in the neoplasm. Grade II - tumor cells show close resemblance to normal hepatic cells, but nuclei are larger and more hyperchromatic. Cell characteristics show sharp, clear-cut borders and abundant, and acidophilic cytoplasm. Acini have variable size and are frequent. Protein precipitate or bile commonly fill lumina. Grade III - larger and more hyperchromatic nuclei are present with a higher proportion of nuclei to existing cytoplasm, which is granular and acidophilic. Single cell growth in vascular channels is more common than Grade II. Grade IV - cell volume is largely nuclei, which is intensely hyperchromatic. Cytoplasm has few granules. Rare acini are seen. Medullary growth pattern predominates with scant trabeculae. Tumor cells scattered in vascular channels are without cohesion.

Barcelona clinic liver cancer (BCLC) staging uses a set of criteria to guide management of patients with HCC. The classification takes the following variables into account.^{30,31} Performance status, Child-Pugh score, tumor size, multiple tumors, vascular invasion, nodal spread, and extrahepatic metastases are the parameters adapted. Child-Pugh score is used to assess the prognosis of chronic liver disease, mainly cirrhosis. Although it was originally used to predict mortality during surgery, it is now used to determine the prognosis, as well as the required strength of treatment and the necessity of liver transplantation (Tables 1 and 2).

Surgical and Further Management for HCC

Current management of HCC includes surgical resection/hepatectomy, liver transplantation (deceased and living), thermal or chemical ablation, chemoembolization, and medical treatment.

Local Regional Therapy for HCC

Local treatment has been a mainstay to slow or arrest the advancement of the disease while patients are waiting for

Table 1: BCLC staging

| | |
|------------------------------|---|
| Stage 0 (very early stage) | Asymptomatic early tumors resection |
| Stage A (early stage) | Asymptomatic early tumors resection, percutaneous ablation, transplantation |
| Stage B (intermediate stage) | Asymptomatic multinodular tumors intra-arterial therapies (chemoembolization and radioembolization) |
| Stage C (advanced stage) | Symptomatic tumors and/or invasive tumors resection, sorafenib, phase II trial agents, or palliative treatments |
| Stage D (end-stage disease) | Symptomatic treatment equivalent to Okuda stage III |

BCLC: Barcelona clinic liver cancer

Table 2: TNM staging for hepatocellular carcinoma

| Primary tumor (T) | | Regional lymph nodes (N) | | Distant metastasis (M) | |
|-------------------|---|--------------------------|---|------------------------|-----------------------|
| TX | Primary tumor cannot be assessed | NX | Regional lymph nodes cannot be assessed | M0 | No distant metastasis |
| T0 | No evidence of primary tumor | N0 | No regional lymph node metastasis | M1 | Distant metastasis |
| T1 | Solitary tumor without vascular invasion | N1 | Regional lymph node metastasis | | |
| T2 | Solitary tumor with vascular invasion or multiple tumors, none >5 cm | | | | |
| T3a | Multiple tumors >5 cm | | | | |
| T3b | Single tumor or multiple tumors of any size involving a major branch of the portal or hepatic vein | | | | |
| T4 | Tumor(s) with direct invasion of adjacent organs other than gallbladder or with visceral peritoneum | | | | |

| Stage | T | N | M |
|-------|-------|-------|----|
| I | T1 | N0 | M0 |
| II | T2 | N0 | M0 |
| IIIA | T3a | N0 | M0 |
| IIIB | T3b | N0 | M0 |
| IIIC | T4 | N0 | M0 |
| IVA | Any T | N1 | M0 |
| IVB | Any T | Any N | M1 |

transplantation.²⁹ Transarterial chemoembolization (TACE) and radiofrequency ablation (RFA) have become prominent clinical tools of therapy.³² TACE uses an infusion of a cytotoxic agent deployed inside the artery followed by the embolization of blood vessels that supply the tumor. This results in a cytotoxic and ischemic effect.⁴ Injecting 95% ethanol into the tumor through a needle produces local coagulation necrosis and fibrosis, with thrombosis of tumor microvasculature and tissue ischemia.³³ The introduction of ethanol and RFA was found to be as efficient in lesions <2 cm in size.³⁴

Resection

Hepatic resection is a possible curative therapy, considered ideal for individuals with maintained hepatic reserve.³⁵ Patients with single lesions and without any evidence of invasion of the vasculature can be offered resection. Individuals without any proof of cirrhosis or having preserved synthetic function with cirrhosis, standardized levels of bilirubin, and the pressure gradient of <10 mmHg in the hepatic vein (Grade II recommendation) are potential candidates.^{4,36} In addition, it is also recommended platelet counts being over 1,00,000.³⁷

Liver Transplantation for HCC

It was believed that this would get rid of the tumor and provides a cure for the primary liver disease.³⁸ The threshold MC is as follows: One lesion smaller than

5 cm; alternatively, up to 3 lesions, each smaller than 3 cm, no extrahepatic manifestations, and no evidence of gross vascular invasion. Selection of patients was a source of constant debate, given a worldwide organ shortage, controlling the amount of tumor present during the time till transplant, exploring live donors, and different immunosuppressive, or supplementary therapy. Individuals identified with minimal tumor load from HCC during surgery that was not seen through imaging because of the small size had excellent results similar to patients without malignant disease. The size of <5 cm was the cutoff.

Recurrence Post-transplantation

The presence of involvement into the vasculature, tumor diameter >5 cm, tumor status beyond Milan, and poor differentiation was felt as prominent variables for the risk for recurrence of HCC. The entire tumor size, defined as the total of all tumor diameters, was found to correlate with a four-fold increase in tumor recurrence if >10 cm. The diagnostic accuracy of MRI and CT has shown to be in the range of 45-60% and for cases with lesions under the stage, noted for 21-43%.

Living Donor Liver Transplant for HCC

The current benefits of living donor liver transplantation are an intensive donor evaluation, time available for optimization before transplantation, as well as a nominal time for cold ischemia.

Medical Treatment

Sorafenib, which is an oral tyrosine kinase inhibitor, was the original therapy that demonstrated any improvement in mortality for progressive HCC. Sorafenib 400 mg was given twice daily or placebo therapy, for a length of at most 4 years. The main endpoint included survival without recurrence of HCC documented by an independent

reviewer. Secondary goals were the time frame until HCC recurred and the overall survival.

Immunosuppression Post-transplant: MTOR Inhibitors

In many transplant centers, sirolimus has been used as monotherapy or in adjunct, for patients who have had adverse effects of calcineurin inhibitors. Furthermore, for patients who have developed non-hepatic malignancies post-transplant, some LT centers have switched patients to sirolimus, again, because of its antiangiogenic properties. Post-transplant, side effects of sirolimus include thrombosis of the hepatic artery, delayed wound healing, incisional hernias, hyperlipidemia, bone marrow suppression, mouth ulcers, skin rashes, albuminuria, and pneumonitis, among others.

Aim

The aim of the study was to correlate histopathology of HCC with the radiological features.

MATERIALS AND METHODS

The total number of liver tumors studied during the 8 years period was 38 cases among which 25 cases were diagnosed by histopathology as various types of HCC conclusively. This is a retrospective study of liver tumors, diagnosed by histopathology as various types of HCC. All the relevant clinical data of the patients were searched from the ward records. The various radiological features were collected. The clinical features examined included age, gender, smoking history, recent onset hypertension, performance status, and presenting symptoms. Laboratory studies should include a complete blood count, electrolytes, liver function tests, coagulation studies (e.g., international normalized ratio and partial thromboplastin time), and alpha-fetoprotein determination. A comprehensive health check up on general conditions were taken and stored in the computer server (Table 3).

RESULTS

Clear cell variant of HCC was the most common subtype reported followed by steatohepatic HCC and scirrhous HCC subtypes of HCC conclusively at Thoothukudi Medical College (Table 4).

Several patterns can be seen, depending on the subtype of HCC. Enhancement pattern is the key to the correct assessment of HCCs. Usually, the mass enhances vividly during late arterial (~35 s) and then washes out rapidly, becoming indistinct or hypo attenuating in the portal venous phase, compared to the rest of the liver. Grade I - minor differentiation between tumor cells and hyperplastic liver. Grade II - tumor cells show a close resemblance to normal hepatic cells, but nuclei are larger and more hyperchromatic. Grade III - larger and more hyperchromatic nuclei are present with a higher proportion of nuclei to the existing cytoplasm. Grade 4 - cell volume is largely nuclei, which is intensely hyperchromatic (Table 5).

HCC

HCC arise in equivocal nodular lesions, such as dysplastic nodules in the cirrhotic liver and are highly differentiated in the early stages. An additional characteristic feature of HCC is its frequent occurrence in the form of multiple nodules. In HCC, the simultaneous occurrence of multiple HCC may reflect either the dissemination of malignant cells from a single primary tumor to form satellite tumor nodules (intrahepatic metastasis), or the synchronous development of several independent tumors. The two possible mechanisms of development of multiple HCC reflect important differences in pathogenesis that appear to have an impact on treatment and prognosis. Differences in prognosis between these two categories probably result from the fact that multiple developing from intrahepatic metastasis are more aggressive and more

Table 3: Histopathological age, sex distribution and signs, symptoms, and history in the subtypes of hepatocellular carcinoma

| Tumor type | Age group | M:F ratio | Signs and symptoms |
|---------------------------|--|-----------|--|
| Fibrolamellar HCC | One male aged 30 years | 1:0 | One patient had complaint of abdominal pain |
| Scirrhous HCC | Females range from 46 to 64 years of age old and the age involved in male was 54-65 years of age old | 3:3 | Three patients had complaints of pain, weight loss, and deep fatigue. Three patients had complaints of nausea, vomiting, and jaundice. Four patients had history of chronic alcoholism |
| Clear cell variant of HCC | Females range from 52 to 60 years of age old and the age involved in male was 55-64 years of age old | 7:3 | Seven patients had complaints of pain, weight loss, and deep fatigue. Three patients had complaints of nausea, vomiting, and jaundice. Seven patients had a history of chronic alcoholism. Three patients had history of hepatitis |
| Steatohepatic HCC | Females range from 44 to 54 years of age old and the age involved in male was 44-55 years of age old | 6:2 | Three patients had complaints of pain, weight loss, and deep fatigue. Five patients had complaints of nausea, vomiting, and jaundice. Four patients had history of chronic alcoholism. Four patients had history of hepatitis |

HCC: Hepatocellular carcinoma

poorly differentiated than multiple HCC that is composed of several independent tumors that emerge more or less simultaneously. Molecular analysis of the HBV integration patterns and genetic changes has indicated the independent multicentric development of these nodules. During the histological assessment, small and early HCC should be distinguished from advanced disease.

The international consensus group for HCC and the WHO proposed the following classification: (1) Early HCC; a: Well differentiated; b: Small size (<2 cm); and c: Poorly defined margins, vaguely nodular type; and (2) progressed HCC: a: >2 cm; b: Small size (<2 cm), but moderately differentiated, distinctly nodular type. HCC of the vaguely nodular type occurs more often in cirrhosis, are usually smaller in size and less often show portal vein

invasion than the distinctly nodular type. The distinctly nodular subtype has a discernible capsule and usually occurs in a cirrhotic liver. Progressed HCC can grossly be classified into the following macroscopic groups: Nodular, massive, and diffuse. The nodular type can either consist of a single or multiple nodules. Single nodules are usually encapsulated and may show extracapsular growth in the vicinity of the primary nodule. The multinodular type is an aggregation of a varying amount of small nodules. The massive type is defined as a large tumor with irregular demarcation. This morphologic appearance can also be seen in advanced stage nodular HCC. The diffuse type is described to have many small nodules in a liver lobe or the whole organ. Rarely, a pedunculated or protruded growth can be observed. If the HCC grows extrahepatically with a peduncle, this should be termed "pedunculated." If a peduncle is absent the term "protruding" is adequate.

Table 4: Factors that influence the prognosis of HCC

| Factor | Good | Bad |
|--------------------------------|---------------------|-------------------|
| Stage | Early | Late |
| Size | 2-5 cm in diameter | >5 cm in diameter |
| Encapsulation | Good | - |
| Number | Single | Multiple |
| Portal vein involvement | - | Bad |
| Microscopic type | Fibrolamellar type | - |
| Mitotic activity | Low | High |
| Presence of cirrhosis | - | Bad |
| Serum AFP levels | - | High AFP levels |
| Viral antigenemia | Nil | - |
| Use of progestational hormones | Contraceptive pills | - |
| Sex | Females | Male |

AFP: Alpha-fetoprotein, HCC: Hepatocellular carcinoma

Histopathology of HCC: The classical histopathologic features of HCC are the following: Well vascularized tumors with wide trabeculae (>3 cells), prominent acinar pattern, small cell changes, cytologic atypia, mitotic activity, vascular invasion, and absence of Kupffer cells and the loss of the reticulin network. The most common histologic growth patterns are trabecular pattern, pseudoglandular or acinar with possible bile or fibrin content and the compact or solid pattern. Bile production can frequently be observed. The well-differentiated lesion is usually replaced by tissue of the dedifferentiated component in advanced disease and therefore leads to a nodule in nodule appearance. In contrast, progressed HCC shows an expansive and infiltrative histologic growth pattern

Table 5: Correlation study of hepatocellular carcinoma

| Tumor | Radiographic findings | Histopathological findings |
|---------------------------|---|--|
| Fibrolamellar HCC | CT scan shows a large heterogeneous mass in the left lobe of liver, with central necrosis. No synchronous lesion or regional lymphadenopathy | Section studied shows cords of large, polygonal tumor cells with large nuclei, prominent nucleoli, and abundant granular eosinophilic cytoplasm. Dense bands of lamellar fibrosis separating the tumor cell cords |
| Scirrhus HCC | CT scan shows typical cirrhotic changes are evident by enlarged left lobe, irregular nodular outer surface and widened fissures. There is malignant infiltration of the left hepatic lobe that enhances in the arterial phase and displays wash out on portal venous phase | Section studied shows bands of dense fibrosis separate cords and nests of large, pleomorphic neoplastic hepatocytes. The tumor cells tend to retain their polygonal shape, round vesicular nuclei, and prominent nucleoli. The cytoplasm is slightly more basophilic compared to non-neoplastic hepatocytes |
| Clear cell variant of HCC | CT scan shows a large hepatic mass with marked enhancement is seen at the right lobe. There is also several small mass with early enhancement at the both right and left lobes of the liver. On delayed phase, washout is detectable at the lesions. Right portal vein involved with tumor thrombosis | Section studied shows tumor cells arranged in a trabecular pattern cytoplasmic clearing may be due to fat, glycogen, or water |
| Steatohepatic HCC | CT scan shows a huge left lobe of liver mass is present with hypodense and hyperdense mixed areas | Section studied shows sheets and nests of large tumor cells with pleomorphic nuclei, prominent nucleoli, abundant granular eosinophilic cytoplasm, scattered Mallory bodies, distinct cell borders, and focal bile plugs. HCCs characteristically secrete bile, which is typically seen in spaces that recapitulate normal bile canaliculi |

HCC: Hepatocellular carcinoma

with complete neovascularization with unpaired arteries and possible vascular infiltration. There are no portal tracts seen within the tumor and all the classical histologic patterns (trabecular/sinusoidal, pseudoglandular, solid, and undifferentiated) are usually present. The tumors are mostly encapsulated and septae are detected. Encapsulation is reported to be more frequent in tumor arising in a cirrhotic liver than in non-cirrhotic livers. Most of these tumors show satellite nodules within 2 cm of the primary tumor nodule as well as metastasis in the liver.

Histopathologic Variants

Fibrolamellar HCC

Fibrolamellar HCC is a rare subtype first described by Edmondson accounting for <1% of all tumors. This subtype is seen in young patients without liver cirrhosis and with no other known predisposing factors and has a better prognosis than classical HCC. Grossly, it shows many fibrous septae and may have a central scarred zone with possible calcification. Histologically, the tumor cells grow in sheets and trabeculae that are separated by collagen fibers which are often hyalinized and show a characteristic lamellar pattern. One male aged 30 years reported with this subtype with a complaint of abdominal pain.

The histopathology and radiology correlation was perfect in all the cases (Figures 1 and 2).

Scirrhou HCC

Scirrhou HCC shows diffuse fibrotic change which can occur after various antitumoral treatments and seldom in untreated tumors. This type of tumor histologically shows fibrosis along the sinusoid-like blood spaces, with atrophy of the trabeculae. A unique directly subcapsular location of most of these tumors which lead to a possible pedunculated macroscopy. Six patients reported with this subtype, female ranges from 46 to 64 years of age old and the age involved in male ranges from 54 to 65 years of age old. Three patients had complaints of pain, weight loss, and deep fatigue. Three patients had complaints of nausea, vomiting, and jaundice. Four patients had a history of chronic alcoholism.

The histopathology and radiology correlation was perfect in all the cases (Figures 3 and 4).

Clear cell Variant of HCC

The clear cell variant of HCC is usually arranged in a trabecular pattern and is characterized by clear cytoplasm that contains glycogen and a variable amount of fat vesicles. Mostly only parts of the tumor show these clear cell changes. A male predominance of variable degree is reported of this particular subtype of HCC. 10 patients reported with this subtype; seven patients had complaints

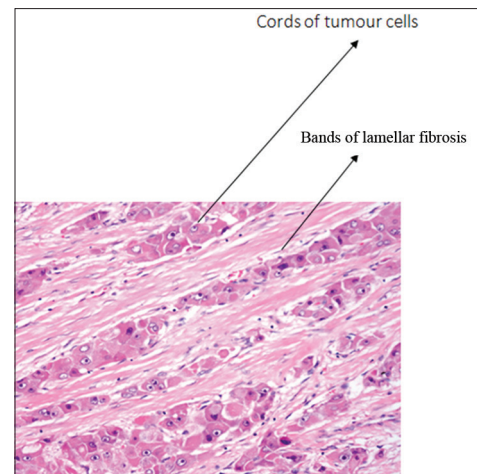


Figure 1: Section studied shows cords of large, polygonal tumor cells with large nuclei, prominent nucleoli, and abundant granular eosinophilic cytoplasm. Dense bands of lamellar fibrosis separate the tumor cell cords

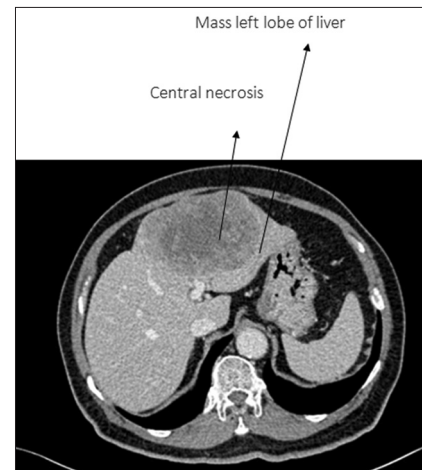


Figure 2: Computed tomography scan shows a large heterogeneous mass in the left lobe of the liver, with central necrosis. No synchronous lesion or regional lymphadenopathy

of pain, weight loss, and deep fatigue. Three patients had complaints of nausea, vomiting, and jaundice. Seven patients had a history of chronic alcoholism. Three patients had a history of hepatitis. The age group in females range from 52 to 60 years of age old and the age group involved in male range from 55 to 64 years of age old.

The histopathology and radiology correlation was perfect in all the cases (Figures 5 and 6).

Steatohepatic HCC

Steatohepatic HCC is characterized by a steatotic appearance of >5% of the tumor, presence of Mallory-bodies, fibrosis, inflammation, and ballooning of the hepatocytes as in steatohepatitis. The inflammatory infiltrate usually consists of neutrophils, plasma cells,

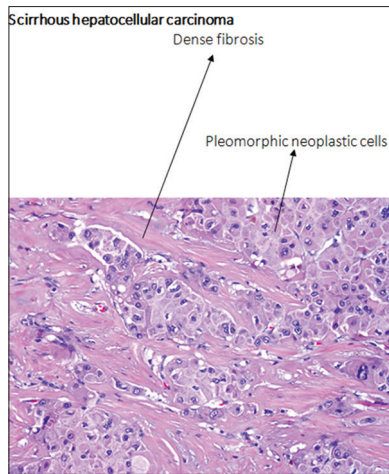


Figure 3: Section studied shows bands of dense fibrosis separate cords and nests of large, pleomorphic neoplastic hepatocytes. The tumor cells tend to retain their polygonal shape, round vesicular nuclei, and prominent nucleoli. The cytoplasm is slightly more basophilic compared to non-neoplastic hepatocytes

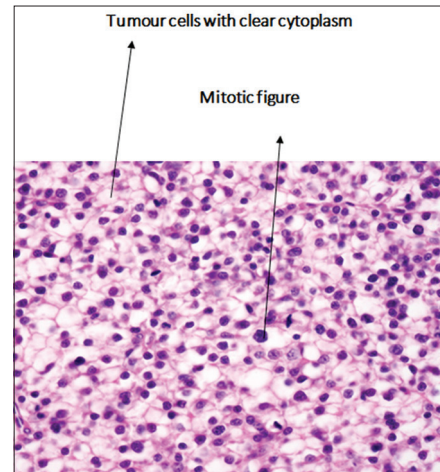


Figure 5: Section studied shows tumor cells arranged in a trabecular pattern with cytoplasmic clearing

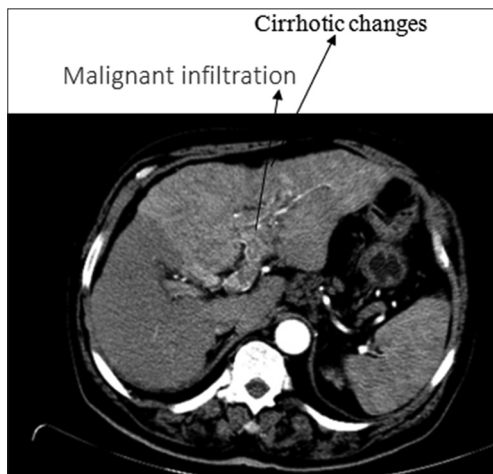


Figure 4: Computed tomography scan shows typical cirrhotic changes are evident by enlarged left lobe, irregular nodular outer surface and widened fissures. There is malignant infiltration of the left hepatic lobe that enhances in the arterial phase and displays wash out on portal venous phase

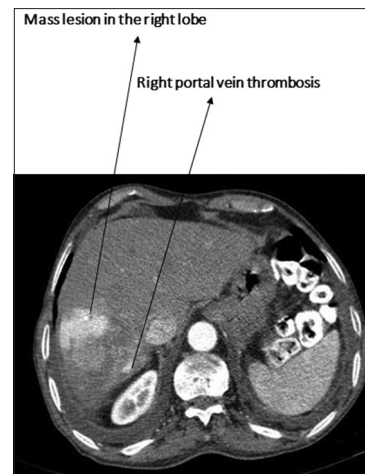


Figure 6: Computed tomography scan shows a large hepatic mass with marked enhancement is seen in the right lobe. There is also several small mass with early enhancement at the both right and left lobes of the liver. On delayed phase, washout is detectable at the lesions. Right portal vein involved with tumor thrombosis

and lymphocytes. Fibrosis usually appears in a pericellular and trabecular form. These patients often suffer from nonalcoholic steatohepatitis, but this phenotype of carcinoma is also seen in patients without steatohepatic changes in the non-neoplastic liver tissue. Eight patients reported with this subtype, the age involved in females range from 44 to 54 years of age and the age involved in male range from 44 to 55 years of age old. Three patients had complaints of pain, weight loss, and deep fatigue. Five patients had complaints of nausea, vomiting, and jaundice. Four patients had a history of chronic alcoholism. Four patients had a history of hepatitis.

The histopathology and radiology correlation was perfect in all the cases (Figures 7 and 8).

Metastasis: The most common primary sites that metastasize into the liver are lung, colon, pancreas, and breast. The primary tumors resembling HCC include clear cell renal cell carcinoma, clear cell adenocarcinoma of the female genital organs, adrenal carcinoma, and hepatoid adenocarcinoma of the stomach. Sometimes metastatic neuroendocrine tumors of the gastrointestinal tract, especially with trabecular growth pattern can also be difficult to distinguish from HCC. The cells are gathered in stands, solid nests, or trabeculae. The cells are small and have scant cytoplasm with an increased nuclear/

cytoplasmatic ratio and are usually embedded within less stroma than the typical subtype.

The prognosis is influenced by several factors, including tumor size, degree of invasion and metastasis, histologic type, and nuclear grade. The fibrolamellar HCC, steatohepatic HCC, and Clear cell variant of HCC responded moderately to the treatment (Table 6).

Baseline abdominal CT or MRI within 3-6 months, then CT, MRI or US every 3-6 months for at least 3 years and then annually up to 5 years; baseline chest CT within

3-6 months after surgery with continued imaging (CT or chest X-ray) every 3-6 months for at least 3 years and then annually up to 5 years are done as the follow-up measure.

DISCUSSION

The prognosis is influenced by several factors, including tumor size, degree of invasion and metastasis, histologic type, and nuclear grade. The fibrolamellar HCC, steatohepatic HCC, and clear cell variant of HCC responded moderately to the treatment. The total cases reported in the department are 25 cases out of which 17 cases are attending follow-up after 3 years. HCC is not a single uniform entity but a group of related neoplasms

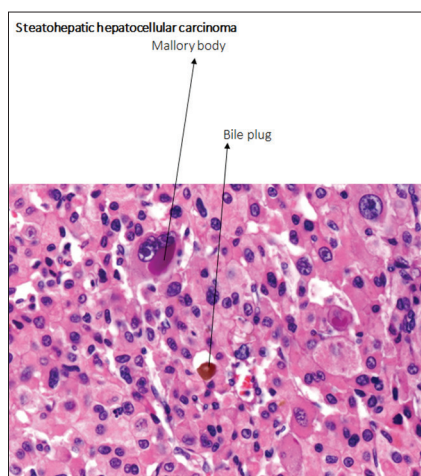


Figure 7: Section studied shows sheets and nests of large tumor cells with pleomorphic nuclei, prominent nucleoli, abundant granular eosinophilic cytoplasm, scattered Mallory bodies, distinct cell borders, and focal bile plugs. Hepatocellular carcinoma characteristically secrete bile, which is typically seen in spaces that recapitulate normal bile canaliculi

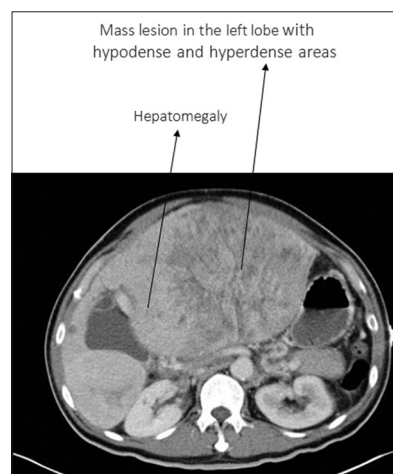


Figure 8: Computed tomography scan shows a huge left lobe of liver mass is present with hypodense and hyperdense areas

Table 6: Final outcome of the study

| Tumor | Surgery done | Cure rate measured after 3 years | Follow-up |
|---------------------------|--|----------------------------------|-----------------------------------|
| Fibrolamellar HCC | One patient underwent asymptomatic early tumor resection | 100% | One patient attended follow-up |
| Scirrhou HCC | Three patients underwent asymptomatic early tumors resection. Three patients underwent symptomatic tumors and/or invasive tumors resection, sorafenib, phase II trial agents, or palliative treatments | 50% | Three patients attended follow-up |
| Clear cell variant of HCC | Seven patients underwent asymptomatic early tumors resection. Three patients underwent symptomatic tumors and/or invasive tumors resection, sorafenib, phase II trial agents, or palliative treatments | 70% | Seven patients attended follow-up |
| Steatohepatic HCC | Six patients underwent asymptomatic early tumors resection. Two patients underwent symptomatic tumors and/or invasive tumors resection, sorafenib, phase II trial agents, or palliative treatments | 75% | Six patients attended follow-up |

in which the histologic findings, cytogenetic abnormalities, biologic behavior, and imaging appearances of the tumors are subtype dependent. Based on the hypothesis, that the diffusion of water to and from the cells is highly dependent on the ratio of intracellular and extracellular space, DWI MRI Scan is used to differentiate the tumor grades. In India majority of patients present with advanced disease and up to 13% have extrahepatic metastasis at the time of presentation. The BCLC staging system is recommended for prognostic prediction and treatment allocation. While anatomical resections provide improved survival, the choice of non-anatomical versus anatomical resections should be individualized taking into account factors such as cirrhosis and function of the liver remnant. A clear margin of resection is essential in all surgically resected cases.

CONCLUSION

The accepted modality for HCC screening is ultrasound. Once HCC is suspected then CT or MRI may be used to confirm the diagnosis and establish the tumor burden for staging purposes. However, multidisciplinary meeting and planning is essential to ensure that the correct pathways are adopted within the context of each institution. Following surgical, locoregional, chemotherapeutic, or radiotherapeutic treatment, follow-up imaging, and regular multidisciplinary discussion are adopted. MRI can not only be used for non-invasive diagnosis and staging, but also for predicting tumor biology as an imaging biomarker in patients with HCC. Favorable findings of HCC on MRI include small size, presence of fibrous capsule/pseudocapsule, intralesional fat, high ADC value, and smooth margins or hyperintensity on hepatobiliary phase images, while unfavorable findings of HCC include large size, multifocality, low ADC value, non-smooth margins, or hypointensity on hepatobiliary phase images. HCC is a difficult to treat and extremely complex malignant disease. Since the landmark SHARP trial in 2007, sorafenib monotherapy remains the only widely accepted standard treatment for advanced HCC. Percutaneous local ablation, namely, RFA and ethanol injection (EI) is the standard of care for BCLC O-A not suitable for surgery. Transarterial chemoembolization (TACE) is the recommended treatment for BCLC stage B multinodular asymptomatic tumors without vascular invasion or extrahepatic spread. The study provides the importance of another medical faculty the Surgeon, Radiologist and Oncologist to work as a team for a successful outcome. We correlated the histopathological findings with radiological findings. This resulted in a perfect correlation between the histopathology study and radiology study.

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Pattern of Refractive Errors in Primary School Children in Rural Areas of Jammu City of Jammu and Kashmir, India

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Abstract

Introduction: Visual impairment in children is mostly detected during school screening program in accordance with National Programme for Control of Blindness (NPCB).

Materials and Methods: All schoolgoing children of both genders aged 5-16 years under school screening program underwent visual acuity (VA) assessment, ocular motility evaluation, and cover-uncover test. Depending on type of eye disease, they were categorized. Children with defective vision were further examined employing objective refraction using autorefractometer followed by streak retinoscopy after instilling 1% cyclopentolate eye drops. Children with any kind of refractive errors were evaluated and categorized according to the type of refractive error on post-mydratic examination. Children with prior ocular surgery or any ocular disease contributing to diminished VA, manifest strabismus, and pathological myopia were excluded from the study.

Results: The prevalence of refractive error in this study is 11.6%. There is no significant difference in prevalence of refractive error between two sexes. The prevalence increases with age. The common refractive error was astigmatism followed by myopia and then hypermetropia.

Conclusion: Refractive error is important cause of treatable blindness in schoolgoing children in the age group of 5-16 years. Hence, regular eye screening among schoolchildren is mandatory as is covered under NPCB.

Key words: Amblyopia, Astigmatism, Hypermetropia, Myopia, Refractive error

INTRODUCTION

Visual impairment in children is mostly detected during school screening program in accordance with National Programme for Control of Blindness. Uncorrected refractive errors constitute a large number of children with treatable blindness.¹ Poor vision in children can profoundly affect his/her participation and learning in the classroom. This can interfere with education, personality development, and career opportunities in the future in addition to causing an economic burden on society. However, this burden of

economic loss may vary with type of visual impairment. Hence, knowledge of prevalence and pattern of visual impairment in schoolchildren can help us in planning public health strategy.

- Approximately 12.8 million children in the age group 5-16 years are visually impaired from uncorrected or inadequately corrected refractive errors, estimating a global prevalence of 0.96%.²
- Due to increasing realization of visual requirements in children, childhood blindness has been considered one of the priorities of Vision 2020 - the right to sight-a global initiative launched by a coalition of non-government organizations and the WHO.³ Uncorrected refractive errors are prevalent even in high income countries.⁴
- This study aims at evaluating pattern and prevalence of refractive errors in school age children in rural area of Jammu which can help us in planning public health strategy.

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MATERIALS AND METHODS

- The present study is a descriptive cross-sectional study. Ethical clearance was taken from the institutional review board. All primary schoolchildren who attended Eye Outpatient Department of Acharya Shri Chander College of Medical Sciences and Hospital, Jammu in 2015, 2016 and till date in 2017 and those children who were screened during school eye screening camps in school premises itself, were included in this study under school screening program.
- Detailed history was taken from all the students including family history, current problems, past problems, and treatment taken.
- The students then underwent a preliminary ocular examination. Snellen's chart was used at 6 m distance for assessment of uncorrected, presenting, and best-corrected visual acuity (VA).
- Extraocular movements and cover test were performed using torch light, and convergence was tested using royal air force rule.
- Children with defective vision were selected for detailed ocular examination including VA both for distance and near, objective refraction with autorefractometer followed by streak retinoscopy under 1% cyclopentolate eye drops, anterior segment, and fundus examination.
- Children with prior ocular surgery were excluded from the study.

Statistical Analysis

- Chi-square test was used to analyze differences in the refractive errors between males and females and among different age groups.
- $P < 0.05$ was considered significant.

RESULTS

- A total of 642 children between 5 and 16 years of age were included in the study. 340 (52.95%) out of these were male students and 302 (47.04%) were female students giving a male: female ratio of 1.12 (Table 1).
- Students were divided into four groups according to their age (Table 2).
- Unaided VA was normal (6/6) in 567 (88.31%) students. Presenting VA was normal (6/6) in 586 (91.27%) students.
- Presenting VA 6/9-6/12 was found in 45 (7%) students.
- Presenting VA of 6/18-6/60 was observed in 17 (2.64%) students.
- VA $< 6/60$ was seen in 13 (2.02%) students.

Table 1: Sex distribution of students

| Sex | n (%) |
|-----------------|-------------|
| Male students | 340 (52.95) |
| Female students | 302 (47.04) |

Table 2: Age-wise distribution of student

| Age (in years) | n (%) |
|----------------|-------------|
| 5-7 | 77 (11.98) |
| 8-10 | 167 (26.01) |
| 11-13 | 205 (31.93) |
| 14-16 | 193 (30.06) |

- 26 (12.7%) students were wearing glasses out of which 19 students had presenting VA of 6/6.
- After refractive correction, VA improved to 6/6 in 636 (99.06%) students. 2 (0.31%) students whose best-corrected VA was $< 6/12$ were amblyopic (Table 3).
- A total of 75 children (11.6%) had refractive error. Refractive error was prevalent in 42 (12.35%) males and 33 (10.92%) females. There was no significant difference between the prevalence of refractive error between male and female sex ($P > 0.05$).
- The prevalence of refractive error which was 3.8% in 5-7 years age group increased to 17.6% in 14-16 years age group. This increase was statistically significant ($P < 0.01$) (Table 4).
- Of the total 75 children with refractive error, myopia was present in 28 (36.9%) cases; hypermetropia in 6 (8.3%), and astigmatism in 41 (54.8%) cases (Table 5).
- The prevalence of myopia increased from 8.6% in 5-7 years age group to 42.7% in 14-16 years age group. The prevalence of hypermetropia progressively decreased from 52.3% in 5-7 years age group to 6.6% in 14-16 years age group. The prevalence of astigmatism progressively decreased from 34.9% in 5-7 years age group to 16.5% in 14-16 years age group (Table 6).
- The prevalence of myopia was 57.1% in males and 42.8% in females. The prevalence of hypermetropia was 66.6% in males and 33.3% in females. The prevalence of astigmatism was 43.9% in males and 56.09% in females (Table 7).

DISCUSSION

- In India as in other developing countries, the school health services provided are quite insufficient contrary to services provided in developed countries. India being a developing country, there is shortage of infrastructure and resources.

Table 3: Distribution of uncorrected, presenting, and best corrected VA

| VA | n (%) | | |
|-----------|-------------|-------------|-------------|
| | Unaided | Presenting | BCVA |
| 6/6 | 567 (88.31) | 586 (91.27) | 636 (99.06) |
| 6/9-6/12 | 45 (7) | 42 (6.54) | 4 (0.62) |
| 6/18-6/60 | 17 (2.64) | 10 (1.55) | 2 (0.31) |
| <6/60 | 13 (2.02) | 3 (0.46) | 0 |

BCVA: Best-corrected visual acuity, VA: Visual acuity

Table 4: Prevalence of refractive error by age and sex

| Age (years) | Refractive error absent | Refractive error present |
|-------------|-------------------------|--------------------------|
| 5-7 | 74 | 3 (3.8) |
| 8-10 | 155 | 12 (7.2) |
| 11-13 | 179 | 26 (12.7) |
| 14-16 | 159 | 34 (17.6) |
| Males | 298 | 42 (12.35) |
| Females | 269 | 33 (10.92) |
| Total | 567 | 75 (11.6) |

Table 5: Distribution of type of refractive errors among cases and the study group

| Type of refractive error | Number of students | Percentage among the cases | Percentage in study group |
|--------------------------|--------------------|----------------------------|---------------------------|
| Myopia | 28 | 36.9 | 4.36 |
| Hypermetropia | 6 | 8.3 | 0.93 |
| Astigmatism | 41 | 54.8 | 6.38 |
| Total | 75 | 100 | 11.6 |

Table 6: Association of age with the type of refractive error

| Age (years) | Myopia n=28 (%) | Hypermetropia n=6 (%) | Astigmatism n=41 (%) | P |
|-------------|--------------------|--------------------------|-------------------------|-------|
| 5-7 | 3 (8.6) | 52.3 | 34.9 | <0.05 |
| 8-10 | 5 (19.7) | 28.6 | 26.6 | |
| 11-13 | 8 (29) | 12.5 | 22 | |
| 14-16 | 12 (42.7) | 6.6 | 16.5 | |

Table 7: Association of sex with the type of refractive error

| Sex | Myopia n=28 (%) | Hypermetropia n=6 | Astigmatism n=41 | P |
|--------|--------------------|----------------------|---------------------|--------|
| Male | 16 (57.1) | 4 (66.6) | 18 (43.9) | P>0.05 |
| Female | 12 (42.8) | 2 (33.3) | 23 (56.09) | |

- To implement Vision 2020 in India, childhood blindness has to be targeted and for that school eye screening program is a must there.
- Data on prevalence and causes of blindness in children is needed for planning and evaluating preventive and curative services for children.

- Among various eye disorders in schoolchildren, prevalence of refractive error in this study was 11.6% which was slightly lesser to prevalence observed by Shakeel *et al.* in Dehradun (13%)⁵ and Sharma *et al.*⁶ in Haryana (13.65%). However, due to differences in demographic factors, socioeconomic factors, different race, etc., prevalence in this study is higher when compared to that by Murthy *et al.*⁷ in New Delhi (6.4%) and Kumar *et al.*⁸ in Lucknow (7.4%). Variations in prevalence data were observed from different parts of the world also like 8.2% in Baltimore, the USA;⁹ 12.8% in Shunyi district in China;¹⁰ 2.9% in Nepal¹¹ and 15.8% in Chile.¹²
- There was an increase in overall prevalence of refractive errors with advancing age as shown in Table 4. Our results were comparable with the study conducted by Shakeel *et al.*, Dehradun⁵ which showed prevalence of refractive error more in 14-16 years age group (16.1%) as compared to 9.1% in 5-7 years age group. Pavithra *et al.*¹³ in Bengaluru showed the prevalence of refractive error higher in 13-15 years age group (7.5%) as compared to 6.6% in 7-9 years age group. Matta *et al.*¹⁴ also found that refractive error increased with increasing age, especially in the age group of 10-14 years.
- There was no significant difference in the prevalence of refractive error between males and females in our study ($P > 0.05$) as shown in Table 4. This was similar to the results shown by Ande *et al.* in Andhra Pradesh¹⁵ and Krisnan *et al.* in Villupuram and Puducherry,¹⁶ where no sex predilection of refractive error was seen. However, some studies showed evidence of increased prevalence in female students,^{6,17} which can be due to earlier puberty in girls with respect to boys. This was in contrast to Sriram and Raj¹⁸ in Tamil Nadu which showed refractive errors to be more prevalent in male children (21.5%) than female children (17%).
- In our study, the single most common refractive error was astigmatism followed by myopia. Hypermetropia was least common of all as shown in Table 5. Our results were comparable with the study conducted by Shakeel *et al.* in Dehradun⁵ where also the most common refractive error among schoolchildren was astigmatism (54.3%), followed by myopia (38.1%) and then hypermetropia (7.6%). Rai *et al.* in Rupendehi district, Nepal¹⁹ have also shown similar results. Pavithra *et al.* in Bengaluru,¹³ Sethi and Kartha Ahmedabad²⁰ and Matta *et al.*¹⁴ concluded that myopia was the most common refractive error among schoolchildren followed by astigmatism and hypermetropia. Medi and Robert in Kampala district showed that commonest refractive error was astigmatism (52%) followed by hypermetropia (37%) and myopia (11%).²¹
- In the present study, myopia showed an increasing trend with advancing age whereas hypermetropia and

astigmatism showed a decreasing trend with advancing age which was statistically significant ($P < 0.05$) as shown in Table 6. Similar pattern was shown in many previous studies conducted in Dehradun,⁵ New Delhi,⁷ Bengaluru,¹³ Andhra Pradesh,¹⁵ and Kolkata.²² There was no significant difference in the prevalence of myopia, hypermetropia, and astigmatism between males and females in our study ($P > 0.05$) (Table 7). Similar results were shown in a study conducted in Villupuram and Puducherry.¹⁶ Hypermetropia was shown to be associated with female sex in some of the previous studies.^{7,13,23} In a study conducted by Pune,²⁴ myopia was found to be more prevalent in females (57.35%) as compared to males (42.65%). Hypermetropia was equally prevalent in both sexes (50%), astigmatism was found only in females (100%) and myopia was shown to be associated with female gender (65%) in a study conducted in Kolkata.²² Myopia was shown to have no sex predilection in few other studies.^{13,15} Study conducted by Shakeel *et al.*⁵ has also shown that myopia has increasing trend with age whereas hypermetropia and astigmatism have decreasing trend with age.

- The presenting VA was 6/6 in 91.27% students while after refractive correction 99.06% students could attain a VA of 6/6. These results raise the need for school-based program that provides prescription of glasses to the deserving students at no cost, through government and non-governmental collaborative fund due to shortage of resources and insufficient facilities in India, School Health Services are hardly more than a token service.²⁵
- 2 (0.31%) students in our study suffered from amblyopia. Amblyopia treatment is most effective when done early in the child's life, usually before 7 years of age.²⁶ School screening is the best way to detect amblyopia in schoolchildren. Since detailed evaluation was done only in children with VA $< 6/12$, some refractive errors like latent hypermetropia might have been missed. Moreover, students with manifest strabismus and pathological myopia were excluded from this study which might distort the demographic data marginally. Another limitation of our study was that only schoolgoing children were included in the study though some proportion of children in Rural India and other developing countries do not go to school. Hence, a more complete assessment of visual impairment in children would be possible with population-based studies not restricted only to schoolgoing children.
- Different studies conducted in India and world over suggest early screening, spectacle compliance, and spreading awareness among parents to motivate students to use spectacles.²⁷

CONCLUSION

Refractive error is a common cause of visual impairment among schoolchildren in developing countries. Uncorrected refractive errors can cause immediate and long-term consequences in children and adults such as lost educational and employment opportunities, reduced economic gain for individuals, families, and societies with impaired quality of life. Various factors are responsible for refractive errors remaining uncorrected in children like lack of awareness and recognition of the problem at personal and family level, as well as at community and public health level; non-availability of and/or inability to afford refractive services for testing; insufficient provision of affordable corrective lenses and cultural disincentives to compliance. School eye screening program need to be implemented on a large scale to detect children suffering from blindness due to refractive error.

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Multiple Effects of Hypothyroidism on Bone Mineral Density and Its Association with Vitamin D, Serum Calcium: A Cross-sectional Study

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Abstract

Introduction: Hypothyroidism is one of the most common endocrine disorders worldwide. Thyroid stimulating hormones (TSH) directly affects the remodeling of bone through TSH receptor found on osteoblast and osteoclast precursor cells. The physiological variation of thyroid hormones is associated with changes in bone mineral density (BMD) and nonvertebral fracture risk in healthy postmenopausal women.

Material and Methods: The study population included 94 females suffering from hypothyroidism and 75 healthy female subjects of 20-60 years age group. Thyroid function test including serum total triiodothyronine, free thyroxine, and TSH was measured by enzyme-linked immunosorbent assay (ELISA) method. Serum calcium level was measured by Arsenazo III Method. Whereas, Vitamin D was estimated by ELISA method. BMD was measured by dual electron X-ray absorptiometry at the femoral neck.

Results: Results of the present study revealed that serum calcium level of Group I hypothyroid female patients was significantly low in comparison to Group II control female subjects ($P < 0.0001$). Vitamin D was significantly low in hypothyroid female patients in comparison of euthyroid female subjects (24.31 ± 13.41 ng/dl vs. 42.79 ± 9.67 ng/dl, $P < 0.0001$). Further, BMD in hypothyroid female patients was significantly high in comparison of euthyroid female subjects (-0.97 ± 0.22 g/cm² vs. -1.06 ± 0.34 g/cm², $P < 0.04$). X-ray of both group participants showed an insignificant difference in a long bone (femur).

Conclusion: Findings of the present study suggest thyroid hormones play an important role in strengthening and remodeling of bones as decreased thyroid hormones are associated with a decrease in serum calcium and Vitamin D. Further, increased BMD in hypothyroid patients induces stiffness of bones which further increases the risk of fracture. Moreover, present research suggests that serum calcium, Vitamin D and BMD should be investigated to prevent the risk of fracture in hypothyroid patients.

