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SHORT COMMUNICATION

Primary Eosinophilic Gastrointestinal Disorders: An Update of Presentations
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Plasma Cystatin C as Marker of Early Renal Impairment in Diabetes Mellitus

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Abstract

Background: The presence of microalbuminuria, which is detected at the time of diagnosis of Type 2 diabetes, has been attributed to the hyperglycemia itself and may reverse to normoalbuminuria after adequate glycemic control. However, microalbuminuria, particularly if it is persistent may also represent incipient nephropathy. Cystatin C is freely filtered by glomerulus.

Materials and Methods: This study has been conducted at a tertiary care hospital with 60 subjects from both inpatient as well as outpatient (diabetes clinic) departments have been selected. The Institutions Ethics Committee has approved the study. Informed consent was obtained from all the study participants. 60 study subjects have been selected and categorized into three groups: (1) Non-diabetic subjects with normoalbuminuria (n = 20), (2) Diabetic patients with normoalbuminuria (<30 mg/day of albumin) and normal plasma creatinine (<1.2 mg/dl) (n=20), (3) Diabetic patients with microalbuminuria (30-300 mg/day of albumin) and moderately raised plasma creatinine (1.2-1.8 mg/dl) (n =20).

Result: The mean cystatin C values in Group B were 1 ± 0.31 and in Group C were 1.08 ± 0.24. In Group B, 60% of patients had raised cystatin C levels whereas in Group C 16 patients (i.e., 80%) had raised cystatin C levels. When plotted against serum creatinine levels, it is evident that in Group B small majority of patients have raised cystatin C inspite of normal serum creatinine levels and in Group C around 80% of patients have it raised. This indicates that cystatin C is a better marker of early diabetic nephropathy when compared with serum creatinine levels.

Conclusion: Cystatin C is an early and better marker of incipient diabetic nephropathy in Type 2 diabetics when compared with serum creatinine. Serum cystatin C is also independent and early maker of incipient diabetics nephropathy and even when compared to microalbuminuria in Type 2 diabetic patients.

Key words: Creatinine, Diabetes mellitus, Diabetic nephropathy, Microalbuminuria, Plasma cystatin C

INTRODUCTION

Diabetes is an emerging global health problem. It has now reached epidemic proportions with a current prevalence of about 170 million. India has the highest prevalence of diabetes in the world. The problem of diabetes and its complications is the price that is being paid for an increase in life expectancy with a concomitant increase in dietary affluence and a decrease in physical activity. The human impact of diabetes includes devastating complications such as retinopathy, neuropathy, and nephropathy with a lot of the most productive years of life. Nowadays, diabete gras (as described by the French Diabetologist Etienne Lancereaux), i.e., Type 2 diabetes mellitus (DM) accounts for 95% of all cases of diabetes worldwide while in comparison diabete maigre, i.e., Type 1 DM is seen less often.¹ ²

It is not common to find evidence of microvascular complications of diabetes in newly diagnosed Type 2 diabetic patients. Proteinuria has been reported in up to 50% of patients with Type 2 diabetes, and in many patients, it is seen soon after diagnosis. The presence of microalbuminuria, which is detected at the time of diagnosis of Type 2 diabetes, has been attributed to the hyperglycemia itself and may reverse...
to normoalbuminuria after adequate glycemic control. However, microalbuminuria, particularly if it is persistent may also represent incipient nephropathy.

The presence of microalbumin in the urine heralds the onset of kidney disease in diabetics. It is not known whether it indicates a greater risk for kidney disease in patients without diabetes. The presence of microalbumin indicates early damage to the glomerular blood vessels; however, in diabetes it also could indicate failure of renal auto regulation. Although there is no direct clinical evidence to support this theory, microalbuminuria is evidence of generalized of vascular function.\textsuperscript{3,4}

In the last 40 years, plasma creatinine has become the most commonly used endogenous marker of renal function. Its rate of appearance in the bloodstream is related to muscle mass, so that intra-individual concentrations are affected by age and gender.

Cystatin C is a 122 - amino acid, 13 kDa protein that is a member of the family of cysteine proteinase inhibitors. It is the product of a “housekeeping” gene expressed in all nucleated cells and is produced at a constant rate.\textsuperscript{5} Due to its small size and basic pH (~9.0), cystatin C is freely filtered by glomerulus. Cystatin C does not return to the blood stream and is not secreted by renal tubules, it has been suggested to be closer to the “ideal” endogenous marker.\textsuperscript{5,6}

Aims and Objectives of the Study
To determine whether plasma cystatin C is a marker of early renal impairment when compared with microalbuminuria in Type 2 diabetic subjects with normal plasma creatinine (<1.2 mg/dl) and moderately elevated plasma creatinine (1.2-1.8 mg/dl).

MATERIALS AND METHODS
This study has been conducted at a tertiary care hospital with 60 subjects from both inpatient as well as outpatient (diabetes clinic) departments have been selected. The Institutions Ethics Committee has approved the study. Informed consent was obtained from all the study participants.

60 study subjects have been selected and categorized into three groups:

1. Non-diabetic subjects with normoalbuminuria ($n = 20$)
2. Diabetic patients with normoalbuminuria (<30 mg/day of albumin) and normal plasma creatinine (<1.2 mg/dl) ($n = 20$)
3. Diabetic patients with microalbuminuria (30-300 mg/day of albumin) and moderately raised plasma creatinine (1.2-1.8 mg/dl) ($n = 20$).

Blood pressure (BP) has been measured in all subjects in sitting position on the right arm with a standard mercury sphygmomanometer. Mean values have been determined from two independent measurements taken at 5 min intervals.

Blood samples have been collected to determine fasting plasma glucose, postprandial plasma glucose or 2 h post glucose and these have been determined by glucose oxidase method in a dry chemistry analyzer, Vitros 250. Glycosyl and hemoglobin (Hb) levels have been measured by chromatography base high-performance liquid chromatography assay and expressed as a percentage. Urine sugar and urine ketones have been checked by dipstick method.

Plasma cystatin C has been measured by immunonephelometry. Normal values considered were between 0.52 and 0.98 mg/L. Microalbuminuria has been determined by an immunotubidimetric method from Siemens Diagnostics, in urine collected over 24 h and expressed as mg/24 h. Plasma creatinine has been determined using Jaffe’s method and expressed as mg/dl.

In all the above cases, for exclusion of the diseases, enlisted, mostly we had to resort to clinical examination, urine examination, blood urea nitrogen, serum creatinine, T3, T4 and thyroid-stimulating hormone (to rule out thyroid disorders), serum bilirubin, serum glutamic pyruvic transaminase, serum glutamic oxaloacetic transaminase, alkaline phosphatase, ultrasonography of abdomen (for jaundice or any liver disease).

RESULTS
A total of 60 subjects were studied. They were divided equally into three groups; Group A consisted of 20 control subjects, i.e., the non-diabetic patients, Group B consisted of 20 diabetic subjects with normal serum creatinine (<1.2 mg/dl) and Group C consisted of 20 diabetic subjects with moderately elevated serum creatinine (1.2-1.8 mg/dl). The results of the various clinical and biochemical parameters and their interrelationship are as follows.

- Group A had a mean age of 59.9 years with the range being 49-70 years
- Group B had a mean age of 59.3 years with a standard deviation of 8.92 years, and all subjects were within the range of 47-74 years
- Group C had a mean age of 62 years with a standard deviation of 8.09 years, and all subjects were within the range of 48-73 years (Table 1).

In Group B almost half the patients lie in the <10 set and the other half lie in the 11-20 years set. In Group C,
however, only 2 patients belong to the first set (<10 years) and the remaining belong to the 11-20 years set with majority among them suffering from diabetes for over 15 years (Table 2).

The number of male patients of Type 2 diabetes is more than females. There are 15 diabetic males and 5 diabetic females in Group B and 12 diabetic males and 8 diabetic females in Group C (Table 3).

- Group A shows a mean fasting blood sugar (FBS) value of 91.85 with a standard deviation of 5.69
- Group B shows a mean FBS value of 117.45 with a standard deviation of 13.38
- Group C shows a mean FBS value of 127.05 with a standard deviation of 18.05.

When compared they show a statistically significant $P$ value of 0.001 and 0.01 (Table 4).

- Group A shows a mean post lunch blood sugar (PLBS) value of 116.15 with a standard deviation of 16.24
- Group B shows a mean PLBS value of 163.85 with a standard deviation of 23.10
- Group C shows a mean PLBS value of 195.15 with a standard deviation of 28.91.

When compared they show a statistically significant $P$ value of 0.033 and 0.002 and 0.04 (Table 5).

- Group A shows a mean HbA$_1$c value of 5.56 with a standard deviation of 0.44
- Group B shows a mean HbA$_1$c value of 7.32 with a standard deviation of 0.48
- Group C shows a mean HbA$_1$c value of 7.62 with a standard deviation of 0.54.

When compared they show a statistically significant $P$ value of 0.029 and 0.011 (Table 6).

In Table 7 we can see that the mean BP in Group A is 120/80 mm of Hg with a standard deviation of 6.88 and 4.55 for systolic and diastolic BP, respectively.

In Group B the mean BP seen is 128/82 mm of Hg with a standard deviation of 11.72 and 8.14 for systolic and diastolic BP, respectively.

And in Group C the mean BP is 142/90 mm of Hg with a standard deviation of 15.20 and 7.69 for systolic and BP, respectively.

Figure 1 compares the mean systolic and diastolic BP in all three groups. It shows that in Group A and B the values are within the normal range whereas in Group C the mean BP has gone beyond 140/90 mm of Hg.

- Group A has microalbuminuria absent

### Table 1: Age distribution

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;50 years</td>
<td>1 (5)</td>
<td>6 (30)</td>
<td>2 (10)</td>
</tr>
<tr>
<td>51-60 years</td>
<td>11 (55)</td>
<td>6 (30)</td>
<td>7 (35)</td>
</tr>
<tr>
<td>61-70 years</td>
<td>8 (40)</td>
<td>5 (25)</td>
<td>7 (35)</td>
</tr>
<tr>
<td>≥71 years</td>
<td>0</td>
<td>3 (15)</td>
<td>4 (20)</td>
</tr>
<tr>
<td>Mean±standard deviation</td>
<td>59.9±5.84</td>
<td>59.3±8.92</td>
<td>62±8.09</td>
</tr>
<tr>
<td>Range</td>
<td>49-70</td>
<td>47-74</td>
<td>48-73</td>
</tr>
</tbody>
</table>

### Table 2: Duration of DM

<table>
<thead>
<tr>
<th>Duration of DM (years)</th>
<th>Group B</th>
<th>Group C</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;10</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>11-15</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>16-20</td>
<td>6</td>
<td>13</td>
</tr>
</tbody>
</table>

DM: Diabetes mellitus

### Table 3: Sex distribution

<table>
<thead>
<tr>
<th>Gender</th>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>12</td>
<td>15</td>
<td>12</td>
</tr>
<tr>
<td>Female</td>
<td>8</td>
<td>5</td>
<td>8</td>
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</tbody>
</table>

### Table 4: Observations of blood sugar levels

<table>
<thead>
<tr>
<th></th>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
</tr>
</thead>
<tbody>
<tr>
<td>FBS</td>
<td>Mean</td>
<td>Median</td>
<td>Standard deviation</td>
</tr>
<tr>
<td></td>
<td>91.85</td>
<td>93.0</td>
<td>5.69</td>
</tr>
<tr>
<td></td>
<td>0.001</td>
<td>0.01</td>
<td></td>
</tr>
</tbody>
</table>

One-way ANOVA (Tukey’s test). FBS: Fasting blood sugar

### Table 5: PLBS

<table>
<thead>
<tr>
<th></th>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLBS</td>
<td>Mean</td>
<td>Median</td>
<td>Standard deviation</td>
</tr>
<tr>
<td></td>
<td>116.15</td>
<td>119</td>
<td>16.24</td>
</tr>
<tr>
<td></td>
<td>0.033</td>
<td>0.02</td>
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</table>

One-way ANOVA (Tukey’s test). PLBS: Post lunch blood sugar

### Table 6: HbA$_1$c

<table>
<thead>
<tr>
<th>HbA$_1$c</th>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>5.56</td>
<td>7.32</td>
<td>7.62</td>
</tr>
<tr>
<td>Median</td>
<td>5.50</td>
<td>7.40</td>
<td>7.75</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>0.44</td>
<td>0.48</td>
<td>0.54</td>
</tr>
<tr>
<td>Range</td>
<td>4.6-6.5</td>
<td>6.5-8.1</td>
<td>6.9-8.9</td>
</tr>
<tr>
<td>$P$ value (A and B)</td>
<td>0.029</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$P$ value (A and C)</td>
<td>0.011</td>
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</tr>
</tbody>
</table>

One-way ANOVA (Tukey’s test). HbA$_1$c: Hemoglobin A$_1$c
• Group B shows a mean microalbuminuria level of 161.6 with a standard deviation of 53.13
• Group C shows a mean microalbuminuria level of 206 with a standard deviation of 54.36.

Comparison between groups shows a statistically significant P = 0.01 (Table 8).
• Group A shows a mean cystatin C level of 0.60 with a standard deviation of 0.04
• Group B shows a mean cystatin C level of 1.00 with a standard deviation of 0.31
• Group C shows a mean cystatin C level of 1.08 with a standard deviation of 0.24.

Comparison between groups shows a statistically significant P = 0.001 and 0.01 and 0.04 (Table 9).

In Group B there are 12 patients with presence of microalbumin in urine, whereas in Group C all the 20 patients have it present. On the other hand, cystatin C is raised in 13 patients in Group B and in 16 patients in Group C (Table 10).

DISCUSSION

Diabetes is an emerging health problem in developed as well as developing countries. India has the highest prevalence of diabetes in the world. It has gained much popularity due to its various microvascular and macrovascular complications. As diabetes is an independent risk factor for cardiovascular and cerebrovascular disease, the early detection of diabetes and its complications is of utmost importance.7,8

Once of the most important microvascular complications of diabetes are diabetic nephropathy. Diabetic nephropathy is the leading cause of chronic kidney disease (CKD) in patients starting renal replacement therapy and is associated with hypertension and a high risk of cardiovascular morbidity and mortality.

The presence of microalbuminuria is a known complication in patients of diabetes. It is an early sign that before glomerular filtration rate (GFR) deteriorates. In Type 2 diabetes, the incidence of microalbuminuria is around 2.0% per year and the prevalence at 10 years after diagnosis is around 25%. Although a reliable investigation, collection of urine over 24 h and other factors (i.e.; Short-term hyperglycemia, exercise, urinary tract infections, marked hypertension, heart failure, and acute febrile illness) influencing its presence makes testing for microalbuminuria a very tedious job.9,10

Cystatin C is a small 13 kDa protein, that is a member of the cysteine proteinase inhibitor family that is produced at a constant rate by all nucleated cells. Due to its small size it is freely filtered by the glomerulus, and is not secreted but

<table>
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<tr>
<th>Parameter</th>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>120</td>
<td>128</td>
<td>142</td>
</tr>
<tr>
<td>Median</td>
<td>120</td>
<td>129</td>
<td>140</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>6.88</td>
<td>11.72</td>
<td>15.20</td>
</tr>
<tr>
<td>Range</td>
<td>110-130</td>
<td>110-150</td>
<td>120-162</td>
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<tr>
<td>Diastolic BP</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>79</td>
<td>82</td>
<td>90</td>
</tr>
<tr>
<td>Median</td>
<td>80</td>
<td>80</td>
<td>87</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>4.55</td>
<td>8.14</td>
<td>7.69</td>
</tr>
<tr>
<td>Range</td>
<td>70-88</td>
<td>70-100</td>
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<table>
<thead>
<tr>
<th>Parameter</th>
<th>Microalbuminuria present</th>
<th>Cystatin C present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group B</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>Group C</td>
<td>20</td>
<td>16</td>
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is fully reabsorbed and broken down by the renal tubules. This means the primary determinate of blood cystatin C levels is the rate at which it is filtered at the glomerulus making it an excellent GFR marker. Estimation of serum cystatin C levels can be done on outpatient department (OPD) basis by a simple blood draw. As microalbuminuria is the first sign of renal microalbuminuria is an important factor in deciding on the usefulness of this test for patients with incipient diabetic nephropathy.\textsuperscript{1,12}

60 patients with Type 2 diabetes either attending the OPD or admitted to hospital were included in our study. A detailed history with special importance to a number of years of diabetes and other comorbidities were taken. A complete clinical examination and required investigations according to the pro forma were done. They were divided equally into three groups. Groups A consisted of 20 control subjects, i.e., the non-diabetic patients, Group B consisted of 20 diabetic subjects with normal serum creatinine, and Group C consisted of 20 diabetic subjects with moderately elevated serum creatinine (1.0-1.8 mg/dl).\textsuperscript{13,15}

In the study, in Group B the mean age of subjects was 55 years ± 7.9, whereas in Group C the mean age was 56 years ± 6.27. In Group B and C a majority of the patients are in the 50-70 years age group. In both these groups, there were more males than females (15 in Group B and 12 in Group C). For Group B, 60% of patients have had history diabetes for between 10 and 20 years. Whereas, in Group C, 85% patients have had a history of diabetes between 10 and 20 years. Thus, our study shows that the prevalence of diabetes in more among the age group 50-70 years. The onset of diabetes is now earlier as majority of subjects in our study has onset of diabetes between 45 and 55 years. More males had diabetes than females and the incidence of microvascular changes in the kidneys was more with a history of the duration of diabetes between 10 and 20 years.

Al-Wakeel et al. showed that the peak incidence of diabetic nephropathy was present between 50 and 70 years if age. The mean age of the onset of diabetes is early, and the majority have diabetes in their forties. Studies conducted by Ericksson et al., Pan et al., Williams et al., and Kanaya et al. show that males are more prone to develop diabetes than females. Evidence of a link between development and progression of diabetic nephropathy and duration of diabetes in Type 2 diabetes was clearly demonstrated in the UKPDS. Following diagnosis, progression to microalbuminuria occurred at 2.0% per year, from microalbuminuria to macroalbuminuria at 2.8% per year, and from macroalbuminuria to elevated plasma creatinine or renal replacement therapy at 2.3% per year. 10 years following diagnosis, microalbuminuria or worse diabetic nephropathy was present in 24.9% of patients.

Our study shows that in Group B the number of patients with presence of microalbuminuria in urine was 12 whereas in Group C all 20 patients had it present. Where microalbuminuria is plotted against serum creatinine levels, microalbuminuria values for certain patients in Group B rise inspite of normal creatinine, whereas in Group C where creatinine is raised to between 1.2 and 1.8 mg/dl, all patients have microalbuminuria present. This indicates that microalbuminuria is indeed an early marker of diabetic nephropathy as compared to serum creatinine levels. Various other studies have also shown that presence of microalbuminuria is an early indicator of diabetic nephropathy, de Zeeuw et al. while working on the RENAAL study showed that albuminuria is the most critical baseline predictor for end-stage renal disease. Chiarelli et al. showed that microalbuminuria is and an early sign that appears before GFR (derived using creatinine-based Cockcroft-Gault equation) deteriorates. Mogensen et al. and Keane et al. also showed that proteinuria was the strongest and most consistent marker for diabetic nephropathy. Date from the UKPDS demonstrated that approximately 25% of patients with Type 2 diabetes develop microalbuminuria or worse, diabetic nephropathy by 10 years. It is estimated that almost 50% of patients who develop microalbuminuria do so within 19 years from diagnosis of diabetes. From any stage of diabetic nephropathy, the rate of deterioration to the next stage is 2-3% per year.

The mean cystatin C values in Group B were 1 ± 0.31 and in Group C were 1.08 ± 0.24. In Group B, 60% of patients had raised cystatin C levels whereas in Group C 16 patients (i.e., 80%) had raised cystatin C levels. When plotted against serum creatinine levels, it is evident that in Group B small majority of patients have raised cystatin C inspite of normal serum creatinine levels and in Group C around 80% of patients have it raised. This indicates that cystatin C is a better marker of early diabetic nephropathy when compared with serum creatinine levels. This is in concurrence with other studies. Newman et al., and Nelso et al. showed that cystatin C now can be widely used and can replace creatinine for the assessment of GFR in clinical practice. Dharnidharka et al. and Roos et al. have concluded that serum cystatin C is superior to serum creatinine as a marker of kidney function.

Where microalbuminuria is plotted against serum cystatin C levels for Group B and C, it can be seen that cystatin C rise in the same patients in whom the microalbuminuria is present. This indicates that when compared with microalbuminuria, cystatin C is also and early marker of incipient renal damage in Type 2 diabetes. Shani Shastri
et al. showed that cystatin C and microalbuminuria are independent risk factors for incipient CKD and could be useful as screening tools to identify those at increased risk. A. Piwowar et al. proved that cystatin C showed a significant increase in diabetic patients with microalbuminuria. Their study suggests that the determination of the plasma concentration of cystatin C is useful in the detection of incipient nephropathy in patients with non-insulin-dependent DM and is a better marker than creatinine.

The FBS levels were 91.85 ± 5.69 mg/dl (mean and standard deviation) in Group A subjects, 117.45 ± 13.38 mg/dl (mean and standard deviation) in Group B and 127.05 ± 18.05 mg/dl (mean and standard deviation) in Group C. The HbA1c levels were 5.56 ± 0.44 in Group A, 7.32 ± 0.48 in Group B, and 7.62 ± 0.54 in Group C. This indicates a poorer control of sugar levels in diabetic subjects in Group B and even poorer glycemic control in the subjects with early diabetic nephropathy in Group C. Wilson et al. proved that those who showed evidence of renal damage, were found to have poor control of blood sugar levels. Landro et al. showed that a glycosylated Hb of more than 7.5% was a major risk factor for development of nephropathy.

The BP levels were within normal limits for the control group. In Group B, the BP levels were 128/82 mm of Hg ± 11.72/8.14, i.e., were still in normal limits. Whereas in Group C the BP was 142/90 ± 15.20/7.69. Most of the subjects in Group C were on antihypertensive medications. This shows that BP in patients with renal damage due to diabetes was on the higher side. Mogensen et al. showed the higher prevalence of hypertension in patients with established diabetic nephropathy and that antihypertensive treatment shows the decline in renal function in diabetic nephropathy. In another study, he also documented that elevated BP was very closely related to development of diabetic renal disease in Type 2 diabetic patients, moreover showed a correlation between BP and rate of progression.

Thus to summarize, it was necessary to study the correlation between microalbuminuria and cystatin C and in cystatin C is also an early marker of incipient renal damage in Type 2 diabetics. Tight control of blood sugars and BP is necessary to arrest the development of renal damage in Type 2 diabetics, and serum cystatin C levels may be used routinely or even as an alternative to microalbuminuria for the detection of diabetic nephropathy.

We may also remember that the incidence of diabetes and its complications are very high. In such small studies, it is hard to generalize or derive conclusive ideas regarding serious complications such as diabetic nephropathy.

Thus, large-scale multi-centric studies are required for early detection of diabetic nephropathy and studying its correlation with serum cystatin C.

**CONCLUSION**

1. A higher prevalence of Type 2 DM is more in the 50-70 years age group and onset of diabetes has moved to forties
2. Prevalence of Type 2 DM is more than in females
3. Incidence of microvascular complications such as diabetic nephropathy increases when the duration of diabetes is more than 10 years
4. Hypertension often accompanies diabetics nephropathy
5. Poorer control of sugar levels is found in patients progressing toward diabetic nephropathy
6. Cystatin C is an early and better marker of incipient diabetic nephropathy when compared with serum creatinine
7. Serum cystatin C is also independent and early maker of incipient diabetics nephropathy and even when compared to microalbuminuria in Type 2 diabetic patients.

**REFERENCES**


Source of Support: Nil, Conflict of Interest: None declared.
Hypocalcemia in Thyroid Surgery: A Prospective Study

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Abstract

Background: Hypocalcemia is low calcium levels in the blood serum. It most commonly occurs as a complication of thyroid surgery. The aim of the study is to determine the incidence, distribution, and cause of the hypocalcemia following thyroid surgery.

Materials and Methods: This is a prospective study conducted for 1 year on 100 patients who were selected for thyroidectomy were randomly selected. Hypocalcemia following thyroidectomy was correlated with parameters such as patients' gender, age, clinical diagnosis, surgical details - type of surgery and number of parathyroid identified. Student’s t-test was used to assess the quantitative and Chi-square test for qualitative differences. P < 0.05 was considered statistically significant.

Results: The maximum incidence of thyroid surgery is in the age group of 30-39 years. The incidence of disease was high in both males and females of age 30-39 years. Out of 100 patients, 30 patients were diagnosed preoperatively as multinodular goiter, 32 patients presented with solitary nodule thyroid, 25 patients were diagnosed as papillary carcinoma thyroid, and the remaining 13 patients with follicular neoplasm. Out of 100 patients, 34 patients developed temporary hypocalcemia; none of them developed permanent hypocalcemia. Average number of parathyroid glands identified was 3. Maximum incidence of developing hypocalcemia was when only one parathyroid gland was identified.

Conclusion: Thyroid surgery is the most common etiology of temporary hypocalcemia. Post-operative hypocalcemia usually results from accidental removal of the parathyroid glands.

Key words: Hypocalcemia, Parathyroid gland, Thyroid surgery

INTRODUCTION

Hypocalcemia is low calcium levels in the blood serum. The normal range is 2.1-2.6 mmol/L. Levels <2.1 mmol/L is defined as hypocalcemia. Mildly low levels that develop slowly often have no symptoms. Otherwise, symptoms may include numbness, muscle spasms, seizures, confusion, or cardiac arrest.1,2

Chronic hypoparathyroidism, one of the important causes of hypocalcemia, is a stern and potentially devastating disorder that results from different causes. It most commonly occurs as a complication of thyroid surgery. Some studies have concluded that the transient hyperparathyroidism prevalence rate varies from 6.9% to 46% and permanent hyperparathyroidism rates from 0.4% to 33%.3-5

Another important reason of hypocalcemia following thyroidectomy is secondary to surgical trauma, devascularization, and unintentional removal of parathyroid glands. The best way to avoid accidental excision is properly identifying the parathyroid glands. Risk of complication is higher when fewer than three glands are identified during surgery.6,7

Physiologically, blood calcium is tightly regulated within a narrow range for proper cellular processes. Calcium in the blood exists in three primary states: Bound to proteins (mainly albumin), bound to anions such as phosphate and citrate, and as free (unbound) ionized calcium. Only the ionized calcium is physiologically active. Normal blood
calcium level is 8.5-10.5 mg/dL, and that of ionized calcium is 4.65-5.25 mg/dL.\textsuperscript{3,5}

Because a significant portion of calcium is bound to albumin, any alteration in the level of albumin will affect the level of calcium is measured. A corrected calcium level based on the albumin level is: Corrected calcium (mg/dL) = Measured total Ca (mg/dL) + 0.8 * (4.0 – serum albumin [g/dL]). Another way to determine the calcium level is to measure directly the ionized calcium level.\textsuperscript{8,9}

The aim of the study is to determine the incidence, distribution, and cause of the hypocalcemia following thyroid surgery.

**MATERIALS AND METHODS**

This is a prospective study conducted in Department of General Surgery, Teerthankar Mahaveer Medical College and Research Centre for 1 year. We enrolled 50 patients in the study who were posted for thyroidectomy. The patients were informed about the study, and written consent was taken. Patients who had recurrent thyroid, concurrent lymph node dissection, and pre-existing hypocalcemia were excluded from the study. Serum albumin and calcium levels were calculated 12 h before surgery. Serum calcium levels were repeated 12 h after surgery, post-operative day 1 and 2.

In this study, calcium level below 8 mg/dL is defined as hypocalcemia. Permanent hypocalcemia was defined as persistent corrected calcium levels <8 mg/dL for 6 months after surgery.

Hypocalcemia following thyroidectomy was correlated with parameters such as patients’ gender, age, clinical diagnosis, surgical details - type of surgery and number of parathyroid identified.

Student’s $t$-test was used to assess the quantitative and Chi-square test for qualitative differences. $P < 0.05$ was considered statistically significant.

**RESULTS**

A total of 50 patients were included in the study, the median age in this study being 34 years. The age ranged from 20 to 79 years with maximum incidence in age group in 30-39 years (Figure 1). The incidence of disease was high in both males and females of age 30-39 years (Figure 2).

Out of 50 patients, 15 patients were diagnosed pre-operatively as multinodular goiter, 16 patients presented with solitary nodule thyroid, 14 patients were diagnosed as papillary carcinoma thyroid, and the remaining 5 patients with follicular neoplasm (Figure 3).

Out of 50 patients, 17 patients developed temporary hypocalcemia; none of them developed permanent hypocalcemia. The mean age of patients developing hypocalcemia was 42.16 years. Average number of parathyroid glands identified was 3. Maximum incidence of developing hypocalcemia was when only one parathyroid gland was identified (Table 1 and Figure 4).
DISCUSSION

Thyroid surgery is mainly followed by hypocalcemia. The incidence of hypocalcemia is high in the first post-operative day in this study. The common symptoms which patients complained are circumoral numbness and tingling sensation. In 5% of patients, carpopedal spasm was the main complaint. In contrast to our study, Sasson et al. and Lin et al. did not find any link between hypocalcemia and incidental parathyroid removal; Sippel et al. stated that the incidental parathyroid removal group had significantly lower post-operative calcium levels, and this is in favor with our outcomes.

Post-operative hypocalcemia mainly results from injury, devascularization, and accidental removal of the parathyroids. Hypocalcemia can remain for longer periods in patients who encounters injury/amputation of parathyroid glands.

In the present study, total thyroidectomy was found to be a threat for the accompanying parathyroid exclusion. Near-total thyroidectomy can also be a risk factor for hypocalcemia but lesser than total thyroidectomy. This finding is favored by many studies.

In the present study, total thyroidectomy was found to be a threat for the accompanying parathyroid exclusion. Near-total thyroidectomy can also be a risk factor for hypocalcemia but lesser than total thyroidectomy. This finding is favored by many studies.

All the patients who developed hypocalcemia were due to temporary hypoparathyroidism, and succeeding follow-up exhibited normal serum calcium levels. The reason behind this may be temporary spasm of the vessels supplying the parathyroid glands and hence the consequential tetany. To avoid hypoparathyroidism, it is important to preserve the parathyroid glands and their vascular supply during thyroid surgery.

The normal location of parathyroid glands is extracapsular mainly on the posterior surface of the thyroid gland. Other variations in the location are extracapsular (58%), intracapsular (20%), and intrathyroidal (22%). The superior parathyroid glands are usually located at the superior pole of the posterior thyroid gland near the cricothyroid junction, while the inferior parathyroid glands are usually found in the lower pole of the thyroid gland.

While identification of all four parathyroid glands is traditionally recommended to reduce post-operative hypoparathyroidism, there are recent studies suggesting that the identification of a greater number of identified parathyroid glands intraoperatively does not reduce the incidence of hypoparathyroidism. In contrast to these studies, we found that the incidence of hypocalcemia is directly proportional to decrease in the number of parathyroid glands identified.

CONCLUSION

The present study furnished the following suggestions:

a. Thyroid surgery is the most common etiology of temporary hypocalcemia
b. Post-operative hypocalcemia usually results from accidental removal of the parathyroid glands.

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Assessment of Knowledge and Attitude of Parents Regarding Dental Radiography for Children

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Abstract

Introduction: Radiographs paired with clinical examination help provide an accurate diagnosis of caries, pulp, and periapical pathoses, and reveal problems related to tooth development and eruption. Although radiation dosage from dental radiograph is low, it is one of the most frequently undertaken radiographic procedure. Due to the faith entrusted by the parents on the dentists regarding their children’s care, it is the moral responsibility of the dentist to inform about the biohazards associated with radiation to the parents. The aim of the study was to assess the knowledge and attitude of parents toward dental radiography for children.

Materials and Methods: A total of 450 questionnaires were distributed to the parents of children studying in 3 different schools. Children were instructed to get the questionnaires filled by their parents, which were collected after 2 days. The questionnaire included 2 sets of questions, for testing the attitude and knowledge of parents toward radiography for children. The collected data were tabulated and presented in graphical manner.

Results: Among the 357 questionnaires returned, 54 were incomplete and 3 were further excluded. Analysis was performed on 300 questionnaires. More than half of the participants believed dental radiographs are safe and useful. Knowledge of the parents regarding radiography was relatively low. Furthermore, 92% of the parents said that the dentist explained the reasons for undertaking dental X-rays, but only 8% felt that the associated risks were explained to them.

Conclusion: Although parents had a low level of knowledge regarding dental radiography, they had a positive attitude toward the same.

Key words: Attitude, Children, Dental radiography, Knowledge

INTRODUCTION

The discovery of X-rays by Roentgen in 1895 revolutionized the entire medical profession and set foundation for diagnostic radiology. The use of X-rays as a diagnostic tool is so well established that it is hard to imagine contemporary medicine and dentistry without them. The use of dental X-rays is manifold. Radiographs paired with clinical examination help provide an accurate diagnosis of caries, pulp, and periapical pathoses and reveal problems related to tooth development and eruption.1 Although radiation dosage from dental radiograph is low, it is one of the most frequently undertaken radiographic procedures.2

According to the 2007 International Commission on Radiological Protection (ICRP) guidelines, the cancer risk associated with dental radiography is 32-42% higher than previously estimated in 1990 ICRP guidelines.3 Studies have showed that diagnostic radiography exposure increases the risk for thyroid cancer and other tumors.4,5 Therefore, operators of radiographic equipment should be thoroughly familiar with radiation safety practices and radiation regulations to protect themselves, their colleagues, and the patients.

Due to the faith entrusted by the parents on the dentists regarding their children’s care, it is the moral responsibility of the dentist to inform about the biohazards associated...
with radiation to the parents. Children are more vulnerable to radiation than adults, which is due to the fact that there is a longer life expectancy and thus a greater potential for radiation-induced cancers to manifest. Furthermore, the cumulative nature of radiation exposure over a patient’s lifetime increases the importance of explaining radiation risks to parents.6

Although several studies have been done to test the knowledge and attitude of dental practitioners, physicians, and other allied health professionals regarding radiography, there is not much published literature available regarding the perspective of parents toward the radiographic procedures undertaken for their children. Thus, the aim of the present study was to assess the knowledge and attitude of parents toward dental radiography for children.

**MATERIALS AND METHODS**

A total of 450 questionnaires were distributed to children studying in three different schools, which were chosen based on convenience. Children were instructed to get the questionnaires filled by their parents, which were collected after 2 days. All the questionnaires were anonymous and a return of filled questionnaire indicated consent from the parent. The questionnaire consisted of 13 items to assess the knowledge and attitude of parents toward radiography for their children.

The first set of questions (questions 1-4) served to evaluate the attitude of parents toward dental radiography. A statement, “I believe dental X-rays for my child are:” was followed by a series of sliding scales with bipolar adjectives at the end of each scale such as harmful-safe, useful-worthless, unpleasant-pleasant, and good-bad. Parents were instructed to place a cross anywhere along the line to best reflect their attitude. These markings were then measured and categorized into three equal groups: Agree, disagree, and undecided (Figure 1).

The next set of questions (questions 5-13) was designed to obtain information regarding the knowledge of parents toward dental radiography. These questions included statements such as benefits from X-rays outweigh the risks, damage to the body from X-rays is permanent, and wearing a lead apron helps protect against radiation damage. It also included questions to assess whether the dentist explains the need for dental X-rays, and the risks associated before taking them. The parents were asked to place a check in either “agree,” “disagree,” or “I don’t know” column. The “I don’t know” option was included to allow the participants to acknowledge the lack of information. The collected data were tabulated and results were presented in graphical form (Figure 1).

**RESULTS**

Out of the 450 questionnaires distributed, 357 were returned. Among the 357 participants, 54 failed to complete all the questions and were therefore excluded from the study. For ease of calculation, 3 random questionnaires were further excluded and analysis was performed on 300 questionnaires.

To determine the attitude, several elements were measured, namely, the perception of how good, pleasant, useful, and safe radiographs are. Regarding the safety of radiographs, 150 (50%) participants felt that radiographs are safe for their children. Among the remaining 150, 30 participants (10%) found X-rays to be harmful and the rest were unsure. 198 (66%) participants believed radiographs are useful. None of them thought them X-rays are worthless. According to 42 (14%) participants, radiographic procedure for their children is unpleasant, whereas 150 (50%) marked pleasant and the rest were unsure. More than half of the parents (62%) said that X-rays are good while only 8% found them to be bad (Figure 2).

Most the respondents answered “I don’t know” to knowledge-based questions. 156 (52%) of the individuals believed that the benefits from dental X-rays outweigh the risks, whereas 34% answered “I don’t know” and 14% answered incorrectly. When asked if the damage to the body from X-rays is permanent, 22% answered correctly, 58% answered “I don’t know,” and 20% answered incorrectly. According to 44% of the participants, exposure from dental X-rays is too small to put a child to any significant harm, 2% of the participants thought otherwise, and more than half of the participants (54%) answered “I don’t know.” 38% of the individuals answered “correct” in response to the statement that children are at a higher risk of harm from X-rays than adults, 44% answered “I don’t know,” and 18% answered “incorrect.” 24% of the participants were aware that exposure to radiation from environment is higher than that from dental X-rays, whereas 58% of the individuals were aware that exposure from medical radiographic procedures is higher than radiation from dental X-rays. Furthermore, 58% of the individuals answered correctly when asked if the child will be protected against radiation damage if he/she wore a lead apron (Figure 3).

Although 92% of the parents said that the dentist explained the reasons for taking dental radiographs, only 8% felt that the associated risks were explained to them.
Department of Pediatric & Preventive Dentistry,
VS Dental College & Hospital, Bangalore
“ASSESSMENT OF KNOWLEDGE AND ATTITUDE OF PARENTS TOWARDS DENTAL RADIOGRAPHY FOR CHILDREN”

Questionnaire
(Place a cross on the line to best reflect your attitude)

I believe dental x-rays for my child are
1. Harmful __________ Safe
2. Useful ______________ Worthless
3. Unpleasant ___________ Pleasant

4. Overall, I believe dental x-rays on my child are
   Good ___________ Bad

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</tr>
<tr>
<td>13.</td>
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</tbody>
</table>

Thank you for completing the survey

Figure 1: Questionnaire
DISCUSSION

Dental radiographs play an important role in diagnosis and treatment planning. The modalities at the disposal of dentists range from intraoral radiography to cone beam computed tomography. In the field of dentistry, radiation exposure for diagnostic purpose is minimal. However, it is one of the most frequently undertaken radiographic procedures, which is repeated several times during childhood and adolescence. Thus, it is the parent’s right to know the associated radiation risks. As per literature available, there are not many studies done to assess the knowledge and attitude of parents regarding dental radiography for their children. Thus, it is unknown whether the fears associated with dental radiography are overstated or the parents are aware about the risks and accept them.

In the present study, an overall positive attitude of parents toward dental radiography was observed. Although many participants placed a cross in the “undecided” zone, only 10% of the participants found X-rays to be harmful and none of them believed dental radiographs are worthless. These findings are similar to those obtained by Chiri et al. where 16.5% of the participants found X-rays to be harmful and 3.9% found them to be worthless. In the present study, 14% of the parents stated that dental radiographic procedure for their children is unpleasant and 8% said X-rays are bad, and these values are also similar to those found in the study by Chiri et al.

The knowledge of the parents toward dental radiography was found to be relatively low. More than half of the participants were oblivious to the facts such as the damage to the body from dental radiographs is not permanent.
(58%) or the exposure from dental X-rays is too small to put their child at any significant harm (54%). 56% of the participants were unaware that the exposure to radiation from the environment (e.g. the sun) is higher than the radiation from dental X-rays. However, 58% of the parents knew that radiation from other medical procedures such as chest X-ray is more and, also that if the child wore a lead apron during dental X-ray procedure, it would provide protection against possible radiation damage. Chiri et al. in their study also reported a low knowledge of the parents regarding dental radiography.\(^7\)

The effective dose for a full mouth series (18 images) with F-speed film and rectangular collimation is 34.9 µSv.\(^3\) To put these values in perspective, background radiation from naturally occurring radionuclides in our environment and from cosmic rays is approximately 3,100 µSv (NCRP 2000) every year.\(^8\) Thus, it is important for the pediatric dentists to assure the parents that the benefits of dental X-rays outweigh the risk. In the present study, 52% of the individuals had a similar belief while 14% felt otherwise and the rest (34%) were unsure.

Although 92% of the parents reported that the dentists explained the need for dental X-rays before taking them, only 8% of the individuals felt that the risks associated with radiography were explained to them. According to Chiri et al., in their study, 90.3% parents were informed about the importance of dental radiographs and 39.7% were informed about the radiation hazards. These findings are similar to studies done by Ludwig and Turner and Lee et al. who also reported that most people are uninformed about the risks associated with medical imaging.\(^7,9,10\) This may not be due to lack of provision of information but could also be due to poor retention of information by the parents.

In conclusion, despite the limited knowledge most parents had regarding radiography, they had a positive attitude toward dental radiography. This low level of parental knowledge emphasizes the need for the dentist to provide appropriate and necessary information including the need for dental X-rays as well as the risks associated with the same before undertaking any radiographic procedure.

**CONCLUSION**

Although parents had a low level of knowledge regarding dental radiography, they had a positive attitude toward the same.

**REFERENCES**

Psychopathology and Neuropsychological Characteristics of Children of Men with Alcohol Dependence

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Abstract

Introduction: Children of men with alcohol dependence are at high risk for a wide range of behavioral and neuropsychological problems.

Aim: The aim of this study was to assess the psychopathology and neuropsychological characteristics of children of men with alcohol dependence syndrome.

Materials and Methods: A total of 100 children (50 in the study group and 50 in the control group) were evaluated for psychopathology and neuropsychological characteristics. Tools used were semi-structured proforma for sociodemographic data, general health questionnaire, child behavior checklist (CBCL), and Malin’s intelligence scale for Indian children (MISIC).

Results: Children of men with alcohol dependence had higher scores on CBCL and lower scores on MISIC, as compared to the children in control group.

Conclusion: Our study suggests that children of men with alcohol dependence had increased psychopathology and impaired neuropsychological characteristics when compared to children of men without alcohol dependence syndrome.

Key words: Alcoholic dependence, Children, Neuropsychological characteristics, Psychopathology

INTRODUCTION

Parental alcoholism has severe effects on their children. Many of these children have symptoms such as low self-esteem, loneliness, guilt feelings of helplessness, fears of abandonment, and chronic depression.¹ These children are at higher risk for psychiatric problems such as learning disability, hyperactivity, psychomotor delays, somatic symptoms, and emotional problems. There have been attempts to study various aspects of children of people with alcohol dependence from India, and some published literature is available that looks at various domains in the same sample.²⁻⁵

Neuropsychological functions in these children have been the center of attention over the last decade. Pihl and Brice⁶ reviewed studies of cognitive functioning in children of alcoholic parents. They found that these children have inferior verbal intelligence, by and large poor verbal skills, poor verbal and nonverbal memory and poor abstraction and planning.

Raman⁷ found that children of men with alcohol dependence have difficulties with frontal lobe functions and neurodevelopmental tasks.

The children of alcoholics are at a greater risk for developing substance use disorders. The highest risk for developing alcoholism exists for individuals who start using alcohol as adolescents, have a high family loading for alcohol problems and display a cluster of behavior traits described as under controlled, impulsive and disinhibited.⁸⁻⁹

This study was an attempt to examine the neuropsychological characteristics and psychopathology in children of men
with alcohol dependence so that early identification and intervention can be planned.

**MATERIALS AND METHODS**

Our study was a prospective case–control study, conducted in a tertiary care psychiatric hospital in the state of Goa, in which we compared a group (50) of children of men with alcohol dependence with a control group (50) of children of men without alcohol dependence.

The study was approved by the hospital ethics committee. Written informed consent was taken from parents of all children who participated in this study.

**Sample**

The sample consisted of children aged between 8 and 18 years of men meeting ICD-10 criteria for alcohol dependence syndrome reporting to this hospital. The control group consisted of children aged between 8 and 18 years from a local school, whose parents did not consume alcohol.

The inclusion criteria for children were fathers with diagnosis of alcohol dependence syndrome according to ICD-10 criteria, aged between 8 and 18 years, with mother having general health questionnaire score <4 and living with the index parent for at least the preceding year.

The exclusion criteria were children with mental retardation, developmental disorders, parents having any known organic brain syndrome, mental retardation or any other psychiatric illness; children with known chronic medical illness such as diabetes mellitus, asthma or chronic renal disease, children having any known visual/auditory handicap.

**Procedure**

Each child and parent was interviewed separately. Sociodemographic data were collected on a semi-structured proforma.

The child’s mother was then administered the general health questionnaire-12 developed by Goldberg and Williams. Children whose mothers scored above four were excluded from the study.

The child behavior checklist (CBCL) was used as a tool for assessment of psychopathology of the children. Adequate reliability and validity has been established by Achenbach and Edelbrock.

The children were then assessed with the Malin’s intelligence scale for Indian children (MISIC) which is an Indian adaptation of Wechsler’s intelligence scale for children. Full-scale IQ, verbal IQ, and a performance IQ are provided by this scale. The reliability and validity of this instrument is well established.

**Statistical Analysis**

Statistical analyses were conducted using the SPSS software (IBM SPSS Statistics version 20). A comparison of the psychopathology and the neuropsychological characteristics was made between the study and the control groups.

**RESULTS**

The study included 100 children of which 50 (31 boys and 19 girls) were in the study group, and 50 (29 boys and 21 girls) were in the control group. There was no significant difference between the study and control group with respect to the age and gender of the children as illustrated in Tables 1 and 2, respectively.

The scores obtained by the two groups on CBCL are shown in Table 3. 32% of children in the study group obtained scores higher than 10 on the CBCL, whereas only 8% of the children of the control group scored above 10. This 8-fold higher score on CBCL of the children of the study group was statistically significant.