Key words: Bone mineral density, Hypothyroid, Serum calcium, Vitamin D

INTRODUCTION

Hypothyroidism is one of the most common endocrine disorders worldwide.¹ The prevalence of hypothyroid is 10-11% in India.² Insufficient production of thyroid hormones is considered as hypothyroidism.³ Hypothyroid is related to the weight changes of the body, heart thyroid

gland and bones.⁴ Any changes of normal thyroid function in euthyroid individuals are related with body weight variations.⁵ Thyroid stimulating hormones (TSH) directly affects the remodeling of bone through TSH receptor found on osteoblast and osteoclast precursor cells.⁶ TSH has a positive correlation with body mass index (BMI) in women; though, this correlation is insignificant in male.⁵ Women having subclinical hypothyroidism have reduced femoral neck bone mineral density (BMD).⁶ The variations in thyroid function are primary, while changes in body weight and bones are secondary.⁵ The physiological variation of thyroid hormones is associated with changes in BMD and nonvertebral fracture risk in healthy postmenopausal women.⁷ Serum calcium levels are decreased in subclinical hypothyroid and overt hypothyroidism compared to euthyroid while a negative

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correlation between serum TSH levels and serum calcium.⁸ Osteoporosis is one of the widespread metabolic diseases of bone in which the bone becomes thin and fragile, creating an increased risk of fracture.⁹ According to the World Health Organization (WHO) BMD 2.5 or more standard deviations (SD) below that of a young adult (T score) at any site is osteoporosis.¹⁰ The defective thyroid function may be one of the important causes of osteoporosis.¹¹ Nonetheless, hyperthyroidism poses a negative effect on bone metabolism while hypothyroidism does not affect bone density in premenopausal females.^{10,11} Bone strength is predicted by both BMD and bone architecture.¹² In general, thinned cortices reduce the number of trabeculae, and endosteal reabsorption is hallmark features of osteoporosis in radiography.¹³ The WHO classified BMD into categories of normal (T-score < -1), Osteopenia ($-1 < \text{T-score} < -2.5$), Osteoporosis (T-score < -2.5), and severe osteoporosis (T-score < -2.5 with a fragility fracture).¹⁴

There is still controversy about the relation between thyroid hormones, osteoporosis and BMD in female hypothyroid patients. Therefore, the present study was designed to fulfill in these lacunae in our understanding of impact of hypothyroid disorder on long bones, serum calcium, and Vitamin D in female patients.

MATERIALS AND METHODS

This was a cross-sectional study which was conducted in the Department of Anatomy, Rama Medical College, Kanpur, Uttar Pradesh. The study population was consisting of females both suffering from hypothyroid and healthy, between 18 and 60 years of age. The study population was divided into two groups, Group I (hypothyroid group) included 59 females suffering from hypothyroid, whereas, Group II (control group) consisted 52 healthy female subjects. All the participants of the present study both hypothyroid patients and controls were recruited from Rama medical college and Hospital, Kanpur. Female hypothyroid patients with BMI 20-40 kg/m² were included while hypothyroid patients are suffering from any type of chronic disease, e.g., diabetes mellitus, tuberculosis, renal failure, and hypertension were excluded from the study. Patients on hormone replacement therapy, antihypertensive medicines or on any other medication were not included in this study. This research was approved by the Ethical Committee of Rama Medical College and Hospital, Kanpur. All the participants gave their informed written consent before participating in the study.

Methodology

Anthropometric parameters

The height of the participants was measured using standard height scale.¹⁵ Weight was measured by the standard

portable weighing machine.¹⁵ BMI was calculated using the formula - BMI = weight (kg)/height (m²).

Biochemical parameters

Thyroid functions were assessed by measuring serum total triiodothyronine (T3), free thyroxine (FT4), and TSH by enzyme-linked immunosorbent assay (ELISA) method (kits manufactured by Avantor Performance Materials, India).¹⁶ Serum concentration of total cholesterol, serum concentration of triglycerides, and serum concentration of high-density lipoprotein were estimated by the enzymatic cholesterol oxidase - peroxidase (CHOD-POD) method, glycerol phosphate oxidase - Papanicolaou test (GPO-PAP) method and CHOD-POD/phosphotungstate method, respectively, (kit manufactured by Erba Mannheim, India).¹⁶ Serum concentration of low-density lipoprotein was measured using Friedewald's formula.¹⁶ Serum calcium level was measured using Arsenazo III Method while kit manufactured by Diagnostics Pvt., Ltd. India was used. Whereas, Vitamin D was estimated by ELISA method (kit manufactured by Cayman chemical company, Ann Arbor, USA).¹⁶ ELISA reader and biochemistry analyzer E-C5VZ (10 k), respectively, manufactured by Robonik (India) Pvt., Ltd. and Transasia (India) were used for biochemistry analysis. X-ray of long bone was done by MDX - 100 (100 mA, 100 KVP fixed X-ray machine) manufactured by recorders and Medicare Systems Pvt., Ltd, Panchkula (HR). BMD was measured dual electron X-ray absorptiometry using the Hologic machine (QDR 4500; Discovery a Hologic, Waltham, Massachusetts) at the femoral neck.¹⁷

Subject's BMD value –

$$T - \text{score} = \frac{\text{Mean young normal BMD value}^6}{\text{ISD young normal BMD}}$$

Statistical Analysis

Baseline characteristics of the study participants were expressed in mean \pm SD. Unpaired student *t*-test was used to analyze if there were any difference in different parameters of both groups. A $P < 0.05$ was considered statistically significant. IBM Statistical Package for the Social Sciences Statistics 21 manufactured by IBM USA will be used for entire calculations.

RESULTS

All the results of the present study were expressed as mean \pm SD. Table 1 summarizes that there was an insignificant change in age ($P > 0.05$) of both groups participants. Further, it is evident from Table 1, that there was a significant difference between weight ($P < 0.001$) and BMI ($P < 0.0012$) of Group I hypothyroid female patients and Group II control female subjects.

Table 2 summarizes that T3 ($P < 0.0001$) and FT4 ($P < 0.0001$) were significantly low in Group I hypothyroid female patients in comparison to Group II normal female subjects. Further, TSH was significantly high in Group I patients in comparison of Group II subjects ($P < 0.0001$). Results of the present study revealed that serum calcium level of Group I hypothyroid female patients was significantly low in comparison to Group II control female subjects ($P < 0.0001$). Furthermore, there was a significant difference in total cholesterol, triglyceride, high-density lipoprotein, and low-density lipoprotein of Group I and Group II (Table 2).

Figure 1 shows that Vitamin D was significantly low in hypothyroid female patients (24.31 ± 13.41 ng/dl) in comparison of euthyroid female subjects (42.79 ± 9.67 ng/dl). The $P < 0.00001$. Further, it is evident from Figure 2 that BMD in hypothyroid female patients was significantly high in comparison of euthyroid female subjects (-0.97 ± 0.22 g/cm² vs. -1.06 ± 0.34 g/cm², $P < 0.04$).

It is evident from Figure 3 that X-ray of both group participants showed an insignificant difference in a long bone (femur).

DISCUSSION

Thyroid disorder has been found associated with alteration of bone growth.¹⁸ Moreover, hypothyroid causes increase risk of fracture of bones¹⁹ finding of this study showed

Table 1: Baseline characteristics of the participants

| Parameters | Group I | Group II | P |
|--------------------------|-------------|-------------|-----------------------|
| Age (years) | 33.29±11.26 | 33.85±11.55 | <0.7486 ^{NS} |
| Height (m) | 154.18±6.71 | 155.19±6.55 | <0.3251 ^{NS} |
| Weight (kg) | 55.73±5.46 | 53.44±5.86 | <0.001** |
| BMI (kg/m ²) | 23.19±2.71 | 22.22±1.81 | <0.0012** |

Values expressed as mean±SD, NS: Nonsignificant, **($P < 0.05$) significant.
BMI: Body mass index, SD: Standard deviation

Table 2: Comparison of thyroid hormones in both groups

| Parameters | Group I | Group II | P |
|---------------|--------------|--------------|----------------------|
| T3 | 0.33±0.16 | 1.07±0.2 | <0.0001** |
| FT4 | 0.9±0.46 | 1.24±0.4 | <0.0001** |
| TSH | 30.73±15.42 | 2.35±1.41 | <0.0001** |
| Serum calcium | 7.66±1.21 | 9.09±0.62 | <0.0001** |
| TC | 213.2±29.16 | 195.16±24.26 | <0.0001** |
| TG | 125.99±27.74 | 109.84±21.57 | <0.0001** |
| HDL | 41.39±5.59 | 42.86±7.42 | <0.147 ^{NS} |
| LDL | 146.39±27.3 | 130±23.79 | <0.0001** |

Values expressed as mean±SD, NS: Nonsignificant, **($P < 0.05$) significant.
T3: Triiodothyronine, FT4: Free thyroxine, TSH: Thyroid stimulating hormones, SD: Standard deviation, LDL: Low-density lipoprotein, HDL: High-density lipoprotein, TC: Total cholesterol, TG: Triglyceride

that serum calcium level of hypothyroid female patients was significantly low in comparison of euthyroid females. Our findings are consistent with the previous studies of Shivalleela *et al.*²⁰ and Kavitha *et al.*⁸ as they observed the similar low concentration serum calcium in hypothyroid patients in comparison to control subjects. Calcium is one of the most important nutrients of the body which is reserved in the bones.²¹ This low serum calcium level in hypothyroid female as observed in the present study seems to be due to a decrease of hypothyroid hormones cause reduced basal metabolic rate which in turn leads to decreasing turnover of calcium.^{8,20} Decrease of calcium for

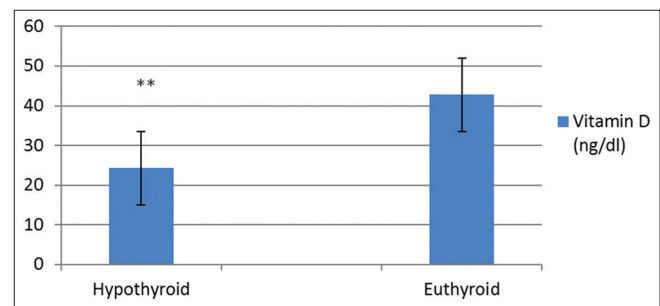


Figure 1: Comparison of Vitamin D in both groups, ** $P < 0.05$ significant

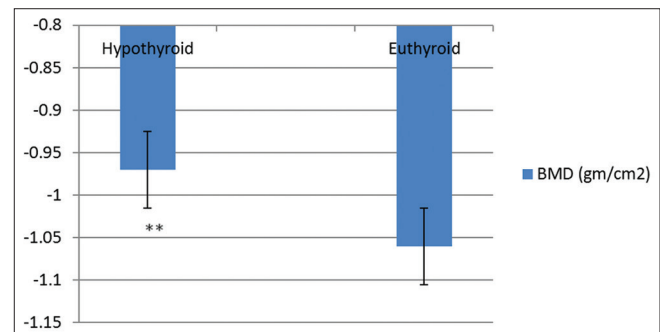


Figure 2: Comparison of bone mineral density in both groups, ** $P < 0.05$ significant

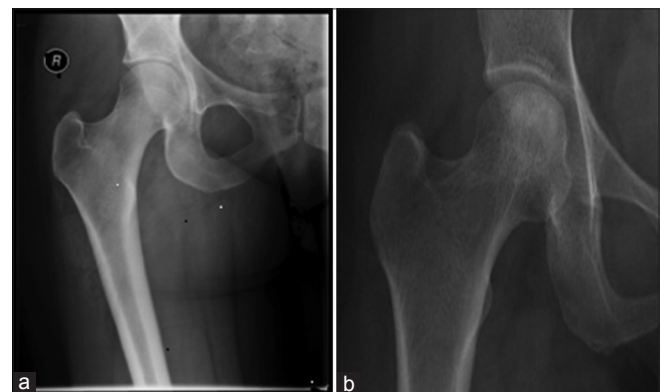


Figure 3: Comparison of femur X-ray of both groups, (a) hypothyroid patients, (b) euthyroid subjects

a long time can significantly depilate the calcium storage of body and leads weakness of bones.²¹ In addition, decrease calcium level has been found associated with osteoporosis in females.²²

Further, the present study recorded a significant low level of Vitamin D in hypothyroid patients in comparison of euthyroid females. The results of the present study are very similar to the previous studies Mackawy *et al.*²³ and Kivity *et al.*²⁴ as they observed low level of Vitamin D in hypothyroid disorder. Moreover, result of our study is consistent with the result of Chio *et al.*²⁵ in which they observed similar decrease level of Vitamin D in hypothyroid patients. Vitamin D is essential for absorption of calcium from stomach; requirement of Vitamin D is fulfilled by exposure to sun light, diet, and supplementation.²⁶ This decrease of Vitamin D in hypothyroid female patients primarily may be due to defective absorption from the intestine, second due to improper activation of Vitamin D.²⁷ Decrease of Vitamin D induces hypocalcaemia.²⁸ Vitamin D plays a permissive role in formation and remodeling of bones.¹⁸

Finding of the present study showed that BMD level of hypothyroid female patients was significantly high in comparison of euthyroid females. Our findings are in harmony with the previous study of Grimnes *et al.*²⁹ as they recorded a significant increase of BMD in hypothyroid female patients in comparison of euthyroid subjects. Further, increased BMD level as recorded in the present study is consistent with the previous studies of Marwaha *et al.*,³⁰ Kavitha *et al.*,⁸ and Morris.³¹ Thyroid hormones are indispensable for the growth and remodeling of the bone.³² This increase of BMD in hypothyroid female patients in comparison to euthyroid female subjects may be due to a decreased rate of metabolism during hypothyroidism which leads to reducing rate of bone resorption process results in a higher net gain of bone.³³ There is a decrease of osteocalcin, and alkaline phosphate during hypothyroidism leads to osteosclerosis and increase of BMD.³⁴ Further, decrease serum calcium level and reduce Vitamin D level induces the poor bone quality as serum calcium and Vitamin D are essential for remodeling of bone as well as maintenance normal BMD level of bones.⁷ TSH has direct effects on bone remodeling, which is mediated through the TSH receptor found on osteoblast and osteoclast precursor cells.¹¹ Therefore, an increase of thyroid hormones causes increased cortical thickness and decreased osteoblast activity which results in prolonged and slow maturation of bones.³² Furthermore, reduced and decelerated bone remodeling due to hypothyroid disorder induces decreased bone matrix protein like osteocalcin while increased mineralization causes sclerosis of bones which further, increased the risk of bone fracture in

hypothyroid patients.^{20,32} Nonetheless, decrease of serum calcium as well as reduce the level of Vitamin D leads to deprived quality of bone; moreover, increased BMD with osteosclerosis leads to increased stiffness of bones increased the susceptibility for fracture in hypothyroid patients.¹⁸

CONCLUSION

Findings of the present study suggest thyroid hormones play an important role in strengthening and remodeling of bones as decreased thyroid hormones are associated with a decrease of serum calcium and Vitamin D. Further, increased BMD in hypothyroid patients induces stiffness of bones which further increases the risk of fracture. Moreover, present research suggests that serum calcium, Vitamin D and BMD should be investigated to prevent the risk of fracture in hypothyroid patients. Moreover, our study encourages the screening of serum calcium and Vitamin D in hypothyroid patients as well suggests supplementation of calcium and Vitamin D to hypothyroid patients. However, more studies on larger populations are warranted to establish a clear relation between hypothyroid and bone health.

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Role of Cartridge-based Nucleic Acid Amplification Test in Diagnosis of Tuberculous Pleural Effusion Compared to Tuberculous Empyema in HIV-seronegative Patients

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Abstract

Introduction: The tuberculous pleural effusion is the second most common form of extrapulmonary tuberculosis (TB) in high TB burden country such as India. Since the endorsement of cartridge-based nucleic acid amplification test (CBNAAT) in the diagnosis of extrapulmonary TB by the World Health Organization, there are several publications assessing the diagnostic accuracy of CBNAAT in pleural effusion. However, there is very little data on its role in tuberculous empyema which is a very common clinical presentation in this part of the world. The objective of the present study is to reevaluate the role of CBNAAT in the diagnosis of tuberculous pleural effusion compared to tuberculous empyema.

Materials and Methods: This was a prospective observational study where patients with a clinical and radiological diagnosis of pleural effusion attending the outpatient department and emergency of a tertiary care hospital were enrolled in the study after obtaining consent and satisfying the set inclusion and exclusion criteria over a period of 1 year. All the pleural fluid samples were sent for CBNAAT for *Mycobacterium tuberculosis* and BACTEC culture along with other routine tests. Statistical analysis was done using SPSS version 20.0 (SPSS Inc., Chicago, IL) software for MS-Windows.

Results: Among a total of 105 patients of tuberculous pleural effusion (male 68 and female 37) with the mean age 36.23 ± 13.45 years, 10 (male 5, female 5) had tuberculous empyema. Pleural fluid acid-fast bacilli smear, mycobacterial culture, and CBNAAT were positive in 8.57%, 20%, and 15.23%, respectively. The sensitivity and specificity of CBNAAT, considering mycobacterial culture positivity as standard reference, were 4.76% (95% confidence interval [CI] 0.99-13.29) and 87.5% (95% CI 71.01-96.49), respectively, for tuberculous pleural effusion, while they are 100% (95% CI 66.37-100) and 100% (95% CI 2.5-100) in tuberculous empyema, respectively. A single case of rifampicin resistance was detected among tuberculous effusion without empyema which was later confirmed by solid and liquid culture.

Conclusion: CBNAAT is a useful rapid diagnostic tool for suspected tuberculous pleural effusion/empyema considering the advantage of rapid test result and information about drug resistance pattern, especially in high burden country such as India.

Key words: Cartridge-based nucleic acid amplification test, Mycobacterial culture, Tuberculous empyema, Tuberculous pleural effusion

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INTRODUCTION

The tuberculous involvement of pleura¹ The diagnosis of tuberculous pleural effusion with confidence is still a challenge before physicians even more than 100 years after the discovery of TB bacilli. The demonstration of *Mycobacterium tuberculosis* (MTB) in pleural fluid or

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demonstration of granuloma in biopsy specimen is considered as a gold standard; however, the sensitivity and specificity of such investigations are widely varied ranging from >10% in pleural fluid smear,² 15-35% for pleural fluid culture,^{3,4} and ranging from 60% to 100% in biopsy specimen depending on the procedure adapted.^{2,5-7} The World Health Organization (WHO) has endorsed cartridge-based nucleic acid amplification test (CBNAAT) as a rapid diagnostic test for the detection of MTB and rifampicin resistance on December 2010. Later, the WHO published a policy update on 2013 emphasizing the role of Xpert MTB/RIF in early diagnosis of extrapulmonary TB.⁸ Since then, several studies and meta-analysis reports have been published assessing sensitivity and specificity of CBNAAT in pleural effusion, ranging from 15-55% and 98-100%, respectively.^{5,9-11} This wide variation is partly due to the use of different reference standards adapted for the analysis. Recently, the index-TB guidelines on extrapulmonary TB, published in 2016, suggest strong recommendation against routine use of Xpert MTB/RIF in the diagnosis of pleural TB.¹ Although there are several publications on CBNAAT in pleural effusion, there is a paucity of data among tuberculous empyema.

The purpose of the present study is to reevaluate the role of CBNAAT in the diagnosis of tubercular pleural effusion with special reference to tuberculous empyema.

MATERIALS AND METHODS

The present study was a prospective observational and analytical study conducted in a tertiary care hospital in eastern India over a span of 1 year extending from January 2016 to December 2016. The study population was recruited from those attending the outpatient department (OPD) of the Department of Pulmonary Medicine or Emergency Department of the hospital.

The diagnosis of tuberculous pleural effusion was established by a composite reference standard (CRS) which was defined as any one of the following in the present study: (1) Demonstration of tubercle bacilli in the pleural fluid or any specimen collected from other body site except sputum, by Ziehl-Neelsen stain or fluorescent microscopy or CBNAAT or line probe assay or culture (solid or liquid media) or demonstration of caseating granuloma in biopsy specimen and (2) exudative lymphocytic pleural effusion (according to Light's criteria) with adenosine deaminase assay (ADA) >40 IU/L with lymphocyte-to-neutrophil ratio of more than 0.75 and other probable causes of pleural effusion excluded with reasonable certainty with complete radiological and clinical resolution of symptoms

at the end of full course of antitubercular drugs (ATDs). The demonstration of either of acid-fast bacilli (AFB) in culture or smear was considered as a gold standard in the diagnosis of tubercular etiology.

The diagnostic criteria for tuberculous empyema are the presence of frank pus with or without demonstration of MTB in smear or culture and/or MTB detected in CBNAAT and/or radiological lesions consistent with diagnosis of active pulmonary TB on chest X-ray or computed tomography (CT) of the thorax (nodular consolidation with or without cavity more in apex, tree in bud appearance) and other obvious causes of empyema excluded.

The inclusion criteria for the study was the age above 12 years, with a clinical and radiological diagnosis of exudative pleural effusion with or without evidence of tuberculous involvement of pulmonary or other extrapulmonary site in the form of lymphadenopathy, and cold abscess.

However, those with HIV seropositive, exudative pleural effusion due to parapneumonic effusion, confirmed malignancy, and transudative effusion were excluded from the study. The patients who did not consent for the full workup or remained undiagnosed at the end of the complete workup were also excluded from the study.

Study Protocol

The patients attending OPD or emergency with clinical and radiological evidence of pleural effusion were recruited for initial screening. After ruling out, cardiac, hepatic, or renal etiology for the effusion a diagnostic thoracentesis was performed under ultrasonography guidance after obtaining consent for the procedure. A minimum of 20-25 ml of pleural fluid sample was collected and sent for physical analysis, chemical tests such as protein, sugar, and ADA, and microbiological tests such as Gram-stain, Ziehl-Neelsen stain, and aerobic and mycobacterial culture, in tube without anticoagulant (red-topped). The pleural fluid cytology and differentials were sent in EDTA-treated vial (purple-topped), and another 5 ml for CBNAAT for MTB in falcon tube and CBNAAT was tested by Cepheid, GX-IV Processing Unit: 11.00" weeks × 12.00" h × 11.70" days, GXIV-4-D. The samples were transferred to respective laboratories at the earliest. The samples collected from other sites were transferred to the nearest laboratory as per the Revised National Tuberculosis Control Policy (RNTCP) guideline as relevant to the presenting symptoms. The investigations such as blood glucose, urea, creatinine, baseline liver function test, and complete hemogram were obtained in all. The contrast-enhanced CT thorax, ultrasonography of the abdomen, closed pleural biopsy

with Abram's needle, and other site-specific advanced investigations were done as indicated in selected patients. Blood was also sent for HIV screening at the integrated counseling and testing center of our hospital.

Those who were diagnosed with tuberculous pleural effusion were started on ATDs according to the RNTCP guideline. Those who were diagnosed to have tuberculous empyema were treated with water-seal intercostal tube drainage along with ATDs. All the patients were followed up on a regular basis till the completion of ATD regimen.

The study was conducted after obtaining permission from the Ethics Committee of the Institute and informed consent from the patients.

Statistical Analysis

The statistical analysis was done using SPSS version 20.0 (SPSS inc., Chicago, IL) software for MS-Windows. The descriptive statistical analyses were done to summarize the age-sex distribution of the study population and presence of comorbid conditions. The diagnostic accuracy of CBNAAT as a diagnostic test for tubercular pleural infection was expressed as sensitivity, specificity, positive predictive value and negative predictive value, and likelihood ratios with special emphasis on tuberculous empyema.

RESULTS

A total of 200 patients were admitted with the diagnosis of pleural effusion (male 115 and female 85) in this 1 year period. Six were excluded for HIV seropositivity, 42 as parapneumonic effusion, 33 with malignant pleural effusion, 10 patients refused to consent for advanced invasive diagnostic tests, and in 4 cases, confirmed diagnosis could not be reached at the end of workup and was lost to follow-up. Among 105 patients with diagnosis of tuberculous etiology, 10 patients were diagnosed as tuberculous empyema. The demographic details of the patients with tuberculous effusion are given in Table 1. The pleural fluid AFB smear was positive in 9 out of 105 (8.57%), with only 2 out of 95 (2.1%) in patients with tuberculous pleural effusion subgroup, and mycobacterial culture was positive in 21/105 (20%) cases, of which nine was in empyema subgroup. The pleural biopsy was performed in 35 patients, and the diagnosis was confirmed in 18 (51%). Four out of 10 (40%) patients with empyema had sputum smear positive for AFB. 21 out of 105 (20.9%) had confirmed the diagnosis of TB in other organs like lymph node TB and caries spine by histology and, whereas CBNAAT confirmed diagnosis in 16 out of 105 (15.23%) cases of pleural effusion.

The ADA level was more than 70 IU/L in 45 out of 95 (47.4%) cases of pleural effusion with lymphocyte neutrophil ratio more than 0.75 and rest had ADA level between 40 and 70 IU/L. The diagnosis of tuberculous pleural effusion was confirmed by culture and/or HPE of pleural biopsy in 27 out of 105 (25.7%). The efficacy of CBNAAT in detecting MTB as compared to pleural fluid smear staining for AFB is shown in Table 2. The details of CBNAAT result along with status of rifampicin resistance are shown in Table 3. The resistance pattern was later confirmed by liquid and solid culture sensitivity test in the intermediate reference laboratory. In one patient with empyema, both CBNAAT and culture were negative; however, diagnosis of tubercular etiology was confirmed by demonstration of AFB in cold abscess aspirate. The diagnostic accuracy of CBNAAT in comparison with mycobacterial culture positivity as a standard reference for tuberculous empyema as compared to tuberculous effusion is shown in Table 4.

Table 1: Demographic profile of the patients

| Demographic profile | TB pleural effusion (N=95) | TB empyema (N=10) | Significance |
|-----------------------------------|----------------------------|-------------------|--------------|
| Male | 63, 66.3% | 5, 50% | $P=0.3064$ |
| Female | 32, 33.6% | 5, 50% | |
| Age, mean±SD | 37.1±13.50726 | 27.4±10.17841 | $P=0.0291$ |
| Proportion of comorbid conditions | | | |
| DM | 13 | 1 | $P=0.7506$ |
| HTN | 9 | 0 | $P=0.3103$ |

TB: Tuberculosis, SD: Standard deviation, DM: Diabetes mellitus, HTN: Hypertension

Table 2: comparison of AFB smear and CBNAAT examination of tubercular pleural fluid

| CBNAAT result | Pleural fluid AFB smear | | Grand total |
|------------------|-------------------------|------------|-------------|
| | AFB smear+ | AFB smear- | |
| MTB detected | 7 | 9 | 16 |
| MTB not detected | 2 | 87 | 89 |
| Total | 9 | 96 | 105 |

AFB: Acid-fast bacilli, CBNAAT: Cartridge-based nucleic acid amplification test, MTB: *Mycobacterium tuberculosis*

Table 3: CBNAAT result of pleural effusion and empyema

| CBNAAT | Tubercular | |
|------------------|------------|------------------|
| | Empyema | Pleural effusion |
| MTB detected | | |
| Sensitive | 9 | 6 |
| Resistant | 0 | 1 |
| MTB not detected | 1 | 88 |
| Total | 10 | 95 |

CBNAAT: Cartridge-based nucleic acid amplification test, MTB: *Mycobacterium tuberculosis*

DISCUSSION

The pathogenesis of tuberculous pleural effusion was once thought to be due to delayed hypersensitivity reaction. However, it is now believed to be due to direct invasion of pleura space by TB bacilli that initiate a cascade of protracted lymphocyte driven immunological reactions which leads to accumulation of pleural fluid.² On the other hand, tuberculous empyema is an active infection of pleural space caused by either rupture of subpleural focus into pleural space or direct extension from adjacent lymph node or subdiaphragmatic foci or hematogenous spread and thus have high bacillary load.² The paucibacillary nature of pleural fluid and partly due to presence of certain inhibitors in pleural fluid may be the reason for low sensitivity of CBNAAT in tuberculous pleural effusion without empyema.¹²

The comparison of the sensitivity and specificity of CBNAAT in the diagnosis of tubercular pleural effusion in several previous studies is shown in Table 5. To the best of the author's knowledge, there is no previous report published on CBNAAT as a diagnostic test in tuberculous empyema even after extensive Medline and Pubmed search. The results vary widely depending on the reference standard adapted for analysis. The pooled sensitivity of CBNAAT in pleural fluid was 46.4% (95% confidence interval [CI] 26.3-67.8) against culture as the reference standard and 21.4% (95% CI 8.8-33.9) when analyzed against CRS as shown in a meta-analysis report.¹⁶ Sehgal *et al.* published a meta-analysis report compiling the list of sensitivity and

specificity of CBNAAT of pleural fluid considering culture and CRS as reference standard from different studies since year 2010.⁵ The pooled sensitivity was found to be more when culture positivity was used as benchmark compared to CRS (51.4% in culture sub group and 22.7% in CRS subgroup), whereas specificity was almost same (98.6% in culture group and 99.8% in CRS subgroup).⁵ The definition of CRS was very different in different studies.^{9,10,13,17}

Pravin *et al.* performed Gene-Xpert assay on 164 pleural fluids and found a positive result in 15 out of 164 samples (10%) including four with rifampicin resistance.¹⁸ On considering CRS, the sensitivity of pleural fluid smear in the present study was 9/105 (8.6%) overall and 7/10 (70%) in empyema subgroup; CBNAAT was overall 16/105 (15.23%) and 9/10 (90%) in empyema cases. Although the sensitivity of pleural fluid smear (2%) and CBNAAT (7.3%) was low in pleural effusion considering CRS as reference standard, it could detect one case with rifampicin resistance. The sensitivity and specificity of CBNAAT were 77.78% (95% CI 39.99-97.19) and 90.62% (95% CI 82.95-95.62), respectively, with pleural fluid smear positivity was considered as reference standard.

Although the overall sensitivity is much low in the present study as compared to several published studies and meta-analysis reports, the sensitivity and specificity are 100% in empyema cases.

However, the major limitation of the present study was that the study did not consider pleural biopsy and culture of the

Table 4: Diagnostic accuracy of CBNAAT in overall tubercular effusion and tubercular empyema in comparison with culture positive

| Statistic | Tubercular pleural effusion (overall) | | Tubercular empyema | | Tubercular effusion without empyema | |
|-------------------------------|---------------------------------------|-------------|--------------------|-----------|-------------------------------------|-------------|
| | Value | 95% CI | Value | 95% CI | Value | 95% CI |
| Sensitivity (%) | 36.36 | 20.4-54.88 | 100 | 66.37-100 | 12.5 | 2.66-32.36 |
| Specificity (%) | 94.4 | 86.38-98.47 | 100 | 2.5-100 | 94.37 | 86.2-98.4 |
| Positive likelihood ratio | 1.05 | 0.40-2.79 | | | 0.38 | 0.09-1.6 |
| Negative likelihood | 0.99 | 0.83-1.18 | | | 1.09 | 0.94-1.25 |
| Positive predictive value (%) | 75 | 51.12-89.59 | 100 | | 25.26 | 16.91-35.22 |
| Negative predictive value (%) | 76.4 | 71.32-80.83 | 100 | | 42.86 | 15.3-75.69 |

CBNAAT: Cartridge-based nucleic acid amplification test, CI: Confidence interval

Table 5: Comparison with the previous studies

| Study | Place | Sensitivity (%) | Specificity (%) | PPV (%) | NPV (%) |
|---|----------|-----------------|-----------------|---------|---------|
| Rosso <i>et al.</i> 2011 ⁹ | Brazil | 42.8 | 94.2 | 93.3 | 48.5 |
| Porcel <i>et al.</i> 2013 ¹⁰ | Spain | 15 | 100 | | |
| Shital <i>et al.</i> 2014 ¹³ | India | 92.86 | 33.33 | 35.13 | 92.3 |
| Du <i>et al.</i> 2015 ¹⁴ | China | 43.6 | 98.6 | | |
| Rufai <i>et al.</i> 2015 ¹¹ | India | 54.8 | 100 | | |
| Saeed <i>et al.</i> 2017 ¹⁵ | Pakistan | 84.3 | 100 | | |

PPV: Positive predictive value, NPV: Negative predictive value

biopsy material in every patient which might have improved diagnostic yield. Moreover, the sample size of tuberculous empyema was too small. The result needs to be validated in a larger patient population. The efficacy of CBNAAT as a diagnostic tool in suspected tuberculous pleural effusion/empyema cases in HIV-seronegative patients compared to HIV-seropositive patients may be considered in the future.

CONCLUSION

CBNAAT is a useful rapid diagnostic tool for suspected TB. The authors would like to conclude that despite low sensitivity and specificity of CBNAAT in suspected tuberculous pleural effusion, the test should be considered in the routine diagnostic workup considering the advantage of early detection of drug resistance pattern, especially in a high burden country such as India. For suspected tuberculous empyema, CBNAAT provides a rapid confirmed diagnosis within 2 h including drug susceptibility status when compared with conventional culture and drug sensitivity tests.

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Health Education is a Key Pillar in Reducing Prevalence of Typhoid among Febrile Patients in Peri-Urban Western Uganda: A Cross-Sectional Study

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Abstract

Introduction: Typhoid has remained a public health burden leading to several morbidities and despite many attempts. Health education targeted to patients receiving care in health centers may significantly reduce burden of typhoid among febrile patients in Uganda.

Material and Methods: We consecutively sampled 283 participants presenting with febrile symptoms. Consent/assent was administered and after fully understanding the study, blood samples were collected using a 2 ml syringe and transferred into red top vacutainer before laboratory tests. We carried out centrifugation at 1000 rpm for 15 min. We performed slide agglutination test to identify presence of *Salmonella typhi* antibodies followed by tube agglutination for quantification. Titers of <1:160 were considered positive for typhoid. Data were analyzed descriptively as medians and proportions using STATA 14. Robust Poisson regression was carried out to obtain both crude and adjusted prevalence ratios (aPR) for bivariate and multivariate analysis, respectively.

Results: The median age for participants was 25 years. The seroprevalence of typhoid was 26.5% (95%, confidence interval [CI]: 21.7-32.0). Teenagers were 3 times more likely to be tested positive for typhoid compared to those below 13 years; (crude prevalence ratio = 2.76, 95%, CI: 1.11-6.83). Participants who reported to have received health education over past 2 months were 58% less likely to suffer from typhoid compared to those that reported no recent health education (aPR = 0.42; 95%, CI: 0.26-0.69). Having history of typhoid over the past 2 months was positively associated with reoccurrence of typhoid (aPR = 1.75, 95%, CI: 1.12-2.72).

Conclusion: Burden of typhoid still persists in rural communities especially among teenagers. Lack of health education predisposes communities. People who have had typhoid in the past 2 months are mostly likely to have a reoccurrence of the disease.

Key words: Febrile patients, Health education, Seroprevalence, Typhoid

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INTRODUCTION

Typhoid fever is an acute and often life-threatening systemic febrile illness caused by a bacterium *Salmonella enterica* serovar typhi.¹ It is transmitted by fecal-oral route through food and water contaminated with human feces.² It is characterized by numerous nonspecific symptoms

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including high fever, headache, malaise, joint pain, abdominal pain, and gastrointestinal symptoms such as nausea, vomiting, constipation, diarrhea, and sometimes gastrointestinal perforations.³

Typhoid fever continues to be one of the major public health problems leading to a number of morbidity and mortality cases among patients with acute febrile manifestation in many developing countries.⁴ World Health Organization estimated that approximately 21 million cases and 222,000 typhoid related death occur annually worldwide.⁵ It is reported that over 80% of Ugandan districts are typhoid endemic with Central and Western District topping the list.⁶

Several studies have pointed leakage in drainage systems, nature of houses eating commercial food in food kiosks as significant factors that are associated with typhoid.⁷ No study has pointed out the importance of health education as a predictor of typhoid seroprevalence.

The factors responsible for persistent typhoid in western Uganda are not well understood to demand appropriate preventive strategies for reduction of typhoid burden. We aimed to find the seroprevalence of typhoid and impact of health education among other factors on typhoid among patients with febrile manifestations attending Kampala International Teaching hospital.

MATERIALS AND METHODS

Ethical approval to conduct this study was sought from Kampala International University Research Ethics Committee. Informed consent was sought from study participants for their participation in the study as well as future use of their sample for other studies.

The study was conducted to identify typhoid fever among patients with acute febrile symptoms. The study began from March to May 2017 at Kampala International University in Ishaka-Bushenyi.

General outpatients manifesting acute febrile symptoms provided a blood sample for typhoid testing.

A vein puncture was performed using a 2 ml syringe. A blood sample was drawn into a red top vacutainer and allowed to settle for 30-45 min. Centrifugation was done at 2500 rpm for 5 min.

The serum obtained was tested using, slide agglutination Widal test, for the presence of *Salmonella* typhi antibodies. All the positive tests were further processed by tube agglutination Widal test to determine the titers. Agglutination

titers greater or equal to 1:160 were considered to be positive typhoid infection.

Details about the study participants were captured using a semi-structured questionnaire. Demographic and socioeconomic details were collected.

Presence of typhoid was captured as binary, i.e., positive and negative for O antigens. Factors thought to influence typhoid seroprevalence were assessed using Robust Poisson regression. STATA version 14 (Statacorp 4905 Lakeway Drive, College Station Texas, 77845 USA) was used to carry all the analyses. Both crude and adjusted prevalence ratios (aPR) were obtained using bivariate and multivariate regression analysis, respectively.

RESULTS

Sociodemographic and Clinical Characteristics of Study Population

A total of 283 patients presenting with a febrile illness who attended general Outpatient Department of Kampala International University Teaching Hospital (GOPD-KIUTH) were diagnosed serologically for typhoid fever between the months of March and May 2017. A greater proportion of the patients who participated in the study were young adults with the median age of 25 with the lower quartile and upper quartile of 19 and 40, respectively. More females 56.9% (161/283) participated in the study compared to males 42.8 (121/283), and among the participants, majority 52.3% were unemployed. Furthermore, a high proportion of the participants 49.82% were single, and most of the participants 107 (37.94%) had attained education up to tertiary level. A few participants 1.1% had their water sources far away from their homes above 1 km distance while majority 61.1% had their water sources nearer to their homes within 100 m reach. Furthermore, most participants 94.0 (266/283) possessed pit latrines as 89.4% (253/283) of the participants found it useful to have a toilet in their homes.

The results also showed that the majority of participants as much as 36.4% (103/283) obtained their treatment from drug shops, while the least proportion of participants 8.8% obtained their treatment from herbal clinics. The data further indicated that most participants 47.0 (133/283) had their health facilities nearer to their homes, within a distance of 0.5 km. However, a larger number of participants 47.3% (129/283) did not receive health education about typhoid fever from their previous health facilities.

Of the 283 participants, data from the laboratory results showed that 75 (26%) of the participants had significant agglutination titers for both O and H *Salmonella* typhi

antigen compared to 208 (73.5%) with insignificant reaction for typhoid fever. Only a few participants 11.3% (32/283) had had a history of typhoid fever in the past 2 months before the study period (Table 1).

Table 1: Sociodemographic and clinical characteristics of study population

| Variable | Summary measure |
|--|-----------------|
| Median age (IQR) | 25 (19-40) |
| Sex <i>n</i> (%) | |
| Male | 121 (42.76) |
| Female | 161 (56.89) |
| Not stated | 1 (0.35) |
| Occupation <i>n</i> (%) | |
| Self employed | 93 (32.86) |
| Un employed | 148 (52.30) |
| Employed | 42 (14.84) |
| Marital status <i>n</i> (%) | |
| Married | 124 (43.82) |
| Single | 141 (49.82) |
| Divorced | 07 (2.47) |
| Separated | 11 (3.89) |
| Education <i>n</i> (%) | |
| None | 42 (14.89) |
| Primary | 60 (21.28) |
| Secondary | 73 (25.89) |
| Tertiary | 107 (37.94) |
| Distance from the water source <i>n</i> (%) | |
| 0-100 m | 173 (61.13) |
| Between 100 and 500 m | 94 (33.22) |
| Between 500 and 1 km | 13 (4.59) |
| >1 km | 3 (1.06) |
| Possession of a pit latrine <i>n</i> (%) | |
| No | 13 (4.59) |
| Yes | 266 (94.00) |
| Not stated | 4 (1.41) |
| Find it useful to have a toilet <i>n</i> (%) | |
| No | 29 (10.25) |
| Yes | 253 (89.40) |
| Not stated | 1 (0.35) |
| Laboratory results <i>n</i> (%) | |
| Non-reactive | 208 (73.50) |
| Reactive | 75 (26.50) |
| History of typhoid over past 2 months <i>n</i> (%) | |
| No | 249 (87.98) |
| Yes | 32 (11.31) |
| Not stated | 2 (0.71) |
| Source of treatment <i>n</i> (%) | |
| Drug shop | 103 (36.40) |
| Health center | 98 (34.63) |
| District hospital | 55 (19.43) |
| Herbal clinic | 25 (8.83) |
| Not stated | 2 (0.71) |
| Distance to the health facility <i>n</i> (%) | |
| 1-500 m | 133 (47.00) |
| Between 500 and 1 km | 61 (21.55) |
| Between 1 km and 5 km | 76 (26.89) |
| >5 km | 10 (3.53) |
| Not stated | 3 (1.06) |
| Received health education <i>n</i> (%) | |
| No | 129 (47.25) |
| Yes | 144 (52.75) |

IQR: Interquartile range

The seroprevalence of typhoid fever was 26.5% (75/283); 95%, confidence interval (CI): 21.7-32.0 among the febrile patients who attended GOPD at KIU Teaching Hospital during the study period (Figure 1).

Bivariate Analysis of Factors Associated with Typhoid Fever

Bivariate analysis of factors associated with the occurrence of typhoid fever indicates that patients who were in the age group 13-14 years were 3 times more likely to be tested positive for typhoid fever compared to those below the age of 13 years; (crude prevalence ratio [cPR]=2.76, 95%, CI: 1.11-6.83) this was statistically significant ($P = 0.03$). Participants who had received health education about typhoid were 57% less likely to suffer from typhoid fever compared to those who had not received health education, (cPR = 0.43, 95%, CI: 0.28-0.66), while participants who had history of typhoid fever were 2 times more likely to be reinfected with the disease (cPR = 2.11, 95%, CI: 1.40-3.19). Participants who obtained a high monthly income >1 million per month had 81% chances of not being infected with typhoid fever (cPR = 0.19, 95%, CI: 0.03-1.38), however, the association was not statistically significant ($P > 0.05$).

In addition, participants who had suffered from typhoid fever in the previous 2 months were 2 times more likely to be reinfected with the disease than those without a history of typhoid fever in the previous 2 months (cPR = 2.11, 95%, CI: 1.40-3.19) and this was a statistically significant factor ($P < 0.001$). Furthermore, participants who obtained their health-care facilities from the district hospital were 38% less likely to suffer from typhoid fever compared to those that obtained health facilities from the drug shops (cPR = 0.62, 95%, CI: 0.32-1.23) but the association was not statistically significant as shown in Table 2.

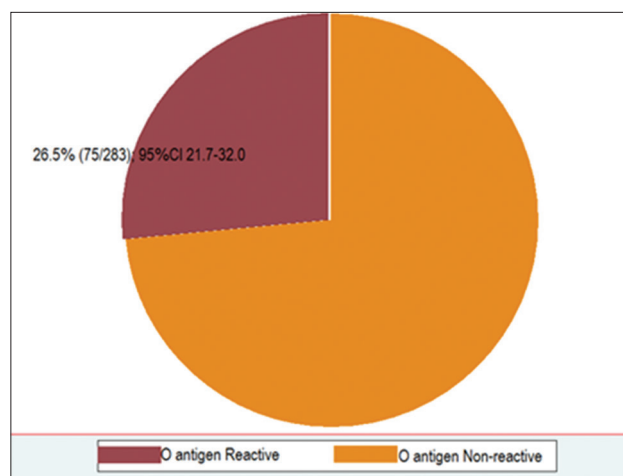


Figure 1: Seroprevalence of typhoid fever in Ishaka-Bushenyi district

Table 2: Bivariate and multivariate analysis of factors associated with typhoid fever among patients attending General Outpatient Department at Kampala International University in Ishaka-Bushenyi Western Uganda

| Variable | Typhoid | | cPR | 95% CI | P-value | aPR | 95% CI | P-value |
|---|--------------------|-------------------|------|-----------|---------|------|-----------|---------|
| | Negative n=208 (%) | Positive n=75 (%) | | | | | | |
| Age (years) | | | | | | | | |
| 0-12 | 26 (83.87) | 5 (16.13) | 1.00 | | | | | |
| 13-18 | 15 (55.55) | 12 (44.45) | 2.76 | 1.11-6.83 | 0.03 | | | |
| 19-25 | 67 (73.62) | 24 (26.38) | 1.64 | 0.68-3.93 | 0.27 | | | |
| 26-39 | 61 (72.62) | 23 (27.38) | 1.70 | 0.71-4.08 | 0.24 | | | |
| ≥40 | 39 (78) | 11 (22) | 1.36 | 0.52-3.56 | 0.53 | | | |
| Health education | | | | | | | | |
| No | 81 (62.79) | 48 (37.21) | 1.00 | | | 1.00 | | |
| Yes | 121 (84.02) | 23 (15.98) | 0.43 | 0.28-0.66 | <0.001 | 0.42 | 0.26-0.69 | 0.001 |
| History of typhoid over the past 2 months | | | | | | | | |
| No | 190 (76.30) | 59 (23.70) | 1.00 | | | 1.00 | | |
| Yes | 16 (50) | 16 (50) | 2.11 | 1.40-3.19 | <0.001 | 1.75 | 1.12-2.72 | 0.013 |
| Distance of health facility | | | | | | | | |
| 1-500 m | 100 (75.19) | 33 (24.81) | 1.00 | | | | | |
| Between 500-1 km | 46 (75.41) | 15 (24.59) | 0.99 | 0.58-1.68 | 0.97 | | | |
| Between 1 km-5 km | 50 (65.79) | 26 (34.21) | 1.38 | 0.90-2.12 | 0.14 | | | |
| >5 km | 10 (100) | (0) | | | | | | |
| Source of treatment | | | | | | | | |
| Drug shop | 76 (73.78) | 27 (26.22) | 1.00 | | | | | |
| Health center | 68 (69.39) | 30 (30.61) | 1.17 | 0.75-1.82 | 0.49 | | | |
| District hospital | 46 (83.64) | 9 (16.36) | 0.62 | 0.32-1.23 | 0.18 | | | |
| Herbal clinic | 17 (68.00) | 8 (32.00) | 1.22 | 0.63-2.36 | 0.55 | | | |
| Useful to have a toilet | | | | | | | | |
| No | 18 (62.07) | 11 (37.93) | 1.00 | | | | | |
| Yes | 189 (74.70) | 64 (25.30) | 1.67 | 0.40-1.11 | 0.12 | | | |
| Possess a pit latrine | | | | | | | | |
| No | 9 (69.23) | 4 (30.77) | 1.00 | | | | | |
| Yes | 195 (73.31) | 71 (26.69) | 0.87 | 0.37-2.01 | 0.74 | | | |
| Monthly salary | | | | | | | | |
| <50,000 | 19 (70.37) | 8 (29.63) | 1.00 | | | | | |
| 5000-100,000 | 41 (66.13) | 21 (33.87) | 1.14 | 0.58-2.25 | 0.70 | | | |
| Between 100,000 and 500,000 | 71 (68.27) | 33 (31.73) | 1.07 | 0.56-2.05 | 0.84 | | | |
| Between 500,000 and 1,000,000 | 59 (83.10) | 12 (16.90) | 0.57 | 0.26-1.24 | 0.57 | | | |
| >1,000,000 | 17 (94.44) | 1 (5.56) | 0.19 | 0.03-1.38 | 0.10 | | | |
| Education | | | | | | | | |
| Non | 31 (70.45) | 11 (29.55) | 1.00 | | | | | |
| Primary | 42 (70) | 18 (30) | 1.15 | 0.60-2.17 | 0.68 | | | |
| Secondary | 57 (78.08) | 16 (21.92) | 0.84 | 0.43-1.63 | 0.60 | | | |
| Tertiary | 77 (71.96) | 30 (28.04) | 1.07 | 0.59-1.94 | 0.82 | | | |
| Marital status | | | | | | | | |
| Married | 93 (75) | 31 (25) | 1.00 | | | | | |
| Single | 101 (71.63) | 40 (28.37) | 1.13 | 0.76-1.70 | 0.54 | | | |
| Divorced | 6 (85.71) | 1 (14.29) | 0.57 | 0.09-3.61 | 0.55 | | | |
| Separated | 8 (72.73) | 3 (27.27) | 1.09 | 0.40-3.01 | 0.87 | | | |
| Occupation | | | | | | | | |
| Self employed | 71 (76.34) | 22 (23.66) | 1.00 | | | | | |
| Unemployed | 105 (70.95) | 43 (29.05) | 1.23 | 0.79-1.92 | 0.37 | | | |
| Employed | 32 (76.19) | 10 (23.81) | 1.00 | 0.52-1.94 | 0.99 | | | |
| Sex | | | | | | | | |
| Male | 87 (71.90) | 34 (28.10) | 1.11 | | | | | |
| Female | 120 (74.53) | 41 (25.47) | 0.91 | 0.61-1.34 | 0.62 | | | |

cPR: Crude prevalence ratio; aPR: Adjusted prevalence ratio; CI: Confidence interval

Multivariate Analysis of Factors Associated with Typhoid Fever

A multivariate analysis was performed on some of the independent variables that possessed a $P < 0.2$ at bivariate analysis to establish the association between the risk factors and typhoid fever occurrence at 95% CI.

Participants who had suffered from typhoid fever in the previous 2 months were 1.75 times more likely to be reinfected with the disease than those without a history of typhoid fever in the previous 2 months, and this was statically significant ($P = 0.013$, CI: 1.12-2.72). However, those who had received health education about

typhoid were 58% less likely to suffer from typhoid fever compared to those who had not received health education, (aPR = 0.42, 95%, CI: 0.28-0.66), and this was also statistically significant ($P = 0.001$).

Furthermore, participants who had suffered from typhoid fever in the previous 2 months and received health education were 1.5 times more likely to be reinfected with typhoid fever ($P = 0.34$, CI: 0.62-3.95) though this was not clinically significant. Receiving health education reduced the chances of being reinfected from 1.7 to 1.5.

Furthermore, participants who obtained a high monthly income >500,000 Ugandan shillings per month had 45% chances of not being infected with typhoid fever (aPR = 0.55, 95%, CI: 0.24-1.27) however, this was not statistically significant ($P = 0.16$). On the other hand, those who received a monthly income of <500,000 Ugandan shillings were 1.39 times more likely to be infected with the disease. Although this was not statistically significant ($P = 0.33$, CI: 0.72-2.66) (Table 2).

DISCUSSION

In developing countries, typhoid diagnostic methods using bacteriological culture are unlikely due to limited resources. Consequently, rapid diagnostic techniques for typhoid become likely. There is need to study possible factors that may influence seroprevalence of typhoid. No study has looked at the relation between typhoid seroprevalence and health education among other factors.

In this study, the seroprevalence of typhoid was found to be 26.5% (75/283; 95% CI 21.7-32.0). A study conducted in Bushenyi District, Uganda showed a significant titer of higher seroprevalence.⁶ However, our seroprevalence findings were far higher in comparison to study conducted in Addis Ababa Ethiopia.⁸ The persistent burden of typhoid fever in Bushenyi District could be due to lack of adequate health education of the communities about the disease burden and its prevention.

Furthermore, this study found out that teenage age was significantly associated with burden of typhoid fever. These findings agree with what Agwu, (2012) found out in Bushenyi District. This implies that typhoid is still persistent in Bushenyi District. This may pose a huge health and economic burden to the entire community and other neighboring communities. A similar report shows the higher burden of typhoid fever among infant, children, and adolescent categories in South Central and Southeastern

Asia.⁴ Reasons could be due to hyperactivity of children within this age group, where they try to explore the natural environment and would touch and eat anything that comes their way.

Participants who reported to have received health education over past 2 months were 58% less likely to suffer from typhoid compared to those that reported no recent health education (aPR = 0.42; 95%, CI: 0.26-0.69), and this is statistically significant at $P < 0.05$. There is no published work addressing the relation between health education and typhoid. This therefore emphasizes the need to plan and implement health education for all the communities as an effective preventive measure of typhoid fever.

This study found out that having a history of typhoid over the past 2 months was significantly associated with a reoccurrence of typhoid (aPR = 1.75, 95%, CI: 1.12-2.72). This could be due to poor adherence to drugs such as failing to complete the dosage resulting into drug resistance.

CONCLUSION

Data from this study have showed that the burden of typhoid fever still persists in rural areas of Ishaka-Bushenyi. Pre-teenage age and Lack of Health Education in these communities were significantly associated with increased typhoid fever. People who have previously suffered from typhoid fever are mostly likely to have a reoccurrence of the disease.

RECOMMENDATIONS

Proper planning for health services and personnel is warranted to counteract the persistent burden of typhoid in rural communities. Further studies are necessary to be carried out over a wide geographical area and using culture methods to correctly identify those with the disease.

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Firewalk – Festival-related Burns: An Analytical Study

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Abstract

Introduction: This paper discusses a specialized type of burns that occur during a ritual in South India, where devotees walk on hot coal or embers to fulfill a vow.

Materials and Methods: Over a study period of 3 years, at a major burn center in South India, all patients getting admitted and treated with this type of firewalk burns, were analyzed.

Results: The various aspects of this type of burn have been studied, and the peculiar and salient features that differentiate these type of burns from other flame burns have been analyzed.

Conclusion: The parts of the body that are particularly affected by these burns and the nature of the injury has been studied.

Key words: Burns, Burns during rituals, Festival burns, Firewalk, Special burns

INTRODUCTION

Festivals are times of celebration and many customs are followed. These customs when followed for many generations it becomes a part of the culture. Being rituals, they are often repeated. Since the discovery of fire has heralded human civilization, it is only natural that fire is commonly associated with many festivals worldwide. Examples of such festivals are burning the Clocks, Brighton, England; Afrikaburn, Tankwa Karoo National Park, South Africa; Beltane Fire Festival, Edinburgh, Scotland; Las Fallas, Valencia, Spain; Rouketopolemos, Vrontados, Greece and Burning Man, Black Rock City, Nevada, the United States. There are even self-immolation rituals like some Buddhist customs.¹ In addition, when there is fire, there are bound to be mishaps.

One such common festival in South India and places like Singapore,² is the Firewalk or walking on hot be hot charcoal

or wood (Figure 1). This is celebrated usually in the Tamil month of “aadi and aippasi” which falls between middle of July and middle of August and between mid-October and mid-November. Fire is considered sacred and people who practice this ritual, are stubborn to do it repeatedly, year after year, for fulfilling the vow, or to achieve the “runner’s high”³ on completion of the daunting task. This religious event is popular in many Hindu Temples and so is the accidental burn that occurs in these devotees. Burns unit in Government Kilpauk Medical College Hospital is the largest burn unit in South India and hence receives many patients with such injuries. A study relating to the epidemiology of the Firewalk burn, and the pattern of injury following such a burn, has been done, for a period of 3 years from September 2014 to August 2017.

Firewalk: A temple pit with red hot charcoal about 6 feet in length with 4 feet width is made the night before the actual event, and is kept red-hot⁴ throughout the ritual. Devotees pour sacred water on themselves and smear turmeric and kumkum (Red powder on the forehead) and neem leaf paste on themselves and with bare feet, try to run from one end to the other keeping the contact time to a minimum. They are so quick to cross and wet skin adds to the safety of their feet. It is only when they lose their balance and fall down, the contact areas get burnt. People who generally walk bare feet,

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as is common in the villages of India, has a thicker layer of sole, which helps them to accomplish this feat successfully. People who do not walk bare feet regularly do not have thick cornified sole, and are more prone to get contact burns of the feet while performing this task of “firewalking”. Many times the problem of burns is when they lose balance and fall in the pit or due to jostling. At certain times, bystanders push and people fall into the hot pit. Children who are carried by adults may fall and get burnt.

MATERIALS AND METHODS

The study period has been 3 years, from September 2014 to August 2017, at the Burns unit in Government Kilpauk Medical College Hospital. All patients getting admitted with a history of burn injuries sustained while firewalking were included in the study.

The age, sex parameters, and the percentage of burn area, outcome of treatment were analyzed.

RESULTS

There were a total of 31 patients admitted during the study period with burns sustained due to firewalk.

Between September 2014 and August 2015 there were 7 admissions.

From September 2015 to August 2016, we received 7 patients. 17 patients have been admitted from September 2016 to August 2017.

The percentage of body surface area burnt (Figure 2) was from 2% to 58%. The age group (Figure 3) of the patients varied from 9 to 65 years.

Sex distribution (Figure 4) is 21 males and 14 females. An interesting observation was that female patients were aged above 45 years only.

Duration of treatment varied from 4 days to 3 weeks.

When the outcome of the treatment for these firewalk injuries was analyzed (Figure 5), it was found that mortality was due to comorbidities. 3 patients died due to comorbidities such as diabetes and deep vein thrombosis and sepsis.

DISCUSSION

There is a typical male preponderance, as the males usually make the vow to walk on the firepit. Most of the patients are middle-aged (age 30-60 years) (Figure 6).



Figure 1: The ritual of firewalking and the typical burn on the sole of the foot

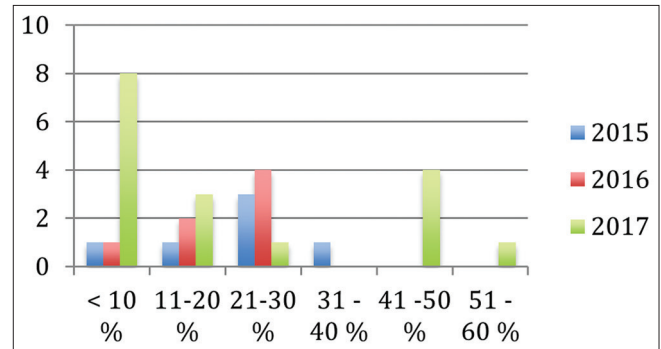


Figure 2: Percentage of body area burnt in firewalk incidents over 3 years

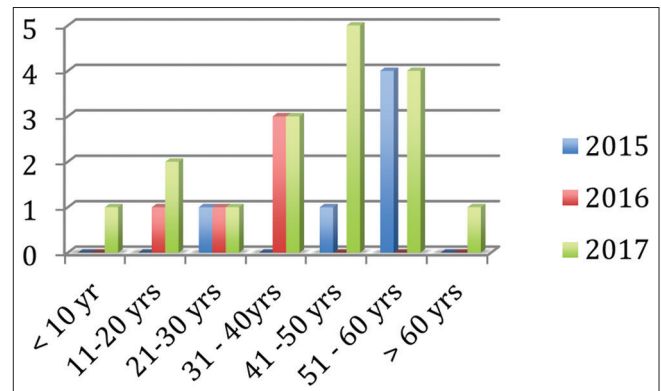


Figure 3: Age distribution of the patients who sustained firewalk burns, over the period of study

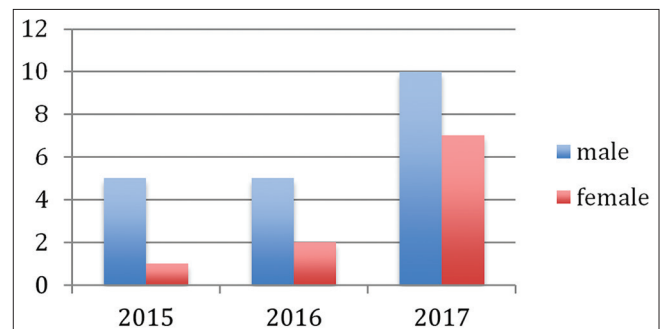


Figure 4: Sex distribution of the patients who sustained firewalk burns

Females participate in firewalk only in older age group. Some temples do not allow women in the menstruating age group to participate in this ritual of firewalking. This could

be the reason why older women are involved. Although children do not participate on their own in this ritual, their parents or grandparents hoist the children on their shoulders, either as part of the vow, or just to entertain the children. When the adults who do this falter on the firepit, they fall, and the children get burnt.⁵

Most of the patients (Figure 7) had a lesser percentage of burn (0-30%). Only the areas that come in contact with the hot coals get burnt. In people who are not used to walking bare feet, contact burns on the soles (Figure 8) of the feet are a hallmark. These burns are typically mixed degree burns, which heal with dressings alone. When the burns are sustained by fall,⁶ the typical distribution of the burn areas in such firewalk injuries are the legs, flanks, and lateral aspects of the arms (Figure 9). Rarely, the face was involved.

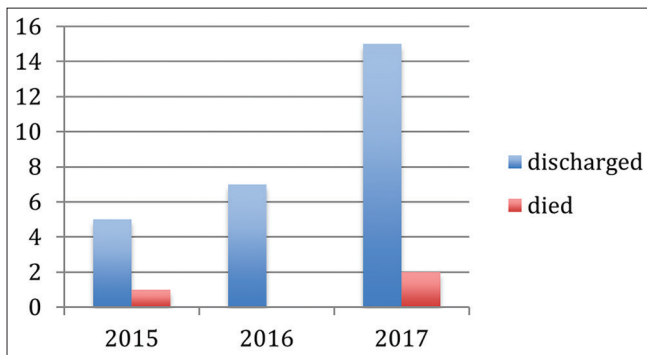


Figure 5: Outcome analysis of the patients being treated for firewalk burns

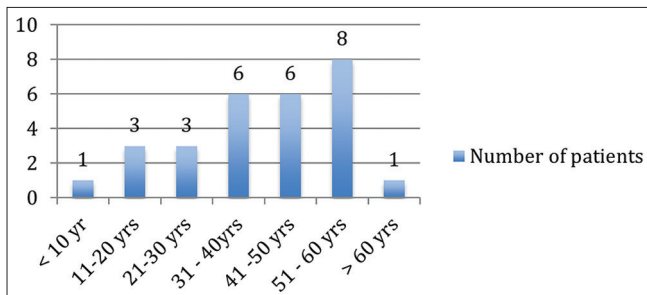


Figure 6: Overall age distribution of the patients with firewalk burns

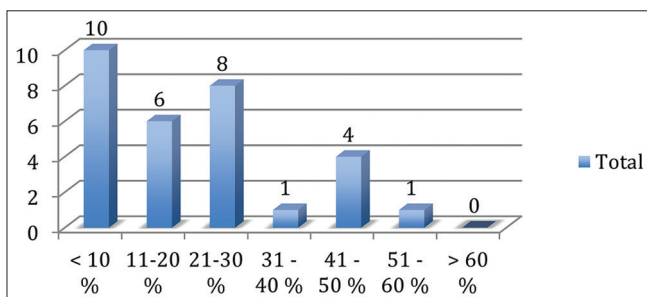


Figure 7: Overall percentage of burns in patients with firewalk injuries

The pattern of burn injury was typically stippled pattern, where the hot coals came in contact with the skin, with intervening areas of normal, uninvolved skin.

27 patients were discharged (Figure 10) after complete healing and only 3 patients expired. All the three patients were aged more than 50 years. Of the three patients who expired, two had burns of 41-50% and one patient had a burn of 58%. All three were diabetic. Although the burn was accidental comorbidities caused higher mortality.

CONCLUSION

Awareness about the hazards of such rituals must be made to the general public. This study highlights the importance of also educating the public about the importance of medical checks before undertaking dangerous religious activities.

The public has to be kept at a safe distance from the firepit so that they do not fall in it accidentally. Jostling at such festivities has to be prevented by proper security personnel.



Figure 8: Contact burns on the soles of the feet



Figure 9: Typical pattern of burns sustained by fall in the firepit

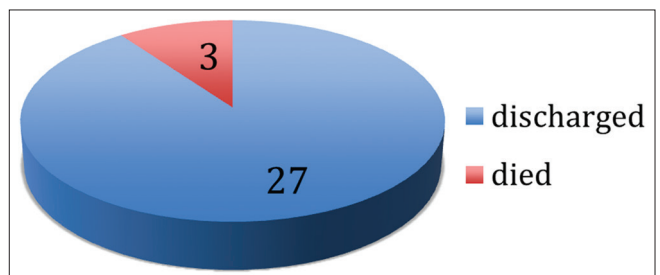


Figure 10: Overall outcome of the patients with firewalk burns

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Randomized Comparative Study of Drug Regimens: Fentanyl with Propofol and Fentanyl with Midazolam as Sedating Agents in Day Care Oral Surgery

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Abstract

Introduction: Widespread use of general anesthesia is limited by the risk associated, requirement of adequate equipment, extensive training required, and the cost. The use of intravenous agents in conjunction with local anesthetics has a definite synergistic effect and is referred to as conscious sedation.

Aim: The aim of this study is to compare usefulness and toxicity by qualitative comparison between two combinations, fentanyl + propofol, and fentanyl + midazolam, as agents for conscious sedation in patients undergoing maxillofacial surgical procedures.

Materials and Methods: The present study was conducted on 10 adult patients, 5 in each group (fentanyl + propofol and fentanyl + midazolam), between 14 and 50 years of age irrespective of sex. The comparison was made in terms of onset of action, recovery anterograde amnesia, patient cooperation, surgeons' convenience, side effects, and other parameters.

Result: Although the therapeutic efficacy of both the combinations was satisfactory, fentanyl + propofol combination showed better amnesic property and tolerance to the surgical procedure, whereas fentanyl + midazolam combination showed greater respiration depression. Fentanyl + propofol was found to be superior sedating agent having rapid onset and predictability of action, profoundness of amnesia, and faster recovery periods, offering advantage of early patient discharge and better patients compliance agent in day care maxillofacial surgical procedures.

Conclusion: Propofol + fentanyl combination as a superior sedating agent compared to fentanyl midazolam combination having rapid onset and predictability of action, profoundness of amnesia, and a faster recovery period, offering advantages early patient discharge and better patient compliance.

Key words: Conscious sedation, Day care procedures, Fentanyl, Maxillofacial surgery, Midazolam, Propofol

INTRODUCTION

Anxiety toward dental procedure varies from a suppressed fear of pain to phobia. This may make dental therapy difficult. Not only do many patients find these procedures

unpleasant but also they may exhibit enhanced sympathetic activity such as xerostomia, tachycardia, sweating, and tremors, which in some cases may lead to anxiety-induced arrhythmia and vasovagal reaction.^{1,2} Local anesthetics and new advances in technology have rendered dental treatment experience and often painless. However, in certain situations, pain and anxiety control become unattainable by local anesthetics, and the administration of local anesthesia is considered to be a traumatic procedure by many patients. General anesthesia is also not practical for many ambulatory patients undergoing minor surgical procedures, and hence, the alternative approach is the use of anxiolytic and sedative agents as adjunct to local

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anesthesia. Intravenous sedative hypnotics are commonly used during day care maxillofacial surgical procedures to enhance patient comfort, improve operating environment, and prevent recall of unpleasant events during surgery.^{3,4} Conscious sedation is a technique in which the use of a drug or drugs produce a state of depression of central nervous system, which enables an operator to carry out a surgical procedure but during which verbal contact with the patient is maintained and patient retains protective reflexes. Among the methods used for conscious sedation intravenous sedation are perhaps the most popular, as it has rapid onset and enables the dose of the drug to be titrated according to the need of the patient, with maximum safety.⁵

Aim

The objective of the present study is to clinically evaluate the usefulness and toxicity by qualitative comparison between two combinations, fentanyl + propofol and fentanyl + midazolam, as agents for conscious sedation in patients undergoing maxillofacial surgical procedures including simple fracture reduction and fixation, impaction, and cyst enucleation on a day care basis.

MATERIALS AND METHODS

The present study was conducted in the Department of Oral and Maxillofacial Surgery, Tamil Nadu Government Dental College and Hospital on an outpatient basis. The study included 10 adult patients, 5 in each group, age between 14 and 50 years irrespective of sex. Apprehensive and uncooperative patients requiring surgery for removal of impacted mandibular third molars, cyst enucleation, and simple mandibular fracture reduction and fixation were included in the study. The procedure was explained to the patients, and a written informed consent was obtained. A detailed case history, including postexposure to anesthetics, sedative agents, and previous surgical procedures were collected and recorded. Routine blood investigation, chest-ray, and electrocardiogram (ECG) were done for all the patients. A pre-anesthetic evaluation and physicians clearance were obtained for all the patients.

Inclusion Criteria

Age group was between 14 and 50 years, and only the American Society of Anesthesiology risk category patients after a complete medical history and physical examination were included in the study. Patients with no history of sensitivity to any of the drugs on their constituents were used in the study.

Exclusion Criteria

Patients who were pregnant, used sedative regularly, drug of alcohol dependent, and had been given general anesthetic

previously for dental procedures were excluded from the study.

Patients were asked to remain nil orally 6 h before surgery. On arrival, patients were connected to a multifunction monitor, and a no 18G cannula inserted in a vein on the fore arm of the non-dominant arm. Surgery was performed with the patient in a reclining position on completion of the procedure that the patients were observed for 10 min and later shifted and allowed to recover in the recovery room.

Randomization of the cases was done by sealed envelope technique into 2 groups, namely, Group I (fentanyl + propofol) and Group II (fentanyl + midazolam).

Patients in Group I received propofol at 100-150 µg/kg/min, which is 6-9 mg/kg/hour + fentanyl 2 mg/kg as induction dose, and later, slow intermittent dose titrated to the required end point of sedation, i.e., ptosis and slurred speech.⁶ Patient in Group II received intravenous doses of midazolam 1-5 mg + fentanyl 2/mg/kg titrated to the required end point. This end point was chosen because it was easy to observe.⁷⁻⁹

Repeat doses were given after the sign of warning of sedation was seen such as phonation, nystagmus, and purposeful movements on surgical stimulation. Patients were given a local anesthetic injection of 2% lignocaine with 1:80000 adrenaline after 2-3 min after the administration of intravenous sedation.

In the operating room, multifunction monitor with pulse oximeter, ECG monitor, and NIBP was connected to the patient. Real-time monitoring of heart rate, systolic, diastolic, mean arterial pressure, and oxygen saturation was made. ECG was monitored, and during the whole-operative period, recording was made of any abnormal rhythm detected.

Onset of Action

The onset of action was calculated by the time elapsed between induction and the onset of signs of the end point of sedation.

Amnesia

Amnesia period and quality were evaluated with the help of post-operative questionnaire regarding surgical procedures and by presenting separate visual and cutaneous stimuli during surgery. Amnesia was assessed after the surgery and just before discharge by means of a checklist asking if the patient remembered.

Visual and cutaneous stimuli were applied to check anterograde amnesia. Recall of venipuncture on the hand

before the administration of any medication was used to assess retrograde amnesia. The correct, partial, or no recalls of these parameters were used to grade the degree of anterograde amnesia as good, moderate, or poor.

Recovery

The recovery period was measured from the last dose of the drug to the time when the patient could walk in a straight line without support. Recovery was assessed by the patient performance in a Trieger Dot test.¹⁰ It was used to measure the psychomotor activity of the patient following sedative administration. Patients performed the test once preoperatively and then postoperatively at 15 min. Patients were asked to walk in a straight line without support under supervision. If the patient could do this, they were assessed as fit for discharge. If they could not, patients were allowed to recover and again asked to walk in a straight line after 15 min.

RESULTS

The study comprised of 10 patients divided into two group 5 each Group I - patients received fentanyl + propofol, Group II - patients received fentanyl + midazolam.

The age and sex incidence shows a mean age of 37.6 years in Group I and 31.2 years in Group II. The male:female ratio was 3:2 in Group I and 2:3 in Group II. The mean duration of surgery shows no significant difference between Groups I and II. The onset of action was assessed with the onset of signs of sedation end point that is slurred speech and presence of ptosis (Verrill's sign). An increase in heart rate was seen in both the groups but the increase in heart rate at all stages was significantly higher in Group I. A sudden increase in heart rate was noticed immediately after local anesthesia administration in both the groups. The intraoperative increased heart rate gradually returned to base line values in the recovery room in both the groups (Figure 1).

Systolic, diastolic, and mean arterial pressure were increased in both the groups following drug administration. No statistically significant difference was found in the level of increase in systolic pressure at various time interval except post local anesthesia administration period, where the raise is 15% in Group I and only 5% in Group II. The rise in systolic blood pressure ranged from 8% to 15% in Group I and 5-10% in Group II (Figure 2).

Oxygen saturation was measured from a pulse oximeter and shows no statistically significant difference between the two groups (Figure 3).

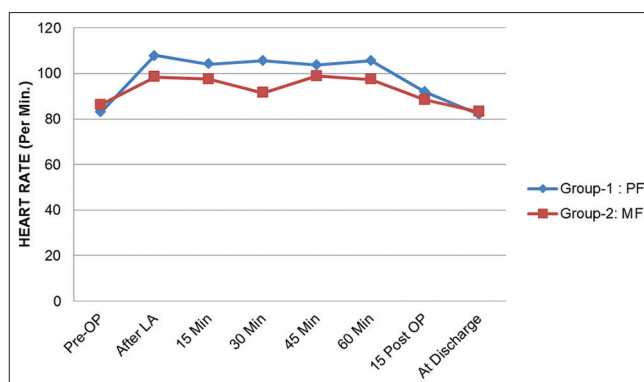


Figure 1: Heart rate

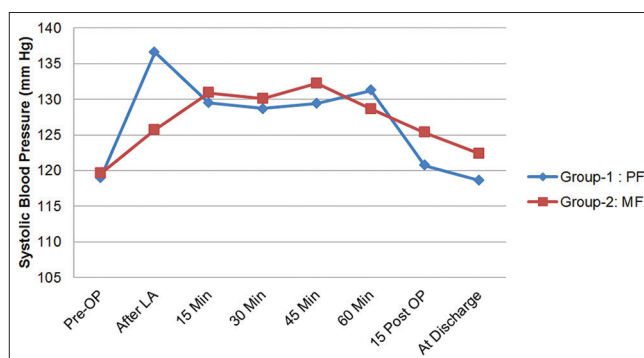


Figure 2: Systolic blood pressure

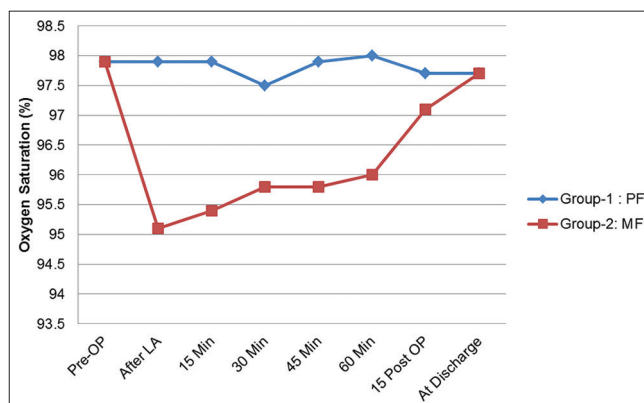


Figure 3: Oxygen saturation

Arrhythmias of any kind were not noticed on the ECG monitor lead II both the groups throughout the procedure.

When the patient was questioned at the post-operative period, the patients could remember vein puncture, and therefore, no retrograde amnesia was established in any of the two groups. From the data, it may be inferred that the patients in Group I experienced early and profound amnesia than the patients in Group II. 80% of patients in Group I experienced profound amnesia for tactile and visual stimuli as compared to 10% in Group II. From the checklist, anterograde amnesia was evaluated as good, moderate, and poor for each group. 90% of the

patients experienced good amnesia as compared to 10% of patients in Group II. The difference between the two groups is statistically significant suggesting a greater degree of intraoperative amnesia with Group I as compared to Group II.

Postoperatively, all patients in both the group were oriented to person, place, and time. Recovery was measured from the last dose of the drug to the time when the patient could walk in a straight line without support. Vital signs were recorded postoperatively which gradually reduced dose to predrug base line values during recovery. The mean recovery period shows that the average recovery time of Group I patient is 10-11 min more than the Group II which was statistically insignificant.

Although psychomotor performance was clearly affected by the drug, all patients were able to complete the post-operative testing regimen on schedule. Many patients slept during the post-operative rest period, but all were easily arousable as from natural sleep. The test scores show that psychomotor coordination is clearly affected in both the groups; however, in Group II, it is slightly more (Figures 4 and 5).

Burning sensation during injection of propofol was reported by a total of 4 patients but no incidence of postinjection thrombophlebitis. None of the patients reported headache or hallucination, and no patient complained of pain at the operated site for about 3 h in both the groups. One incidence of delirium, post-operative vomiting, and hiccup immediately after propofol administration was noticed. None had an incidence of ptosis or change in body temperature. No evidence of any delayed complication occurred.

No serious complication occurred intra- and post-operatively that required attention.

DISCUSSION

Fear and anxiety about pain are common reasons for patients to delay dental care. Fear, apprehension, anesthesia, and surgery are also accompanied by various harmful cardiovascular, metabolic, and hormonal response.¹¹ Conscious sedation in combination with local anesthesia has been used as a safe alternative to general anesthesia for control of perioperative pain and anxiety in oral surgery.¹² The introduction of intravenous sedation by Pierre-Cyprian Ore of Bordeaux, France, in 1872 leads to various agents being used for analgesia, amnesia, anxiolysis, and patient cooperation.^{13,14} The evaluation of a therapeutic modality of intravenous conscious sedation should start with a statement of the clinical goals of the treatment which

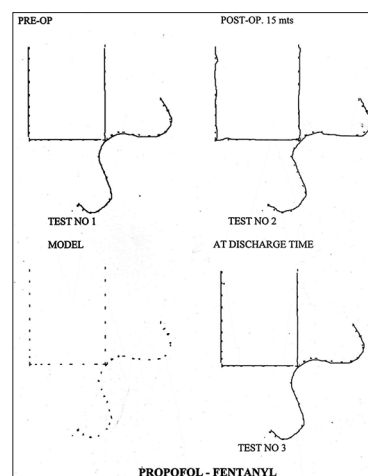


Figure 4: Trieger dot test - propofol and fentanyl

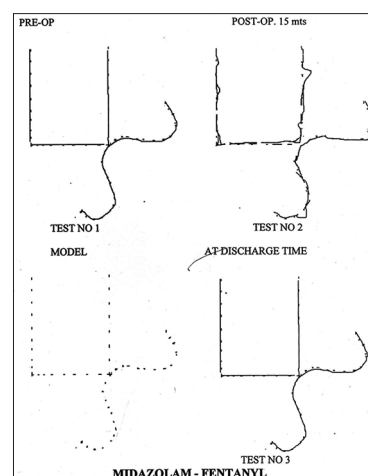


Figure 5: Trieger dot test - midazolam and fentanyl

can be divided into measures of efficacy and measures of clinical toxicity.

The identified measures of the efficacy of intravenous sedation agents are anxiolytic activity, analgesic activity, amnesic effect, and patient cooperation, whereas toxicity response variables of primary importance are cardiovascular and respiratory effects, prolonged recovery from psychomotor impairment, and side effect liability.¹⁵ Currently, there are several medication regimens used for efficient, safe, conscious sedation during outpatient oral surgical procedures. In this context, we compared the clinical efficacy and toxicity response of two drug groups which may provide a satisfactory combination for conscious sedation.

CONCLUSION

The design of the present study permitted a qualitative comparison between the intravenous sedative drug combinations, i.e., propofol + fentanyl and

midazolam + fentanyl apprehensive and uncooperative patients undergoing oral and maxillofacial surgical procedure on a day care basis. Based on the parameters evaluated in the present study, we can conclude propofol + fentanyl combination as a superior sedating agent compared to fentanyl midazolam combination having rapid onset and predictability of action, profoundness of amnesia, and a faster recovery period, offering advantages early patient discharge and better patient compliance. However, further extensive double-blind studies over a larger population are required to accord fentanyl + propofol group as ideal sedating agent combination in the day care oral surgical procedure.

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A Prospective Study of Esophageal Variceal Recurrence and Rebleed Rates after Primary Eradication

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Abstract

Introduction: Variceal bleeding is a life-threatening complication of portal hypertension with a high probability of recurrence. Treatment to prevent first bleeding or rebleeding is mandatory.

Aim: The aim of this study is to evaluate prospectively the overall long-term clinical outcome in terms of recurrence of varices and rebleed rates after eradication of varices following endoscopic sclerotherapy (EST) in consecutively treated cirrhotic patients with bleeding esophageal varices.

Materials and Methods: Consecutive patients presenting with bleeding esophageal varices for the first time and registered in the liver clinic of the institution were included in the study. Those patients with an earlier variceal bleed and on EST schedule, initiated elsewhere, were excluded from the study. Child C patients who failed to recover and presented with variceal bleed were also excluded.

Results: A total of 133 consecutive patients were treated for esophageal variceal bleeding, there were 86 men and 47 women (mean age: 45.51 + 11.8 years; age range, 20-77 years). A total of 611 EST sessions were performed with a mean of 4.6 injections. 43 (32.3%) of the 133 patients continued to have recurrent bleed in between the EST sessions and eradication of varices. 16 (12%) patients died within 3 months of registration, 8 from massive GI bleed, 4 from hepatic encephalopathy, 2 from hepatorenal syndrome, and 2 from spontaneous bacterial peritonitis. They had overall 28 EST sessions with a mean of 1.8 injections.

Conclusion: Ultimately, the use of sequential combined endoscopic techniques with variceal banding initially when varices are large followed by sclerotherapy when varices are small may enhance the endoscopic management of esophageal varices in terms of reducing complications, facilitating earlier eradications, and preventing recurrence.

Key words: Cirrhosis, Esophageal varices, Variceal bleeding

INTRODUCTION

Bleeding from esophageal varices is the leading cause of death in patients with portal hypertension, with a mortality of up to 50% for the initial bleed and 30% for subsequent bleeds.^{1,2} Endoscopic variceal sclerotherapy

(EST) has been widely used in the emergency treatment of patients with actively bleeding esophageal varices. Even though the initial bleed may effectively be controlled by sclerotherapy, the risk of subsequent rebleeding is substantial.^{3,4}

There is a general consensus that patients surviving a bleed episode should be treated to prevent rebleeding. Considerable evidence has supported the use of repeated sclerotherapy to obliterate esophageal varices to prevent further variceal bleeding. While undergoing sclerotherapy before eradication, patients may continue to have variceal bleeds. Repeated injection also increases the cumulative risk of developing complications in patients.⁵

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Endoscopic variceal ligation (EVL) is widely used and may provide safer and quicker eradication of varices. However, no long-term data for recurrent bleeding after variceal eradication by ligation exists, and there is a concern that rebleeds may be higher after ligation than after sclerotherapy.⁶ The cost and affordability by the patient have resulted in selective use of EVL when compared to EST which cheaper and readily available in all centers in the Indian subcontinent. Furthermore, a recent study from our institution has highlighted the natural history of esophageal varices in an era of sclerotherapy. The rebleed rate was 29.4%.

Despite the previous widespread use of EST, accurate data on long-term recurrence and rebleeding after variceal eradication and the need and optimal frequency of endoscopic surveillance are scant.

Aim

The aim of this study was to evaluate prospectively the overall long-term clinical outcome in terms of recurrence of varices and rebleed rates after eradication of varices following EST in consecutively treated cirrhotic patients with bleeding esophageal varices.

MATERIALS AND METHODS

Consecutive patients presenting with bleeding esophageal varices for the first time and registered in the liver clinic of the institution were included in the study. Those patients with an earlier variceal bleed and on EST schedule, initiated elsewhere, were excluded from the study. Child C patients who failed to recover and presented with variceal bleed were also excluded.

Patient details at the time of registration were recorded in a pre-structured pro forma. Details included address, cell number, age, gender, etiology of portal hypertension, and Child-Pugh Score. The latter was applied to grade the severity of cirrhosis. This was based on serum bilirubin, serum protein, ascites, prothrombin time, and encephalopathy (Table 1).

Based on the scoring system, cirrhosis was classified as Child A when the total score was 5 and 6, Child B when the total scores 7-9, and Child C when the total score was 10-15.

Bleed details included the date of index bleed, subsequent bleed until eradication, details of EST such as grades of varices, features of imminent bleed, nature and volume of sclerosant used, and number of sessions required to obliterate the varices. The protocol for variceal injection followed by the department was as follows: 14-18 ml of

Table 1: Child-Pugh score

| Variables | Child A | Child B | Child C |
|------------------|----------|---------------|-----------------|
| Serum bilirubin | <2 mg % | 2-3 mg % | >3 mg % |
| Serum albumin | >3.5 g % | 2.8-3.5 g % | <2.8 g % |
| Ascites | Nil | Mild | Moderate/severe |
| Prothrombin time | <14 s | 15-1 s | >18 s |
| Encephalopathy | Nil | Mild/moderate | Moderate/severe |

1% sodium tetradecylsulfate was used to inject the varices in the first sitting. All patients were admitted for a day and were on prophylactic parenteral ciprofloxacin 200 mg 1 h before the EST session. EVL was not available at all times, and hence, only those cases on regular EST were included for the study.

The varices were injected both intra- and para-variceal close to the gastroesophageal junction using 23-gauge needle. For larger varices, Grades III and IV para-variceal were followed by intravariceal injection. The second and subsequent injections were done at three weekly intervals until eradication of varices. The end point was sclerosed varices. The number of sessions and complications if any during or after the procedure were noted. The injection was deferred in those patients who had odynophagia, chest pain, and esophageal ulcers or had fever or focus of infection. Those patients who had a bleed in between the recommended sessions had an EST at that point of time. Patients with large fundal varices were excluded from the study. Revascularization with or without shunt is the recommended protocol of management for these patients in our institutions.

All patients were on secondary prophylaxis with propranolol 40 mg twice a day or until the pulse rate decreased by 25% of the baseline rate.

Follow-up protocol of eradicated varices included rescope for variceal recurrence at 3-month intervals. Eradication of varices was defined as the absence of varices on subsequent endoscopy examination during follow-up visits.

The grades of varices, signs of imminent bleed such as red wale sign, cherry red spots, and hematocystis spots were noted. Details of bleed after eradication, i.e., defined as rebleed were noted, and sclerotherapy was done as per the protocol. The end point of the study was the first bleed after eradication. Further, EST was done for residual or recurrent varices.

RESULTS

A total of 133 consecutive patients were treated for esophageal variceal bleeding. There were 86 men and

47 women (mean age: 45.51 ± 11.8 years; age range, 20-77 years). A total of 611 EST sessions were performed with a mean of 4.6 injections.

43 (32.3%) of the 133 patients continued to have recurrent bleed in between the EST sessions and eradication of varices. 16 (12%) patients died within 3 months of registration, 8 from massive GI bleed, 4 from hepatic encephalopathy, 2 from hepatorenal syndrome, and 2 from spontaneous bacterial peritonitis. They had overall 28 EST sessions with a mean of 1.8 injections.

Of the 39 (29.3%) patients who did not complete the study, 26 (19.5%) were lost to follow-up. They had 89 EST sessions with a mean of 3.4 injections. In 13 patients, oesophageal varices persisted at the end of 6 months despite repeated EST sessions (mean: 9.4 injections). Six patients died during the interim period due to hepatic encephalopathy (4 patients) and hepatorenal syndrome (2 patients). Three patients required elective surgery (revascularization). Four patients declined regular long-term follow-up and further injection therapy.

The 133 patients received a total of 611 emergency and elective injection treatments during the study period. A minor complication of sclerotherapy consists of transient fever and chest pain.

Esophageal mucosal ulceration at the injection site was found on 128 (20.9%) occasions in 62 patients. Subsequent sclerotherapy was delayed in patients who had mucosal ulceration in greater than one quadrant of the esophageal circumference.

A contained injection leak occurred on 2 occasions in 2 patients and was treated with intravenous antibiotics and nasogastric tube feeding.

Esophageal stricture at the injection site occurred in 4 patients after sclerotherapy. One patient required esophageal dilation, with complete relief of symptoms after dilation (Table 2).

78 (58.6%) patients had eradication of the varices and were available for follow-up of 1 year (Table 3).

Majority of the patients had alcohol-related cirrhosis (42.3%), followed by HBV-related cirrhosis (19.2%). In 22 patients, the cause remained unknown (28.2%).

There were 48 men and 30 women. The mean age for men was 41.2 ± 11.8 years and for women was 48.1 ± 11.76 years. Minimum period of follow-up of obliterated esophageal varices was for 12 months, and the longest follow-up was

Table 2: Complications in 133 patients

| Type of complication | Complications per sclerotherapy (%) |
|-----------------------|-------------------------------------|
| Esophageal ulceration | 128 (20.9) |
| Injection site leak | 2 (0.3) |
| Stricture | 4 (0.7) |

Table 3: Causes of cirrhosis in 78 cases

| Cause | Total number of patients (%) |
|-----------------------|------------------------------|
| Alcoholic cirrhosis | 33 (42.3) |
| HBV-related cirrhosis | 15 (19.2) |
| HCV-related cirrhosis | 3 (3.8) |
| NAFLD | 1 (1.3) |
| Wilson's disease | 4 (5.1) |
| Cryptogenic cirrhosis | 22 (28.2) |

for 22 months. Eradication of varices was possible after a median of 4.77 injections.

Recurrence of Varices, Bleed Rates, and Bleed-related Mortality

In follow-up of 32 cases, 17 had eradication of varices after the mean of 4.8 sessions. 9 patients (52.9%) had recurrence of varices on follow-up of 21.5 months. The grades of varices were I, II, and III in 3 (33.3%), 5 (55.5%), and 1 (11.1%), respectively. Four patients (44.4%) bled during the follow-up period. One of the two deaths was due to variceal bleed.

In follow-up of 35 cases, 23 cases had eradicated the varices after a mean of 5 EST sessions. These patients could be followed up 18 months. Of the 11 (47.8%) who had recurrence of varices, 5 (45.5%) had Grade I varices, 5 (45.5%) had Grade II varices, and one (9.1%) had Grade II varices. Three patients (27.3%) had a variceal bleed. There were no bleed-related deaths. After eradication, bleed occurred in 3 (27.3%) patients.

In follow-up of 29 cases registered, 16 had varices eradication after a mean of 4.5 injection. Follow-up for 15.8 months after eradication showed recurrence of varices in 8 (50%), 2 of whom, i.e. 25% had Grades I and III and 4 (50%) had Grade II varices. Two patients had variceal bleed after eradication.

Of the 37 cases registered in the fourth quarter, 22 cases had varices eradication within 4 months of registration after a mean of 4.8 variceal injections. On follow-up at 12 months after eradication, 13 (35.1%) had recurrence of varices, among whom 5 (38.4%) had Grade I varices, 6 (46.1%) had Grade II varices, and 2 (15.4%) had Grade III varices. Bleed after eradication occurred in 5 (38.4%) patients; one of the two deaths was due to variceal bleed.

On summarizing, of the 41 variceal recurrences, majority, i.e., 32 (78%) patients had recurrence of varices within 6 months of follow-up and the rest subsequently. Furthermore, majority of rebleed occurred within 3 months, i.e., in 11 patients (78.6%) and the rest later.

There were 27 (65.9%) non-bleeders. The grades of varices were I, II, and III in 7 (26%), 15 (55%), and 5 (19%), respectively. 10 (27%) patients died, 5 from hepatic encephalopathy, 3 from hepatorenal syndrome, and 2 from spontaneous bacterial peritonitis. One (63%) patients were alive at the end of the study.

Non-recurrence of Varices, Bleed Rates, and Bleed-related Mortality

In 37 of the 8 (47.3%), the varices remained eradicated until the end of follow-up. 12 (32.4%) patients died, 6 from hepatic encephalopathy, 4 from hepatorenal syndrome, and 2 from spontaneous bacterial peritonitis.

DISCUSSION

Bleeding from esophageal varices is the leading cause of death in patients with portal hypertension, with a mortality of up to 50% for the initial bleed and 30% for subsequent bleeds. The greatest risk is during the first 72 h, and more than 50% of all early rebleed episodes occur within the first 10 days after cessation of active hemorrhage.

The most common source of recurrent bleeding before variceal eradication is from residual patent varices. This was 32.3% in the present series, a figure similar to that reported by Krige *et al.*⁷ emergency endoscopy is essential since in 85.9% of patients with recurrent bleeding, the source is invariably the varices. These can be optimally treated by sequential EVL or sclerotherapy.

Overall, the esophageal varices remained eradicated in 37 (47.3%) patients after a follow-up period of 1 year. Although new varices formed following initial obliteration in 41 (52.6%) of the 78 patients, this was associated with varices-related rebleed in 14 patients (34.1%), a figure similar to that reported by Krige *et al.*⁷ (37.5%). Of the 41 variceal recurrences, majority, i.e., 32 (78%) patients had recurrence of varices within 6 months of follow-up and the rest subsequently. Furthermore, majority of rebleed occurred within 3 months, i.e., in 11 patients (78.6%) and the rest later.

The present study evaluated the complications occurring in 133 patients undergoing emergency and elective sclerotherapy. Complications were mostly minor and occurred in half of patients similar to Krige *et al.* their figure

of 20.9% corresponds to the 20-23% reported in earlier series by Westaby *et al.*⁸ this is in contrast to the 39.4% reported by Krige *et al.*, who performed EST sessions at weekly intervals.

Asymptomatic esophageal ulceration at the injection site was the most common complication and was detected at follow-up endoscopy. Ulcers are generally considered an inevitable temporary consequence of the sclerosant, occurring after frequent or large volume injections.

In most of the patients, in this study, mucosal ulceration healed without sequelae. Our present policy is to use lower volumes of sclerosant as varices decrease in size in an attempt to reduce the extent of ulceration.