**Table 1: Age distribution of children**

<table>
<thead>
<tr>
<th>Age (in years)</th>
<th>Study group</th>
<th>Control group</th>
<th>χ²</th>
<th>df</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-12</td>
<td>26 (52.0)</td>
<td>25 (50)</td>
<td>0.040</td>
<td>1</td>
<td>0.841</td>
</tr>
<tr>
<td>13-18</td>
<td>24 (48.0)</td>
<td>25 (50)</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

There was no significant difference between the study and control group

**Table 2: Sociodemographic profile of the sample (gender)**

<table>
<thead>
<tr>
<th>Gender</th>
<th>Study group</th>
<th>Control group</th>
<th>χ²</th>
<th>df</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>31 (62)</td>
<td>29 (58)</td>
<td>0.167</td>
<td>1</td>
<td>0.683</td>
</tr>
<tr>
<td>Female</td>
<td>19 (50)</td>
<td>21 (50)</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

There was no significant difference between the study and control group

**Table 3: Scores obtained by the 2 groups on CBCL**

<table>
<thead>
<tr>
<th>CBCL score</th>
<th>Study group</th>
<th>Control group</th>
<th>χ²</th>
<th>Df</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤10</td>
<td>34 (68)</td>
<td>48 (96)</td>
<td>37.395</td>
<td>5</td>
<td>0.000</td>
</tr>
<tr>
<td>&gt;10</td>
<td>16 (32)</td>
<td>2 (4)</td>
<td></td>
<td></td>
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</tbody>
</table>

CBCL: Child behavior checklist. 32% of children in the study group obtained scores higher than 10 on the CBCL, whereas only 8% of the children of the control group scored above 10. This 8-fold higher score on CBCL of the children of the study group was statistically significant.
Neuropsychological characteristics were assessed using the MISIC. The results are presented in Table 4. The average IQ of the children of the study group was 81.83 and that of the control group was 103.96. The verbal, performance, and full-scale IQ of the study group was 76.24, 87.42, and 81.83, respectively, whereas that of the control group was 100.64, 107.28, and 103.96, respectively. The difference between these scores was statistically significant.

**DISCUSSION**

Our study aimed to assess the psychopathology and neuropsychological characteristics of children of fathers with alcohol dependence syndrome in comparison to children of fathers without alcohol dependence syndrome.

A total of 50 children each in the study and control group were assessed for the sociodemographic profile. Further, the psychopathology of these children was assessed using the CBCL and the neuropsychological characteristics with MISIC.\(^\text{13}\)

As seen from the sociodemographic profile of the study group, 52% of the children belonged to the pre-adolescent age group (8-12 years), and 48% of the children belonged to the adolescent age group (13-18 years). In the study by Raman et al., the mean age of the children included in the study was 7.6 years. A slight male preponderance was seen in the gender distribution of the children in our study. This is in contrast to the study by Raman et al. where a female preponderance was seen.

The CBCL, used to assess the psychopathology, found high scores in 18 children. 88% of these were children of men with alcohol dependence. We found an 8-fold increase in the prevalence of psychopathology in children of men with alcohol dependence syndrome in comparison to the control group, which was statistically significant.

The MISIC was used to assess the neuropsychological characteristics in both the groups. We observed that there was a difference in the verbal, performance and full-scale IQ of children of men with alcohol dependence syndrome and those of men without alcohol dependence syndrome. The mean full-scale IQ of children of men with alcohol dependence syndrome was (81.830) which was less in comparison to the mean full-scale IQ of the control group (103.96). The difference in full-scale IQs was statistically significant. Similarly, the children of men with alcohol dependence syndrome also showed lower scores in verbal and performance IQ in comparison to children of men without alcohol dependence. This difference in verbal and performance IQ showed statistical significance. Our findings are in keeping with those of the below-mentioned studies.

In a study by Ervin et al.,\(^\text{16}\) full IQ, performance scores, and verbal scores were lower among a sample of children raised by alcoholic fathers than among children raised by nonalcoholic fathers. In another study comparing children of alcoholics and children of nonalcoholics, Bennett et al. found that children from alcoholic families had lower IQ, arithmetic, reading and verbal scores.\(^\text{17}\)

**CONCLUSIONS**

Alcohol consumption in the father has a negative impact on the child’s psychopathology and neuropsychological characteristics. Preventive strategies for emotional and behavioral problems of children of men with alcohol...
Dependence syndrome may decrease adverse consequences. Early detection of academic difficulties in children of fathers with alcohol dependence syndrome and appropriate intervention for these children will help in their academic performance.

Limitations of the Study
1. The sample size was small and the subjects included were children of men with alcohol dependence syndrome who attended a tertiary care psychiatric hospital, hence, the findings cannot be extrapolated to the general population.
2. Those children whose parents were separated, divorced and whose parents had deceased were not included in the study.

ACKNOWLEDGMENTS

We would like to express our sincere gratitude to the patients, relatives and the staff of the Tertiary care psychiatric hospital.

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Role of Environmental Factors in the Etiology of Non-syndromic Cleft Lip Palate

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Abstract

Aim: To assess the role of environmental factors such as smoking, alcohol, prescription of drugs or illness of mother and also socioeconomic status attribute to nonsyndromic cleft lip/palate (NSCL/P) and also to evaluate if vitamin supplements play a protective role against NSCL/P.

Materials and Methods: Data were collected using self-formulated questionnaire from a total of 250 mothers of which, 125 were mothers of children with NSCL/P who were undergoing treatment in various CL/P centers in and around Mangalore constituted the study group and 125 mothers of normal healthy children who were the outpatients with trauma or inpatients with bone fractures or under some other treatment in the hospital in and around Mangalore.

Results: There was a positive association between socioeconomic status and NSCL/P occurrence (odds ratio [OR]: 7.76, P = 0.000, confidence interval [CI]: 95%). Positive correlation was also seen for maternal exposure to passive smoking (OR: 1.97; CI: 95%, P = 0.008). In contrast no statistically significant results were found for history of occupational exposure (P = 0.122) maternal alcohol consumption (P = 0.498), active smoking (P = 0.498), maternal illnesses and drugs taken during pregnancy. It was also seen that vitamin supplementation played a protective role against NSCL/P (OR: 0.19, CI: 95%, P = 0.003).

Conclusion: NSCL/P is of multifactorial origin with both environmental risk factors and genetic predisposition concurrently playing a key role in the causation of the same. It can be concluded from our study that absence of maternal nutritional supplementation, maternal passive smoking and mothers of lower socioeconomic strata conferred greater susceptibility to the occurrence of NSCL/P in their offsprings.

Key words: Cleft lip/palate, Environmental factors, Nonsyndromic cleft lip/palate

INTRODUCTION

Craniofacial anomalies in particular cleft lip/palate (CL/P), are the major congenital defects, ranking with a worldwide preponderance of 1 in 700 births per year.¹ CL/P varies considerably in occurrence with wide variability across geographic origin, racial and ethnic groups as well as environmental exposures and socioeconomic status (SES). In general, Asian and American-Indian populations have the highest reported birth prevalence rates, often as high as 1/500, European-derived populations have intermediate prevalence rates at about 1/1000 and African-derived populations have the lowest prevalence rates at about 1/2500. Asian and American Indians having the highest rate and Africans the lowest.² They are immediately recognized disruptions of normal facial structures. Although not a major cause of mortality in developed countries, CL/P does cause considerable morbidity to affected children which extends beyond the obvious disfigurement of face and extends to repeated infections, social stigma, and mental impairment that affect the speech, hearing, and teeth formation.³ These children are teased about their cleft-related features such as speech, teeth, and lip appearance, and lose self-confidence. Research has shown that attractive children are seen by others as brighter, as having more positive social behavior and receive more positive treatment than their less attractive cleft counterparts. These children suffer with emotional “burn out” in adolescence.⁴

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Month of Peer Review : 02-2017
Month of Acceptance : 02-2017
Month of Publishing : 03-2017

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Numerous studies have construed that the etiology of nonsyndromic CL/P (NSCL/P) may be multifactorial in origin with both genetic and environmental causative factors. Environmental factors which are of greater preponderance mentioned in various studies are associated with lower SES, maternal exposures to environmental factors like prescription of drugs which include pseudoephedrine aspirin, ibuprofen, amphetamine, cocaine or ecstasy and cigarettes smoking; alcohol, and nutritional deficiency particularly folic acid and certain illnesses of mother like ulcerative colitis, and epilepsy during critical early period of pregnancy. There is a variation in infant mortality and access to care between and within countries, because of which some clefts remain unrepaired into adulthood. Hence for prevention, two things must be done: (1) Identify the etiology to take appropriate preventive measures; and (2) plan for quality of care. Worldwide research is required in developing and developed countries targeting common risk factors, which will not only analyze biological and social determinants of health but also determine other chronic health problems.

Therefore, the purpose of this study was to evaluate the environmental risk factors associated with the occurrence of NSCL with or without palate from various CL/P centers in Karnataka.

**MATERIALS AND METHODS**

Data were collected using self-formulated questionnaire (Figure 1) from a total of 250 mothers of which, 125 were mothers of children with CL/P who were undergoing treatment in various CL/P centers in and around Mangalore and 125 mothers of healthy children who were outpatients with trauma or inpatients with bone fractures or under some other treatment in the hospital in and around Mangalore. Children with no other malformations diagnosed by specialists confirming their nonsyndromic status were included in the study. Mothers of children with any other anomaly such as neural tube defects, monozygotic twins, various syndromes, and mothers not willing to answer the questionnaire were excluded from the study.

**RESULTS**

This study was conducted to assess the role of environmental factors in the causation of NSCL/P. This study was based on the data collected from 125 mothers of NSCL/P and 125 mothers of normal children, and it is a case-control study consisting of questionnaires answered by 250 mothers. We assessed the SES of case and controls using Kuppuswamy’s...
scale taking into consideration education, income and occupation which showed that 2.4% of cases and 8.8% of controls were coming under upper middle class, 38.4% of cases and 63.2% of controls under middle/lower middle class, 57.6% cases that is the maximum number of cases and 27.2% of controls were under upper part of lower class, and 1.6% of cases and 0.8% of controls were coming under the lower class. The results for this were statistically significant ($P = 0.000$) showing that there is a strong tendency for lower SES group toward CL/P. Giving and odds ratio (OR) of 7.76 (2.03-29.65) at 95% confidence interval (CI) (Table 1).

Family history taken showed that 30.4% of the cases had a positive history in comparison to the controls who showed a negative history for the same. The difference is statistically significant ($P = 0.000$) showing that despite the negative family history of CL/P in the subjects, the offsprings still contracted the same suggesting the importance of environmental factors and genetic predisposition in the causation of NSCL/P. Alcohol consumption during pregnancy has been shown to cause CL/P.7,13,22 Hence, we assessed alcohol consumption for 3 months of conception and if reported the number, times they drank/month, units they drank/occasion, and the kind of drink were ascertained. However, our study showed 1.6% of mothers smoked in the form of distilled spirits in the study group, whereas none of the controls consumed alcohol during the first trimester of pregnancy, therefore the result obtained was not statistically significant ($P = 0.498$).

Among the other causative factors most blamed is maternal smoking during the first trimester of pregnancy.1,11,16,20,23 In our study only 1.6% of case mothers smoked which was statistically nonsignificant ($P = 0.498$).

Passive smoking at home or at work place also has been considered as one of the etiologic factors.22,23 In our study, 59.2% of mothers in the study group were exposed to passive smoking as compared to 42.4% of control mothers and the results for this were statistically significant ($P = 0.008$) giving an OR of 1.97 (95% CI) these results confirm the role of tobacco in the etiology of NSCL/P (Table 2).

The previous studies proved that are drugs taken for various illnesses during embryogenesis are teratogenic,1,2,14,24 however, in our study none of the cases gave a history of consuming any teratogenic drugs mentioned in questionnaire during the first trimester of pregnancy and also neither did the controls group gave any history of teratogenic drugs taken. The results showed no relation between drugs consumed during pregnancy and occurrence of NSCL/P.

None of the study population nor control group reported of any illnesses like epilepsy, ulcerative colitis, morning sickness or any other uneventful diseases during the first trimester of pregnancy so our study could not assess the relationship between the incidence of NSCL/P and the history of illness during pregnancy. In our exposure of mother to hazardous chemicals was assessed and we found 3.2% of mothers were exposed to various chemicals during the first trimester however the result was not statistically significant ($P = 0.122$), and it ruled out the role of exposure to chemicals in pregnancy as a causative factor for NSCL/P. Both case and control children were confirmed free of syndromes, and our collected data through questionnaire showed the absence of any other malformations. Many previous studies have proved protective role of multivitamin on NSCL/P occurrence5,7,13,15,26,27 and to know the role of vitamins in protection against NSCL/P in our population, we interviewed the case and control mothers about consumption of multivitamin and folic acid in particular and it showed that 85.6% of 125 mothers of cases as compared to 96.8% of control mothers had taken multivitamin supplements. 14.4% of the cases did not take any supplements as compared to 3.2% of controls (OR = 0.19, 95% CI: 0.06-0.59) and this was statistically significant ($P = 0.003$) showing more risk toward the ones who had not consumed the supplement. Hence, results of our study showed the statistically significant relation between the occurrence of NSCL/P with the SES of the mothers and passive exposure of mother to tobacco smoking. Furthermore, it proves a statistically significant protective role of vitamin supplements against NSCL/P when taken during the 1st trimester as shown in control group (OR: 0.19).

### DISCUSSION

Orofacial defects are the most common developmental deformities seen worldwide and they are undoubtedly

<table>
<thead>
<tr>
<th>Table 1: Socioeconomic status and cleft lip palate</th>
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<tbody>
<tr>
<td>SES</td>
</tr>
<tr>
<td>Cases</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>Upper middle</td>
</tr>
<tr>
<td>Middle/lower middle</td>
</tr>
<tr>
<td>Lower/upper lower</td>
</tr>
<tr>
<td>Lower</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

SES: Socioeconomic status

<table>
<thead>
<tr>
<th>Table 2: Passive smoking and cleft lip palate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passive smoking</td>
</tr>
<tr>
<td>Cases</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

$χ²$ value= 7.058, $df=1$, $p=0.008$, significant, OR=1.97. OR: Odds ratio
an important oral health issue due to their impact on the quality of life, function and also clinical impacts over many years. Etiology of this defect is said to be complex and incompletely understood, but is generally considered to be determined by genetic and environmental factors. Many researches recently conducted show an interrelationship between environmental risk factors that the mother is exposed to during the critical period of pregnancy among which the crucial ones are found to be: Drinking alcohol, smoking, diseases of mother, working in harmful environment, use of drugs during first trimester and deficiency of folic acid, because of which clefts have been growing in numbers. Hence, the purpose of this study was to evaluate environmental risk factors associated with the occurrence of this NSCL/P.

In this study, data were collected using self-formulated questionnaire from a total of 250 mothers of which, 125 were mothers of children with the defect who were undergoing treatment in various CL/P centers in and around Mangalore and 125 mothers of healthy children from the hospitals in and around Mangalore.

In our study, both case and control mothers were interviewed for the presence of any other congenital malformations in children and confirmed that none of the cases had any other malformations other than CL/P and the controls were normal and also not associated with any malformations. This was done mainly to rule out any syndrome associated as approximately 70% of all CL/P cases occur as isolated, sporadic birth defects, known as NSCL/P, while the remaining 30% occur as a part of more than 300 different syndromes with the Mendelian inheritance pattern, in which CL/P is only one manifestation as mentioned by Sprintz et al. As SES is said to be associated with risks of neural tube defects, conotruncal defects, and orofacial clefts. We assessed the SES of the cases and controls using Kuppuswamy’s scale taking into consideration the income, occupation and education which showed that upper part of lower SES group, were at an increased risk of CL/P, than the higher socioeconomic groups which are in conformity with the previous studies relating low SES to CL/P occurrence. Upper part of the lower socioeconomic group could be more prone because people in this group are less educated, have no good occupation and are unable to access and interpret health-related information, they also have more chances of workplace hazards exposure, poor living condition and also malnourishment.

In our study, only 30.4% of mothers of children with CL/P had a family history of cleft whereas other cases and controls did not have a family history of CL/P. This shows that the socioeconomic and/or environmental variables shared by the family members could be one of the causative factors of CL/P other than genetic predisposition and this finding is in accordance to the study conducted by González et al.

Among the causative factors most blamed environmental factor of NSCL/P is maternal smoking during the first trimester also is associated with risk of CL/P. Maternal smoking modifies variants of gene related to detoxification of compounds of cigarette smoke. Philipp et al. stated that women who smoked during pregnancy had compromised utero-placental blood flow that could result in the poor fetal development and also carbon monoxide affects oxygen transfer to the placenta, and nicotine constricts the uterine wall resulting in hypoxia. However, in our study many of them did not indulge in smoking habit which could be explained because of the Indian culture where most of them do not indulge in smoking habits. Interestingly, however we found, passive smoking is common in 74%, and many of the women were exposed to passive smoking at home or work place giving an OR of 1.97, suggesting an increased risk of passive smoking on orofacial clefts. This result is in accordance with a study by Taghavi et al. and various other studies have been conducted in the last which show the association between passive smoking and CL/P. However, one limitation in our study was the inability to quantify such exposure.

Alcohol consumption has been associated to the occurrence of CL/P in many of the previous studies. It is suggested that alcohol exerts some of its embryopathic effects by destructively affecting cranial neural crest cell activities. However, in our study only 1.6% consumed alcohol in the study group which is not statistically significant. The results of our study are in contrast to existing literature showing no such co-relation ($P = 0.156$). In our study, many of them did not indulge in alcohol consumption which could be explained because of the Indian culture where most of them do not indulge in alcohol consumption.

To assess the protective role of vitamin supplement specially folic acid the history of multivitamin and folic acid supplement was interviewed and we found that 84.0% cases and 96.0% controls had taken the multivitamin supplements in pregnancy (OR: 0.196) suggesting that there might be an increased risk of cleft among the ones who had not taken the supplements which agree with the studies about the protective role of multivitamin supplementation especially folic acid before or after conception. The reason for the importance of supplements can be attributed to the fact that the human body needs nutrients and it is crucial to have them in adequate concentration in
Goveas and Savitha: Environmental Factors and Cleft Lip Palate

mothers body at early stages of pregnancy so that fetus can develop normally. Folic acid, in particular, is recognized as playing an important role in neural tube formation. Folic acid supplementation can decline the risk of neural tube defects which in turn leads to prevention of many potential clefts. However, the mothers could not recollect the exact prescription to differentiate between other vitamins and folic acid which could be due to a lack of education or lack of documentation and this remains a drawback of this study.

Studies have also shown that maternal diseases such as epilepsy, ulcerative colitis, and angina pectoris have been one of the contributing factors for the causation of CL/P. Whereas, the lower rate of oral clefts was observed among the offspring of women who had experienced severe “morning sickness” with vomiting. But none of the patients interviewed in our study had any of the above-mentioned illnesses or any other uneventful diseases during the first trimester of pregnancy during pregnancy. This suggests that more detailed studies using hospital records which were not accessible to us might be required and also more detailed documentations in the hospitals is suggested for hospital based studies on preventable diseases like NSCL/P.

Some of the drugs taken for illnesses during pregnancy are also considered as a factor associated with clefts. Czeizel et al. stated that the use of an antinausea or vomiting drug was more common among mothers of subjects with cleft palate. Werler et al. stated that maternal intake of vasoactive drugs, which include pseudoephedrine, aspirin, ibuprofen, amphetamine, and cocaine or ecstasy have been associated with higher risk for oral clefts. In the case of antiepileptic drugs, there is reasonable evidence that valproate is a significant teratogen during therapeutic use in women; the other older antiepileptic drugs phenobarbitone, phenytoin, carbamazepine probably have some teratogenic potential, but less than valproate. However, there is some question as to whether this increase is due to the medications or the underlying epilepsy. An association between maternal intake of sulfasalazine, naproxen, and glucocorticoids during the first trimester has been suggested to be a factor. Aminopterin (a cancer drug) has also been linked to the development of oral clefts. In our study, none of the mothers interviewed took any of the teratogenic drugs during first trimester pregnancy. This may be because none of the mothers had any illnesses which required the teratogenic drugs or may be of lack of education and documentation. Emphasis on documentation of prescription and diseases needs to be implemented.

Exposure to organic solvents, specifically benzene, was reported as a contributing factor to an increase in neural crest malformations in offspring, including orofacial clefting by some researchers. In our study, 3.2% of the mothers reported that they were exposed to occupational hazards and pesticides, (based on their profession and the area of residence that is one mother was working as a beautician-suspected of exposure to organic solvents used like benzene in hair spray and three of the mothers were from endosulfan affected areas) and it was statistically nonsignificant relation between this exposure to hazardous chemicals and occurrence of NSCL/P however there could be a bias in the number of people reporting because of the lack of awareness about exposure to these chemicals at home or at work place. Hence, more specific studies have to be conducted in this aspect with the help of industrial hygienists who assess the presence of chemicals and the probability of exposure.

It is, therefore, shown from our study that absence of maternal nutritional supplementation, maternal passive smoking, and mothers of lower socioeconomic strata had a greater susceptibility to the occurrence of NSCL/P in their offspring.

However, in contrast to the existing literature, our study did not show any significant correlation of NSCL/P occurrence with maternal exposure to environmental risk factors such as active smoking, alcohol consumption, exposure to teratogenic drugs, and illnesses because of Indian culture where maternal smoking and alcohol consumption is uncommon, lack of proper hospital documentation and improper recollection of prescription drugs by the mothers in the population sample included in this study.

**CONCLUSION**

Confirmation of the risk factors and proving it can be beneficial in preventing a defect with lifelong implication on the affected child. This can be done by educating the mothers about the ill effects of these avoidable environmental factors, and active participation of all the health-care providers in this preventive protocol is the need of the hour. Documentation on of prescriptions and diseases in pregnancy needs to be highly emphasized to prevent any possible bias in the future so we can find the precise factor responsible for the etiology of NSCL/P. Nationwide social awareness programs should be planned that focuses on the environmental factors responsible for NSCL/P.

**REFERENCES**


Treatment of Difficult Non-union of Long Bones using the Ilizarov Technique

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¹Assistant Professor, Department of Orthopaedics, Medical College & Hospitals, Kolkata, India, ²Senior Registrar, Department of Orthopaedics, ESI PGIMSR, Joka, Kolkata, West Bengal, India

Abstract

Introduction: The Ilizarov technique has been the gold standard for treatment of difficult non-unions for the last few decades. Here, fine wires are inserted percutaneously, tensioned adequately and attached to rings to provide a strong frame construct.

Materials and Methods: Circular external fixation using the Ilizarov apparatus combined with compression-distraction techniques was used to treat six patients with non-union of long bones compounded by infection, bone loss, deformity, or failure of the previous internal fixation.

Results: The series comprised three males and three females, with an average age of 38.2 years (range 24-58). Five of the non-unions were in tibia and one in femur with four infected cases. They were treated with Ilizarov technique along with simultaneous correction of deformity. All the patients eventually obtained clinical and radiological evidence of union and eradication of infection in all six cases. According to the Association for the Study and Application of Methods of Ilizarov, bone score results three (50%) were classed as excellent, 2 (33%) as good and 1 (17%) as fair. Functionally, 1 (17%) was graded as excellent, 3 (50%) as good, and 2 (33%) as fair.

Conclusion: Treatment of difficult non-unions with Ilizarov technique has stood the test of time. It can be concluded that the use of Ilizarov technique for difficult non-unions yields good function in terms of union, deformity correction, pain relief, and activities of daily living in our center.

Key words: Ilizarov technique, Infection, Non-union

INTRODUCTION

In 1951, Ilizarov et al. in the Siberian city Kurgan developed the method of distraction osteogenesis for treating acute trauma fractures. The Ilizarov technique has been the gold standard for treatment of difficult non-unions for the last few decades. Here, fine wires are inserted percutaneously, tensioned adequately, and attached to rings to provide a strong frame construct.¹ It permits the use of compression, distraction, bone lengthening, and deformity correction. The stability of the construct permits weight bearing and joint mobilization. It demands a higher technical knowledge and supervised postoperative rehabilitation confining its use to specialist centers. The majority of tibial and femoral non-unions can be treated successfully by internal fixation. However, an infected non-union can prove a difficult problem. This can be compounded by bone loss, deformity, or failure of the previous internal fixation. The choice of such procedure can ensure limb salvage and prevent amputation.² The treatment of bone infections after intramedullary nailing usually includes a series of different surgical procedures, such as removal of metalwork, radical bone debridement, deep-tissue sampling, elimination of dead space, and insertion of local antibiotic delivery systems. This is followed by the application of the Ilizarov external fixator. Furthermore, local or free soft tissue transfers are employed to cover any soft tissue defect. The Ilizarov method addresses all the above problems simultaneously and offers a good solution for infected non-unions. Furthermore, bone defects can be filled by a corticotomy and bone transport. The control of infection is by debridement of the bone ends and increased
vascularity of the limb. Amputation is one of the risks of infected non-union and so the Ilizarov method can minimize this potential outcome.

MATERIALS AND METHODS

We wanted to see the outcome of treatment of difficult non-unions with Ilizarov technique in our center. All patients who had a nonunion of any long bone compounded with infection, gap, shortening, or deformity presenting at the Out Patient Department of Orthopaedics, Medical College and Hospitals, Kolkata, between January 2013 and December 2013 were included in this study (Table 1).

Six patients with difficult non-unions underwent management by Ilizarov technique were undertaken for this study. There were three male and three females with an average age of 38.2 years (range 24-58). In terms of significant comorbidities, there was one smoker. In five patients, the fracture was at the tibia, and one was in femur (Table 1).

Three tibial fractures were initially open injuries which were primarily stabilized with linear external fixator. Intramedullary nailing was done for the femoral fracture which became infected. This was followed by implant removal, stabilization with linear external fixator, and series of debridement.

Infection was present in four cases as evident by persistent pus discharge from fracture site. Five cases had a shortening with bone gap in two cases. Three cases had associated deformity.

The average time from initial injury to the application of an Ilizarov frame was 25 weeks (range 13-42). All definitive procedures were done by a single surgeon. The bone ends were debrided, and tissue samples were sent for microbiological studies. The frame was then applied with transosseous wires and half pins to preserve the anatomical axis and avoiding neurovascular structures. Proximal tibial corticotomy was done in one case. The frames were extended to the foot to minimize equinus deformity where necessary.

Contact between the two bony segments was obtained, and then inter-fragmentary compression was performed to stabilize the entire frame. Following this, slow uninterrupted distraction (1 mm/day) was applied to the bone fragment; the resulting distraction gap regenerates new tissue and undergoes ossification within this newly created space. The newly regenerated bone can be stretched in virtually any direction by progressive manipulation of groups of Ilizarov rings to accomplish lengthening, reconstruction of the gap, and axial and torsional correction. Necessary gradual correction of deformity was done simultaneously during this period using hinges.

Postoperatively, the patients were encouraged to bear weight immediately with the aid of crutches. Antibiotics were administered as per the sensitivity report, and the patients were trained regarding the compression-distraction of fixator and pin site care. Patients were then subsequently discharged into the community along with hand written protocol for the fixator manipulation. They were followed up at weekly interval till the correction of deformity and then biweekly till union is achieved. Radiological pictures of one such case is depicted in Figure 1.

Functional and radiological outcomes were assessed using the Association for the Study and Application of Methods of Ilizarov (ASAMI) criteria (Tables 2-4).

RESULTS

All six fractures eventually united. None had any residual infection. None required amputation. The mean time to union was 34 weeks (range 20-46 weeks). The average follow-

<table>
<thead>
<tr>
<th>Patient name</th>
<th>Age (years)</th>
<th>Sex</th>
<th>Bone</th>
<th>Initial injury</th>
<th>Initial management</th>
<th>Type of non-union</th>
<th>Infection</th>
<th>Shortening (cm)</th>
<th>Gap</th>
<th>Deformity</th>
</tr>
</thead>
<tbody>
<tr>
<td>LB</td>
<td>58</td>
<td>F</td>
<td>Tibia</td>
<td>Closed</td>
<td>Plaster immobilization</td>
<td>Hypertrophic</td>
<td>Absent</td>
<td>Nil</td>
<td>Nil</td>
<td>Procurvatum varus</td>
</tr>
<tr>
<td>MB</td>
<td>45</td>
<td>F</td>
<td>Tibia</td>
<td>Open</td>
<td>External fixator</td>
<td>Atrophic</td>
<td>Present</td>
<td>1.5</td>
<td>Nil</td>
<td>Recurvatum valgus</td>
</tr>
<tr>
<td>FS</td>
<td>42</td>
<td>M</td>
<td>Tibia</td>
<td>Open</td>
<td>External fixator</td>
<td>Atrophic</td>
<td>Present</td>
<td>3.5</td>
<td>Present</td>
<td>Nil</td>
</tr>
<tr>
<td>MA</td>
<td>24</td>
<td>M</td>
<td>Tibia</td>
<td>Closed</td>
<td>Plaster immobilization</td>
<td>Hypertrophic</td>
<td>Absent</td>
<td>2</td>
<td>Nil</td>
<td>Procurvatum valgus</td>
</tr>
<tr>
<td>NB</td>
<td>32</td>
<td>F</td>
<td>Femur</td>
<td>Closed</td>
<td>IM nailing</td>
<td>Atrophic</td>
<td>Present</td>
<td>4</td>
<td>Present</td>
<td>Nil</td>
</tr>
<tr>
<td>PS</td>
<td>28</td>
<td>M</td>
<td>Tibia</td>
<td>Open</td>
<td>External fixator</td>
<td>Atrophic</td>
<td>Present</td>
<td>2</td>
<td>Nil</td>
<td>Nil</td>
</tr>
</tbody>
</table>

Figure 1: Illustration showing one of the cases of the study
up time was 68 weeks (30-110 weeks). The average leg length discrepancy was 1.7 cm (0-4 cm). Three had an obvious limp. One had appreciable deformity, and two had soft tissue dystrophy. Two patients developed pin site infections which were successfully treated with oral antibiotics.

Only one patient (MB) needed a second procedure for the adjustment of fixator for correction of deformity. One patient (MA) insisted for premature removal of fixator and had a persistent procurvatum and valgus deformity (Figure 2). Another patient (NB) refrained from a second procedure to equalize the limb length and had a final shortening of 4 cm in the femur (Figure 3).

All the patients eventually obtained clinical and radiological evidence of union and none required bone grafting at the fracture or at the corticotomy site.

According to the ASAMI bone score results, 3 (50%) were classed as excellent, 2 (33%) as good, and 1 (17%) as fair. Functionally 1 (17%) was graded as excellent, 3 (50%) as good, and 2 (33%) as fair.

**DISCUSSION**

The methods of Ilizarov, including compression-distraction and osteosynthesis offer alternatives to the standard treatment of infected non-unions of bone. Conventional methods of non-union treatment are successful in cases of non-infected non-unions, in which bone vascular supply and soft tissue integrity are not compromised. Repeated surgical procedures, osteomyelitis, non-union, bone loss, disuse osteopenosis, muscle dystrophy, impaired arterial circulation, and decreased venous and lymphatic drainage ensue when bone fractures do not consolidate. The Ilizarov method is the method of choice in these situations and can be considered as limb salvage operation.

Use of the Ilizarov circular frame allows resection of the infected bone, repair of the defect, and stabilization to consolidation while maintaining or restoring the length of the limb. Joint function is encouraged while the apparatus is worn and functional loading can be initiated within the first few days after application of the frame.\(^5\) The Ilizarov apparatus is very resistant to torsion and bending forces but is adaptable to axial loading.\(^6\)

Union achieved by repairing defects with cancellous bone grafts, as recommended by Johnson et al. and Lack et al.,\(^7,8\) may be satisfactory, but the biomechanical structure of the restored bone may require the years of remodeling to achieve the radiological appearance that is obtained by distraction regeneration by the Ilizarov method.\(^9\)

In our study, radiological and clinical union was achieved in all cases along with eradication of infection. Nearly, all of our patients were able to stand and walk with partial extremity loading immediately after the circular frame was installed. This is considered the most essential part of this method. One patient had a persistent deformity due to non-

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**Table 2: Bone results using the ASAMI scoring system**

<table>
<thead>
<tr>
<th>Bone results</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>Union, no infection, deformity&lt;7°, limb length discrepancy&lt;2.5 cm</td>
</tr>
<tr>
<td>Good</td>
<td>Union+any two of the following: Absence of infection&lt;7° deformity and limb length inequality&lt;2.5 cm</td>
</tr>
<tr>
<td>Fair</td>
<td>Union+only one of the following: Absence of infection, deformity&lt;7° and limb length inequality&lt;2.5 cm</td>
</tr>
<tr>
<td>Poor</td>
<td>Non-union/refracture/union+infection+deformity&gt;7° + limb length inequality&gt;2.5 cm</td>
</tr>
</tbody>
</table>

**Table 3: Functional results using the ASAMI scoring system**

<table>
<thead>
<tr>
<th>Functional Results</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>Active, no limp, minimum stiffness (loss of&lt;15° knee extension/&lt;15° dorsiflexion of ankle), no RSD, insignificant pain</td>
</tr>
<tr>
<td>Good</td>
<td>Active, with one or two of the following: Limp, stiffness, RSD, significant pain</td>
</tr>
<tr>
<td>Fair</td>
<td>Active, with three or all of the following: Limp, stiffness, RSD, significant pain</td>
</tr>
<tr>
<td>Poor</td>
<td>Poor inactive (unemployment or inability to perform daily activities because of injury)</td>
</tr>
<tr>
<td>Failure</td>
<td>Amputation</td>
</tr>
</tbody>
</table>

**Table 4: Results of the patients undertaken in the study**

<table>
<thead>
<tr>
<th>Patient name</th>
<th>Injury Ilizarov time (in weeks)</th>
<th>Union time (in weeks)</th>
<th>Follow-up period (in weeks)</th>
<th>Union</th>
<th>Infection</th>
<th>Shortening (cm)</th>
<th>Deformity</th>
<th>Bone ASAMI score</th>
<th>Functional ASAMI score</th>
</tr>
</thead>
<tbody>
<tr>
<td>LB</td>
<td>42</td>
<td>26</td>
<td>110</td>
<td>United</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
<td>Excellent</td>
<td>Excellent</td>
</tr>
<tr>
<td>MB</td>
<td>30</td>
<td>28</td>
<td>50</td>
<td>United</td>
<td>Nil</td>
<td>1</td>
<td>Nil</td>
<td>Excellent</td>
<td>Good</td>
</tr>
<tr>
<td>FS</td>
<td>26</td>
<td>40</td>
<td>68</td>
<td>United</td>
<td>2.7</td>
<td>2</td>
<td>+</td>
<td>Good</td>
<td>Fair</td>
</tr>
<tr>
<td>MA</td>
<td>17</td>
<td>20</td>
<td>30</td>
<td>United</td>
<td>2</td>
<td>+</td>
<td>+</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>NB</td>
<td>13</td>
<td>46</td>
<td>80</td>
<td>United</td>
<td>4</td>
<td>+</td>
<td>+</td>
<td>Fair</td>
<td>Fair</td>
</tr>
<tr>
<td>PS</td>
<td>25</td>
<td>44</td>
<td>70</td>
<td>United</td>
<td>1</td>
<td>Nil</td>
<td>Excellent</td>
<td>Good</td>
<td></td>
</tr>
</tbody>
</table>

ASAMI: According to the Association for the Study and Application of Methods of Ilizarov.
compliance with the treatment, however, the fracture got united. The patient with femoral fracture had a shortening of 4 cm, but she refrained from further intervention to correct it.

Barbarossa et al. in their study of 30 patients with chronic osteomyelitis and infected pseudoarthroses of the femur showed the efficacy of the Ilizarov method for treatment of such conditions but emphasized the importance of patient compliance and involvement in order to achieve the best results.10

Even though many patients perceive the clumsy looking Ilizarov fixator as a social stigma, it provides them with immediate weight bearing. They were able to perform daily activities notably locomotion independently, thus minimizing the social and economic burden.

Maini et al. in their study had excellent results in 21 patients (70%), good in 3 (10%), fair in none (0%), and poor in 6 (20%). The functional results were excellent in 8 patients (26.7%), good in 12 (40.0%), fair in 3 (10%), and poor in 7 (23.3%).11 The outcome in terms of ASAMI bone and functional scores in our study were appreciable with no poor results. The main limitation to the study was our numbers. The total treatment time can take up to 2 years, therefore, we would not expect to have such high numbers.

CONCLUSION

Treatment of difficult non-unions with Ilizarov technique has stood the test of time. It can be concluded that the use of Ilizarov technique for difficult non-unions yields good function in terms of union, deformity correction, pain relief, and activities of daily living in our center. However, this is a long and arduous process requiring patient compliance and involvement.

REFERENCES


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Spontaneous Abnormal Involuntary Movements in Drug Naïve Schizophrenia

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Abstract

Background: Spontaneous involuntary movements or dyskinetic movements are often seen in patients with schizophrenia and other psychotic disorders and are widely considered to be a side effect of antipsychotics. Nevertheless, spontaneous movement disorders are also observed in the preneuroleptic era and among patients who were never exposed to antipsychotic medications. The aim of this study was to determine the extent of spontaneous movement disorders among antipsychotic-naive patients and to evaluate contextually relevant risk factors.

Objective: The objective of this study is to study the rate of spontaneous abnormal involuntary movements in a group of patients presenting with a first episode of schizophrenia.

Methods: A total of 46 patients with the first episode of schizophrenia attending the Outpatient Department of Chengalpattu Medical College, who were neuroleptic-naive, were examined for the presence of involuntary movements with the use of the Abnormal Involuntary Movement Scale.

Results: Three patients (6.5%) had spontaneous dyskinesia as defined by the criteria of Schooler and Kane, and four other patients had mild orofacial involuntary movements. Spontaneous involuntary movements were unrelated to age at onset, gender, subtype of schizophrenia, and family history.

Conclusions: Spontaneous abnormal involuntary movements were evident among a proportion of patients with the first-episode schizophrenia at baseline presentation. This finding supports previous suggestions that abnormal involuntary movements in schizophrenia may be related to the pathophysiology of the illness, and therefore, cannot be attributed entirely to the adverse effects of neuroleptic medication.

Key words: Drug naïve, Dyskinesia, Schizophrenia

INTRODUCTION

Tardive dyskinesia has long been considered to be a side effect of neuroleptic medications. The fact that it is both common and potentially irreversible makes it perhaps the most serious long-term side effect of these drugs, which are one of the mainstays of treatment of schizophrenia and other psychotic disorders. An alternative perspective is that abnormal involuntary movements are not simply a side effect of treatment but may be, at least partially, an inherent part of some psychotic illnesses. Reports of abnormal involuntary movements in schizophrenia date almost from the first description of the disorder itself. The abnormal involuntary movements in dementia praecox described by Kraepelin are indistinguishable from the movements we now term tardive dyskinesia. Numerous studies were done to report the presence of abnormal movements in both drug naïve and treated schizophrenia. One study done by Chorfi and Moussaoui tend to show an increasing rate of spontaneous dyskinesia with increasing age and chronicity of illness. The highest rate was reported by Owens et al. in a sample of long-term institutionalized patients, which...
may have a selection bias for higher rates of movement disorders. A fundamental issue is whether such movements are present at the time of the first presentation of the illness or develop over time, either in relation to or independent of exposure to neuroleptic medication. In a study of first-episode schizophrenia/schizoaffective disorder, Chatterjee et al. found that only one of the 89 patients evidenced abnormal involuntary movements. In a study done by McCreadie et al. on Indian patients in 1996, they found that dyskinesia was found in 15% of normal subjects, 15% of first-degree blood relatives of younger schizophrenic patients, 38% of never medicated patients, and 41% of medicated patients. Dyskinesia was associated with negative schizophrenic symptoms.

Aim
The aim of this study is to study the rate of spontaneous abnormal involuntary movements in a group of patients presenting with the first episode of schizophrenia.

METHODS

The prospective observational study was conducted at Department of Psychiatry, Chengalpattu Medical College in 46 patients fulfilling the International Classification of Diseases (ICD)-10 criteria for schizophrenia, who were drug naïve or medicated for less than a month. The purpose and nature of the study were explained to the patients, and informed consent was obtained. The patients were examined for the presence and severity of involuntary movements by one of the investigators myasthenia gravis using the Abnormal Involuntary Movement Scale (AIMS), which assesses involuntary movements in seven body areas. The presence of spontaneous dyskinesia was determined with the use of the criteria of Schooler and Kane, which requires that a patient have mild involuntary movements in at least two body areas or moderate involuntary movements in one body area to be classified as a “case.” Symptoms were assessed at the baseline using scale for assessment of positive symptoms (SAPS) and scale for assessment of negative symptoms (SANS). Sociodemographic and clinical data were compiled by interview and review of clinical case notes. Exclusion criteria were aged under 18 years or over 45 years; evidence of psychotic symptoms precipitated by an organic cause; previous treatment for psychoses; comorbidity with other psychiatric conditions.

RESULTS

A total of 46 patients who met the ICD-10 criteria for schizophrenia were assessed over the period of the study. Of these, 30 (65.2%) were female and 16 were male. Their mean age was 31.07 ± 9.7 years. The mean age at presentation did not differ between the patients with spontaneous dyskinesia and those without (mean = 30.47 ± 11.6 years and mean = 30.66 ± 9.6 years, respectively; t = 0.63, df = 77, P = 0.95). There was no significant difference in gender distribution between the group of patients with spontaneous dyskinesia (one male and two female) and the group without (16 male and 30 female) (P = 0.66, Fisher’s exact test) (Table 1).

There is no significant association between the two groups with regard to the symptoms at the baseline, SAPS (mean = 6.36 ± 1.52 for those with dyskinesia and mean = 9.33 ± 2.4 for those without dyskinesia, P = 0.14), SANS (P = 0.94).

Patients with spontaneous dyskinesia had completed fewer years of education (mean = 11.3 ± 2.3 years) than patients without spontaneous dyskinesia (mean = 12.3 ± 2.4 years) (t = 2.15, df = 77, P = 0.23) though the association was not significant. There is no association with other variables such as subtype, age at onset. However, in a logistic regression (Table 2) in which the presence of spontaneous dyskinesia was the dependent variable and age, gender, years of education, family history, age at onset and subtype of schizophrenia were the independent variables; the overall regression model was not significant (−2 log likelihood χ² = 8.21, df = 5, P = 0.15).

Table 1: Comparison of socio-demographic and clinical variables between the patients with spontaneous dyskinesia and without spontaneous dyskinesia

<table>
<thead>
<tr>
<th>Variable</th>
<th>With spontaneous dyskinesia</th>
<th>Without spontaneous dyskinesia</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>30.47</td>
<td>30.66</td>
<td>0.95</td>
</tr>
<tr>
<td>Education</td>
<td>2.63</td>
<td>3.66</td>
<td>0.25</td>
</tr>
<tr>
<td>Age at onset (years)</td>
<td>27.7</td>
<td>30</td>
<td>0.53</td>
</tr>
<tr>
<td>SAPS</td>
<td>6.36</td>
<td>9.33</td>
<td>0.14</td>
</tr>
<tr>
<td>SANS</td>
<td>3.47</td>
<td>3.33</td>
<td>0.94</td>
</tr>
</tbody>
</table>

SAPS: Scale for assessment of positive symptoms, SANS: Scale for assessment of negative symptoms.
DISCUSSION

The principal finding of this study was a baseline rate of 6.5% for spontaneous dyskinesia in a group of patients with the first-episode schizophrenia, which is higher than the rate (1.1%) reported by Chatterjee et al. in their first-episode group. This finding is at odds with the findings of McCreadie and Ohaeri in their Nigerian study, where the rate was 0% for spontaneous dyskinesia in 12 never-medicated patients and 10% in 49 patients who were medicated. Fenton et al. previously reported an association between spontaneous dyskinesia and both a more malignant course and lower intelligence quotient among patients with schizophrenia, but there is no such finding in our study.

Our finding of no relation between the presence of spontaneous dyskinesia and age in our subjects is not surprising in a group of relatively young first-episode patients that is homogeneous in age. The association between increasing age and involuntary movements is perhaps the most robust finding across studies in samples with different ages (McCreadie et al. 1996 and 2002).

Spontaneous dyskinesia was more common at baseline presentation among patients with first-episode schizophrenia was found previously in the first-episode group of Chatterjee et al. This adds weight to the argument that involuntary movements in schizophrenia may be at least in part intrinsic to the pathophysiology of the illness rather than a side effect of its treatment. The lower number of years of education completed by patients with spontaneous involuntary movements, if considered indicative of poorer cognitive function, suggests that associations between involuntary movements and poorer cognitive function may antedate the onset of the illness and may also be independent of treatment with neuroleptic drugs. This emphasizes the clinical and medicolegal importance of monitoring patients for the presence of spontaneous involuntary movements at the time of the first presentation.

CONCLUSIONS

Spontaneous abnormal involuntary movements were evident among a proportion of patients with first-episode schizophrenia at baseline presentation. This finding supports previous suggestions that abnormal involuntary movements in schizophrenia may be related to the pathophysiology of the illness, and therefore, cannot be attributed entirely to the adverse effects of neuroleptic medication.

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Comparison of Ropivacaine Alone versus Ropivacaine with Dexamethasone in Caudal Block for Pediatric Post-operative Analgesia

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Abstract

Background: Caudal block is a regional anesthesia technique most commonly used for post-operative analgesia in children undergoing infraumbilical surgeries. The local anesthetics used in caudal block have the shortcoming of less duration of action which can be increased by adding adjuncts. The aim of our study was to compare the duration of post-operative analgesia when 0.2% ropivacaine versus 0.2% ropivacaine with dexamethasone is administered caudally in pediatric patients undergoing infraumbilical surgeries.

Materials and Methods: The study included 80 patients of 1-8 years age group of ASA Status I undergoing infraumbilical surgery allocated randomly into two groups of 40 each in double-blinded manner after ethical committee clearance and parent’s/legal guardians consent. After securing airway with laryngeal mask airway under standardized general anesthesia Group R received 0.2% ropivacaine 1 ml/kg and Group RD received 0.2% ropivacaine 1 ml/kg with 0.1 mg/kg dexamethasone for caudal analgesia according to group allocated. Post-operative pain was assessed by objective pain scale and face, legs, activity, cry and consolability behavioral pain assessment scale for 24 h. Motor recovery and side effects were noted. The hemodynamics, duration of post-operative analgesia and number of rescue analgesia needed was noted and analyzed statistically.

Results: Mean duration of analgesia in Group R was 324 ± 55.6 min and in Group RD was 1278 ± 304.4 min with $P = 0.000$. The number of subjects who remained pain-free up to 24 h postsurgery was significantly higher in Group RD than in Group R.

Conclusion: Dexamethasone added to ropivacaine for caudal block has significantly improved analgesic efficacy and increased the duration of post-operative analgesia in children undergoing infraumbilical surgery.