EVL has now replaced injection sclerotherapy in the elective treatment of esophageal varices. Data from randomized controlled trials show more rapid eradication of varices with lower rates of recurrent bleeding and fewer complications such as strictures and perforation.⁹ However, a recent survey by the American College of Gastroenterology International GI Bleeding Registry shows that sclerotherapy is still used as frequently as bleeding for endoscopic intervention during index bleeding and more frequently than banding for control of variceal rebleeding. Likely, reasons include convenience, cost, and widespread availability. It is noteworthy that several recent randomized controlled trials comparing band ligation with sclerotherapy have reported a higher recurrence rate of varices in patients undergoing band ligation.¹⁰

Our current management policy is to have regular endoscopic therapy to achieve early variceal eradication, appreciating those factors such as esophageal ulceration, and poor patient compliance may interfere with the endoscopic therapy program. After eradication of the varices, patients have surveillance endoscopy at 3-month intervals, and if recurrent varices are identified, a comprehensive endoscopic treatment schedule is instituted again.^{11,12}

CONCLUSION

Over the past two decades, several treatment modalities have been improved and introduced to practice with a decreased rebleeding risk and mortality. Combination of EVL plus drug therapy is indicated because of the high risk of recurrence, despite that the side effects are more common than in a single agent therapy (recommended for primary prophylaxis). Ultimately, the use of sequential combined endoscopic techniques with variceal banding initially when varices are large followed by sclerotherapy

when varices are small may enhance the endoscopic management of esophageal varices in terms of reducing complications, facilitating earlier eradications and preventing recurrence. The choice of treatment should be based on local resources and expertise, patient preference and characteristics, side effects, and contraindications.

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Comparison of Ultrasonography Guided Fascia Iliaca Compartment Block and Intravenous Fentanyl for Positioning During Spinal Anesthesia in Fracture Femur Surgeries - A Randomized Controlled Study

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Abstract

Introduction: Anesthesia for femur surgeries is usually provided by subarachnoid block. Proper positioning during subarachnoid block is essential for a successful procedure. Alleviating pain increases patient comfort and also provides better patient positioning for subarachnoid block.

Aim: To compare the efficacy of fascia iliaca compartment block (FICB) under ultrasound guidance and intravenous (IV) fentanyl (FENT) for positioning during spinal anesthesia in fracture femur surgeries.

Materials and Methods: A total of 60 patients were randomly allocated into two groups, Group FICB and Group FENT. Group FICB patients were administered 30 ml of 0.25% bupivacaine in the fascia iliaca compartment using ultrasound. Group FENT patients received titrated doses of injection FENT 0.5 mcg/kg IV repeated to 3 doses (1.5 mcg totally) with an interval of 5 min between doses.

Results: There was a statistically significant difference in relation to visual analog scale score during positioning between FICB group and FENT group. There was a statistically significant difference in relation to patient satisfaction status between FICB group and FENT group. There was a statistically significant difference in relation to time to perform subarachnoid block between FICB group and FENT group.

Conclusion: It is concluded that FICB is more efficacious than IV FENT for positioning during spinal anesthesia in surgery for fracture femur. FICB provides superior analgesia, better quality of patient positioning, greater patient satisfaction thereby reducing the time taken to perform spinal anesthesia in sitting position compared to IV FENT in fracture femur surgery.

Key words: Fascia iliaca block, Femur surgery, Fentanyl, Spinal anesthesia, Ultrasound

INTRODUCTION

Fracture femur is a common orthopedic injury which causes severe pain and distress to the patient. Anesthesia

for femur surgeries is usually provided by subarachnoid block. Proper positioning during subarachnoid block is essential for a successful procedure.¹ However, overriding of bone ends during movement worsens pain, delays positioning which in turn increases pain further. Alleviating pain increases patient comfort and also provides better patient positioning for subarachnoid block.² Various drugs such as nonsteroidal anti-inflammatory drugs, opioids, midazolam, ketamine, and propofol have been in use to reduce the pain preoperatively and improve positioning in these patients.³ Nerve blocks have come up as an effective and a safe alternative to provide pain relief. Ultrasound

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is gaining importance in recent years and has provided anesthesiologists, ineffective alternative tool for the identification and safe blockade of nerve fibres.^{4,5} In this study, we compared fascia iliaca compartment block (FICB) under ultrasound guidance and intravenous (IV) fentanyl (FENT) for positioning during spinal anesthesia in femur fractures. Primary objective of this study is to compare the analgesia obtained for positioning during spinal anesthesia and the ease of positioning and the time taken for giving spinal anesthesia.

Aim

To compare the efficacy of FICB under ultrasound guidance and IV FENT for positioning during spinal anesthesia in fracture femur surgeries.

MATERIALS AND METHODS

A total of 60 patients posted for femur surgeries were included in the study after obtaining written informed consent ($n = 30$ in FICB arm and $n = 30$ in FENT arm) and approval from the Institution Ethics Committee. Patients belonging to ASA Grade I and II, of either sex, between the age group 18-55 years, with fracture femur, posted for surgery under subarachnoid block, who gave a valid informed consent, were included in the study. Patients not satisfying inclusion criteria belonging to ASA Grade III or IV, with hemorrhagic diathesis, neurological disorders, psychiatric disorders, previous femoral bypass surgery, allergy to local anesthetics or opioids and with polytrauma, infection over the injection site were excluded from the study. After obtaining informed consent, patients who were willing to be included in the study were enrolled. They were preoperatively evaluated, clinically examined and assessed. A total of 60 patients were included in the study. They were randomly allocated into two groups. Group FICB were administered ultrasound guided FICB preoperatively. Group FENT were administered IV FENTs preoperatively. All patients were kept nil per oral for at least 6 h before the procedure. Patients were shifted inside the operation theater $\frac{1}{2}$ h before the scheduled procedure. Baseline vitals such as pulse rate, noninvasive blood pressure, saturation in room air, respiratory rate, and ECG pattern were recorded. IV access was obtained with 18G IV cannula and IV fluid started. Local anesthetic test dose was given using 0.1 ml of injection lignocaine 2%. All patients were premedicated with injection ondansetron 0.1 mg/kg intravenously. Oxygen was given through Hudson's mask at 4 L/min. Group FICB patients were placed in supine position. The local anesthetic solution was prepared with 15 mL of 0.5% bupivacaine and of distilled water and hence 30 ml of 0.25% bupivacaine. The ultrasound machine was powered on and the linear array probe was covered with

sterile dressing after applying ultrasound gel. The probe was placed in a horizontal direction over the anterior part of thigh just below the inguinal ligament. The ultrasound setting used to visualize was at a frequency of 10 MHz and a depth of 3-4 cm. The gain and focus were adjusted according to the image scanned. Femoral artery was identified first. Then, the iliacus muscle covered by fascia iliaca was identified lateral to the artery. An 18G needle was then inserted in plane to the ultrasound beam. The needle was advanced until the tip of the needle was placed beneath the fascia iliaca (appreciating the give as the fascia is perforated) and after negative aspiration, the local anesthetic was injected and its spread visualized on the ultrasound screen. The FICB was done 15 min before the subarachnoid block. Group FENT patients received titrated doses of injection FENT 0.5 mcg/kg IV repeated to 3 doses (1.5 mcg totally) with an interval of 5 min between doses. Hemodynamic variables such as heart rate, noninvasive blood pressure, saturation of oxygen, and respiratory rate were recorded after the block/IV FENT and at 5 min intervals till positioning. The analgesia provided by either of the modes was assessed using visual analog scale (VAS) scores 15 min (i.e., during positioning) after the block/IV FENT. Subarachnoid block was performed in the sitting posture under strict aseptic precautions in the L3-L4 space using 25G Quincke needle with 3 ml of 0.5% bupivacaine (hyperbaric and dextrose 80 mg/ml) + 0.5 ml (50 mcg) of FENT. The quality of patient positioning for administering spinal anesthesia was recorded by another anesthesiologist blinded to the mode of analgesia with scores of 0-3.0 - Not satisfactory, 1 - Satisfactory, 2 - Good, and 3 - Optimal. Time to perform spinal anesthesia will be recorded (time from beginning of positioning to end of spinal). Patient satisfaction was also recorded; 1 - Satisfactory and 2 - Not satisfactory.

Post-operative analgesia was standardized in all patients of both groups with injection tramadol 50 mg IV. 8th hourly; first dose was given whenever patient complained of pain. The collected data were recorded for further statistical analysis. Descriptive statistics were done for all data and were reported in terms of mean values and percentages. Suitable statistical tests of comparison were done. Continuous variables were analyzed with the unpaired *t*-test. 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 SPSS version 16.

RESULTS

Both the groups were comparable with respect to age, gender, weight, and duration since fracture.

Among the patients undergoing spinal anesthesia in fracture femur surgery, there was a statistically significant difference in relation to VAS score during positioning between FICB group (mean = 1.13, standard deviation [SD] = 1.25) and FENT group (mean = 2.27, SD = 1.55). The mean VAS score during positioning was significantly lesser in FICB group compared to FENT group by a mean difference of 1.13 scoring points (50% lesser). This difference is significant with a $P = 0.0029$ as per unpaired t -test. There was a statistically significant difference in relation to quality of patient positioning between FICB group (mean = 2.43, SD = 0.63) and FENT group (mean = 1.87, SD = 0.78). The mean quality of patient positioning score was significantly higher in FICB group compared to FENT group by a mean difference of 0.57 scoring points (23% higher). This difference is significant with a $P = 0.0024$ as per unpaired t -test. There was a statistically significant difference in relation to patient satisfaction status between FICB group (yes = 96.67%, no = 3.33%) and FENT group (yes = 76.67%, no = 23.33%). The positive patient satisfaction status was significantly higher in FICB group compared to FENT group by a percentage difference of 20.00 (21% higher). This difference is significant with a $P = 0.0284$ as per Fisher's exact test. There was a statistically significant difference in relation to time to perform subarachnoid block between FICB group (mean = 4.90, SD = 0.55) and FENT group (mean = 5.86, SD = 0.83). The mean time to perform subarachnoid block was significantly shorter in FICB group compared to FENT group by a mean difference of 58 s (16% shorter). This difference is significant with a $P < 0.0001$ as per unpaired t -test. There was a statistically significant difference in relation to heart rate at 10-15 min between FICB group (mean = 86.52, SD = 8.39) and FENT group (mean = 81.02, SD = 7.10). The mean heart rate was significantly lower in FENT group compared to FICB group by a mean difference of 6 breaths per minute (bpm) (6% lower). This difference is significant with a lowest $P = 0.0022$ as per unpaired t -test. There was a statistically significant difference in relation to time of first post-operative analgesic need between FICB group (mean = 5.90, SD = 0.80) and FENT group (mean = 1.65, SD = 0.60). The mean time of first post-operative analgesic need was significantly delayed in FICB group compared to FENT group by a mean difference of 4 h and 15 min (72% more delayed). This difference is significant with a $P < 0.0001$ as per unpaired t -test. There was a statistically significant difference in relation to respiratory rate at (10-15 min) between FICB group (mean = 16.93, SD = 0.93) and FENT group (mean = 15.07, SD = 1.27). The mean respiratory rate was significantly lower in FENT group compared to FICB group by a mean difference of 2 bpm (11% lower). This difference is significant with a lowest $P < 0.0001$ as per unpaired t -test. Both the groups

were comparable with respect to SpO_2 and mean arterial pressure (MAP). There was no statistical difference between the groups with respect to SpO_2 and MAP. There were no complications of block such as infection, block failure, vascular puncture, nerve damage, or systemic toxicity of bupivacaine.

DISCUSSION

FICB, first described by Dalens *et al.*⁶ is a simple, low skill, and safe technique that can be used during prehospital care, emergency department and in the pre-operative settings. It blocks the femoral, lateral femoral cutaneous nerve and sometimes the obturator nerve. Furthermore, since the injection is done away from the artery and nerve, there are minimal chances of neurovascular injury. The usage of ultrasound guidance to visualize the fascia iliaca and to deposit the drug beneath it lateral to the femoral nerve increases the success rate of block and further reduces the risk of neurovascular injury. The VAS score during positioning was 1.13 ± 1.25 in FICB group and 2.27 ± 1.55 in FENT group and was statistically significant with a $P = 0.0029$. It shows that FICB provides better analgesia for patient positioning in fracture femur surgeries (Figure 1).

A study conducted by Jadon *et al.*⁷ compared the femoral nerve block (FNB) and IV FENT for analgesia obtained in surgery for femur fractures. 60 patients were divided into two groups. In one group, FNB was performed using a peripheral nerve stimulator with 20 ml of 1.5% lignocaine with adrenaline. In the other group, 1 mcg/kg of FENT IV was given. Both these interventions were done 5 min before positioning and then both the groups received subarachnoid block. In FNB group, during positioning, the VAS score was significantly lower ($P = 0.002$). The quality of positioning ($P = 0.027$) and the patient acceptance ($P = 0.031$) was significantly better when compared to IV FENT. The time required to perform subarachnoid block was also less in FNB ($P = 0.049$). The results showed that FNB when compared to IV FENT provided better

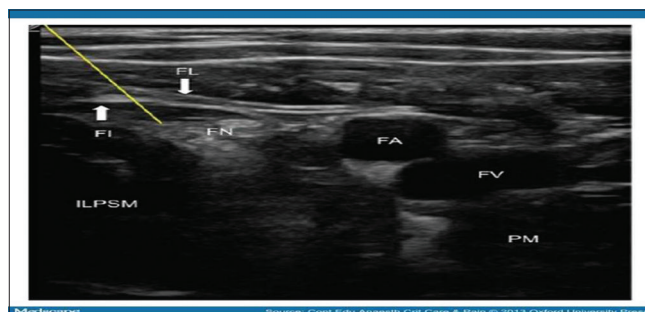


Figure 1: Sonographic appearance of fascia iliaca block (fentanyl)

analgesia for patient positioning during subarachnoid block in surgery for femur fractures.

Yun *et al.*⁸ compared the analgesia obtained while positioning between FICB and IV alfentanil in the elderly who were posted for surgery for neck of femur fracture. In one group, IV alfentanil 10 mcg/kg loading dose was given, and then an infusion of 0.25 mcg/kg/min was started 2 min before subarachnoid block. In the second group, FICB was done with 30 ml of ropivacaine 20 min before subarachnoid block. The VAS score was lower ($P = 0.001$) and the acceptance of the patient was better in the block group compared to IV alfentanil. Furthermore, the mean time taken to perform subarachnoid block was also significantly lower ($P = 0.009$) in the fascia iliaca compartment group. The study showed that FICB is more efficient compared to IV alfentanil for positioning in the elderly who underwent subarachnoid block for neck of femur fractures. In our study, the quality of patient positioning was higher in FICB group with a mean of 2.43 ± 0.63 when compared to FENT group which had a mean of 1.87 ± 0.78 . It was statistically significant with a $P = 0.002$. It means that FICB provides better quality of patient positioning for spinal anesthesia compared to IV FENT. Patient satisfaction was also significantly better in FICB group ($P = 0.028$). The time taken to perform subarachnoid block (time from beginning of positioning to end of spinal) was shorter in FICB group 4.90 ± 0.55 compared to FENT group 5.86 ± 0.83 . It was statistically significant with a $P < 0.0001$. It indicates that FICB reduces the time taken for providing subarachnoid block.

Lamaroon *et al.*⁹ compared FNB and IV FENT for analgesia to facilitate positioning in patients with fracture femur who underwent surgery under subarachnoid block. 64 patients were included. Among them, 32 were given FNB 15 min before spinal block with 20 ml of 0.5% bupivacaine and 10 ml of normal saline. The other 32 patients were given IV FENT 0.5 mcg/kg initially followed by another 0.5 mcg/kg 5 min later. Additional FENT 0.5 mcg/kg was given in increments if the pain scores were above 4. Subarachnoid block was then performed in both the groups. The results obtained showed that the requirement of additional FENT, the satisfaction of positioning and the time taken to achieve spinal block ($P = 0.74$) did not vary significantly between the two groups.

FNB and IV FENT were compared by Sia *et al.*¹⁰ for analgesia during positioning in fracture shaft of femur surgeries done under spinal block. Patients with fracture shaft of femur posted for surgery under spinal block were randomized into two groups. One group was given FNB

with 15 ml of 1.5% lidocaine under the guidance of a peripheral nerve stimulator while the other group was given 3 mcg/kg of IV FENT. Spinal block was done after 5 min in the sitting position in both the groups. The VAS scores ($P < 0.001$), quality of patient positioning ($P < 0.005$) and the acceptance of the patient ($P < 0.005$) were comparatively better in the FNB group. Furthermore, the time for performing spinal anesthesia was lesser ($P < 0.05$) in the FNB group compared to IV FENT. The results showed that FNB is more efficacious during positioning compared to IV FENT in fracture shaft of femur surgeries done under spinal block.

Durrani *et al.*¹¹ did a study in patients with femur fractures posted for surgery under spinal block. 84 patients were divided into two groups. 15 min before positioning for spinal block, the FNB group received FNB with 15 ml of lignocaine with adrenaline and 5ml distilled water, and the IVN group received 6 mg IV nalbuphine. VAS during positioning was significantly less in FNB group (1.40 ± 0.66) versus IVN group (3.02 ± 1.39), $P = 0.000$. Time taken to perform spinal block was significantly shorter in FNB group (2.15 ± 0.78 min) versus IVN (3.50 ± 1.46 min), $P = 0.001$. Quality of patient positioning during spinal was significantly better in FNB group (2.45 ± 0.55) than IVN group (1.88 ± 0.80), $P = 0.000$. Acceptance of patient was very significantly higher among FNB group ($40/42 = 95.24\%$) than IVN ($28/42 = 66.67\%$) group, $P = 0.001$.

In our study, the heart rate was significantly lower in FENT group at 10 and 15 min ($P < 0.05$) while there was no significant difference in MAP and oxygen saturation between the two groups. The respiratory rate was significantly less in FENT group at 10 and 15 min ($P < 0.0001$) though none of the patients had a respiratory rate of $<12/\text{min}$ or a saturation of $<95\%$. FICB had the advantage of significant post-operative analgesia as the requirement of first rescue analgesic was after 5.90 ± 0.80 h compared to 1.65 ± 0.60 h in FENT group ($P < 0.0001$). There were no complications of block such as infection, block failure, vascular puncture, nerve damage, or systemic toxicity of bupivacaine.

CONCLUSION

Ultrasound guided FICB is more efficacious than IV FENT for positioning during spinal anesthesia in surgery for fracture femur. FICB provides safety, superior analgesia, better quality of patient positioning, greater patient satisfaction thereby reducing the time taken to perform spinal anesthesia in sitting position compared to IV FENT in fracture femur surgery.

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Metabolic Syndrome in Female Patients with Ischaemic Heart Disease: A prospective study

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Abstract

Introduction: Metabolic syndrome is a cluster of clinical characteristics that is associated with enhanced coronary risk.

Materials and Methods: A total of 62 female patients with IHD were observed. These females were having at least one criteria of metabolic syndrome. Based on this 47 females of IHD were having 3 criteria of metabolic syndrome and 15 were having < 3 criteria. A comparison study was done in between these groups. Subjects were physically assessed for the abdominal obesity, based on waist circumference. Fasting blood samples for glucose and lipid profile were drawn and tested.

Results: In present study, women were mostly from postmenopausal age group. 69.4% were from postmenopausal age group and 30.6% were from premenopausal age group with mean age 51 ± 10 years. There was significant positive correlation IHD and systolic and diastolic blood pressure, fasting and postprandial hyperglycemia, low HDL, high triglycerides, total cholesterol, BMI, waist circumference.

Conclusion: Mortality and morbidity was having direct correlation with number of components of Metabolic syndrome present in females with IHD.

Key words: Metabolic Syndrome, Female, Patients

INTRODUCTION

Metabolic syndrome is a cluster of clinical characteristics that is associated with enhanced coronary risk. According to NATIONAL CHOLESTEROL EDUCATION PROGRAMME ADULT TREATMENT PANEL III (NCEP ATP III) CRITERIA, metabolic syndrome is associated with a greater risk atherosclerotic disease than any of its individual.¹

It has been studied that individuals with metabolic syndrome are at increased risk Artery Disease (CAD).²

Insulin resistance is a central pathophysiological process associated with metabolic syndrome.³

Presence of metabolic syndrome increases the risk of Coronary Artery Disease by 7.3 times in male and 10.2 times in female patients.⁴

NCEP ATP III identified Coronary Artery Disease as the primary clinical outcome of the Metabolic Syndrome.⁵

The aim of this study is to determine the frequency of Metabolic Syndrome in female patients having ischaemic heart disease.

MATERIAL AND METHODS

This is a prospective study done at a tertiary care institute in patients with acute coronary syndromes admitted in ICCU or in General medical ward. In this period 62 female patients with IHD were observed. These females were having at least one criteria of metabolic syndrome. Based on this 47 females of IHD were having > 3 criteria of metabolic syndrome and 15 were having < 3 criteria. A comparison study was done in between these groups.

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All the patients are evaluated with-

1. History
2. General physical examination.
 - A. Waist circumference- Measured in a standing position at the levels of iliac crest with the help of a non- stretchable measuring tape in centimetres (cm) or inches
 - B. Body mass index = Weight in kilogram (kg)/(Height in metres (m))²
 - C. Blood pressure- Measured with manual sphygmomanometer in supine position.
3. Systemic examination.
4. Investigations.
 - A. Blood sugar level-Fasting & post prandial. (Enzymatic Method)
 - B. Lipid profile- in mg/dl or mmol/l
 - a) Serum Cholesterol
 - b) Serum Triglyceride
 - c) HDL
 - d) LDL
 - e) VLDL
 - C. Cardiac Enzyme-CPK MB
 - D. Electrocardiogram
 - E. 2D-Echocardiogram

Patients were classified according to Acute Coronary Syndrome as Unstable angina/NSTEMI and STEMI according to standard definitions as follows:

I. Unstable angina/Non ST elevation MI (UA/NSTEMI):

Braunwald's clinical classification of UA/NSTEMI was used as below:

Severity:

- **Class I:** new onset of severe angina or accelerated angina; no rest pain.
- **Class II:** angina at rest within past month but not within preceding 48 hours.
- **Class III:** angina at rest within 48 hours.

Clinical circumstances:

- A. Secondary angina: develops in the presence of extracardiac condition that intensifies myocardial ischaemia.
 - B. Primary angina: develops in the absence of extracardiac condition.
 - C. Post infarct angina: develops within Disease. 2 weeks after acute MI.
- The patients were subgrouped into UA or NSTEMI according to the absence or presence of elevated cardiac biomarker CPK MB.

II. ST elevation MI (STEMI):

Typical rise and gradual fall (troponin) or more rapid rise and fall (CPK-MB) of biochemical markers of

myocardial necrosis with at least one of the following:

- Ischaemic symptoms
- Development of pathological Q waves on the
- ECG reading ECG changes indicative of ischaemia (ST-segment elevation or depression)

Inclusion Criteria

1. All female patients >18 years of age.
2. All the patients who are having symptoms of Ischaemic Heart
3. Patients who fulfill the criteria of Metabolic Syndrome. (as per NCEP ATP III Guidelines)

Exclusion Criteria

1. All the Male patients.
2. Female patients <18 years of age.
3. Patients having Non Cardiac Chest pain.
4. Patients not fulfilling criteria of Metabolic Syndrome as per NCEPATP III Guidelines.
5. To exclude patients with other causes of obesity like Polycystic ovarian syndrome, Hypothyroidism, Cushing's syndrome, receiving medications like steroids, antidepressants, etc and other causes of secondary obesity.

STATISTICAL ANALYSIS

Data was analyzed using statistical software, statistical Product and service solution V-16 (SPSS 16). The categorical data was presented in frequency and percent distribution. In between parameters association was tested using non parametric pearson chi square test or fishers exact test. The level of significance was selected at $p < 0.05$, for accepting the difference in between the parameters as significant.

RESULTS

This is a prospective study done at a tertiary care institute between 1st September 2012 and 30th October 2014 in patients with acute coronary syndromes admitted in ICCU or in General medical ward (Tables 1-4).

Compared to females with less than 3 NCEP III criterias, it was noted than in 3 and more NCEP III criterias females mean age was lower, BMI was greater, waist circumference was greater, Higher SBP and DBP, greater fasting and PP BSL which was statistically significant ($p < 0.05$).

Out of 62 females having IHD according to metabolic syndrome, maximum were hypertensive with 3 and more NCEP ATP III, while only 12.9% were hypertensive and had less than 3 NCEP ATP III.

Table 1: Comparison of characteristics according to metabolic syndrome presence in females with IHD group statistics

| Parameter | NCEP ATP III (Metabolic syndrome Criteria) | | T value | Sig. (2-tailed) |
|-------------------------------|--|-----------------|---------|-----------------|
| | 3 and more (n=47) | < 3(n=15) | | |
| Age (years) | 48.6±7.45 | 53.5±6.17 | -2.341 | 0.023 |
| Duration of DM (years) | 10.81±2.38 | 10.80±2.28 | 0.008 | 0.994 |
| BMI (kg/m ²) | 29.5±4.98 | 26.65±2.28 | 2.174 | 0.034 |
| Waist circumference (cm) | 96.28±10.32 | 86.27±6.53 | 3.527 | 0.001 |
| Pulse | 89.19±12.97 | 93.20±13.91 | -1.024 | 0.310 |
| Systolic BP (mm Hg) | 151.36±10.95 | 138.13±18.20 | 3.430 | 0.001 |
| Diastolic BP (mm Hg) | 94.23±5.89 | 86.20±10.43 | 3.758 | 0.000 |
| O ₂ saturation (%) | 95.77±3.03 | 95.13±2.75 | 0.719 | 0.475 |
| HB (gm/dl) | 11.026±1.070 | 11.333±1.086 | -0.967 | 0.338 |
| WBC (per cmm) | 6132.34±1575.14 | 6645.33±1848.07 | -1.053 | 0.297 |
| Fasting BSL (mg%) | 118.1±28.8 | 101.8±5.76 | 2.163 | 0.035 |
| POST PRANDIAL BSL (MG%) | 175.2±36.55 | 153.20±3.73 | 2.316 | 0.024 |
| Total Cholesterol (mg%) | 217.9±43.26 | 208.4±30.0 | 0.791 | 0.432 |
| Triglycerides (mg%) | 180.9±42.6 | 148.1±40.9 | 2.621 | 0.011 |
| HDL (mg%) | 42.55±7.58 | 44.07±7.50 | -0.675 | 0.502 |
| VLDL (mg%) | 29.94±4.45 | 28.73±4.95 | 0.887 | 0.379 |
| LDL (mg%) | 88.47±18.77 | 87.07±11.20 | 0.273 | 0.786 |
| HDL/LDL | 0.50±0.13 | 0.51±0.10 | -0.326 | 0.745 |
| CPK-MB | 91.13±28.9 | 77.4±38.3 | 1.469 | 0.147 |

Table 2: Past history of females having IHD according to metabolic syndrome

| Past history | NCEP ATP III (Metabolic syndrome Criteria) | | | | Total | | P value |
|--------------|--|------|-----------|------|-----------|------|---------|
| | 3 and More | | <3 | | Frequency | % | |
| | Frequency | % | Frequency | % | | | |
| HTN | | | | | | | |
| Absent | 5 | 8.1 | 7 | 11.3 | 12 | 19.4 | 0.002 |
| Present | 42 | 67.7 | 8 | 12.9 | 50 | 80.6 | |
| DM | | | | | | | |
| Absent | 26 | 41.9 | 10 | 16.1 | 36 | 58.1 | 0.438 |
| Present | 21 | 33.9 | 5 | 8.1 | 26 | 41.9 | |
| IHD | | | | | | | |
| Absent | 43 | 69.4 | 14 | 22.6 | 57 | 91.9 | 0.819 |
| Present | 4 | 6.5 | 1 | 1.6 | 5 | 8.1 | |
| CVA | | | | | | | |
| Absent | 44 | 71 | 14 | 22.6 | 58 | 93.5 | 0.969 |
| Present | 3 | 4.8 | 1 | 1.6 | 4 | 6.5 | |
| OC Pills | | | | | | | |
| No | 44 | 71 | 15 | 24.2 | 59 | 95.2 | 0.316 |
| Yes | 3 | 4.8 | | | 3 | 4.8 | |

33.9% of IHD were diabetic and with 3 and more NCEP ATP III, while only 8.1% were diabetic and had less than 3 NCEP ATP III.

6.5% of females had IHD and with 3 and more NCEP ATP III, while only 1.6% females had IHD and less than 3 NCEP ATP III.

In 4.8% females there was CVA and 3 and more NCEP ATP III and only 1.6% females had CVA and less than 3 NCEP ATP III.

There was OC Pills consumption history in 4.8% female along with 3 and more of NCEP ATP III criterias.

There was statistically significant ($p < 0.05$) difference of Hypertension while insignificant ($p > 0.05$) difference of DM, IHD, OCP use and CVA history compared to metabolic criteria differentiation of NCEP ATP III.

Raised TGs with 3 and more NCEP ATP III metabolic criteria was found in 32.3% than 12.9% with less than 3 NCEP ATP III criteria. Lower HDL with 3 and more NCEP ATP III metabolic criteria was noted in 54.8% females compared to 17.7% with less than 3 NCEP ATP III metabolic criteria.

There was statistically significant difference TG's and HDL ($p < 0.001$) compared to the NCEP ATP III metabolic

Table 3: Lipid profile of females having IHD according to metabolic syndrome

| Lipid profile | NCEP ATP III (Metabolic syndrome Criteria) | | | | Total | | P value |
|-------------------|---|------|-----------|------|-----------|------|---------|
| | 3 and more | | <3 | | | | |
| | Frequency | % | Frequency | % | Frequency | % | |
| Total cholesterol | | | | | | | |
| Normal | 27 | 43.5 | 7 | 11.3 | 34 | 54.8 | 0.465 |
| Raised | 20 | 32.3 | 8 | 12.9 | 28 | 45.2 | |
| TGs | | | | | | | |
| Normal | 18 | 29 | 11 | 17.7 | 29 | 46.8 | 0.018 |
| Raised | 29 | 46.8 | 4 | 6.5 | 33 | 53.2 | |
| HDL | | | | | | | |
| Low | 34 | 54.8 | 3 | 4.8 | 37 | 59.7 | <0.001 |
| Normal | 13 | 21 | 12 | 19.4 | 25 | 40.3 | |
| LDL | | | | | | | |
| Normal | 34 | 54.8 | 13 | 21 | 47 | 75 | 0.259 |
| Raised | 13 | 21 | 2 | 3.2 | 15 | 24.2 | |

Table 4: Mean age in various metabolic syndrome studies in females

| | Number (sample size) | Place | Study population | Mean age (years) |
|--|----------------------|-------------------|------------------|------------------|
| Our study | 62 | India | ACS | 51±10 |
| SamraYasmi n et.al.(2007) ⁶ | 100 | Lahore (Pakistan) | ACS | 56±12.5 |
| K Pravee n et.al.(2002) ⁷ | 4081 | Kochi (India) | ACS | 61.8±10.49 |
| Mishra et.al.(2004) ⁸ | 157 | Berhampur (India) | ACS | 51.5 |
| Ulf Linblad et.al.(2001) ⁹ | 1259 | California | ACS | 72.9 |

criteria in females with IHD, while no significant ($p < 0.05$) ($p > 0.05$) difference was noted of Total cholesterol and LDL.

DISCUSSION

This is a prospective study done at a tertiary care institute between 1st September 2012 and 30th October 2014 in patients with acute coronary syndromes admitted in ICCU or in General medical ward. The age range in our study was 36 to 64 years. The mean age was 51±10 years. This comparably favoured with other Indian studies. However the mean age was decade higher in western population studies.

In present study, women were mostly from postmenopausal age group. 69.4% were from postmenopausal age group and 30.6% were from premenopausal age group. Oscar C. Marroquinet.all^o from Women's Ischaemia Syndrome Evaluation Study (WISE) showed that 75% of metabolic females were postmenopausal with mean age of 58±12 years. Namrata Chhabra et.al.¹¹ observed that the mean age of postmenopausal women was 57.25±0.80 years.

In our study 50 out of 62 females were hypertensive i.e. 80.6% and is the most common risk factor of metabolic syndrome associated with ischaemic heart disease in women. Tan M C et.al.¹² noted that hypertension was present in

91.2% of patients with systolic BP 136.5±20.9 mm Hg and diastolic BP 79.4±12.6 mm Hg. Oscar C. Marroquinet.all^o from Women's Ischaemia Syndrome Evaluation Study (WISE) showed that 91.8% had hypertension with metabolic syndrome. Amitesh Aggarwal et.al.¹³ observed that 76.9% of hypertensive female with metabolic syndrome had Coronary Artery Disease.

In our study Diabetes Mellitus was present in 41.9% i.e. 26 out of 62 patients. Amitesh Aggarwal et.al.¹³ observed that 32.1% of females were having DM with metabolic syndrome with CAD. Oscar C. Marroquinet.all^o observed that 25.5% of females were having DM with metabolic syndrome.

In our study duration of diabetes mellitus was 10±6 years with metabolic syndrome. Tan M C et.al.¹² noted that duration of diabetes mellitus was 11.5±8.7 years in Cardiovascular Disease. Vijay Achari et.al.¹⁴ observed that duration of diabetes mellitus was 10.99±7.6 years in metabolic syndrome with Coronary Artery Disease

CONCLUSION

In our study, mean age of female patients with Metabolic syndrome with IHD is 51±10 years i.e. perimenopausal age. Postmenopausal women were most commonly affected than premenopausal having Metabolic syndrome with IHD

i.e. 69.4% were from postmenopausal age group and 30.6% were from premenopausal age group.

In our study, BMI of female patients with Metabolic syndrome with IHD was raised in 43.5 % and was in range of $29.5 \pm 4.98 \text{ kg/m}^2$.

In our study, waist circumference of female patients with Metabolic syndrome with IHD was $>88 \text{ cm}$ in 62.9% and was in range of $96.28 \pm 10.32 \text{ cm}$.

In our study, most common risk factor of metabolic syndrome associated with IHD in women was Hypertension (80.6%) i.e. statistically significant $p < 0.05$ followed by Diabetes Mellitus 41.9%.

In our study, duration of Diabetes mellitus was 10 ± 6 years with metabolic syndrome in females with IHD. In our study, dyslipidemia was present in 88.7% females with metabolic syndrome with IHD having low HDL in 59.7% and raised TG in 53%.

In our study, lower levels of HDL were statistically significant in females of Metabolic syndrome with IHD. ($p < 0.001$) In our study, raised levels of TG were statistically significant in females of Metabolic syndrome with IHD. ($p < 0.05$)

In our study, smoking as a risk factor of IHD was absent in all females of Metabolic syndrome. In our study, majority of females of metabolic syndrome with IHD i.e. 71% presented with STEMI. ($p < 0.05$)

In our study, ECG finding of T wave changes either primary or secondary were found in 100% female patients of Metabolic syndrome with IHD. In our study, Inferior Wall Myocardial Infarction was most common in female patients (50%) of Metabolic syndrome with IHD. In our study, Ejection fraction in 2D-ECHO was below 50% in 56.5% female patients of Metabolic syndrome with IHD.

In our study, females with higher BMI were statistically significant with IHD. ($p < 0.05$) In our study, females with higher waist circumference were statistically significant with IHD. ($p < 0.001$) In our study, females with higher

systolic and diastolic BP were statistically significant with IHD. ($p < 0.001$)

In our study, females with higher fasting BSL were statistically significant with IHD in Metabolic syndrome. ($p < 0.05$) In our study, mortality and morbidity was having direct correlation with number of components of Metabolic syndrome present in females with IHD.

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Clinical Profile of Mucormycosis: A Descriptive analyses

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Abstract

Background: Mucormycosis is a relatively rare opportunistic fungal infection. It is one of the devastating infections of immunocompromised host. Though several studies were done in India and elsewhere on Mucormycosis, it has not been extensively studied of late.

Objectives: The objective of the study is to study the clinical profile of Mucormycosis in the medical college at Moradabad, Uttar Pradesh.

Methods: Our series comprised of 14 cases seen over a period of 3 years. Detailed history, clinical examination, laboratory investigations were carried out in all the cases.

Results: The study group consisted of 10 males and 4 females aged 20 – 70 years (mean 50 years). Most of the patients in the study group had evident blackish nasal eschar and sinus disease. Cultures were positive for Mucorales in 08 cases. 11 patients were treated with amphotericin B in the doses ranging from 0.5 – 1.0 mg/kg up to a total of 2.6 grams, and duration of the treatment varied from 1 – 31 days.

Conclusions: Mucormycosis is a rare opportunistic fungal infection with rapidly progressive and fulminant course with often fatal outcome. A strong suspicion, prompt diagnosis with pathological confirmation and aggressive surgical treatment gives a better outcome.

Key words: Amphotericin, Fungal, Mucormycosis

INTRODUCTION

Mucormycosis is an uncommon opportunistic infection, which represents the third most common angio-invasive fungal infection after candidiasis and aspergillosis and is considered as one of the most important medical complications in immunocompromised patients^{1,2}. Even though it is extremely rare, it has been reported from all corners of the world^{1,3}. The majority of cases reported were either isolated communications or small, retrospective series⁴. Management of this devastating infection is still big challenge and is based on different strategies which

include a rapid diagnosis, reduction of risk factors and rapid and aggressive antifungal agents with or without surgical debridement⁵.

We report 14 cases of Mucormycosis retrospectively reviewing medical records of such patients and have made attempt to define clinical features, risk factors, diagnosis and treatment of such patients.

MATERIALS AND METHODS

Our series comprised of 14 cases seen over a period of 3 years. Data studied were patient age, gender, underlying disorders, clinical features, risk factors, diagnostic procedures and treatment including side effects and outcome. Microbiological studies were performed on tissue biopsies. Samples were examined microscopically in a 20% KOH mount and fungal culture was done in most cases. Histological studies included paraffin embedded H & E, PAS and methenamine silver stained slides.

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STATISTICAL METHODS

Descriptive analyses were used to study the parameters. Microsoft word and excel have been used to generate the graphs and tables.

RESULTS

The study group consisted of 10 males and 4 females aged 20 – 70 years (mean 50 years). Almost all patients except one had at least one recognised underlying disorder (Table 1), of whom 13 had diabetes mellitus. Four patients had more than one risk factor.

Presenting symptoms and signs are listed in Table 2. Most of the patients in the study group had evident blackish nasal eschar and sinus disease was demonstrated in most

of them (08), where neuroimaging was done (Table 3); this includes computed tomography scanning (07) and magnetic resonance imaging (01).

All patients underwent biopsies. Broad, non septate, branching hyphae were seen in all cases in KOH smears and in 14 histologic specimens showing tissue invasion. Cultures were positive for Mucorales in 08 cases, all of them showing rhizoids and collapsed columellae compatible with *Rhizopus* species. Mixed fungal infection was seen in one patient (Aspergillosis + candidal infection).

09 patients underwent surgical debridement procedures. 02 patients had an orbital exenteration. 08 patients were alive, 4 dead, 1 was referred to other centre and 1 was discharged against medical advice.

Table 1: Characteristics of mucormycosis patients

| Patient | Age (yrs) | Gender | Underlying disorder | Infecting organism | Medical treatment Ampho B (mg/day), cumulative dose (mg) | Duration of treatment (days) | Adv effects of Ampho B | Surgery (no of procedures) | Outcome |
|---------|-----------|--------|---------------------|--------------------|--|------------------------------|------------------------|----------------------------|----------|
| 1 | 64 | Male | DM, severe anemia | M | - | - | - | - | Alive |
| 2 | 55 | Female | DM | M | 50 (50) | 1 | NR | Db | Alive |
| 3 | 38 | Male | DM, Pul.Koch | R | 50 (600) | 12 | NR | Db | Dead |
| 4 | 45 | Male | DM | R | 50 (50) | 1 | None | - | Dead |
| 5 | 60 | Male | DM, Steroids | R | 50 (1675), lipos | 31 | ++++ | Db+E | Alive |
| 6 | 52 | Female | DM, CKD | R+A+ C | 50 (750) | 16 | ++ | Db | Dead |
| 7 | 20 | Male | DM | R | 25 (225) | 9 | + | Db | Alive |
| 8 | 65 | Male | DM | R | 50 (2600), lipo | 29 | ++++ | Db+E | Alive |
| 9 | 70 | Male | DM | R | 25 (300) | 12 | ++ | Db | Alive |
| 10 | 25 | Male | AML | M | - | - | - | - | Referred |
| 11 | 60 | Female | DM | M | 50 (1150) | 15 | ++ | Db | Dead |
| 12 | 35 | Female | - | R | - | - | - | - | DAMA |
| 13 | 50 | Male | DM | M | 25 (500) | 20 | ++ | Db | Alive |
| 14 | 63 | Male | DM | M | 50 (800) | 17 | NR | - | Alive |

DM- diabetes mellitus, CKD- chronic kidney disease, M-mucor racemosus, R-rhizopus, A-aspergillus, C-candida, NR-not recorded,+-mild, ++- moderate,++++-severe, Db- debridement, E-orbital exenteration, DAMA- discharge against medical advice.

Table 2: Clinical profile of patients

| Patient | Black nasal eschar | Malaise | Chemosis | Periorbital cellulitis | Nasal discharge | Proptosis | ophthalmoplegia | Decreased vision | Fever | headache | Altered sensorium | Palatal palsy |
|---------|--------------------|---------|----------|------------------------|-----------------|-----------|-----------------|------------------|-------|----------|-------------------|---------------|
| 1 | - | + | - | - | - | - | - | - | + | + | - | - |
| 2 | - | + | - | - | + | - | IC | + | + | + | - | - |
| 3 | + | - | + | + | - | + | - | - | + | - | - | - |
| 4 | - | - | - | + | + | - | IC | + | - | - | - | - |
| 5 | + | + | + | - | - | + | C | + | - | - | - | - |
| 6 | + | - | - | - | - | - | C | + | - | + | + | - |
| 7 | + | - | - | - | + | - | - | + | - | - | - | - |
| 8 | + | + | - | + | - | + | IC | + | + | + | - | - |
| 9 | + | - | - | - | - | - | - | - | + | - | - | - |
| 10 | - | + | - | - | - | - | - | - | + | - | - | - |
| 11 | + | + | - | + | + | + | IC | - | + | - | + | - |
| 12 | + | - | + | + | - | + | C | + | + | + | - | - |
| 13 | - | + | - | - | - | - | - | - | - | + | - | - |
| 14 | - | - | + | + | - | + | IC | - | - | - | - | - |

+-present, -absent, IC-incomplete, C-complete

Table 3: Neuroimaging findings

| Patient | Neuroimaging findings | Involved sites | Predisposing local conditions |
|---------|--|--|-------------------------------|
| 1 | - | - | - |
| 2 | - | - | - |
| 3 | CT (PNS): Abnormal soft tissue mucosal thickening/fluid involving maxillary, ethmoid, frontal and sphenoid sinuses. CT (brain): large ill-defined hypodense area involving left basifrontal, frontal, corpus callosum with mild mass effect over ventral horn of left lateral ventricle. | Left maxillary, ethmoid, frontal and sphenoid sinus | Chronic sinusitis |
| 4 | - | - | - |
| 5 | MRI: fluid collection in right sphenoid, ethmoid, maxillary sinus. Small intracranial, extraaxial extension in right medial temporal region with partial thrombosis of right cavernous sinus. | Right sphenoid, ethmoid, maxillary sinus | Chronic sinusitis |
| 6 | CT (PNS): soft tissue swelling in the nasal cavity. Inflammatory soft tissue tissue in bilateral maxillary, ethmoid and focal sphenoid sinus. | Bilateral maxillary, ethmoid and focal sphenoid sinus | Chronic sinusitis |
| 7 | CT (PNS): Abnormal soft tissue mucosal thickening/fluid involving right maxillary, ethmoid sinus with cellulitis. | Right maxillary, ethmoid sinus | Chronic sinusitis |
| 8 | CT (PNS): Inflammatory soft tissue tissue in bilateral maxillary, frontal, anterior ethmoid and sphenoid sinus with erosion of medial wall of left orbit. | Bilateral maxillary, frontal, anterior ethmoid and sphenoid sinus. | Chronic sinusitis |
| 9 | CT (PNS): abnormal soft tissue with hypodense contents involving right premaxillary, retromaxillary and inframaxillary regions | Right maxillary sinus. | Chronic sinusitis |
| 10 | - | - | - |
| 11 | CT (PNS): Abnormal soft tissue mucosal thickening/fluid involving right maxillary. | Right maxillary sinus. | Chronic sinusitis |
| 12 | CT (PNS): Inflammatory soft tissue tissue in bilateral maxillary, frontal, anterior ethmoid and sphenoid sinus with erosion of medial wall of left orbit. | Bilateral maxillary, frontal, anterior ethmoid and sphenoid sinus. | Chronic sinusitis |
| 13 | - | - | - |
| 14 | - | - | - |

11 patients were treated with amphotericin B in the doses ranging from 0.5 – 1.0 mg/kg up to a total of 2.6 grams, and duration of the treatment varied from 1 – 31 days. Incidence and severity of adverse effects of treatment are recorded in Table 1. Reaction varied from mild to severe and was intolerable in 2 cases. These patients were treated with liposomal form of the drug – Ambisome. 07 cases had hypokalemia and 02 cases had renal dysfunction.

DISCUSSION

Mucormycosis is a devastating infection of immunocompromised hosts. The different forms of mucormycosis are rhino-orbital-cerebral, pulmonary, disseminated, cutaneous, gastrointestinal and miscellaneous^{6, 7, 8}.

The mucoraceae are ubiquitous in nature^{6, 7, 8}. This fungi gain entry to the body through the respiratory tract. They have affinity for arteries and grow along the internal elastic lamina, causing thrombosis and infarction. Progression of the disease from the nose and sinuses is either direct or leads to the vascular occlusion of the orbital contents. Intracranial involvement occurs also from the invasion by the way of the superior orbital fissure, ophthalmic vessels and cribriform plate, through the carotid artery, or possibly via a perineural route.

Due to the rarity of this infection, it is difficult to calculate accurately its incidence. In 2011 Mignogna et.al⁵ reported in their study the annual incidence of mucormycosis in United States is approximately 500 cases per year.

The mean age of the patients was 50 years in our study. Talmi et.al⁴ in their study reported mean age of the patients was 50 years. Commonly, Mucormycosis has shown an equal sex distribution. But in our there is slightly male predominance with ratio of male: female is 2.5:1.

Uncontrolled diabetes mellitus was the most common underlying predisposing disease in our series. While Talmi et.al⁴ reported hematological malignancies as most common underlying disease.

Orbital and nasal findings are the most common presenting clinical features. Orbital involvement ranges from 58 to 100% of cases in our series. Similar findings were also observed by Talmi et.al⁴ in their study (66-100%). Orbital symptoms include loss of function of the 2nd, 3rd, and 6th cranial nerves with proptosis, ptosis, Chemosis, orbital pain, central retinal artery occlusion, conjunctival hyperaemia, dilated pupil and visual loss. Invasion of the eye globe is uncommon and was noted in only one of our cases.

Cultures were positive in 8 of 14 our cases, of which one case had mixed fungal infections. Talmi et.al reported similar findings in their study. *Rhizopus* was the most common infective agent in our study.

The treatment of Mucormycosis is mainly medical treatment with amphotericin B (amph B) and surgical debridement. 11 received the treatment, 8 were treated with conventional amph B and 3 were treated with liposomal amph B and it is not widely used because of its cost. Recognised side effects of amph B noted in our study are fever, chills, headache, nausea, vomiting, thrombophlebitis, hypokalemia and azotemia.

Survival in mucormycosis patients dependent on multiple factors and early initiation of treatment is an important element. More than 60% of the patients survived in our study.

Conclusion: Mucormycosis is a rare opportunistic fungal infection with rapidly progressive and fulminant course with often fatal outcome. A strong suspicion, prompt

diagnosis with pathological confirmation and aggressive surgical treatment gives a better outcome.

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Clinical Profile of Euvolemic Hyponatremia in Elderly Hospitalized Patients in a Tertiary Care Hospital in India

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Abstract

Introduction: Hyponatremia is common among hospitalized patients and can lead to serious neurological complications. Hyponatremia is especially common in older people owing to impaired ability to maintain water and electrolyte homeostasis in response to diet, drugs, and environmental changes. Even mild, chronic hyponatremia can lead to cognitive impairment, falls, and fractures, the latter being in part due to bone demineralization and reduced bone quality. Hyponatremia is therefore of special significance in frail older people.

Aim: The aim of the study is to study the etiology, clinical features of euvolemic hyponatremia in elderly hospitalized individuals and to assess the morbidity and mortality.

Materials and Methods: The study was conducted in Government Rajaji Hospital affiliated to Madurai Medical College during the period from April to September 2016. 50 patients aged ≥ 60 years admitted with serum sodium < 135 mEq/L were included in the study. Patients with hypovolemic and hypervolemic hyponatremia (congestive cardiac failure, chronic kidney disease, and chronic liver disease) were excluded from the study. Detailed history, clinical examination including meticulous neurological examination, and relevant laboratory investigations and imaging studies were done. Treatment was done with fluid restriction, saline infusion, and other measures as necessary.

Results: 58% were asymptomatic at presentation. The most common symptom was lethargy. Syndrome of inappropriate antidiuresis was the most common etiology. One patient died during the study period.

Conclusion: Hyponatremia is a potentially lethal disorder which is more harmful in the elderly hospitalized. Proper and meticulous management according to the clinical picture gives a better outcome.

Key words: Hyponatremia, Lethargy, Geriatrics

INTRODUCTION

Hyponatremia is defined as a plasma sodium concentration < 135 mEq/L.¹ Hyponatremia is found in 15-22% of hospitalized patients. Most cases of

hyponatremia arises out of water imbalance rather than sodium imbalance. Sodium is the principal determinant in maintaining extracellular fluid volume and in the regulation of blood pressure and osmotic equilibrium. The plasma sodium concentration is dependent on multiple factors including sodium intake, osmolality and tonicity of plasma, the renin angiotensin system, total body potassium, and water.²

Several physiological changes occur in the regulation of water and sodium balance as a part of the normal aging process, such as decreased glomerular filtration rate, decreased renal blood flow, impaired ability to dilute

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urine, and impaired water excretion. These changes result in an increased likelihood of developing hyponatremia with increasing age. The thirst mechanism decreases as age advances which significantly impairs the capacity to maintain homeostasis thereby intensifying the risk for dehydration. Maximal urinary concentrating capacity also diminishes with age. In the aged, there is a five-fold increase in atrial natriuretic peptide (ANP) concentration over the basal levels.³ Increased ANP leads to direct suppression of renin with a secondary decrease in angiotensin II and in aldosterone, resulting in renal loss of sodium associated with ageing.

The etiology of hyponatremia in older people is predominantly multifactorial. Common causes include drugs (thiazide and loop diuretics, antidepressants, anticonvulsants, non-steroidal anti-inflammatories, and proton pump inhibitors), comorbidities (congestive cardiac failure [CCF], renal failure, cirrhosis, and respiratory infections), fluid overload, and volume depletion.⁴

Symptoms are related largely to dysfunction of the central nervous system (CNS) and are more evident when the decrease in the serum sodium concentration is large or fast. However, patients also present with non-neurologic symptoms, such as fatigue, thirst, weakness, cramping, nausea, vomiting, bloating, swelling, and tightness of the hands and feet. Headache, muscle cramps, reversible ataxia, psychosis, lethargy, restlessness, disorientation, apathy, anorexia, and agitation are symptoms seen in patients with serum sodium levels below 125 mEq/L. Complications of severe and rapidly developing hyponatremia include seizures, coma, brainstem herniation, respiratory arrest, permanent brain damage, and death. These complications result primarily from hyponatremia-induced cerebral edema.⁵

Distinction between acute and chronic hyponatremia is clinically important because chronic hyponatremia is surprisingly well-tolerated, even at very low levels of serum sodium, and overly aggressive treatment may result in serious neurological sequelae. Aggressive initial correction is warranted in patients with acute symptomatic hyponatremia, which can potentially cause irreversible neurological damage and death.

Euvolemic hyponatremia is the most common form of asymptomatic hyponatremia. If the underlying cause is syndrome of inappropriate antidiuretic hormone (SIADH) and its etiology is unknown or cannot be effectively treated, therapy should be instituted for the hyponatremia itself. A recent alternative to saline administration in the management of hyponatremia is the use of ADH receptor

antagonists. The most specific treatment for SIADH is to block the V2 receptors in the kidney that mediate the diuretic effect of antidiuretic hormone (ADH). Vasopressin antagonists are currently indicated for the treatment of euvolemic and hypervolemic hyponatremia, and these agents are usually preferred if SIADH or ADH is the cause. Central pontine myelinolysis has traditionally been associated with rapid correction of hyponatremia, but the etiology has not been clearly established.

Aim

The aim of the study is to study the etiology, clinical features, and to assess the morbidity and mortality of euvolemic hyponatremia in elderly individuals hospitalized in Government Rajaji Hospital.

MATERIALS AND METHODS

The study was conducted in Department of General Medicine at Government Rajaji Hospital. Individuals aged ≥ 60 years with serum sodium < 135 mEq/L (Government of India defines "senior citizen" or "elderly" as a person who is of age 60 years or above) were included in the study. Patients with hypovolemic and hypervolemic hyponatremia (CCF, chronic kidney disease [CKD], and chronic liver disease [CLD]) were excluded from the study. Detailed history was taken. This included symptoms of hyponatremia, predisposing factors, and pre-existing illness if present. Symptomatology included the presence of altered sensorium, postural dizziness, lethargy, and seizures. Sensorium changes included acute confusional states, memory disturbances, stupor, delirium, and coma. Detailed clinical examination was done in every patient. Hydration status of the patient was determined by clinical examination. Accordingly patients were divided into hypervolemic, hypovolemic, and euvolemic. SIADH and cerebral salt wasting were differentiated on the basis of volume status of the patient, urine osmolality after volume expansion, treatment, and response to treatment. At the time of diagnosis of hyponatremia, detailed CNS examination was done to document mental status of the patient and other focal neurological deficit. CNS examination was repeated after the correction of hyponatremia and the presence of symptoms such as dizziness, lethargy, altered sensorium, and seizures were attributed to hyponatremia unless there was a coexisting medical condition or medication effect to account for these symptoms. Complete blood count, serum sodium, osmolality, blood urea nitrogen, glucose; urine osmolality, specific gravity, sodium, microscopic examination; serum proteins, lipid profile, thyroid function tests, brain imaging, and cerebrospinal fluid analysis were done. Treatment included fluid restriction, normal saline, hypertonic saline, loop diuretics, etc.

For all patients clinical and demographic details, final diagnosis, investigations, and management were recorded onto a standard data collection sheet as per the study pro forma and later transferred to Microsoft excel spreadsheet for analysis. Analysis was done using SPSS for windows (version 20.0). Statistical method used was descriptive and analytical statistics. Data are presented as frequency distribution and simple percentages. Analysis was done using probability tests.

RESULTS

The maximum number of patients were in the age group 60-70 years, i.e., 39 cases (78%), 14% were in 71-80 group and 8% were in >80 group. In the study, out of 50, 60% were males and 40% were females.

The majority of the cases were asymptomatic at time of presentation, 58%. Out the symptomatic cases, 42%, 100% had lethargy, 76% had abnormal behavior, 14% had postural dizziness and 9% (2 cases) had seizures. None of the patients were in coma (Table 1).

Out of 50 cases majority 62% were having severe hyponatremia, 16% were having moderate hyponatremia and 22% were having mild hyponatremia (Table 2).

Out of 29 asymptomatic patients 11 were having mild hyponatremia, 10 were having severe hyponatremia and 8 were having moderate hyponatremia. All the symptomatic patients were having severe hyponatremia. All the mild hyponatremic patients (11) had Glasgow coma scale (GCS) ≥ 13 . Out of 8 moderate hyponatremic patients, 7 had GCS ≥ 13 and 1 had GCS 8-12. Out of 31 severe hyponatremic patients, 17 had GCS ≥ 13 and 14 had GCS 8-12. None of the patients had GCS < 8 .

CNS infections and endocrine causes constitute the major predisposing factors, followed by malignancy and pulmonary diseases.

Out of 50 cases, the most common etiology was SIADH. About 36% had SIADH. 26% had hypothyroidism. 18% were having drug induced hyponatremia. 6% with exercise induced, and other causes like reset osmostat. The days for normalizing sodium were noted during the study. For 17 cases, 1-3 days were needed, 22 cases needed 4-7 days. 2 cases had not recovered (Table 3).

There is significant association between serum sodium values and symptoms (Table 4).

There is significant association between serum sodium values and outcome (Table 5).

Table 1: Symptomatology

| Symptoms | Number (%) |
|--------------------|------------|
| Asymptomatic | 29 (58) |
| Lethargy | 21 (42) |
| Postural dizziness | 3 (6) |
| Abnormal behavior | 16 (32) |
| Seizures | 2 (4) |
| Coma | 0 (0) |

Table 2: Severity of hyponatremia

| Sodium levels (mmol/L) | Number of patients (%) |
|------------------------|------------------------|
| 130-135 (mild) | 11 (22) |
| 125-129 (moderate) | 8 (16) |
| <125 (severe) | 31 (62) |
| Total | 50 (100) |

Table 3: Etiology of euvolemic hyponatremia

| Etiology | Number (%) |
|-----------------------|------------|
| Hypothyroidism | 13 (26) |
| Adrenal insufficiency | 2 (4) |
| Drugs | 9 (18) |
| Exercise-induced | 3 (6) |
| SIADH | 18 (36) |
| Primary polydipsia | 2 (4) |
| Others | 3 (6) |

SIADH: Syndrome of inappropriate antidiuretic hormone

Table 4: Relation between serum sodium level and symptoms

| Symptoms | Sodium level | SD |
|-------------------|-------------------|-------|
| Asymptomatic | 123.55 | 8.971 |
| Dizziness | 112 | 9.849 |
| Seizure | 118 | 8.485 |
| Lethargy | 115 | 7.475 |
| Abnormal behavior | 114.75 | 7.688 |
| P | 0.002 significant | |

SD: Standard deviation

DISCUSSION

This study was undertaken keeping in view of frequent occurrence of hyponatremia in the elderly sick patients who are at higher risk of development of electrolyte disturbance as these people have age-related physiological changes in the function of kidneys and other multiple comorbid conditions.

In the present study, 50 elderly patients (≥ 60 years) were included in the study. Out of 50, 60% (30) were males and 40% (20) were females. In study done by Rao *et al.*,⁴ 55 were females and 45 were male. In study by Agarwal *et al.*,⁶ 64.3% were males and 53.7% were females.

The majority of the cases were asymptomatic at time of presentation, 58%. Out the symptomatic cases, 42%,

Table 5: Relation between outcome and serum sodium levels

| Outcome | Sodium level | SD |
|----------------------------|-------------------|-------|
| Complete recovery (38) | 121.64 | 9.506 |
| Residual defects (3) | 117.5 | 5.766 |
| Expired (1) | 115 | 1 |
| Nil (8) | 113.64 | 7.272 |
| <i>P</i> (38/50 vs. 12/50) | 0.023 significant | |

SD: Standard deviation

100% had lethargy, 76% had abnormal behavior, 14% had postural dizziness and 9% (2 cases) had seizures. In study Rao *et al.*,⁴ lethargy, drowsiness with slow response, and irrelevant talk were the common presenting symptoms. 4% had seizures. In study by Agarwal *et al.*,⁶ confusion was present in 30% and altered sensorium in 17.1%. 2% had seizures. 14% were asymptomatic.

In the present study, out of 29 asymptomatic patients, 11 were having mild hyponatremia, 10 were having severe hyponatremia, and 8 were having moderate hyponatremia. All the symptomatic patients were having severe hyponatremia. When the GCS score was compared, all the mild hyponatremic patients (11) had GCS ≥ 13 . Out of 8 moderate hyponatremic patients, 7 had GCS ≥ 13 , 1 had GCS 8-12. Out of 31 severe hyponatremic patients, 17 had GCS ≥ 13 , 14 had GCS 8-12. None of the patients had GCS < 8 . However, in studies carried out elsewhere, patients with mild hyponatremia tended to be asymptomatic, while those with moderate hyponatremia tended to have anorexia, nausea, and headache; those with severe hyponatremia had confusion, coma, seizures, or death.^{7,8}

In the present study, out of 50 patients, most common predisposing factor was endocrine causes followed by CNS lesions followed by malignancy and pulmonary diseases. In the present study, out of the cases most common etiology was SIADH, about 36% had SIADH. 26% had hypothyroidism. 18% having drug induced hyponatremia, 6% with exercise-induced and other causes. In the study by Rao *et al.*,⁴ common causes were SIADH (30%) followed by drugs (24%). In study by Vurghese,⁹ the most common etiology was SIADH (34.8%), CKD (19.69%), CCF (18.18%), 6% of diabetes mellitus, hypertension, cirrhosis, and 3% acute gastroenteritis. In the study by Agarwal *et al.*,⁶ decreased intake (82.9%) was the most common etiology, increased loss (65.7%) was also present as second most common cause.

The days for normalizing sodium were noted during the present study. For 17 cases, 1-3 days were needed, 22 cases needed 4-7 days. 2 cases had not recovered.

CONCLUSION

Hyponatremia is a common electrolyte abnormality found in hospitalized patients. It is more common in elderly patients. Lethargy was the most common symptom. Other common symptoms were abnormal behavior and postural dizziness. All the symptomatic cases had severe hyponatremia. There is significant association between serum sodium levels and symptoms and with outcome of the patients. Most common etiology was SIADH. Other major causes were hypothyroidism, drugs, and exercise. Hyponatremia was found to be related to multiple etiological factors in a large number of patients. A systematic approach to the diagnosis of hyponatremia with the application of simple diagnostic algorithms, using history, clinical examination, and laboratory findings to establish mechanism of hyponatremia can significantly improve the management and outcome of hyponatremia.

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A Study on Clinical Presentation and Morphological Types of Carcinoma in Stomach

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Abstract

Introduction: Gastric cancer mortality rates have remained relatively unchanged over the past 30 years, and gastric cancer continues to be one of the leading causes of cancer-related death. Well-conducted studies have stimulated changes to surgical decision-making and technique.

Aim: The aim of the study was to study various modes of clinical presentation and morphological types of carcinoma in stomach.

Materials and Methods: Observational cross-sectional study in patients with carcinoma stomach. Clinical examination and other relevant investigation were done.

Results: In our study, dyspepsia is the most common clinical presentation (36%) followed by loss of weight 18% and pain abdomen 14%. Antrum forms the most common site of carcinoma stomach (68%), protruding type most common (52%) out of three types of lesions, protruding has a better prognosis than the other two types. Infiltrative type carries the worst prognosis.

Conclusion: The peak incidence of carcinoma stomach in our study is in fourth decade. Epigastric pain, dyspepsia, anorexia, and weight loss are the most common clinical symptoms of carcinoma stomach. It predominantly involves the antrum, usually as polypoid/fungating or ulcerated lesion and the majority of gastric carcinomas.

Key words: Diffuse type, Gastric carcinoma, Intestinal location, Intestinal type, Morphology

INTRODUCTION

Gastric cancer is the second most common cancer worldwide, with a frequency that varies greatly across different geographic locations. It is a relatively infrequent neoplasm in North America, yet contributes substantially to the burden of cancer deaths.^{1,2} The symptoms and sign of the stomach cancer are often reported late when the disease is already in advanced stages and 5 years survival is <30% in developed countries and around 20% in developing

countries.³ In India, the number of new stomach cancer cases in 2001, was estimated to be approximately 35,675 ($n = 23,785$ in men; 11,890 in women).⁴ Surgery is the mainstay for the treatment of gastric cancer. Subtotal gastrectomy is the preferred modality in distal cancers and total or proximal gastrectomy is preferred in proximal cancers.⁵ A combination of chemotherapy and radiotherapy has been very effective in certain malignancies such as head and neck cancers and anorectal cancers. The chemotherapy potentiates the effect of radiation therapy and helps in controlling distant metastasis. Pre-operative chemoradiotherapy looks attractive as it has the potential to downsize tumors and make unresectable gastric cancer resectable.

Aim

The aim of the study was to study various modes of clinical presentation and morphological types of carcinoma in stomach.

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MATERIALS AND METHODS

Observational cross-sectional study was conducted in the Department of General Surgery, Government Rajaji Hospital, Madurai. Histopathologically proven cases of carcinoma stomach were screened. Institutional Ethics Committee approval and informed consent from the patients were obtained. Thorough evaluation of these patients was done clinically, endoscopically, and radiologically and other relevant investigations were done to arrive at a confirmatory diagnosis. Most of these patients were treated surgically with varied results. The incidence of carcinoma stomach in relation to age, sex, and site was studied. The various available investigations, the treatment modalities, and their outcome were analyzed. All patients were followed-up in the immediate post-operative period and some were followed-up thereafter, for a period ranging from 1 month to 2 years.

RESULTS

The youngest patient in our study was a 35-year-old woman with an undifferentiated carcinoma of antrum of stomach and the oldest was on 81-year-old man with carcinoma of antrum. In our series, gastric cancer was found to be common in the fourth decade of life 38% (Table 1).

In our series of 50 cases, antrum forms the most common site of carcinoma stomach (68%). Next common site was body of stomach (20%). Least common site is fundus about 6% (Table 2).

In our study, protruding type most common (52%) out of three types of lesions, protruding has a better prognosis than the other two types. Infiltrative type carries the worst prognosis. Most of our cases with infiltrative type lesions were inoperable. Infiltrative type is least common in our series about 22%. In our series of 50 cases, all cases were reported as adenocarcinoma. Adenocarcinoma of stomach has been histologically subclassified as papillary, tubular, mucinous, and signet-ring type. Four of our cases with diffusely infiltrative lesions were reported as signet-ring type (Table 3).

In our study, dyspepsia is the most common clinical presentation (36%) followed by loss of weight 18% and pain abdomen 14% (Table 4).

DISCUSSION

The peak incidence of carcinoma stomach in our study is in fourth decade. According to the western study reports,

Table 1: Age distribution of study patients

| Age group | Male | Female | Total (%) |
|-----------|------|--------|-----------|
| 31-40 | 0 | 1 | 1 (2) |
| 41-50 | 7 | 12 | 19 (38) |
| 51-60 | 4 | 9 | 13 (26) |
| 61-70 | 5 | 8 | 13 (26) |
| 71-80 | 1 | 2 | 3 (6) |
| 81-90 | 1 | 0 | 1 (2) |
| Total | 18 | 32 | 50 (100) |

Table 2: Incidence of location of carcinoma stomach

| Site | Male | Female | Total (%) |
|-------------------|------|--------|-----------|
| Antrum | 15 | 19 | 34 (68) |
| Body | 1 | 9 | 10 (20) |
| Fundus and cardia | 2 | 4 | 6 (12) |
| Total | 18 | 32 | 50 (100) |

Table 3: Distribution of morphology

| Macroscopic types | Antrum | Body | Fundus | Total (%) |
|-------------------|--------|------|--------|-----------|
| Protruding | 16 | 6 | 4 | 26 (52) |
| Ulcerative | 10 | 2 | 1 | 13 (26) |
| Infiltrating | 8 | 2 | 1 | 11 (22) |
| Total | 34 | 10 | 6 | 50 (100) |

Table 4: The clinical presentation of carcinoma stomach

| Clinical presentation | Antrum | Body | Fundus | Total (%) |
|-----------------------|--------|------|--------|-----------|
| Dyspepsia | 15 | 2 | 1 | 18 (36) |
| Pain | 5 | 1 | 1 | 7 (14) |
| Anorexia | 3 | 1 | 1 | 5 (10) |
| Vomiting | 1 | 1 | 1 | 3 (6) |
| Hematemesis | 1 | 1 | 1 | 3 (6) |
| Melena | 1 | 1 | 1 | 3 (6) |
| Dysphagia | 1 | 1 | 1 | 3 (6) |
| Loss of weight | 7 | 2 | 0 | 9 (18) |
| Total | 34 | 10 | 6 | 50 (100) |

the peak incidence of gastric cancer is in seventh decade. The disease is rare before 30 years. The clinical and pathological characteristics of gastric cancer diagnosed in young patients have been described in various recently published reports.⁶ In a population that included patients who were over and under the age of 30 years, Bedikian *et al.* reported that both groups presented with similar symptoms, predominantly undifferentiated neoplasms, and poor prognosis.⁷ Occurrence of carcinoma stomach is more in men than in women. In our series, out of 50 cases, the male to female ratio is 1:1.8, 18 (36%) being male and 32 (64%) females. The usual high incidence in males is probably due to increased association with smoking and alcohol consumption when compared to females. However, our studies male is lower than female sex incidence.⁸

Similar to that reported in Caucasians, epigastric pain, dyspepsia, anorexia, and weight loss are the most common clinical symptoms of carcinoma stomach in our region. A palpable mass was present in 66% of the patients indicating an advanced disease, and hence, curative surgery was not possible in them. Antrum forms the most common site of carcinoma stomach (68%). Next common site was body of stomach (20%). Least common site is fundus about 6% which is similar to that in Japan, where distal lesions are the most common.⁹

The most common macroscopic type of carcinoma stomach in our region is protruding type next to which is the ulcerative type. There are no pathognomonic symptoms of early cancer, and so called classical clinical manifestations are usually those of an advanced tumor.¹⁰

CONCLUSION

The peak incidence of carcinoma stomach in our study is in fourth decade. Epigastric pain, dyspepsia, anorexia, and weight loss are the most common clinical symptoms of carcinoma stomach. It predominantly involves the antrum, usually as polypoid/fungating or ulcerated lesion and the majority of gastric carcinomas.

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Surgical Management of Galeazzi Fractures - A Clinical Study of 42 Patients

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Abstract

Introduction: Fracture of the lower end of radius and Galeazzi fractures are common in orthopedic practice all over the world. The distal radioulnar joint disruption usually is simple in nature, which gets reduced spontaneously after radius fixation. Sometimes, this can be complex which can be irreducible because of the entrapped bone or tendon - most often extensor carpi ulnaris tendon. There are different methods of approaches and modes of internal fixation described in the literature. The present study is to analyze the results post-operatively following internal fixation with plate and screws.

Materials and Methods: A total of 42 patients with distal radial fracture and Galeazzi fractures were randomly selected and subjected to internal fixation with dynamic plate and screws. Post-operatively, the results were analyzed using Mayo wrist score and piano tests.

Results: There were 28 (64.28%) male patients and 15 (35.71%) female patients. Age of the patients ranged between 22 years and 60 years with a mean age of 43.7 years. Grip strength was excellent in the majority of the patients with stable distal radioulnar joint. Statistical analysis shows a significant correlation between grip strength and distal radioulnar joint stability ($P < 0.05$). There was a significant correlation between deficits in the range of pronation/supination with age groups in the present study. Four patients in the age group of above 50 years had pronation supination difference of 30-50.

Conclusion: The treatment of the Galeazzi fractures is anatomic restoration of length of the radius with application of rigid internal fixation to maintain the reduction.

Key words: Functional outcome, Galeazzi fracture, Internal Fixation, Radioulnar joint, Piano test

INTRODUCTION

Fractures of the distal end of the radius are one of the most common skeletal injuries treated by the orthopedic surgeons, the world over. By definition, Galeazzi fracture involves fracture of the shaft of radius anywhere between radial tuberosity and a point 2-4 cm proximal to the wrist, associated with subluxation or dislocation of the lower end of the ulna. It was first reported in 1822 by Sir Astley Cooper, and nearly, 110 years later by Riccardo Galeazzi of Milan.^{1,2} Most often, the fractures occur at the junction of middle 1/3 and distal 1/3 between the insertion of pronator teres and pronator quadratus.³ Whether the mechanism of injury is direct or indirect, the radial fracture occurs

first followed by disruption of distal radioulnar joint. The distal radioulnar joint disruption usually is simple in nature, which gets reduced spontaneously after radius fixation.⁴ Sometimes, this can be complex which can be irreducible because of the entrapped bone or tendon - most often, extensor carpi ulnaris tendon. In 1941, it was termed by Campbell as the fracture "the fracture of necessity"⁵ necessitating surgical treatment since non-surgical treatment in adults results in persistent or recurrent dislocations of the distal ulna. In 1957, Houghston³ outlined the definitive management of these fractures. Early treatment of choice is open anatomical reduction with rigid secure internal fixations. Resection of the distal portion of the ulna and bone grafting should be seriously considered in fractures brought after 3-4 weeks. Restoration of good function in fractures treated late appears to be most successfully accomplished by means of intramedullary fixation combined with bone grafting of the radius and resection of distal portion of ulna. In 1975, Mikic⁴ in his study involving 125 patients, he concluded that conservative management is successful only in children. In adults, this method

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resulted in failure in 80% of cases. The fracture fragments of radius and the dislocation of the distal radioulnar joint in this complex injury are very unstable. He advised open reduction and internal fixation of radius and temporarily fixes the distal radioulnar joint with 1 or 2 Kirschner wires. In 1982, Reckling⁵ in his study involving 47 Galeazzi lesions concluded that neither of the procedure described before immediate resection of distal part of the ulna and temporary fixation of distal radioulnar joint with Kirschner wires was necessary. Uniformly, good results have been obtained by open anatomical reduction, internal fixation of the radial fixation, and immobilization of forearm in full supination. In 1985, Moore *et al.*⁶ observed that compression plating was a satisfactory method of management. In 1988, Mohan *et al.*,⁷ in his study of 50 patients, observed that early open reduction and internal fixation reestablish the normal relationship of the fractured fragments and the distal radioulnar joint without repair. In 1993, Strehle and Gerber⁸ in their study concluded that open revision, repair of triangular of bio-cartilage complex, and immobilization of the wrist are not necessary if anatomic reduction of the joint is obtained by indirect means of open reduction and internal fixation of the radius. In 1994, Beneyto *et al.*,⁹ in their study, concluded that anatomical reduction and internal fixation of the fracture are better than conservative management. Immobilization in a fully supinated position is recommended to reduce the dislocation of distal radioulnar joint. Additional temporary fixation of distal radioulnar joint is also necessary in case of severe derangement of the joint. In 2001, Rettig and Reskin¹⁰ introduced a new treatment-oriented classification and concluded that a high index of suspicion, early recognition, and acute treatment of distal radioulnar joint instability will avoid chronic problem in this complex injury. In 2005, Ring *et al.*¹¹ concluded that isolated radial shaft fractures are more common than Galeazzi fractures. The present study was conducted to review the post-operative functional results using different methods of surgical approaches and techniques in our hospital.

Aim of the Study

This is aimed to study the distal radial fractures in terms of its type, mechanism of injury, results of surgical treatment, and its complications, to analyze the efficacy of surgical techniques in achieving reduction and restoring the congruency of joint and stability of distal radioulnar joint, and to assess the functional outcome of distal radioulnar joint in Galeazzi fractures treated by surgical method.

Study Period

The study period is from July 2011 to June 2013.

Institute of Study

KMCT Medical College Hospital, Mukkom, Manassery, Calicut, Kerala, India, was selected for the study.

MATERIALS AND METHODS

The present study is a hospital-based prospective study evaluating the results of surgical management of Galeazzi fracture dislocation in a series of 42 cases. Patients attending the Department of Orthopedic and Trauma Unit of the KMCT Hospital were included in the study. Ethical committee clearance was obtained, and a consent form approved by the ethical committee was used during the study.

Inclusion Criteria

1. Patients with fracture shaft of radius with an associated dislocation of distal radioulnar joint were included.
2. Patients with fracture of shaft between bicipital tuberosity proximally and an area 4-5 cm from the distal articulating surface of radius distally were included.
3. Patients with the Galeazzi fracture-dislocation above the age of 15 years were included.
4. Patients with Galeazzi fracture-dislocation associated with neurovascular injury were included.
5. Patients with compound fracture type 1 (Gustillo Anderson classification) were included in the study.

Exclusion Criteria

Patients with following criteria were excluded from the study:

1. Galeazzi fracture-dislocation <15 years.
2. Fracture of distal end of radius (e.g., Colle's fracture).
3. Fracture of radial head and neck.
4. Associated with fracture of ulna.
5. Associated with posterior dislocation of the elbow.
6. Old malunited fracture of radius.
7. Pathological fracture.
8. Compound fracture Type 2 and 3 (Gustilo-Anderson classification).

Management

All patients on presentation to the emergency department were initially immobilized in above elbow Plaster of Paris slab. After the general condition of the patient was stabilized, detailed history was taken to determine the mechanism of trauma, and clinical evaluation was done to determine the status of soft tissue envelope, fracture pattern, and associated fractures and neurovascular competence. Plain radiographs were taken in anteroposterior and lateral views. Pre-operative surgical profile was done before taking up for surgical correction.

Surgical Procedures

All the surgeries were performed under general anesthesia (28) or brachial block (14). Tourniquet was used in all cases. Surgical approaches used were volar (37 cases) and dorsal (5 cases). The fracture is reduced with the help of reduction forceps and traction. A 3.5 mm narrow dynamic compression plate (NDCP) was used in all patients to immobilize the fracture. The surgical steps and criteria used were:

- Fracture and distal radioulnar joint was evaluated for reduction.
- No K-wire was used to fix the distal radioulnar joint.
- Distal radioulnar joint exploration was not done in any case.
- No primary bone graft was used.
- Tourniquet released, hemostasis attained before closure.
- Wound closed in layers.
- Above elbow, slab is applied to all cases with the forearm in supination.
- Upper extremity was elevated for 1-day post-operative.
- Check X-ray was done for every case to assess the reduction of fracture and distal radioulnar joint.
- Neurological and vascular status was aroused.
- IV antibiotics were given for all patients for 7 days.
- Sutures were removed by 10th day.
- Splint was replaced with above elbow cast in supination.

Follow-up

Patients were followed up at an interval of 6 weeks for 6 months. At 4-6 weeks, the cast is removed. Radiograph obtained, and physiotherapy was initiated for the elbow and wrist motion. The “Piano Keys” test and the supination lift test are used to assess the distal radioulnar joint stability apart from radiological diastases.

Mayo Wrist Score

The Mayo wrist score was used to evaluate the wrist function on the basis of pain, satisfaction, range of motion, and grip strength. Grip strength of the injured and contralateral hands was measured using a hand dynamometer. The wrist score is reported as the percentage of that obtained in the normal site.

Mayo Wrist Scoring System

| Category | Score | Findings |
|-----------------------------|-------|---|
| Pain (25 points) | 25 | No pain |
| | 20 | Mild pain with vigorous activities |
| | 20 | Pain only with weather changes |
| | 15 | Moderate pain with vigorous activities |
| | 10 | Mild pain with activities of daily living |
| Satisfaction (25 points) | 5 | Moderate pain with activities of daily living |
| | 0 | Pain at rest |
| | 25 | Very satisfied |
| | 20 | Moderately satisfied |
| | 10 | Not satisfied, but working |
| Range of motion (25 points) | 0 | Not satisfied, unable to work |
| | 25 | 100% of normal |
| | 15 | 75-99% of normal |
| | 10 | 50-74% of normal |
| | 5 | 25-49% of normal |
| Grip strength (25 points) | 0 | 0-24% of normal |
| | 25 | 100% of normal |

| | | |
|-----------------------------|--------|------------------|
| | 15 | 75-99% of normal |
| | 10 | 50-74% of normal |
| | 5 | 25-49% of normal |
| | 0 | 0-24% of normal |
| Final result (total points) | 90-100 | Excellent |
| | 80-89 | Good |
| | 65-79 | Fair |
| | < 65 | Poor |

The results are classified as excellent, fair, and poor. An excellent result is one in which there is: (a) Union, (b) perfect alignment, (c) no loss of length, (d) no subluxation of the distal radioulnar joint, (e) no limitation of supination or pronation, and (f) no limitation of wrist flexion-extension. A fair result is one in which there is: (a) Delayed union, (b) minimal malalignment (5-10°), (c) minimal SHORTENING (0-4 mm), (d) subluxation/unstable, (e) limitation of pronation supination <45°, (e) excessive scar, and (f) loss of grip strength - 30-50%. A poor result is one in which there is: (a) Non-union, (b) angulation >10° (c), loss of length > 5 mm, (d) dislocation of distal radioulnar joint, (e) limitation of pronation and supination >45°, (f) wrist flexion-extension limitation >45°, (g) pain, and (h) grip strength loss >15%.

Criteria for Classification of Results

| Criteria | Excellent | Fair (one or more) | Poor (one or more) |
|-----------------------------|--------------|----------------------------|-------------------------|
| Union | Solid | Delayed union | Nonunion |
| Alignment | Perfect 0-5° | Minimal malalignment 5-10° | >10° angle |
| Loss of length | Nil | Minimal shortening 0-4 mm | Marked shortening ≥5 mm |
| Distal radioulnar joint | Stable | Subluxation/Unstable | Dislocation |
| Supination and pronation | Full | Limitation <45° | Limitation >45° |
| Wrist flexion and extension | Full | Limitation <45° | Limitation >45° |
| Pain | Nil | Excessive scar | Pain |
| Grip strength | <30% | 30-50% | >50% |

All the data were analyzed using standard statistical methods. The following statistical methods were applied in the study.

1. Crosstabs procedures (contingency coefficient test).
2. Chi-square test.
3. Descriptive statistics.
4. One-way ANOVA.
5. Independent sample *t*-test.

OBSERVATIONS AND RESULTS

A total of 42 patients were included in the present study among the patients attending the department of orthopedics of KMCT Medical College Hospital between

July 2011 and June 2013. There were 28 (64.28%) male patients and 15 (35.71%) female patients. Age of the patients ranged between 22 years and 60 years with a mean age of 43.7 years. The distribution of number of patients according to their age groups is depicted in Table 1.

Fall on outstretched hand was observed in 21 (50%), direct hit in 11 (26.19%), and road traffic accident (RTA) in 10 patients (23.80%) (Table 2).

Out of 32 right-sided injuries observed, 24 were dominant side, and 8 were non-dominant. In 10 cases of left-sided injury, 6 were non-dominant, and 5 were dominant. Only 1 patient had associated injury fracture both bones of leg due to RTA (Table 3).

The duration between trauma and undertaking surgery varied from 1 to 9 days with a mean duration of 4.35 ± 1.10 days (Table 4).

Table 1: Age and sex incidence (n=42)

| Age group (years) | Sex | | Total n (%) |
|-------------------|------|--------|----------------|
| | Male | Female | |
| 20-30 | 7 | 3 | 10 (23.80) |
| 31-40 | 5 | 1 | 6 (14.28) |
| 41-50 | 8 | 6 | 14 (33.33) |
| 51-60 | 5 | 4 | 9 (21.42) |
| >60 | 2 | 1 | 3 (7.14) |
| Total | 27 | 15 | 42 (100) |

Table 2: Mechanism of injury observed (n=42)

| ??? | No. of cases (%) |
|---------------------------|------------------|
| Fall on outstretched hand | 21 (50) |
| Direct hit | 11 (26.19) |
| RTA | 10 (23.80) |
| Total | 42 (100) |

RTA: Road traffic accident

Table 3: Injured side/handedness (n=42)

| Side | Dominant side | Non-dominant side | Total |
|----------|---------------|-------------------|-------|
| Right-32 | 24 | 08 | 32 |
| Left-10 | 06 | 04 | 10 |

Table 4: Period between injury and surgery

| Period (days) | No. of cases (%) |
|---------------|------------------|
| <2 | 3 (15) |
| 3-4 | 8 (40) |
| 5-6 | 5 (25) |
| 7-8 | 2 (10) |
| 8-9 | 2 (10) |
| Total | 20 (100) |

Most of the patients presented with transverse fractures 24 (57.14%), 11 were oblique (26.18%) and 7 were with comminuted fractures (16.66%) (Table 5).

A total of 36 patients underwent fixation through volar approach (anterior Henry's), (85.71%); remaining 6 patients (14.28%) through dorsal Thomson's approach was used (Table 6).

Seven-holed plates were used in 20 patients (47.61%), 8 holed plates were used in 10 patients (23.80%), and (28.57%) 6 holed plates were used in 12 patients (Table 7).

The duration of immobilization is shown in Table 8.

Complications observed in the present study were superficial post-operative infection in 1 patient, tourniquet palsy in 1 patient, and distal radioulnar joint subluxation in 3 patients. Fracture union took place in 4-6 months. All cases healed clinically and radiologically by 1 year. Four cases union was delayed beyond 9 months (Table 9).

There was a significant correlation between deficits in range of pronation/supination with age groups in the present

Table 5: Type of fracture (n=42)

| Type of fracture | No. of cases (%) |
|------------------|------------------|
| Comminuted | 7 (16.66) |
| Oblique | 11 (26.19) |
| Transverse | 24 (57.14) |
| Total | 20 (100) |

Table 6: Surgical approaches used (n=42)

| Side of the fracture | No. of cases (%) |
|----------------------|------------------|
| Volar | 36 (85.71) |
| Dorsal | 6 (14.28) |
| Total | 42 (100) |

Table 7: Plate length of narrow DCP (n=42)

| No. of holes | No. of cases (%) |
|--------------|------------------|
| 6 | 12 (28.57) |
| 7 | 20 (47.61) |
| 8 | 10 (23.80) |
| Total | 20 (100) |

DCP: Dynamic compression plate

Table 8: Length of immobilization (n=42)

| Length of immobilization | No. of cases (%) |
|--------------------------|------------------|
| 4 weeks | 22 (52.38) |
| 6 weeks | 14 (33.33) |
| 8 weeks | 6 (14.28) |
| Total | 42 (100) |

study. Four patients in the age group of above 50 years had pronation supination difference of 30-50°. It was statistically significant ($P < 0.05$) (Table 10). Patients over the age of 50 years are found to have the limitation of wrist flexion-extension range of motion. Four patients in this group had a deficit of 30-50° in the present study. It is statistically significant ($P < 0.05$) (Table 10).

Patients over the age of 50 years are found to have the limitation of wrist flexion-extension range of motion. Four patients in this group had a deficit of 30-50° in the present study. It is statistically significant ($P < 0.05$) (Table 11).

Four of 42 cases had pain with wrist movements. In this group, 2 had stable distal radioulnar joint and 2 had subluxated distal radioulnar joint (Table 12).

Grip strength was excellent in majority of the patients with stable distal radioulnar joint. Statistical analysis shows significant correlation between grip strength and distal radioulnar joint stability ($P < 0.05$) (Table 13).

The mayo risk score is shown in Table 14.

Table 9: Fracture union in months (n=42)

| Duration (months) | No. of cases (%) |
|-------------------|------------------|
| 4-6 | 13 (65) |
| 7-8 | 3 (15) |
| 9-10 | 2 (10) |
| >10 | 2 (10) |
| Total | 20 (100) |

Table 10: Pronation supination difference age wise (n=42)

| Pronation supination difference | Age group (years) | | | | | Total |
|---------------------------------|-------------------|-------|-------|-------|-----|-------|
| | 20-30 | 30-40 | 40-50 | 50-60 | >60 | |
| 0° | 9 | 8 | 13 | 5 | 2 | 37 |
| 10° | | | | | | |
| 20° | | | | 1 | | 1 |
| 30° | | | | 1 | | 1 |
| 50° | | | | 2 | 1 | 3 |
| Total | | | | | | 42 |

Table 11: Wrist flexion-extension difference (n=42)

| Wrist flexion-extension difference | Age group (years) | | | | | Total |
|------------------------------------|-------------------|-------|-------|-------|-----|-------|
| | 20-30 | 30-40 | 40-50 | 50-60 | >60 | |
| 0° | 09 | 08 | 13 | 05 | 02 | 37 |
| 10° | | | | 1 | | 1 |
| 20° | | | | | | |
| 30° | | | | 2 | | 2 |
| 50° | | | | 1 | 1 | 2 |
| Total | | | | | | 42 |

In 14 cases (70%), results were excellent with perfect alignment, stable distal radioulnar joint, and full pronation supination and flexion-extension of the wrist. In 2 cases, results were fair (10%). In 4 cases, results were poor (20%) (Table 15).

DISCUSSION

It has to be agreed with Hughston³ who said: "We believe that the high percentage of unsatisfactory results in the treatment of this fracture is due to most physicians' lack of knowledge of the forces active when customary reduction with immobilization is applied." Successful treatment of Galeazzi fractures depends on the reduction of the radius and distal radioulnar joint and the restoration of the forearm axis. Hughston³ outlined the difficulties and complications

Table 12: Pain and distal radioulnar joint stability (n=42)

| Observation | Distal radioulnar joint stability | | Total |
|-------------|-----------------------------------|------------|-------|
| | Stable | Subluxated | |
| No pain | 15 | 1 | 38 |
| Pain | 2 | 2 | 4 |
| Total | 17 | 3 | 42 |

Table 13: Grip strength, distal radioulnar joint stability (n=42)

| Grip strength (%) | Distal radioulnar joint stability | | Total |
|-------------------|-----------------------------------|------------|-------|
| | Stable | Subluxated | |
| 60 | 1 | 2 | 5 |
| 80 | - | 1 | 1 |
| 90 | 9 | - | 8 |
| 100 | 29 | - | 6 |
| Total | 39 | 3 | 42 |

Table 14: Mayo wrists score

| Observation | Number (%) |
|-------------|------------|
| Excellent | 35 (83.33) |
| Good | 2 (4.76) |
| Fair | 2 (4.76) |
| Poor | 2 (4.76) |
| Total | 42 (100) |

Table 15: Final results (n=42)

| Observation | Number (%) |
|-------------|------------|
| Excellent | 37 (88.09) |
| Fair | 3 (7.14) |
| Poor | 2 (4.76) |
| Total | 42 (100) |

of non-operative treatment in 1957. An unsatisfactory result was identified in 92% (35 of 38) of patients treated with closed reduction and cast immobilization. This was due to loss of reduction, resulting in malunion. Loss of reduction was attributed to the deforming force of the brachioradialis, the pull of pronator quadratus leading to rotation of the distal radial fragment toward the ulna, and weight of the hand as a deforming force leading to dorsal angulations of the radius and subluxation of the distal radioulnar joint. These deforming forces are unable to be controlled with plaster immobilization, and the operative management is required in these fractures. Radius and ulna are nearly parallel, and they have complex mechanical relationship to one another.¹² Any disproportion in length results in a disturbance of the radioulnar joints. Hence, the fracture of radius must be anatomically reduced and must be maintained throughout the healing period. Moreover, an unstable radioulnar joint should also be reduced and fixed in optimal position. The present study has limitation in comparing exactly with the previous published series. The selection criteria of the patient were different, and the long-term outcome could not be predicted in this study. Hence, the general outcome in Galeazzi fracture-dislocation pursue could not be drawn. The short-term outcome of selected cases is only studied. The present study is similar to that one conducted by Moore *et al.*,⁷ Strehle and Gerher,⁸ Moore *et al.*,¹³ and Bhan and Rath.¹⁴

The demographic data on our 42 patients indicate that 64.28% of the Galeazzi fracture-dislocation occurred in male patients. Similarly, Mikic⁴ found a male preponderance of 74% in males.

A study by Moore *et al.*⁷ reported that 80% were males. A male preponderance is not surprising considering the higher risk of violent injury among men.

In this study, the age of the patients ranged between 22 years and 60 years with a mean age of 43.7 years. Most of the patients (50%) were in the third and fourth decades. In the study of Mikic⁴ and Moore *et al.*,⁷ most of the cases occurred in the third and fourth decades. In the present study, the right side was involved in 32 (76.19%) of 42 cases. Mikic⁴ reported 54% of these injuries occurred in left side but did not determine the dominant hand in his patients. Wong¹⁵ found that 23 of his 44 patients had an injury to the right forearm (Figure 1).

In the present study, most of the fractures occurred due to self-fall on outstretched hand, i.e., 21 (50%) of 42 cases. Every third of the patients in the study of Moore *et al.*⁷ sustained multiple injuries that were associated with Galeazzi fracture. Obviously, major share of the

injury comes from vehicular accidents. In this study, only 10 cases were due to RTA (23.80%). In the present study, in the majority of cases, volar plating by anterior Henry's approach was used in 36 cases (85.71%) (Figures 2 and 3).

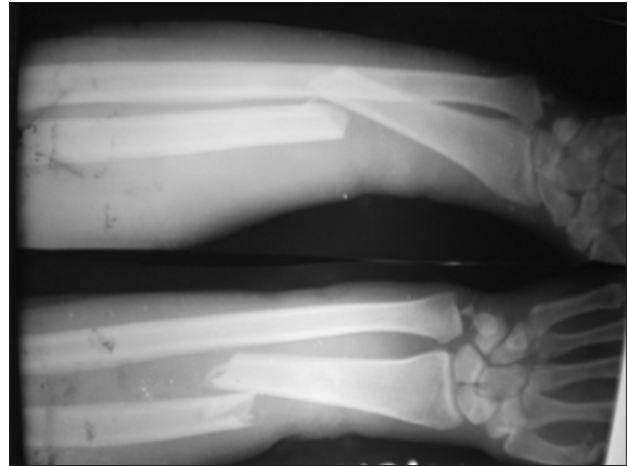


Figure 1: Anteroposterior and lateral views of the distal radial fracture

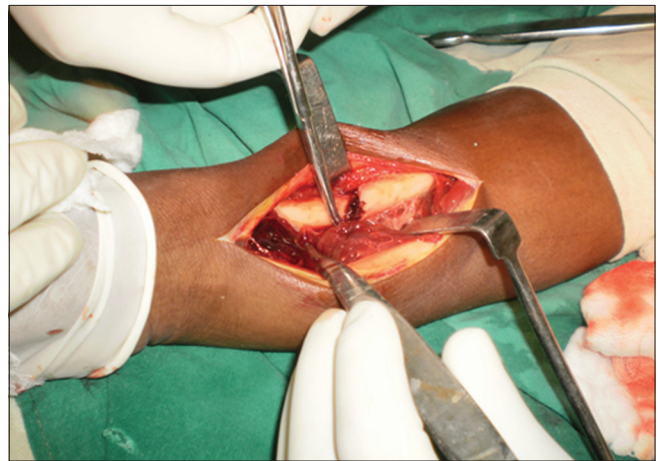


Figure 2: Volar approach



Figure 3: Fracture reduction

Dorsal plating by Thompson approach used only in 6 cases because of superficial abrasion and pinpoint wound over volar side.