Key words: Caudal, Dexamethasone, Pediatric, Post-operative analgesia, Ropivacaine

INTRODUCTION

The society of pediatric anesthesia on 15th Annual Meeting at New Orleans (2001) defined the alleviation of pain as a basic human right, irrespective of age, medical condition, treatment, primary service response for the patient care, or medical institution.¹ The scope of anesthesiologists has widened these days in pediatric regional analgesia as its use is supported by extensive data from the literature documenting its safety and efficacy. The almost complete absence of hemodynamic effects of regional anesthesia in infants and young children together with realization that anesthesiology includes treatment of all form of pain in all patients have led to renewed interest in pediatric regional anesthesia.² In 1998 more than 50 anesthesiologists from all over the world demonstrated that the performance of a block in an anesthetized child is safe, reliable and ethical and that the use of this technique in a sedated child is much safer than its use in an awake and excited baby.³

Surgical procedures in children are followed by pain, which may give rise to restlessness, tachycardia, hypertension,
fear, crying, anxiety, and agitation in children. To negate these physiological and psychological effects of pain and to improve the quality of analgesia, caudal epidural block is a well-known technique and thus caudal anesthesia holds a definite part in anesthesiologist armamentarium.

Local anesthetics are drugs that inhibit conduction in peripheral nerves, and these are being used in regional anesthesia. Bupivacaine was the local anesthetic commonly used previously. Ropivacaine is a long-acting local anesthetic which is considered safe in pediatric population because of its property to produce differential neural blockade with less motor block along with reduced cardiovascular and neurological toxicity.

Single shot caudal was preferred and most commonly used technique. However, the disadvantage of single shot caudal is less duration of action of local anesthetic and the need for supplementation of analgesia postoperatively. Epidural catheters were introduced which lost its popularity due to increased incidence of infection and other complications. To overcome these drawback of epidural catheters adjuncts have been added to local anesthetics which prolonged the duration of action of local anesthetics thus providing post-operative analgesia.

Various adjuncts have been introduced initially to increase the duration of action of local anesthetics which includes opioids, epinephrine, ketamine, clonidine, fentanyl, and tramadol. However, these adjuncts have their own side effects such as respiratory depression, nausea, vomiting, pruritis, urinary retention, and tachycardia. Dexamethasone is a glucocorticoid with strong anti-inflammatory effects. Dexamethasone is successfully used as an adjunct in caudal blocks for children to reduce pain without inducing any significant respiratory and hemodynamic effects.

The pain scores are developed for pediatric patients as they cannot express the actual intensity of pain verbally and these pain scores help documentation of pain and its effective management.

The acronym face, legs, activity, cry and consolability (FLACC) facilitates recall of the categories, each of which is scored from 0 to 2 with total scores ranging 0-10 similar to other clinical assessment tools. Inter-rater reliability of the FLACC among two observers was established in 30 children in the postanesthesia care unit (PACU) \( r = 0.94 \). Validity was established by demonstrating an appropriate decrease in FLACC scores after analgesic administration. A high degree of agreement was found between FLACC scores, the PACU nurses global rating of pain, and with objective pain scale (OPS) scores. The reliability and validity of this tool has been established in diverse settings and in different patient populations.

Norden et al. developed the OPS to monitor pain in children of 8 months to 13 years after surgery. Observational pain scale incorporates 4 pain behaviors (crying, movement, agitation, and verbalization) and blood pressure (BP) change, a physiological measure of pain. Each of these categories was scored from 0 to 2. In our study, we used two pain scales to eliminate underestimation of some categories included in both the scores.

This study was designed to compare the efficacy and duration of post-operative analgesia in pediatric population undergoing infraumbilical surgeries and to find out the effect of ropivacaine alone versus ropivacaine with dexamethasone on duration and quality of pain relief and also side effects after getting approval from Hospital Ethical Committee.

**MATERIALS AND METHODS**

**Subjects**

This study was conducted as prospective double-blinded randomized controlled trial conducted on 80 pediatric patients at Guru Nanak Dev Hospital (GNDH) connected to Government Medical College, Amritsar, after obtaining approval from Hospital Ethical Committee. The children in the age group of 1-8 years, ASA Grade I admitted to GNDH undergoing infraumbilical surgery were included in the study after obtaining informed consent from parents/legal guardians. The exclusion criteria included Parent’s refusal, developmental delay, mental retardation, Type I diabetes mellitus, suspected coagulopathy, known allergy to local anesthetic or steroid, congenital anomaly of spine, and infection at sacral region. Patients were divided into two groups of 40 each, namely, Group R (ropivacaine alone) and Group RD (ropivacaine with dexamethasone) by a computer-generated randomization method. Sample size was calculated by consulting the statistician after taking into account the parameters such as duration of analgesia, motor blockade, hemodynamic changes, and side effects to get the power of the study >85%.

**Anesthesia**

Patients were kept fasting for 4-6 h depending on age before surgery. On the day of surgery patients were reassessed in the pre-operative room. Premedication was given orally with syrup midazolam 0.5 mg/kg, 30-45 min before induction. In the operating room monitors to check the heart rate (HR), respiratory rate (RR), noninvasive BP (NIBP), oxygen saturation (SpO₂), and electrocardiogram were attached. After securing intravenous (IV) access...
injection glycopyrolate 0.005-0.01 mg/kg and injection ondansetron 0.1 mg/kg were administered. Induction of anesthesia was done with either injection propofol 2-3 mg/kg or halothane/sevoflurane in 100% $O_2$. Airway was secured with appropriate size of supraglottic airway devices, and anesthesia was maintained with $O_2$, $N_2O$ and halothane/sevoflurane. Multiparameter monitoring was done.

**Caudal Block**

Patients positioned in left lateral position. The triangle formed by 2 posterior superior iliac spines with sacral hiatus was identified. The area above was carefully cleaned with antiseptic solution. Under all aseptic precautions, a 22 gauge short beveled needle was introduced into the skin at an angle of 45-50°. Needle was advanced till a click was felt as the sacro coccygeal membrane was pierced. The needle is further advanced in cephalad direction at an angle approaching the long axis of the spinal cord. Position of the needle was tested by “Whoosh” test and after aspiration test to exclude needle in blood vessel drug was given according to the group assigned.

**Assessments**

The patient was positioned supine, and surgery was allowed to proceed with continuous intraoperative monitoring of $SpO_2$, HR, NIBP, and RR every 5 min. Postoperatively an observer blinded to the group allocation and procedure observed hemodynamics, pain scores, motor blockade, and side effects were calculated every 15 min till 2 h, then every 2 hourly till 12 h and then at 24th h. OPS (Table 1) and FLACC (Table 2) behavioral pain assessment scale were used for assessment of pain scores. Bromage scale was used for motor block (Bromage 3 [complete]: Unable to move feet/knees; Bromage 2 [almost complete]: Able to move feet only; Bromage 1 [partial]: Just able to move knees; Bromage 0 [none]: Full flexion of knee and feet). Rescue analgesia was administered when OPS and FLACC ≥4. The number of rescue analgesia needed and time for 1st rescue analgesia noted.

**Statistical Analysis**

All the hemodynamic parameters, pain scores, and side effects were entered in master chart and analyzed statistically using SPSS software. Variables were analyzed using Chi-square test and continuous parameters were analyzed using unpaired $t$-test. A $P < 0.05$ - significant at 5% significance level is considered to be nonsignificant; $P < 0.01$ - significant at 1% significance level and $P < 0.001$ is considered to be highly significant.

**RESULTS**

A total of 80 subjects of age group 1-8 years were enrolled in the study. Caudal block was successful in all the patients. The demographic data and surgical profiles of the two groups did not differ (Table 3). There was no significant difference in the hemodynamic parameters between the two groups. There was no case of motor blockade after the surgery. Vomiting and retching was noticed in one patient in Group R. No other side effects were noticed. Comparison of OPS and FLACC pain score among Group R and Group RD was analyzed (Table 4). In Group R, the OPS and FLACC pain score reached 4 at 6th h in most of the patients with mean analgesic duration of 324 ± 55.6 min (mean - 5.4 h). In Group RD, the OPS and FLACC score reached 4 at 24th h in most of the patients with mean analgesic duration of 1278 ± 304.4 min (mean - 21.3 h) (Figures 1 and 2). The patients who needed 2nd dose of rescue analgesia were more in Group R (27 patients) as compared to Group RD where no patients needed 2nd dose of rescue analgesia. The mean dose of rescue analgesia needed in Group R was 1.58 ± 0.501 and in Group RD was 1.00 ± 0.000 (Table 5 and Figure 3).

**DISCUSSION**

Regional anesthetic techniques have gained considerable popularity for use in pediatric patients. The primary advantage of regional supplementation is lowering the anesthetic requirement along with good post-operative analgesia. And also relieving the patient of pain will lead to early ambulation which helps in decreasing morbidity and improving the outcome after surgery.

This study was aimed at evaluating the efficacy of dexamethasone in prolonging the analgesic duration when
Pre-emptive analgesia involves the introduction of an analgesic before the onset of noxious stimuli. The effectiveness of pre-emptive analgesia has been studied by Wulf et al.  

The age group we selected was 1-8 years old pediatric patients, and the dosage of ropivacaine we used in our study was 1 ml/kg of 0.2% ropivacaine. This dosage has been documented to be safe in this age group by the study done by Wulf et al. who evaluated the pharmacokinetics of ropivacaine 0.2% in children after caudal epidural injection.  

Circumcision was the most commonly performed surgery followed by herniotomy, hypospadias, and chordae repair. The mean duration of surgery (in minutes) in Group R was 36.75 ± 7.970 min and in Group RD was 34.75 ± 8.082 min. The type of surgeries was selected in such a way that they have approximately equal mean duration to avoid the misinterpretation of early pain if surgery is for longer time.

All the hemodynamic parameters were comparable at all-time intervals throughout the study. The property of ropivacaine to cause less motor blockade has been explained by the fact that ropivacaine is less lipophilic than bupivacaine and so it is less likely to penetrate the large myelinated motor nerve fibers (Aβ). Therefore, it has selective action on pain-transmitting nerve fibers. A study done on comparison of caudal ropivacaine 0.2% with bupivacaine 0.2% in pediatric patients by Kumar et al. showed that motor recovery was faster in ropivacaine group with motor power scale of 10.00 ± 0.00 in comparison to 8.80 ± 0.99 in bupivacaine group \( (P < 0.01) \) at 2 h in post-operative period. A study done by Kim et al. compared caudal ropivacaine versus ropivacaine with dexamethasone has also stated that they found no motor blockade in their study.  

Our study is also in accordance to the literature had no motor blockade in the recovery room. There was one patient in Group R who had retching and vomiting, and no other side effects noted. A study done by Yousef et al. compared enhancement of analgesic duration of ropivacaine using dexamethasone (RD)

### Table 2: FLACC score

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

FLACC: Face, legs, activity, cry and consolability

### Table 3: Demographic data shown as mean±SD or mean (%)  

<table>
<thead>
<tr>
<th>Data</th>
<th>Group R</th>
<th>Group RD</th>
<th>( P ) value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>3.88±1.5</td>
<td>3.88±1.3</td>
<td>1.000</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>15.23±3.0</td>
<td>14.90±2.8</td>
<td>0.626</td>
</tr>
<tr>
<td>Sex (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>33 (82.5)</td>
<td>35 (87.5)</td>
<td>0.531</td>
</tr>
<tr>
<td>Female</td>
<td>7 (17.5)</td>
<td>5 (12.5)</td>
<td></td>
</tr>
<tr>
<td>Duration of surgery (min)</td>
<td>36.75 (7.9)</td>
<td>34.75 (8.0)</td>
<td>0.269</td>
</tr>
</tbody>
</table>

SD: Standard deviation
Chatrath, et al.: Comparison of Post-operative Analgesic Effects of Ropivacaine versus Ropivacine with Dexamethasone in Caudal Block for Pediatric Patients

Table 4: Pain scores shown as mean±SD and P value

| Time  | OPS score |  | FLACC score |  |
|-------|-----------|----------------|----------------|
|       | Group R   | Group RD        | P value        | Group R   | Group RD        | P value        |
| 0 min | 0.10±0.30 | 0.05±0.22       | 0.402          | 0.08±0.26 | 0.03±0.15       | 0.311          |
| 15 min| 0.08±0.26 | 0.10±0.30       | 0.697          | 0.05±0.22 | 0.08±0.26       | 0.649          |
| 30 min| 0.23±0.53 | 0.23±0.53       | 1.000          | 0.20±0.51 | 0.03±0.15       | 0.044          |
| 45 min| 0.40±0.77 | 0.15±0.53       | 0.098          | 0.65±0.77 | 0.03±0.15       | 0.000          |
| 60 min| 0.53±0.90 | 0.05±0.22       | 0.002          | 1.05±0.95 | 0.10±0.30       | 0.000          |
| 75 min| 0.90±0.95 | 0.03±0.15       | 0.000          | 1.08±0.88 | 0.28±0.45       | 0.000          |
| 90 min| 1.30±1.24 | 0.20±0.56       | 0.000          | 1.55±1.19 | 0.35±0.48       | 0.000          |
| 105 min| 1.50±1.34 | 0.33±0.65       | 0.000          | 2.03±1.02 | 0.40±0.49       | 0.000          |
| 120 min| 2.20±1.13 | 0.75±1.03       | 0.000          | 2.30±1.11 | 0.58±0.71       | 0.000          |
| 4 h   | 2.98±1.25 | 1.10±1.12       | 0.000          | 3.05±1.13 | 0.88±0.75       | 0.000          |
| 6 h   | 3.43±1.43 | 1.35±1.09       | 0.000          | 3.08±1.80 | 1.48±0.67       | 0.000          |
| 8 h   | 1.33±1.20 | 1.50±1.13       | 0.506          | 1.00±0.87 | 2.35±0.62       | 0.000          |
| 10 h  | 2.38±1.12 | 1.58±1.08       | 0.002          | 1.33±0.85 | 2.68±0.52       | 0.000          |
| 12 h  | 2.23±1.38 | 2.08±1.34       | 0.025          | 2.18±1.05 | 2.98±0.69       | 0.000          |
| 24 h  | 2.25±1.53 | 3.65±0.73       | 0.000          | 2.73±1.485| 3.38±1.19       | 0.034          |

FLACC: Face, legs, activity, cry and consolability, OPS: Objective pain scale, SD: Standard deviation

Table 5: Number of rescue analgesia needed

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean number of rescue analgesia required</th>
<th>P value with significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>1.58±0.501</td>
<td>0.000 (HS)</td>
</tr>
<tr>
<td>RD</td>
<td>1.00±0.000</td>
<td></td>
</tr>
</tbody>
</table>

Figure 3: Number of rescue analgesia needed

or magnesium (RM) documented significant difference of Children’s Hospital of Eastern Ontario Pain Scale and FLACC score between three groups at 4th h and in Group RD the score of four was attained at 12th h. Kim in his study concluded that the post-operative pain score at 6th and 24th h postsurgery were significantly lower in dexamethasone group. Similarly, our study also showed OPS and FLACC score ≥4 at 4 and 6 h with mean of 5.4 h in Group R and at 12 and 24 h with mean of 21.3 h in Group RD. Thus, the analgesic duration of ropivacaine in our study is 324 ± 55 min. This is in consistent with study Ray et al. who has noted the average duration of analgesia as 405 ± 18 min in ropivacaine (0.25%) group and Kumar et al. who found that average duration of analgesia in ropivacaine group (0.2%) was 390 ± 35.16 min.

Dexamethasone is a high potency, long-acting glucocorticoid with little mineralocorticoid effect that has been proved useful in post-operative nausea and vomiting. Single dose of dexamethasone has also been proved to have analgesic effects after surgery whether by oral or IV route.

It is demonstrated that the duration of post-operative pain relief was lengthened when dexamethasone is administered as an additive for peripheral nerve blockade. Kopacz et al. also have showed in their study that steroids have analgesic effects in neuraxial and peripheral blocks. Thomas and Beevi found that epidural dexamethasone is significantly more effective than IV dexamethasone to reduce post-operative pain and morphine consumption following laparoscopic cholecystectomy.

The action of epidural steroid to decrease pain may be attributed to its property of anti-inflammatory action, edema reduction, and shrinkage of connective tissue. Local steroid application was found to suppress transmission in unmyelinated C fibers but not in myelinated A-β fibers. Steroids act by binding to intracellular nuclear receptors and altering the protein synthesis by gene transcription.

Epidural dexamethasone affects intraspinal prostaglandin formation. Acute noxious stimuli during surgery lead to activation of phospholipase A2 and upregulation of cyclooxygenase 2 (COX 2) in the spinal cord, leading to prostaglandin synthesis and a resultant hyperalgesic state. Inflammatory, metabolic, hormonal and immune response to surgery are activated immediately after surgical incision. Moreover, pre-operative administration of steroids may
reduce these responses due to their anti-inflammatory and immunosuppressive property, by inhibiting both phospholipase A2 and COX 2 enzymes. This was obvious with the reduction of C-reactive protein levels, pain and fatigue score in patients who received pre-operative dexamethasone.

The effect of dexamethasone on spinal cord is due to the presence of transcription factor nuclear factor kappa β (NF-κβ) present throughout the nervous system. Dexamethasone by regulating NF-κβ inhibits central sensitization after surgery and potentiates analgesia of the caudal block.

In a study conducted by Mohamed on evaluation of the analgesic effect of caudal dexamethasone combined with bupivacaine the duration of analgesia was significantly longer in the dexamethasone/bupivacaine group, where it was (9.2 ± 0.9 h), when compared with the bupivacaine group (4.8 ± 1.1 h).

Another study conducted by Almajali et al. with dexamethasone as an adjunct to bupivacaine came out with the results that mean pain-free period was more significant in group who received bupivacaine along with dexamethasone (272 min) than in group who received only bupivacaine (186 min).

Yousef et al. demonstrated that post-operative analgesia persisted for a longer duration in Groups RM (ropivacaine with magnesium) and RD (ropivacaine with dexamethasone), 8 (5-11) h and 12 (8-16) h, respectively compared with 4 (3-5) h in Group R (ropivacaine alone, with a (P < 0.001). It was also found that time to first paracetamol was to 260 ± 65 min in ropivacaine group and 730 ± 260 min in ropivacaine with dexamethasone group.

Choudhary et al. in their study found 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.

Kim et al. conducted study on analgesic efficacy of caudal dexamethasone combined with ropivacaine found that the number of subjects who remained pain free up to 48 h after operation was significantly greater in ropivacaine-dexamethasone group (Group D) (19 of 38) than in ropivacaine group (Group C) (4 of 37). The number of subjects who received oral analgesic was significantly lower in Group D (11 of 38) than in Group C (20 of 37). Time to first oral analgesic administration after surgery was also significantly longer in Group D than in Group C.

In consistent with the literature our study also showed that the mean duration of analgesia in Group R was 324 ± 55.6 min and in Group RD was 1278 ± 304.4 min. The difference in their mean was highly significant with P < 0.001 and this is in consistent with the literature.

And also our study has found that the mean dose of rescue analgesia that was needed in Group R was 1.58±0.501 and in Group RD was 1.00 ± 0.000, and the difference between them was statistically significant with P < 0.001.

Furthermore, it was found that the number of patients who needed two doses of rescue analgesia in Group R was 23 (57.5%). In Group RD, there were no patients who needed 2nd dose of rescue analgesia. In Group R, there were 17 (42.5%) who needed one dose of rescue analgesia.

CONCLUSION

In our study, we concluded that caudal block with ropivacaine and ropivacaine with dexamethasone combination are safe and effective in providing intraoperative and post-operative analgesia in pediatric patients undergoing infraumbilical surgeries. Addition of dexamethasone to ropivacaine prolongs the duration of analgesia and decreases the need of rescue analgesia in the post-operative period. The maximum duration of analgesia was noted in ropivacaine with dexamethasone group and the total rescue analgesic requirement in the post-operative period was found to be less in this group.

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Nomogram of Fetal Pulmonary Artery Diameter in Second Trimester of Pregnancy

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Abstract

Objective: The purpose of the present study was to construct a nomogram for fetal pulmonary artery diameter (PAD) in three-vessel view plane in the second trimester of pregnancy.

Material and Methods: The study was carried out on women who were sent for their routine obstetric ultrasound between the gestational age (GA) of 18-26 weeks. After obtaining written and informed consent 451 subjects were included in the study according to predefined criteria. Fetal PAD was measured in three-vessel view plane which was obtained by cephalad movement of transducer from four chamber view.

Results: Mean age of study subjects was 24 years. GA of study participants ranged from 18 to 26 weeks with the mean GA of 21 weeks. The PADs ranged from 2.46 mm at 18 weeks of gestation to 4.61 mm at 26 weeks of gestation with the mean diameter of 3.33 mm. The regression analysis for fetal pulmonary artery was calculated according to GA as PAD = 3.22 + 0.015 × GA. Based on the regression analysis, nomogram for pulmonary artery was established and compared with the previously established nomograms.

Conclusion: A nomogram of fetal PAD was established between the GA of 18-26 weeks and a linear relationship was found between PAD and GA of fetus.

Key words: Fetal pulmonary artery diameter, Second trimester, Three-vessel view

INTRODUCTION

Congenital heart disease (CHD) is one of the most common forms of severe congenital abnormality with the estimated incidence of 8-10 per 1000 live births.¹ It is a leading cause of infant mortality, with an estimated incidence of about 4-13 per 1000 live births.² In spite of high incidence, cardiac anomalies are not easily diagnosed by routine antenatal ultrasound examination.³ Currently, four chamber view has been incorporated into the routine prenatal ultrasound examination to detect major heart defects in utero. However, up to 20% of major heart defects, including those of ventricular outflow tracts and great arteries can be missed by using the classical four-chamber view alone.⁴ Measurement of fetal pulmonary artery as visualized in three-vessel view can aid in the detection of CHDs such as tetralogy of Fallot, transposition of great vessels, truncus arteriosus, pulmonary atresia, and ventricular outflow abnormalities.⁵-⁸ Hence with the aim to establish a nomogram for fetal pulmonary artery diameter (PAD) in the second trimester between the gestational age (GA) of 18-26-week present study was conducted.

MATERIALS AND METHODS

Ethics Statement

All patients enrolled in the study were briefed about the nature, and the course of the study and informed consent in the regional language was taken from them after approval from the Institutional Ethics Committee.
Study Design
This was hospital-based, prospective, cross-sectional, observational, diagnostic study.

Study Setting and Period
This study was carried out in ultrasound section of Department of Radio-Diagnosis from November 1, 2014, to October 30, 2016.

Sample Size
During the study, we recruited 546 cases but with exclusion criteria, 458 subjects (outpatients and in patients) of 18-26 weeks of gestation were included in the study.

Subjects
A study subjects were pregnant women who were referred to ultrasound section of the Department of Radio-Diagnosis for their routine ultrasound scan at 18-26 weeks of gestation who were willing to participate in study and were having singleton pregnancy were included in the study. The women who were not willing to participate in study, having multiple gestation, intruterine demise were excluded from the study.

In case of more than one examination of a fetus, results of the first examination were excluded from the study.

Equipment Used
Ultrasonography machines available in the department (Voluson S6 WIPRO GE Healthcare Sonography Machine, Philips HD 11XE and Philips Affinity 70 Sonography Machine) with curvilinear 2-5 MHz curvilinear transducer.

Study Methodology
After taking valid consent, cases were enrolled for the study. All obstetric ultrasounds were done strictly following the guidelines under the Pre Conception Pre Natal Diagnostic Technique Act. A predesigned, validated, and pre-tested pro forma was used as a study tool to collect information such as name, age, area of residence, and maternal history for any risk factors of CHD. Then after obstetric ultrasound, fetal echocardiography was done, and PADs were measured in 3 vessel view plane.

Technique
The first step in fetal echocardiography is an evaluation of fetal visceral situs (Figure 1). Then, four-chamber view was obtained. Three-vessel view was obtained by sliding the transducer cranially from four chamber view while maintaining the transverse orientation of chest. Three-vessel view demonstrates the main pulmonary trunk in an oblique section and ascending aorta and superior vena cava in transverse section (Figure 2a).

All measurements of pulmonary artery were measured at the level of semilunar valve with pulmonary artery in a longitudinal section. The calipers were placed on the lines that defined the wall, with the crossbar of caliper merging with the border of vessel (Figure 2b). During the scan, two independent measurements were taken, and the average of two was used.

For the purpose of the study, the weeks of GA were rounded downward when days exceeded weeks by <4 days and rounded upward when days exceeded weeks by ≥4 days.

Post Natal Follow-up
Postnatal follow-up of all the study subjects was done. All neonates were evaluated by neonatologist at birth and the first week of life. Only the neonates having a normal cardiac evaluation at birth and first week were included in the study.

Statistical Analysis
The statistical analysis was done using descriptive and inferential statistics using Student’s t-test, Pearson’s correlation coefficient, reliability analysis, and regression analysis. Software used in the analysis was Statistical Product and Service Solutions 17.0 version and EPI_INFO 7.0 and P < 0.05 is considered statistical significance.

RESULTS
A total number of 546 study subjects were enrolled in the study. Initially, 50 subjects were evaluated by two observers to look for interclass correlation which was found to be high (98-99%). These cases were not included in the study. In 38 subjects, the measurements of fetal pulmonary artery and aorta were taken twice, but only the last measurements were used in the study. Moreover, 7 subjects were having cardiac anomalies so were excluded from the study. Hence, a total of 451 subjects were included in the study as per the inclusion criteria.

Mean age of the study subjects was 24.22 ± 3.49 years. The majority of our study subjects (87.7%) belonged to rural area. Out of total 451 study subjects, 7.3 % were in 18th week of gestation, 13.7% in 19th week, 16.4% in 20th week, 15.5% in 21st week, 13.6% in 22nd week, 11.8% in 23rd week, 7.1% in 24th week, and 7.3% in 25th and 26th week of gestation (Table 1).

A regression equation was derived from the present study for predicting the fetal PAD if GA was known and it was (Graph 1):

$$PAD = 3.22 + 0.015 \times GA$$
Positive correlation was found between GA and PAD ($r = 0.011$).

Based on the regression equation, a new nomogram was established showing the predicted values of fetal PAD from 18 to 26 weeks of gestation (Table 2).

**DISCUSSION**

Efforts should be made to increase the detection rates of CHD as there are evidence that neonatal mortality and morbidity improves significantly in prenatally diagnosed cases of CHD. Cartier et al. established that measurements of fetal pulmonary artery and aorta can aid in the detection of CHD, so they constructed nomogram for fetal pulmonary artery and aorta for GAs between 14 and 42 weeks. Abnormal size of these vessels contributed the diagnosis of tetralogy of Fallot, aortic atresia, pulmonary atresia, and Marfan syndrome.

In the present study, 451 fetuses were evaluated between the GA of 18-26 weeks. Cartier et al. evaluated the diameter of pulmonary artery in 403 fetuses between the GA of 14 and 42 weeks. Achiron et al. evaluated 139 fetus with GA 18-26 weeks and constructed nomogram of pulmonary artery. Wong et al. evaluated 966 singleton fetuses for establishing nomogram of fetal pulmonary artery to aortic diameter ratio. Ruano et al. constructed nomogram of main pulmonary artery, right and left pulmonary artery in 220 fetuses between the GA of 19 and 40 weeks.

Comparison between the $50^{	ext{th}}$ percentile of pulmonary artery diameter of present study and other established studies by Archiron et al. Wong et al. and Ruano et al. was done. Apart from few differences, the $50^{	ext{th}}$ percentile

<table>
<thead>
<tr>
<th>Table 1: Mean PAD of study subjects according to GA</th>
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<td>Gestational age (weeks)</td>
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<tr>
<td>26</td>
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<tr>
<td>Total</td>
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</tbody>
</table>

| F value                  | 376.81                   |
| P value                  | 0.0001, Significant      |

GA: Gestational age, PAD: Pulmonary artery diameter

<table>
<thead>
<tr>
<th>Table 2: Predicted values for PAD (mm) between 18 to 26 weeks gestation and 95% confidence interval</th>
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<tbody>
<tr>
<td>GA (weeks)</td>
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<td>Total</td>
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</table>

PAD: Pulmonary artery diameter, GA: Gestational age
of pulmonary artery diameter in our study correlated with pulmonary artery diameters established by Archiron et al, Wong et al and Ruano et al. This difference between the present study and in the other studies may be due to different sample size, different study technique, and different study population. Ours being rural the Indian population having low constitutional weight and height, the measured parameters were less as compared to the Western population.

The regression equation for PAD according to GA was calculated as (Graph 2):

$$PAD \ (mm) = 3.22 + 0.015 \times GA$$

This derived regression equation was used to construct nomogram for fetal PAD in the present study.

Different studies have used different regression equations to predict the GA if diameter of pulmonary artery is known.

Cartier et al. used the following regression equation for PAD against GA:

$$PAD \ (mm) = 0.320 \ GA - 3.0$$

Where PAD is pulmonary artery diameter.

Achiron et al. in their study found that there is strong correlation between the fetal PAD and GA ($r^2 = 0.94\%$) and used following regression equation for PAD as a function of GA was expressed as:

$$PAD \ (mm) = -14.7637 + 2.4026 \times GA \ \text{(weeks)}$$

Where PAD is pulmonary artery diameter.

He found that there is high statistical significance between the fetal PAD and GA with P value being $<0.0001$.

Moon et al. in their study concluded that size of pulmonary artery had a significant relationship with GA. Regression equation used for PAD versus GA was (Graph 3):

$$MPA \ (mm) = -2.76 + 0.34 \times GA$$

Where MPA is main pulmonary artery diameter.

On the basis of regression equation derived, a new institute specific nomogram was established for prediction of GA by fetal PAD.

The nomogram shows that with increasing GA, there is a progressive increase in the PAD. Fetal PAD in millimeter with 95% confidential interval ranged from $2.48 \pm 0.27 \text{ mm}$ at 18 weeks to $4.68 \pm 0.37 \text{ mm}$ at 26 weeks of gestation with the mean diameter being $3.37 \pm 0.66 \text{ mm}$. The diameters
of fetal pulmonary artery by Achiron et al.\(^5\) ranged from 2.83 mm at 18 weeks to 4.90 mm at 26 weeks. In the study by Wong et al.\(^6\) fetal pulmonary artery measured between 2.1 and 4.93 mm (mean = 3.3 mm) at 16-24 weeks of gestation. In the study done by Ruano et al.\(^10\) fetal PAD ranged from 2.93 to 5.03 mm at 19 and 26 weeks of gestation. Hence, the nomogram of fetal PAD of the present study was comparable with that of Achiron et al. and Wong et al.

**CONCLUSION**

There were significant correlation and linear relationship between fetal PAD and GA of fetus. The nomogram constructed for fetal PAD in 3 vessels view plane can be to screen prenatal cardiac anomalies.

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**Source of Support:** Nil, **Conflict of Interest:** None declared.
Comparative Study of Minor Physical Anomalies in Schizophrenia

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Abstract

Background: Minor physical anomalies (MPAs) are mild clinically and cosmetically insignificant errors of morphogenesis which have a prenatal origin. The presence of MPAs in schizophrenia supports the neurodevelopmental hypothesis of schizophrenia.

Aim: The aim of this study is to find the prevalence of MPAs in patients with schizophrenia, to compare it with their first-degree relatives and general population as well as to assess its association with illness characteristics.

Materials and Methods: In total, 50 patients of schizophrenia diagnosed as per ICD-10 diagnostic criteria for research along with 50 unaffected first-degree relatives and 50 normal controls were selected. The Waldrop scale was used for assessment of MPAs.

Results: The Waldrop scores were higher in patients (48%) followed by relatives (28%) and controls (10%), with more anomalies in the head, eyes, ears, and feet.

Conclusion: MPAs can be considered as an endophenotype for schizophrenia which may be used for screening vulnerable individuals.

Key words: Minor physical anomalies, Schizophrenia, Waldrop

INTRODUCTION

Minor physical anomalies (MPAs) represent dysmorphic features reflecting subtle deviations in the early development of individual structures in the head, eyes, ears, mouth, hands, and feet. They are morphological variants appearing during the first or second trimester of gestation without presenting a significant functional or cosmetic impact. Once formed, these anomalies persist into adulthood and can be evaluated reliably through visual examination of the particular region of the body.

MPAs involving the eyes, ears, mouth/palate/tongue, and limbs have been found to be consistently higher in patients with schizophrenia than in healthy individuals. Increased frequency of these anomalies in patients with schizophrenia denotes a strong prenatal component in the development of the illness, thereby supporting the neurodevelopmental hypothesis of schizophrenia. These anomalies also signify the neurodevelopmental vulnerability these individuals carry long before the onset of illness.

MPAs are suggested as an endophenotype on account of the findings that MPAs present more in patients than healthy controls and are state independent.

The more common appearance of these signs among the relatives of schizophrenia patients can confirm MPAs as intermediate phenotypes. Very few studies in the Indian context have compared the presence of MPAs in schizophrenia patients, their first-degree relatives (FDRs) and controls.

Aim

This study aims to find the prevalence of MPAs in patients with schizophrenia, to compare it with their FDRs and controls.
general population as well as to assess its association with illness characteristics.

**MATERIALS AND METHODS**

This cross-sectional descriptive study was conducted in Institute of Mental Health, Madras Medical College. A total of 50 patients who met the ICD-10 criteria for schizophrenia were selected. 50 FDRs of the patients selected were included in the study, and 50 age and sex-matched controls were selected randomly from the community as the participants of this current study. Patients were included in the study after obtaining Institutional Ethics Committee approval and informed consent from the patient’s attender.

The participants in the schizophrenia group (Group 1) were in the age group 18-45 years. Patients with a history of substance use disorders, mood disorders, head injury, neurological disorders such as seizures and tics, those with IQ <90 and those belonging to the Mongoloid race were excluded from the study. Furthermore, patients with severe cognitive impairment and those uncooperative due to severe psychosis were excluded from the study.

Group 2 comprised FDRs of the patients with schizophrenia, belonging to the age group 18-45 years and who had given written informed consent. Relatives with a history of any prior psychiatric or major medical illness were excluded from the study.

The participants in the control group were in age group of 18-45 years; given written informed consent. People with a history of any psychiatric or major medical illness were excluded from the study.

The diagnosis of schizophrenia is ascertained on detailed clinical examination using ICD-10 diagnostic criteria for research. Schedules clinical assessment neuropsychiatry was administered to all the participants of the study to include only patients with schizophrenia and to rule out other comorbid mental disorders.

Semi-structured pro forma was used to collect information regarding sociodemographic characteristics and other related clinical information. Positive and negative syndrome scale was employed for assessing the severity of psychopathology symptoms in schizophrenia. The Waldrop scale was used for assessing the MPAs of all the participants. General health questionnaire-12 was used to screen the FDRs and controls for psychiatric disorder.

**RESULTS**

A total of 50 patients’ data taken from three groups were analyzed. Mean ages of Group 1, 2 and 3 were 30.56±6.69 years, 31.18±7.70 years and 30.84±7.28 years respectively. No significant difference was found in the age distribution of the three groups. Other demographic profiles are provided in Table 1.

Among the patients, 74% were diagnosed as paranoid schizophrenia, 14% as disorganized, and 12% as undifferentiated schizophrenia. The prevalence of MPAs in schizophrenia patients was found to be around 48%, whereas it was 28% and 10% in the FDR and control group, respectively (Figure 1).

In schizophrenia patients with MPAs, 40% of patients had intercanthal distance greater than normal and 36% patients had fine electric hair (Table 2).

The comparison of the total Waldrop scores among the three groups showed a significant difference with the

<table>
<thead>
<tr>
<th>Demographic characteristics</th>
<th>Group 1 (schizophrenia patients)</th>
<th>Group 2 (FDRs)</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (mean±SD)</td>
<td>30.56±6.69</td>
<td>31.18±7.70</td>
<td>30.84±7.28</td>
</tr>
<tr>
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<tr>
<td>Marital status</td>
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<tr>
<td>Unemployed</td>
<td>17</td>
<td>8</td>
<td>6</td>
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</table>

SD: Standard deviation, FDRs: First-degree relatives

![Figure 1: Prevalence of minor physical anomalies among the three groups](image-url)
scores for the patient group being significantly higher followed by the FDR group and then the control group. The individual scores showed significant differences for the head, eyes, ears, and feet among the three groups whereas no difference was found with regard to MPAs in the hands and mouth (Table 3).

The patient group was further divided into two groups - one comprising patients with MPAs and another without MPAs. The two groups were then compared with regard to their illness characteristics. There was no significant difference between the two groups except for the age of onset (Table 4).

**DISCUSSION**

The prevalence of MPAs in the current study was found to be 48%, 28%, and 10% in patients, their FDRs, and controls, respectively. Prevalence as low as 15% to as high as 62.7-90% was found in literature. A similar study done by Ismail et al. found higher rates in patients (60%) and their relatives (38%) while the prevalence in the control group was only around 5%. Comparing previous studies, the prevalence in this study can be considered to be slightly on the higher side.

The mean Waldrop score for the patient group was 6.2. Scores lower (0.74, 4.8) as well as higher (5.8, 6.8) than in the present study have been reported. Scores were found to be more frequent in participants with schizophrenia and their relatives as compared to healthy controls. Furthermore, siblings had significantly higher score than the healthy controls. These findings are in accordance with prior studies. Probably, it indicates a group of patients with schizophrenia who are having the genotype of MPAs interacting with favorable environmental variables and finally expressing as an endophenotype, which indicates the heterogenic nature of the illness.

The most common MPAs in patients were intercanthal distance (40%), fine electric hair (36%), sandal gap (32%), high-arched palate (30%), and clinodactyly (25%). Certain prior studies have shown similar findings. With regard to the illness characteristics, the age of onset was found to be of significance in patients with MPAs, with early age of onset having a greater association. There is a wide variation regarding this topic with some studies showing that early-onset schizophrenia had a greater association with MPAs while other studies showing no significant association.

The major limitation of our study was that only one FDR was included. Moreover, we used a cross-sectional study design with a smaller sample size. Results of the study should be interpreted with these limitations in the background.

**CONCLUSION**

The prevalence of MPAs is significantly higher in schizophrenia patients followed by relatives and then controls. MPAs can be considered as one of the endophenotypes for schizophrenia. These anomalies can be a useful tool for screening individuals who are vulnerable for the future onset of schizophrenia.

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A Clinicomicrobiological Study on Incidence of Mycotic Infections in Diabetic Foot Ulcers

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INTRODUCTION

Diabetes mellitus is fast gaining the status potential epidemic in India. With 62 million diabetic populations, India is diabetic capital of the world.¹ According to Wild et al., diabetic population is going to nearly double to 366 million worldwide by 2030 from 177 million in 2000.²,³

Foot ulceration is the most common complication of diabetes, affecting approximately 15% of diabetic patients during their lifetime.⁴,⁵

Globally, diabetic foot lesions are a major medical, social, and economic problem and are the leading cause of hospitalization for patients with diabetes. Diabetic foot ulcers account for more than half of non-traumatic lower limb amputations.⁶ This can be attributed to several factors such as barefoot walking, inadequate knowledge of diabetic self-care, poor socioeconomic conditions, poor glycemic control, and peripheral neuropathy.⁷

Nearly 56% of diabetic foot ulcers become infected and 20% of these patients with infected foot ulcers land
up in some type of foot amputation. Therefore, timely intervention of diabetic foot ulcers for prevention and healing is fundamental for foot amputation prevention.8,9

Infections in diabetic foot ulcer are mostly polymicrobial, and risk of development of diabetic foot syndrome is more with mycotic infections. However, little data are available on the prevalence of fungal foot infections in patients with diabetes. The fungi involved in diabetic foot ulcers are mainly Candida spp. Other species commonly isolated are Trichophyton sp. and Epidermophyton flocculosum.10-13

**MATERIALS AND METHODS**

This prospective study was carried out in a tertiary care hospital in Central India over a period of 2 years from November 2014 to October 2016. Being a tertiary care and teaching hospital with 900 beds, it attracts patients from different states of Central India. A total of 105 consecutive patients who were admitted for diabetic foot ulcer were enrolled in the study. The study was carried out after obtaining due clearances from the Institutional Ethics Committee. The entire diabetic foot ulcer patients of Wagener's ulcer grade 2-5 admitted in the surgery ward who consented were enrolled in the study. Wagener's ulcer grade 0 and 1 were excluded from the study to avoid inoculation of normal skin flora on culture.

After obtaining written informed consent in local dialect from the patients, detailed history and clinical examination were done. The basic data on age, sex, education, occupation, and socioeconomic status were collected from all patients. Detailed history and clinical examination data were obtained from each study patient. History regarding their present complaint, type and duration of diabetes, and history of ulceration and amputation, treatment history, habits of smoking, alcohol intake, and self-care behavior was noted. After thoroughly cleaning the ulcer with normal saline and debridement of superficial slough, around 5 mm long two tissue pieces were obtained from the ulcer bed. The tissue samples were collected in sterile containers containing normal saline and were immediately transported to microbiology laboratory. The tissue pieces were homogenized. Portions of the tissue specimen were mounted in 10% potassium hydroxide (KOH) and inoculated on Sabouraud's dextrose agar (SDA) supplemented with chloramphenicol and cycloheximide. The samples were incubated at 37°C for 4 weeks. Patients were managed with regular debridement, daily dressing of wound, antibacterial therapy, and glycemic control therapy. Based on macroscopic and microscopic features, growth of colonies was identified and named. The results of this study were compared with other similar studies in literature.

**Statistical Analysis**

The results of physical examination, clinical tests, microbiological and KOH mount were entered in the master chart using MS EXCEL. Statistical analysis was done using descriptive and inferential statistics using Chi-square test. Software used in the analysis were SPSS (Statistical Product and Service Solutions) 17.0 version and Graph Pad prism 6.0, and P < 0.05 is considered as level of significance.

**RESULTS**

The demographic profile of 105 patients enrolled in our study showed that 75 (71.43%) were males and 30 (28.57%) were females, with a male to female ratio being 2.5:1. The age of the patients ranged from 35 to 84 years, with mean age of 56.06 (±12.46 SD) years. The highest incidence was in the age group 45-54 and 55-64 years accounting for 27.62% each (Table 1). In this study, 20% patients were type 1 diabetics and 80% were type 2 diabetics. 63.81% patients had diabetes for more than 10 years duration and 36.19% patients had diabetes for ≤10 years duration.

53% patients were hypertensive, 62.8% had peripheral neuropathy, 40% had peripheral vascular disease, 41% had nephropathy, and 43.8% had dyslipidemia. 93 (88.6%) patients had abnormal fasting blood glucose levels while 80 (76.2%) had elevated glycosylated hemoglobin. 40.95% patients had Wagener's grade 2 ulcer while grade 4 ulcers were found in 31.43% (Table 2). There was statistically significant relation between grade of ulcer and duration of diabetes.

| Table 1: Details of patients according to their age in years and gender |
|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| Age group (years) | Male n=75 (%) | Female n=30 (%) | Total n=105 (%) |
| 35-44 | 8 (7.62) | 9 (8.57) | 17 (16.19) |
| 45-54 | 17 (16.19) | 12 (11.43) | 29 (27.62) |
| 55-64 | 25 (23.81) | 4 (3.81) | 29 (27.62) |
| 65-74 | 16 (15.24) | 5 (4.76) | 21 (20) |
| 75-84 | 9 (8.57) | 0 (0) | 9 (8.57) |
| Total | 75 (71.43) | 30 (28.57) | 105 (100) |
| Mean±SD | 50.76±10.17 | 59.06±12.55 | 56.96±12.46 |

SD: Standard deviation

| Table 2: Wagener's Grading and its relationship with duration of diabetes |
|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| Wagener's grading | Duration of diabetes | ≤10 years | >10 years | Total |
| Grade 0 | 0 (0) | 0 (0) | 0 (0) | 14.82 | 0.002, S |
| Grade 1 | 0 (0) | 0 (0) | 0 (0) | 14.82 | 0.002, S |
| Grade 2 | 17 (16.19) | 26 (24.76) | 43 (40.95) | |
| Grade 3 | 13 (12.38) | 20 (19.05) | 33 (31.43) | |
| Grade 4 | 8 (7.62) | 4 (3.81) | 12 (11.43) | |
| Grade 5 | 0 (0) | 17 (16.18) | 17 (16.19) | |
of diabetes with \( P \) value 0.02. Weight-bearing area was the most common site (65.71\%) of foot ulceration. 54 (51.43\%) patients had prior history of foot ulceration while 29 (27.62\%) had previous history of major or minor foot amputation. Of the 105 patients, 30 (28.6\%) were positive for fungal elements on direct microscopy on 10% KOH mount (Table 3) while fungal cultures on SDA were positive in 21 (20\%) patients. Most common fungus isolated was Candida sp. (11.43\%), followed by Aspergillus (3.81\%), Fusarium sp. (2.86\%), and Trichophyton sp. (1.90\%) (Table 4) No fungal growth was seen in 80\% specimen.

**DISCUSSION**

Diabetes mellitus is a metabolic disease, but it affects nearly all organs of the human body including peripheral nerves, blood vessels, eyes, kidneys, and immune system. Diabetic foot ulcer is a very common complication of longstanding disease. Development of diabetic foot ulcer has many risk factors and has complications such as infection, gangrene, and amputation.5,14 Any foot infection is serious in diabetic patients. Diabetic foot infections may vary from superficial paronychia to deep infection involving bone and gangrene. Types of infection include cellulitis, myositis, necrotizing fasciitis, septic arthritis, tendinitis, and osteomyelitis. Diabetic foot infections are associated with increased risk of ulceration. Foot ulceration and infection are leading risk factors for lower extremity amputation.15-17 Various risk factors for diabetic foot ulcer have been studied. In a study by Boyko et al.,18 longer duration of diabetes, elevated glycosylated hemoglobin (HBA1c), erythrocyte sedimentation rate and serum creatinine, lower ankle blood pressure, and diagnosed peripheral vascular disease were significant risk factors. In another study by Shahi et al.,4 longer duration of diabetes, tobacco use, insulin use, and rural residence were statistically significant risk factors for the development of diabetic foot ulcers.

Microbiological profile of diabetic foot ulcer patients ranges from chronic bacterial infections to opportunistic fungal infections. Most of the diabetic foot infections are polymicrobial, and microbiology of diabetic foot wounds is variable depending on the extent of involvement.19,20 Immunocompromised patients are known to be susceptible for fungal infection and are a major public health concern worldwide. However, fungal infections in diabetic foot ulcers have not been studied extensively. Moreover, hence, treating clinicians focus mainly on bacterial infections in diabetic foot ulcers. This many a times leads to protracted course of illness and longer stay in hospitals.

Our study evaluated prevalence of fungal infections in diabetic foot ulcer patients in Central India. Significant relationships were found between age and sex of the patients. Majority of the patients were male and in age group 45-64 years, with mean age being 56.06 years. In our study, males numbered 2.5 times the females, which is similar to the results of a study by Shahi et al.4 This indicates males with diabetes are more prone to develop foot ulcer and infection than females and it may be attributed to more outdoor activities, poor foot care, and differences in lifestyle.