A study conducted by Anderson *et al.*¹⁶ found that volar plating is technically easier and results in better soft tissue coverage. However, a plate in this location may mechanically limit pronation. Since supination and pronation were not analyzed separately, we have no data suggesting 1 site of plate application over the other. The treatment outcome of Galeazzi fracture has drastically improved from a high failure rate of 52% with closed treatment³ to 70-80% excellent result with AO plating. This success rate is in spite of more stringent outcome. We had used 3.5 mm NDCP in all the cases. We had excellent results in 14 patients (70%). A complete dislocation of distal radioulnar joint always involves rupture of articular disc and of the associated dorsal and volar distal radioulnar ligaments. This articular injury as well as the fracture of radius must be dealt with if good results are to be obtained in the treatment of Galeazzi fracture. All studies in this subject have cited the poor results that are obtained when the injuries are treated by closed methods. Houghston³ suggested immediate resection of distal part of ulna, and Mikic⁴ advocated temporary fixation of the distal radioulnar joint, with 1 or 2 K-wires after fixation of the radial fracture site. Anderson *et al.*¹⁶ advised grafting under certain conditions, but this was not done by most authors or in this study. After the fracture of the radius was reduced and plated, no irritability was observed in the distal ulnar joint. Hence, "K" wire fixation was observed. In this series, immobilization of the forearm in full supination was done. In that position, dislocation of distal radioulnar joint reduced, and the torn articular discs and ligaments are approximated. Most of the cases in the present study were immobilized for 4 weeks in 52.38% of 42, 6 weeks in 33.33%, and for 8 weeks in 14.28% of patients. The feared problem of supination contracture was not present in the present study. In a study by Reckling and Cordell,¹⁷ immobilization was done in full supination and continued for 6-8 weeks. In a study by Moore *et al.*,⁷ post-operative immobilization in neutral position or 5-10° of supination for 4 weeks was done. There were no pre-operative neurovascular complications in this series. However, such nerve injuries have been described in the previous studies.^{18,19} Unfortunately, high frequency of intraoperative nerve injuries was seen in the series of Moore *et al.*⁷ Anderson *et al.*¹⁶ reported 7% and Dodge and Cady²⁰ reported 10% frequency of nerve injury in their series. Stern and Drunty²¹ reported no such injury (Figure 4).

In this study, there were no intraoperative nerve injuries. The radial sensory nerve was the most common branch injured and associated with Henry's approach.¹⁸

Moore *et al.*⁷ in their study of 36 Galeazzi fracture noted a complication rate of 39%. The complication rate in Strehle and Gerher⁸ series was 32%. In the present series, the complication rate was 25%. In this study, 3 cases of radioulnar joint subluxation, 1 case of tourniquet palsy, and 1 case of superficial post-operative infection were observed. Older people in the present study were found to have movement restriction in flexion-extension and pronation-supination. Pronation-supination difference of 30-50° was noted in 4 patients above the age of 50 years when compared to the opposite side. A similar degree of flexion-extension limitation noted in 4 patients over 50 years of age (Figure 5).

Uniformly, good results have been obtained by open anatomical reduction, internal fixation of the radial fracture, and immobilization of the forearm in full supination. Temporary fixation of distal radioulnar joint with K-wire or repair of triangular fibrocartilage complex is rarely if ever required after open reduction and internal fixation of the radius and immobilization.

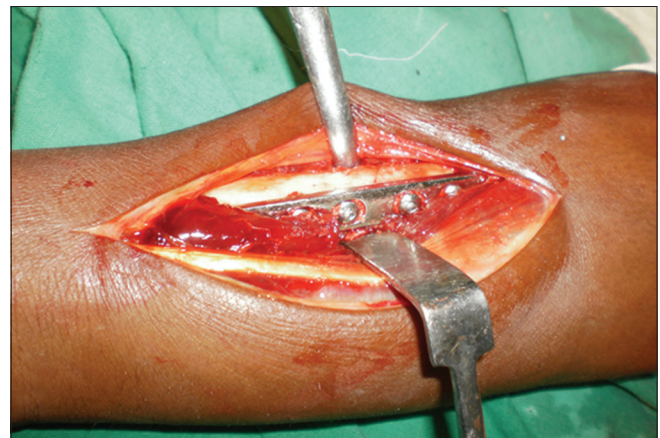


Figure 4: Fracture reduction

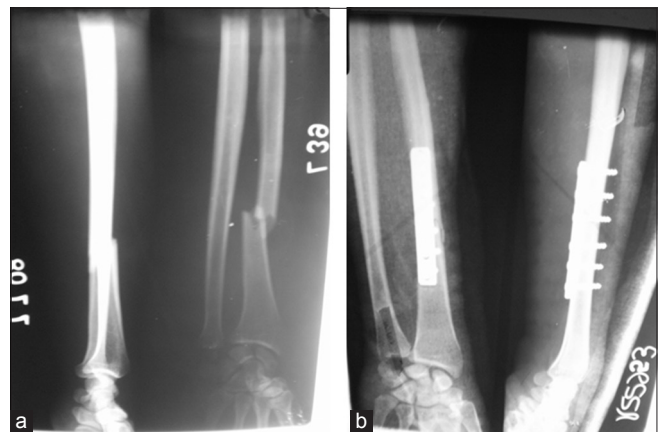


Figure 5: (a and b) Pre- and post-operative X-rays of Lower radial fracture

CONCLUSION

The key to the satisfactory results in the treatment of the Galeazzi fractures is anatomic restoration of length of the radius with application of rigid internal fixation to maintain the reduction. Open revision and K-wire fixation of distal radioulnar joint are not necessary if anatomic reduction of the joint is obtained by indirect means such as open reduction and internal fixation of the radius and immobilization.

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A Non-randomized Control Trial Study on the Outcome of Percutaneous Release of Tennis Elbow

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Abstract

Background: Lateral epicondylitis or tennis elbow is considered one of the most frequent types of myotendinosis of the upper extremity. Both conservative and surgical treatments are available. A simple surgical method adopted to analyze its effectiveness in patients failing to respond to conservative treatment.

Aim: The aim of the study was to analyze the effect of the percutaneous release of extensor origin in tennis elbow compared to the conservative treatments with analgesics and steroid injection.

Materials and Methods: Thirty-five patients with diagnosis of tennis elbow and not responding to a conservative line of treatment were subjected to the division of the extensor origin at the site where the patient was maximum symptomatic. The results were classified according to the subjective relief informed by the patients. The data were analyzed to conclude.

Observations and Results: Among the 35 patients 22 (62.85%) were females, and 13 were males (37.14) with a male to female ratio of 1:1.69. In all the patients' symptoms of tennis elbow were unilateral. The patients in the study were in the age group of 25-50 years with a mean age of 32.46 ± 2.30 . In 48.57%, i.e., 17 patients, the results were excellent. In 25.71%, i.e., 9 patients, the results were good and in 14.28%, i.e., 5 patients, the results were satisfactory. In 11.42%, i.e. 4 patients, the results were considered poor.

Conclusions: Percutaneous release of common extensor origin with 18 G needle provided a superior outcome in the management of tennis elbow patients who are not responding to the conservative line of management.

Key words: Lateral epicondylitis, Myotendinosis, Percutaneous release, Tennis elbow

INTRODUCTION

Lateral epicondylitis or tennis elbow is considered one of the most frequent types of myotendinosis of the upper extremity. It is mostly associated with substantial pain and loss of function at the affected elbow. The chief complaints in lateral epicondylitis are decreased grip strength, decreased functional activities.¹ It affects 1-6% of the general population.² Controversy exists regarding the pathophysiology of lateral epicondylitis; periostitis, fibrositis, radial nerve entrapment, bursitis, extensor tears,

infection, intraarticular abnormality, and orbicular ligament inflammation have all been suggested.³ In 75% of cases dominant side is affected suggesting that work-related forceful and repetitive extension of wrist movements may have a role in the pathogenesis.⁴ Clinically, there will be tenderness over the lateral aspect (lateral epicondyle) of the humerus, pain on resisted dorsiflexion of the wrist, middle finger, or both are classical findings.^{5,6} There had been numerous researchers on the possible etiology of tennis elbow, and the most accepted one suggests that it is primarily an overuse injury with consequent microtears of the hyaline layer of the extensor muscles.⁷ Many conservative measures have been advised including nonsteroidal anti-inflammatory drugs (NSAIDs), ultrasound, low-dose laser therapy, steroid injections, functional brace, and manipulative treatment, but none have shown consistent results.⁸ Most of the patients respond to nonoperative treatment.⁹ However, surgical intervention is required in 4-11% of the patients in whom the symptoms persist.⁶ Mostly, these are treated

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conservatively with analgesics or oral steroids. The outcome of the percutaneous release of the common extensor origin has been very attractive considering the simplicity of the procedure, safety, morbidity, and good to excellent outcome in vast majority of patients. This study is conducted in the light of the above information gathered from literature.

Aim of the Study

The aim of the study was to analyze the effect of the percutaneous release of extensor origin in tennis elbow compared to the conservative treatments with analgesics and steroid injection.

Study Period

Study was conducted from January 2016 to December 2017.

Institute of Study

Study was conducted at KMCT Medical College Hospital, Mukkam, Manassery, Calicut, Kerala.

MATERIALS AND METHODS

This nonrandomized control trial study was conducted at the Department of Orthopaedics, KMCT Medical College, Calicut, from 2016 to 2017 on a total of 35 patients who underwent percutaneous release of the common extensor origin using an 18 gauge (hypodermic) needle. Study duration was 12 months. An Ethical Committee clearance was obtained, and a consent form approved by the Ethical Committee was used.

Inclusion Criteria

1. Patients aged between 25 and 50 years were included,
2. Patients of both sexes were included,
3. Patients with duration of symptoms for more than 4 months were included,
4. Patients taking previously primary conservative treatment with analgesics and steroids were included.

Exclusion Criteria

1. Patients who are pregnant/breastfeeding mothers were excluded,
2. Patients with previous history of trauma to the symptomatic elbow/polytrauma were excluded,
3. Patients on long-term use of systemic steroids,
4. Patients with acute presentation (<2 months),
5. Patients who have undergone previous surgical intervention,
6. Patients who are not willing to be part of the study.

Data were collected by going through the patient's past medical records, and a follow-up was done to assess the outcome and patient satisfaction with the procedure based on preset questionnaire. The diagnosis of tennis

elbow was made on the basis of clinical findings such as tenderness over the lateral humeral epicondyle, pain on extension of the wrist against resistance. 35 patients with age ranging from 25 to 50 who had pain presenting for more than 6-month period, who did not responding to medical therapy or single dose of local steroid injection was included in our study. A total of 35 elbows were included in the study. All the data were analyzed using standard statistical methods.

Procedure

All the procedures were performed in the minor procedure room of KMCT Medical College, Department of Orthopaedics, outpatient department (OPD) under local anesthesia, after attaining written consent from the patient.

Position

The patient is positioned supine on an examination table with the forearm resting freely on arm board by the side of the patient and elbow at 90°.

Preparation

The entire elbow starting from mid humerus up to mid-forearm is painted with chlorhexidine and betadine solution (Figure 1).

The elbow was draped using a sterile holed towel (Figure 2).

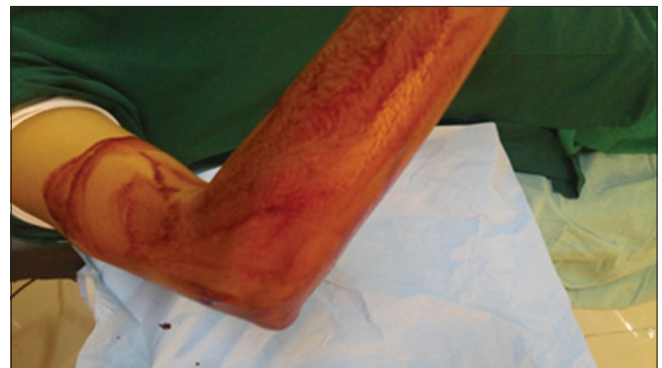


Figure 1: The preparation of the elbow



Figure 2: The covering the elbow

Local anesthesia was given around the common extensor origin using 30 G needle and 10 ml of 2% lignocaine (Figure 3).

Operative Procedure

Once the local anesthesia action was confirmed, the bevel of an 18 G needle was used to divide the extensor origin at the site where the patient was maximum symptomatic. Care was taken not to go to the area of radial nerve by staying around the extensor origin (Figure 4).

Post-operative Follow-Up

The needle puncture site is sealed using a leukomed, along with a tennis elbow brace as support. NSAIDs and antacids were given along with antibiotic coverage for 5 days postoperatively. The tennis elbow brace is discontinued once the patient is symptom-free (Figure 5).

The final outcome of the procedure was graded as excellent, good, fair, and poor on the basis of symptoms.

| Excellent | Completely symptom-free |
|-----------|---|
| Good | Symptom-free on daily activities with occasional pain |
| Fair | Symptoms on heavy/strenuous activities |
| Poor | No relief at all |

OBSERVATIONS AND RESULTS

Among the 35 patients, 22 (62.85%) were females, and 13 were males (37.14) with a male to female ratio of 1:1.69. In all the patients' symptoms of tennis elbow were unilateral. The patients in the study were in the age group of 25-50 years with a mean age of 32.46 ± 2.30 . Among the 22 female patients, 10 were housewives, 8 were office goers, and the remaining 4 were working as manual laborers.

Among the males, 7 were manual laborers and the remaining were office goers. 33 patients were satisfied with the overall procedure (94.28%), and 2 patients were not symptom-free after the procedure and were subsequently managed by surgical release. These 2 patients in whom the symptoms did not subside were daily workers on daily wages and had an immediate return to strenuous activity post-procedure. In 48.57%, i.e., 17 patients, the results were excellent. In 25.71%, i.e., 9 patients, the results were good and in 14.28%, i.e., 5 patients, the results were satisfactory. In 11.42%, i.e., 4 patients, the results were considered poor (Table 1).

Considering the above results totally 31/35 patients (88.57%) became symptom-free.

DISCUSSION

Once the diagnosis of tennis elbow is made the treating orthopedic surgeon considers conservative management and looks forward to subjective response from the patient.

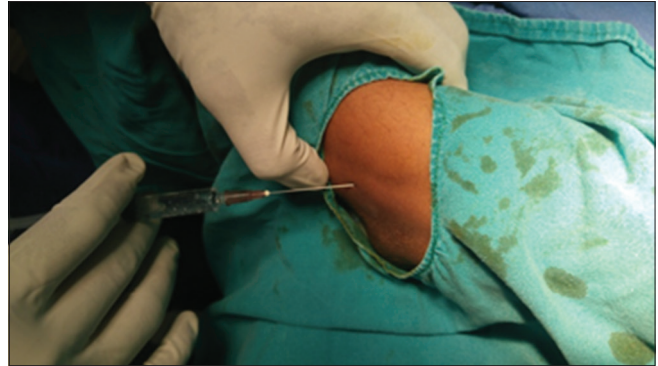


Figure 3: The infiltration of the elbow

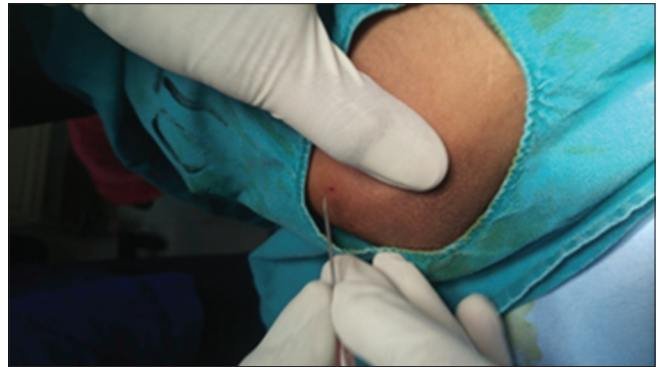


Figure 4: The division of extensor origin at the site where the patient is having maximum pain

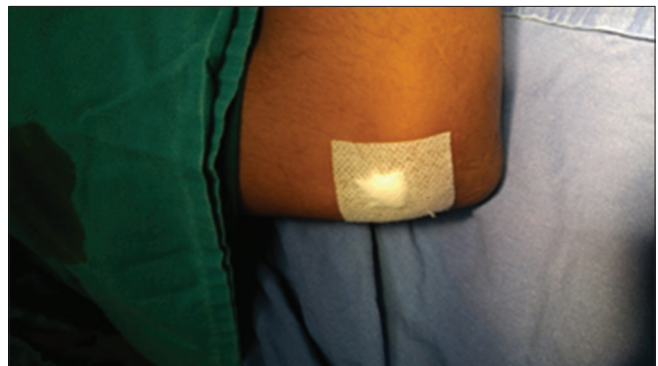


Figure 5: The surgical bandage at the end of the procedure

Table 1: The post-procedure results (n=35)

| Observation | n (%) |
|-------------|------------|
| Excellent | 17 (48.57) |
| Good | 9 (25.71) |
| Fair | 5 (14.28) |
| Poor | 4 (11.42) |

Around 90% of patients initially can be managed with conservative treatment, i.e., by rest, lifestyle/activity modification, analgesics, or local steroid injection with good results.¹⁰ However, when surgery is indicated we have a wide variety of options as different theories have been proposed over time as a cause for this condition.¹⁰ There are various studies which discuss the outcome following the percutaneous release of extensor carpi radialis brevis for tennis elbow, but none of them had a clear criterion to study the outcome.^{11,12} Majority of these studies suggest that tennis elbow results from a gradual degenerative tear of the common extensor origin.¹³ Tenotomy of the common extensor tendons and scraping of the epicondylar region using an 18 G needle fasten the healing process of the damaged tendon by converting a chronic inflammatory condition to an acute inflammatory condition which heals rapidly, thereby providing immediate symptomatic relief of tennis elbow.¹⁴ In this study, the procedure adopted has given an 88.57% of subjective symptomatic relief in patients.

CONCLUSIONS

Percutaneous release of common extensor origin with 18 G needle provided a superior outcome in the management of tennis elbow patients who are not responding to the conservative line of management.

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Acute Febrile Infectious Diseases with Acute Renal Failure

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Abstract

Introduction: Infectious diseases are an important cause of morbidity and mortality in our country. Tuberculosis, falciparum malaria, and leptospirosis are some of the common infectious diseases associated with mortality.

Aim: The aim of the study is to study the causes, clinical features, and associated organ dysfunction in patients with acute febrile illnesses with acute renal failure.

Materials and Methods: Patients with fever and serum creatinine level ≥ 1.5 were included in the study. Patients with acute diarrheal diseases, obstetric patients, surgical patients, chronic renal failure pre-existing renal disease, diabetes mellitus, and nosocomial infection were excluded.

Results: 40 patients with infectious diseases with acute renal failure, leptospirosis was the most common illness (45%) followed unclassified group (40%), falciparum malaria (10%), and sepsis 5%.

Conclusion: Serum creatinine 1.5 and above is an early marker of severe infection and aggressive therapy reduced mortality.

Key words: Acute renal failure, Infectious diseases, Mortality and morbidity

INTRODUCTION

Worldwide incidence of acute kidney injury (AKI) is variable, and even more among the developed and the developing countries. Tropical acute febrile illnesses such as malaria, typhoid, leptospirosis, dengue, and others are a major cause of AKI in the tropics.¹⁻³

Infectious diseases are an important cause of morbidity and mortality in our country. Tuberculosis, falciparum malaria, and leptospirosis are some of the common infectious diseases associated with mortality.⁴ Complicated falciparum malaria, leptospirosis, and sepsis are associated with multi-organ dysfunction. Acute renal failure is an important

component of multi-organ dysfunction. Jaundice occurs quiet early. Detection of acute renal failure in the early stage of infectious diseases and aggressive management of these illnesses will reduce the mortality.⁵ Hot and humid climate that is conducive to support life in its various forms is the hallmark of tropical ecosystem. Persistence of microorganisms, their reservoirs and vectors are greatly facilitated by this tropical ecology. The great biodiversity adds to complex interactions between them and adds to evolution with changing circumstances. Human contact with this ecosystem is almost unavoidable in most of the poor tropical countries because of prevailing poor social and economic circumstances translating into increased susceptibility to infections and poor access to health-care services.⁶⁻⁸

AIM

The aim of the study is to study the causes, clinical features, and associated organ dysfunction in patients with acute febrile illnesses with acute renal failure.

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MATERIALS AND METHODS

The observational prospective study was conducted in the Department of Medicine, Stanley Medical College, Chennai. Ethics committee approval and informed consent from the patients were obtained. Patients with fever and serum creatinine level ≥ 1.5 were included in the study. Patients with acute diarrheal diseases, obstetric patients, surgical patients, chronic renal failure pre-existing renal disease, diabetes mellitus, and nosocomial infection were excluded. Demographic details, clinical examinations, and medical history were recorded. Urine analysis, complete blood count, electrolytes, liver function test, peripheral smear for malarial parasite, quantitative buffy coat for malarial parasite, widal, chest X-ray, posteroanterior, electrocardiogram, ultrasonography abdomen, macroscopic slide agglutination test, microscopic agglutination test, urine culture and sensitivity, blood culture and sensitivity were done.

RESULTS

Of the 40 patients with infectious diseases with acute renal failure, leptospirosis was the most common illness 45%, followed by unclassified group 40%, falciparum malaria 10%, and sepsis 5%. Leptospirosis - total 18 patients in that 11 male, 7 female patients. The mean age of the patients is 39.8 (Figure 1).

Fever (100%), myalgia (67%), headache (28%), and conjunctival suffusion (22%) were the common clinical features in leptospiral renal failure patients. Jaundice occurred in 5 patients among 18 patients of leptospirosis, 4 cases had protein urea (mild, nonnephrotic). 10 cases had anemia. 5 cases had hyponatremia. 2 cases had hypokalemia. 1 case had thrombocytopenia (Tables 1 and 2).

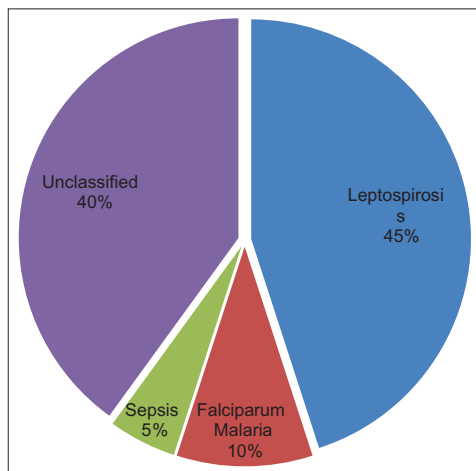


Figure 1: Distribution of infections

All cases of falciparum malaria had mild renal failure only. 3 cases had jaundice; all had anemia. 2 cases of leptospirosis with severe renal failure were dialyzed and recovered completely. 2 cases from unclassified group died as they were in shock at the time of admission. In all other patients, there was complete recovery and the creatinine value was below 1.2 at the time of discharge.

DISCUSSION

Infectious diseases are an important cause of acute renal failure in tropical countries. The common infectious diseases producing acute renal failure are leptospirosis, falciparum malaria, and sepsis. Difficulties in evaluating the various causes of acute renal failure are due to the lack of adequate diagnostic facilities. Acute renal failure in infectious diseases is a sign of severe illness.⁹ Early detection can improve the patient's survival by aggressive management. In our study, of 40 patients with acute renal failure due to infectious diseases, leptospirosis, and falciparum malaria were the important causes. In many patients, we could not identify the organism due to lack of sophisticated diagnostic facilities and they

Table 1: Distribution of sign and symptoms

| Symptoms and sign | Among 40 patients | Leptospiral renal failure | Unclassified group |
|------------------------|-------------------|---------------------------|--------------------|
| Fever | 40 | 18 | 16 |
| Myalgia | 21 | 12 | 8 |
| Headache | 11 | 5 | 6 |
| Vomiting | 16 | 6 | 4 |
| Diarrhea | 5 | 2 | 2 |
| Jaundice | 13 | 5 | 4 |
| Bleeding diathesis | 1 | 1 | - |
| Altered sensorium | 4 | 3 | 1 |
| Oliguria | 9 | 4 | 4 |
| Anemia | 30 | 10 | 14 |
| Conjunctival suffusion | 4 | 4 | - |
| Hepatosplenomegaly | 13 | 7 | 5 |

Table 2: Distribution of investigations

| Investigation | Among 40 patients | Leptospiral renal failure | Unclassified group |
|------------------|-------------------|---------------------------|--------------------|
| Proteinuria | 11 | 4 | 5 |
| Leukocytosis | 1 | - | 1 |
| Hypoglycemia | 2 | 1 | 1 |
| Hyponatremia | 6 | 5 | - |
| Hypokalemia | 9 | 2 | 3 |
| Acidosis | 1 | 1 | - |
| Alkalosis | 2 | - | - |
| Increased SGOT | 10 | 6 | 2 |
| Increased SGPT | 10 | 6 | 2 |
| Increased SAP | 2 | - | - |
| Thrombocytopenia | 1 | 1 | - |

SGOT: Serum glutamic oxaloacetic transaminase, SAP: Serum alkaline phosphatase, SGPT: Serum glutamic pyruvic transaminase

were grouped as unclassified.¹⁰ Most of them responded to quinine therapy, and we presumed that these patients were due to malarial renal failure. It has been our policy to treat such patients as malarial renal failure. Leptospirosis is the most common cause of acute renal failure in our study. Leptospirosis is a zoonosis and has been reported recently from various parts of the country. Leptospirosis is clinically characterized by the mild form which contributes 90% of the case (anicteric) and severe form. About 5.5%, severe renal failure in 16.6%, 2 cases of severe leptospiral renal failure underwent dialysis and recovered completely. 4 cases had proteinuria (mild, nonnephrotic). 10 cases had anemia. 5 cases had hyponatremia. 2 cases had hypokalemia. 1 case had thrombocytopenia. Total count was normal. Mortality in the previous study at GH Chennai was 20.8%. There was no mortality in our study among leptospiral renal failure patients probably because of early detection and aggressive therapy. Falciparum malaria is an important cause of infectious diseases causing acute renal failure. Falciparum malaria-causing renal failure is more common in North India. Recently, the incidence has been increasing in South India also.¹¹⁻¹⁴

CONCLUSION

Raised creatinine was valuable in the early diagnosis of severe leptospirosis and complicated falciparum malaria. There was no mortality in leptospirosis probably due to early diagnosis of severe illness and aggressive management. Similarly, in falciparum malaria (diagnosed and unclassified) early diagnosis reduced the mortality. We

conclude that serum creatinine is an early marker of severe infection and aggressive therapy reduced mortality.

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Analysis of the Gracilis Myocutaneous Flap as a Workhorse Flap for Reconstruction of Perineal and Ischial Soft Tissue Defects

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Abstract

Introduction: The gracilismyocutaneous flap is useful in reconstruction of perineal defects. Management of perineal and ischial wounds can be very frustrating as these invariably get contaminated from the anogenital tract. Moreover, the apparent skin defect may be associated with a significant three-dimensional dead space in the pelvic region. Such wounds are likely to become chronic and recalcitrant if appropriate wound management is not instituted in a timely manner.

Materials and Methods: The study was performed over a period of 5 years and 10 patients were included in the study, who required cover for perineal defects.

Results and Conclusion: The study highlights the usefulness of the gracilismyocutaneous flap in reconstruction of soft tissue defects in the perineal and ischial regions.

Key words: Gracilis myocutaneous flap, Ischial pressure sore, Perineal reconstruction, Perineum, Water-can perineum

INTRODUCTION

The perineum is Greek words “Peri + inan” meaning to “empty out.” The perineum is an anatomical region located in the pelvis. It is the most inferior part of the pelvic outlet, located between the thighs. It is separated from pelvic cavity superiorly by the pelvic floor. Functionally the perineum contains structures that support the urinary, genital and gastro intestinal viscera, they play a vital role in micturition, defecation, sexual intercourse, and child birth.

The perineum is a diamond-shaped structure (Figure 1). There are two ways in which the boundaries of the perineum can be described. Anatomical borders refer to the exact bony margins. The perineum can be subdivided

by a theoretical line drawn transversely between the ischial tuberosities into anterior urogenital and posterior anal triangles. These triangles are associated with different components of the perineum.

Perineal defects result due to post-surgical wound in case of genital malignancies, anorectal malignancies, chronic inflammatory diseases, perineal trauma, infections, postradiation, and perineal burns.

The reconstruction of the perineum can be quite demanding as one has to preserve both sexual as well as the excretory functions of the perineal area. The perineal defects need to be assessed in three dimensions, the skin defects may be associated with a large dead space in the pelvis following surgical excision of tumors, and it must be remembered that the rigid bony pelvis does not allow the wounds to collapse, resulting in fluid collection.

It is also important to know if the patient has received, or is likely to receive radiotherapy. Provision of a well-vascularized muscle cover is very important in such a situation.

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There are many options for reconstruction of the perineum. They range from primary closure, grafting to flaps.¹ Flaps include fasciocutaneous/muscle flap, gracilis myocutaneous flap, rectus abdominis flaps, posterior thigh flaps, groin flap, pudendal fasciocutaneous flap, gluteal flaps, rectus femoris flaps, tensor fascia lata flap, vastus lateralis flap, and perforator flaps. Less commonly used options are internal oblique muscle flap and omental flaps.

The gracilis myocutaneous flap²⁻⁵ is favored by several influential groups of reconstructive surgeons due to the donor site profile and speed of dissections and has traditionally been used to reconstruct small to large size perineal defects.^{6,7} It is particularly attractive to patients who do not want abdominal, buttock, or back scars. In gracilis myocutaneous flap, donor site scars are well concealed, and it gives the added benefit of a thigh lift.

In this article, we present a case series of 10 gracilis myocutaneous flap (Table 1) used for reconstructing perineal and ischial defects.

MATERIALS AND METHODS

The study was performed over a period of 5 years (August 2007 to August 2012). 10 patients were included in the study, who required cover for perineal defects. The study included 4 male and 6 female patients with age group 35-67 years. The etiology of the defect was Ischial pressure sore (4 cases) (Figures 2 and 3), post radiation ulcer (1 case) (Figure 4), sarcoma lateral wall of vagina (1 case) (Figure 5), vulvar malignancy (2 cases) (Figures 6 and 7), watering-can perineum (1 case) (Figure 8), and hidradenitis suppurativa (1 case). Two patients with vulvar malignancy needed bilateral gracilis flap, radiation ulcer, and watering-can perineum required bilateral gracilis flap. The cases with

ischial pressure sore and one case of vaginal malignancy covered with single gracilis myocutaneous flap. Standard

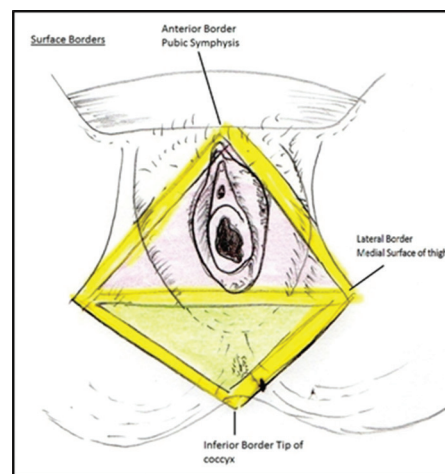


Figure 1: The area defined as the perineum



Figure 2: (a-d) Ischial pressure sore: A case of ischial pressure on the left side sore reconstructed with a gracilis myocutaneous flap

Table 1: Cases of reconstruction with gracilis myocutaneous flap

| Case No. | Age | Sex | Diagnosis | Size defect | Size of flap | Result |
|----------|-----|-----|--|---|---|--|
| Case 1 | 67 | F | Soft tissue sarcoma lateral wall of vagina | 6 cm × 3 cm | 7 × 4 cm | Flap survived completely |
| Case 2 | 60 | F | Carcinoma vulva | Bilateral 8 cm × 4 cm right, 6 cm × 5 cm left | Bilateral 9 × 5 cm right, 7 cm × 6 cm left | Flap survived completely |
| Case 3 | 60 | F | Carcinoma vulva | Bilateral 9 cm × 4 cm right, 7 cm × 5 cm left | Bilateral 10 cm × 5 cm right, 8 cm × 6 cm left | Flap survived completely |
| Case 4 | 57 | M | Radiation ulcer perineum | Bilateral 8 cm × 12 cm right, 8 cm × 11 cm left | Bilateral 9 cm × 13 cm right, 9 cm × 12 cm left | Bilateral flap cover. flap survived completely with minimal wound dehiscence |
| Case 5 | 54 | M | Watering can perineum | Bilateral 10 cm × 7 cm right, 10 cm × 8 cm left | Bilateral 11 cm × 8 cm right, 11 cm × 9 cm left | Bilateral flap cover. Flap survived completely |
| Case 6 | 42 | M | Ischial pressure sore | 6 cm × 4 cm | 7 cm × 5 cm | Flap survived completely with minimal wound dehiscence |
| Case 7 | 42 | F | Ischial pressure sore | 5 cm × 3 cm | 6 cm × 4 cm | Flap survived completely |
| Case 8 | 45 | F | Ischial pressure sore | 6 cm × 5 cm | 7 cm × 6 cm | Flap survived completely |
| Case 9 | 48 | M | Ischial pressure sore | 6 cm × 5 cm | 7 cm × 6 cm | Flap survived completely |
| Case 10 | 35 | F | Hidradenitis suppurativa | 10 cm × 11 cm | 11 cm × 12 cm | Flap survived completely |

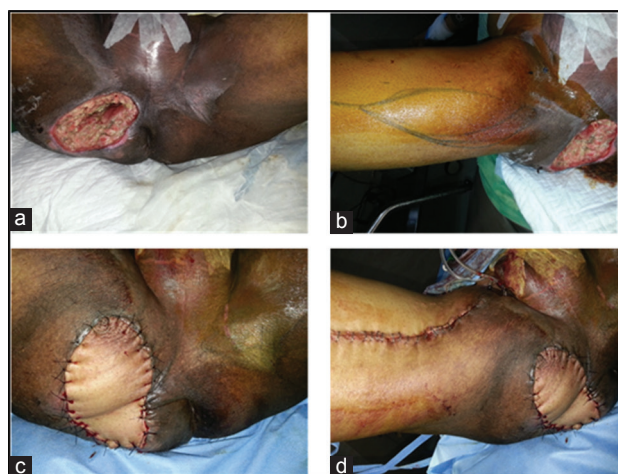


Figure 3: (a-d) Ischial pressure sore: Right-sided ischial pressure sore, reconstructed with gracilis myocutaneous flap

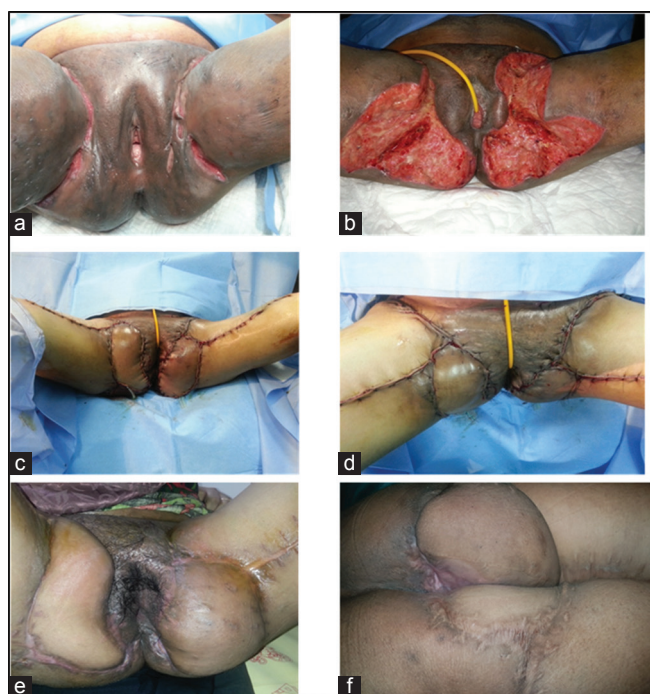


Figure 4: (a-f) Post-radiation ulcer: Post-irradiation ulcers in the perineum, treated with gracilis myocutaneous flap cover

operative protocol was followed. Patients were operated in lithotomy position. The vulval malignancies were resected by surgical oncologist and reconstruction was done in single stage. The wounds of patients with radiation ulcer and multiple fistula case were debrided and vacuum-assisted closure application was done in the first stage. Gracilis flap was done in the 2nd stage. The ischial pressure sore patient had a debridement and gracilis flap cover in single sitting.

After the surgery, perineal wound was regularly dressed. Prophylactic antibiotic was given and followed in the post-operative period for 5 days. Drains were removed on 3rd post-operative day. Patient discharged on 7th to 10th post-operative



Figure 5: (a-f) Sarcoma lateral wall of vagina: Gracilis myocutaneous flap used for reconstruction of defect following wide excision for sarcoma of the lateral wall of the vagina

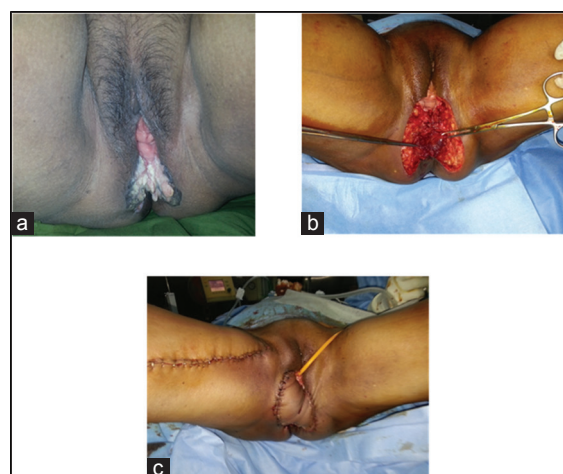


Figure 6: (a-c) Carcinoma vulva: Reconstruction of the defect with unilateral gracilis myocutaneous flap, following wide excision of carcinoma vulva

day. All the patients were followed for 3 years. There was no recurrence in case of malignancies and pressure sores. No urinary and fecal fistulas. All the wounds healed well.

This defect bordered on the perineum and has been included in the study. The reach of the gracilis myocutaneous flap was demonstrated in this surgery.

Post-irradiation ulcers are common in the perineal region following irradiation for malignancy of the

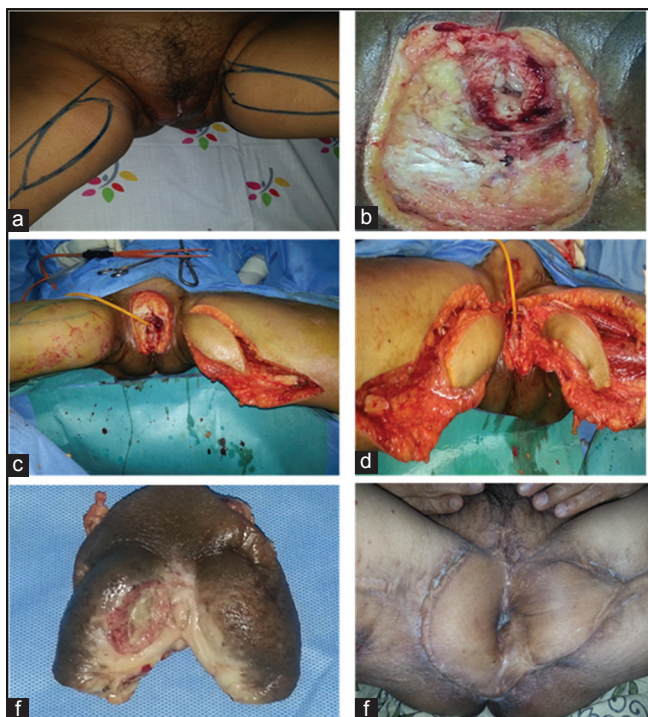


Figure 7: (a-f) Carcinoma vulva: Use of bilateral gracilis myocutaneous flap after wide excision of carcinoma of the vulva



Figure 8: (a-f) Water can perineum: Use of bilateral gracilis muscle flap to replace chronically ulcerated skin in "water-can perineum"

vagina/cervix. These ulcers are very recalcitrant, as the vascularity is very much reduced. Healing of these wounds has been possible with the use of the gracilis myocutaneous flap, which not only provides the soft

tissue cover but also brings in vascularized tissue that can heal the wounds faster.

Tumors of the vagina or vulva, when excised, lead to a soft tissue defect in the perineum. These defects require reconstruction with stable skin cover,^{8,9} as they may require adjunctive therapy with irradiation. The gracilis myocutaneous flap provides immediate cover of vascularized soft tissue that allows immediate irradiation therapy.

The "water-can" perineum is a debilitating condition following multiple attempts at reconstruction of hypospadias. The skin is chronically macerated and needs to be covered with vascularized soft tissue to permit healing. The gracilis myocutaneous flap was used in this patient to achieve good healing of the area.

DISCUSSION

The gracilis flap represents the workhorse for reconstruction of the perineal and pelvic defect. The use of the gracilis muscle in reconstructive surgery was first described by Pickrell in 1952 for rectal sphincter reconstruction. Use of the musculocutaneous variant was first reported by Orticochea,¹ in 1972 as a cross leg flap, before McCraw *et al.* used a pedicled gracilis musculocutaneous flap for vaginal reconstruction in 1976.² In the same year Harii *et al.* reported the first gracilis free flap for reconstruction of the head and neck.

Gracilis myocutaneous flap^{10,11} reconstruction of perineal defects has added advantages of reliability and long-standing use. Many methods of vaginal reconstruction have been used in the past including skin graft, local flaps, and distant tubed flaps. Each has significant advantages and disadvantages. In rectus abdominis, flap donor site morbidity is more when compare to gracilis flap. Anterior abdominal wall weakness, incisional hernia, and unsightly scar in the anterior abdominal wall these are the disadvantages of rectus abdominis flap. When compare to rectus abdominis flap, the deep inferior epigastric perforator (DIEP) flap has less abdominal wall morbidity. The major disadvantages of DIEP flap is harvesting the flap is difficult. Venous insufficiency and perforator injury is more while harvesting the DIEP flap. When compare to other flaps gracilis flap has many advantages as already mentioned.

McCraw *et al.* concluded that gracilis myocutaneous flap¹²⁻¹⁴ is superior to the other methods of vaginal reconstruction in a study conducted on 22 patients with pelvic exenteration or abdominoperineal resection.² In a case study done by

Solomon *et al.*, on 5 patients with inflammatory bowel disease have chronic non-healing perineal sinuses, they inferred that the gracilis muscle and myocutaneous flaps are simple flaps that are of particular use when a laparotomy is not necessary. Gracilis flap also has the advantage of being mobilized relatively easily.³

CONCLUSION

Gracilis myocutaneous flap is a time-honored flap of choice for perineal reconstruction. It has the advantage of bringing a well-vascularized tissue for reconstruction. It is better than fasciocutaneous flap in a place where the infection chances are very high. The donor scar is well tolerated and hidden. Gracilis muscle is expandable muscle. Technique of harvesting is simple and fast. Bulky flap and lymphedema of the flap are only disadvantages. It takes longer time for reduction of edema.

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Ligamentous Reconstruction for Post-traumatic Chronic Instability of Distal Radioulnar Joint

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Abstract

Introduction: Disorders of the distal radioulnar joint (DRUJ) are a common source of ulnar-sided wrist pain. The ulnar side of the wrist has often been likened to the lower back because of the difficulties involved in establishing a specific diagnosis for pain at both sites and therefore in prescribing an effective treatment plan.

Aim: The aim of the study was to analyze the clinical and functional results of ligamentous reconstruction in cases of post-traumatic chronic instability of DRUJ.

Materials and Methods: Twenty-one cases of chronic instability of dorsal radioulnar joint were included for this prospective study. Bunnell–Boyes procedure and Adam's procedure were performed.

Results: Bunnell–Boyes procedure: Out of 11 patients, 5 patients had excellent wrist score at follow-up, 3 patients had good wrist score, 3 cases of dorsovolar instability for which Bunnell–Boyes procedure was done had only marginal improvement (fair grade) post operatively. Preoperatively, all patients had either fair (or) poor score. Adam's procedure: Out of 10 patients, 4 patients had excellent wrist scores, 4 patients had good wrist score and 2 cases of old Colle's fracture the patients had pain during extreme range of pronation and supination movements and recurrence of instability of DRU during follow up (fair grade). All these patients had good stability, pain-free good range of pronation, and supination movement.

Conclusion: The goals of chronic instability of DRUJ management are to restore stability and pain-free rotation. Ligamentous reconstruction achieves these goals. The Bunnell–Boyes procedure is ideal for dorsal instability. The Adam's procedure gives better results for dorsal and volar instability.

Key words: Distal radioulnar joint, Distal radius fracture, Distal radioulnar joint injuries

INTRODUCTION

Stability of the distal radioulnar joint (DRUJ) is provided by bony architecture and by soft tissues such as the triangular fibrocartilage complex (TFCC), the joint capsule, and surrounding muscles. The most common cause for DRUJ instability is a distal radius fracture.¹ Although instability after accurate reduction and fixation of the distal radius is relatively uncommon, it is important to evaluate DRUJ stability after treatment of

a distal radius fracture. Patients with DRUJ instability after a malunion of the distal radius fracture usually present with loss of forearm rotation, prominence of the ulnar head, weakness, or ulnar-sided wrist pain.^{2,3} A dorsally angulated malunion usually presents with volar displacement of the ulna and volar instability, and a volarly angulated malunion usually presents with dorsal displacement of the ulna that may limit forearm supination. Patients may present with chronic DRUJ instability without a history of a distal radius fracture. The most common history is a traumatic event involving a fall on the outstretched hand or an unexpected forcible rotation of the wrist. Patients usually report ulnar-sided wrist pain of a mechanical nature that is increased with wrist positions and activities that reproduce the mechanism of injury such as forearm rotation or ulnar deviation of the wrist. Localized swelling, crepitus, weakness, and a sense of instability may exist. In severe

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cases, there may be a painful clunk and loss of rotation due to chronic subluxation. In addition, patients with ulnar impaction syndrome with a considerably large ulnar-positive variance may have instability symptoms in addition to typical ulnar abutment symptoms.^{4,5}

Aim

The aim of the study was to analyze the clinical and functional results of ligamentous reconstruction in cases of post-traumatic chronic instability of DRUJ.

MATERIALS AND METHODS

Twenty-one cases of chronic instability of dorsal radioulnar joint were included for this prospective study. The inclusion criteria for surgery were patients with ulnar-sided wrist pain and instability to perform their usual occupational duties, clinical evidence of DRUJ instability, patients who had failed to improve with conservative management consisting of internal splinting and wrist therapy.

Exclusion Criteria

Patients who had radiological evidence of DRUJ or ulnocarpal osteoarthritis, perioperative evidence of erosions in the articular cartilage of the sigmoid notch or ulnar head were excluded. The mean follow-up was 11.5 months. Dominant hand (right side) was involved in 6 patients and in 15 patients the nondominant (left side) was involved. Among 21 patients, all patients gave a history of injury. Nine patients had initial treatment by plaster immobilization for 10 days to 2 weeks. Two patients had associated Colles' fracture treated by "K-" wire fixation elsewhere. Rest of cases was treated as just sprains elsewhere. All patients were diagnosed as chronic DRUJ instability based on their history, clinical assessment, and radiological findings.

RESULTS

Among 21 patients, 14 were males and 7 were females. The age group varied from a minimum of 21 years to a maximum of 45 years. The mean age group is 31.3 years. 10 patients had dorsal instability alone, whereas 11 patients had both dorsal and volar instability.

All presented with ulnar-sided wrist pain (or) weakness and were unable to perform their usual occupational duties. All had mild tenderness on palpation of the DRUJ, radial to the ulnar styloid dorsally and palmarly and a positive "piano key" sign. On anteroposterior translation in neutral, supination, and pronation, 11 patients had increased palmar and dorsal instability of the DRUJ as compared to opposite, uninjured wrist.

Table 1: Distribution of instability

| Instability | Bunnell-Boyes procedure (%) | Adam's procedure (%) |
|--------------|-----------------------------|----------------------|
| Dorsal | 72.7 | 20 |
| Dorsal+volar | 27.3 | 80 |

Table 2: Distribution of Mayo wrist scores

| Mayo wrist score | Bunnell's procedure | Adam's procedure |
|------------------|---------------------|------------------|
| Pre-operative | 64.1±5.8 | 85.9±8 |
| Post-operative | 62±3.5 | 86±8.8 |
| P value | 0.232 | 0.942 |

Table 3: Distribution of stability

| Stability | Bunnell-Boyes procedure (%) | Adam's procedure (%) |
|-----------|-----------------------------|----------------------|
| Stable | 81.8 | 90 |
| Unstable | 18.2 | 10 |

Table 4: Distribution of grade

| Grade | Bunnell-Boyes procedure (%) | Adam's procedure (%) |
|-----------|-----------------------------|----------------------|
| Excellent | 45.5 | 40 |
| Good | 27.3 | 40 |
| Fair | 27.3 | 20 |
| Poor | 0 | 0 |

The other 10 patients had dorsal instability only Table 1. A prominent ulnar head was noted in 8 patients. Grip strength was diminished in all patients. Supination and pronation were restricted in 6 patients, but all patients had pain at extremes of supination and pronation. Posteroanterior radiographs in neutral rotation showed widening of the DRUJ in 8 patients, but all patients had some degree of subluxation of the ulnar head compared to the uninjured side on weight bearing lateral radiographs in pronation and supination.

Bunnell-Boyes Procedure

There were no intraoperative complications. Postoperatively, one patient developed transient paresthesia and altered sensation in the distribution of the dorsal cutaneous branch of the ulnar nerve, but this resolved spontaneously a month after surgery. This was probably caused by retraction of the nerve during surgery.

Out of 11 patients, 5 patients had excellent wrist score at follow-up and 3 patients had good wrist score. Preoperatively, all patients had either fair (or) poor score. Eight patients improved in all components of the wrist score except range of supination and pronation movements which improved from fair to good rating

only Table 2. Three cases of dorsovolar instability for which Bunnell–Boyes procedure was done had only marginal improvement (fair grade) postoperatively. Out of 3 patients, 2 patients had recurrence of instability and 1 had restricted pronation and supination movements. All but two patients were satisfied with the outcome of surgery, and indicated they would undergo the surgery again if necessary.

None of the patients had radiological evidence of DRUJ widening except for the two patients who developed recurrent instability Table 3. The two patients were not willing for any further surgical procedures.

Adam's Procedure

There was no intraoperative complication. Postoperatively, patient had prolonged stiffness following post-operative immobilization for 12 weeks, having failed to return for removal of the cast at 6 weeks. He was lost to follow-up after 13 weeks.

Out of 10 patients, 4 patients had excellent wrist scores and 4 patients had good wrist score. All these patients had good stability, pain-free good range of pronation and supination movement.

In the two cases of old Colles' fracture the patients had pain during extreme range of pronation and supination movements and recurrence of instability of DRUJ during follow-up (fair grade) Table 4. Possible causes of failure in these two patients are insufficient tensioning of the graft and rupture or loosening of the graft during initial mobilization. These patients were not willing for any further surgical procedures.

DISCUSSION

Bunnell–Boyes procedure has both anatomic and physiological approach. It gives excellent results for dorsal instability, however, it is not ideal, when there is both dorsal and volar instability, as evidenced by our study results.⁵ Adam's procedure effectively reconstructs the anatomy of both dorsal and palmar radioulnar ligaments of the TFCC simultaneously. It gives better results, when there is both dorsal and volar instability. However, it is a technically demanding procedure. In their short-term follow-up, Adams and Berger (2002) reported that stability was restored in 12-14 patients with grip strength improving to 85% normal.⁶

The DRUJ is the distal articulation of the biarticulate rotational arrangement of the forearm where the ulna is fixed segment and the radius rotates around it in supination

and pronation. The peculiarity of this joint is it allows simultaneous rotation and anteroposterior translation.⁷ Stability of the DRUJ is provided by the joint surface morphology, the joint capsule, the dorsal and palmar radioulnar ligaments, the interosseous membrane, and the musculotendinous units, primarily the extensor carpi ulnaris (ECU) and pronator quadratus.^{8,9} The difference in radii of curvature of ulnar head and the sigmoid notch causes translation of ulna volarly in supination and dorsally in pronation.

Pathological instability can be acute or chronic and is a result of soft tissue injury or osseous malunion or a combination of both. Chronic DRUJ instability is a painful and disabling condition with reduced hand grip, restricted rotation of forearm and pain on axial loading.

Isolated dislocation of DRUJ is relatively rare entity described only as case studies and case series in literature. In that, the dorsal dislocation is more common than volar.

The usual mechanism for dorsal subluxation and dislocation is hyperpronation and extension, with a tightened ECU and ulnar carpal ligaments, which pull the ulnar head out through the dorsal capsule. TFCC avulsion and attenuation of the palmar radioulnar ligament also allow this dislocation.¹⁰

CONCLUSION

The goals of chronic instability of DRUJ management are to restore stability and pain-free rotation. Ligamentous reconstruction achieves these goals. The Bunnell–Boyes procedure is ideal for dorsal instability. The Adam's procedure gives better results for dorsal and volar instability.

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Surgical Outcomes of Percutaneous Nephrolithotomy in Rural Tertiary Care Hospital

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Abstract

Introduction: Percutaneous nephrolithotomy (PCNL) is the most common procedure for large renal calculus and upper ureteric stones. Outcome of the procedure varies depend on many factor such as stone features, renal anatomy, and patient characteristics. **Aim:** The aim of our study was to present our experience in PCNL and the outcome analysis.

Materials and Methods: This prospective study was conducted in 53 patients. Stone-free rates were assessed intraoperatively, on the first post-operative day, and at outpatient review using radiography. Intraoperative and post-operative complications were analyzed.

Results: Fifty-three patients who had 53 PCNL procedures of which 29 were male and 24 were female. Stone size was varying from 18 to 4.5 cm with a mean size of 3.07 cm. All the case was done in prone position only. The average operating time was 128 ± 39.03 min. Stone-free rate was 91.2%. There was no pleural injury and morbidity. Duration of mean hospital stay was 8.07 ± 2.43 days.

Conclusion: PCNL is a safe procedure for renal and upper ureteric stones. Large renal stones can also be managed by PCNL.

Key words: Complications, Percutaneous nephrolithotomy, Stone-free rate

INTRODUCTION

Urolithiasis considered to be a health-care problem due to its prevalence and recurrence. Renal stone management has evolved from open surgery to minimal invasive surgical procedures. First report of the removal of renal stones through nephrostomy by Rupel and Brown in 1941,¹ since then, there have been significant improvements in techniques, instruments, and experience. First reported percutaneous nephrolithotomy (PCNL) is by Fernström and Johansson in 1976.² Further development of the technique is greatly due to introduction of the renal endoscope and ultrasonic lithotripsy by Alken *et al.*³

European Association has considered PCNL as the first option for large, multiple, or inferior calyx stones.⁴ Open stone surgery has been largely replaced by PCNL because of its cost-effectiveness, lower morbidity, shorter operative time, and lower post-operative complications.^{5,6} PCNL is recommended for cases with stones larger than 20 mm², cases failed with extracorporeal shock wave lithotripsy (ESWL), or cases accompanied by anatomical malformation. However, PCNL does carry a risk of significant morbidity, with contemporary series describing a complication rate of 20.5%. PCNL is a gold standard procedure for upper renal tract stones.

Aim

The aim of our study was to present our experience in PCNL and the outcome analysis.

MATERIALS AND METHODS

This is a prospective study conducted in the Department of Urology at Tirunelveli Medical College. Sample

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size was 53. Patient data were collected for each case. Stone-free rates were assessed intraoperatively, on the first post-operative day, and at outpatient review using radiography. Intraoperative and post-operative complications were analyzed.

RESULTS

This is a single-center study which contributed 53 patients who had 53 PCNL procedures of which 29 were male and 24 were female. The mean age was 39.03 ± 8.92 years. Male:female ratio was 1.2:1. Four patients were diabetic and two were hypertensive. Stone size was varying from 18 to 4.5 cm with a mean size of 3.07 cm. Of these 23 left-sided stone and 30 right-sided, 32% were pelvic and 56% were calyceal calculus, 3% were staghorn calculus, 2% were upper ureteric calculus, and 7% were pelvicalyceal calculus. The lower calyx was the most common site of stone location (48.2%). Stones were multiple and bilateral in 4% of cases. All the cases were done in prone position only. The average operating time was 128 ± 39.03 min. The lower calyx was the most common site of stone location (48.2%) and puncture site (86.8%), and stone-free rate was 91.2%.

Tracts were dilated using serial dilatation and Amplatz sheath of size 28 Fr used in all cases. Calyceal puncture was infracostal in all cases, 46 (86.8%) cases lower calyceal puncture, 5 (9.4%) cases middle calyceal puncture, and 2 (3.7%) cases were converted to open pyelolithotomy. Lower calyceal puncture was done in 86.8% patients. Stone-free rate was 91.2%. After the procedure, nephrostomy and double J stenting were done in all the cases. 8 (15.1%) cases had blood transfusion and 6 (11.3%) cases had recorded post-operative complications such as fever and hematuria. There was no pleural injury and morbidity. Duration of mean hospital stay was 8.07 ± 2.43 days.

DISCUSSION

Surgical management of renal tract stone disease has evolved during the past two decades after the introduction of minimal invasive techniques such as ESWL and PCNL.⁶ PCNL has become a common procedure performed in patients with renal calculi.⁷ Since the recurrence rate for renal stones is high, these patients often need reintervention. Reports have claimed higher failure rates of PCNL in patients with prior open intervention.^{8,9} Conversely, Shah *et al.* and Margel *et al.*, in their studies demonstrated that anatomical changes after open stone surgery such as infundibulum stenosis, perinephric fibrosis, bowel displacement, and incisional hernia may decrease PCNL success rate and increase its complications.^{10,11}

Margel *et al.* and Tugcu *et al.* have also expressed that operative time was longer in patients with a history of previous open nephrolithotomy.^{11,12} PCNL is generally accepted as a safe procedure. Hemorrhage is the most frequent complication of this procedure. Excessive bleeding can occur during needle passage, tract dilatation, or nephrostomy.¹³⁻¹⁵ Accurate reporting of complications is an essential component to critical appraisal and innovation in surgery and specifically in PCNL. A standardized complication reporting methodology is necessary to enable appropriate comparisons between institutions, time periods, or innovations in technique.^{16,17} The Dindo *et al.* grading system has become widely accepted in urology and has facilitated the study of PCNL complications.¹⁸

CONCLUSION

More than 95% of patients had complete stone clearance with PCNL alone. PCNL is effective and safe procedure for calculus of more than 1.5 cm if kidney is properly accessed and calyceal system is assessed. Advantages of PCNL in comparison with surgery include cost-effectiveness, less complications, less discomfort, and increased stone-free rate.

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Anatomical Variations of the Osteomeatal Complex as a Cause of Chronic Sinusitis and Correlation with Surgical Results Following Functional Endoscopic Sinus Surgery

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Abstract

Introduction: Chronic sinusitis is the most common disease for which consultation of otorhinolaryngologist is sought. The approach to patients with chronic rhinosinusitis is endoscopic surgery which aims at removing the obstruction of the main drainage pathway. The osteomeatal complex (OMC)-based essentially on the concept that such obstruction perpetuates the sinus disease.

Aim: To study the anatomical variations of OMC in chronic sinusitis patients.

Materials and Methods: Patients with chronic sinusitis with anatomical variations were randomly selected from our outpatients department. Patients with the evidence of chronic sinusitis were treated with functional endoscopic sinus surgery. They were followed for 3 months. The patients were assessed every 2 weeks by questioning them for reduction of symptoms.

Results: The most common anatomical variation on computed tomography scan was deviated nasal septum in 62% patients, concha bullosa was found in 38% patients, while medialized uncinate narrowing OMC was seen in 30% patients, enlarged bulla was found in 12% patients, Haller cells were found in 4% patients, and agger cells were found in 2%.

Conclusion: Deviated nasal septum was the most common anatomical variation encountered in our study followed by concha bullosa.

Key words: Chronic sinusitis, Osteomeatal complex, Paranasal sinuses

INTRODUCTION

Chronic rhinosinusitis (CRS) is the most common disease for which consultation of otorhinolaryngologist is sought. The approach to patients with CRS has changed after Messerklinger published the first comprehensive account of technique of nasal endoscopy and its application to the diagnosis and treatment of sinonasal diseases.^{1,2} The endoscopic surgery aims at removing the obstruction of the

main drainage pathway - in the osteomeatal complex (OMC)-based essentially on the concept that such obstruction perpetuates the sinus disease.³ The key underlying concept behind minimally invasive functional endoscopic sinus surgery (FESS) is the OMC – the small compartment located in the region between the middle turbinate and the lateral nasal wall in the middle meatus – represents the region for drainage of anterior ethmoid, maxillary, and frontal sinuses.⁴ Obstruction of OMC causes a vicious cycle of events that lead to sinusitis. Its obstruction leads to mucosal congestion that decreases airflow and leads to further obstruction.

The role of anatomical variants in the sinusitis genesis is controversial. Theoretically, these variants could shift and compress OMC components, determining an obstruction to the paranasal sinuses (PNS) mucus drainage. Researchers

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on this theme consider that, if anatomical variants really predispose to sinusitis, one should expect that these variants were more frequently found at computed tomography (CT) in patients with sinus disease (symptomatic) than in the general population (asymptomatic).⁵⁻⁷

Aim

The aim of the study was to study the anatomical variations of an OMC in chronic sinusitis patients and to study the correlation of anatomical variations of an OMC with chronic sinusitis by relief of symptoms after correction by FESS.

MATERIALS AND METHODS

Prospective study of patients with chronic sinusitis who attended the Department of Ear, Nose, and Throat at Kilpauk Medical College Hospital. Patients with chronic sinusitis with anatomical variations were randomly selected from our outpatients department. The patients selected were subjected to diagnostic nasal endoscopy (DNE) and CT scans of PNS. Patients with evidence of chronic sinusitis were treated with FESS. They were followed for 3 months. The patients were assessed every 2 weeks by questioning them for reduction of symptoms.

Inclusion Criteria

Age 18–50 years, clinical and radiological evidence of OMC narrowing, patients with chronic sinusitis without other comorbid condition.

Exclusion Criteria

Patients with sinonasal polyposis, malignant condition of nose, patients with other medical disorder were excluded from the study. About 50 patients, who met the above criteria, were selected for the study. All these patients underwent DNE and CT-PNS.

RESULTS

Of the total 50 patients, 30 were male and 20 were female, in the age group of 18-40 years. 40% of the patients were in the age group of 18-25 years, 30% were in the age group of 26-30 years, 14% were in the age group of 31-35 years, and 16% were in the age group of 36-40 years. 76% cases belonged to the lower socioeconomic group, 30 cases belonged to middle socioeconomic group. Of the 50 cases, 36% cases were from the rural population and 64% cases from the urban population. In our study, DNE was done for all patients, 62% patients had septal deviation which was the most common anatomical variant, 52% had enlarged middle turbinate, 38% had medialized uncinate, 18% had enlarged bulla, and 28% had paradoxical middle turbinate (Figure 1). Accessory ostium which is one of the signs of

chronic sinusitis was found in 15% patients. All patients had discharge in the middle meatus while the discharge was mucopurulent in 50% of the patients; it was purulent in 28% patients and mucoid in 22% patients. CT scan of PNS showed the following variations the majority of cases had Grade I disease 54%, i.e., minimal disease limited to OMC followed by Grade II - 26%, Grade III - 14%, and Grade IV - 6% (Figure 2). The most common anatomical variation on CT scan was deviated nasal septum in 62% patients, concha bullosa was found in 38% patients, while medialized uncinate narrowing OMC was seen in 30% patients, enlarged bulla was found in 12% patients, Haller cells were found in 4% patients and agger cells were found in 2% (Figure 3). Out of the 50 patients, 44 patients (88%) had nasal obstruction, 40 patients (80%) had headache, 39 patients (78%) had post-nasal discharge, and 3 patients had loss of smell (Figure 4). All the patients had anatomical variations and signs strongly suggestive of chronic sinusitis on DNE and CT scan PNS. The patients underwent FESS by Messerklinger technique for the treatment of chronic sinusitis (Figure 5). Following clearance of sinusitis, improvement of symptoms was assessed. Out of the 50 patients, 96% showed good improvement while 2% patients showed partial improvement and 2% showed no improvement at all. Since 96% of the patients, in the study who came for the symptoms of chronic sinusitis, with variations on CT-PNS and signs of sinusitis and anatomical variations on DNE showed improvement following surgical correction, it shows that there is a strong correlation between anatomical variations of OMC and chronic sinusitis (Figure 6). The detailed anatomy of OMC as displayed by CT scan, acts as a roadmap for surgery, before endoscopic sinus surgery. Finally, since 96% of patients showed improvement after surgical correction, it is to be understood that surgical correction for chronic sinusitis with OMC variations has an important role in relieving the patients' symptoms and diseases.

DISCUSSION

The surgical management of chronic sinusitis has evolved over the years. External facial incisions, extensive nasal packing, and prolonged hospital stays have been replaced by minimally invasive surgery. This involves opening the obstructed ostia to provide normal ventilation with preservation of adjacent mucosa.^{8,9} While excellent results have been reported in literature to date,^{10,11} given the close relation of the PNS to important structures such as the orbit and skull base, if complications occur in surgery, they are usually dangerous and harmful.

Liu *et al.*, who observed the prevalence of about 81% anatomical variations in chronic rhinosinusitis cases.¹² Araújo Neto *et al.* reported relatively less anatomical variations 65% in the OMC of the CRS cases.¹³ Pérez-Piñas

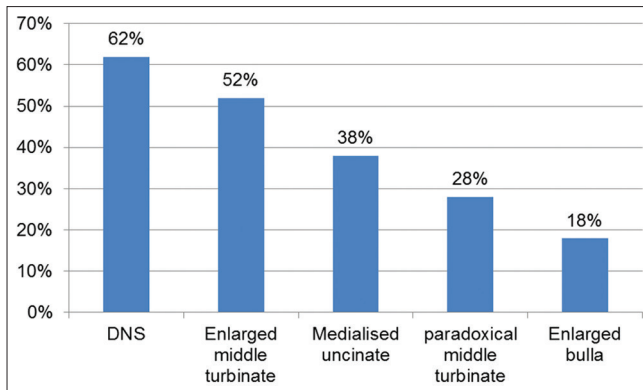


Figure 1: Anatomical variations on diagnostic nasal endoscopy

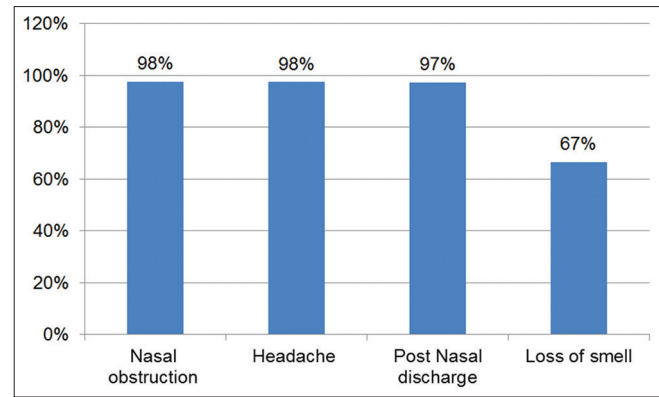


Figure 4: Improvement of symptoms

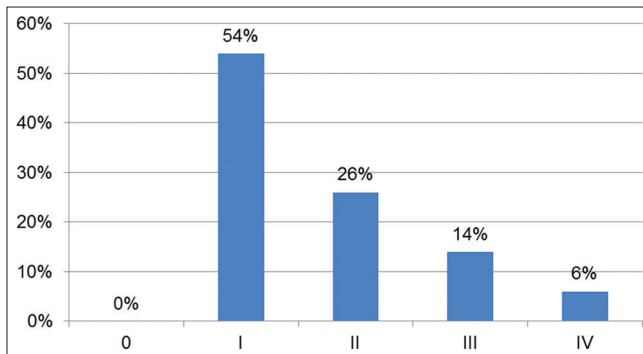


Figure 2: Computed tomography scan paranasal sinus findings

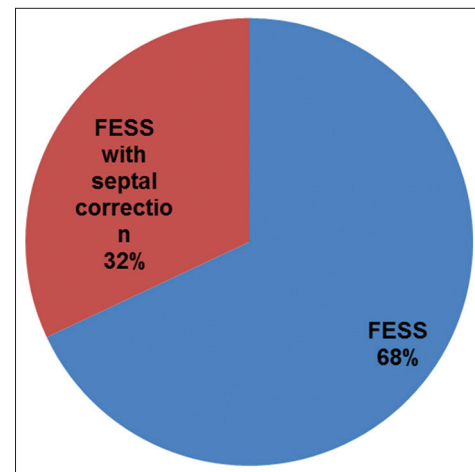


Figure 5: Surgical procedure done for the clearance of sinusitis

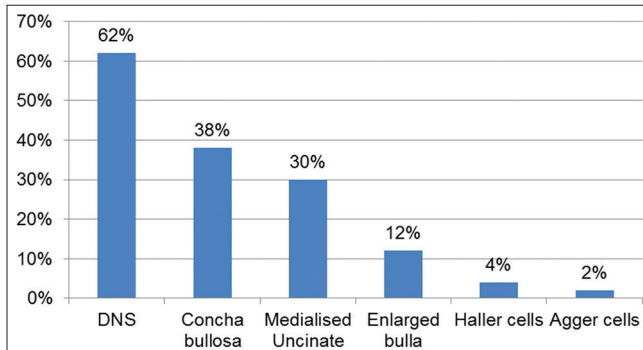


Figure 3: Computed tomography scan paranasal sinuses anatomical variations

et al. also observed the similar prevalence of anatomical variations in the chronic sinusitis cases.¹⁴

Concha bullosa (pneumatized middle turbinate) has been implicated as a possible etiological factor in the causation of recurrent chronic sinusitis. It is due to its negative influence on PNS ventilation and mucociliary clearance in the middle meatus region as quoted by Tonai.¹⁵

Zinreich *et al.*¹⁶ and Zinreich *et al.*¹⁷ described Haller's cells as ethmoid air cells found inferior to the ethmoid bulla adhering to the roof of the maxillary sinus, in continuity with the proximal infundibulum, which formed part of

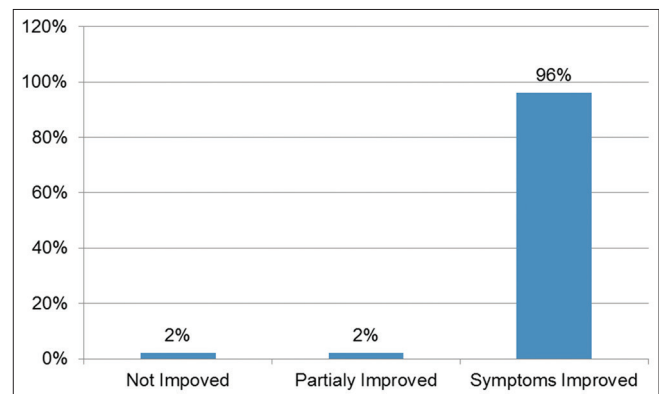


Figure 6: Result of surgery

the lateral wall of the infundibulum. They are considered as ethmoid cells that grow into the floor of orbit and may narrow the adjacent ostium of the maxillary sinus especially if they become infected.¹⁸

CONCLUSION

Deviated nasal septum, concha bullosa medialized uncinate, enlarged bulla, and in order of frequency are

the most common anatomical variants of nose and PNS, predisposing to sinusitis. Anatomical variations lead to narrowing of OMC is a major cause of chronic sinusitis. Clearance of sinusitis by FESS has a favorable effect on improving symptoms particularly major symptoms such as nasal obstruction, headache, post-nasal discharge, and loss of smell. Symptoms are improved following correction of anatomical variations by FESS suggest that there is correlation between the anatomical variation of OMC and chronic sinusitis. FESS has emerged as an effective and reliable procedure for clearance of sinusitis.

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A Study on Surgical Management of Carcinoma Stomach

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Abstract

Introduction: Cancer is known as one of the major causes leading to many disorders, death, and disabilities worldwide. Among all organ cancers, gastrointestinal tract cancers present an interesting pattern in distribution worldwide.

Aim: The aim was to study the surgical management of carcinoma stomach.

Materials and Methods: The observational cross-sectional study in patients with carcinoma stomach. Clinical examination and other relevant investigation were done.

Results: Total radical gastrectomy was performed for three cases of carcinoma stomach, two involving the body and one involving the fundus. Distal radical gastrectomy was performed for 11 patients with carcinoma of antrum. In 15 of our patients where antral growth become adherent to adjacent structures, only palliative partial gastrectomy was performed for these patients. About eight patients present with the irresectable growth of antrum causing gastric outlet obstruction, where only a palliative anterior gastrojejunostomy was done as a bypass procedure.

Conclusion: Surgery, in the form of a complete surgical resection, remains the cornerstone of management of resectable gastric adenocarcinoma. There is high level of evidence to support the role for perioperative chemotherapy as well as adjuvant chemoradiotherapy to improve the overall and recurrence-free survival in these patients.

Key words: Gastrectomy, Gastric cancer, Management

INTRODUCTION

Gastric cancer (GC) is the second most common cause of cancer-related deaths causing about 800,000 deaths worldwide/year.¹ Although its incidence is on the decline in the developed nation, it continues to be the “captain of the men of death” in developing countries. It carries bad prognosis despite the available conservative treatments and new surgical techniques. Although surgical resection with clear margins is considered the definitive treatment, rates of locoregional, or distant recurrences are still high.² The intent of treatment is “curative” for patients with Stage I-IIIC and “palliative” for patients with Stage IV disease. In patients with locally

advanced disease, surgical resection should be undertaken following neoadjuvant chemotherapy only if a complete/R0 (microscopically negative margins) resection is feasible (based on the assessment of response to chemotherapy).³ A combination of chemotherapy and radiotherapy has been very effective in certain malignancies such as head and neck cancers and anorectal cancers. The chemotherapy potentiates the effect of radiation therapy and helps in controlling distant metastasis. Pre-operative chemoradiotherapy looks attractive as it has the potential to downsize tumors and make unresectable GC resectable.⁴ While surgery is not indicated in the presence of distant metastatic disease, palliative resections may need to be undertaken in patients who have uncontrolled bleeding or gastric outlet obstruction who are otherwise well preserved with a projected longer life expectancy.⁵ A gastrojejunostomy may be helpful in patients with distally obstructing tumors with features of gastric outlet obstruction but distant metastases. In those patients with short-life expectancy, endoscopic stenting, or an endoscopically placed nasojejunal tube for feeding may be useful in patients with obstructing tumors.

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Aim

The aim was to study the surgical management of carcinoma stomach.

MATERIALS AND METHODS

The observational cross-sectional study was conducted in Department of General Surgery, Government Rajaji Hospital, Madurai. Histopathologically proven cases of carcinoma stomach were screened. Institutional Ethics Committee approval and informed consent from the patients were obtained. Thorough evaluation of these patients was done clinically, endoscopically, and radiologically, and other relevant investigations were done to arrive at a confirmatory diagnosis. Most of these patients were treated surgically with varied results. The incidence of carcinoma stomach in relation to age, sex, and site were studied. The various available investigations, the treatment modalities, and their outcomes were analyzed. All patients were followed up in the immediate post-operative period, and some were followed up thereafter, for a period ranging from 1 month to 2 years.

RESULTS

The youngest patient in our study was a 35-year-old woman with an undifferentiated carcinoma of antrum of the stomach and the oldest was an 81-year-old man with carcinoma of antrum. In our series, GC was found to be common in the fourth decade of life (38%). In our series of 50 cases, antrum forms the most common site of carcinoma stomach (68%). The next common site was body of stomach (20%). The least common site is fundus (6%). In our study, protruding type is the most common (52%) out of three types of lesions, protruding has a better prognosis than other two types. Infiltrative type carries the worst prognosis. Most of our cases with infiltrative type lesions were inoperable. Infiltrative type is least common in our series about 22% (Table 1). In our series of 50 cases, all cases were reported as adenocarcinoma (Table 2). Adenocarcinoma of stomach has been histologically subclassified as papillary, tubular, mucinous, and signet ring type. Four of our cases with diffusely infiltrative lesions were reported as signet ring type. In our study, dyspepsia is the most common clinical presentation (36%) followed by loss of weight (18%) and pain abdomen (14%).

Total radical gastrectomy was performed for three cases of carcinoma stomach, two involving the body and one involving the fundus. Distal radical gastrectomy was performed for 11 patients with carcinoma of antrum. In 15 of our patients where antral growth became adherent to adjacent structures, only palliative partial gastrectomy was performed for these patients. About eight patients present with irresectable

growth of antrum causing gastric outlet obstruction, where only a palliative anterior gastrojejunostomy was done as a bypass procedure (Table 3). Feeding gastrostomy done for five cases of advanced carcinoma of fundus extending on to cardia causing obstruction. Four of our cases present with huge growth involving entire body of stomach and become fixed to adjacent structures, where even a palliative surgery could not be possible, biopsy alone was done and closed. About four patients presented with terminal cachectic stage with secondary liver and ascites for whom a palliative chemotherapy alone given.

The shock was the cause of death in four cases. Two of our patients developed post-operative hemorrhage indicated by bloody aspirates in nasogastric tube resolves within 48 h in all cases. Two of the patients developed duodenal stump blowout which are promptly recognized and controlled with drain, which resolves with time. In our series, two patients developed dumping syndrome, which subsides within 3 months in all cases. Six of our patients developed wound infection, which subsided with antibiotics and drainage. Prophylactic antibiotics are indicated if extensive dissection or thoracotomy is done. Other complications are anastomotic leak pancreatitis, afferent and efferent loop obstruction, blind loop syndromes, malabsorption, and nutritional disturbances (Table 4). Post-operative adjuvant chemotherapy reduces the recurrence rates and prolongs survival to a certain extent. Most commonly used chemotherapeutic regimen of carcinoma stomach is 5-FAM regimen which includes 5-fluorouracil, adriamycin, and mitomycin. All patients in our series were started on post-operative chemotherapy, but only twenty patients completed the course of six cycles, and others fell out in the middle. Out of 29 cases who underwent curative resection, twenty patients were followed up to 1 year, out of which four developed local recurrence who were referred to Oncology Department for Radiotherapy and Chemotherapy. Out of seven cases who were given palliative chemotherapy alone, none has turned up for follow-up after 6 months.

DISCUSSION

The first laparoscopic gastrectomy with a Billroth II construction for cancer was performed by Kitano and published in 1994.⁶ Since then, several authors have reported successful laparoscopic subtotal or total gastrectomy, demonstrating the important post-operative advantages of this procedure. However, the role of laparoscopic surgery in the treatment of GC has not yet been defined, and doubts remain about its ability to satisfy all the oncological criteria that are met with during conventional open surgery.⁷⁻¹⁰

In prospective-randomized studies of open versus laparoscopy-assisted distal gastrectomy (LADG) for early GC,

Table 1: Distribution of macroscopic types

| Macroscopic types | Antrum | Body | Fundus | Total (%) |
|-------------------|--------|------|--------|-----------|
| Protruding | 16 | 6 | 4 | 26 (52) |
| Ulcerative | 10 | 2 | 1 | 13 (26) |
| Infiltrating | 8 | 2 | 1 | 11 (22) |
| Total | 34 | 10 | 6 | 50 (100) |

Table 2: Distribution of stages of cancer

| Stages | Antrum | Body | Fundus | Total (%) |
|--------|--------|------|--------|-----------|
| I | 16 | 4 | 2 | 22 (44) |
| II | 6 | 3 | 2 | 11 (22) |
| III | 5 | 2 | 1 | 8 (16) |
| IV | 7 | 1 | 1 | 9 (18) |
| Total | 34 | 10 | 6 | 50 (100) |

Table 3: Distribution of types of cancer

| Type of surgery | Number of cases (%) |
|--------------------------------|---------------------|
| Total radical gastrectomy | 3 (6) |
| Distal radical gastrectomy | 11 (22) |
| Palliative partial gastrectomy | 15 (30) |
| Anterior gastroduodenostomy | 8 (16) |
| Feeding gastrostomy | 5 (10) |
| Laparotomy and biopsy | 8 (16) |

Table 4: Distribution of complications

| Complication | Number of patients (%) |
|--------------------|------------------------|
| Wound infection | 6 (12) |
| Partial dehiscence | 2 (4) |
| Duodenal blowout | 2 (4) |
| Hemorrhage | 2 (4) |
| Dumping syndrome | 2 (4) |
| Shock | 4 (8) |
| Total | 18 (36) |

interim results showed that LADG had several advantages over open surgery. These included early recoveries, less post-operative pain, and better post-operative pulmonary functions, while yet maintaining the radicality of surgery.¹¹

In Japan, early-stage GC (T1/T2, N0) is considered the only indication for laparoscopic gastrectomy.¹² There is an evidence in the literature that the procedure is technically safe, recovery is faster, hospital stay is shorter, and there is less pain, as compared to the open procedure. However, data on the oncological outcome of the laparoscopic gastrectomy is limited, and high-level evidence is lacking. Good-quality multicenter-randomized controlled trials (RCTs), comparing

the outcomes after laparoscopic surgery versus open surgery is necessary to establish the role of laparoscopy in GC surgery. Laparoscopic gastrectomy has a steep learning curve, and credentialing for such procedures remains an unresolved issue.¹³ With this background, new data, even from RCTs, will have to be interpreted with caution before laparoscopic gastrectomy can be firmly established as a procedure of choice.

CONCLUSION

Complete removal of the tumor with microscopically negative margins (R0 resection) offers the best chance of survival in patients with GC. Removal of the tumor may be achieved by endoscopy or surgery, the choice depending on the extent of the tumor and nodal involvement. Chemotherapy, radiotherapy, and novel targeted therapies serve as adjunctive tools to surgery in improving survival and/or delaying recurrence of disease, whenever they are indicated.

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Acinetobacter spp. an Emerging Pathogen of Septicemia in a Tertiary Care Hospital

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Abstract

Introduction: Bloodstream infections are an important cause of patients serious morbidity and mortality worldwide. Changing bacterial flora and emergence of resistant strains further aggravate the problem. *Acinetobacter* spp. has emerged as an important pathogen. Multidrug-resistant (MDR) *Acinetobacter* has become a global threat to the seriously infected patients who critically rely on antibiotic therapy. Carbapenems remain the treatment of choice if isolates are susceptible to this antimicrobial class. Carbapenem-resistant *Acinetobacter* isolates are increasingly reported worldwide. MDR of *Acinetobacter* increasingly jeopardizes the health-care setting, and this is leading to substantial mortality and morbidity globally. The Centers for Disease Control and Prevention considers *Acinetobacter* a “serious” threat.

Methods: The study was done from September 2014 to August 2015. Blood culture of 1073 samples was processed, of which 374 were positive. The tests were done in the microbiology laboratory of the institution. Blood specimens were collected aseptically into Bactec blood culture bottles. Identification of *Acinetobacter* species was made on the basis of phenotypic criteria. Antimicrobial susceptibility was done using the disc diffusion method (modified Kirby-Bauer test).

Results: *Acinetobacter* spp. was isolated in 41 (10.96%) cases, of which *Acinetobacter baumannii* was isolated in 24 cases (58.54%), *Acinetobacter lwoffii* was isolated in 17 cases (41.46%). In the present study, *Acinetobacter* spp. sensitivity pattern to antibiotics are as follows: Imipenem was sensitive in 33 (80.48%) cases, meropenem was sensitive in 35 (85.36%), levofloxacin in 25 (62.50%) cases, and ofloxacin was sensitive in 22 (53.65%) cases. Polymyxin and tigecycline were sensitive in all cases of *Acinetobacter* septicemia.

Conclusion: *Acinetobacter* spp. is emerging as an important pathogen and developing drug resistance. Health education to be provided to the public on the dangers of indiscriminate use of antibiotics. Rational antibiotic use along with implementation of infection control policies are required for control of such infections.

Key words: *Acinetobacter* spp., Drug resistance, Emerging, Septicemia

INTRODUCTION

Bloodstream infections are an important cause of patients serious morbidity and mortality worldwide.¹ *Acinetobacter* species are the second most commonly isolated nonfermenter in human specimens. *Pseudomonas aeruginosa* is

the most common. *Acinetobacter* species ranks fourth after *P. aeruginosa*, *Staphylococcus aureus*, and *Klebsiella pneumoniae* among the most frequent hospital-acquired infectious agents.² *Acinetobacter* was considered as opportunistic pathogen of low virulence, and it has recently emerged as an important nosocomial pathogen world over, mostly involving patients with impaired host defense, especially in intensive care units, neonatal units, and surgical wards.² Changing bacterial flora and emergence of resistant strains further aggravate the problem. *Acinetobacter* spp. has emerged as important pathogens.³ *Acinetobacter* is strictly aerobic Gram-negative coccobacilli, and it is widely distributed in soil and water but also commonly found in the hospital environment. 33 genomic species of the

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Acinetobacter genus have been identified.⁴ *Acinetobacter* is a non-glucose fermenting Gram-negative bacillus, and it has emerged in the past three decades as a major etiological agent of hospital-associated infections giving rise to significant morbidity and mortality particularly in immunocompromised patients. Multidrug resistant (MDR) *Acinetobacter* has become a global threat to the seriously infected patients who critically rely on antibiotic therapy.⁵ Carbapenems remain the treatment of choice if isolates are susceptible to this antimicrobial class. Carbapenem-resistant *Acinetobacter* isolates are increasingly reported worldwide. Tigecycline, a relatively newer glycylcycline agent, has been reported to have antimicrobial activity against MDR *Acinetobacter* species. Aminoglycoside agents such as tobramycin and amikacin (AK) are used if susceptible. These agents are usually used in conjunction with another active antimicrobial agent.⁵ MDR of *Acinetobacter* increasingly jeopardizes the health-care setting, and this is leading to substantial mortality and morbidity globally.⁶ The Centers for Disease Control and Prevention considers *Acinetobacter* a “serious” threat.⁷

The aim of this study was to determine the emerging occurrence of *Acinetobacter* in septicemia and their antibiotic susceptibility pattern.

METHODS

The study was done from September 2014 to August 2015. Blood culture of 1073 samples was done, of which 374 were positive. The tests were done in the microbiology laboratory of the institution. Blood specimens were collected aseptically into Bactec blood culture bottles after cleaning proposed venepuncture sites with 70% alcohol, then povidone iodine, and finally, 70% alcohol to remove the iodine at the end of venepuncture. 5 mL of blood was collected from each patient, injected into the bottle, and transported to the microbiology laboratory for incubation in the Bactec blood culture system. Gram stain and subcultures using MacConkey and blood agar plates were done for culture bottles where growths were indicated other specimens were inoculated on MacConkey agar and blood agar and incubated at 35-37°C for 18-24 h. *Acinetobacter* species grew on MacConkey agar appearing as a non-lactose fermenter. All Gram-negative coccobacilli isolates were tested for catalase and motility. All catalase-positive, non-motile Gram-negative coccobacilli were subjected to an oxidase test. All oxidase negative organisms were inoculated into peptone broth. Gram-negative coccobacilli were identified as *Acinetobacter* spp. based on the reactions on the identification. Identification of

penicillin susceptibility, oxidase, catalase and urease activity, citrate reduction, gelatin hydrolysis, glucose and lactose fermentation, and growth at 37°C and 44°C.

Antimicrobial susceptibility was done using the disc diffusion method (modified Kirby-Bauer test). The inoculum was prepared from a suspension of the organism made by picking 2 or 3 colonies of the organism and making an emulsion of it in peptone water. This suspension was then compared against a turbidity standard (0.5 McFarland standard). Using a sterile swab stick, Mueller-Hinton agar plates were inoculated with the broth cultures. Antibiotic-impregnated discs were placed on the surface of the agar and incubated at 35-37°C for 24 h. The diameter of the zones of inhibition was measured with a calibrated meter rule and interpreted with the standard interpretative Clinical and Laboratory Standards Institute charts.

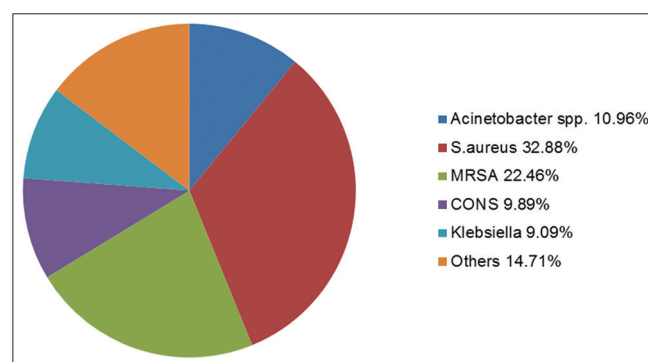


Chart 1: Isolates in septicemia

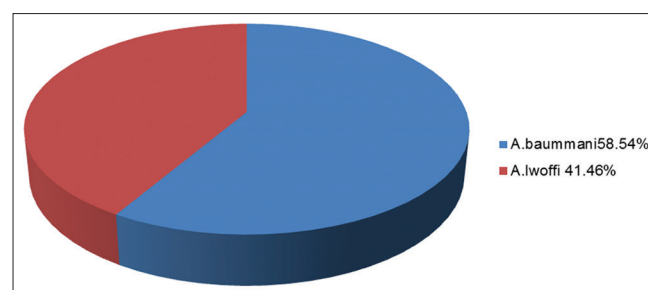


Chart 2: *Acinetobacter* spp.

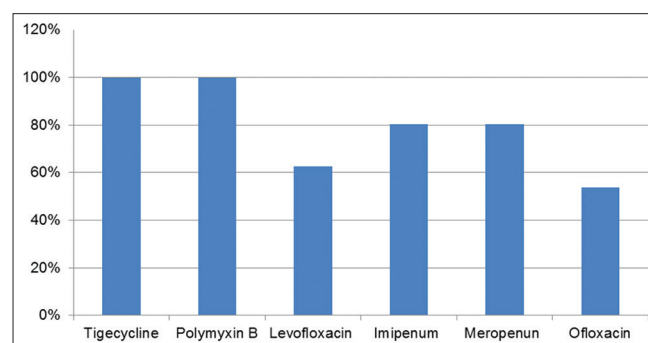


Chart 3: Antibiotic sensitivity pattern of *Acinetobacter*

RESULTS

The study was done from September 2014 to August 2015 in the Department of Microbiology of the tertiary care hospital. Blood culture of 1073 samples was done, of which 374 were positive. *S. aureus* was isolated in 123 (32.88%) cases. Methicillin-resistant *S. aureus* was isolated in 84 (22.46%) cases. Coagulase-negative *Staphylococci* was isolated in 37 (9.89%) cases Chart 1. In 34 (9.09%) cases, *Klebsiella* spp. were isolated. Other organisms were isolated in 55 (14.71%) cases Chart 2. *Acinetobacter* spp. was isolated in 41 (10.96%) cases, of which *Acinetobacter baumannii* was isolated in 24 cases (58.54%), *Acinetobacter lwoffii* was isolated in 17 cases (41.46%). In the present study, *Acinetobacter* spp. sensitivity pattern to antibiotics are as follows: Imipenem was sensitive in 33 (80.48%) cases, meropenem was sensitive in 35 (85.36%), levofloxacin in 25 (62.50%) cases Chart 3. Ofloxacin was sensitive in 22 (53.65%) cases. Polymyxin and tigecycline were sensitive in all cases of *Acinetobacter* septicemia.

DISCUSSION

The study was done from September 2014 to August 2015 in the Department of Microbiology of the tertiary care hospital. Blood culture of 1073 samples was done, of which 374 were positive. *Acinetobacter* spp. was isolated in 41 (10.96%) cases, *A. baumannii* was isolated in 24 cases (58.54%), and *A. lwoffii* was isolated in 17 cases (41.46%).

In the present study, *Acinetobacter* spp. was isolated in 41 (10.96%) cases. In a study done by Saravu *et al.*, in 2015, *Acinetobacter* spp. was isolated in 10% of cases.⁸ In a study done by Marwah *et al.*, in 2015, *Acinetobacter* spp. was isolated in 14.9%.⁹ In a study done by Nwadike *et al.*, in 2014, *Acinetobacter* spp. was isolated in 9% of cases.⁵ In a study done by Jyothi *et al.*, in 2013, *Acinetobacter* spp. was isolated in 12.2% of cases.¹⁰ In a study done by Shete *et al.*, in 2009, *Acinetobacter* spp. was isolated in 10.8% cases.² In a study done by Arora and Jaitwani in 2005, *Acinetobacter* spp. was isolated in 12.3%.³

Increasing rates of *Acinetobacter* infections may be due to lapses in infection-control practices. In these situations, “colonization pressure,” which is a function of the proportion of patients already colonized or infected with *Acinetobacter*, can affect the likelihood of cross-transmission between patients. *Acinetobacter* has been implicated in many outbreaks. *Acinetobacter*, once considered as an opportunistic pathogen of low virulence, has recently been emerged as an important nosocomial pathogen world over, mostly involving patients with impaired host defense, especially in intensive care units, neonatal units, and surgical wards.