Most of the patients 67 (63.81\%) in our study had diabetes for more than 10 years which is similar to the other studies carried out by Gadepalli et al.21 and Mamo et al.22 Poor glycemic control was observed in majority (76.2\%) of our study population, which was similar to results of studies carried out by Zubair et al.23 and Mendes et al.24

Our study results show that 30 (28.6\%) patients were positive for fungus on KOH mount microscopy and 21 (20\%) had growth of fungus on SDA culture media. According to few available studies, a variety of fungal infections in diabetic patients with Aspergillus species, Candida types, and other opportunistic species are found, in which yeasts are more common than others. Opportunistic species are not capable of causing disease in healthy people and only when the host resistance is reduced they can be pathogenic.11,25 Due to the decreased immunity and increased concentration of glucose in the mucosal membrane and various body tissues and fluids, which increases the proliferation of the normal flora of the body yeast, hence, diabetic patients are prone to develop fungal diseases.26 Heald et al. have reported the association of

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**Table 3: KOH mount results from 105 diabetic foot ulcer patients**

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<thead>
<tr>
<th>KOH mount</th>
<th>Number of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>30 (28.6)</td>
</tr>
<tr>
<td>Negative</td>
<td>75 (71.4)</td>
</tr>
<tr>
<td>Total</td>
<td>105 (100.00)</td>
</tr>
<tr>
<td>KOH: Potassium hydroxide</td>
<td></td>
</tr>
</tbody>
</table>

**Table 4: Fungal culture results from 105 diabetic foot ulcer patients**

<table>
<thead>
<tr>
<th>Fungal culture</th>
<th>Number of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspergillus species</td>
<td>4 (3.81)</td>
</tr>
<tr>
<td>Candida species</td>
<td>12 (11.43)</td>
</tr>
<tr>
<td>Fusarium species</td>
<td>3 (2.86)</td>
</tr>
<tr>
<td>Trichophyton species</td>
<td>2 (1.90)</td>
</tr>
<tr>
<td>No growth</td>
<td>84 (80.00)</td>
</tr>
<tr>
<td>Total</td>
<td>105 (100.00)</td>
</tr>
</tbody>
</table>
protracted ulceration in diabetic feet with *Candida*, which improved the following systemic antifungal therapy.**27**

Misoni *et al.* reported the presence of various species of *Candida* (*Candida parapsilosis, Candida albicans, Candida tropicalis, Candida famata, and Candida glabrata*) in interdigital spaces of the same or the other foot of diabetic foot ulcer patients.**28** Our study results showed predominance of *Candida* infection in diabetic foot ulcers with mycotic infections. *Candida* sp. was found in 11.43% patients, which *Candida* (52%) as most frequently isolated fungus. *Aspergillus* (88.8%) and *Fusarium* (50%) as most predominant isolate, followed by *Aspergillus* spp. (35%) and then *Fusarium* spp. In contrast to our study, Bansal *et al.***31** reported *Aspergillus* sp. (2.86%), and *Fusarium* sp. (5%) as most frequently isolated fungus in our study, followed by *Aspergillus* species (19%), *Fusarium* species (14.2%), and *Trichophyton* species (9.5%).

Similarly, Abilash *et al.***30** reported very high prevalence of *Candida* spp. (88.8%) and Fata *et al.***30** reported the *Candida* spp. (52%) as most frequently isolated fungus. Similar to our study, Bansal *et al.***31** reported *Candida* spp. (50%) as most predominant isolate, followed by *Aspergillus* spp. (35%) and then *Fusarium* spp. In contrast to our study, Wijesuriya *et al.***32** in Sri Lanka reported *Aspergillus niger* as the most common fungal isolated followed by *C. albicans*.

**CONCLUSION**

Our study highlights the presence of fungal infection and predominantly candidiasis, in more than a quarter of diabetic foot ulcers, and hence, evaluation of diabetic foot ulcers for mycosis should be a routine. It may help reduce hospitalization, reduce morbidity, and reduce financial burden on the part of the patients. Although some studies have highlighted the benefits of antifungal therapy in diabetic foot ulcer patients, more studies are needed in this field. However, in view of beneficial effects of antifungals on protracted diabetic foot ulcer, mycotic infections should always be evaluated.

**Limitations of Study**

We could not do subtyping of *Candida* species in the absence of subtyping facility and cost issues.

**ACKNOWLEDGMENT**

We would like to acknowledge and thank contributions of Dr. Vijayshree Deotale, Dr. Thamke, Dr. Siddharth Rao, Dr. Namrata and postgraduates of the Department of Surgery and Microbiology.

**REFERENCES**


Mehra, et al.: A Study on Incidence of Mycotic Infections in Diabetic Foot Ulcers


Source of Support: Nil, Conflict of Interest: None declared.
Study of Complications of Cirrhosis and their Impact on Survival

Rahul Rai¹, Asha Thomas²

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Abstract

Introduction: Cirrhosis of liver is a dreaded disease when decompensated shortens survival. Various complications of cirrhosis adversely affect survival. In the scenario where liver transplantation can offer a definitive cure, prognostication of patients with liver cirrhosis has become an issue of important concern as it can prioritize the patients on waiting list for liver transplant and can ensure proper allocation of donor livers.

Purpose: To study the incidence of various complications in patients with cirrhosis and to correlate these complications with the outcome of these patients in terms of mortality.

Methods: A total of 96 cirrhotic patients admitted to the Department of Medicine Services, NSCB Medical College, Jabalpur, India, during 2015-2016 were studied. Diagnosis of cirrhosis was based on clinical, biochemical, and ultrasonographic findings. Various complications were assessed and patients were prognosticated using model for end-stage liver disease (MELD) and Child-Turcotte-Pugh (CTP) score. They were then followed up after 3 months and their outcomes were assessed in terms of survival versus mortality.

Results: The mean age of patients of cirrhosis was 48 ± 8 years. The male: female ratio was 4:1. Alcoholic cirrhosis predominated constituting about 60.4% of our study population followed by those with hepatitis B virus-induced cirrhosis (19.8%) and hepatitis C virus-related cirrhosis (4.2%). Among complications, ascites was most common (all cases) followed in order of frequency by anemia > thrombocytopenia > hepatic encephalopathy > coagulopathy > hepatorenal syndrome (HRS) > hyponatremia > variceal bleeding. The complications that could be attributed to mortality included HE, HRS, spontaneous bacterial peritonitis, coagulopathy, variceal bleeding, and hyponatremia. All cases (14%) who died belonged to child’s C category. Those patients who died had a higher CTP and MELD scores than those who survived.

Conclusion: Most complications of cirrhosis had high mortality. Those patients who had high CTP and MELD prognostication score had high chances of mortality.

Key words: Cirrhosis, Complications, Mortality

INTRODUCTION

Cirrhosis has become one of the leading causes of death worldwide with alcohol abuse contributing to the most common inciting etiology in developed countries and viral hepatitis contributing to the vast majority of cases in developing countries. Following the global trend, in our country, also, liver cirrhosis has become a major cause of mortality owing to the large number of cases of viral hepatitis and heavy alcohol consumption.

In this scenario where liver transplantation can offer a definitive cure, prognostication of patients with liver cirrhosis has become an issue of important concern as it can prioritize the patients on waiting list for liver transplant and can ensure proper allocation of donor livers. For about 3 decades, Child-Turcotte-Pugh (CTP) score has been the reference for assessing the prognosis of cirrhotic patients based on its prediction of 1-year survival. Because of its several limitations, model for end-stage liver disease (MELD) score has recently emerged as a modern alternative to CTP.
score for effectively predicting 3-month mortality. However, these days, new modified MELD scores such as MELD-Na and delta MELD have been developed and validated. Other scores that can predict mortality in patients with liver disease include chronic liver failure-sequential organ failure assessment score and Acute Physiology and Chronic Health Evaluation II score.

The main concern of our study was to study the incidence of various complications in patients with cirrhosis and to correlate these complications with the outcome of these patients in terms of mortality versus survival. The study also aims to prognosticate patients with cirrhosis based on MELD and CTP scores and also to compare the predictive efficacy of these scores in predicting the 3-month mortality.

**METHODS**

This was a longitudinal prospective study conducted on 96 patients with cirrhosis (diagnosed on the basis of clinical, biochemical, and radiological findings) and who were admitted in various wards and intensive care unit under the Department of Medicine, NSCB Medical College, Jabalpur, India, during a study period of March 1st, 2015, to August 31st, 2016. Cirrhotic patients with significant comorbidities were excluded from the study.

A relevant medical history was taken along with proper clinical examination to look for any stigmata of liver failure. Routine laboratory parameters were studied. Radiological investigations were done including ultrasound of abdomen with Doppler and computed tomography abdomen (whenever necessary). Upper gastrointestinal endoscopy was also performed as per the guidelines.

These patients were then evaluated for various complications such as ascites, spontaneous bacterial peritonitis (SBP), hepatorenal syndrome (HRS), hepatic encephalopathy (HE), coagulopathy, variceal bleeding, and hyponatremia; their CTP and MELD scores were calculated at the time of admission and after 3 months. Their outcomes were assessed in terms of survival versus mortality. Furthermore, correlations were made between various complications present with the outcome of the patients. All the patients were categorized as per Child’s Criteria (Table 1) and MELD. MELD score was calculated on the basis of the formula: $(9.57 \times \log \text{creatinine}) + (3.78 \times \log \text{bilirubin}) + (11.2 \times \log \text{INR}) + 6.43$ (constant for liver disease etiology).

The probability level of <0.05 was set for statistical significance. SPSS 10 (SPSS Inc., Chicago, IL, USA) was used for statistical computations. Ethical Committee of the Institute approved the study.

**RESULTS**

The mean age of patients of cirrhosis was 48 ± 8 years. The male:female ratio was 4:1. Etiology wise, alcoholic cirrhosis predominated constituting about 60.4% of our study population followed by those with hepatitis B virus (HBV)-induced cirrhosis (19.8%) and hepatitis C virus (HCV)-related cirrhosis (4.2%). The complications of cirrhosis are described in Table 2.

On prognostication of these cases using CTP scoring, it was seen that majority of these cases, i.e., about 52.1% ($n = 50$), belonged to the category C and the rest 47.9% ($n = 46$) belonged to category B; none of them belonged to category A. At 3 months, it was found that all the cases who died belonged to category C which constituted about 28% of the total cases which originally belonged to category C. Category B had no mortality; at 3 months, there was reduction in the number of cases from 46 to 35 which implied that 9 cases of 46 cases deteriorated to category C. None of the cases improved to category A.

The presence of variceal bleed, hyponatremia, HRS, SBP, INR >2, and HE were associated with increased mortality. Anemia and thrombocytopenia were not associated with increased mortality. The mean CTP and MELD scores of cirrhotics were significantly higher in those who died than those who survived (Table 3).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>1 point</th>
<th>2 points</th>
<th>3 points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum bilirubin (mg/dL)</td>
<td>2.0</td>
<td>2.0-3.0</td>
<td>&gt;3.0</td>
</tr>
<tr>
<td>Serum albumin (g/dL)</td>
<td>&gt;3.5</td>
<td>3.0-3.5</td>
<td>&lt;3.0</td>
</tr>
<tr>
<td>Prothrombin time (sec prolonged)</td>
<td>0-4</td>
<td>4.6</td>
<td>&gt;6</td>
</tr>
<tr>
<td>Ascites</td>
<td>None</td>
<td>Easily controlled</td>
<td>Poorly controlled</td>
</tr>
<tr>
<td>Hepatic encephalopathy</td>
<td>None</td>
<td>Minimal</td>
<td>Advanced</td>
</tr>
</tbody>
</table>

CTP: Child-Turcotte-Pugh

**Table 2: Complications of cirrhosis**

<table>
<thead>
<tr>
<th>Complications</th>
<th>Number of cases</th>
<th>Wise distribution (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anemia</td>
<td>70</td>
<td>72.9</td>
</tr>
<tr>
<td>Thrombocytopenia</td>
<td>69</td>
<td>71.9</td>
</tr>
<tr>
<td>Ascites</td>
<td>96</td>
<td>100</td>
</tr>
<tr>
<td>Variceal bleeding</td>
<td>20</td>
<td>20.8</td>
</tr>
<tr>
<td>Hepatic encephalopathy</td>
<td>28</td>
<td>29.16</td>
</tr>
<tr>
<td>Spontaneous bacterial peritonitis</td>
<td>14</td>
<td>14.6</td>
</tr>
<tr>
<td>Hepato-renal syndrome</td>
<td>25</td>
<td>26</td>
</tr>
<tr>
<td>Coagulopathy</td>
<td>26</td>
<td>27.1</td>
</tr>
<tr>
<td>Hyponatremia</td>
<td>23</td>
<td>24</td>
</tr>
</tbody>
</table>
The mean age of patients of cirrhosis was 48 ± 8 years. The male:female ratio was 4:1. Mean age of our cirrhotic patients was similar to that noted by Kudva in Malaysia. In another study by Baijal et al., the mean age of the patients was 46.42 years, and the male:female ratio was 5:1.

Etiology wise, alcoholic cirrhosis predominated about 60.4% (n = 58) followed by those with HBV-induced cirrhosis about 19.8% (n = 19). Patients with HCV-induced cirrhosis constituted 4.2% (n = 4). In 15 cases (15.6%), no cause could be ascertained. In a study at KEM Hospital, Mumbai, the authors reported that among 72 patients of cirrhosis, etiology of cirrhosis was alcoholism in 37 cases, hepatitis B in 25 cases, and hepatitis C in 10 cases. In the study at GB Pant Hospital, New Delhi, the authors observed that among 176 cases of cirrhosis, 104 were related to viral etiology, 40 with alcoholic liver disease, 26 cryptogenic, and 6 with miscellaneous causes.

Among the complications, ascites was found to be present in 100% of the cases taken (n = 96), meaning that ascites was the most common presenting complaint followed in order of frequency by anemia - 72.9% (n = 70), thrombocytopenia - 71.9% (n = 69), HE - 29% (n = 28), coagulopathy - 27% (n = 26), HRS - 26% (n = 25), hyponatremia - 24% (n = 23), and variceal bleeding - 20.8% (n = 20). In the Goteborg University study, ascites was most common complication in 61% followed by upper gastrointestinal bleeding in 55% and hepatocellular carcinoma in 11%.

On prognostication of these cases using CTP scoring, it was found that about majority of these cases, i.e., about 52.1% (n = 50), belonged to the category C and the rest 47.9% (n = 46) belonged to category B while none of them belonged to category A.

At the end of 3 months, it was found that all the cases who died belonged to category C which constituted about 28% of the total cases which originally belonged to category C. Category B had no mortality, while at the end of 3 months, it was found that there was a reduction in the number of cases from 46 to 35 which implied that about 9 cases out of 46 deteriorated to category C while the rest remained in the same category. This indirectly implied that liver transplantation is the only definitive cure in cirrhosis and that medical therapy has limited role in decompensated cirrhosis.

Consistent with CTP scoring, the progression of MELD scoring over 3 months also implied the need for liver transplantation in cirrhosis to prevent any clinical deterioration. Those who died had higher CTP and MELD scores than those who survived.

In an article by Attia et al., to study the performance of CTP versus MELD for predicting survival in a retrospective cohort of 172 African cirrhotic patients, by univariate analysis, the following parameters have been found to significantly influence mortality which includes age >48 years (P < 0.023), male gender, (P < 0.003), CTP score Stage C (P < 0.016), MELD >21 (P < 0.03). The cutoff value above which maximum mortality was found to occur was 10 for CTP score and 21 for MELD score. AUROC was also significantly more for MELD as compared to CTP at 3 months.

In a case–control study published in NIH public access, 41 cases were identified who died from liver-related causes with a MELD <20 within 3 months while waiting for liver transplant. In univariate analyses, variceal bleed (odds ratio [OR] 5.6, P = 0.003), albumin (OR 0.5, P = 0.041), increasing cirrhosis stage (P = 0.003) and reaching stage 2, 3, or 4 cirrhosis versus lower stages (OR 3.6, P = 0.048; OR 7.4, P < 0.001; OR 4.1, P = 0.008; respectively), sodium < 135 (OR 3.4, P = 0.006), and HE (OR 2.3, P = 0.082) were associated with liver-related death. In a multivariable model including cirrhosis stage, albumin, sodium, and HE, increasing cirrhosis stage (P = 0.010) was independently associated with liver-related death.

### Table 3: Mean MELD and CTP among dead and survivors

<table>
<thead>
<tr>
<th>Prognostic scores</th>
<th>At admission</th>
<th>At 3 months</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dead</td>
<td>Survivors</td>
</tr>
<tr>
<td>MELD±SD</td>
<td>30±5.2</td>
<td>12.8±3.2</td>
</tr>
<tr>
<td>CTP±SD</td>
<td>13.9±1.3</td>
<td>9.68±1.8</td>
</tr>
</tbody>
</table>

CTP: Child-Turcotte-Pugh, MELD: Model for end-stage liver disease, SD: Standard deviation

### DISCUSSION

On prognostication using CTP scoring at the time of admission, majority of the cases had decompensation. Irrespective of their prognostic category, i.e., whether CTP or MELD, at 3-month follow-up, all of the cases were either found to remain in their same prognostic category or deteriorate down to lower down prognostic categories carrying poorer outcome despite giving medical treatment which necessitated the need of liver transplantation as a definitive cure for these patients.

### CONCLUSION

Etiology wise, alcoholic cirrhosis predominated over other groups while HBV-induced cirrhosis occupied the second position. Complications wise, ascites was the most common complication as well as the most complaint common presenting complaint followed in order of frequency by thrombocytopenia > HE > coagulopathy > HRS > hyponatremia > variceal bleeding. On prognostication using CTP scoring at the time of admission, majority of the cases had decompensation. Irrespective of their prognostic category, i.e., whether CTP or MELD, at 3-month follow-up, all of the cases were either found to remain in their same prognostic category or deteriorate down to lower down prognostic categories carrying poorer outcome despite giving medical treatment which necessitated the need of liver transplantation as a definitive cure for these patients.
Maximum mortality was observed in child’s C category. A major limitation of our study was a small sample size and inability to have a histological diagnosis. Since the facility for liver transplantation was not available in our hospital and majority of patients belong to low socioeconomic status, even after identifying patients belonging to poor prognostic category, definitive cure treatment in the form of liver transplantation could not be offered to these patients.

REFERENCES

A Cross-sectional Study of Suicide Attempters Presenting in Tertiary Care Hospital

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Abstract

Background and Objective: The rate of suicide is rising. The study aims to describe the nature and determinants of suicidal behaviors in individuals to better understand this phenomenon and suggest measures to prevent the suicidal deaths.

Methods: A cross-sectional descriptive study of consecutive cases attending Chengalpattu Medical College Hospital using a semi-structured pro forma and clinical evaluation.

Results: A total of 236 suicide attempters were interviewed. Suicide attempts were more common in men, younger population were triggered by interpersonal conflict and linked to impulsivity, depression, and alcohol use.

Conclusion: Suicidal behavior is common in the population, and a careful analysis of societal, psychological, and individual factors in its causation is necessary for appropriate treatment and risk reduction.

Key words: Demographic profile, Method of attempt, Suicide attempters

INTRODUCTION

The WHO defines suicidal act as self-injury with varying degrees of lethal intent and suicide is defined as a suicidal act with fatal outcome. Suicidal acts with non-fatal outcome are labeled by the WHO as either, suicide attempts, suicidal gestures, or acts of deliberate self-harm.¹ The WHO estimates about 1.8 lakh deaths in India every year are due to suicide.² Southern states lead the others in suicidal deaths.³ Despite the efforts to control, suicides rise at a rate of 0.7% annually. Unlike cardiovascular disorders, suicide is prevalent even among the younger population. Such as other non-communicable diseases, suicide is increasing throughout the world and is a major public health problem.⁴ The prevalence, methods, and triggers of suicidal attempt vary between different cultures and time periods. The purpose of this study is to describe the nature and determinants of suicidal behaviors in individuals to better understand this phenomenon and suggest measures prevent suicidal deaths.

Common factors that are described to be related with suicide attempts in various studies include male gender, availability of pesticides, economic instability and debts, inter personal conflicts, substance abuse, mental and physical illness, impulsivity, adverse life experience, low serotonin levels, peer influences, and modeling.⁵ Swanson and Colman have determined that knowing someone who had committed suicide was associated with increased suicidality for all age groups.⁷ Warning signs of imminent suicidal attempt include talking about committing suicide, change in behavior, withdrawal from social activities, lack of interest in work and family, preparation for death by making final arrangements, recent or severe loss, and pre-occupation with dying.⁸

Aim

The aim of the study was to describe the social profile of suicide attempters, methods adopted, and preceding causes for suicidal attempts and the relation between substance abuse and suicide.
METHODS

This cross-sectional study was done in Department of Psychiatry, Chengalpattu Medical College Hospital in the period from June to July 2016. All cases admitted after suicidal attempt brought for treatment were enrolled in the study after obtaining informed consent. A semi-structured pro forma was used to gather socio-demographic details and circumstances surrounding the attempt. Data were obtained from the attempters and relatives. For the purpose of this study, “suicidal attempt” was defined as “a person who had made deliberate act of self-harm consciously aimed at self-destruction, irrespective of his/her intention to die, irrespective of outcome.” Those who did not consent were excluded and all other attempters were included. Data obtained were studied by descriptive statistics.

RESULTS

The total number of attempters admitted during the study period was 236. All individuals gave consent and none were excluded. The distribution of attempters in various socio-demographic variables is given in Table 1. Suicidal attempters were more often men (60.59%) than women (39.41%). Most were from urban areas. The majority of attempters were farmers, workers, and housewives. The attempters were predominantly Hindu (96.18%) and very few were from other religions. Many were unmarried and lived in nuclear families. There were fewer cases in the higher socio-economic groups.

Table 2 shows the distribution of attempters in different age groups sorted by gender. Suicide attempts are more common in the younger age groups (age 11-40 years). As the age increases, the proportion of females drops in comparison with women. The average age was 33 years, and the modal distribution was between 21 and 30 years.

An analysis of the circumstances and triggers for the suicidal attempt (Table 3) reveal that most attempts are carried out in the evenings and occur predominantly in the home. The proportion of women in those who attempt suicide outside the house is minimal. The precipitating cause in most attempts was marital and family conflict. Academic and work stress were a minor contributor. While most attempts were carried out alone, careful planning and suicidal note were rare.

Pesticides were the most commonly chosen method and oleander seed ingestion second most preferred. Nearly 15 individuals (6.40%) had attempted hanging. Easily available household toxins such as mosquito repellants, cleaning liquid, tablets, and kerosene were also preferred (Table 4).

Most of the male attempters had a history of alcohol use and a majority (75.93%) was intoxicated during the attempt. Depression was diagnosed in 20.76% of all attempters. A total of 77.11% of attempts were rated to be impulsive. Previous history of suicidal attempt was noted in 13 individuals and 13 attempters had a positive history for suicidal attempts in the family. Physical illnesses were comorbid in 42 attempters (17.80%) (Table 5).

<table>
<thead>
<tr>
<th>Table 1: Socio-demographic profile of attempters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>Gender</td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Female</td>
</tr>
<tr>
<td>Area</td>
</tr>
<tr>
<td>Rural</td>
</tr>
<tr>
<td>Urban</td>
</tr>
<tr>
<td>Occupation</td>
</tr>
<tr>
<td>Farmer</td>
</tr>
<tr>
<td>Driver</td>
</tr>
<tr>
<td>Construction worker</td>
</tr>
<tr>
<td>Industrial worker</td>
</tr>
<tr>
<td>Student</td>
</tr>
<tr>
<td>Unemployed</td>
</tr>
<tr>
<td>Housewife</td>
</tr>
<tr>
<td>Others</td>
</tr>
<tr>
<td>Education</td>
</tr>
<tr>
<td>Uneducated</td>
</tr>
<tr>
<td>Primary</td>
</tr>
<tr>
<td>Intermediate</td>
</tr>
<tr>
<td>High school</td>
</tr>
<tr>
<td>Higher secondary</td>
</tr>
<tr>
<td>Degree/diploma</td>
</tr>
<tr>
<td>Religion</td>
</tr>
<tr>
<td>Hindu</td>
</tr>
<tr>
<td>Christian</td>
</tr>
<tr>
<td>Muslim</td>
</tr>
<tr>
<td>Marital status</td>
</tr>
<tr>
<td>Arranged marriage</td>
</tr>
<tr>
<td>Love marriage</td>
</tr>
<tr>
<td>Unmarried</td>
</tr>
<tr>
<td>Type of family</td>
</tr>
<tr>
<td>Nuclear</td>
</tr>
<tr>
<td>Joint</td>
</tr>
<tr>
<td>Socio-economic status</td>
</tr>
<tr>
<td>Class 5</td>
</tr>
<tr>
<td>Class 4</td>
</tr>
<tr>
<td>Class 3</td>
</tr>
<tr>
<td>Class 2</td>
</tr>
<tr>
<td>Class 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2: Distribution of attempters by age and gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age group (years)</td>
</tr>
<tr>
<td>-------------------</td>
</tr>
<tr>
<td>11-20</td>
</tr>
<tr>
<td>21-30</td>
</tr>
<tr>
<td>31-40</td>
</tr>
<tr>
<td>41-50</td>
</tr>
<tr>
<td>51-60</td>
</tr>
<tr>
<td>61-70</td>
</tr>
<tr>
<td>71-80</td>
</tr>
</tbody>
</table>
DISCUSSION

The presence of 236 cases of attempted suicide in a span of just 2 months is an indicator of the burden of suicide in the population. Men outnumbered women in the sample and this trend is reflected in many recent studies in South India. Most of the sample was rural reflecting the catchment area of the hospital. Being a public hospital, lower socio-economic, and less educated populations were predominant in the sample. The preponderance of Hindu religion disproportionate to demographic distribution reveals the role of cultural factors in modulating expression of suicidal behavior. The relative frequency of love marriage and nuclear family type reflect the changing societal trends and might be the mediator of the rise in suicide incidence.

The decrease in number of women in the older age group could reflect the protective role of family and child rearing and the effect of substance use on male population. The higher prevalence in younger age group could reflect the role of impulsivity and interpersonal conflict in suicidal behavior.

The relative frequency of pesticide and oleander seed ingestion could be due to the easy availability of these toxins in the rural region and also cultural factors. The prominent role of impulsivity is manifest in the link between younger population, interpersonal and marital conflict, and unplanned suicide attempts. The higher frequency of depression than in the general population is an indicator of the need for psychological screening all suicide attempters. The prominence of alcohol use and intoxication in men attempting suicide is a clear indicator of the role of alcohol in suicide in men.

CONCLUSION

Suicidal behavior is common in the population and a careful analysis of societal, psychological, and individual factors in its causation is necessary for appropriate treatment and risk reduction.

REFERENCES


Source of Support: Nil, Conflict of Interest: None declared.
Analysis of Coronary Artery Disease and Associated Risk Factors in Patients with Chronic Kidney Disease

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Abstract

Introduction: Cardiovascular diseases including coronary artery disease (CAD) are the leading cause of morbidity and mortality in chronic kidney disease (CKD) patients. The main factors responsible for this increased risk besides traditional risk factors (such as higher age, smoking, diabetes, and hypertension (HTN)) are uremia related which includes inflammation, oxidative stress, malnutrition, endothelial dysfunction, coronary artery calcification, hyperhomocysteinemia, left ventricular hypertrophy, and bone mineral disorders.

Purpose: To find the occurrence of CAD in CKD and to study the clinical profile and various risk factors of CAD in this population.

Materials and Methods: This was a hospital-based cross-sectional study in which 100 CKD cases were recruited. CAD was diagnosed on the basis of history, electrocardiogram, 2D ECHO, and treadmill test findings, and accordingly, all CKD cases were subdivided into CAD and non-CAD group. Patients having acute renal failure, life-threatening infections, and age <20 years were excluded from the study.

Results: Out of 100 CKD cases, CAD was found in 35% patients. Mean age in CAD group was 52.40 years and non CAD group was 48.63 years (P > 0.05). Edema (76%), oliguria (74%), and dyspnea (70%) were most common symptoms among all CKD cases with no significant difference in both groups while chest pain (48.6% in CAD versus 4.6% in non-CAD group) was significant (P < 0.05). Among traditional risk factors, diabetes (45.7% vs. 24.6%), HTN (94.3% vs. 72.3%), tobacco chewing (68.6% vs. 47.7%), and smoking (57.1% vs. 30.8%) were significantly higher in CAD group (P < 0.05). Among non-traditional (uremia-related) risk factors, C-reactive protein (60% vs. 18.5%); ESR (mean 65 vs. 38.97 mm/h); creatine phosphokinase-MB (mean 65.743 vs. 32.162 IU); 24 h urine protein (mean 0.53 vs. 0.32 g/24 h), and diastolic blood pressure (DBP) (mean 97.26 vs. 92.09 mm Hg) were significantly higher in CAD group (P < 0.05).

Conclusion: CAD has high occurrence in CKD patients and timely detection of various risk factors in CKD patients, and their prompt treatment can delay the progression of cardiovascular complications.

Key words: Chronic kidney disease, Coronary artery disease, C-reactive protein, Diabetes, End-stage renal disease, Hypertension, Left ventricular hypertrophy, Treadmill test, Uremia

INTRODUCTION

Chronic kidney disease (CKD) encompasses a spectrum of different pathophysiologic processes associated with abnormal kidney function and a progressive decline in glomerular filtration rate (GFR). CKD is a major health problem worldwide. Approximately 20 million adults in the United States have CKD with or without decreased GFR.¹ In India, with its population >1 billion, the rising incidence of CKD is likely to pose major problems for both healthcare and the economy in future years.

The spectrum of cardiovascular diseases (CVD) not only involves obstructive coronary artery disease (CAD) but also involves other disease states such as chronic heart failure, sudden death, and arrhythmias.² The relationship between...
cardiovascular events and CKD has been repetitively shown by the epidemiological studies. Go et al. conducted a largest population-based study in more than 1.1 million adults and concluded that a decline in GFR was the main independent risk factor for CV events, secondary to peripheral artery disease, CAD, congestive heart failure, or stroke even after the elimination of confounding risk. In another study, it was found that age-adjusted CVD mortality is about 30 times higher in patients of end-stage renal disease as compared to general population.

Patients with CKD show a high prevalence of arteriosclerosis in addition to atherosclerosis in the pathogenesis of CAD. A wide variety of traditional and non-traditional CV risk factors are present in patients with CKD at all stages, but particularly in those receiving dialysis. Traditional risk factors are similar to those for the general population and comprise older age, male sex, hypertension (HTN), diabetes mellitus, dyslipidemia, cigarette smoking, physical inactivity, and a family history of premature CVD. A variety of non-traditional (uremia-related) CV risk factors, such as hyperhomocysteinemia, increased oxidative stress, malnutrition and inflammation, endothelial cell dysfunction, activation of the renin-angiotensin-aldosterone and the sympathetic nervous systems, vascular calcification due to bone mineral disorder, and anemia also facilitate CVD risks in CKD population.

The diagnosis of CAD and ACS in CKD population is a challenging task. The typical symptoms of CAD may not be seen in CKD patients as well as various diagnostic modalities are not very much predictive such as: (1) classic triad of ischemic symptoms, elevated cardiac biomarkers, and electrocardiogram (ECG) changes is frequently absent in CKD patients, (2) left ventricular hypertrophy (LVH) with a strain pattern may mask diagnostic ST depression and (3) creatine kinase-MB isofrom and cardiac troponin may be elevated in the absence of true myocardial necrosis because of myocardial apoptosis or small vessel disease. Exercise electrocardiography is limited by lack of specificity of ST segment response and by inability of many CKD patients to exercise to a diagnostic workload. The risk of contrast agent-induced nephrotoxicity also limits the use of computerized tomography coronary angiography and perfusion MRI.

This study was undertaken to analyze CKD patients for the occurrence of CAD and for the assessment of clinical profile of CAD and various traditional and non-traditional (uremia related) risk factors so that correlation of risk factors with the occurrence of CAD can be studied.

MATERIALS AND METHODS

This study was a hospital-based cross-sectional study where 100 CKD cases including both male and female patients, irrespective of etiology, were recruited. A person was considered CKD if his/her illness was of more than 3 months duration and had abnormal USG findings and reduced creatinine clearance pointing to CKD.

Patients were categorized into five stages of CKD based on National Kidney Foundation Kidney Disease Outcomes Quality Initiative guidelines and GFR was estimated GFR using the 4-variable modification of diet in renal diseases formula.

The following patients were excluded from the study: Patients not willing to be a part of the study, all cases of acute renal failure, and patients having any kind of life-threatening infections.

All these patients were clinically evaluated for cardiac involvement and the following investigations were done: Complete hemogram, ESR, lipid profile, renal function test, liver function test, serum electrolytes, blood glucose level, C-reactive protein (CRP) level, creatine phosphokinase-MB (CPK-MB) level, 24 h urine protein using standard techniques in the clinical laboratory.

A standard 12-lead ECG (using Magic R model) was done and any changes suggestive of ischemic heart diseases (IHD) such as QS pattern or ST and T changes in various chest leads were recorded.

2D and color Doppler echocardiography (using Philips HD-7 XE model) was done in all patients and abnormalities were classified as LVH if left ventricular wall thickness more than 12 mm and regional wall motion abnormality (RWMA) if any segmental area of thinning and decreased or absent contractility was observed in the absence of non-ischemic cause.

Patients were subjected to treadmill exercise testing (using Schiller CS-200 model) according to standard Bruce protocol and horizontal or downsloping ST depression ≥ 1 mm measured 80 m after the J point, and ST elevation ≥ 1 mm measured 40 m after the J point, were regarded as positive results.

Diagnosis of CAD was made using the following criteria:

1. CAD-ACS (STEMI/NSTEMI/unstable angina):
   - Symptoms of ischemia along with detection of a rise and/or fall of cardiac biomarker values with at least one value above the upper reference limit was considered as acute MI.
   - Symptoms of ischemia along with one of the following in the absence of raised cardiac biomarkers:
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- New or presumed new significant ST-segment–T-wave (ST-T) changes or new left bundle branch block.
- Development of pathological Q waves in the ECG.
- Imaging evidence of new loss of viable myocardium or new RWMA.

2. Evidence of prior myocardial infarction (any one of the following)
   - Pathological Q waves with or without symptoms in the absence of non-ischemic causes.
   - Imaging evidence of a region of loss of viable myocardium that is thinned and fails to contract, in the absence of a non-ischemic cause.

3. Treadmill test (TMT) positive for inducible ischemia irrespective of history of anginal chest pain.

4. Documented history of coronary angioplasty or CABG or significant coronary artery stenosis (>50%) on coronary angiography.

Based on the presence or absence of CAD among all patients, they were categorized into two major groups, i.e., CAD and non-CAD group for further analysis.

**Statistical Analysis**

Data were analyzed using SPSS for Windows version 20.0 (trial version) and Microsoft Office Word and Microsoft Office Excel were used to generate tables and graphs. Chi-square/Fisher’s exact test was used for categorical variables and continuous variables were analyzed using independent *t*-test when the data were normally distributed otherwise non-parametric test (Mann–Whitney *U*-test) was applied. A *P* < 0.05 was considered statistically significant.

**RESULTS**

Out of 100 patients, there were 58% males and 42% females with overall M:F ratio of 1.38:1 and mean age of all CKD patients was 49.95 years, ranging from 22 to 80 years. Maximum number of patients in both CAD and non-CAD group belonged to age group of 50-59 years (28.6% vs. 26.2%).

CAD was found in 35 out of 100 patients; thus, there was 35% occurrence of CAD in CKD patients. Majority of the CAD patients belonged to Stage IV (25.7%) and Stage V (71.4%) CKD and similar trend was seen in non-CAD group.

Among all CKD cases, edema (76%) was the most common presenting complaint followed by oliguria (74%), dyspnea (70%), and chest pain (20%). Other symptoms observed were nausea, vomiting, generalized body ache, and decreased appetite (Table 1).

In our study, diabetes (32%), HTN (80%), tobacco usage (55%), smoking (40%), positive CRP (33%), severe anemia (61%), and low HDL (58%) were most commonly associated risk factors among all CKD patients.

Among traditional risk factors, diabetes, HTN, tobacco chewing, smoking, and chronic alcoholism were significantly higher (*P* < 0.05) in CAD group as compared to non-CAD group (Table 2a and b).

Among non-traditional (uremia-related) risk factors, CRP, ESR, CPK-MB, 24 h urine protein, and DBP were significantly higher in CAD group (*P* < 0.05) and other risk factors such as severe anemia (<8 g/dl) and low HDL (<40 mg/dl); they were higher in CAD group as compared to non-CAD group, but they were not statistically significant (*P* > 0.05) (Table 2a and b).

Basic clinical and biochemical characteristics of patients belonging to CAD and non-CAD group were compared (Table 3).

Among ECG changes, LVH was the most common finding which was present in 41% of CKD patients followed by ST-T changes in various chest leads (Figure 1). On echocardiography, LVH and RWMA were the most common findings observed among all CKD patients (Figure 2).

Exercise ECG testing using TMT was done on 20 out of 100 CKD patients and TMT was found positive for inducible ischemia in 25% of patients, negative in 65% of patients, and inconclusive in 10% of patients (Figure 3).

**DISCUSSION**

Historically, Richard Bright in 1836 observed that patients with advanced uremia had high mortality rates and massive

![Figure 1: Electrocardiogram finding of studied cases](image-url)
left ventricular enlargement at autopsy, and Lindner in 1974 postulated that accelerated atherosclerosis was the major driver of heart disease in most dialysis patients.6

Patients with CKD are at increased risk for CVD for several reasons: (1) CKD is associated with increased prevalence of traditional and non-traditional cardiovascular risk factors, (2) CKD is an independent risk factor for CVD, (3) many CVD risk factors are also risk factors for progression of CKD, and (4) the presence of CVD may be a risk factor for CKD. This interrelationship between cardiovascular and CKD, with each contributing to the pathogenesis of the other, leads to a cycle of cardiovascular and kidney disease progression.7

In our study, we found 35% occurrence of CAD in CKD patients. Our findings were consistent with Levin.8 (2003) where they found that at least 35% of CKD patients

<table>
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<tr>
<th>Table 1: Distribution on basis of presenting symptoms</th>
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<td>Edema</td>
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<td>Oliguria</td>
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<td>Dyspnoea</td>
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<td>Chest pain</td>
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CAD: Coronary artery disease

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<th>Table 2a: Distribution on basis of traditional and uremia related risk factors</th>
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<td>Risk factors</td>
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CAD: Coronary artery disease, HTN: Hypertension, CRP: C-reactive protein

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<th>Table 2b: Distribution on basis of clinical and biochemical parameters</th>
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CAD: coronary artery disease, SD: Standard deviation, eGFR: Estimated glomerular filtration rate, DBP: Diastolic blood pressure, SBP: Systolic blood pressure

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<th>Table 3: Distribution on basis of clinical and biochemical parameters</th>
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CAD: Coronary artery disease, BMI: Body mass index, SD: Standard deviation
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had evidence of ischemic event (myocardial infarction or angina) and Foley et al.\(^9\) (1998) where prevalence of CAD was approximately 40% among patients undergoing hemodialysis or peritoneal dialysis. Goldsmith and Covic\(^10\) (2001) concluded that angiographically confirmed prevalence of significant (>50%) stenosis in the epicardial coronary arteries vary from 24% prevalence in a young, non-diabetic hemodialysis population undergoing evaluation for renal transplantation to 85% in long-standing diabetic dialysis patients over 45 years. Nikparvar et al.\(^11\) (2015) in their study on hemodialysis patients using dipyridamole myocardial perfusion imaging to detect undiagnosed IHD found that 21.7% of the study population had IHD.

In this study, patients with CAD had edema (71.4%), dyspnea (68.6%), and oliguria (65.7%) as more common symptoms compared to chest pain which was present in only 48.6% of the patients. Sosnov et al.\(^12\) (2006) observed that patients with kidney disease were less likely to report chest pain (odds ratio 0.57) or arm pain (odds ratio 0.52) while more likely to report shortness of breath (odds ratio 1.35) in comparison to patients without kidney disease in the setting of acute myocardial infarction (Table 1).

In our study, diabetes (32%), HTN (80%), tobacco usage (55%), smoking (40%), positive CRP (33%), severe anemia (61%), and low HDL (58% patients) were most common risk factors in all CKD patients. Sharma et al.\(^13\) (2005) found HTN (91%), diabetes (39%), and smoking (14%) as common risk factors in renal transplant candidates and Ix et al.\(^14\) (2003) found HTN (75%), diabetes (26%), smoking (14%), and high CRP (> 0.38 mg/dl) (29%) as risk factors in CKD patients. These findings were consistent with our study.

Comparison of Risk Factors among CAD Group versus Non-CAD Group

Among traditional risk factors, diabetes (45.7% vs. 24.6%), HTN (94.2% vs. 72.3%), tobacco chewing (68.6% vs. 47.7%), smoking (57.1% vs. 30.8%), and chronic alcoholism (28.6% vs. 12.3%), and among non-traditional (uremia-related) risk factors, CRP (60% vs. 18.5%), ESR (mean 65 ± 23.82 vs. mean 38.97 ± 18.27), CPK-MB (mean 65.743 ± 35.975 vs. mean 32.162 ± 14.418), 24 h urine protein (mean 0.525 ± 0.395 vs. mean 0.323 ± 0.381), and DBP (mean 97.26 ± 12.75 vs. mean 92.09 ± 9.69) were significantly higher \((P < 0.05)\) in CAD group as compared to non-CAD group. Nikparvar et al.\(^11\) (2015) also found HTN and diabetes to be significantly higher \((P < 0.05)\) in IHD group of hemodialysis patients as compared to non-IHD group and Ohtake et al.\(^15\) (2005) found diabetes to be significantly associated \((P < 0.05)\) in CKD patients having coronary artery stenosis (≥ 70% on angiography). Kim et al.\(^16\) (2004) found significant differences in CRP \((P < 0.001)\) among dialysis patients who were positive on thallium SPECT and Menon et al.\(^17\) (2005) also concluded that high CRP \((P < 0.001)\) was an independent predictor of cardiovascular mortality in CKD (Table 2a and b).

In our study, LVH (60%) was the most common 2D ECHO finding among all CKD patients and RWMA in the form of decreased or absent contractility was observed in 32% of the patients. Laddha et al.\(^18\) (2014) found LVH in 74.3% patients, pericardial effusion in 14% patients, and RWMA in 13% of patients having CKD, and Shivendra et al.\(^19\) (2014) in their study on ESRD patients found LVH in 48% patients, pericardial effusion in 17% patients, and RWMA in 8.5% patients (Figure 2).

In our study, out of 100 CKD cases, exercise ECG testing using TMT was done on 20 CKD patients and TMT was found positive for inducible ischemia in 25% of patients which was consistent with studies of Sharma et al.\(^13\) (2005) where exercise test result was positive in 17% patients and Ix et al.\(^14\) (2003) where inducible ischemia was found in 42% of chronic renal insufficiency patients (Figure 3).

**CONCLUSION**

CKD is a major health problem worldwide, and there is highly increased risk of development of cardiovascular
Limitations
1. Follow-up was not done in our study which would have given a better idea about progression of renal dysfunction and its effect on cardiovascular morbidity and mortality.

2. Lack of availability of various diagnostic modalities including dobutamine stress echocardiography, thallium perfusion scans, and coronary angiography at our institute.

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Histopathological Study of Neoplastic and Non-neoplastic Lesions of Salivary Gland: An Institutional Experience of 5 Years

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Abstract

Background: There is a wide spectrum of salivary gland lesions with morphologically and clinically diversity which is a difficult task for histopathological interpretation. There are three major salivary glands-parotid, submandibular, and sublingual as well as minor salivary glands distributed throughout the mucosa of the oral cavity. Neoplastic and non-neoplastic disease may develop within any of these.

Aims and Objectives: (1) To study the morphological appearances of salivary gland lesions, (2) To study the prevalence of salivary gland lesions, (3) To evaluate the incidence, age at the occurrence, and sex ratio among the patients with salivary gland lesions.

Materials and Methods: Retrospective study was done for 5 years from January 2011 to 2015 December. The study was done on 55 specimens from patients with salivary gland lesions which are referred to the Department of Pathology from Department of ENT and Surgery, SVS Medical College and Hospital, Mahabubnagar, Telangana. Salivary gland specimens were immediately fixed in 10% formalin and processed by paraffin embedding. Sections were stained by hematoxylin and eosin stain. Finally, microscopic examination was done to diagnose.

Results: Of 55 cases, 40 cases are neoplastic and 15 cases are non-neoplastic. Among 40 neoplastic lesions, 30 cases are benign and 10 cases are malignant. Most common benign tumor of salivary glands is pleomorphic adenoma followed by Warthin’s tumor. Most common malignant tumor of salivary glands is mucoepidermoid carcinoma followed by adenoid cystic carcinoma.

Conclusion: Histopathological study of salivary gland lesions is the most important method in establishing the final diagnosis.

Key words: Mucoepidermoid carcinoma, Pleomorphic adenoma, Salivary gland

INTRODUCTION

Salivary gland lesions constitute <1% of all tumors and about 4% of all epithelial neoplasms in head and neck region.¹ These comprise a wide variety of benign and malignant neoplasms, non-neoplastic lesions which exhibit a difference in biological behavior. Non-neoplastic lesions range from an inflammatory disorder of infectious, granulomatous, or autoimmune etiology to obstructive, developmental, and idiopathic disorders. These often clinically present as tumors and may have pathological feature similar to some of the neoplasm.²

Salivary gland tumors can show a striking range of morphological diversity between different tumor types and sometimes within an individual tumor mass. In addition, hybrid tumors, dedifferentiation and the propensity for some benign tumors to progress to malignancy can confound histopathological interpretation. About 80% of the salivary gland tumors are found in the parotid gland, 10-15% in the submandibular gland. The majority of salivary gland tumors (80-85%) are of benign histology, with pleomorphic adenoma being the most common, constituting 70% of benign tumors. The probability of
malignancy is relatively inversely proportional to the size of the gland. Overall, benign tumors of the salivary glands tend to present somewhat earlier than malignant ones. Pleomorphic adenoma is the most common among benign tumors. Mucoepidermoid carcinoma is the most common among malignant tumors. Affected patients are between 15 and 70 years age group. Predominantly, females are affected.

**Aims and Objectives**
1. To study the morphological appearances of salivary gland lesions
2. To study the prevalence of salivary gland lesions
3. To evaluate the incidence, age at the occurrence, sex ratio among the patients with salivary gland lesions.

**MATERIALS AND METHODS**

A retrospective study was done for 5 years from January 2011 to 2015 December. A study was done on 55 specimens from patients with salivary gland lesions which are referred to the Department of Pathology from Department of ENT and Surgery, SVS Medical College and Hospital, Mahabubnagar, Telangana. Salivary gland specimens were immediately fixed in 10% formalin and processed by paraffin embedding. Sections were stained by hematoxylin and eosin stain. Finally, microscopic examination was done to diagnose.

**RESULTS AND OBSERVATIONS**

A total of 55 specimens of salivary gland specimens were reviewed. Out of 55 cases (Table 5), 40 cases are neoplastic and 15 cases are non-neoplastic. Among 40 neoplastic lesions, 30 cases are benign, and 10 cases are malignant. Most common benign tumor of salivary glands is Pleomorphic adenoma followed by Warthin’s tumor. Most common malignant tumor of salivary glands is mucoepidermoid carcinoma followed by adenoid cystic carcinoma. Affected patients are between 15 and 70 years age group. Predominantly females are affected.

A maximum number of cases are seen in parotid gland constituting 37 cases (67.27%) followed by submandibular gland constituting 14 cases (25.45%) (Table 1).

A maximum number of cases are seen in 41-50-year age group followed by 51-60-year age group. Table 2 shows female preponderance with M:F ratio 0.5:1.

Nature of salivary gland lesions are non-neoplastic lesions are 15 cases (27.27%) Neoplastic lesions are 40 cases (72.72%) (Table 3).

A maximum number of salivary gland neoplasms are benign neoplasms are 30 cases (75%) malignant cases are 10 cases (25%) (Table 4).

**DISCUSSION**

The salivary gland disorders represent a distinct group of disorders affecting both the major and minor glands. These conditions range from inflammatory disorders of infectious, granulomatous, autoimmune etiology to obstructive, developmental, idiopathic disorders, and neoplasm.

Among the salivary lesions studied, maximum cases were neoplasms - 40 cases (72.72%) and the non-neoplastic...
cases were 15 (27.27%). Among the neoplasms studied, 30 (75%) cases were benign and 10 (25%) were malignant. This observation was comparable to most of the studies including case series by Nepal et al., Ali et al., and Atarbashi Moghadam et al.

Among the neoplastic lesions, maximum incidence was seen with benign neoplasms. Among the benign neoplasms, pleomorphic adenoma (Figures 1 and 2) was frequently seen followed by Warthin’s tumor. Among the malignant neoplasms, more commonly is Mucoepidermoid carcinoma (Figures 3 and 4) followed by adenoid cystic carcinoma (Figure 5).

Out of 15 non-neoplastic cases, there were 6 cystic lesions (10.9%) and 9 (16.36%) inflammatory lesions, sialadenitis (Figure 6). The majority of cystic lesions occurred in parotid gland. Among the cysts in the minor salivary glands, mucus retention cysts were common. Benign salivary gland tumors were more common in age group of 41-50 years. The youngest age of occurrence of benign salivary neoplasms was 15 years and the oldest age observed was 65 years. Both the cases were pleomorphic adenomas. The peak age incidence observed for malignant salivary gland tumors was 61-70 years. The youngest age for the
occurrence of malignancy observed in the present study was 35 years and the oldest age observed was 64 years.

Shrestha et al. have done a retrospective study of 176 cases of salivary gland tumors at B. P. Koirala Memorial Cancer Hospital; pleomorphic adenoma was found to be the most common benign tumor (72.7%), followed by Warthin tumor (15.1%). Bashir et al. conducted a combination study was done with retrospective data of 8 years and prospective data of 2 years. Out of total 80 cases, 49 (61.25%) were benign and 31 (38.75%) were malignant. Parotid was the most common site for the location of tumors (65%) followed by submandibular (25%) and minor salivary glands (10%). Pleomorphic adenoma was the most common salivary gland tumor observed in both sexes. Mucoepidermoid carcinoma was the most common among the malignant salivary gland tumors followed by adenoid cystic carcinoma.

Dandapat et al. and Rewsuwan et al. also reported a female preponderance in their series Parotid was the most common site of lesion (73.5%) in this series followed by submandibular gland (16.9%) and minor salivary glands (9.4%).

Out of 55 cases studied there were 24 cases of pleomorphic adenoma, 6 cases were of cyst, 6 cases of Warthin's tumor, 4 cases of mucoepidermoid carcinoma, 2 cases of adenoid cystic carcinoma, 2 cases of poorly differentiated carcinoma, and 2 cases of carcinoma ex-pleomorphic adenoma. Out of 6 cysts received 3 cases were seen in the parotid gland, 1 case was in the submandibular gland, and 2 cases were in the minor salivary gland. Most of the cysts were of mucus retention type and mostly occurred in the minor salivary glands. Those in the major salivary glands were salivary duct cysts and retention cysts.

According to Foote and Frazell 65-75% of the tumors are pleomorphic adenomas. 24 cases (43.63%) encountered in parotid, submandibular, and minor salivary glands. Most of these cases occurred in the parotid gland. Mucoepidermoid carcinoma was reported to be the most common malignant salivary gland tumor of parotid by Richardson et al. There were 2 cases of adenoid cystic carcinoma. It is the second most common malignancy of the salivary glands in the present study.

SUMMARY AND CONCLUSION

Following observations are noted.
1. During the 5 years study, total 55 cases of salivary gland lesions were studied
2. There were 20 males (36.63%) and 35 females (63.63%) with an M:F ratio of 0.5:1
3. Parotid was the most common site of lesion (67.27%)
4. Maximum cases were neoplasms - 40 cases (72.72%) and the non-neoplastic lesions were 15 cases (27.27%)
5. Among the neoplasms, 30 cases were benign (75%), and 10 cases were malignant (25%)
6. Majority of cases among benign salivary gland tumors were pleomorphic adenoma
7. Majority of cases among malignant salivary gland tumors were mucoepidermoid carcinoma
8. The majority of cases among non-neoplastic lesions were inflammatory lesions, sialadenitis.

REFERENCES

Reliability in Landmark Plotting between Manual and Computerized Method - A Cephalometric Study

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Abstract

Introduction: In orthodontics, cephalometrics plays a key role in diagnosis and treatment planning. Cephalometric radiograph is the product of a two-dimensional image of the skull in lateral view, which helps in enabling the relationship between teeth, bone, soft tissue, and empty spaces in horizontal and vertical planes of space. It also helps in evaluation, diagnosis, treatment results, and prediction of growth.

Aim: The aim of the study is to evaluate the reliability of landmark identification between manual and digital landmark plotting in both X and Y axis.

Materials and Methodology: A total of 50 pre-treatment lateral cephalograms were selected from patients reported for orthodontic treatment. The digital images of each cephalogram were imported directly into Dolphin software for onscreen digitalization, while for manual tracing images were printed using a compatible X-ray printer. After the images were standardized and 10 commonly used hard tissue landmarks were plotted on each cephalogram by six different professional observers and the values obtained were plotted in X and Y axis. Intraclass correlation coefficient was used to determine the intrarater reliability for repeated landmark plotting obtained by both the methods.

Results: The interclass correlation for manual in X and Y axis had a high reliability for all the 10 hard tissue points but when the intraclass correlation was performed, all the hard tissue landmarks showed high reliability both in X and Y axis except Point B which had moderate reliability with less agreement for cephalometric variables in X axis.

Conclusion: The inter- and intraclass correlation in X and Y axis shows high reliability in hard tissue.

Keywords: Cephalometric, Dolphin software, Intraclass correlation, Landmark plotting

INTRODUCTION

In orthodontics, cephalometrics plays a key role in diagnosis and treatment planning. Cephalometric radiograph is the product of a two-dimensional image of the skull in lateral view, which helps in enabling the relationship between teeth, bone, soft tissue, and empty spaces in horizontal and vertical planes of space. It also helps in evaluation, diagnosis, treatment results, and prediction of growth.

The era of radiographic cephalometry began in orthodontics in 1931 by Broadbent and Hofrath; happen to simultaneously present a standardized cephalometric technique for obtaining standardized radiographs of the head.¹

The major sources of errors in cephalometric analysis are radiographic film magnification, tracing, measuring, and landmark identification. The inconsistency in landmark identification may lead to major error in cephalometric analysis.
“Dolphin” cephalometric software, which according to manufacturer promises accurate landmark identification, cephalometric analysis, treatment prediction in orthognathic cases, superimposition, and acts as a tool for educating the patient on treatment outcome.

Several studies have been undertaken to compare the accuracy of landmark identification in scanned or digitized lateral cephalogram with the manual methods, whereas studies evaluating the reliability in landmark identification of digitally obtained radiographs with the manual method are scanty in the literature.

Hence, the objective of this study is to evaluate the errors and reliability in cephalometric landmark identification using Dolphin orthodontic software which is commercially available in the market for cephalometric analysis and to compare it with the manual cephalometric landmark identification.

**Aims and Objectives**

**Aim**
The aim of the study is to detect errors and reliability of landmark identification between manual and digital plotting for hard tissue landmarks.

**Objective**
The objective of the study is to conclude the superior method of plotting cephalometric landmarks and their reliability between manual and computerized method (DOLPHIN SOFTWARE) for hard tissue landmark points.

**MATERIALS AND METHODOLOGY**

A total of 50 pre-treatment digital lateral cephalograms of patients who reported to our department for orthodontic consultation and treatment were taken using digital cephalometer (orthophos XG-SIRONA MODEL NO: D3352), and a written consent form was obtained from all the patients. The criteria for selecting the 50 cephalograms were as follows:

1. Good quality lateral cephalograms with sufficient contrast.
2. The presence of permanent dentition with no missing and impacted teeth.
3. Patients without trauma, syndromes, craniofacial deformity, or gross asymmetry.
4. Lateral cephalograms of patients between 18-25 years of age.

The originally saved digital cephalographic images are retrieved from the computer in which they were stored. As suggested by Alexander^2^ among the selected images 3 registration crosses for orientation were marked, 2 in cranium and 1 in cervical vertebrae region for reorientation and 2 fiduciary points were chosen on the rulers that were imaged with the patients. Y axis was constructed by the software connecting the two fiduciary points as the vertical reference for landmark coordination, the X axis was constructed perpendicular to this line that served as horizontal reference, and they were printed to 100% of the original size. The prints were obtained in Fuji Medical Dry Imaging Film of size 20×25 cm (8”×10” inches).^4^ These printed lateral cephalograms were subjected to manual plotting, and the digital images cephalograms were imported to computer aided cephalometric software Dolphin imaging V.11.8 to perform the landmark plotting.

A total number of 10 landmarks (Figure 1) were identified by 6 qualified investigators, each observer was to perform landmark plotting per each cephalogram 3 times manually and 3 times digitally, at a 2 week interval as performed by Yu et al.^5^ These were the most commonly used landmarks which play a significant role in routine orthodontic diagnosis and treatment planning. Not more than two radiographs were plotted at a given time to avoid errors due to operator fatigue in both the methods.

**Manual Plotting**
The 50 samples^5,6^ were manually plotted in a dark room over an x-ray view box (Figure 2) on acetate sheet of thickness 0.003”^6-8^ with a 0.5 mm^8,9^ lead pencil by 6 qualified investigators. All plotted sheets by investigators were collected and each landmark, was separately transferred to graph sheet, and the values of the landmarks were evaluated in X and Y axis.^8^

**Digital Plotting**
Digital plotting was performed by the same 6 investigators using Dolphin imaging V.11.8 software. The images were calibrated by dpi settings and viewed in a 15” LCD flat screen monitor (Figure 3). The landmarks were manually identified using cursor controlled mouse.^10^ After plotting, each image was printed in 20×25 cm (8”×10” inches) and landmarks were transferred to the graph sheet to get values in X and Y axis.^6^

**Statistical Analysis**
A total of 12,000 values were obtained of which 6,000 X-component and 6,000 Y-component. It includes 600 reading for an individual landmark; the analysis was performed using Statistical Package for Social Sciences version 16.0. Average values of each landmark plotting were calculated and presented as mean ± standard deviation (Table 1). Differences in mean were analyzed using analysis of variances. The level of significance was set at P < 0.05. Intraclass correlation coefficient (ICC) is used to determine
the intrarater reliability for both the techniques. According to Landis and Koch,\(^1\) the following ICC interpretation scale was used: Poor to fair (below 0.4), moderate (0.41-0.60), excellent (0.61-0.80), and almost perfect (0.81-1).

**DISCUSSION**

To evaluate the reliability of landmark identification by using manual and computerized plotting, the results obtained for the hard tissue landmarks (Table 2) were as follows:

Sella on evaluation in X axis, complete homogeneity was achieved between manual and computerized plotting. When compared both the techniques, ICC indicates good homogeneity. And also in Y axis, the manual landmark plotting indicates high reliability and in digital plotting with an ICC value of 1.000 which denotes complete homogeneity. On direct comparison between both the methods, ICC denotes very high reliability of the cephalometric variable. Chang et al.\(^3\) stated that sella is consistent and reliable which supports the values obtained for our study. According to Liu et al.,\(^12\) their study stated that sella was the most accurately identified landmark. According to Chen et al.\(^13\) stated that the errors in sella were smaller than 1mm in both horizontal and vertical directions. Chen et al.\(^14\) stated that the landmarks with minimal difference were sella, and the values obtained were statistically significant. McClure et al.\(^9\) also described sella as the most accurately defined landmark in both film and digital methods.

Nasion in X axis denotes complete homogeneity. On comparing both the technique, ICC is 0.863 which is a good indicator for cephalometric reliability. On Y axis nasion intraclass correlation indicates excellent reliability in landmark plotting. Uysal et al.\(^15\) suggested that nasion identification was difficult. Several other studies showed inconsistency in nasion identification such as Baumrind and Frantz,\(^16\) McClure et al.\(^9\) suggested that nasion point was considered accurate for both digital identification and film based landmark identification, which supports the results obtained from our study. Chen et al.\(^13\) study stated that the landmarks with minimal location difference were the point nasion, compared to all the landmark points, he has studied. Chang et al.\(^3\) in his study of landmark identification errors by CBCT image mode suggested that errors were rated for nasion, orbitale, ANS compared to other landmark identification points.

Porion in X axis ICC is close to homogeneity. When compared directly between manual and digital ICC value is 0.881, indicates good reliability. Along Y axis, ICC is 0.980 in manual and 0.999 in dolphin. When comparing both methods, the ICC value is 0.912, which are closest
to homogeneity. Lai et al.\textsuperscript{17} suggested that the difficulty in identifying porion on images of superimposed structures results in variation of Frankfort horizontal plane. Bruntz et al.\textsuperscript{18} showed porion had lower reliability in landmark identification, thus leading to significant unreliability of Frankfort horizontal plane. Chen et al.\textsuperscript{19} suggested that the reliability of porion in digital images was inferior in our radiographs. Chang et al.\textsuperscript{3} had a difficulty in identifying porion point due to overlapping structures, thus increase in identification error. Chen et al.\textsuperscript{13} had a very small error which is less than 1mm in both horizontal and vertical directions stating that porion point was accurately plotted. This study supports our study for high identification reliability of porion landmark. The other reason for identification of porion may be due to the conscious effort of the observers while plotting as the literature suggests otherwise.

Orbitale - in X axis ICC values indicate complete homogeneity. And when both are directly ICC is 0.835 which indicates excellent reliability. When assessed along Y axis ICC value are reliable but when compared directly the ICC value is 0.671, indicating excellent agreement. Celik et al.\textsuperscript{20}, Sayinsu et al.\textsuperscript{21}, Chen Yi et al.\textsuperscript{19}, Uysal et al.\textsuperscript{15} and Bruntz et al.\textsuperscript{18} suggested that orbitale sometimes is not clearly identified in a cephalogram. Chen et al.\textsuperscript{13} suggested that orbitale point had a maximum error difference compared to other landmarks he had studied in both X and Y axis. Chang et al.\textsuperscript{3} in his study, he expressed those identification errors were greater for orbitale even with CBCT derived cephalograms. The explanation given for this later identifies errors was because of superimposed bilateral structures and maybe blurred images. Broch et al.\textsuperscript{22} suggested that the landmark if in blurred area of facial structures like orbitale errors will be larger. Chen et al.\textsuperscript{13} suggested that significant location difference of porion and orbitale can lead to alteration in FH plane.

ANS in X axis has an ICC value are reliable but when compared directly ICC value is 0.741, which shows excellent agreement. In Y axis ICC for ANS, the digital plotting has a very higher value; it is very close to complete homogeneity. On comparing directly manual and digital, ICC is 0.750 which indicates excellent agreement for the cephalometric variable. Baumrind and Frantz,\textsuperscript{16} Santoro et al.,\textsuperscript{23} Polat-Ozsoy et al.,\textsuperscript{24} Ongkosuwito et al.,\textsuperscript{25} Gregston et al.,\textsuperscript{26} and Houston et al.\textsuperscript{27} found difficulty in locating ANS. Chen et al.\textsuperscript{19} suggested that the reliability of ANS was inferior that of which original radiograph, and hence it was difficult to compare absolute value of reliability between different studies.

ICC for PNS in X axis shows good agreement for manual plotting but for digital it is near to complete homogeneity but when both techniques are compared the ICC is 0.616 which shows good reliability for cephalometric variables. In Y axis intraclass correlation value is closest to complete homogeneity. Ralf Kurt Willy-Schulze et al.,\textsuperscript{28} in his journal, observed that PNS was least reliable landmark in the X and Y direction both for inter and intraobserver reliability. Forsyth et al.\textsuperscript{29} suggested that PNS is a poorly defined

### Table 1: Results obtained by manual plotting of hard tissue landmarks

<table>
<thead>
<tr>
<th>Hard tissue landmarks</th>
<th>Manual</th>
<th>Computerized</th>
<th>Manual ICC</th>
<th>Computerized ICC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>Y</td>
<td>X</td>
<td>Y</td>
</tr>
<tr>
<td>Sella</td>
<td>111.08±20.8</td>
<td>34.92±21.69</td>
<td>111.31±18.5</td>
<td>32.48±19.68</td>
</tr>
<tr>
<td>Nasion</td>
<td>42.31±7.02</td>
<td>19.95±7.62</td>
<td>42.46±8.56</td>
<td>19.04±7.15</td>
</tr>
<tr>
<td>Porion</td>
<td>34.47±23.8</td>
<td>54.01±22.00</td>
<td>134.41±21.4</td>
<td>51.93±20.10</td>
</tr>
<tr>
<td>Orbitale</td>
<td>56.09±5.6</td>
<td>47.20±5.34</td>
<td>56.21±6.17</td>
<td>46.90±5.84</td>
</tr>
<tr>
<td>ANS</td>
<td>38.90±9.5</td>
<td>68.79±11.13</td>
<td>37.99±9.40</td>
<td>68.77±8.7</td>
</tr>
<tr>
<td>PNS</td>
<td>90.07±8.5</td>
<td>73.97±7.31</td>
<td>90.07±8.96</td>
<td>72.72±8.36</td>
</tr>
<tr>
<td>Point A</td>
<td>42.98±10.6</td>
<td>73.77±11.65</td>
<td>41.74±9.68</td>
<td>74.03±9.4</td>
</tr>
<tr>
<td>Point B</td>
<td>50.76±18.9</td>
<td>109.13±23.8</td>
<td>48.59±16.63</td>
<td>112.68±15.5</td>
</tr>
<tr>
<td>Pogionion</td>
<td>51.21±22.4</td>
<td>124.49±25.3</td>
<td>48.75±19.56</td>
<td>126.6±18.9</td>
</tr>
<tr>
<td>Menton</td>
<td>57.75±22.5</td>
<td>132.04±24.0</td>
<td>55.82±19.52</td>
<td>136.97±32.9</td>
</tr>
</tbody>
</table>

### Table 2: Results obtained on comparing ICC values of hard tissue landmark plotting between manual and computerized method

<table>
<thead>
<tr>
<th>Landmarks</th>
<th>ICC-manual</th>
<th>ICC-computerized</th>
<th>ICC-manual versus computerized</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>Y</td>
<td>X</td>
</tr>
<tr>
<td>Sella</td>
<td>0.994</td>
<td>0.979</td>
<td>1.000</td>
</tr>
<tr>
<td>Nasion</td>
<td>0.981</td>
<td>0.963</td>
<td>0.991</td>
</tr>
<tr>
<td>Porion</td>
<td>0.991</td>
<td>0.980</td>
<td>0.996</td>
</tr>
<tr>
<td>Orbitale</td>
<td>0.982</td>
<td>0.956</td>
<td>0.992</td>
</tr>
<tr>
<td>ANS</td>
<td>0.989</td>
<td>0.760</td>
<td>0.985</td>
</tr>
<tr>
<td>PNS</td>
<td>0.819</td>
<td>0.845</td>
<td>0.997</td>
</tr>
<tr>
<td>Point A</td>
<td>0.990</td>
<td>0.927</td>
<td>0.998</td>
</tr>
<tr>
<td>Point B</td>
<td>0.985</td>
<td>0.962</td>
<td>0.999</td>
</tr>
<tr>
<td>Pogionion</td>
<td>0.928</td>
<td>0.846</td>
<td>0.998</td>
</tr>
<tr>
<td>Menton</td>
<td>0.967</td>
<td>0.789</td>
<td>0.917</td>
</tr>
</tbody>
</table>
structure that is disguised by surrounding noise. Bruntz et al. suggested that PNS had low reliability in landmark identification as observed from interobserver error. Huja et al. observed in his study indicating the value as more than 1 mm while taking upper 95 interval consideration suggesting that PNS identification was reliable during superimposition. McClure et al. suggested that PNS seems to be more reliably identified in vertical than in horizontal directions.

Point A on digital plotting along X axis has a higher value compared to manual method; a significant difference between both the values is not present. But on direct comparison, the ICC value is 0.771 which suggests good reliability as a cephalometric variable. In Y axis digital plotting has a higher value than in manual method, but both are near to homogeneity. And in comparison of both manual and digital, the ICC value is 0.749 indicating excellent reliability as the value is within 0.61 and 0.80. McClure et al. in his study, indicated that Point A was accurate in horizontal direction. Trpkova et al. found Point A to be accurate vertically. Shaheed et al. had a problem in accurately identifying the A point. Jacobson et al., in his landmark article where he revisited Point A, suggested this point is obscured by prominent cheeks, and rare earth identifying screens for enhancement of soft tissue visualization which makes it difficult to locate accurately. Kazandjian et al. suggested that intraoperator reliability was decreased for Point A in Y axis. Guedes et al. had a difficulty in locating Point B in both manual and computer assisted methods.

Point B with ICC values in X axis is near to complete homogeneity. On direct comparison, the ICC is 0.737 in X axis which denotes good reliability. For Y axis, both the methods indicate complete homogeneity. On direct comparison between manual and digital methods intraclass correlation value is 0.469 which shows moderate agreement. Kazandjian et al. suggested that interoperator reliability was included using computer assisted method for Point B in both X and Y axis. McClure et al. suggested that identification of Point B was accurate among the horizontal plane. Shah et al. suggested that Point B lies on a poorly defined outline or low contrast areas. Guedes et al. had a difficulty in reproducing Point B in both manual and computer assisted methods.

POGONION in X axis ICC values are in complete homogeneity. When compared directly the intraclass correlation value is 0.754, indicating good reliability. Along Y axis intraclass correlation values indicate complete homogeneity, as they range between 0.81 and 1. But when compared directly, the ICC is 0.665 which indicates good agreement. Agarwal et al. have indicated location of POGONION was difficult. Chang et al. indicated that identification of POGONION in horizontal direction was relatively consistent and reliable in both imaging modes. The results of this study correlated with the results of our study.

MENTON when subjected to ICC in X axis both the values are near to complete homogeneity. On direct comparison, the ICC is 0.759 which is a good reliability of landmark plotting. Manual plotting in Y axis manual values shows good reliability, and digital value indicates complete homogeneity, but when directly compared between both the techniques the ICC value is 0.718 indicating good reliability. Chen et al. suggested that the error for MENTON point were smaller than 1mm in both vertical and horizontal direction suggesting reliability. Kazandjian et al. indicated that intraoperator reliability improved for MENTON point when compared to other points both in X and Y axes. The results of these studies support our findings. Chen et al. explained that the uncertainty in locating MENTON point may be caused by the difficult of delineating landmark on a curved anatomical boundary. According to Chang et al., landmark identification of MENTON in the vertical direction was the most reliable point.

CONCLUSION

The inter- and intraclass correlation in X and Y axes shows high reliability in hard tissue.

The results obtained for manual and digital was almost similar, but the digital landmark plotting has an added advantage in archiving, retrieval, transmission and can be enhanced during plotting of lateral cephalograms so that the digital method of landmark plotting could be preferred for both daily use and research because of the advantages.

REFERENCES

Relation of Systemic Blood Pressure and Its Effect on Intraocular Pressure

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Abstract

Introduction: Hypertension is a condition characterized by elevated blood pressure (BP) in the arteries. Hypertension affects 16-37% of the population worldwide. Long-term hypertensive patients may develop complications such as stroke, heart failure, kidney disease, and peripheral vascular disease.

Aim: To correlate changes in systemic BP and its effect on intraocular pressure.

Methods: A total of 100 hypertensive patients and 100 normotensive individuals were included in this study between the age group of 35 and 60 years. BP and intraocular pressure were recorded. Data were compared between both the groups.

Results: There was a significant correlation between changes in systemic BP and intraocular pressure (IOP). Independent t-test showed a significant rise in IOP with an increase in systemic BP.

Conclusion: Increased BP is associated with a significant rise in IOP.

Key words: Intraocular pressure, Hypertension, Systemic blood pressure

INTRODUCTION

Hypertension is a condition characterized by elevated blood pressure (BP) in the arteries. Normal BP varies between 100 and 140 mmHg systolic and 60-90 mmHg diastolic.¹ High BP is when the resting BP is above 140/90 mmHg.² Hypertension affects 16-37% of the population worldwide. Long-term hypertensive patients may develop complications such as stroke, heart failure, kidney disease, and peripheral vascular disease.³ It can also affect the retinal arterioles leading to blindness subsequently. Intraocular pressure (IOP) is found to be associated with systemic BP levels. The purpose of this study is to correlate these changes in IOP with an increase in systemic BP and compare it with IOP in normotensive patients.

METHODS

This study included 200 patients between the age group of 35 and 60 years. The patients were divided into two groups: 100 normotensive individuals in Group 1 and 100 hypertensive patients in Group 2. A detailed history was taken. General examination was done and vitals recorded. All the patients were made to rest for 30 min after which BP was recorded in the supine position. Patients with systolic BP of ≥150 mmHg and/or diastolic BP of ≥100 mmHg were included in the hypertensive group.

IOP was recorded for all the patients and individuals using Goldmann applanation tonometer. Fundus examination was done to rule out retinopathy. Data were analyzed and compared between both the groups P value calculated using one-way ANOVA test.

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Analyses were done for calculating mean, standard deviation, minimum and maximum IOP in normotensive, and hypertensive groups.

RESULTS

The mean age of male individuals was 53.6, and that of female was 49.3 years. Minimum and maximum IOP values in each group along with their mean and standard deviation are depicted in Table 1.

Two sample independent t-test showed significant values are suggesting hypertension correlating with an increase in IOP, respectively, \( P = 0.00005 \).

DISCUSSION

According to various studies, a positive correlation was noted between intraocular pressure and BP.\(^4\) Beaver Dam study showed that an increase of systolic BP \( \geq 10 \) mmHg from baseline leads to 0.44 mmHg rise in IOP and a decrease of systolic BP \( \leq 10 \) mmHg from baseline leads to 0.59 mmHg decrease in IOP over a 5-year interval.\(^5\) Similarly, diastolic BP was associated with 0.19 mmHg in IOP over a 9-year follow-up.\(^6\)

It is believed that hypertension has an indirect effect on IOP based on sympathetic tone of hypertensive individuals.\(^7\) This can influence IOP by affecting the episcleral venous pressure which helps in regulation of aqueous outflow across the trabecular meshwork into the Schlemm’s canal.\(^8\)

According to Wong et al., IOP increased with age to the sixth decade, after which a decrease in IOP was seen with the further increase in age.\(^9\) In our study, we selected patients between the age group of 35 and 60 years. IOP was measured and the minimum IOP in normotensive individuals was found to be 6 mmHg and that of hypertensive patients was 8 mmHg. The maximum IOP in normotensive individuals was 26 mmHg, and that of hypertensive patients was 36 mmHg. The mean value and standard deviation of Group 1 individuals were 14.64 and 4.00, respectively, whereas in Group 2 it was 18.04 and 6.02.

\( P \) value was significant (0.00005) suggesting correlation between increase in IOP with an increase in systemic BP.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Minimum IOP value (mmHg)</th>
<th>Maximum IOP value (mmHg)</th>
<th>Mean±SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1 (normotensive)</td>
<td>6</td>
<td>26</td>
<td>14.64±4.00</td>
</tr>
<tr>
<td>Group 2 (hypertensive)</td>
<td>8</td>
<td>36</td>
<td>18.04±6.02</td>
</tr>
</tbody>
</table>

IOP: Intraocular pressure, SD: Standard deviation

The increase in IOP can lead to optic neuropathy further leading to deterioration of vision which is irreversible.\(^10\) Hence, hypertension being a modifiable risk factor for increase in IOP should be controlled and maintained at optimal level to prevent its effect on vision.

CONCLUSION

There is a strong correlation between increase in BP and IOP. Hence, every physician should target toward maintaining adequate systemic BP levels in every hypertension patients.

REFERENCES

Comparative Study of Buprenorphine 150 µg with 0.3% Bupivacaine and 0.3% Bupivacaine Alone in Brachial Plexus Block by Low Interscalene Approach in Upper Limb Surgeries

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Abstract

Background: In this modern era, using adjuvants with local anesthetics has immensely improved the efficiency of upper limb blocks. The outcomes of adding buprenorphine with bupivacaine are studied and compared.

Aim: A comparative evaluation of the effectiveness of 150 µg of buprenorphine added to 0.3% bupivacaine in upper limb surgeries performed by low interscalene brachial plexus block with 0.3% bupivacaine alone.

Materials and Methods: A prospective randomized control study with 40 patients of ASA-PS 1 and 2 of both sexes between 18 and 58 years posted for upper limb surgeries formed the study group. First group received 30 ml of 0.3% bupivacaine plus 1 ml of isotonic sodium chloride and Group 2 patients were administered 18 ml of 0.5% bupivacaine plus 1 ml of 150 µg buprenorphine. Low interscalene brachial plexus block was performed.

Results: Admixture of buprenorphine produced statistically significant results in terms of onset, duration and intensity of sensory and motor blockade with no complications.

Conclusion: It could be concluded that low interscalene brachial plexus block combining 150 µg of buprenorphine with 0.3% bupivacaine improved the quality of block with no adverse events in comparison to plain 0.3% bupivacaine alone.

Key words: 150 µg buprenorphine, 0.3% bupivacaine, Low interscalene brachial plexus block, Upper limb surgeries

INTRODUCTION

Regional anesthesia finds a unique place in the anesthesiologist’s armamentarium by avoiding the complications of general anesthesia in elective and emergency surgeries. It is the safest technique with full stomach patients, also a cost effective and avoids theater pollution.¹,²

It involves a blockade of peripheral nerve conduction using local anesthetic agents. Along with complete pain relief and total muscle relaxation, it produces vasodilatation which improves blood circulation and prevents tissue hypoxia. Furthermore prolonging of surgical analgesia by adding some adjuvants or by fixing catheters is possible. It also avoids polypharmacy.³,⁴

Various approaches for successful performance of brachial plexus blockade have been described with permutation and combination of several adjuvants. The present study is on low interscalene approach for brachial plexus block comparing the efficacy of adding 150 µg of buprenorphine to 0.3% bupivacaine with plain local anesthetic solution. Halsted WS first performed brachial plexus block in 1885.⁵ Winnie first demonstrated the...
interscalene approach of the brachial approach of the brachial block in 1970. Among the three approaches, that is, supraclavicular, interscalene, and axillary block, the safest method of the block is axillary block. However, this axillary block is inadequate for the operation on arm and shoulder, difficult to block musculocutaneous nerve and it may cause sparing of radial aspect of forearm and dorsum of the hand. The tourniquet pain is also not tolerable. Hence, we choose low interscalene approach to compare the studies.

**Aim**

A comparative evaluation of the effectiveness of 150 µg of buprenorphine added to 0.3% bupivacaine in upper limb surgeries performed by low interscalene brachial plexus block with 0.3% bupivacaine alone.

**MATERIALS AND METHODS**

A prospective comparative study of 40 patients of ASA-PS I and II category of both sexes in the age group of 18-58 years posted for upper limb surgeries in the department of plastic and hand reconstructive surgery at Kilpauk Medical College Hospital formed the material for the study. The Institutional Ethical Committee approval and informed consent were obtained. Patients were randomly divided into two groups. Group I \((n = 20)\) received 18 ml of 0.5% bupivacaine + 12 ml of isotonic sodium chloride solution making the solution 0.3% and Group II \((n = 20)\) received 18 ml of 0.5% bupivacaine + 12 ml of isotonic sodium chloride solution + 1 ml of 150 µg of buprenorphine. The brachial block was performed by interscalene approach. Inclusion criteria are all consented patients of both the sexes weighing between 40 and 70 kg and aged between 18 and 58 years belonging to ASA I and II category undergoing both elective and emergency upper limb surgeries. Exclusion criteria are patient refusal, clinically significant coagulopathy, bacterial and fungal infection of the injection site, pneumothorax, known epileptic, allergy to any of the drugs used in the study and ASA PS III and IV. Patients were evaluated preoperatively both clinically and with routine baseline investigations and assessed for fitness. Patients selected were counseled about the risks and benefits in performing the block. After getting informed and written consent, patients willing to be included in the study were enrolled. Intravenous (IV) access was secured with 18G IV cannula and all the baseline monitors such as pulse oximeter, noninvasive blood pressure (BP), electrocardiogram (ECG) (lead II continuous) were connected. Local anesthesia test dose was done. For continuous neurological evaluation, no sedative drugs were administered preoperatively. Boyle's machine, suction equipment, emergency intubation cart, and manual resuscitation bag with mask were kept ready. The procedure was carried out in Operation theatre (OT) or preparation room where all the facilities for resuscitation are available. The patient is positioned on the table and proper illumination was done at the site of block. Drugs used were 0.5% bupivacaine 1 vial, and bupergesic 1 amp (buprenorphine 0.3 mg) and distilled water 2 vials. Initially, the pre-procedure parameters were recorded such as pulse rate (PR), oxygen saturation \((\text{SpO}_2)\), ECG, and monitored intra- and post-operatively. Block was then administered and patients were observed vigilantly for the development of any complications.

**Surface Landmarks**

The anesthesiologist stands at the head end of the table. The interscalene groove is located by asking the patient to lift the head slightly to bring the clavicular head of the sternocleidomastoid into prominence and the index finger is rolled laterally across the belly until the groove is palpated. The finger is then moved inferiorly down the groove until the pulse of subclavian artery is palpated between scalene muscles. Once the groove is found, skin wheal is increased about 2.3 cm above the midpoint of the clavicle with 2 ml of lignocaine with 23G needle. After sterile preparation of the region, a 22G 4 cm needle was inserted through the skin wheal above the palpating fingers immediately lateral to the subclavian artery. It was directed 45 dorsolaterally parallel to the scalene muscles toward the elbow of the patient. There was a click once the sheath is pierced and entered. The patient felt paraesthesia of the hand and fingers once the tip of the needle crossed the perineural sheath. In this technique, paraesthesia was obtained before the 1st rib was contacted. If paraesthesia was not elicited, then the needle was withdrawn and redirected. Distal paresthesia was sought as a confirmatory index of being close to the nerves. Then, the needle was carefully held at the same position and the drugs were injected after aspiration for blood in the syringe. If there was any shooting pain, then the needle was slightly withdrawn. Repeated aspirations were performed after every 3-5 ml of drug injected. After injecting the local anesthetic, the block is tested for both sensory (using pin prick) and motor (using muscle power) and is compared with the same stimulation or power in the contralateral arm using the Hollmen's scale. The onset of blockade means minimum Grade 3 of Hollmen's scale. Motor block is evaluated by thumb abduction (radial nerve), thumb adduction (ulnar nerve), thumb opposition (median nerve), and flexion of the elbow in supination and pronation of the forearm (musculocutaneous nerve). Patients with failed blocks were excluded from the study. Postoperatively, patients were monitored for 12 h. Baseline vital signs such as PR, BP, and \(\text{SpO}_2\) were recorded and monitored. The time required for onset and completion of the blockade, duration of blockade, the intensity of sensory and motor blockade, complications of the blockade, and rescue analgesia were assessed.
RESULTS

A total of 20 patients in each group results were analyzed. Distribution of gender is given in Table 1. Male patients are more in each group.

Table 2 shows time taken for complete sensory and motor blockade. Time taken for sensory blockade in Group I and II is 20.5 min and 22.4 min, which is statistically insignificant ($P = 0.187$). Time taken for motor blockade in Group I and II is 17.25 min and 19.2 min, which is statistically insignificant ($P = 0.104$). Group II took more time for sensory and motor total blockade.

Table 3 shows total duration of sensory and motor blockade. Total duration for sensory blockade in Group I and II is 331.2 min and 680.6 min, which is statistically significant ($P < 0.0001$). Total duration for motor blockade in Group I and II is 300.9 min and 632.2 min, which is statistically significant ($P < 0.0001$).

As per the Hollmen’s scale, the intensity of sensory blockade between two groups had statistically significant difference ($P < 0.0001$). The intensity of motor blockade between two groups had statistically significant difference ($P = 0.016$) (Table 4).

DISCUSSION

In this prospective randomized study, 40 patients satisfying the inclusion criteria underwent brachial plexus block with or without the addition of buprenorphine; onset, completion, duration and intensity of blockade were compared and statistically analyzed. The addition of 150 µg of buprenorphine to 0.3% bupivacaine resulted in significant increase in duration and intensity of sensory and motor blockade, shortens the onset of sensory and motor blockade, and there was no difference in time taken for total blockade. Hirschel described the first percutaneous technique for blocking the brachial plexus by the axillary approach in 1911 and reported on its successful use in this patients. Kulenkampff assistant to Heinrich Braun used the supraclavicular technique in 1913. Viel et al. postulated three possible mechanisms of action of prolonged analgesia produced by peripheral administration of opioids. The dorsal nerve root tissues contain mu opioid receptor finding sites. Young et al. demonstrated axonal flow or movement of opioid receptors and these moving receptors circulated endorphins and their ligands in addition to exogenous opioids. Daugaard et al. found that concentration of opioids to produce analgesia by diffusion from brachial plexus sheath to extramural and subarachnoid spaces to act on opioid receptors in the dorsal horn was inadequate. Evidence of axonal flow of various macromolecules suggests possible centripetal axonal transport of opioids into the substantia gelatinosa after perineural injection. Stein et al. postulated that activation of these neuronal receptors causes attenuation of the excitability of the nociceptive input terminals or inhibition of release of excitatory transmitters or both.

CONCLUSION

Brachial plexus blockade by low interscalene approach using 150 µg of buprenorphine as an adjuvant to 0.3% bupivacaine provided a faster onset of sensory and motor blockade with a significant increase in the duration and intensity of sensory and motor blockade with no complications when compared to plain 0.3% bupivacaine local anesthetic solution in upper limb surgeries.
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Prevalence of Liver Cirrhosis with Tuberculosis and Its Outcome

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Abstract

Background: Tuberculosis (TB) is a global disease; about one-third of the world’s population is infected with Mycobacterium TB. Immunosuppressive states like cirrhosis of the liver can lead to higher prevalence of TB than in the general population. Treatment of TB in immunocompromised set up is challenging.

Materials and Methods: After ethical approval, the study was conducted as a prospective observational study and included 100 patients. Diagnosis of cirrhosis of liver and TB were made as per standard protocols. Ascites in the setting of cirrhosis was diagnosed when high serum albumin ascites gradient any of the findings of high adenosine deaminase levels more than 33 U/L in ascetic fluid. Pyrazinamide was completely avoided and a 9 months 3 drug regime (rifampicin, isoniazid, and ethambutol) was used. The outcome of the treatment was noted, and all the data were analyzed using Statistical Package for the Social Sciences (SPSS) (SPSS for Windows, version 12.0; SPSS; Chicago, IL, USA). Statistical significance was assumed at P < 0.05.

Results: In this study, the prevalence of TB was found in 7% of cirrhotic patients. Out of 79 male cirrhotics, 4 patients (2 had extrapulmonary disease) had TB (5.1%). Sex distribution was not statistically significant (odds ratio: 3.13; 95% confidence interval [CI]: 0.41-20.02). Among all cirrhotics, extrapulmonary cases (5%) out-numbered pulmonary cases (2%), but the difference was not significant. In majority of cirrhotics, etiology was alcoholism (66%) followed by chronic hepatitis B infection (27%). The most common complication seen in cirrhosis was sepsis. In overall cirrhotic patients, 60% were in Child’s B (8-10). In this study, mortality was 13%.

Conclusions: (1) Prevalence of TB in cirrhotic patients was found to be 7%, (2) most common etiology of cirrhosis was alcoholism. (3) Extrapulmonary TB cases outnumbered the pulmonary TB cases in the present study.

Key words: Liver cirrhosis, Tuberculosis, Outcome

INTRODUCTION

Tuberculosis (TB) is a global disease; about one-third of the world’s population is infected with Mycobacterium TB (M.TB). In the developing countries like Africa and Asia, an estimated 40-50% of the adult population is infected.¹ According to the World Health Organization (WHO) statistics for 2011, the estimated incidence of TB in India is 2.2 million cases out of a global incidence of 8.7 million cases.² In about 5-10% of infected persons, reactivation occurs causing active TB.³ Any condition leading to immunosuppression can lead to activation of latent infection progressing to active disease.⁴ Cirrhosis of liver is considered to be an immunosuppressive state resulting in higher prevalence of TB than in the general population.⁵

Treatment of TB in patients with underlying cirrhosis is a challenge because of compromised liver functions and high risk of hepatotoxicity. Till date, the data on prevalence, clinical spectrum, complications, and treatment outcome of TB in cirrhotic are very limited. Hence, it was thought prudent to undertake this study, which could help in better management of cirrhotic patients with TB.

MATERIALS AND METHODS

This study was conducted in Department of Medicine and Department of Pulmonary and Sleep Medicine, NSCB
Medical College Hospital, Jabalpur, Madhya Pradesh, during the period between October 2014 and October 2015. The study was a prospective observational study and included 100 consecutive patients of cirrhosis of liver who consented for the study and presented in outpatient department or admitted in NSCB Medical College and Affiliated Hospital, Jabalpur. The study was approved by ethical committee of the institution.

Exclusion Criteria
1. Not willing to give informed consent
2. HIV-positive patients
3. Pregnant females
4. Patients on long-term steroid therapy
5. Patients on chemotherapy
6. Old pulmonary TB (PTB) patients
7. Chronic obstructive pulmonary disease patients.

Diagnosis of cirrhosis of the liver was based on clinical and biochemical findings; and imaging (ultrasonography or computed tomography or magnetic resonance imaging). Esophagogastroduodenoscopy was done whenever indicated.

The diagnosis of TB in cirrhosis otherwise was similar as the diagnosis of TB in general population. Patients having fever, productive cough for more than 2 weeks, anorexia, weight loss were advised to do sputum acid-fast bacilli (AFB) examination, and Chest X-ray posterior anterior view to detect the active pulmonary lesion. Tubercular ascites was suspected in the setting of a new ascites in a patient with compensated cirrhosis in patients with increasing or resistant ascites despite diuretic treatment, in the background of constitutional symptoms such as anorexia, fever, and weight loss. Tubercular ascites in the setting of cirrhosis was diagnosed when high serum albumin ascites gradient, high protein ascites was present with a lymphocytic predominant high cell count fluid in the absence of alternate diagnosis. Any of the findings of high adenosine deaminase levels more than 33 U/L in ascetic fluid, detection of AFB or positive M.TB culture in body fluid was taken as a confirmatory test for diagnosis of tubercular ascites. The diagnosis of TB in other extrapulmonary sites was based on appropriate biochemical tests of body fluids, imaging or histology in selected cases.

Cirrhosis patients were categorized in Category A, B or C as per Child Turcotte Pugh classification (Table 1). The patients of TB were then started on modified anti-tuberculosis treatment (ATT) drug regimens according to 2010 WHO guidelines and recommendations by Dhiman et al.

Treatment Criteria for TB with Cirrhosis Patients
- Child’s A cirrhosis (score <7): Since pyrazinamide is potentially the most hepatotoxic drug, it was completely avoided and a 9 months 3 drug regime (rifampicin, isoniazid, and ethambutol) was used.
- Child’s B cirrhosis (score between 8 and 10): A regimen containing 2 months of Isoniazid, ethambutol and streptomycin followed by 10 months of isoniazid and ethambutol was used.
- Child’s C cirrhosis (score >11): No hepatotoxic drug was given, 18-24 months of streptomycin, ethambutol, and quinolones were used. Regular liver function test monitoring was done in all cirrhosis patients receiving anti-tubercular treatment and drug therapy was stopped or altered as per the values or clinical deterioration.

The outcome of the treatment was noted, and all the data were analyzed using Statistical Package for the Social Sciences (SPSS) (SPSS for Windows, version 12.0; SPSS, Chicago, IL, USA). Statistical significance was assumed at \( P < 0.05 \).

<table>
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<td>34-51</td>
<td>&gt;51</td>
</tr>
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<td>Serum albumin (g/dL)</td>
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<td>30-35</td>
<td>&lt;30</td>
</tr>
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</table>

The outcome of the treatment was noted, and all the data were analyzed using Statistical Package for the Social Sciences (SPSS) (SPSS for Windows, version 12.0; SPSS, Chicago, IL, USA). Statistical significance was assumed at \( P < 0.05 \).