In the present study, *A. baumannii* was isolated in 24 cases (58.54%).

In a study done by Nwadike *et al.*, in 2014, *A. baumannii* was isolated in 79% of cases.⁵ In a study done by Goel *et al.*, in 2011, *A. baumannii* was isolated in 49.44% of cases.¹¹ In a study done by Shete *et al.*, in 2009, *A. baumannii* was isolated in 84.6% of cases.² In a study done by Arora and Jaitwani in 2005, *A. baumannii* was isolated in 56.5% of cases. *A. baumannii*, in the past three decades, has emerged as a major etiological agent of hospital-associated infections giving rise to significant morbidity and mortality particularly in immunocompromised patients. In the present study, *A. lwoffii* was isolated in 17 cases (41.46%).

In a study done by Nwadike *et al.*, in 2014, *A. lwoffii* was isolated in 14% of cases.⁵ In a study done by Shete *et al.*, in 2009, *A. lwoffii* was isolated in 15.4% of cases.² In a study done by Arora and Jaitwani in 2005, *A. lwoffii* was isolated in 43.47% of cases.³

In the present study, polymyxin and tigecycline were sensitive in all cases of *Acinetobacter* septicemia. Imipenem is sensitive in 80.5% of cases. Meropenem is sensitive in 85.5% of cases. Levofloxacin is sensitive in 62.5% of cases. In a study done by Shete *et al.*, in 2009, cephalosporin resistance is observed in 81-86% *Acinetobacter* strains. MDR pattern was observed with *Acinetobacter* strains. Meropenem, imipenem, and AK were found to be the most effective drugs against *Acb* complex strains. *A. lwoffii* had shown comparatively sensitive pattern. All *Acinetobacter* strains showed 100% sensitivity to imipenem and meropenem (MERO).²

In a study done by Arora and Jaitwani in 2005, 23 *Acinetobacter* spp. isolated, all the 23 isolates were resistant to two or more antibiotics, and resistance to ampicillin (82.5%), cephalexin (69.6%), gentamicin (GEN) (66.5%), and cefotaxime (47.8%) was noted. The strains were sensitive to AK (82.6%), ciprofloxacin (CIP) (73.9%), and piperacillin (69.6%). In a study done by Marwah *et al.*, all isolates of *Acinetobacter* spp. were sensitive to polymyxin B.⁹

In a study done by Nwadike *et al.*, in 2014, *Acinetobacter* spp. Were resistant to amoxicillin clavulanate, ceftriaxone (CFN), CIP, ofloxacin, GEN, and ampicillin-sulbactam, while susceptible to MERO (64.3%), AK (50.0%), and levofloxacin (35.7%).⁵ In a study done by Gowda *et al.*, in 2014, resistance to most potent drugs for *A. baumannii*-associated infections, namely, AK, CFN, and MERO firmly increased to 50%, 71%, and 55% during the year 2009 from 21%, 42%, and 12%, respectively, during year the 2005. Resistance to AM-S fluctuated in these years maximizing in the year 2009 to 60%, and similarly the resistance rates to CIP (60%) and GEN (55%) attained peak values during the year 2009.⁶

The increasing development of multiple antimicrobial resistances in this pathogen has severely restricted the

therapeutic options available for infected patients and has increased the length of stay and mortality.

CONCLUSION

MDR *Acinetobacter* septicemia may cause severe clinical disease that is associated with a high mortality. The increase in the infection rate due to a particular pathogen may be due to lapses in infection control measures. Therefore, continuous bacteriological surveillance, implementation of infection control policies, careful disinfection of intensive care equipment, and rational antibiotic use are required to control such infections.

Acinetobacter spp. is emerging as an important pathogen and developing drug resistance. Health education be provided to the public on the dangers of indiscriminate use of antibiotics. Rational antibiotic use along with the implementation of infection control policies are required for control of such infections.

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A Study on Treatment of Recurrent Temporomandibular Joint Dislocation

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Abstract

Introduction: Temporomandibular joint (TMJ) dislocation is an uncommon but debilitating condition of the facial skeleton. The condition may be acute or chronic.

Aim: To study the surgical treatment of recurrent TMJ dislocation.

Materials and Methods: A total of 14 patients with complaints of recurrent dislocation of the TMJ were included in the study. Glenotemporal osteotomy and interposition of mastoid bone grafts (Norman technique) are done as a definite treatment of recurrent dislocation of the jaw.

Results: Of the 14 patients, 4 female and 10 male, age range between 19 and 29 years with an average of 24 years. The duration of the post-operative follow-up period was 12 months. The mean maximal mouth opening was estimated at 38 mm.

Conclusion: Chronic protracted and chronic recurrent dislocations are among the most difficult to manage. Surgical intervention is required to treat these properly.

Key words: Bone graft, Recurrent dislocation, Temporomandibular joint

INTRODUCTION

Temporomandibular joint (TMJ) is a unique, ginglymoid, diarthrodial synovial joint which is essential for the normal functions. Two features make the joint unique. This is the only joint in the body whose movements are limited not only by the muscular activity but also by the occlusion of teeth through their connection of the articulating bones. Second, left and right joints are connected by a single bone the mandible.¹ Although capable of slight bending, it is essentially a solid unit, which precludes one joint from moving independently of the other. The classification of the disorders of TMJ is

by no means comprehensive, but for practical purposes, the problems that afflict the TMJ have been divided into common and rare disorders. One of the most distressing disorders of the TMJ is chronic recurrent dislocation of the joint with a multifactorial etiology.^{2,3} Dislocation is a displacement of the condylar head completely out of the glenoid fossa, and anterosuperior to the articular eminence which usually cannot be reduced by the patient (Sir Astley Cooper, 1832).⁴ Dislocation that take place repeatedly is referred to as recurrent dislocation. A wide variety of treatment modalities has been discussed in literature broadly classified as conservative and surgical management.⁵ Although it is possible to start treating this pathology conservatively, these forms of treatment are almost always unsuccessful. Over the years a wide variety of operations have been performed that included operating on muscles, the articular capsule the articular meniscus and the condyle. At present, the most widely accepted techniques are those applied to the articular eminence. The eminence is reduced thus favoring free movement of the condyle or an eminential

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augmentation interposing graft material to prevent excess movement of the condyle. Glenotemporal osteotomy with interpositional bone graft was first described by De Norman 1984.⁶ It is an eminence augmentation procedure and is a definitive treatment for chronic recurrent dislocation of the jaw. It has been highly satisfactory of commendable simplicity, productive of excellent results and minimal morbidity.

Aim

The aim of the study was to study the surgical treatment of recurrent TMJ dislocation.

MATERIALS AND METHODS

A total of 14 patients with complaints of recurrent dislocation of the TMJ were included in the study. All of them had suffered multiple episodes of dislocation of the jaw; that needed reduction on at least five occasions. The mean duration of the recurrent dislocation was 1 year. In all patients, bilateral dislocations were reported. All patients were subjected to careful and thorough examination to establish the exact diagnosis. All the 14 patients were diagnosed as having bilateral, chronic recurrent dislocation of the TMJ clinically and radiologically. After establishing the diagnosis, the patients were placed on conservative therapy such as intake of soft diet, restricting the opening of the mouth and immobilization of the mandible by maxillomandibular fixation for a period of 3 weeks. None of the patients responded to these treatments, and they developed new episodes of recurrent dislocation. Hence, glenotemporal osteotomy and interposition of mastoid bone grafts (Norman technique) are done as a definite treatment of recurrent dislocation of the jaw.

RESULTS

Of the 14 patients, 4 female and 10 male, age range between 19 and 29 years with an average of 24 years. The duration of the post-operative follow-up period was 12 months. The mean maximal mouth opening was estimated at 38 mm. A number of the patients experienced pain, which subsided with analgesics. In 1 case, the miniplate was fractured, and a second operation was performed. In 2 cases, abscesses existed. In 1 case, although there were two surgical operations, the complaints did not subside, and steroids were injected into the joint. Permanent facial nerve paralysis was not observed in any case. Performing substantial post-operative physiotherapy prevented osteoarthritis of the TMJ dislocation. A permanent joint sound was not observed at 1 year of follow-up.

DISCUSSION

Recurrent TMJ dislocation is a common disease of TMJ. The primary treatment is the removal of the etiological factors of dislocation such as occlusion and psychological problems. Recurrent TMJ dislocations cause the surrounding tissue and bone structure to degenerate. In such a situation, conservative treatment is not successful. For the treatment of recurrent TMJ dislocation, many methods are attempted for the articular eminence, condyle or soft tissue.^{3,7}

Many surgical procedures have been advocated for treatment of hypermobility of the TMJ. Conservative approaches include limiting the excursion of the condyle, including physical therapy; splints, intra-articular sclerosing injections cause joint fibrosis and use of Botulinum type-A toxin. These treatments are rarely successful, and therefore, surgery is often indicated.⁸

According to the literature, capsulorrhaphy, meniscectomy, eminectomy, capsular ligament plaction, and shortening are useful methods for the treatment of TMJ dislocation. However, after a period of time, the dislocation can relapse. Condylectomies, mandibular shortening and ankylosis, and the downfracture of the zygomatic arch have complications, such as facial asymmetry and a limited degree of jaw movement.

After 2 years, Raja Kummoona achieved 100% success in all 7 cases of hypermobility with an average post-operative mouth opening of 32.5 mm. Medra *et al.* observed one recurrence out of 60 cases operated. The average post-operative mouth opening after 1 year was 42 mm.^{8,9}

The results of our study are quite comparable. This technique is versatile but long-term follow-up on a larger group of patients is, of course, necessary to be able to draw definitive conclusions.

CONCLUSION

When conservative treatment methods are ineffective for a recurrent TMJ dislocation, surgery is the only option. The management of TMJ dislocation is customized as per the underlying cause. Manual reduction is sufficient in case of acute dislocation. Chronic protracted and chronic recurrent dislocations are among the most difficult to manage. Surgical intervention is required to treat these properly.

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Comparative Study of Dentinal Defects after Root Canal Preparation with Hand Protaper, Continuous Rotation and Reciprocating Instruments

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Abstract

Aim: The aim of the study was to compare the root dentinal defects with Hand Protaper, continuous rotation and reciprocating instruments used to prepare root canals.

Materials and Method: 120 freshly extracted teeth were used for the study. They were divided into 3 groups with 40 teeth in each group. The root canals of teeth under group I were prepared with Dentsply Hand Protaper files while teeth under group II were prepared using Dentsply rotary protaper files, Group 3 were prepared using Reciproc system Germany. Sectioning of these teeth was done at 3, 6 and 9 mm from the apex and was evaluated for the presence of any defects.

Results: The incidence of dentinal defects was 30 % in group I, 52.5% in-group II and 40 % in-group III. In coronal third 82.5% of the teeth in group I, 70% of teeth in group II and 77.5% in group III were having Score 0. However the difference was statistically insignificant ($p=0.8918$). In middle third 87.5% of the teeth in group I, 77.5% of teeth in group II and 82.5% in group III were having Score 0. However the difference was statistically insignificant ($p=0.9323$). None of the teeth showed dentinal defects in apical third in all the three groups, however only one tooth was having score 1 in group II. A significant difference in the incidence of dentinal defects between hand and rotary pro-taper ($p=0.0410$) was observed. The reciprocating instruments showed less dentinal defects as compared to rotary pro-taper but the results were statistically insignificant ($p=0.2622$). Similarly there was no significant difference between hand versus reciprocating system ($p=0.3484$).

Conclusion: It was concluded that hand protaper files produce less number of dentinal cracks in comparison to rotary instruments, however reciprocating rotary instruments produce lesser number of dentinal defects as compared with the instruments with continuous rotation. However, for more conclusive result, a more elaborated study needs to be carried out.

Key words: Dentinal cracks, Incidence, Rotary, Reciprocating files

INTRODUCTION

The removal of the bacteria and debris along with nerve tissue from the canal, preparation of the canal, and three-dimensional obturation of root canal system are the principal for successful endodontic treatment.^[1]

Biomechanical preparation is one of the major steps toward achieving this goal. It is preferred to use rotary NiTi files over stainless steel because of its rapid canal shaping which is more centered with less chances of canal transportation.^[2,3]

The NiTi instruments are used with two types of movement: first is continuous rotating full sequence and second is reciprocating. Torsion and flexion occur with continuous rotating NiTi instruments while preparing root canals, which can lead to instrument fracture. To avoid this, reciprocating movement was proposed.^[4] This movement minimizes the stresses on instrument by counterclockwise (cutting action) and clockwise (release of instrument)

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movements.^[5] Reciprocating movement claims to mimic manual movement and reduces various risks associated with continuous rotating file systems. But reciprocating systems with small and equal Clockwise (CW)/Counterclockwise (CCM) angles have decreased cutting efficiency, thus making progression into canal more laborious.^[6]

Endodontically treated teeth have a long-term functional survival rate, but they are more prone to fracture when compared to vital teeth.^[7] Studies done in the past have shown that root fracture is not an instant event but rather gradual propagation of tiny, less pronounced craze lines in tooth structure.^[8,9,10]

The present study was conducted with an aim to compare the root dentinal defects with Hand Protaper, continuous rotation and reciprocating instruments used to prepare root canals.

MATERIAL AND METHOD

120 freshly extracted teeth were used for the study. They were divided into 3 groups with 40 teeth in each group. The root canals of teeth under group I were prepared with Dentsply Hand Protaper files while teeth under group II were prepared using Dentsply rotary protaper files and Group 3 were prepared using Reciproc system Germany. Sectioning of these teeth was done at 3,6 and 9mm from the apex and was evaluated for the presence of any defects. The scoring system was used according to the type of defects present, which is as follows:

No Defect (Score 0): Root dentin devoid of any lines or cracks where both external surface of root and internal root canal wall does not present any evident defects.

Craze line (Score 1): Line extending from outer surface into dentin but does not reach the canal lumen

Partial crack (Score 2): Line extending from canal walls into dentin without reaching outer surface

Fracture (Score 3): Line extending from root canal space all the way to outer surface of root^[11]

Using a Chi square test the incidences of root dentinal defects among various groups was computed.

RESULTS

Table 1 showed that incidence of dentinal defects was 30% in group I, 52.5% in-group II and 40 % in-group III. Table 2 showed that in coronal third 82.5% of the teeth in group I, 70% of teeth in group II and 77.5% in group III were having Score 0. However the difference was statistically insignificant ($p=0.8918$).

In middle third 87.5% of the teeth in group I, 77.5% of teeth in group II and 82.5% in group III were having Score 0. However the difference was statistically insignificant ($p=0.9323$).

None of the teeth showed dentinal defects in apical third in all the three groups, however only one tooth was having score 1 in group II.

Table 3 showed that there was a significant difference in the incidence of dentinal defects between hand and rotary protaper ($p=0.0410$). The reciprocating instruments showed less dentinal defects as compared to rotary pro-taper but the results were statistically insignificant ($p=0.2622$). Similarly there was no significant difference between hand versus reciprocating system ($p=0.3484$).

DISCUSSION

The present study was conducted with an aim to compare the root dentinal defects with Hand Protaper, continuous rotation and reciprocating instruments used to prepare root canals. The findings of our study showed that majority of the teeth in all the 3 groups were having a score 0 in both coronal and middle third with none of them showing any score in apical third except 1 teeth with a score 1 in group II. Similar results were concluded by Monga P. *et al.*^[12] Also, Versluis *et al.* also concluded that the stresses generated at 1 mm short of the apical foramen were one third of stresses at more coronal levels which might be due to an increase in taper of various files towards the coronal third.^[13]

The present study showed that 52.5% of the teeth prepared with rotary protaper system showed dentinal defects which was more than dentinal defects created by hand protaper (30%) and reciproc reciprocating system (40%) which is in accordance with the study done by Monga P. *et al.* and GambariniG.^[12,14] They found that the difference in the incidence of dentinal cracks was due to the reciprocating motion, different file design, with a shorter preparation of the root canal duration.

Reduction in dentin wall thickness is an important factor for increased fracture susceptibility. Mostly, fractures were located in apical and mid-root area, due to higher load located under cemento-enamel junction.^[15] Similar findings were shown in the present study. However, Milani *et al.*^[9] found contrary results and concluded that hand K les produced more number of defects than rotary les. In their study, they used large tapered rotary les in mandibular incisors; however, by including periodontal ligament simulation, the relative number of defects in

Table 1: Comparison of number and percentage of teeth showing defects between three study groups

| Defects | Group I (n=40) Hand protaper system (%) | Group II (n=40) Rotary pro-taper system (%) | Group III (n=40) Reciproc reciprocating system (%) |
|---------|--|--|---|
| Present | 12 (30) | 21 (52.5) | 16 (40) |
| Absent | 28 (70) | 19 (47.5) | 24 (60) |
| Total | 40 (100) | 40 (100) | 40 (100) |

Table 2: Comparison of percentage of teeth in various study groups showing dentinal defects at various third of the roots

| Dentinal damage | Group I (n=40) Hand protaper system (%) | Group II (n=40) Rotary pro-taper system (%) | Group III (n=40) Reciproc reciprocating system (%) | P value |
|------------------|--|--|---|----------|
| At coronal third | | | | |
| Score 0 | 33 (82.5) | 28 (70) | 31 (77.5) | P=0.8918 |
| Score 1 | 4 (10) | 6 (15) | 4 (10) | |
| Score 2 | 2 (5) | 4 (10) | 4 (10) | |
| Score 3 | 2 (2.5) | 2 (5) | 1 (2.5) | |
| At middle third | | | | |
| Score 0 | 35 (87.5) | 31 (77.5) | 33 (82.5) | P=0.9323 |
| Score 1 | 3 (7.5) | 5 (12.5) | 5 (12.5) | |
| Score 2 | 1 (2.5) | 2 (5) | 1 (2.5) | |
| Score 3 | 1 (2.5) | 2 (5) | 1 (2.5) | |
| At apical third | | | | |
| Score 0 | 0 (0) | 0 (0) | 0 (0) | - |
| Score 1 | 0 (0) | 1 (2.5) | 0 (0) | |
| Score 2 | 0 (0) | 0 (0) | 0 (0) | |
| Score 3 | 0 (0) | 0 (0) | 0 (0) | |

Table 3: Level of significance between different groups

| Group comparison | Chi square (χ^2) | Degree of freedom (df) | P value | Level of significance |
|----------------------------------|-------------------------|------------------------|---------|-----------------------|
| Hand vs rotary protaper | 4.178 | 1 | 0.0410 | Significant |
| Hand vs reciprocating | 0.879 | 1 | 0.3484 | Insignificant |
| Rotary protaper vs Reciprocating | 1.257 | 1 | 0.2622 | Insignificant |

the rotary group was low and the difference was not significant.

The limitation of the present study was that different teeth among both the jaws with different root dentin thickness were not compared which could show significant differences in results due to change in strength and response to stresses during preparation of the canals. The duration of preparation was also not considered. Further studies with standardized protocols will provide better results.

CONCLUSION

It was concluded that hand protaper files produce less number of dentinal cracks in comparison to rotary instruments, however reciprocating reotary instruments produce lesser number of dentinal defects as compared with the instruments with continuous rotation. However, for more conclusive result, a more elaborated study needs to be carried out.

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Assessment of Oral Hygiene Behavior during Fixed Orthodontic Treatment in Patients Visiting Indira Gandhi Government Dental College, Jammu

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Abstract

Objective: To assess oral hygiene behavior among patients undergoing fixed orthodontic treatment.

Material and Method: One hundred orthodontic patients (37 males and 63 females) undergoing fixed orthodontic treatment in the Department of Orthodontics Indira Gandhi Government Dental College, Jammu were studied. Patients were asked to fill the provided questionnaire regarding the reason for opting orthodontic treatment, oral hygiene behavior after placement of fixed orthodontic appliances. The result was statistically analyzed using SPSS software version 20 for interpretation of data.

Results: Most of the patients used orthodontic toothbrush and fluoridated toothpastes to maintain oral hygiene but frequency of brushing for majority of the subjects was only once. Majority of the females used interdental brush and floss (57.14% and 33.33% respectively) regularly whereas majority of the males (78.37%) used mouthwash as a supplemental oral hygiene aid. There was no statistically significant gender difference with the selection of oral hygiene products.

Conclusion: Patients undergoing fixed orthodontic treatment are required to be educated and motivated to maintain their oral health. Orthodontists should emphasize on increasing the awareness of the patients towards maintaining oral hygiene with various oral hygiene measures to prevent dental caries and periodontal disease during fixed orthodontic treatment.

Key words: Fixed Orthodontic treatment, Oral hygiene behavior, Orthodontics, Jammu

INTRODUCTION

Patient undergoes orthodontic treatment to enhance esthetics, function, and increase self esteem. However, fixed orthodontic therapy is often associated with various risk factors like white spot lesions (enamel demineralization), tooth decay, marginal gingivitis, gingival enlargement. Studies done in the past have shown that orthodontic therapy can lead to respective risk factors.^[1,2] Excessive plaque retention adjacent to brackets and attachments is the cause of this white spot lesion.^[3]

One of the major and most common challenges in prevention within the field of oral health is the control of plaque and, consequently, the control of dental caries and gingival inflammation.^[4]

Fixed orthodontic appliances with bands, coils, elastics, or- thodontic archwires, and direct bonding of brackets influence the accumulation of dental plaque.^[5,6]

Various studies evaluated and compared the effectiveness of various plaque elimination methods like manual or electric toothbrushes on plaque elimination for patients undergoing orthodontic treatment,^[7-10] whereas some of them evaluated the efficiency of toothpastes and mouthwashes with different ingredients, on gingival health and plaque elimination.^[11-16]

Hence, it is a challenge for the orthodontist to maintain proper oral hygiene in patients undergoing fixed orthodontic

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treatment to prevent various risk factors associated with the accumulation of dental plaque. Thus the purpose of the present study is assessment of oral hygiene behavior among patients undergoing fixed orthodontic treatment.

MATERIALS AND METHOD

One hundred orthodontic patients (37 males and 63 females) undergoing fixed orthodontic treatment in the Department of Orthodontics Indira Gandhi Government Dental College, Jammu were studied. Patients were asked to fill the provided questionnaire regarding the reason for opting orthodontic treatment, oral hygiene behavior after placement of fixed orthodontic appliances. The result was statistically analyzed using SPSS software version 20 for interpretation of data. The questions regarding the selection of toothbrush, toothpaste and supplemental oral hygiene products, frequency of brushing and oral hygiene education, as received from orthodontist.

RESULTS

The results of our study showed that out of total 100 subjects undergoing fixed orthodontic treatment majority of the males and females (54.05% and 55.5% respectively) chose orthodontic toothbrush to maintain oral hygiene, followed by 21.6% males and 23.8% females choosing ultrasoft tooth brush (Table 1). The results of our study showed that 45.94% males and 52.38% females used to brush once a day followed by 32.43% males and 30.15% females who used to brush twice a day. A lesser percentage of 21.6% and 17.46% of males and females used to brush after every meal (Table 2). Table 3 shows that 78.4% of males and 74.6% females used fluoridated toothpaste in comparison with 21.6% males and 25.4% females who used non-fluoridated toothpastes. Table 4 shows that during orthodontic treatment, majority of the females i.e. 57.14 % used interdental brush regularly whereas 37.8% of males use interdental brush occasionally.

DISCUSSION

Orthodontic treatment helps to improve the patient's self esteem, facial aesthetics and masticatory functions. [17,18]

In spite of various advantages of fixed orthodontic appliances they were found to contribute towards increased plaque accumulation and if proper oral hygiene measures were not implemented it will lead to gingivitis, dental caries, and halitosis. [19,20]

In the present study, majority of the males and females used orthodontic toothbrush, which is in accordance

Table 1: Oral hygiene behavior on basis of selection of toothbrush

| Selection of tooth brush | Males (%) n=37 | Females (%) n=63 |
|--------------------------|----------------|------------------|
| Ultra Soft tooth brush | 8 (21.6) | 15 (23.8) |
| Medium | 7 (18.9) | 10 (15.87) |
| Hard | 2 (5.40) | 3 (4.76) |
| Ortho | 20 (54.05) | 35 (55.5) |

$P=0.9768$ (statistically insignificant)

Table 2: Oral hygiene behavior on basis of frequency of brushing

| Frequency of brushing | Males (%) n=37 | Females (%) n=63 |
|-----------------------|----------------|------------------|
| Once | 17 (45.94) | 33 (52.38) |
| Twice | 12 (32.43) | 19 (30.15) |
| After every meal | 8 (21.6) | 11 (17.46) |

$P=0.8008$ (statistically insignificant)

Table 3: Oral hygiene behavior on basis of frequency of brushing

| Selection of tooth paste | Males (%) n=37 | Females (%) n=63 |
|--------------------------|----------------|------------------|
| Fluoridated | 29 (78.4) | 47 (74.6) |
| Non- Fluoridated | 8 (21.6%) | 16 (25.4) |

$P=0.6696$ (statistically insignificant)

with the findings of study done by Anuwongnukroh N *et al.* [21] However certain studies showed conflicting results regarding the effectiveness of the orthodontic toothbrush in reducing plaque when compared with conventional toothbrush. [22,23]

The results of our study showed that majority of the males and females brush only once a day which is contradictory with the findings of Anuwongnukroh N *et al.* [21] who found that majority of the subjects (44.8%) brushed their teeth twice a day, while the remaining brushed more than twice. Our study showed that majority of the subjects used fluoridated tooth pastes which is in agreement with other studies like 82% of the patients in one of the study used fluoridated toothpaste, whereas 6.7% of the samples did not use fluoridated toothpaste. [21] The results of the present study showed that majority of the females used interdental brush and dental floss regularly as a supplemental oral hygiene aid whereas males used mouth wash more in comparison to other supplemental oral hygiene products. [24-28]

The studies done with the use of oral irrigator are very sparse and further studies are required to prove its efficacy.

As fixed orthodontic treatment reduces the efficiency of the patient to maintain oral hygiene, it is important for the orthodontist to give proper education regarding the use of oral hygiene aids and maintain the oral hygiene properly.

Table 4: Oral hygiene behavior on basis of usage of supplemental oral hygiene products

| | Interdental brush | | Dental floss | | Mouth wash | | Oral irrigator | |
|----------------|-------------------|---------------------|-------------------|---------------------|-------------------|---------------------|-------------------|---------------------|
| | Males (%) n=37 | Females (%) n=63 | Males (%) n=37 | Females (%) n=63 | Males (%) n=37 | Females (%) n=63 | Males (%) n=37 | Females (%) n=63 |
| Regular use | 13 (35.13) | 36 (57.14) | 11 (29.7) | 21 (33.33) | 29 (78.37) | 37 (58.73) | 0 (0) | 0 (0) |
| Occasional use | 14 (37.8) | 15 (23.8) | 13 (35.13) | 20 (31.7) | 6 (16.2) | 15 (23.80) | 0 (0) | 0 (0%) |
| No use | 10 (27.02) | 12 (19.04) | 13 (35.13) | 22 (34.9) | 2 (5.4) | 11 (17.5) | 0 (0) | 0 (0) |

CONCLUSION

Patients undergoing fixed orthodontic treatment are required to be educated and motivated to maintain their oral health. Orthodontists should emphasize on increasing the awareness of the patients towards maintaining oral hygiene with various oral hygiene measures to prevent dental caries and periodontal disease during fixed orthodontic treatment.

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The Incidence of Occlusal Disturbances and its Causes in Complete Denture Patients

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Abstract

Aim: The aim of the present study is to evaluate the incidence of occlusal disturbances and its various causes in the Complete Denture patients.

Materials and Methods: 120 patients aged 60 years and above visiting the OPD District Hospital, Kathua, J&K for occlusion related problems were selected for the study. Patient's clinical record was accessed for the detailed data of subjects like age, gender, ridge relationship, occlusal scheme. The performance of a clinical remount from patients' treatment records was also evaluated. A calibrated examiner trained for specific purpose determined the presence of occlusal disturbance. The incidence of occlusal disturbance was noted and the role of the factors causing it was evaluated and analyzed using Chi-square analysis. The results were considered significant at $p < 0.05$.

Results: Out of 107 patients, 31 patients (28.8%) showed occlusal disharmony. No statistically significant relationship was found between occlusal disharmony and age, gender, ridge relationships, or occlusal scheme ($p < 0.5$). Twenty-five (81%) out of 31 complete dentures with occlusal disharmony were not clinically remounted. There was a highly significant relationship between the absence of clinical remounting and occlusal disharmony ($p < 0.001$).

Conclusion: Within the limits of this study, the prevalence of occlusal disharmony was noticeable. A randomized clinical trial is strongly recommended to investigate factors related to the incidence of occlusal disharmony.

Key words: Complete denture, Occlusal disturbance, Prosthodontics, Incidence

INTRODUCTION

Complete dentures are prosthetic replacements which are fabricated to restore impaired functions and appearance. Fabrication of complete dentures comprises clinical and laboratory procedures, whose precise execution is of crucial importance for achieving success.^[1]

Historically complete denture prosthodontics has been at the forefront of the study of occlusion and many of the

terms used in occlusion have their origin in this subject. The reason that occlusion has always been a consideration in the provision of removable complete prosthetics is because the adoption of good occlusal practice has a significant and immediate impact on the overall success of the treatment, as it affects denture stability. If an inappropriate occlusion is built into a denture then the patient will be unlikely to be able to accommodate to that denture and the dentist will be immediately aware that the treatment has been unsuccessful. The reason why the correct distribution of occlusal forces is so important in the design of removable prosthetics is because the prosthetic teeth that provide the occlusion are not directly attached to the patient.^[2]

Fabrication of dentures involves many separated but related procedures regardless of the techniques or instruments used for making impression, making jaw relation records, arranging teeth in balanced occlusion and processing the

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dentures. An error in any one of the procedure contribute to error in the occlusion of complete denture. The inaccuracies of the material and methods used to fabricate dentures at this stage must be recognised and eliminated before the patient wears the denture. These errors can result of:

- Technical errors or errors made by the dentist.
- Technical errors developed during the laboratory procedures.
- Inherent deficiencies of the materials used in the construction of the dentures.

The occlusal errors may result from variety of reasons including change in state of health of temporomandibular joints, inaccurate maxillomandibular relation record made by the dentist, errors in transfer of the maxillomandibular relation records to the articulator, ill-fitting temporary record bases, failure to use facebow and subsequently changing the vertical dimension on the articulator, incorrect arrangement of posterior teeth. [3]

Good-quality dentures with a harmonious occlusion lead to patient satisfaction with their dentures as well as with the high level of masticatory performance and efficiency. Such patients adapt to their dentures much faster than individuals with occlusal disharmony. [4567]

Variety of reasons may be responsible for occlusal disturbances, which are also sparsely documented in literature; hence the present study is conducted to determine the incidence of occlusal disturbances in centric relation and its associated reasons.

MATERIALS AND METHODS

120 patients aged 60 years and above visiting the OPD of District Hospital, Kathua, J&K for complete denture were included in the study. Patient's clinical record was accessed for the detailed data of subjects like age, gender, ridge relationship, occlusal scheme. The performance of a clinical remount from patients' treatment records was also evaluated.

A calibrated examiner trained for specific purpose determined the presence of occlusal disturbance.

Inclusion Criteria

Subjects who were delivered with a complete denture and then were introduced into the study no more than 15 days after placement of their new dentures.

Exclusion Criteria

Subjects with removable partial dentures, immediate dentures, over dentures, implant-assisted prosthetics.

In order to locate the occlusal contacts, a remounting procedure was done for each complete denture. Clinical Remount is defined as a procedure where occlusal refinement is carried out on the articulator after remounting the dentures with new records obtained from the patient. [8]

The orientation jaw relation that orient the mandible to the cranium in such a way that when mandible is kept in its most posterior position, the mandible can rotate in sagittal plane around an imaginary transverse axis passing through or near the condyles was evaluated using the facebow. [9] The mandibular denture was stabilized by placing both index fingers of the operator intraorally on the buccal flanges and the thumbs placed extraorally on the chin while guiding the mandible into centric relation. Centric relation was recorded using bite registration material (Jet Bite- Coltene). Maxillary and mandibular complete dentures were then mounted on a articulator (Hanau H2).

40 micron articulating paper (Bausch Arti Check) was used to evaluate actual contact of the teeth by tactile sensation.

Occlusal disturbance or disharmony is defined as the absence of simultaneous bilateral contacts of the opposing posterior teeth in centric relation of the jaws. The total numbers of occlusal contacts for each complete denture were measured, and less than three occlusal contacts between the left and right posterior teeth are considered to constitute occlusal disharmony.

The ridge relationships (Classes I, II, and III) and the occlusal schemes were observed extraorally on the articulator.

Statistical Analyses

The incidence of occlusal disturbance was noted and the role of the factors causing it was evaluated and analyzed using Chi- square analysis. The results were considered significant at $p < 0.05$.

RESULTS

This study was conducted on 120 completely edentulous subjects wearing complete dentures among which 58 (48.33%) were males and 62 (51.66%) were females. The age groups considered for the study were less than and greater than 60 years. Table 1 showed that out the 120 subjects, 61.4% subjects with occlusal disturbance absent were less than the age of 60 years whereas 38.6% of the subjects were 60 years and above. In subjects showing occlusal disturbance, 62% were below 60 years of age and 37.8% were in the age group of 60 years and above. There was no statistically significant relationship between occlusal disharmony and age of the subjects.

Table 2 showed that out of the total male and female subjects, 51.4% males and 48.6% females showed occlusal disturbance where as 46.98% males and 53.01% females showed no occlusal disturbance. There was no significant relationship between occlusal disharmony and gender of the subjects.

Table 3 showed that out of the subjects who showed no occlusal disturbance, 67.5% were having class I ridge relationship and 32.5% were with class II and class III ridge relationship. Similarly in patients with occlusal disturbance present 72.97% were having class I ridge relationship and 27.02% showed class II and class III ridge relationships. No significant relationship was found between ridge relationship and occlusal disharmony.

Table 4 showed that out of the subjects, who were without any occlusal disturbance, 73.5% were with anatomic occlusal scheme and 26.5% were with semi and non anatomic occlusal scheme. Similarly in patients with occlusal disturbance present 64.8% were having anatomic occlusal scheme and 35.13% were with semi and non anatomic occlusal scheme. There was no significant relation between occlusal disharmony and occlusal scheme.

Table 5 showed that a clinical remount procedure was performed for 81(67.5%) patients, while the remaining

39 (32.5%) had no remount procedure done. Of 37 cases with occlusal disharmony, 4 (10.81%) were in the remounted group, whereas 33 (89.1%) were in the group of patients with no clinical remount performed. This demonstrates a highly significant relationship between the absence of clinical remount and occlusal disharmony ($p=0.0000$).

DISCUSSION

In the present study, 120 subjects were evaluated to find the incidence of occlusal disturbances and its various causes in the Complete Denture patients. The occlusion of complete dentures given to the patients were assessed using a clinical remount procedure to adjust the occlusion of the dentures after fabrication in the lab, which prevents irreversible damage to the supporting tissues to the supporting tissues.

The present study showed a statistically highly significant relationship between occlusal disturbance and the absence of the clinical remount procedure ($p=0.000$), which is in accordance with the results of various studies.^[10-15] However, our study is not in agreement with the studies done by Wilson and Rees and Firtell *et al.*^[12,15] wherein they showed the use of articulating paper between the occlusal surfaces of complete dentures.

Various authors have stated that the clinical remount procedure results in a highly significant improvement in the comfort of upper dentures and better fit of lower dentures.^[16,17]

The results of our study are in accordance with the study done by Atashrazm P. *et al.*, factors such as age, gender, ridge relationships, and occlusal scheme or posterior

Table 1: Distribution of occlusal disturbances in terms of age

| Contributing factors | Occlusal disturbance present (%) <i>n</i> =37 | Occlusal disturbance absent (%) <i>n</i> =83 | <i>P</i> value |
|----------------------|--|---|----------------|
| Age | | | |
| <60 years | 23 (62) | 51 (61.4) | $P=0.9625$ |
| 60 years and above | 14 (37.8) | 32 (38.6) | |

Table 2: Distribution of occlusal disturbances in terms of gender

| Gender | Occlusal disturbance present (%) <i>n</i> =37 | Occlusal disturbance absent (%) <i>n</i> =83 | <i>P</i> value |
|--------|--|---|----------------|
| Male | 19 (51.4) | 39 (46.98) | $P=0.6587$ |
| Female | 18 (48.6) | 44 (53.01) | |

Table 3: Distribution of occlusal disturbances in terms of ridge relationship

| Ridge relationship | Occlusal disturbance present (%) <i>n</i> =37 | Occlusal disturbance absent (%) <i>n</i> =83 | <i>P</i> value |
|------------------------|--|---|----------------|
| Class I | 27 (72.97) | 56 (67.5) | $P=0.5466$ |
| Class II and Class III | 10 (27.02) | 27 (32.5) | |

Table 4: Distribution of occlusal disturbances in terms of occlusal scheme

| Occlusal scheme | Occlusal disturbance present (%) <i>n</i> =37 | Occlusal disturbance absent (%) <i>n</i> =83 | <i>P</i> value |
|-----------------------|--|---|----------------|
| Anatomic | 24 (64.8) | 61 (73.5) | $P=0.3369$ |
| Semi and non anatomic | 13 (35.13) | 22 (26.5) | |

Table 5: Distribution of occlusal disturbances in terms of clinical remounting of CD

| Clinical remount | Not present (%) <i>n</i> =83 | Present (%) <i>n</i> =37 | <i>P</i> value |
|------------------|---------------------------------|-----------------------------|----------------|
| Performed | 77 (92.77) | 4 (10.81) | 0.0000** |
| Not performed | 6 (7.22) | 33 (89.18) | |

**Highly significant

occlusal forms were not significantly associated with occlusal disharmony.^[10]

Firtell *et al.* also concluded that the absence of a clinical remount procedure introduced most of the oral damage, and different occlusal forms were not significant.^[12]

The limitation of the current study is that the study was conducted on the basis of centric relation position of the jaws and eccentric interferences were not taken into consideration. More over the use of pressure indicator paste or newer methods of measuring occlusal disturbances like T scan could have been done. Therefore, other studies overcoming these drawbacks should be conducted in future

CONCLUSION

Within the limits of this study, the prevalence of occlusal disharmony was noticeable. A randomized clinical trial is strongly recommended to investigate factors related to the incidence of occlusal disharmony which overcomes the shortcomings of the present study.

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Lip Augmentation Using Dermal Fascia Graft in Unilateral Cleft Lip Patient - A Case Report

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Abstract

Ideally, augmentation of lips is essentially done in patients with various congenital deformities, namely, cleft lip, trauma, and aging where lips undergo volume, length, color transformation, and decrease of structural components, leading to decreased pouting, vermilion inversion, and ptosis. There are various filling and non-filling lip augmentation techniques. However, no systematic review is currently available regarding the efficacy of one particular technique. Hence, this paper puts forth a case of lip augmentation in unilateral cleft lip patient done using dermal fascia graft at our hospital, thereby providing encouraging results. Local Anaesthesia (LA) with adrenaline injected into the subcutaneous tissue. Elliptical incision given in the iliac site (donor), skin excised, and dermal fascia harvested and grafted into the deformed lips (recipient). Vertical mattress sutures placed using 4-0 Vicryl and pressure dressing placed in donor and recipient sites. Post-operative result was highly encouraging rendering good longevity, low complication rate with optimal functional, and esthetic result. The success rate in lip augmentation can be determined by anthropometric measurements, patient satisfaction, and complication rates. This lip augmentation procedure using dermal fascia graft has good longevity and least possible complications, thereby helping the cosmetic surgeon to achieve consistent and reliably good results which are also simple and safe.

Key words: Dermal fascia graft, Lip augmentation, Unilateral cleft lip

INTRODUCTION

When images of the human body are shown to observers, attention to the face is much greater (73%) than to other anatomical parts (Massaro *et al.*, 2012). The correct identity recognition rate solely by viewing the lips is >98% (Liu *et al.*, 2012). In case of unilateral cleft lip patients, there is an absence of philtral ridge on the cleft side, vertical shortening of margins, thinning of vermilion on the cleft side, blurring of white roll in vicinity of the cleft, decreased volume, decreased length, and so on. Many techniques are currently being used for lip augmentation in cleft lip cases post lip repair, and the best technique is yet to be determined¹. Two groups of surgical procedures that assure labial

augmentation and vermilion eversion are currently enjoying increasing popularity, one without volume addition, i.e. non-filling procedures for lip augmentation (FPLAs), namely, the direct lip lift (DLL), in DLL (ILL), corner of the mouth lift, the VeY lip advancement, and the other employing volume addition using FPLAs, namely, implantation of synthetic biomaterials as silicone microdroplets, textured microparticles, polytetrafluoroethylene sheets or polymethylmethacrylate microspheres, implantation of semisynthetic fillers such as bovine collagen, grafting of autologous tissue such as fat, dermis, temporoparietal fascia, palmaris longus tendon, and the latissimus dorsi strip graft² but none of it is full proof with added disadvantages such as high cost, graft resorption, persistent numbness of lips, local flaps work well to improve the ratio between vermilion, and white roll (elongated upper lip), but the bulking effect is not retained as edema resolves. Implants, on the other hand, provide a permanent result but are prone to complications such as infection, migration, or extrusion³. Hence, we present a case of lip augmentation in unilateral cleft lip patient using dermal fascia graft which is reliable and long-standing⁴.

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CASE REPORT

A 18-year-old female patient reported to our hospital with a chief complaint of deformed upper lip and wanted to get it rectified. The patient informed us that she had previously undergone cleft lip repair 17 years back and the deformity of the lip is present since then as also confirmed by the bystanders of the patient. No other relevant medical or dental history was present. General physical examination was noncontributory.

Extraoral examination revealed vermillion notching which was centrally located, thereby rendering a “whistle deformity” appearance, decreased volume of upper lip, discrepancy in the heights of cupid bow with respect to cleft and noncleft sides, deficiency in the height of lateral vermillion on the cleft side, white roll malalignment, and a surgical scar extending from alar base to vermillion border of upper lip on the left side. The lateral view confirmed the decreased lip volume with retruded appearance. The intraoral examination was noncontributory to the chief complaint of the patient. After proper evaluation of the patient, we concluded with the diagnosis of secondary deformity of the upper lip in the left unilateral cleft lip and planned for a surgical intervention of augmenting the lip using dermal fascia graft. The patient underwent a pre-surgical preparation consisting of complete hemogram, serology, physician, and anesthetic evaluation and was posted for surgery (Figure 1).

Technique

Under general anesthesia, the patient was painted and draped. Local anesthesia was administered adequately in the iliac crest region to facilitate hydrodissection. Skin markings were done, elliptical incision is placed in the donor site, and skin is excised. Fascia lata is harvested. Excess fat is removed from the graft. The recipient site, i.e. the lip is prepared and markings done. Two vertical incisions are placed on either sides of the deformity and tunneling is done. The graft is then tunneled into place with the use of a mosquito clamp, providing a small excess, to prevent a “bow-string effect” when the patient smiles, and then, it is adjusted until the desired result is achieved. The operation ends with the final closure of the donor and the recipient sites using 4-0 Vicryl. The procedure went uneventful with no intraoperative complication. It lasted for the duration of 1 h and 34 min. The patient was thereafter extubated and shifted to post-operative ward for recovery (Figures 2 and 3).

Postoperatively, the patient was under routine antibiotic and analgesic coverage for 5 days. The patient was evaluated clinically by the surgeons and another independent observer on 1 month, 6 months, and 1 year post-surgery to check



Figure 1: Pre-operative photo showing whistle deformity



Figure 2: Harvesting of graft



Figure 3: Tunneling of lips for augmentation

for the functional and esthetic outcomes and also to look for complications (if any). Vertical height measurements were done at 3 locations: From white roll to inferior free margin at the non affected cupid's bow point (a), midline



Figure 4: Post-operative photo

on the upper lip (b), and affected cupid's bow point (c) in unilateral cleft lip at every visit and was compared to the pre-operative measurements and was found to be satisfactory. Two independent observers confirmed with the esthetic results and remarked it as "Good appearance."

Follow up Outcomes

No signs of dehiscence, infection, persistent numbness, and graft resorption were noted in the surgical sites (recipient and donor) on 1st, 6th, and 12th-month follow-ups. Hence, both sites were healthy with least donor-site morbidity. However, mild swelling and erythema were noted immediately postoperatively which resolved after 5 days of surgery.

Esthetically, the upper lip looked youthful, pouty, and voluptuous. No vermillion notching, asymmetry, and volume deficit was noted.

Functionally, the motion of upper lip was acceptable and well-formed upper lip was noted when she smiled or blew a whistle (Figure 4).

DISCUSSION

Cleft lip and palate is a congenital defect with an incidence rate of about 1:639 in India (Survey conducted by Christian Medical College, Vellore), and about 75% cases are unilateral clefts. There are various techniques for the management of unilateral cleft lips with Millard's rotation and advancement technique being most popular among all⁵. In our center,

we use Millard's rotation and advancement technique with Noordhoff modification⁶ to avoid vermillion notching post lip repair. Unfavorable results after lip repair such as whistle deformity and volume deficit might occur due to inadequate rotation of the medial flap, inversion of sutured edges, orbicularis oris marginalis muscle deficiency, and straight line scar contracture⁶. Improvement of this area has recently become the focus for new enhancement techniques, but no technique whether filling or non-filling is definite. The fact that many techniques are described for lip augmentation suggests that no single procedure is completely satisfactory. The ideal filler would be stable, remain soft, and maintain its original volume which is achieved in our technique⁷. Residual defects, namely, lip asymmetry, vermillion notching, and volume deficits were adequately addressed by us with this technique, thereby providing encouraging results. However, due to lack of control group and small sample size, it is difficult to analyze the versatility of this technique in comparison to other known techniques with the assertion.

CONCLUSION

A beautiful lip is one that is pleasing to the eye when viewed in isolation. Since the beginning of recorded time, man has considered the lips to be a key feature of facial appearance, beauty, and dynamics. With our experience, dermal fascia graft for lip augmentation in case of whistle deformity and volume deficit is one of the safest, reliable, and long-standing procedures that can be recommended to all cosmetic and cleft surgeons for the future use.

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