RESULTS

In this study, the prevalence of TB was found in 7% of cirrhotic patients. Mean age of patients of cirrhosis was 41.28 ± 4.61 years. The mean age was similar in cirrhotic patients with TB when compared to those without TB. Out of 79 male cirrhotics, 4 patients (2 had extrapulmonary disease) had TB (5.1%). However, among 21 cirrhotic females, 3 (14.3%) had TB (all had extrapulmonary disease). Although females had >3 times greater chances of TB in the present study, the difference was not statistically significant (odds ratio 3.13; 95% CI: 0.41-20.02). Among all cirrhotics, extrapulmonary cases (5%) out-numbered pulmonary cases (2%), but the difference was not significant. In the present study, we found 2 cases of PTB in patients with cirrhosis; among 5 cases of extra-PTB, 4 had abdominal TB (peritoneal TB) and 1 had spinal TB (Pott's spine).
In majority of cirrhotics, etiology was alcoholism (66%) followed by chronic hepatitis B infection (27%), cryptogenic (13%), cardiac failure (2%), and Wilson's disease (1%). Chronic hepatitis C could not be found in any cirrhotic patients.

The most common complication seen in cirrhosis was sepsis (other than spontaneous bacterial peritonitis [SBP]) in 25% cases followed by hepatic encephalopathy (14%), hepatorenal syndrome (10%), SBP (10%), hepatocellular carcinoma (9%), and gastrointestinal bleed (8%).

In patients of cirrhosis with TB, similar pattern of complications was seen. Sepsis was the most common complication (28.37%), in addition to SBP (14.28%).

In overall cirrhotic patients, 60% were in Child’s B (8-10), 24% in Child’s C (>11), and 16% were in Child’s A (<7) category with a mean value of 9.38 ± 1.89. In patients with TB and cirrhosis, all the patients were in Child’s B (57.14%) and Child’s A (42.85%) category with a mean value of 8.71 ± 2.06. Comparison of mean Child’s score between TB and non-TB subjects showed no significant difference by using Wilcoxon Mann–Whitney test (Z = 0.78; P > 0.05).

In the present study, out of 100 cases of cirrhosis, there were 13 deaths (13%). Of these 13 deaths, 2 cases had TB also. Cause of death in these 2 patients was found to be TB. The mortality of cirrhotic patients without TB was 11.8%. Out of total 7 cases of TB with cirrhosis, there were 2 deaths, i.e., 28.5% mortality (Table 2). However, this difference was not statistically significant. On comparing with the number of patients who were alive at 3 months of follow-up, there was 3 times greater chance of TB among those who died (odds ratio: 2.98; 95% CI: 0.25 - 20.87) however this difference was again not statistically significant.

Child Pugh Class A (compensated): Score <7; Child Pugh Class B (significant functional compromise): Score 8-10; Child Pugh Class C (decompesated): Score >11.

**DISCUSSIONS**

This study was done to find the prevalence, clinical profile, and outcome of patients of liver cirrhosis who were concurrently suffering from active TB. Total 100 cirrhotic patients who gave the consent for the study were included in the study.

Mean age of patients of cirrhosis was 41.28 ± 4.61 years, and male to female ratio was 4:1. We showed that the overall prevalence of TB in cirrhotic patients was 7% which was similar to the prevalence seen in the study by Baijal et al. (in which it was 7.4%). The mean age of the patients was 46.42 years, and the male to female ratio was 5:1 in the same study. In another study, authors found that more than 70% of TB with cirrhosis cases occurred in the age group of 15-54 years, with a mean age of presentation of 49.34 years. A recent review by Kumar et al. suggests a higher prevalence of TB in patients with cirrhosis when compared to the general population. The high incidence of TB in patients with cirrhosis has been ascribed mainly to immune dysfunction with associated higher virulence as compared to the general population. In a cohort study of patients with liver cirrhosis from Denmark (1977-1993), the incidence of TB was 168.6/100,000. It was highest in men aged >65 years, with an incidence of 246/100,000. Furthermore, patients with cirrhosis who acquired TB had a poor prognosis in that study.

We found that among male cirrhotics, 5.1% patients had TB, and among females 14.3% had TB, however, the difference was not statistically significant. In the study by Baijal et al., TB was more common among the males (8.36% in males versus 3.5% in females).

We found that extra-PTB tends to be more common than pulmonary disease, but the difference could not reach significance. Among extra-PTB in cirrhotic patients, the majority had abdominal TB. Similar observation was seen in other studies. In the study by Baijal et al., PTB was noted in 40% of cases and extrapulmonary TB in 60%. In another study, 31% patients with cirrhosis had extrapulmonary TB, as compared to 12% in the non-cirrhosis group with a predominance of peritoneal TB as seen in our case. Recently, a study conducted in India also suggested that extrapulmonary TB (63%) was more common than PTB. Although the host defense systems are impaired in cirrhotics like in other immune-deficient states like HIV infection, there is no explanation why patients are more likely to develop extrapulmonary TB than PTB.

In our study, major etiologies of cirrhosis were found to be alcoholism (66%) followed by hepatitis B (27%) and cryptogenic (13%). In a study at KEM Hospital, Mumbai, authors reported that among 72 patients of cirrhosis, etiology of cirrhosis was alcoholism in 37 cases, hepatitis B in 25 cases and hepatitis C in 10 cases. In the study at GB Pant Hospital, New Delhi, authors observed that among 176 cases of cirrhosis, 104 were related to viral etiology, 40 with alcoholic liver disease, 26 cryptogenic and 6 with miscellaneous causes.

In the present study, the most common complication found in cirrhosis was sepsis (other than SBP) which was seen 25% of cirrhotic patients, followed by hepatic...
encephalopathy (14%), hepatorenal syndrome (10%), SBP (10%), hepatocellular carcinoma (9%), and gastrointestinal bleed (8%). Similar pattern of complications was seen in patients of cirrhosis with TB. Sepsis was the most common complication (28.37%) followed by SBP (14.28%). Theoretically, any deterioration of liver function due to ATT-induced hepatotoxicity in a patient with well-compensated or previously decompensated chronic liver disease may result in severe, acute deterioration, resulting in a clinical picture suggestive of acute-on-chronic liver failure resulting in high mortality. Fortunately, we did not come across such deterioration, most likely due to limited sample size. In our study, there was no statistical difference in the Child’s Score and mortality among the cirrhotics who had TB when compared to those who did not. In the study by Sharma et al., 35% of the patients treated with combination treatment developed hepatotoxicity and majority of these patients are from Child B and Child C as these patients have low albumin and poor nutritional status. The median Child’s score of cirrhotics with TB in their cohort was 8.5 (5-12) and none of their patient died due to ATT.13

CONCLUSION

We concluded from our study that the prevalence of TB in cirrhosis was less and affects same age group as cirrhotics without TB. TB tends to occur more frequently in females, and extrapulmonary disease tend to occur more often than pulmonary disease. In contrast to other parts of India, hepatitis C virus related cirrhosis was not seen in our cohort. We could not demonstrate any difference in severity of liver disease in patients with or without TB, and the pattern of complications was also similar. Although mortality in patients of cirrhosis with TB tend to be higher when compared to those without TB, the difference was insignificant. The major limitation in our study was of small sample size, and the results were not compared with patients of TB in general population.

<table>
<thead>
<tr>
<th>Table 2: Outcome of patients of cirrhosis with and without TB</th>
<th>( \text{Number of cirrhotics (N=100)} )</th>
<th>( \text{No TB (N=93)} )</th>
<th>( \text{TB (N=7)} )</th>
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<tr>
<td>Death</td>
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<td>11</td>
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<tr>
<td>Alive (3 months)</td>
<td>87</td>
<td>82</td>
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TB: Tuberculosis

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Prevalence of Intestinal Parasites in a Tertiary Care Hospital in Rural Bihar

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Abstract

Background: That intestinal parasitosis is a major health problem in developing countries including India is well known. Many studies have been done in our country on this issue, but most of them are from South India and a few from North and Central India. However, very few studies in recent years have been done from Bihar. Ours being a rural medical college in Bihar, we have ventured to study the epidemiology of intestinal parasites to find the recent changes in trend and differences from other parts of India and from other developing countries.

Materials and Methods: An institution-based retrospective study was done on the stool examination reports of the past 2 years. All symptomatic patients clinically suggesting intestinal parasitosis in the Medicine Outpatient Department were referred to the Microbiology Department for routine stool examination to detect the intestinal parasites in that population. Only adults above 18 years were included in the study irrespective of sex. Apart from naked eye observation, each sample was examined microscopically for ova, parasites, and cysts, after preparing the sample with saline wet mount and Lugol’s iodine wet mount.

Results: Out of 3343 samples examined, 1346 (40.26%) were positive for parasites. The rest 1997 were parasite negative. Out of those positive, 1113 had only one parasite in their stool specimen, 221 had two parasites, and only 12 had three parasites. The prevalence of Entamoeba histolytica, Giardia lamblia, and Ascaris lumbricoides was the highest in that order.

Discussion: The prevalence of E. histolytica (~40%) was almost common throughout India. G. lamblia was the next common in Bihar, but Blastocystis was the second most common in South Indian studies and those in all coastal regions of the country. Incidences of hookworm have reduced throughout India compared to that in 1980s studies.

Conclusion: Our studies reveal that the situation of intestinal parasitosis is a matter of concern and drastic steps should be taken to minimize the gravity of this malady.

Key words: Intestinal parasites, Prevalence, Rural Bihar

INTRODUCTION

Intestinal parasitic infections are one of the major health problems in several developing countries including India.¹ They constitute the greatest universal cause of morbidity and mortality. It is estimated that 60% of the world population is infested with enteric parasites.² The WHO estimates that one person in every four harbors parasitic worms.³ Intestinal parasitic infections persist and flourish wherever poverty, inadequate sanitation, insufficient health care, and overcrowding are entrenched.⁴

The prevalence of parasitic diseases depends on environmental, social, and economic factors.⁵ Poverty, illiteracy, high population density, proximity with animals, and poor hygiene conditions along with unavailability of safe and potable water attribute to the higher prevalence of intestinal parasites in developing nations.⁶ Moreover, certain environmental factors such as pollution, global warming and the tropical hot, and humid weather conditions also contribute to disease. Consequently, the epidemiological pattern of the parasite varies with geographic location.

The most common parasitic infestations reported globally are Ascaris (20%), Ancylostoma duodenale (18%), Trichuris
E. histolytica (10%), and Entamoeba histolytica (10%). The WHO estimates that approximately 50 million people worldwide endure insidious amoebic infection, resulting in 40-100 thousand yearly deaths. Current estimates suggest that Ascaris lumbricoides can infest more than 1 billion and T. trichiura and hookworms can infest 795 and 740 million people, respectively. In India, overall prevalence rate of intestinal parasitic infestation ranges from 12.5% to 66%, with varying prevalence rate for individual parasite.

Studies reporting the overall parasitic load in the state of Bihar have been scanty, whereas a study related particularly to soil-transmitted helminths (STHs) among school children in Bihar have been published in the recent past. Another study reported the prevalence of helminthic infestations to be greater than protozoal infestations in the eastern part of Bihar. The most important drawback of intestinal parasitic infestations is that about 90% infected individuals remain asymptomatic.

Pertaining to our knowledge, no recent study, taking into account the overall prevalence rate of intestinal parasites, has been reported from north-eastern part of Bihar. Therefore, a retrospective study was undertaken by the Department of Medicine and Microbiology, MGM Medical College and Lions Seva Kendra Hospital, Kishanganj, whereby all symptomatic patients from Medicine Outpatient Department (OPD) were referred to Microbiology Department for routine stool examination to detect the intestinal parasites in that population. The study also aims to analyze the prevalence rate of multiple parasitic infestations in this community.

**MATERIALS AND METHODS**

The present study is a retrospective study undertaken at a rural medical college and hospital in the eastern region of India. Adult patients who reported to medical OPD of the hospital during the period of January 2015 - December 2016 with gastrointestinal symptoms and were subjected to routine stool examinations were included in the study. A total number of 3343 patients of both sexes were found to fulfill the criteria of inclusion. The age range of the patient population was 18-76 years.

Routine macroscopic examinations were carried out for consistency, color, presence of mucous and blood, and presence of adult worms, scolices, and proglottids.

For microscopic examinations, saline wet mount and Lugol’s iodine wet mount were prepared as per standard protocol. Each sample was examined under microscope for the presence of ova, parasites, and cysts.

**RESULTS**

A total of 3343 stool samples received, 1346 were positive and 1997 were negative. The results of the study are given in Tables 1-3 and Figures 1-3.

**DISCUSSION**

Overall, our study included examination of stool specimens of 3343 persons, inclusive of both sexes and aged above 18 years. These patients had some clinical signs and symptoms raising the suspicion that they might be suffering from gastrointestinal parasitic infestations. They all attended the Medicine Outpatient Department of our Medical College and were referred from there to the Microbiology Department for examination of stool, detection of ova, and cysts and adult forms of different infesting parasites. The study was done for a period of 2 years beginning from January 1, 2015, and ending on December 31, 2016. Out of the 3343 specimens examined, only 1346 stool specimens were found to be parasite positive whereas the rest 1997 specimens happened to be parasite negative. Now, from among the 1346 parasitosis cases, 221 had 2 parasite infestations and only 12 had infestations with three parasites. The rest 1113 parasite positive patients had only one parasite in their stool specimens.

Among all, E. histolytica leads the group covering 40.49% of all parasitosis cases. The second place was occupied by Giardia lamblia (24.44%). The next in order were A. lumbricoides (21.09%), Enterobius vermicularis (4.9%), A. duodenale (2.82%), Hymenolepis nana (2.3%), Strongyloides stercoralis (1.93%), T. trichiura (1.26%), and Taenia (0.74%).

Among dual parasite infestation cases, a combination of E. histolytica and G. lamblia is by far the most common (68.33%). The nearest but quite at a lower rank is the combination of A. lumbricoides and E. histolytica, the percentage being 9.05%. The leading combination in the triple infestation group is one of E. vermicularis, A. lumbricoides, and G. lamblia (34%). The next combination is that of E. histolytica, A. lumbricoides, and E. vermicularis (25%). The rest triple parasite combinations are equally distributed.

A similar retrospective study was done in JIPMER, Puducherry, wherein a 5-year study, a total of 1508 samples were obtained and studied, compared to the 3343 samples in our study in just 2 years, even if they also included children in their study which we did not. However, in their study method apart from direct wet mount, they also used stool concentration techniques along with Wheatley’s modified trichrome staining and also modified acid-fast staining for better detection of the different types and forms of...
parasites. In this study in southern India, there were some differences noted in the pattern of parasites compared to ours in eastern state of Bihar. They observed in their population some parasite species such as *Entamoeba dispar*, *Entamoeba moshkovskii*, *Entamoeba coli*, *Blastocystis*, *Balantidium coli*, and also some members of coccidian parasite genera such as *Cystoisospora*, *Cyclospora*, and *Cryptosporidium*, none of which was observed in our study in a rural background. On the contrary, we noted quite a significant number of cases of *H. nana* (31) and *S. stercoralis* (26), even a single number of these parasites were not found in Puducherry study. However, both in theirs and our study, *E. histolytica* was the most common intestinal parasite (39.7% in South India and 40.49% in Bihar) proving that the percentage of population suffering from this type of parasitosis, namely *E. histolytica* is almost exactly the same. Interestingly, this was consistent with other Indian studies also.8,13,14 However, the second most common parasite is *Blastocystis* in South

<table>
<thead>
<tr>
<th>Table 1: Intestinal parasites in stool specimens</th>
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<tbody>
<tr>
<td>Name of the parasite</td>
</tr>
<tr>
<td>A. lumbricoides</td>
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<tr>
<td>E. histolytica</td>
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<tr>
<td>G. lamblia</td>
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<tr>
<td>A. duodenale</td>
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<tr>
<td>E. vermicularis</td>
</tr>
<tr>
<td>T. trichiura</td>
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<tr>
<td>H. nana</td>
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<tr>
<td>S. stercoralis</td>
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<td>Taenia</td>
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<th>Table 2: Double parasitic infestation</th>
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<tr>
<td>Name of the parasites</td>
</tr>
<tr>
<td>E. histolytica+G. lamblia</td>
</tr>
<tr>
<td>A. lumbricoides+E. histolytica</td>
</tr>
<tr>
<td>E. vermicularis+G. lamblia</td>
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<tr>
<td>E. histolytica+H. nana</td>
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<tr>
<td>A. lumbricoides+G. lamblia</td>
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<tr>
<td>E. vermicularis+A. lumbricoides</td>
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<tr>
<td>A. lumbricoides+A. duodenale</td>
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<tr>
<td>A. lumbricoides+T. trichiura</td>
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<tr>
<td>E. vermicularis+Taenia</td>
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<tr>
<td>A. duodenale+H. nana</td>
</tr>
<tr>
<td>A. lumbricoides+H. nana</td>
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<tr>
<td>E. vermicularis+H. nana</td>
</tr>
<tr>
<td>G. lamblia+T. trichiura</td>
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<tr>
<td>E. vermicularis+A. duodenale</td>
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<tr>
<td>E. histolytica+Taenia</td>
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<tr>
<td>G. lamblia+S. stercoralis</td>
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<tr>
<td>A. lumbricoides+S. stercoralis</td>
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<tr>
<td>E. vermicularis+S. stercoralis</td>
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</table>

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<tr>
<th>Table 3: Triple parasitic infestation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of the parasites</td>
</tr>
<tr>
<td>E. vermicularis+A. lumbricoides+G. lamblia</td>
</tr>
<tr>
<td>E. histolytica+E. vermicularis+A. lumbricoides</td>
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<tr>
<td>E. histolytica+G. lamblia+S. stercoralis</td>
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<tr>
<td>E. vermicularis+A. lumbricoides+A. duodenale</td>
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<tr>
<td>A. lumbricoides+A. duodenale+G. lamblia</td>
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<tr>
<td>A. lumbricoides+E. histolytica+G. lamblia</td>
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<tr>
<td>E. vermicularis+H. nana+T. trichiura</td>
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</table>

India, compared to that being *G. lamblia* in Bihar. They also noted a gender bias, i.e., parasitosis in 56% of females and only 44% of the affected persons were males. We did not include this in our study.

Regarding prevalence, Puducherry study showed a prevalence rate of 22.21%, ours in Bihar was 40.26%, and in another study in Vellore, it ranged from as low as 12.5% to as high as 67%.15

Even if we did not get any *Blastocystis* case in our study, it was the second most common in Puducherry study and was one of the most frequent intestinal parasites in other studies such as another from Puducherry16 and two from Chennai.8,14 In Western countries, *Blastocystis* ranges from 0.5% to 62% (Clark et al., 2013).17 Studies from other parts of India showed a high prevalence of *Blastocystis* also.18,19 The absence of *Blastocystis* could be due to our techniques, but there has been a suggestion that *Blastocystis* infestation is more common in coastal regions mainly which could be a cause of non-infestation with *Blastocystis* in Bihar which is quite far from sea coast.15

Among the STH, *A. duodenale* (hookworm) is by far the most common in India, as also in our study (4.9%), leading to intractable anemia in rural people who are accustomed to walking barefoot in contaminated soil. However, the prevalence of hookworm infestation is now grossly decreased in our country compared to that in the 1980s, as shown by our study (2.82%). Puducherry study in 2016 (8.7%) compared to study by Parija and Rao in 1987 where it was 10.5%. This may be due to more use of footwear among farmers, laborers, and other common people in the present days and also gross improvement of sanitation and a commendably higher use of sanitary latrines in villages and among people of poor socioeconomic status due to vigorous campaigning, financial and technical helps by the government in recent years.

One study in rural Cote d'Ivoire showed that polyparasitism is very common in that place (30%).20 In our study, the prevalence of this was 17.3% and that in Puducherry study, it was 1.46%.

In a study in Thailand, *G. lamblia* was the most frequent parasite (18.4%).21 Furthermore, it was more common in the asymptomatic population than the symptomatic ones. The next most frequent parasite in that report was *Cryptosporidium* oocysts. This also was more common in asymptomatic individuals (2.5%) than in symptomatic patients (0.8%). Two other Thailand studies showed the prevalence of said parasite to be 9.1%.22,23

In a study from north-east India, Shillong, Meghalaya, it was shown that parasite infestations were present in 53.2% of all immunocompromised patients.24 We did not do any separate study for this population. A study from Morocco showed a peculiar finding that 65.7% of all pregnant women had one or more parasites when their stool was examined.25 In a similar study from Venezuela, the prevalence rate was 73.9%.26

In a guideline by the US Department of Health, 2013, it is suggested that the people from developing countries of Asia, Africa, and others are highly susceptible to parasitic infestations, but among them, STH is the most important and to be looked after seriously as they lead to significant illness and even death.27

**CONCLUSION**

It has been revealed from the present study that there is a gross burden of parasites in the gastrointestinal tract which leads to morbidities ranging from minor symptoms to major maladies. Although it is suggested by a guideline of the US Department of Health to first screen the population with simple differential count of WBC in blood and then to screen the stool in a large population only in those with some degrees of eosinophilia, yet the process is not based on significant evidences and a direct stool examination of all cases even the asymptomatic ones in a susceptible community is the best method of intestinal parasite detection. Our study also suggests that steps need to be taken rigorously to prevent health damage through intestinal parasitosis in the state of Bihar, or for all developing countries as a whole, for that matter.

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Evaluation of Risk Factors Influencing Surgical Outcome in Meningiomas with CLASS Algorithm

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INTRODUCTION

Meningiomas are one of the most common extra-axial neoplasms of intracranial nature constituting 13-25% of all intracranial neoplasms. Recent advances in neuroimaging have increased the incidence of asymptomatic meningiomas. Arising from arachnoid cap cells, meningiomas are present in varied locations and are of diverse histopathological types primarily stratified by the WHO classification into three grades with the majority being of benign grade.¹ ³

Treatment options for meningiomas have varied historically from mere observation to surgery to radiation therapy to combined modalities of treatment. Most meningiomas being benign and slow growing proper planned treatment is possible, thus providing higher chances of complete extirpation of these tumors. The degree of complete surgical removal essentially depends on the location of the tumor and the presence of nearby vital neurovascular structures and eloquent brain matter. The success or otherwise of the surgical modality of treatment offered rests on the completeness of resection as graded by Simpson grading which primarily correlates the degree of extirpation of the meningioma and associated dura with the probability of recurrence.

The varying and heterogeneous nature of presentation of the various types of meningiomas and the commonality of occurrence has sparked efforts to primarily predict the success of surgical outcomes in meningioma surgery. It is
imperative that proper assessment of the risk and benefit ratio of surgery for individual patients with meningiomas is done keeping with the basic tenet of benefits to far outweigh the risks involved. With this aim in mind, various stratification systems like the “CLASS” algorithm have been developed the validity of which is assessed in this study.

**Aim of the Study**

Aim of the study is:
1. To analyze the various epidemiological and risk factors associated with and influencing surgical outcome in the treatment of meningiomas.
2. To assess the validity of the CLASS algorithm as applied to patients diagnosed with meningiomas and subject to surgical treatment and comparing the findings and outcome of this study with other major studies in literature utilizing CLASS algorithm for meningiomas.

With this background of information, the “CLASS” algorithm was proposed by Lee, the purpose of which was to analyze the risk-benefit ratio of the surgical alternatives provided to patients with meningiomas and the study of the impact of the various pre-operative risk factors on the degree of functional outcome after surgery (Table 1).

The stratification of patients is based on the factors.

**Comorbidity**

It is assessed the use of the American Society of Anesthesiologists (ASA) scale with reference to the ability or otherwise of patients to withstand surgical procedures and tolerate anesthetic medications. The scores assigned are 0 for Grade I, −1 for ASA II, and −2 for ASA III. ASA IV and ASA V are not included as they are not considered desirable candidates for surgery.

**Location**

Tumor location was classified as “low-risk” locations included convexity and lateral skull base (lateral and middle sphenoid wing, posterior petrous) and were given a score of 0.

**Table 1: Parameters of CLASS algorithm**

<table>
<thead>
<tr>
<th>Factors</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>−2</td>
</tr>
<tr>
<td>Comorbidity</td>
<td>ASA 3</td>
</tr>
<tr>
<td>Location</td>
<td>Complex</td>
</tr>
<tr>
<td>Age</td>
<td>≥71</td>
</tr>
<tr>
<td>Size (cm)</td>
<td>≤2</td>
</tr>
<tr>
<td>Signs and symptoms</td>
<td>Asympt.</td>
</tr>
<tr>
<td>Other</td>
<td>Prior RT/Sx</td>
</tr>
</tbody>
</table>

ASA: American society of anesthesiologists, *Prior radiotherapy or surgery, *³radiographic progression

Olfactory groove, planum sphenoidale, tentorial (lateral/paramedian), parasagittal, intraventricular, cerebellopontine angle, falcine, posterior/lateral foramen magnum as well as para-sigmoid and para-transverse sinus locations constituted the “moderate-risk” group and were assigned a score of −1.

The “high-risk” locations included clinoidal, cavernous sinus, tuberculum sellae, tentorial (medial/incisural), ventral petrous, petroclival, and anterior/antrolateral foramen magnum, for which a score of −2 was given.

**Age**

A score of 0 was assigned for patients who are 60 years of age or younger, −1 for 61-70 years, and −2 for 71 years or older.

**Size**

A score of 0 was given if the maximum tumor size was 2 cm or less, +1 for between 2.1 and 4 cm, and +2 for tumors larger than 4.1 cm.

**Signs and Symptoms**

A score of 0 was assigned for incidental tumors and +1 for mild symptoms or irreversible neurologic deficits. A score of +2 was assigned for severe symptoms or reversible neurologic deficits.

The stratification of outcome is done using the Glasgow outcome scale (GOS), and the attendant neurological, post-operative, and medical complications are factored in the compartmentalization of the patients undergoing surgical treatment of meningiomas and the risk-benefit ratio assessment thereof.

**MATERIALS AND METHODS**

The analysis was done after proper approval from the IRB/IEC of Government Rajaji Hospital, Madurai, on patients who were admitted in the Department of Neurosurgery, Government Rajaji Hospital, during the 3 years’ period and were diagnosed as having meningiomas on the basis of clinical and radiological features.

The variables studied included the age, sex, and presenting symptoms of the patient with stratification of the patients with regard to their comorbidities and pre-existing medical and chronic disorders and the clinical profile and placed as per the ASA grading from I to IV.

The radiological picture was recorded, and the parameters studied were the cross-sectional size of the lesion in its maximum extent as reported by the radiologist using standard protocol. Other parameters studied were the
anatomical location of the lesion with respect to the normal anatomical disposition of the tumor and the degree of proximity to the vital neural, and the vascular entities present in that area and the degree of secondary effects caused by the lesion to the internal milieu of the brain and intracranial compartments.

The inclusion criteria for the patients were categorized as those who were offered the surgical alternative and were willing for surgery as well as amenable and accessible to regular follow-up.

The patients who underwent surgery were studied with regard to the degree of extirpation that was done based on the Simpson grading of meningioma resection. The post-operative course was monitored, and the patients were assessed at the end of the 1st week of convalescence and after 6 weeks following surgery based on the GOS between 1 and 5 (worst-best).

All these parameters were included in the risk stratification and with special emphasis with respect to comorbidities, location, age, size, and signs and symptoms, and these were used for calculation of the CLASS scoring and grouping of patients based on this algorithm.

Based on the outcome as assessed by the GOS and the presence of complications (neurological and medical), the outcome evaluation of surgery was done for the three groups of patients under the various CLASS groups, and the results were analyzed with regard to the success and otherwise of the surgery for the various types of meningiomas, and the observations are presented.

The information collected regarding all the selected cases were recorded in a master chart, and data analysis was done.

RESULTS

The study encompasses the analysis of the evaluation done of about forty-six patients who underwent surgery for meningiomas during the period 2013-2016. The patients were stratified on the basis of the CLASS algorithm, and the outcome parameters were analyzed.

The demographic epidemiology of the forty-six patients is as follows. The grouping of patient with respect to the age-wise breakup is age range of <29-13%, 30-39-22%, 40-49-39%, the highest, 50-59-17%, >60-9%. The sex-based incidence showed a female preponderance of about 76% in females and 24% in males.

With regard to the symptomatology of presentation, the findings were as follows:

- Headache and vomiting - 38
- Headache alone - 2
- Seizures - 9
- Hemiparesis/Deficits - 3
- Behavioral disturbances -2
- Diminution of vision - 7
- Papilledema - 3.

The location of the lesion and the radiological correlate were found to be:

- Left-sided lesions - 46%
- Right-sided lesions - 39%
- Midline structures - 15%.

The anatomical location of the meningiomas as radiologically diagnosed and the findings were shown in Table 2.

The other parameter that was diagnosed radiologically was with respect to the size of the lesion:

- Size >4 cm - 19
- Size <4 cm - 27.

The pre-operative functional status of the patient was analyzed based on the ASA scale, and the stratification was 59% of patients in ASA Stage II, 39% of patients in Stage III, and 2% of patients in Stage I. The grade of resection according to Simpson grading was also stratified and the results were shown in Table 3.

Based on the above findings with regard to the comorbidity, location, age, size, and symptoms and signs of the various kinds of meningiomas in the sample evaluated the CLASS scoring was performed and the groups were assigned and the following findings were noted with 59% in CLASS I, 32% in CLASS II, and 9% in CLASS III.

All patients were subject to surgical treatment, and the results of the surgery were measured by the parameters of the Glasgow outcome scoring at the end of the period of 6 weeks postoperatively. The overall GOS distribution was shown in Table 4.

<table>
<thead>
<tr>
<th>Table 2: Classification based on site</th>
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<tbody>
<tr>
<td>Location of the lesion</td>
</tr>
<tr>
<td>Convexity</td>
</tr>
<tr>
<td>Parasagittal</td>
</tr>
<tr>
<td>Tentorial</td>
</tr>
<tr>
<td>Sphenoid wing</td>
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<tr>
<td>Falcine</td>
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<tr>
<td>Olfactory groove/basifrontal</td>
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<tr>
<td>Suprasellar</td>
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<tr>
<td>Cerebellopontine angle</td>
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<tr>
<td>Petroclival</td>
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<tr>
<td>Clinoidal</td>
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<td>Intraventricular</td>
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</table>
The scoring of the patients was done with GOS ≤3 taken as poor outcome and GOS more than 3 taken as representative of good outcome (Table 5).

The outcome was also assessed on the basis of the post-operative neurological and medical complications that were also analyzed (Table 6).

The grouping of the complications observed with respect to the stratification by the CLASS algorithm is observed as follows (Table 7).

The distribution of the type of complications included wound-related predominantly pseudomeningocele and neurological complications such as visual deterioration, hemiparesis, aphasia, and behavioral disturbances.

The study also included medical complications the most important of which was deep vein thrombosis leading on to pulmonary embolism, and the overall mortality was 3/46 (2 of which were due to associated medical complications).

**DISCUSSION**

The study encompasses the results of the analysis of 46 patients who underwent surgical treatment for meningiomas in the Department of Neurosurgery at Government Rajaji Hospital, Madurai.

The epidemiological analysis revealed that the incidence of meningiomas in terms of occurrence was more common in the age group of 40-49 with 39% of patients presenting in this age group closely followed by the age group of 30-39 with 22% with an incremental incidence with increasing age.

The overall ratio of sexual preponderance of meningiomas heavily tilts toward the female sex with three times more likely incidence and an odds ratio of 10.02 indicating ten times the odds of developing meningiomas (Table 8).

With regard to the primary symptomatology of presentation, the study indicates that the most common symptom is headache and vomiting both of which are non-specific in the sense that no localization could be attributed to the headache as was evidenced in 40 of 46 patients about 86.9% of the total sampled.

The site of lesion as exemplified in this study was found to be left sided lesions in 46% of cases, right sided in 39% and midline in 15% of cases. The location of the meningioma was of the order that convexity meningiomas were the most common accounting for about 30% of the lesions with parasagittal and falce meningiomas making up about 22% of the lesions (Table 9).
With regard to the size of the lesions, the findings of the study were of the order that 59% of lesions measuring <4 cm and 41% of lesions were >4 cm with no significant odds ratio of occurrence.

The stratification of patients according to the CLASS algorithm revealed that 59% of patients were placed in Group I, 32% of patients in Group II, and 9% of patients in Group III.

The pre-operative morbidity status of the patients analyzed in the study was of the finding of 59% of patients placed in the ASA II category and 39% of patients in the ASA III category.

The analysis of grade of resection with respect to the CLASS algorithm grouping was elucidated as 44% of Group I patients undergoing Grade 1 resection and 40% of Group II and 25% of Group III undergoing Grade 1 resection.

The outcome parameters of the surgical methodology adopted with reference to the CLASS stratification were then analyzed in reference to the Glasgow outcome scoring with 80% of GOS 4-5 and 20% of GOS 1-3.

The outcome of surgical intervention based on the “CLASS” scoring with respect to the poor outcome as measured by the GOS score of 1-3 was observed to be about 15% in Group I and 20% in Group II and about 50% in Group III. Odds ratio of having unfavorable outcome according to the CLASS score was compared, and the analysis is 5.6 in Group III versus Group I and 1.4 in Group II versus Group I. The comparisons of post-operative complications observed in the study using odds ratio with respect to the grouping according to the CLASS algorithm analysis was calculated as 4.55 when Group III and Group I was compared and 2.03 when Group II and Group I were compared indicative of a prominent and higher probability of occurrence of complications.

**CONCLUSION**

The overall results and conclusions from the study corroborate that the following findings were on the basis of the results of the observations on the forty-six patients in the study.

The epidemiological conclusions were that the incidence of meningiomas is highest in the fourth decade with a marked preponderance of lesions in females. The primary symptomatology is headache of a non-localizing variety accompanied by vomiting. Most of these symptoms were mild to moderate in intensity and severity.

With regard to the imaging findings, the location of the lesion was more in the convexities of the cerebral hemispheres, followed by the parasagittal/falcine varieties and tentorial and sphenoid wing varieties with no specific predilection for side- and midline-located lesions formed a third of these varieties.

“CLASS” algorithm forms a viable alternative for pre-operative standardization and stratification of meningiomas, and the validity of the algorithm is very well demonstrated by this study as is evidenced by the higher correlation of complications and poor outcome in the Group III patients.

**REFERENCES**


Depression, Anxiety, and Stress among Health Science Students belonging to Non-affluent Families: A University-based Study

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Abstract

Introduction: In due course of training, the health science students confront significant stress in psychological, academic, and existential domains. Coping strategies are definitely needed for a medical student placed in a new school with new teaching schedule.

Objective: To study depression, anxiety and stress (DAS) levels among the health science students belonging to academic years 1-5 of University Tunku Abdul Rahman in Malaysia, and the associated factors.

Methods: Undergraduate Health Science students of courses medicine, traditional Chinese medicine, and physiotherapy were selected for the study. DAS scale 21 questionnaire was used for analyzing the level of stress and other parameters before the examinations in 134 students. General health questionnaire 12 (GHQ 12) was used for assessment of general health among students of various health science courses.

Results: The three domains of DAS were significantly correlated. Depression was found significantly among female students (38%) more than male students (18%). DAS were all significantly high among the first year students as compared to the final year examination going students in MBBS course. Depression and stress were associated more with those students having adverse life events encountered in the recent past 1 year. Severe depression was found in 9.7% students. Combined depression and anxiety was found in 42% of students belonging to health science courses. GHQ scores for 134 participants of all health science courses were score >6 in 39.55%, score = 6 in 9.7%, and others in 50.75%.

Conclusion: A significant number of health science students were having higher levels of DAS and were associated with several important factors. There is a need to adopt a better counseling and mentoring techniques among the university staff, with better connectivity among health science students. Proactive steps must be implemented at the community level for the amelioration of the drawbacks.

Key words: Anxiety, Depression, Health science, Stress, Students

INTRODUCTION

In due course of training, the health science students confront significant stress in psychological, academic, and existential domains. Coping strategies are definitely needed for a medical student placed in a new school with new teaching schedule. Hence, such students experience depression, anxiety and stress (DAS) to varying levels.

Original Objective

a. To investigate the stress level among students on facing examinations in a Malaysian university setting.
b. To discover the main or top stressors among students in a Malaysian university setting.
c. To compare the difference in stress level on facing examinations among medical students, non-medical health science students, and non-medical non-health science students in a Malaysian university setting.

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d. To compare the difference in stress level between first year and final year students of the cohorts mentioned above.

Depression in younger population has been associated with increased risk of suicidal behavior, homicidal ideation, and substance abuse into adulthood. Most of the suicides among students in India are by people below the age of 30 years. Nearly 90% deaths by suicide have a mental disorder. Mental health of students in higher education is of extreme concern in the recent times. The present study was done with an objective to study the levels of DAS among health science students belonging to non-affluent families in Malaysia, and the association with various sociodemographic characteristics of the students. The hypothesis was that the DAS levels would be high among final year students compared to other academic years.

MATERIALS AND METHODS

The study was an institution-based study undertaken in the year 2014. Permission for carrying out the study was obtained from the Institutional Ethics Committee of University Tunku Abdul Rahman, Kuala Lumpur, a not for profit university having students mostly belonging to non-affluent families in state of Selangor, Malaysia.

Number of Participants

A total of 134 undergraduate health science students were included in the study.

Period of Study

Ten months.

All available students of health science courses were included in the study. In each class, informed consent from the students was taken after explaining and orienting about the study purpose and that their responses kept as confidential. All students in the selected classes were eligible to participate, who were present on that day of the survey conducted, allowing for confidential and voluntary participation. Depression, anxiety and stress scale (DASS) questionnaire was used as self-administered scale along with a sociodemographic data collection questionnaire. DASS consists of a set of three self-report scales meant to measure the negative emotional states of DAS. In addition to the basic 42-item questionnaire, a short version of DASS 21 is available with 7 items per scale. Earlier studies mentioned that the DASS was developed essentially with non-clinical samples as a study sample, it is suitable for screening normal adolescents and adults. For every item question, the respondent students are to rate the extent to which they have experienced the given state over the past week that uses a 4-point severity scale. DAS scores are calculated by addition of scores for the relevant items.

In the present study, the short version of DASS (21-item) was used. As recommended, the obtained scale scores are multiplied by 2 so as to make scores comparable to the DASS normative data scores. The adolescent students of school and university levels both were tested earlier with the DASS questionnaire.

Nearly 75% of the students (100) came from nuclear families. Most (102) were living in rented shared homes or with guardians, while only 26 (20%) residing with their own family in the downtown. A majority (120, 90.0%) had mothers who were nongraduates. Regarding the mothers’ occupation, a majority (76.8%) were homemakers. Only 6 (4.5%) reported having a parent not alive, which was not relevant for the analysis of association with DAS.

Data Analysis

Table 1 shows the % of incidence of DAS. The incidence of both depression and anxiety together in single participants was greater (Figure 1).

Table 2 projects the number of students with DAS depending on severity (Figure 2).

Table 3 gives the % of stress-inducing factors; perception of academic factors as more stressful by students than any other factors (Figure 3).

General health questionnaire 12 (GHQ 12) appropriately measures the current status of mental health focusing on the present.
on two critical areas: (a) The inability of carrying out routine day-to-day activities and (b) the appearance of distressing new experiences. Each item question is rated in a 4-point Likert scale that asks whether the respondent had experienced any symptom or behavior recently during the past few days. Past research indicates that clinical assessments of the severity of psychiatric illness are proportional to the number of symptoms mentioned in GHQ 12.9

Table 4 gives the scoring by GHQ 12 questionnaire among health science students of university. Scores higher than 6 indicate some problem risk (Figure 4).

**DISCUSSION**

A self-rated DASS questionnaire was administered on 134 health science students in university to assess and analyze the levels of DAS. The outcome measure of this screening reflects during the past week duration. Hence, the survey questionnaire was administered 2-3 days before the periodical examination so as to do better screening of nervous symptoms and tension effects. The incidence of mild stress was found to be 5.22%, anxiety 11.2%, and depression as 25.4%. Moderate stress was found in 0.75%, anxiety 14.93%, and depression 43.3%. No severe stress was recorded but severe anxiety in 4.5% and severe depression in 9.7%. Both anxiety and depression were seen in 42% of students which sounds alarming (Table 2). The incidence of depression was more prevalent.

Academic factors were perceived as critical in inducing stress among students. About 18.60% of students perceived stress due to change in methods of assessment tools and its unpredictability and other students performing better (Table 3). Academic factors were perceived more burden/influence than physical emotional and social factors ($P < 0.05$) among all the stress-inducing factors. Past research revealed similar findings that the chief stressors were related to medical training rather than their own personal problems in the first year.10

| **Table 2: Levels of depression, anxiety, and stress among students** |
|-------------------|--------|------|------|
| **N=134**         | **Depression** | **Anxiety** | **Stress** |
| Normal            | 34     | 15   | 7    |
| Mild              | 58     | 20   | 1    |
| Moderate          | 13     | 6    | 0    |
| Severe            | 1      | 15   | 2    |

<table>
<thead>
<tr>
<th><strong>Table 3: Percentage of stress-inducing factors</strong></th>
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<tr>
<td><strong>Magnitude</strong></td>
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<tr>
<td>Great extent</td>
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<td>Considerable extent</td>
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<td>Moderate extent</td>
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<td>Little extent</td>
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<table>
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<tr>
<th><strong>Table 4: GHQ 12 scores in number of students and percentage</strong></th>
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<tr>
<td><strong>Score</strong></td>
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<tr>
<td>&gt;6</td>
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<tr>
<td>≤6</td>
</tr>
<tr>
<td>Others</td>
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<tr>
<td>Total</td>
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</table>

GHQ: General health questionnaire 12
Greater number of students were found to be having significantly higher levels of D, A, and S. Depression was more among female students compared to males, and this is in conformity with the past research evidence. This indicates that irresistible pressure is faced by the students with regard to their performance in the medical board examinations. Undue emphasis is placed by the parents and society on just the paper-based results of the examinations, which is taken as a measure of their entire academic caliber among the health science courses. This is definitely a shortcoming that is leading to the higher levels of negative mental states like DAS among the health science course joined students. A strong predisposing factor for DAS among the students may be due to intense pressure to perform well in academic examinations during the formative assessment is reinforced by finding that all these negative states were greater in students with lower grade marks in their last academic year examinations. This might be a reflection of parental attitude and immense pressure (or perceived pressure of students) to get better their academic performance in the form of better marks during the assessment reports. Study done by Bayram and Bilgel 2008 indicated that students satisfied with their education had lower DAS scores than the other unsatisfied students. Adverse life events in the recent past such as death of a family member, illness in family, and accident show a considerable effect on the DAS levels among the young fresher students, similar in the present study. This suggests that a special support is of utmost importance for such students. Both the family and the school authorities need to do the required updates into the curriculum so as to be more sensitive to the needs of such susceptible students for better prop up and guidance.

Major limitation in this study is that it was done in a setting of a single university. Hence, the generalizability of the factors found here may be impacted. Moreover, the data mentioned by students on their demographics and academic grades were self-reported and not verified with the school authorities. The crucial utility of the present research study is that several factors exist among the health science students for DAS including those from relatively non-affluent family backgrounds. Academicians working with such students in educational institutes must be fully aware of and responsive to these negative mental health states so that timely support is offered to mitigate this problem.

CONCLUSION

Considerable amount of depression and anxiety were found among the first year medical students and first year health science students. These negative mental states are related to academic factors more than other factors that induced stress among students. Comprehending the prevalence of DAS and its associated factors would help in the designing and implementation of school-based counseling and treatment options exclusively for newly joined students of health science courses. This might go a long way in ensuring that the university students can emerge as healthy adult citizens of the nation.

ACKNOWLEDGMENT

My sincere thanks to the Professors and students of the University who gave immense support with understanding and allowing me to use the scale on stress inducing factor as well as encouraging me toward the studies.

REFERENCES

Pre-operative Hypoalbuminemia is an Independent Predictor for the Development of Post-operative Surgical Site Infection in Gastrointestinal Surgeries: A Study in Rural Population of Central India

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Abstract
Background: Surgical site infection (SSI) is defined as an infection occurring in an incisional wound within 30 days of the procedure or within 1 year if a prosthesis is implanted.

Objective: To determine the correlation of pre-operative serum hypoalbuminemia with post-operative SSI in patients who underwent gastrointestinal surgeries.

Methods: A prospective cross-sectional study was performed which included 150 patients who had undergone gastrointestinal surgery. Each patient was evaluated for pre-operative serum albumin and followed postoperatively for SSI. Hypoalbuminemia was defined as serum albumin <3 g/dL. Univariate analysis was done and P value was calculated for each variable.

Results: Age of the patients varied from 19 to 70 years and a maximum number of patients were between 40 and 59 years (43.43%). The mean ± standard deviation for age in the study was 48.25 ± 15.16 years, and maximum rate of SSI was noted in the patients of age 60-70 years which was 13% (P = 0.66) which was higher among females than males (32.50% vs. 17.27%, P = 0.04). A total of 32 patients (21.33%) had developed SSI. There were 22 superficial infections (68.75% of all infections), 7 deep infections (21.8%), and 3 organ space infections (9.3%). The rate of complication was maximum in patients with serum albumin <2.1 g/dL (80%). A univariate analysis shows that pre-operative serum albumin (<3 g/dL) is a strong predictor for SSI (P = 0.001). Rate of SSI was most common in patients with basal metabolic index <18.5 kg/m² which was found to be 32.78% (P = 0.011) with increased length of hospital stay.

Conclusion: Pre-operative hypoalbuminemia <3.0 g/dL is a strong independent risk factor for post-operative SSI following gastrointestinal surgeries.

Key words: Albumin, Hypoalbuminemia, Surgical site infection

INTRODUCTION

Hypoalbuminemia has been shown to be associated with increased mortality and morbidity rates in both hospitalized patients and community-dwelling elderly persons. In surgery, an association between hypoalbuminemia and adverse outcome has been recognized for many years.⁴ There is a substantial evidence to show that patients who have signs of malnutrition have a higher risk of complications and an increased risk of death in comparison with patients who have adequate nutritional reserves.⁵ Nutritional assessment is essential for identifying patients who are at risk of developing complications related to significant malnutrition. A dietary history, physical examination (including anthropometric measurements), and relevant laboratory tests are the appropriate tools needed for an accurate evaluation of a patient’s pre-operative nutritional status.

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status. Albumin is the most commonly used and reliable indicator of a patient's nutritional status; it is also a negative acute phase protein. In an acute illness or stress response, there is a reduction in serum albumin due to alterations in hepatic metabolism and loss of albumin into the interstitium. Serum albumin is a reliable and reproducible predictor of surgical risk and has a close correlation with the degree of malnutrition.

Surgical site infection (SSI) is defined as infection occurring in an incisional wound within 30 days of the procedure or within 1 year if a prosthesis is implanted. SSI can be superficial (involving only the skin and subcutaneous tissue of the incision), deep (involving fascial and muscle layers), or organ space. SSI is also important from an economic point of view, especially among the rural population. These patients can expect to spend additional days in the hospital and suffer significantly increased morbidity and mortality.

Previously described risk factors for the development of a SSI determined by the National Nosocomial Infection Surveillance include American Society of Anesthesiology (ASA) Grade III/IV, contaminated or dirty wounds, and the duration of procedure. Other risk factors described include increased body mass index (BMI), emergency surgery, surgeries involving a stoma, blood loss, frequency of glove changes, and the use of subcuticular sutures.

The aim of this study was to determine the relationship between pre-operative albumin and the development of SSI.

**MATERIALS AND METHODS**

In a prospective study, we included 150 patients with hypoalbuminemia (serum albumin <3 g/dL) who had undergone gastrointestinal surgeries in a rural hospital in Central India. Post-operative diagnosis of SSI in each case was done by the attending surgeon. Infection was determined according to the Centers for Disease Control and Prevention definitions of wound infection and was confirmed with positive wound cultures. Nutritional assessment including mid-upper arm circumference and skin-fold thickness along with BMI was calculated for all the patients in the study. Other details were recorded including age, gender, operation type (gastric, hepatobiliary, small, or large bowel), operation class (elective or emergency), ASA Grade, type of anesthesia, duration of procedure, length of hospital stay (LOS), and wound classification (clean, clean/contaminated, contaminated, and dirty). SSI was also classified as superficial incisional, deep incisional, or organ space SSI. Routine post-operative care was provided to each patient and each patient was followed up for a minimum of 30 days. Patients were divided into three class based on the degree of hypoalbuminemia - Class I (2.8-3 g/dL), Class II (2.1-2.7 g/dL), and Class III (<2.1 g/dL).

This study has been accepted and sanctioned by the Ethics Committee Board of the Institute where the study has been undertaken.

**Inclusion Criteria**

This included patients who consented for the study with age >18 years; patients having pre-operative serum albumin <3 g/dL among those who underwent emergency and elective gastrointestinal surgeries and ASA up to Grade III were included in the study.

**Exclusion Criteria**

All patients having pre-operative serum albumin ≥3.0 g/dL were excluded from the study; patients diagnosed for chronic liver disease and jaundice, sepsis (white blood cell >12,000 cells/mm³), severe anemia (hemoglobin <8 g/dL); diabetes mellitus Type II and chronic renal disease; patients on steroids or chemotherapy for any oncological disease or any other hepatotoxic drugs; and clinically significant signs and symptoms of hypoalbuminemia. Obese patients and patients with BMI <12 and >40 were excluded from the study and especially prolonged addiction to alcohol and tobacco were excluded from the study; significant medical and family history pertaining to medical disease including cirrhosis of liver, protein-losing enteropathy, nephrotic syndrome, congenital analbuminemia, ulcerative colitis, cystic fibrosis, hepatitis, heart failure, renal failure, amyloidosis, and autoimmune diseases were ruled out.

**Statistical Analysis**

Statistical analysis was done using descriptive and inferential statistics using Chi-square test and multiple regression analysis and software used in the analysis were SPSS 17.0 version and GraphPad Prism 5.0. Data have been entered in excel sheet and has been analyzed using STATA software. Continuous variables are presented as mean ± standard deviation and compared using t-test. Categorical variables are presented as proportions and compared using Chi-square test. Multivariate analysis is used to determine risk factors associated with serum albumin and various clinical and biochemical parameters. P < 0.05 is regarded as being statistically significant.

**OBSERVATIONS AND RESULTS**

**Patient Characteristics**

Of the total 150 patients included in the study, a total of 32 patients (overall rate 21.33%) had developed SSI. The median duration to diagnosis of SSI was 7 (5-10) days. There were 22 superficial infections (68.75% of all infections), 7 deep
infections (21.8%), and 3 organ space infections (9.3%). The mean age was 48.25 ± 15.16 years with maximum percentage of SSI in the age group of 60-70 years (32.65%; 13% with SSI), but no significance in age at the time of surgery and development of SSI (P = 0.66). Male to female ratio (M:F) was 2.8:1 and the complication rate was more in females than males (32.50% vs. 17.27%, P = 0.04). The rural population included in the study showed a wide range of nutritional deficiencies which were evaluated through various tools including BMI and 40.66% of patients had BMI <18.5 kg/m², 43.33% patients between 18.5 and 24.9 kg/m², and 16% having BMI between 25 and 30 kg/m². ASA Grade III was associated with an increased incidence of SSI (32.20%, P = 0.032, Chi-square test). Operation types were classified as gastric (closure of perforation, partial, or total gastrectomy; n = 36), hepatobiliary (open cholecystectomy, CBD exploration, hepaticojejunostomy, and Whipple’s procedure; n = 10), small bowel (resection, wedge resection, adhesiolysis, and closure of perforation; n = 48), and colorectal (resection of colon or rectum, abdominoperineal resection and stoma formation, Hartmann’s procedure, and fecal diversion; n = 56) (Table 1).

### Hypoalbuminemia and SSI

Pre-operative evaluation of serum albumin showed that the maximum number of patients had hypoalbuminemia Class II (2.1-2.7 g/dL, 56.66%) which had an direct impact of the number SSI postoperatively (rate 24.09%) and highest rate was found in patients with hypoalbuminemia Class III (<2.1 g/dL, rate 80%, P = 0.001) (Table 2 and Figure 1). Rate of superficial wound infection increased with decrease in value of serum albumin and rates of deep wound infection (25%) and organ space infection (50%) was maximum for Class III hypoalbuminemia (Table 3 and Figure 2). Depth of infection of wound is inversely proportional to the class of hypoalbuminemia.

### BMI and SSI

In our study, 40.66% of the total patients had pre-operative BMI <18.5 kg/m² which had a maximum impact on the development of SSI (8.33% Grade I; 15.38% Grade II; 32.78% Grade III; P = 0.011) (Table 2 and Figure 3). The rate of SSI increased as there is decrease in BMI which is quite prevalent in low socioeconomic background of the rural population. Involuntary weight loss (WL) >5% was found in 34.54% (P = 0.01) of significant WL within 6 months of post-operative period in patients who developed SSI. All these had a direct influence on increased LOS postoperatively in patients that developed SSI (overall rate 34.54%, P = 0.04).

### Operative Variables and SSI

Those patients who had undergone an emergency surgery relative to an elective procedure had a higher incidence of SSI (29.48% vs. 12.50%; P = 0.011) (Table 1 and Figure 5). Moreover, the extent of intraoperative contamination...
affected the rate of SSI with 8.92% of clean wounds, 21.73% of clean-contaminated wounds, 25% of contaminated, and 56.25% of dirty wounds developing SSI ($P = 0.0007$) (Table 1 and Figure 4). The incidence of SSI following gastric surgery was 13.88%, hepatobiliary was 60%, small bowel was 22.91%, and colorectal was 17.85% ($P = 0.014$) (Table 1 and Figure 6).

DISCUSSION

Malnutrition is a major problem in patients undergoing gastrointestinal surgeries for any reason. The potential contributors to malnutrition in these patients are multiple including insufficient food and nutrient intakes, impairment of nutrient absorption, and low socio-economic status of the patients where patients cannot afford good nutritive diet. There are many tools to assess patient’s nutritional

Figure 1: Presentation of distribution of surgical site infection and class of hypoalbuminemia

Figure 2: Distribution of depth of wound infection based on class of hypoalbuminemia

Figure 3: Distribution of surgical site infection based on grade of pre-operative body mass index ($P = 0.011$)

Figure 4: Effect of wound class on post-operative surgical site infection ($P = 0.0007$)

Figure 5: Effect of operation class on post-operative surgical site infection ($P = 0.011$)

Figure 6: Effect of operation type on post-operative surgical site infection ($P = 0.014$)
status, ranging from clinical appraisal to anthropometric and various laboratory investigative measures. Serum albumin is a good and simple predictor of surgical risk and has a close correlation with the degree of malnutrition. Pre-operative hypoalbuminemia, serum albumin level <3 g/dL was associated with the development of SSI and is an independent risk factor for other post-operative complications. Although serum albumin level may also be affected by acute factors such as trauma and surgical stress, it is predictive of operative outcome because it is a marker of disease and malnutrition as well as possibly conferring a direct protective effect through several biological mechanisms. There are increased needs by the body due to stress of illness, injury, or infection which results in depletion of visceral protein sources leading to abnormal function in organ systems including gastrointestinal malabsorption, impaired immunologic response and impaired production of albumin, and other plasma proteins in the liver. Gibbs et al. reported that pneumonia (10.6%) and SSI (SSI, 10.3%) were the two most common complications in the patients who had hypoalbuminemia. Similar results were observed by Hennessey et al. in their study of 524 patients where a total of 105 patients developed SSI (20%). They also concluded that there is a significant rise in the rate of post-operative complications as the age advances (P < 0.001 in both studies).

Mullen et al. found that low BMI <18.5 kg/m² has a five-fold increased risk in resulting to post-operative complications. Similarly, a study by Beghetto et al. concluded that serum albumin level was the strongest predictive parameter for death and hospital infection (<3.5 g/dL) and BMI <18.5 kg/m² was associated with death and post-operative infection and with increased LOS (P <0.01).

However, albumin infusion is usually not effective because the albumin will degrade quickly, and infusion does not address the underlying causes of adverse operative outcome. A recent report discussed the administration of a supplemented diet before and after surgery, and its beneficial effect on outcomes in malnourished patients with gastrointestinal cancer, thus highlighting the detrimental effects of malnutrition. Surgeons should be aware of the implications of low pre-operative serum albumin and consider nutritional intervention in the malnourished patients undergoing surgery. The use of prophylactic antibiotics in surgery has been shown to be effective in reducing the incidence of SSI. These patients should receive antibiotic prophylaxis within 60 minutes of surgery and they should be continued for 24 h.

Patients’ nutritional status has to be optimum to avoid the occurrence of post-operative SSI. It is obvious in our study that wherever serum albumin and BMI were low, the complication rates increased. Pre-operative improvement of nutritional status must be done before undertaking any surgery. However, this is possible only when the surgery is routine and patients can safely be kept in waiting till the improvement of nutritional status. However, this is not always possible in case of emergency surgeries.

CONCLUSION

Pre-operative hypoalbuminemia is a predictor of post-operative SSI and assessment of nutritional status with pre- and post-operative buildup of patients is of importance to prevent SSI, thus decreasing additional cost burden, LOS, and an overall better quality of life.

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Factors Influencing Duration of Untreated Psychosis

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Abstract

Introduction: Schizophrenia is a chronic disabling disorder for most affected individuals. Despite historical pessimism about prognosis, more recent studies suggest that early intervention can improve outcome. The duration of untreated psychosis (DUP) is a potentially modifiable prognostic factor and understanding its relation to outcome could lead to improved therapeutic strategies and public health initiative. Relationship of DUP to outcome may indicate a neurodegenerative process and so have important implications for understanding the pathophysiology of schizophrenia.

Aim: To study the factors predicting influence of DUP on the short-term outcome in schizophrenia and to study the relationship of premorbid social adjustment on the DUP and outcome.

Materials and Methods: 100 consecutive patients diagnosed and admitted as inpatient schizophrenia in institute of mental health. Study variables include scales: Scale for assessment of positive symptoms, scale for assessment of negative symptoms, clinical global impression-schizophrenia scale, global assessment of functioning, were given and age criteria 18-45 years, drug naive patients, and patients with a diagnosis of schizophrenia.

Results: A total of 100 patients were screened, evaluated, and entered into the study out of which 3 patients were excluded, one patient was found to be HIV positive and 2 patients were found missing from the ward. Hence, the total number of sample at baseline assessment was 97. At the end of 8 weeks follow-up, assessment was done for 63 patients who reported along with their caregivers. The remaining 34 patients who did not complete the follow-up were categorized as non-completers.

Conclusion: Longer DUP is associated with higher age at presentation, higher negative symptoms, and poor premorbid functioning. Improved patients have a shorter DUP and better premorbid functioning than unimproved patients.

Key words: Duration of untreated psychosis, Schizophrenia, Sociodemographic factors

INTRODUCTION

Outcome of schizophrenia has been repeatedly demonstrated to be “good” and “favorable,” which generally implies that most of the patients treated adequately are able to maintain a reasonable quality of life, remain free from distressing symptoms, can function at a moderate level, and live a life outside psychiatric institutions in the community.¹,² In previous studies, duration of untreated psychosis (DUP) was found to be related to symptom-related domains of outcome such as psychotic relapse and remission but not to other domains such as social functioning. In most of the studies, DUP has been defined as the time between onset of psychotic symptoms and the start of treatment with antipsychotic medication. Besides medication, frameworks for psychiatric intervention directed at the problems of patients with a recent onset psychosis also include psychosocial interventions. DUP is a particularly important prognostic factor because it can be reduced by enhancing early detection and treatment referral procedures. The concept of DUP attracted much interest because of its possible relationship to treatment outcome and implications for preventive efforts in schizophrenia.³ Many studies demonstrated a link between DUP and both short- and long-term outcome in schizophrenia, but some contested this claim.⁴ The relationship of DUP to outcome was strongest in the initial months of psychosis. The concept of a “limited window of opportunity” in the early course of illness, a critical period when putative deficit
factors are at their peak and the intervention has maximum benefit, was put forth. Studies showed that outcome was significantly enhanced by more intensive treatment only if the DUP was less than 6 months. It was not known if this relation between DUP and treatment response would hold if the illness was untreated for many years.

**Aim**

The aims of this study were to study the factors predicting influence of DUP on the short-term outcome in schizophrenia and to study the relationship of premorbid social adjustment on the DUP and outcome.

**MATERIALS AND METHODS**

This prospective observational study was conducted in the Department of Psychiatry, Madras Medical College. A total of 100 patients admitted as inpatients fulfilling the ICD-10 criteria for schizophrenia and who were never treated were included in the study, age group was within 18-45 years and reliable informants. After complete description of the study, written informed consent was obtained from the participants. Exclusion criteria were patients under age of 18 years or above 45 years, and a history of head injury, evidence of psychotic symptoms precipitated by an organic cause; previous treatment for psychosis; and transient psychotic symptoms resulting from acute intoxication as defined by ICD-10. Data relating to date of onset of psychosis were collected from interviews with the patient and a close relative of the patient. We asked when the patient first experienced or when the family members first noticed psychotic symptoms a rating of onset was made only when there was a clear, unequivocal description from any source of symptoms meeting these criteria.

**RESULTS**

During our study period, 100 consecutive patients were screened, evaluated, and entered into the study, out of which 3 patients were excluded, one patient was found to be HIV positive and 2 patients were absconded, 97 patients were analyzed.

In the improved group, the DUP was 0.898 ± 0.5 (logDUP), the corresponding DUP in months being 7.92, and in the unimproved group, the DUP was 1.36 ± 0.5 (logDUP), the corresponding DUP in months was 22.78. The difference between the two groups was statistically significant (Table 1).

In the improved group, the premorbid social adjustment score was 25.78 ± 6.8 and the score in the unimproved group was 31.81 ± 2.5. The difference between the two groups was statistically significant (Table 2).

In the improved group, 4.9% were treated with typical antipsychotic drugs, 78% with atypical drugs, 17.1% with electroconvulsive treatment (ECT) and drugs. In the unimproved group, 54.5% were treated with atypical drugs, 45.5% were treated with ECT and drugs. The differences between the two groups were statistically significant ($P = 0.039$) (Table 3).

**DISCUSSION**

There is a statistically significant difference between the improved and the unimproved groups on the DUP as the mean DUP for the improved groups is 7.92 months and 22.78 months for the unimproved group of patients. This finding is similar to other studies that shorter DUP is associated with good outcome and treatment response than those with a longer DUP in a study done by Philip et al. of drug schizophrenia patients.

Influence of duration untreated of untreated psychosis on the short-term outcome of drug-free schizophrenia patients reported that patients with a short DUP have shown improvement at the end of 6 weeks following treatment. There have been contrasting reports that DUP has an influence on the outcome in the short term but not on the long term. Drake et al. in his study concluded that DUP's relationship to outcome is strongest in the initial months of psychosis and has implications for targeting early intervention. The duration

**Table 1: Comparison of duration of untreated psychoses**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean±SD</th>
<th>t value</th>
<th>P value</th>
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<tr>
<td>Improved N=41</td>
<td>Unimproved N=22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LogDUP</td>
<td>0.898±0.5</td>
<td>1.36±0.5</td>
<td>3.41</td>
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<tr>
<td>DUP: Duration of untreated psychosis, SD: Standard deviation</td>
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**Table 2: Comparison of premorbid functioning**

<table>
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<th>Mean±SD</th>
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<th>P value</th>
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<tr>
<td>Improved (N=41)</td>
<td>Unimproved (N=22)</td>
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<tr>
<td>Premorbid social adjustment</td>
<td>25.78±6.8</td>
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<td>SD: Standard deviation</td>
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**Table 3: Comparison of mode of treatment**

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<th>Mode of treatment</th>
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<th>Unimproved (N=22)</th>
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<td>Typical drugs</td>
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<td>Atypical</td>
<td>32</td>
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<td>44</td>
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<tr>
<td>ECT and drugs</td>
<td>7</td>
<td>10</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>41</td>
<td>22</td>
<td>63</td>
<td></td>
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of hospitalization between two groups was not significant as more than 80% of the patients were hospitalized for <2 weeks. This finding is similar to the report of Haas et al. that there is no significant difference in terms of duration of hospitalization between the long and short DUP groups.12 Regarding treatment between the two groups is statistically significant as 78% of the improved group were treated with atypical antipsychotics and 54.5% among the unimproved group with atypical. This difference could be explained by the fact that patients with shorter DUP would have had a better response to treatment as described by Perkins et al.13 This result has to be interpreted with caution as the type of drugs, dosage, and adequacy of dose was not included in our study. Few studies differ as Barnes et al. found that there was little evidence of any association between DUP and the development of resistance to initial drug treatment.8 In our study, the premorbid social adjustment score is statistically significant between the improved and unimproved groups, indicating that poor premorbid functioning is associated with poor improvement. This finding is similar to the reports of Verdoux et al. that premorbid functioning is an important predictor of outcome, again the premorbid social adjustment scale used in this study assesses premorbid functioning in social and school activities, for which 11.34% of the sample in our study were uneducated making it difficult to assess in these group of patients.14 To find the relationship of confounding factors associated with DUP and outcome, a partial correlation was done controlling for the confounding factors such as age, age at onset of illness, symptom domains of psychotic, disorganized and negativism, and premorbid functioning. The correlation found that DUP is not statistically significant after controlling the confounding factors. This finding that DUP is not an independent predictor of outcome is in contrary to most of the studies that reported DUP to be significant predictor of outcome after controlling for the confounding factors. As premorbid functioning has shown a statistically significant correlation with improvement at 8 weeks, we did a partial correlation controlling for the confounding factors and found that premorbid functioning is not statistically significant. This finding is similar to studies that report premorbid functioning is not a strong predictor of outcome and the observed association between DUP and outcome was not explained by premorbid adjustment.

CONCLUSION

The findings from this study suggest that a longer DUP is associated with poor premorbid functioning, but the association is not significant after the confounding factors were controlled and statistically significant difference between the improved and the unimproved groups by the mode of treatment was observed from the study. This finding concludes that DUP is not an independent predictor of outcome as stated in literature. It was conceivable that the reported better outcome for schizophrenia in India is unlikely to be because of shorter DUP. However, instituting treatment earlier gives further advantage and can make the outcome in our people even brighter.

REFERENCES


Source of Support: Nil, Conflict of Interest: None declared.
Autologous Miniature Punch Skin Graft Procedure in 25 Cases of Stable Vitiligo

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Abstract

Background: Vitiligo is an acquired disorder of depigmentation of skin, hair, and mucosa. There are many numbers of medical therapies that may restore the pigmentation. When medical therapies fail, surgical methods should be considered. Among the various surgical modalities of treatment available for stable vitiligo, autologous miniature punch skin graft is an effective, simple office procedure.

Aim of the Study: The aim of the study was to treat the patient with stable vitiligo with the procedure of punch grafting and to observe the repigmentation process and cosmetic improvement.

Materials and Methods: A total of 25 cases of “stable vitiligo” were selected from the patients attending the outpatient department over a period of 10-year from 2005 to 2015, subjected to miniature punch grafting technique. Patient data, results and outcome tabulated after 12-month follow-up.

Results: About 25 cases were studied, out of which 9 were males (36%), 16 were females (64%) with a male to female ratio of 3:5; out of 25 patients, 15 had focal vitiligo, 6 had segmental vitiligo, 2 had mucosal lesions, and 2 had acrofacial vitiligo. Age group ranged from 12 to 50 years with mean age group ranged from 25 to 32 years. A total number of grafts taken were 222. Graft uptake rate was 77.8%. Overall, cosmetic improvement is 70% at the end of 12 months.

Conclusion: Miniature punch grafting is a simple, versatile procedure with good repigmentation and cosmetic outcome for patients with stable vitiligo.

Key words: Miniature punch grafting, Vitiligo, Repigmentation

INTRODUCTION

Vitiligo is an acquired disorder of depigmentation with the incidence of 1-2%, but may reach as high as 8%.¹ It is not only a dermatological problem but also a social stigma, often called by lay people as “white leprosy.” Cosmetic disfigurement has a substantial impact on a person’s social and professional relationship.² Due to this fact marriage proposals of both the sexes are affected and poses a problem to the parents and society.³

At present, there are a number of medical therapies that may restore the pigmentation, some combination therapies give complete repigmentation in approximately 60-90% of cases of vitiligo.⁴ When the medical mode of therapies fail, surgical methods should be considered.⁴ Among the various surgical modalities of treatment available for stable vitiligo, autologous miniature punch skin graft is an effective, reliable and simple office procedure.⁵⁻¹³

MATERIALS AND METHODS

About 25 cases of “stable vitiligo” were selected among vitiligo patients attending skin outpatient department at Government Theni Medical College and ESI Hospital Coimbatore from January 2005 to December 2015. Selection criteria included stable vitiligo with no new lesions for the last 2 years and patients not improving inspite
of long-term medical treatment. Patients with bleeding tendency, keloidal tendency were excluded from the study.

History regarding selection criteria, family, personal, occupation, and Last history was documented and the general examination was done. In dermatological examination, the skin type, the number, size, site, and type of vitiligo were assessed. Complete hemogram, stool examination, urine analysis, bleeding time, and clotting time were done.

Ear, nose throat, and dental examination were done to rule out focal sepsis. Endocrinology opinion regarding thyroid status was obtained in all the patients. Formal written consent was obtained from the patients. Photographs were taken before the procedure and during the follow-up reviews.

**Procedure**

Under local anesthesia and aseptic precautions, donor site was prepared. Upper lateral or anterior extensor aspect of thigh was the preferred donor site. 2.5 mm mini punch grafts were harvested until the depth of upper dermis with 1-2 mm of normal skin in between, in parallel rows of 10-15 such cuts. Grafts were transferred to tray moistened with saline gauze. Hemostasis by pressure achieved. Dressing with framycetin gauze was done.

Recipient site was prepared in the same way and 2 mm punches were rotated, keeping the distance 5-8 mm approximately between the grafts and pressured up to mid dermis approximately 1-1.5 mm in depth, and the achromic grafts were discarded.

The normal skin grafts already stored were transferred to these punched sites with assurance of dermal side down by assessing the glistening surface. Spreader was used to spread the grafts. Firm pressure with moist gauze was applied to achieve hemostasis and snug fit. The dressing was done as for donor site. Antibiotics and anti-inflammatory drugs were given for 7 days. The dressing was removed using saline water. Take up of grafts ascertained. PUVASOL was given for 3-6 months until repigmentation process occurs. Patients were followed up periodically for 1 year. The rate of repigmentation was documented and repigmentation ratio calculated.

**RESULTS**

About 25 cases were selected according to the selection criteria. These cases included 9 males (36%) and 16 females (64%) with a male to female ratio of 3:5, out of them 15 had focal vitiligo, 6 had segmental, 2 had mucosal, and 2 had acrofacial.

Age group of patients ranged from 12 to 50 years with mean age of 25-32 years (Table 1). Face was the most common site of distribution of vitiliginous patches followed by legs and other sites (Table 2).

A total number of grafts taken for surgery were 222. 182 grafts took well, and 40 grafts were rejected. Graft uptake percentage was the highest in focal type and least with acrofacial vitiligo. The average graft uptake rate was 77.8% (Table 3).

The onset of pigmentation varied from 2.5 to 12 weeks in the case of nonglabrous skin and 3.5-24 weeks in the glabrous skin. In the mucosa, pigmentation was observed in 4 weeks itself (Figure 1). With regard to the site, the pigmentation was observed earlier in the back followed by chest, face, scalp, and leg in the nonglabrous skin. In glabrous skin, the earlier pigmentation was observed in the feet followed by fingers and leg (Table 4).
The onset of pigmentation was almost the same in the segmental (Figure 2), mucosal, and acrofacial types (Figures 3-5) with an average of 3.5-4 weeks. In the focal type, pigmentation was observed to occur between 5 and 8 weeks (Figure 6).

On an average, the rate of pigmentation in different types of vitiligo varied from 0.6 to 1.3 mm. The segmental type of vitiligo had the fastest spread (Figure 2), followed by focal, acrofacial, and the mucosal type (Figure 1).

Cosmetic assessment was done in relation to the age, sex, type, and site of vitiligo at the end of 12 months by a single blind observer. It was graded as excellent 91-100%, good 71-90%, fair 51-70%, and bad with <50% improvement (Table 5).

On an average, the cosmetic improvement was 83% in age group of 21-30 years and 67% in the age group of 10-20 years age and 17% in the age group of 31-40 years. The cosmetic improvement was 100% in a male patient with vitiligo.

The overall cosmetic improvement achieved was 70% in our study. Complications noted at the receptor sites are tabulated in (Table 6).

### Table 1: The type of vitiligo with the age and sex distribution among 25 selected cases

<table>
<thead>
<tr>
<th>Type of vitiligo</th>
<th>Total number of cases</th>
<th>10-20 years</th>
<th>21-30 years</th>
<th>31-40 years</th>
<th>Above 40 years</th>
<th>Percentage of type of vitiligo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focal</td>
<td>15</td>
<td>1</td>
<td>7</td>
<td>2</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Segmental</td>
<td>6</td>
<td>1</td>
<td>-</td>
<td>2</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Mucosal</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Acrofacial</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>4</td>
<td>8</td>
<td>4</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

| (%)             | 48                    | 28          | 16          | 8           | 4              | 1                | 1                |

### Table 2: Distribution of lesions of vitiligo in selected cases

<table>
<thead>
<tr>
<th>Site of vitiligo</th>
<th>Number of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face</td>
<td>7</td>
</tr>
<tr>
<td>Leg</td>
<td>5</td>
</tr>
<tr>
<td>Lips</td>
<td>2</td>
</tr>
<tr>
<td>Back</td>
<td>2</td>
</tr>
<tr>
<td>Abdomen</td>
<td>2</td>
</tr>
<tr>
<td>Hands</td>
<td>2</td>
</tr>
<tr>
<td>Fingers</td>
<td>2</td>
</tr>
<tr>
<td>Scalp</td>
<td>1</td>
</tr>
<tr>
<td>Chest</td>
<td>1</td>
</tr>
<tr>
<td>Foot</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
</tr>
</tbody>
</table>

### DISCUSSION

Among the selected group of patients females outnumbered males, especially in the matrimonial age group.

The graft rejection in our study worked out to be 18% in contrast to the graft rejection of 10% reported by Das and Pasricha. Rejection could be avoided by mastering the technique and by providing proper dressing to the movement prone areas. The graft uptake in focal and mucosal vitiligo is similar to the observation made by the
### Table 3: Depicting grafts “taken” and “rejected” in relation to the type of vitiligo

<table>
<thead>
<tr>
<th>Type of vitiligo</th>
<th>Total number of grafts placed</th>
<th>Sex</th>
<th>Grafts placed</th>
<th>Total number of grafts taken</th>
<th>Grafts Taken</th>
<th>Grafts Rejected</th>
<th>Graft taken percentage</th>
<th>Total graft taken percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focal</td>
<td>84</td>
<td>M</td>
<td>11</td>
<td>79</td>
<td>11</td>
<td>0</td>
<td>100</td>
<td>97</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>73</td>
<td></td>
<td>68</td>
<td>5</td>
<td>94</td>
<td></td>
</tr>
<tr>
<td>Mucosal</td>
<td>6</td>
<td>M</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>83</td>
<td>83</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>59</td>
<td></td>
<td>33</td>
<td>26</td>
<td>56</td>
<td></td>
</tr>
<tr>
<td>Segmental</td>
<td>117</td>
<td>M</td>
<td>58</td>
<td>90</td>
<td>57</td>
<td>1</td>
<td>98</td>
<td>77</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>59</td>
<td></td>
<td>33</td>
<td>26</td>
<td>56</td>
<td></td>
</tr>
<tr>
<td>Acrofacial</td>
<td>15</td>
<td>M</td>
<td>7</td>
<td>8</td>
<td>4</td>
<td>3</td>
<td>57</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>8</td>
<td></td>
<td>4</td>
<td>4</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>222</td>
<td></td>
<td>182</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>77.8</td>
</tr>
</tbody>
</table>
Table 6: Observation at the donor sites in vitiligo patients treated with punch grafts

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Donor site changes</th>
<th>Number of cases</th>
<th>Age group</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>T</td>
<td>M</td>
<td>F</td>
</tr>
<tr>
<td></td>
<td>Scarring</td>
<td>21</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Depigmentation</td>
<td>1</td>
<td>1</td>
<td>-</td>
</tr>
</tbody>
</table>

1. Total number of case, M: Male, F: Female, A: Total number of affected cases

**CONCLUSION**

Miniature punch grafting is a simple, versatile procedure with good repigmentation and cosmetic outcome for patients with stable vitiligo.

**REFERENCES**


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

Repigmentation achieved in around 5 months in our study with PUVASOL was in contrast to the studies made by others without PUVASOL, where in pigmentation could be achieved only after 6 months.

Complication at the recipient site included depigmentory joining line which is the most common complication comparable with other studies.

The cosmetic improvement was best in the age group of 20-30 years in both males and females with a better response in females than males. This finding was in concurrence with the previous studies.

Figure 5: segmental vitiligo over right cheek, pigmentation at 4 weeks and 5 months.

Figure 6: Focal vitiligo over back, pigmentation at 2.5 weeks and 3.5 months.
Clinical Assessment with Bacteriological Evaluation of Patients with Retropharyngeal Abscess in a Tertiary Hospital in Thiruvananthapuram

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Abstract

Introduction: Retropharyngeal abscess is an infection of one of the deep spaces of the neck. An abscess in this location is an immediate life-threatening emergency with potential for airway compromise and other catastrophic complications. It is a condition with potential for significant morbidity and mortality if not detected early.

Aims of the Study: (1) To evaluate the underlying etiology of retropharyngeal abscess in patients in the Department of Otorhinolaryngology (ENT), Medical College, Thiruvananthapuram, Kerala, India (2) to evaluate bacteriology of the pus obtained from the abscess, (3) to study the management and prognosis of patients presenting with retropharyngeal infection and effect of co-morbid illness on outcome of the disease.

Materials and Methods: (1) Source of data: This study was a prospective analysis performed on a group of 53 patients with retropharyngeal abscess who attended the Department of Otorhinolaryngology (ENT), Medical College, Thiruvananthapuram, Kerala, India, during the period of 1-year from November 2006 to December 2007, (2) method of data collection: Data were collected using a standardized questionnaire, personal interview, physical examination, and biochemical investigations.

Results: In our study, 53 patients were taken, 62.26% of the patients were males and 37.74% were females) with mean age of 44.5 years. The majority of the patients in the study group presented with odynophagia and dysphagia. In the bacteriological evaluation of pus most common organism was *Streptococcus* viridians and *Pseudomonas*. The main predisposing factor was foreign body ingestion. Out of the 53 patients, 8 had complications of which 5 were diabetic.

Conclusion: Retropharyngeal abscess was more seen in male adults following foreign body ingestion. Bacteriological studies showed *Streptococcus* viridians and *Pseudomonas* to be the common pathogens in the pus. The main complication was respiratory distress and comorbidities like diabetes mellitus affected the outcome of the disease.

Key words: Bacteriology, Comorbidities, Foreign body, Retropharyngeal abscess

INTRODUCTION

Retropharyngeal abscess is an infection of one of the deep spaces of the neck. An abscess in this location is an immediate life-threatening emergency with potential for airway compromise and other catastrophic complications. It is a condition with potential for significant morbidity and mortality if not detected early. They account for 12-22% of all deep neck infections in the neck.

Etiologies of retropharyngeal abscess can vary from infections of retropharyngeal lymph nodes, adenoids, nose, nasopharynx, paranasal sinuses, tonsils, pharynx or from cervical adenitis, foreign bodies penetrating posterior pharyngeal mucosa, penetrating injuries of posterior pharyngeal wall of cervical esophagus or due to
tuberculosis of the cervical spine. Rarely, it can occur as sequelae of suppurative otitis media.

The patient can present with fever, progressive dysphagia, odynophagia, drooling, neck stiffness and rarely stridor and neck swelling.

Clinical suspicion of retropharyngeal abscess can be further confirmed by complete blood count with differential count, lateral soft tissue radiograph and if needed computed tomography (CT) scan of the neck with contrast. Once diagnosis is confirmed, antibiotic therapy is directed empirically toward aerobic and anaerobic flora of nasopharynx. The definitive treatment is surgical drainage of abscess and sending the pus for culture and sensitivity. The appropriate antibiotic is started postoperatively.

Complications of retropharyngeal abscess can range from acute upper airway obstruction, spontaneous abscess rupture, aspiration pneumonia, mediastinitis to septicemia and even death.

With early suspicion of the clinical possibility of a retropharyngeal abscess along with CT imaging, good anesthesia, prompt surgical drainage and good antibiotic coverage, complications should be extremely low with zero mortality.

In this study, a prospective analysis of patients with retropharyngeal abscess attending the Department of Otorhinolaryngology (ENT), Government Medical College, Thiruvananthapuram, Kerala, India, from November 2006 to December 2007 is done.

Factors such as age, sex, etiology, presenting symptoms and signs, methods of diagnosis, treatment, and complications are reviewed. In this study, the bacterial profile of the pus obtained during surgical drainage of the abscess is also studied.

**AIMS OF THE STUDY**

1. To evaluate the underlying etiology of retropharyngeal abscess in patients in the Department of Otorhinolaryngology (ENT), Medical College, Thiruvananthapuram, Kerala, India
2. To evaluate bacteriology of the pus obtained from the abscess
3. To study the management and prognosis of patients presenting with retropharyngeal infection
4. To study the effect of co-morbid systemic illnesses on the prognosis and outcome of the disease.

**MATERIALS AND METHODS**

**Source**

This study was conducted on a group of 53 patients with retropharyngeal abscess who attended the Department of Otorhinolaryngology (ENT), Medical College, Thiruvananthapuram, Kerala, India, during the period of 1-year from November 2006 to December 2007.

**Period-12 Months**

In all the patients with retropharyngeal abscess, detailed clinical evaluation was done which included a detailed history, general examination, and thorough ENT examination. The findings were recorded on a proforma. Investigations included blood and urine examination and specific investigations for diabetes, immunosuppression, and tuberculosis in indicated patients.

A lateral soft tissue radiograph of the neck taken in inspiration and normal extension of the neck was the main diagnostic tool used in all the cases.

Retropharyngeal space widening greater than half the width of vertebra and loss of lordosis were the main criteria used for diagnosis. Chest X-ray postero-anterior view was also taken in all the cases. CT scan of the neck was recommended in certain cases especially in children and those with complications. All the patients were subjected to surgical drainage under general anesthesia/local anesthesia after proper airway maintenance. Pus obtained from the surgical drainage of the abscess was sent for bacteriological evaluation to the microbiology lab.

In the microbiology lab, the specimen was inoculated into 4% human blood agar, chocolate agar, McConkey’s agar, and salt agar. These plates were incubated at 37°C aerobically and examined after 24 h. Organisms were identified on the basis of colonial, morphological and cultural characteristics and biochemical reactions. In case of poor growth in solid media, subcultures were made using glucose broth.

After identifying the microorganisms, they were tested for their antimicrobial sensitivity. The antibiotic disc used was cloxacillin, tetracycline, first generation cephalosporin, erythromycin, gentamicin, carbenicillin, chloramphenicol, ciprofloxacin, amikacin, penicillin, ampicillin, and cotrimoxazole.

Based on the culture and sensitivity results, appropriate antibiotics were started for all patients. Management of comorbid systemic illnesses was done. Complications following retropharyngeal abscess noted and adequately managed. The mean hospital stay assessed in all patients. The prognosis and outcome with respect to age, predisposing
factors and comorbid systemic illnesses assessed. All the patients were followed for 6 months for recurrence.

RESULTS

Sex Distribution
Study was done in a total of 53 patients.

Out of 53 cases (Figure 1):
• Male - 33 (62.26%)
• Females - 20 (37.74%).

Of the 53 cases:
• Adults - 49
• Children - 4 (3 females and 1 male).

Age Distribution
The age of presentation varied from 0-10 years to 60-70 years and most of the patients were between 40 and 49 years of age (Figure 2 and Table 1).

Predisposing Factors
The main predisposing factor was trauma due to ingestion of foreign bodies, which accounted for about 40 out of 53 cases. The second main etiology was upper aerodigestive infections. In 9 cases etiologies were not clear (Figure 3 and Table 2).

Comorbid Systemic Illnesses
Out of the total no of cases, 13 had diabetes mellitus, 1 patient had human immunodeficiency virus (HIV) and tuberculosis spine. 6 people had other comorbid illnesses (1 - rheumatoid arthritis, 2 - hypertension, 1 - asthma, 1 - Kawasaki’s disease, 1 - coronary artery disease) (Figure 4).

Presenting Complaints
Presenting complaints of each patient was studied. Adults with foreign body trauma presented mainly with foreign body sensation/sore throat, odynophagia, dysphagia and/or fever. Children mainly presented with difficulty in feeding and drooling (Figure 5 and Table 3).

Associated Abscesses
In some patients, there were other deep neck space abscesses along with retropharyngeal abscess. of 53, 6 had other neck space abscesses of which 5 were parapharyngeal abscess and 1 submental abscess. Among the 5 parapharyngeal abscess, 2 people were diabetic, 1 had HIV, 1 of them was a child, and 1 had no other illnesses (Figure 6).

Bacteriological Study
Pus obtained from the surgical drainage of the abscess was sent for culture and sensitivity and the following result obtained.

---

**Table 1: Age distribution in study of retropharyngeal abscess**

<table>
<thead>
<tr>
<th>Age</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>4</td>
</tr>
<tr>
<td>10-19</td>
<td>0</td>
</tr>
<tr>
<td>20-29</td>
<td>4</td>
</tr>
<tr>
<td>30-39</td>
<td>13</td>
</tr>
<tr>
<td>40-49</td>
<td>15</td>
</tr>
<tr>
<td>50-59</td>
<td>13</td>
</tr>
<tr>
<td>60-70</td>
<td>4</td>
</tr>
</tbody>
</table>

**Table 2: Predisposing factors in retropharyngeal abscess**

<table>
<thead>
<tr>
<th>Predisposing factors</th>
<th>Number of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish bone</td>
<td>28 (52.8)</td>
</tr>
<tr>
<td>Chicken bone</td>
<td>10 (18.86)</td>
</tr>
<tr>
<td>Other foreign body</td>
<td>2 (3.77)</td>
</tr>
<tr>
<td>Upper respiratory infection/tonsillitis</td>
<td>3 (5.66)</td>
</tr>
<tr>
<td>Tuberculosis spine</td>
<td>1 (1.88)</td>
</tr>
<tr>
<td>Unknown</td>
<td>9 (16.98)</td>
</tr>
</tbody>
</table>
Streptococcus species were mostly sensitive to penicillin or cephalosporins. Pseudomonas showed variable sensitivities to amikacin, ciprofloxacin, piperacillin tazobactam, and vancomycin. Methicillin-resistant Staphylococcus aureus (MRSA) sensitive to vancomycin. In case of sterile cultures and retropharyngeal cellulitis, a general empirical treatment with ampicillin, cloxacillin, and metronidazole were started. In mixed flora ampicillin, cloxacillin, gentamicin, and metronidazole were started (Figure 7 and Table 4).

Radiological Investigation

X-rays were obtained from all 53 patients and widening more than ½ the vertebral width was diagnostic. Loss of lordosis seen in some cases. Foreign bodies were seen in some cases. CT was mostly taken in children. It was also taken in some adults who had complication and in some patients in whom the foreign body could not be localized, also in some to differentiate between cellulitis and abscess.

Complications

Of the 53 patients, 8 had complications, 7 had upper airway obstruction causing respiratory distress and 1 had mediastinitis and empyema chest. Hence, the percentage of patients having complications was 15.09%. Among the patients who had complications, 5 were diabetic and 1 was a child (Figure 8 and Table 5).

Tracheostomy

Tracheostomy was done in 8 (13.2%) of the 53 patients. 7 patients had acute airway obstruction causing respiratory distress of which one was a child. Tracheostomy was done in 6 adult patients and the child who was put on non-invasive ventilation for respiratory distress. Two people underwent tracheostomy as a precaution (Figure 9 and Table 6).

Table 3: Presenting complaints of patients with retropharyngeal abscess

<table>
<thead>
<tr>
<th>Presenting complaints</th>
<th>Number of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign body sensation</td>
<td>36 (67.92)</td>
</tr>
<tr>
<td>Odynophagia</td>
<td>45 (84.9)</td>
</tr>
<tr>
<td>Dysphagia</td>
<td>45 (84.9)</td>
</tr>
<tr>
<td>Fever</td>
<td>14 (26.4)</td>
</tr>
<tr>
<td>Swelling neck</td>
<td>5 (9.43)</td>
</tr>
<tr>
<td>Cervical adenitis</td>
<td>2 (3.77)</td>
</tr>
<tr>
<td>Respiratory distress</td>
<td>3 (5.66)</td>
</tr>
<tr>
<td>Stridor</td>
<td>2 (3.77)</td>
</tr>
<tr>
<td>Difficult feeding</td>
<td>3 (5.66)</td>
</tr>
<tr>
<td>Drooling</td>
<td>3 (5.66)</td>
</tr>
<tr>
<td>Trismus</td>
<td>3 (5.66)</td>
</tr>
<tr>
<td>Torticollis</td>
<td>1 (1.88)</td>
</tr>
</tbody>
</table>

Table 4: Bacteriology in retropharyngeal abscess

<table>
<thead>
<tr>
<th>Organisms</th>
<th>Number of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Streptococcus viridans</td>
<td>12 (22.64)</td>
</tr>
<tr>
<td>Pseudomonas</td>
<td>8 (15.09)</td>
</tr>
<tr>
<td>Beta streptococci</td>
<td>4 (7.54)</td>
</tr>
<tr>
<td>Mixed flora</td>
<td>2 (3.77)</td>
</tr>
<tr>
<td>MRSA</td>
<td>1 (1.88)</td>
</tr>
<tr>
<td>AFB</td>
<td>1 (1.88)</td>
</tr>
<tr>
<td>No pathogen</td>
<td>18 (33.92)</td>
</tr>
<tr>
<td>Minimal to no pus</td>
<td>7 (13.2)</td>
</tr>
</tbody>
</table>

MRSA: Methicillin resistant Staphylococcus aureus, AFB: Acid-fast bacilli

Table 5: Complications in retropharyngeal abscess

<table>
<thead>
<tr>
<th>Complications</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute upper airway obstruction (respiratory distress)</td>
<td>7</td>
</tr>
<tr>
<td>Mediastinitis</td>
<td>1</td>
</tr>
<tr>
<td>Empyema</td>
<td>1</td>
</tr>
</tbody>
</table>
Hospital Stay
Of the 53 patients, longer hospital stay was seen in patients who had diabetes, complications, associated abscesses and in children. All patients after discharge were followed up for 6 months. There was no recurrence (Figure 10 and Table 7).

DISCUSSION
The management of retropharyngeal abscess remains an area of debate and development in otolaryngology circles.

Once most exclusively a disease in children, it is now seen increasingly in adults. The correct diagnosis and evaluation of this condition remain crucial for the proper and adequate treatment of the disease.

Among the 53 patients included in this study, 33 were males and 20 were females. This showed a slight male preponderance. This was consistent with the study of Poluri et al. in 2000, where male: female ratio was 1.2: 1.

Most of the patients in this study were adults. There were 49 adults and 4 children. This was consistent with studies of Tetsuo et al. in 1999 and Sethi and Stanley in 1991 where retropharyngeal abscess was more seen in the adult population. The most common predisposing factor was a trauma due to ingestion of foreign bodies and it included 40 of the 53 cases (75.4%). Fish bones were the most common ingested foreign body. Sethi and Stanley’s study in 1991 also showed 56.5% of the retropharyngeal abscess was due to foreign bodies. In Poluri et al., 2000, the study showed fish bones to be the most common ingested foreign body.

Comorbid diseases affect the general outcome of retropharyngeal abscesses. There were 14 patients of which 13 had diabetes mellitus and 1 had tuberculosis spine and HIV. Complications were more seen with people who had diabetes mellitus. The most common complications were upper airway obstruction causing respiratory...
distress (7 patients), 1 patient developed mediastinitis and empyema chest which was managed along with Department of General Surgery. Of the 8 people who developed complications 5 had diabetes mellitus. There were 6 of 53 patients who had other deep neck space infections other than retropharyngeal abscess. Parapharyngeal abscess was dealt along with the help of the Department of General Surgery. Among them, 3 were diabetic. These correlated with the studies of Tetsuo et al. in 1999, which showed increased incidence of retropharyngeal abscess in patients with diabetes.

The presenting complaints varied from patient to patient, and the most common symptoms were foreign body sensation (67.9%), dysphagia and odynophagia (84.9%), fever (26.4%), swelling neck (9.43%), respiratory distress (3.77%), and stridor (3.77%). Whereas in the study conducted by Craig and Schunk in 1991, which was mainly conducted in children, the main symptoms were fever 17%, neck mass 16%, respiratory distress or stridor 5%.

The microbiological flora of retropharyngeal abscess varied from study to study. In our study, the most common organisms were Streptococcus viridans, Pseudomonas aeruginosa, and beta-hemolytic streptococci. Most of the cultures were sterile. This may be due to the use of broad-spectrum antibiotics at local hospitals for the infection before the patient was referred to Medical College, Thiruvananthapuram, Kerala, India, for expert management. Our study correlated with findings of Pontell et al. in 1995 in which Streptococcus viridans and Klebsiella pneumonia were most common pathogens. In 1991 study by Coulthard and Isaacs, the most common pathogens were staphylococcus, Streptococcus, and Klebsiella species. Antibiotics sensitive for Streptococcus species was penicillins and cephalosporins. In patients with Pseudomonas infection sensitivity varied from ciprofloxacin, amikacin, and piperacillin - tazobactam to vancomycin. MRSA showed sensitivity to vancomycin.

X-ray was the diagnostic tool used in this study as in the study by Sethi and Stanley in 1991. The widening of the retropharyngeal space more than ½ the width of vertebra and loss of lordosis were the criteria used.

In our study, all of them recovered from the complications. There were no deaths. There were no recurrences as well. In the study by Daya in 2005, there were no deaths but there were 5 recurrences.

Tracheostomy was done in 8 of the 53 patients of which 6 were for respiratory distress and 2 were done as a precaution.

The hospital stay of the 53 patients varied from as short as 5 days to 2 months. Longer hospital stays were seen in patients who were diabetic as seen in studies by Leibovici et al. in children, in patients with complications and in patients with associated other abscesses. Patients with tracheostomy also had longer hospital stay than other patients who had no complications.

CONCLUSION

1. Retropharyngeal abscess in this study was seen more in adults
2. There was a slight male predominance
3. Foreign body ingestion was the main predisposing factor
4. Immunocompromises like diabetes mellitus affected the outcome of the disease. Complications, associated abscesses and longer hospital stay were seen in these patients
5. The main bacterial flora was Streptococcus viridans and P. aeruginosa
6. Respiratory distress was the most common complication seen in our study
7. The most common associated abscess was parapharyngeal abscess, which was more seen in patients with diabetes mellitus
8. Hospital stay was longer in patients with diabetes mellitus, complications, associated abscesses and in children
9. No deaths or recurrences were seen in our study.

A sensible approach, awareness of the pitfalls and good clinical acumen should enable clinicians involved in cases of the retropharyngeal abscess to ensure that they are well managed.

REFERENCES

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Comparative Study of Intraocular Pressure and Haemodynamic Responses to Laryngeal Mask Airway and Endotracheal Tube

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Abstract

Introduction: Laryngoscopy and endotracheal intubation is the most common method of securing a definitive method for administering anesthesia. However, it is associated with tachycardia, hypertension, and increase in intraocular pressure.

Materials and Methods: The present study was undertaken between August 2004 and October 2005. The approval for the study was obtained from the ethics committee.

Results: The time taken for tracheal tube (TT) intubation was slightly more than that of laryngeal mask airway (LMA) (14.00 ± 1.58 vs. 13.37 ± 2.09). Basal reading was taken, and the next reading taken was after induction and ventilation with 100% oxygen for 3 min. Hence, the heart rate response to anesthetic induction might not have been observed. Basal and postinduction values between the two groups did not differ significantly. Increase in heart rate in LMA and TT groups after insertion of airway was from 84.53 ± 7.79 to 92.13 ± 10.83 and from 87.43 ± 9.90 to 98.20 ± 9.45, respectively. Heart rate remained elevated till 4 min in TT group whereas in LMA group tachycardia resolved by the 3rd min.

Conclusion: It was observed that after premedication with midazolam 0.05 mg/kg, IV pentazocine, 0.5 mg/kg, IV glycopyrrolate 4-6 µg/kg causes decrease in all the parameter in both the groups individually, but comparison between the two groups was not significant. Time taken for insertion of LMA was more as compared to endo TT, but the difference was not significant. After insertion of airway, heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, SpO2, and intraocular tension were noted. It was observed that 9.17% increased in pulse rate over basal value in LMA group and 12.78% increased in TT group.

Key words: Anesthesia, Endotracheal, Laryngoscopy

INTRODUCTION

Laryngoscopy and endotracheal intubation is the most common method of securing a definitive method for administering anesthesia. However, it is associated with tachycardia, hypertension, and increase in intraocular pressure (IOP). These changes have been associated with a rise in plasma noradrenaline levels, confirming a predominantly sympathetic response to it.1-3 The rise in IOP may also be secondary to increased sympathetic activity causing vasoconstriction and an increase in central venous pressure which has a closer relationship with IOP than systemic arterial pressure. The hemodynamic effects are likely to be deleterious in patients with pre-existing hypertension or coronary ischemia whereas the rise in IOP may be detrimental in patients with glaucoma, perforating eye injury, and compromised retinal or optic disc circulation.4,5

The laryngeal mask airway (LMA) was introduced by Brain in 1983.6 LMA fills the gap in airway management
Puja, et al.: Intraocular Pressure and Haemodynamic Responses to Laryngeal Mask Airway and Endotracheal Tube

between tracheal intubation and face mask, both in terms of anatomical location and degree of invasiveness. Over the past 10 years, its use has progressed from a novelty to an important part of an anesthetist’s equipment. Among its advantages in comparison with the tracheal tube are:
1. Minimal risk of esophageal or endobronchial intubation.
2. No requirement for laryngoscope or a muscle relaxant.
3. Better tolerance at lighter levels of anesthesia.
4. Less incidence of sore throat.
5. Less resistance to breathing.
7. Minimal effects on IOP.

Since its initial introduction, many advantages of the LMA have become apparent. It is now proposed as
• A routine airway for general anesthesia.
• As an aid in the management of the difficult airway.

As mentioned earlier, the benefits of the LMA on IOP and pressor response might prove it to be useful in certain groups of patients in whom a marked response might be detrimental. Many techniques to attenuate the response to the TT have been attempted. Perhaps, the LMA might replace the TT as the device of choice for airway management in these types of patients.7-10

Hence, the present study was designed to assess the hemodynamic and IOP response by LMA and TT.

Aims and Objectives
1. To study the hemodynamic changes by LMA and TT.
2. To study the IOP changes by LMA and endoTT.

MATERIALS AND METHODS

The present study was conducted between August 2004 and October 2005. The approval for the study was obtained from the ethics committee.

Study Population
A total of 60 American society of Anesthesiologists (ASA I) patients aged 20-40 years undergoing elective or emergency surgical or orthopedic procedures of 2-3 h duration were included in the study.

Design of Study
This was a randomized, prospective, and single-blinded study.

Inclusion Criteria
1. Patients of ASA physical status I.
2. Age of patients between 20 and 40 years.
3. Patients who were nil by mouth for 6-8 h.
4. Patients have minimum mouth opening of 3 cm.
5. Patients posted for duration of up to 2-2½ h of surgical or orthopedic procedures.

Exclusion Criteria
• Patients with history of hypertension, ischemic heart disease, diabetes mellitus, bronchial asthma.
• Patients with glaucoma.
• Inability to open the mouth more than 2 cm or have restriction in neck movements.
• Patients having pharyngeal pathology (abscess, hematoma).
• Patients with potential risk for gastric regurgitation, obesity, hiatus hernia.
• Patients with low lung compliance or high airway resistance (Chronic smokers, bronchospasm, thoracic trauma).
• Patients taking drug treatment known to affect heart rate, blood pressure, or hormonal stress response.
• Patients requiring more than one attempt at airway insertion.

Intervention Allocation
The patients were randomly divided into one of the two groups (random allocation by draw of chits).
1. Group I (n = 30)
   They were induced and LMA was inserted.
2. Group 2 (n = 30)
   They were induced and laryngoscopy and then endotracheal intubation was done. The same set of hemodynamic monitors and equipment were used for each group.

Preoperative Preparation
• Informed consent was obtained from all patients.
• Basal pulse rate per minute, systolic blood pressure (SBP) (mmHg), diastolic blood pressure (DBP) (mmHg), SpO₂ (%), IOP (mmHg) were recorded by Schiotz tonometer after instillation of 4% lignocaine drops.
• Intravenous ranitidine 1 mg/kg and intravenous metoclopramide 0.15-3.0 mg/kg was administered half an hour before induction.
• Standard monitoring including manual blood pressure, pulse oximetry probe, electrocardiography.

Both the groups received following premedication.
• Intravenous glycopyrrolate: 4-6 µg/kg.
• Intravenous midazolam: 0.04 mg/kg.
• Intravenous pentazocine: 0.5 mg/kg.

Induction and Maintenance
• Oxygen at 6 l/min was delivered through a face mask for 2 min. Anesthesia was induced with 5-6 mg/kg.
of 2.5% thiopentone sodium followed by 0.10 mg/kg vecuronium.

• Patients were ventilated using a face mask with O₂ for 3 min. After 3 min, the patients were either intubated orally using a Macintosh laryngoscope and cuffed endoTT or an LMA was inserted using Brain’s classical method. Patients requiring more than one attempt at airway insertion were excluded from the study.

• Cuff of LMA was inflated with 20 ml size 3 (MA) or 25-30 ml (size 4) of air and cuff of TT inflated with 3-5 ml of air

• The airway was connected to Bain circuit. Proper placement of LMA or ETT was confirmed by auscultating the breath sounds on both sides of chest during controlled ventilation. After confirmation of placement of airway, airway was fixed. Anesthesia was maintained using a mixture of nitrous oxide and oxygen (67%; 33%) with halothane (0.5-1%). Supplemental vecuronium was administered if necessary.

• Ventilation was controlled with Bain breathing system. At the end of the procedure, neuromuscular block was antagonized by 0.05 mg/kg neostigmine and 0.02 mg/kg glycopyrrolate; patients were ventilated with 100% O₂ for few minutes following which airway device was removed after assessing adequate reversal.

The parameters to be studied, i.e., IOP, heart rate, blood pressure (SBP, DBP, and mean arterial pressure [MAP]) were measured. MAP = DBP +1/3 (SBP-DBP).

1. Just before intubation.
2. After premedication.
3. Immediately following intubation.
4. Each minute following intubation for 5 min.

The right eye was used for all IOT measurements.

**Statistical Analysis**
IOP and hemodynamic values were compared with baseline preinduction and preinsertion values by paired t-test.

At each point of measurement, the IOP and hemodynamic values between the two airway management groups were compared by an analysis of variance and by an unpaired Student’s t-test. Non-parametric variables within the two groups were compared using Chi-square test. Results were decided as follows:

- \( P < 0.001 \): Highly significant.
- \( P < 0.01 \): Significant.
- \( P < 0.05 \): Probably significant.
- \( P > 0.05 \): Not significant.

**RESULTS**
This is hospital-based, randomized, controlled, single-blinded clinical study. This study was carried out during the period from August 2004 to October 2005, in Government Medical College and Hospital, Nagpur.

The study was approved by the Ethics Committee of Government Medical College and Hospital, Nagpur.

A total of 60 patients of either sex, undergoing surgical, orthopedic procedures of 1-2 h duration and satisfying the inclusion criteria were included in the study.

The patients were divided into two groups of 30 each.

Group I (n = 30): Patients in which LMA was inserted.

Group 2 (n = 30): Patients in which endoTT (TT) was used (Table 1).

Patients belonging to the age group of 20-40 years were included in the study (Table 2).

The patients included in the study weighed between 40 and 70 kg with maximum number of patients falling in the range of 40-50 years (Table 3).

The average age of the patients in the groups was 28.38 ± 6.70 years in Group I and 30.50 ± 5.91 years.
in Group II. The age of the two study groups were comparable and have insignificant difference ($P > 0.05$).

Similarly, the average weight of the patients was comparable, with average weight of $48.63 \pm 5.55$ in Group I and $50.40 \pm 5.56$ in Group II and they have an insignificant difference ($P > 0.05$).

The percentages of male patients in Groups I and II were 60 and 63.34, respectively, while percentages of female patients in Groups I and II were 40 and 36.66, respectively. Both the groups are comparable with respect to their sex (Table 4).

A maximum number of patients were subjected to hydrocele followed by fractured patella. All of the above surgeries required about 1-2 h. Most of the patients were made ambulatory in 6-8 h. Intravenous fluids given were lactated ringer solution and dextrose normal saline. There was no blood replacement (Table 5).

The basal pulse, SBP, DBP, MAP, oxygen saturation, and IOP were comparable and their difference is not significant ($P > 0.05$) (Table 6).

After premedication, although there is decrease in value from the basal line in both groups individually, but when the two groups were compared after premedication, two groups were comparable with insignificant difference ($P > 0.05$).

Table 7 shows the insertion time for the airway in two groups. In Group I, mean time taken for insertion is $14.00 \pm 1.58$ and in Group II it is $13.37 \pm 2.09$. Insertion time was marginally less in Group II than Group I, but the difference is comparable and is insignificant ($P > 0.05$).

Table 8 shows the change in mean pulse rate after premedication and for 5 min after airway insertion. The basal pulse rate in both the groups was comparable ($P > 0.05$).

There was rise in pulse rate in both groups after insertion of airway with maximum rise in Group I at 0 min and at 1 min in Group II.

The maximum increase in Group II is at 1 min with mean of $100.68 \pm 9.13$ (14.82% over the basal value).

The increased heart rate was significantly more with TT till the 5th min after intubation ($P < 0.05$), with maximum significant difference is at 1 min ($P = 0.000$).

### Table 4: Distribution of patients according to sex

<table>
<thead>
<tr>
<th>Sex</th>
<th>Group I (n=30)</th>
<th>Group II (n=30)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>18 (60)</td>
<td>19 (63.34)</td>
<td>37</td>
</tr>
<tr>
<td>Females</td>
<td>12 (40)</td>
<td>11 (36.67)</td>
<td>23</td>
</tr>
</tbody>
</table>

### Table 5: Distribution of patients according to the type of surgery

<table>
<thead>
<tr>
<th>Type of surgery</th>
<th>Group I (n=30)</th>
<th>Group II (n=30)</th>
<th>Number of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fracture medial malleolus</td>
<td>2 (6.7)</td>
<td>2 (6.7)</td>
<td>4 (6.7)</td>
</tr>
<tr>
<td>Fractures humerus</td>
<td>2 (6.7)</td>
<td>2 (6.7)</td>
<td>3 (5)</td>
</tr>
<tr>
<td>Hydrocele</td>
<td>7 (23.4)</td>
<td>6 (20)</td>
<td>13 (26.6)</td>
</tr>
<tr>
<td>Orchidopexy</td>
<td>2 (6.7)</td>
<td>3 (10.05)</td>
<td>4 (6.7)</td>
</tr>
<tr>
<td>Excision of breast lump</td>
<td>2 (6.7)</td>
<td>1 (3.3)</td>
<td>3 (5)</td>
</tr>
<tr>
<td>Appendicitis</td>
<td>5 (16.6)</td>
<td>5 (16.6)</td>
<td>10 (16.6)</td>
</tr>
<tr>
<td>Fracture patella</td>
<td>5 (16.6)</td>
<td>4 (13.3)</td>
<td>9 (20.1)</td>
</tr>
<tr>
<td>Amputation below knee</td>
<td>4 (13.3)</td>
<td>3 (10.05)</td>
<td>7 (11.6)</td>
</tr>
<tr>
<td>Herniorrhaphy</td>
<td>1 (3.3)</td>
<td>4 (13.3)</td>
<td>4 (6.7)</td>
</tr>
</tbody>
</table>

### Table 6: Comparison of Basal haemodynamic parameters, intraocular tension and after premedication

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mean±SD</th>
<th>$P$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group I</td>
<td>Group II</td>
</tr>
<tr>
<td></td>
<td>Basal</td>
<td>Premedication</td>
</tr>
<tr>
<td>Pulse±SD</td>
<td>84.53±7.79</td>
<td>84.97±7.86</td>
</tr>
<tr>
<td>SBP±SD</td>
<td>124.33±10.1</td>
<td>109.67±10.43</td>
</tr>
<tr>
<td>DBP±SD</td>
<td>78.87±5.48</td>
<td>75.33±5.39</td>
</tr>
<tr>
<td>MAP±SD</td>
<td>93.77±5.97</td>
<td>86.73±6.21</td>
</tr>
<tr>
<td>SpO2±SD</td>
<td>99.10±0.84</td>
<td>98.67±0.76</td>
</tr>
<tr>
<td>IOT±SD</td>
<td>13.86±1.99</td>
<td>13.86±1.99</td>
</tr>
</tbody>
</table>

IOT: Intraocular pressure change, SD: Standard deviation, MAP: Mean arterial pressure, DBP: Diastolic blood pressure, SBP: Systolic blood pressure
Table 9 shows the changes in mean SBP in the two groups.

The basal SBP in both the groups were comparable ($P > 0.05$).

After premedication, the SBP was decreased, but when two groups compared, difference was not significant ($P > 0.05$). The fall in two groups was similar.

Both airway groups demonstrated a rise in SBP after insertion, with the maximum increase in both groups at 0 min. In Group I, mean SBP is $128.00 \pm 16.73$ (3.05% increase above the baseline value) and in Group II it is $154.27 \pm 8.82$ (22.56% increase above the baseline).

SBP remains elevated for 4 min in Group II, but it reached baseline value in 2 min in Group I; there was highly significant difference between the two groups till 2 min ($P = 0.000$), but it remains significant throughout the 5 min ($P = 0.01$).

Table 10 shows the change in mean DBP in two groups. The basal and postinduction values were comparable ($P > 0.05$) and not statistically significant.

DBP fell with induction of anesthesia, and then rose with airway insertion. Maximum increase in both groups is at 0 min, with mean of $80.40 \pm 5.42$ (2.23% increase over the baseline value) in Group I and mean DBP in Group II at 0 min is $94.37 \pm 6.48$ (with 19.34% increase over is basal value). The difference between the two groups is highly significant ($P = 0.000$) and it remains significant till 2 min ($P = 0.010$).

DBP falls to its preintubation value around 3rd min in Group II and 2nd min in Group I.

Table 11 shows the change in MAP at various time intervals.

The basal MAP values were comparable in two groups with $P > 0.05$. Although MAP fell with induction of anesthesia in both groups, it did not differ much between two groups ($P > 0.05$).

Laryngoscopy and intubation were accompanied by a rise in MAP that remained above preinsertion levels even by 5 min. LMA insertion in contrast was associated with rise in MAP that fell to preinsertion values after 1st min.

Maximum mean MAP achieved was $114.30 \pm 6.23$ with Group II (20.59% increase over the basal value) and $96.23 \pm 8.34$ (2.31% over basal value) in Group I. The maximum mean MAP is at 0 min and is highly significant ($P = 0.000$) and it remained highly significant till 2 min ($P = 0.000$). The change, however, remains significant till 5 min ($P < 0.05$).

The changes in mean $\text{SpO}_2$ in both groups were comparable at all times. The mean $\text{SpO}_2$ in both groups was between 97% and 99% (Table 12).
Table 13 shows the change in mean IOP at various time intervals.

The basal values of the both groups were comparable (P > 0.05). Induction of anesthesia was accompanied by a negligible fall in IOP.

After insertion of airway of airway, there was marked rise of IOP that remained above baseline by 5 min in Group II whereas in Group I IOP fall to preinsertion value by 3 min.

Maximum mean IOP immediately following insertion at 0 min was 16.11 ± 2.36 (16.32% over the basal value) while it was 20.71 ± 1.83 in Group II (52.62% over the basal value).

The rise in IOP was highly significantly in Group II when compared to Group I (P = 0.000) till 1 min and remained significant till 3rd min (P < 0.05) of airway instrumentation.

Head position had to be changed for placement of airway. In Group I, 3 patients, i.e., 10% of the total patients, need head positing but in Group II change of head position was not needed. The difference was however not significant (P = 0.076) (Table 14).

Cough was present after the removal of airway and present in 7 patients (23.34%) in Group II and I (3.34%) in Group I. The numbers of patients in Group II showed statistical significant difference (P = 0.01).

Vomiting was present more in Group I; 6 (20%) patients had vomiting in Group I and only 1 (3.34%) patient had vomiting in Group II. The number of patients showing vomiting was thus significantly more in Group I when compared to Group II (P = 0.044).

Thus, it was seen that the incidence of change of head position and vomiting was more in Group I. However, the change of head position was not significant. Cough is more in Group II as compared to Group I.

**DISCUSSION**

Laryngoscopy and tracheal intubation to achieve airway control in anesthesia practice have been consistency bothering anesthesiologists with regard a regular occurrence of the pressor response associated with it even in normal patients, the process of airway insertion or removal is accompanied by significant pressor as well as IOP response.11-13

The hemodynamic responses, manifesting as increase in heart rate and blood pressure, are due to reflex sympathoadrenal discharge provoked by epilaryngeal and laryngotracheal stimulation subsequent to laryngoscopy and tracheal intubation. The stress response to tracheal intubation and extubation is also associated with increase in IOP. The mechanism of increase in IOP is secondary to increased sympathetic activity. Adrenergic stimulation causes increase in IOP by causing vaso- and veno-constriction, and increase in central venous pressure, and

### Table 11: Mean Arterial blood pressure at various time intervals

<table>
<thead>
<tr>
<th>MAP</th>
<th>Mean±SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td>Group II</td>
<td></td>
</tr>
<tr>
<td>Basal</td>
<td>93.97±5.97</td>
<td>95.03±5.23</td>
</tr>
<tr>
<td>Post induction</td>
<td>86.73±6.21</td>
<td>87.3±±9.99</td>
</tr>
<tr>
<td>Post insertion T0</td>
<td>96.23±8.34</td>
<td>114.3±6.23</td>
</tr>
<tr>
<td>Post insertion T1</td>
<td>94.80±7.33</td>
<td>106.4±7.91</td>
</tr>
<tr>
<td>Post insertion T2</td>
<td>91.90±6.87</td>
<td>99.87±9.47</td>
</tr>
<tr>
<td>Post insertion T3</td>
<td>90.50±5.63</td>
<td>95.57±9.02</td>
</tr>
<tr>
<td>Post insertion T4</td>
<td>88.63±5.96</td>
<td>93.40±8.23</td>
</tr>
<tr>
<td>Post insertion T5</td>
<td>87.80±6.28</td>
<td>91.40±7.36</td>
</tr>
</tbody>
</table>

SD: Standard deviation, MAP: Mean arterial pressure

### Table 12: Mean SpO₂ changes in two groups

<table>
<thead>
<tr>
<th>Mean SpO₂</th>
<th>Mean±SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td>Group II</td>
</tr>
<tr>
<td>Basal</td>
<td>98.77±0.57</td>
</tr>
<tr>
<td>Post induction</td>
<td>98.57±0.57</td>
</tr>
<tr>
<td>Post insertion T0</td>
<td>98.60±0.56</td>
</tr>
<tr>
<td>Post insertion T1</td>
<td>98.60±0.56</td>
</tr>
<tr>
<td>Post insertion T2</td>
<td>98.80±0.41</td>
</tr>
<tr>
<td>Post insertion T3</td>
<td>98.90±0.31</td>
</tr>
<tr>
<td>Post insertion T4</td>
<td>98.90±0.31</td>
</tr>
<tr>
<td>Post insertion T5</td>
<td>99.90±0.31</td>
</tr>
</tbody>
</table>

### Table 13: Mean IOT between two groups

<table>
<thead>
<tr>
<th>Mean IOT</th>
<th>Mean±SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td>Group II</td>
<td></td>
</tr>
<tr>
<td>Basal</td>
<td>13.86±1.51</td>
<td></td>
</tr>
<tr>
<td>Post induction</td>
<td>13.86±1.99</td>
<td>13.49±1.40</td>
</tr>
<tr>
<td>Post insertion T0</td>
<td>16.11±2.36</td>
<td>20.71±1.83</td>
</tr>
<tr>
<td>Post insertion T1</td>
<td>15.43±2.04</td>
<td>18.39±1.96</td>
</tr>
<tr>
<td>Post insertion T2</td>
<td>14.69±1.93</td>
<td>15.78±1.47</td>
</tr>
<tr>
<td>Post insertion T3</td>
<td>13.86±1.46</td>
<td>14.99±1.50</td>
</tr>
<tr>
<td>Post insertion T4</td>
<td>13.81±1.42</td>
<td>14.42±1.76</td>
</tr>
<tr>
<td>Post insertion T5</td>
<td>13.73±1.44</td>
<td>14.22±1.88</td>
</tr>
</tbody>
</table>

IOT: Intraocular pressure change, SD: Standard deviation

### Table 14: Intra and post operation complication

<table>
<thead>
<tr>
<th>Complication</th>
<th>n (%)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>Group 2</td>
<td></td>
</tr>
<tr>
<td>Head positing</td>
<td>3 (10)</td>
<td>0</td>
</tr>
<tr>
<td>Cough</td>
<td>1 (3.34)</td>
<td>7 (23.34)</td>
</tr>
<tr>
<td>Vomiting</td>
<td>6 (20)</td>
<td>1 (3.34)</td>
</tr>
</tbody>
</table>
by increasing the resistance to the outflow of aqueous humor in trabecular meshwork between anterior chamber and Schlemm’s canal.\textsuperscript{14,17}

To attenuate such consequences during induction of anesthesia, various methods have been employed which include certain pharmacological agents, such as sublingual nifedipine, lignocaine, e\textsuperscript{3}narcotic agents, sodium nitroprusside, and beta adrenergic blockers. The use of LMA in place of endoTT has also been shown to have attenuated hemodynamic response and IOP changes after its insertion.\textsuperscript{18-20}

In this study, a total of 60 patients were selected aged 20-40 years posted for orthopedic or surgical procedure of 2-3 h. The patients satisfying the inclusion criteria were divided into 2 groups of 30 each as follows:

Group 1: In this group after induction LMA was inserted.

Group 2: After induction laryngoscopy was done and endoTT inserted.

All the patients were premedicated with intravenous ranitidine 1 mg/kg and IV metoclopramide 0.15-0.3 mg/kg was administered half an hour before induction and then IV glycopyrrolate 4-6 µg/kg IV midazolam 0.05 mg/kg, IV pentazocine 0.5 mg/kg was given. Induction was done with IV thiopentone 5-6 mg/kg (2.5%) followed by 0.1 mg/kg rocuronium and airway inserted after 3 min of mask ventilation. Anesthesia maintained with M\textsubscript{2}O and O\textsubscript{2} (67%; 33%) with halothane (0.5-1%) or Bain circuit on controlled ventilation supplemental vecuronium was administered in necessary reversal done with IV neostigmine 0.05 mg/kg and 0.01 mg/kg glycopyrrolate, airway removed adequate reversal.

The same set of hemodynamic parameters such as pulse rate, systolic BP, diastolic BP, SpO\textsubscript{2}, continuous ECG, and IOP were monitored in all patients.

**CONCLUSION**

After premedication with midazolam 0.05 mg/kg, IV pentazocine, 0.5 mg/kg. IV glycopyrrolate 4-6 µg/kg causes decrease in all the parameter in both the groups individually, but comparison between the two groups was not significant. Time taken for insertion of LMA was more as compared to endoTT, but the difference was not significant. After insertion of airway, heart rate, SBP, DBP, MAP, SpO\textsubscript{2}, and intraocular tension were noted. It was observed that 9.17% increased in pulse rate over basal value in LMA group and 12.78% increased in TT group.

The pulse rate in two groups was highly significant at 1 min and remained till 5 min. The SBP increased 3.05% above baseline in LMA group and 22.56% in TT group. There was highly significant difference between two groups at 0 min and remained till 5 min. Increase in DBP in LMA group was 2.23% over 19.34% increases in TT group. The difference was highly significant at 0 min and remains significant till 2 min. Mean arterial blood pressure was 2.31% increase in LMA group and 20.59% in TT group. The difference between two was significant at 0 min. The change, however, remains significant till 5 min. The increase in IOP in LMA group was 16.32% over basal value while in TT it was 52.62%. The difference is highly significant at 0 min and remains significant till 3\textsuperscript{rd} min. There were no episodes of oxygen desaturation in any of the patients. The hemodynamic changes and the IOP changes in the LMA are less as compared to TT.

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Evaluation of Photocatalytic Titanium Oxide Surface Modified Stainless Steel and Nickel-Titanium Orthodontic Wires for its Antiadherent and Antibacterial Properties - An In Vitro Study

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Abstract

Background: The purpose of this study was to assess the photocatalytic titanium oxide surface modified stainless steel and nickel–titanium (NiTi) wires for its antiadherent and antibacterial properties against Streptococcus mutans.

Materials and Methods: The study was preceded on 80 specimens of stainless steel and NiTi wires which were divided into four groups each having two subgroups. Groups containing uncoated wires acted as control groups for their respective experimental groups containing coated wires. Surface modification of wires was performed with TiO₂ sol which was further heated at 400°C. For assessment of antiadherent and antibacterial properties of wires, microbiological test against S. mutans was performed.

Result: Orthodontic wires coated with TiO₂ showed antiadherent effect against S. mutans as compared to uncoated wires. The groups containing surface modified wires showed a statistically significant decrease in the survival rate of S. mutans expressed in the colony-forming unit when compared to the groups containing uncoated wires.

Conclusion: Surface modification of the orthodontic wires can be used to prevent accumulation of dental plaque, hence, the development of periodontal problems as well as dental caries during fixed orthodontic treatment.

Key words: Antiadherent properties, Antibacterial properties, Nickel-titanium wires, Stainless steel wires, Streptococcus mutans, TiO₂

INTRODUCTION

Fixed orthodontic appliances are the most common habitat for dental caries and periodontal diseases. Although there are many reasons which may cause dental caries and periodontal diseases such as physical, chemical, and biological characteristics of dental plaque, the oral environment with fixed appliances provides ideal conditions for colonization of microorganisms as a result of their inherent morphological irregularities.¹

The incidence of enamel demineralization and periodontal diseases after fixed orthodontic treatment can involve up to 50% of the patients.² Among different components of fixed orthodontic appliances, wires are present throughout the course of orthodontic therapy and hence pay a crucial part in causing demineralization of enamel surface.

The wire bracket interface provides unique conditions that hinder proper access to the tooth surface for cleaning.
**Prince, et al.: Photocatalytic Titanium Oxide Surface Modified Stainless Steel and NiTi Orthodontic Wires for its Antiadherent and Antibacterial Properties**

*Streptococcus mutans* and *Lactobacillus* are the microorganisms that have been identified as the main pathogen in periodontal diseases and dental caries, and their presence increases the risk of decalcification.¹

To combat these ill effects resulting from fixed orthodontic therapy, it is essential to give proper oral hygiene instructions as well as to maintain supervision during the course of the treatment. This subsequently poses to be a challenge for the orthodontist.

To reduce the growth of oral microorganisms during fixed orthodontic treatment, surface modification of the appliances used in fixed orthodontics can be initiated, which will subsequently prevent enamel decalcification and dental caries.

The photocatalytic degradation of organic compounds in water treatment process and decomposition of air pollutants have been studied for the several decades.²

Many kinds of nano-photocatalytic coating have been reported such as TiO₂, ZnO, Ag, and SrTiO₃, in which TiO₂ has been reported as the most active.³

TiO₂ is a white-colored inorganic substance that is thermally stable, non-flammable, poorly soluble, chemically inert, and not classified as hazardous according to the United Nations Globally Harmonized System of classification and labeling of chemical.⁴

TiO₂ has been used for industrial as well as consumer goods including paints, adhesive paper, coatings, and water treatment agents. Thorough research on sterilization mechanism of photocatalytic coating is made and has proved that the cell wall is wrecked first, which lead to the change of osmotic pressure, then the intercellular structures are destroyed subsequently degrade the bacterial.⁵

Many studies have also proved the antiadherent property of TiO₂. The photocatalytic TiO₂ has strong oxidation and superhydrophilicity.⁶

Therefore, using this photocatalytic activity of TiO₂ may provide effective results in preventing bacterial adhesion and growth around fixed orthodontic appliances.

Among all the pathogens in the oral cavity, *S. mutans* and *Lactobacillus* have been identified as the main pathogens for dental caries and periodontal diseases.⁷-¹⁰

Thus, this study was framed to evaluate the antiadherent and antibacterial properties of surface modified photocatalytic TiO₂ stainless steel and nickel–titanium (NiTi) against *S. mutans*.

**MATERIALS AND METHODS**

The study was done on 80 specimens of 0.016” stainless steel and NiTi wires of 4 cm length. The specimens were divided into four groups and further divided into two subgroups of each group have a control and experimental group, in which the control group consisted of uncoated wires and the experimental group consisted of photocatalytic TiO₂ coated wires. Group 1 and 3 consisted of stainless steel wires and Group 2 and 4 consisted of NiTi wires (Table 1). All the groups were then assessed for antiadherent and antibacterial properties.

**Bacterial Strains**

*S. mutans* was used for the antiadherent and antibacterial tests. *S. mutans* was inoculated overnight in 5 ml of brain heart infusion (BHI) for adhesion test, 10% of the broth after 24 h of inoculation was transferred to 10 ml of BHI broth which contained 10% sucrose, which was further incubated for 24 h.

**Coating of Stainless Steel and NiTi Wires with Photocatalytic TiO₂**

Coating of stainless steel and NiTi wires with photocatalytic TiO₂ was done by sol-gel method.⁴ In this method, 0.40 g of titanium isopropoxide was dehydrolized in deionized aqueous solution. As a result, titanium hydroxide as a precipitate was achieved, which was separated by decantation process. The precipitate was further washed thoroughly with water until the alcohol generated during the hydrolysis was completely removed. The precipitate was then dissolved in 10 ml of hydrogen peroxide, which gave the yellowish orange solution of titanium perrin complex. Thus, the TiO₂ sol was prepared (Figure 1).

The wires were cleaned, air dried, then dipped in solution for 5 min, and then were pulled out with motor-operated equipment in uniform motion. Wires were then dried at room temperature. Further, the coated wires were heated for 5 h under electric furnace at 400°C (Figure 2).

![Figure 1: Prepared TiO₂ sol](image)
Assessment of Bacterial Adhesion to Orthodontic Wires
Before adhesion test, adventitious macroscopic contaminations of the wire were removed by ultrasonication in 2-propanol for 5 min and were dried in a desiccator. After that, the wires were sterilized in an autoclave and were pre-weighed on analytical balance and were stored in container having 10 ml of BHI broth (Figure 3). An overnight cultured S. mutans growth was inoculated to final concentration of 10% and was incubated for 24 h at 37°C under illumination of ultraviolet (UV)-A black light inside the incubator (Figure 4). Wires were carefully removed and then immersed in 10% formaldehyde solution for 30 min to immobilize the cells. The wires were then weighed under analytical balance for bacterial adherence.

Assessment of Antibacterial Properties of Orthodontic Wires
The antibacterial properties of orthodontic wires were demonstrated against S. mutans. The culture media used were BHI agar, and the disc diffusion method was carried out. BHI agar plates were brought at room temperature, and the inoculum preparation was done using a swab to transfer the colonies onto the plates. Turbidity was adjusted visually with broth to equal that of 0.5 McFarland turbidity standard. The suspension was standardized with a photometric device. After that, the inoculation of other plates was done in 15 min by adjusting the inoculum to McFarland turbidity standards; a sterile cotton swab was dipped against the walls of the tube above the liquid to remove the excess inoculum. After that, the wires were placed in the plate, and the plates were illuminated with a UV-A black light inside the laminar air flow chamber with an intensity of 1.0 MW/cm² for 60 min (Figure 5). Antibacterial activity was described as the survival rate for colony-forming units (CFUs) for S. mutans.

**Table 1: Groups of coated and uncoated wires used for antiadherent and antibacterial activities**

<table>
<thead>
<tr>
<th>Group 1</th>
<th>Group 1a</th>
<th>Control group – Consisted of 10 uncoated stainless steel wires that was used for evaluation of bacterial adhesion to orthodontic wires</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group 1b</td>
<td>Experimental group – Consisted of 10 surface modified stainless steel wires with photocatalytic TiO₂ thin film which was used for evaluation of bacterial adhesion to the orthodontic wires</td>
</tr>
<tr>
<td>Group 2</td>
<td>Group 2a</td>
<td>Control group – Consisted of 10 uncoated NiTi wires that used for the bacterial adhesion</td>
</tr>
<tr>
<td></td>
<td>Group 2b</td>
<td>Experimental group – Consisted of 10 surface modified NiTi wires with photocatalytic TiO₂ thin film which was used for bacterial adhesion</td>
</tr>
<tr>
<td>Group 3</td>
<td>Group 3a</td>
<td>Control group – Consisted of 10 uncoated stainless steel wires used for evaluation of antibacterial property</td>
</tr>
<tr>
<td></td>
<td>Group 3b</td>
<td>Experimental group – Consisted of 10 surface modified stainless steel wires with photocatalytic TiO₂ thin film which was used for evaluation of antibacterial property to the orthodontic wires</td>
</tr>
<tr>
<td>Group 4</td>
<td>Group 4a</td>
<td>Control group – Consisted of 10 uncoated NiTi wires that was used for the antibacterial property</td>
</tr>
<tr>
<td></td>
<td>Group 4b</td>
<td>Experimental group – Consisted of 10 surface modified NiTi wires with photocatalytic TiO₂ thin film which was used for antibacterial property</td>
</tr>
</tbody>
</table>

NiTi: Nickel titanium

**Statistical Analysis**
The results were evaluated by SPSS 12.0 K software (SPSS Inc., Chicago, IL, USA). A paired t-test was used for the
bacterial adhesion test, and Kruskal–Wallis $H$-test was applied for the antibacterial activity tests.

RESULTS

**Adhesion of S. mutans on the Surface of Orthodontic Wires**
From the data shown in Table 2, it is observed that there was a significant increase in the weight of the uncoated wires of Group 1b and 2b and coated wires of Group 1a and 2a showed less change in weight than the uncoated wires and hence, showing the antiadherent property of coated wires.

**Antibacterial Activity of Surface Modified Orthodontic Wires on S. mutans**
The survival rate of bacterial cells was calculated in terms of CFU as shown in Table 3, Group 3a and 4a having uncoated wires showed a significant increase in bacterial colony when compared to Group 3b and 4b which contained the surface modified wires showing a statistically significant decrease in bacterial colony.

DISCUSSION

The present study was undertaken to modify the surface of stainless steel and NiTi wires with photocatalytic TiO$_2$ and to assess their antiadherent and antibacterial properties against S. mutans. It is possible that a sufficient amount of reactive oxygen species such as OH was released from the TiO$_2$ coated wires as a result of UV-A light, whereas reduced adhesion of S. mutans to the TiO$_2$ coated wires might be a result of decomposition of surface organic molecules of S. mutans such as M protein. This phenomenon might further cause the cell walls of bacteria to become more fragile.\textsuperscript{11}

The photocatalytic activity of illuminated TiO$_2$ has been actively investigated in adverse areas such as water treatment processes, air cleaning agents, and antibacterial agents. TiO$_2$ might be sufficient to degrade the microbial cell components which are mainly composed of organic compounds.\textsuperscript{12}

Among the various infectious organisms in the oral cavity, S. mutans is one of the most closely investigated organisms in dentistry to cause enamel decalcification and periodontal diseases.\textsuperscript{8-10}

The main problem faced by orthodontists during fixed orthodontic treatment is the development of dental plaque, which is initiated by the adhesion of S. mutans to the tooth surface on the fixed orthodontic appliance.\textsuperscript{13-15}

Several studies have been conducted for the antibacterial properties of TiO$_2$.\textsuperscript{16} Zhang \textit{et al.} in their study concluded that because of TiO$_2$ there is disintegration of bacterial cell wall.\textsuperscript{16} Jacobi \textit{et al.} also proved that organic matters in the cell can be decomposed completely by photocatalysis of TiO$_2$.\textsuperscript{17} Caballero composited the TiO$_2$ photocatalyst into acrylic paint, and this coating could kill \textit{Escherichia coli}.\textsuperscript{18}

Various studies have also been conducted for the antiadherent property of TiO$_2$. Shi \textit{et al.} excogitated a

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean weight initial</th>
<th>Mean weight final</th>
<th>Mean difference</th>
<th>$P$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1a</td>
<td>0.0290±0.0020</td>
<td>0.0292±0.0021</td>
<td>-0.0002</td>
<td>0.37</td>
</tr>
<tr>
<td>Group 1b</td>
<td>0.0292±0.0008</td>
<td>0.0306±0.0015</td>
<td>-0.0014</td>
<td>0.04*</td>
</tr>
<tr>
<td>Group 2a</td>
<td>0.0236±0.0013</td>
<td>0.0242±0.0014</td>
<td>-0.0006</td>
<td>0.07</td>
</tr>
<tr>
<td>Group 2b</td>
<td>0.0254±0.0032</td>
<td>0.0266±0.0037</td>
<td>-0.0012</td>
<td>0.03*</td>
</tr>
</tbody>
</table>

*Statistically significant
self-cleaning coating and said that dust on the wall will be abscised together with TiO$_2$.\textsuperscript{19} Qin prepared TiO$_2$/Al by liquid phase deposition and then blended it with coating. The self-cleaning performance was evaluated in the end. Oleic acid was the pollution stimulant.\textsuperscript{20}

Shah et al. found the photocatalytic TiO$_2$ surface modified stainless steel bracket has an antiadherent and antibacterial property against \textit{Lactobacillus acidophilus}.\textsuperscript{1} Mhaske et al. found the same result with the stainless steel and NiTi wires against \textit{Lactobacillus acidophilus}.\textsuperscript{2} Study done by Chattani et al. on photocatalytic TiO$_2$ coated NiTi and stainless steel wires demonstrated antiadherent and antibacterial property against \textit{S. mutans}.\textsuperscript{3}

In this study, surface modified NiTi and SS wires with photocatalytic TiO$_2$ showed effective antiadherent and antibacterial property against \textit{S. mutans}.

**CONCLUSION**

- Photocatalytic TiO$_2$ coating on SS and NiTi wire prevented the adhesion of \textit{S. mutans}, hence demonstrating antiadherent property.
- The photocatalytic TiO$_2$ also revealed antibacterial effects against \textit{S. mutans}.
- Surface modification of orthodontic wires with photocatalytic TiO$_2$ can be used to prevent the development of dental plaque and dental caries during orthodontic treatment.

**REFERENCES**

Incidence and Prevalence of Maxillofacial Injuries in Government Theni Medical College – Two Years Retrospective Study

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Abstract
Introduction: The incidence of maxillofacial fractures varies widely between different countries. The large variability in reported incidence and etiology is due to a variety of contributing factors, including environmental, cultural, and socioeconomic factors.

Aim: This study aimed to assess retrospectively the incidence and prevalence of maxillofacial injuries in patients reported in Government Theni Medical College.

Materials and Methods: The data collected included age, sex, place, date and month, time, etiology, influence of alcohol, nature, and pattern of the facial bone fractures, associated injuries.

Results: As per records a total of 10589 patients were reported. Of which, 1325 patients had maxillofacial injuries. Nearly 72.3% of the patients were men, and the most frequently affected age group was 21-30 years (33.5%) with males outnumbering females in all age groups. A maximum number of trauma cases were reported at 6 pm-12 am (40.3%). Road traffic accidents (RTAs) (57.2%) were the primary etiological factor followed by assault (21.6%). Among the maxillofacial fractures, mandible (27.9%) was most frequently involved followed by the midface, particularly zygomaticomaxillary complex region (24.2%).

Conclusion: RTAs remain the major cause of maxillofacial injuries. Periodic review of driving skills and strict implementation of traffic rules is must to minimize maxillofacial trauma.

Key words: Facial injury, Facial trauma, Maxillofacial trauma, Retrospective study

INTRODUCTION

Nowadays, maxillofacial injuries are commonly encountered in a day-to-day human life and are often associated with other injuries. For the past few decades, there has been a significant increase in maxillofacial traumas. Maxillofacial fractures result from blunt or penetrating trauma. Blunt injuries are far more common, including motor-vehicle accidents, sports-related trauma, personal violence, occupational injuries, and falls. Penetrating injuries include gunshot wounds, stabblings, and explosions. Trauma of maxillofacial region frequently involves the soft tissues and facial skeleton including maxilla, mandible, zygoma, orbit, nasal bone, etc.

Several studies have been conducted to investigate the epidemiological features of maxillofacial fractures in different population groups, such as Austria,¹ Australia,²,³ Iran,⁴ India,⁵,⁶ New Zealand,⁷ Nigeria,⁸,⁹ Scotland,¹⁰ United Arab Emirates,¹¹ and the United States.²

A large number of patients with maxillofacial injuries are reported in Government Theni Medical College casualty. Hence, retrospective study is conducted to determine various parameters with respect to maxillofacial injuries.
MATERIALS AND METHODS

This is a retrospective descriptive study conducted in the Government Theni Medical College Hospital, Theni. It is the main referral center for all places in and around the area. Included all trauma patients were reported to Government Theni Medical College casualty from March 2014 to April 2016. Pathology cases such as toothache, dentoalveolar abscess, space infection, pathological fracture, temporomandibular joint dislocation other than trauma were excluded from the study.

Study Variable

Data regarding age, sex, place, date and month, time, etiology, the influence of alcohol, nature, and pattern of the fractures, associated injuries. The etiological factors were classified as road traffic accidents (RTAs), falls, assault, occupational, and sports, injuries caused by animal and others (blasts, gunshot). The RTAs were further subdivided according to the type of vehicle (bicycle, two-wheelers, three- and four-wheelers, and others). The anatomic locations of mandibular fractures were divided into six groups as symphysis, parasympysis, body, angle, condyle, and coronoid. Middle-third of the face as frontal, zygomaticomaxillary complex (ZMC), zygomatic arch alone, nasal, naso-orbito-ethmoid (NOE), Le Fort I, Le Fort II, Le Fort III, dentoalveolar. Associated injuries were taken including head injury, chest and abdominal injury, upper limb fracture, lower limb fracture, pelvic fracture, and cervical spine injury.

RESULTS

As per casualty records, a total of 10589 patients were reported. In which, 1325 patients had a maxillofacial fracture.

Sex Distribution (Table 1 and Graph 1)

Among 1325, 72.3% of patients were males and 27.6% were females, with a male and female ratio of 3:1.

Age Group Distribution (Table 2 and Graph 2)

In all age groups, there was a preponderance of the male gender. The peak incidence was in the 21-30 age group (33.5%), followed by 31-40 age group and the 11-20 age group with 22.8% and 16.3%, respectively. In the age group, 21-30 majority were male 31% (n = 1308) and majority of female reported with maxillofacial injuries were in the age group of 31-40 (22.0%, n = 227).

Distribution of Time of Injury (Table 3 and Graph 3)

The maximum number of cases were reported at 6 pm-12 am (40.3%) followed by 12 pm-6 pm (24.7%).
Month Wise Distribution of Injuries (Table 4 and Graph 4)
Maxillofacial traumas were highest in the months of September (20.8%) followed by October (14.6%), with least incidence in the month of April (3.3%).

Distribution of Aetiology of Trauma (Table 5 and Graph 5)
RTA was the leading cause of maxillofacial injuries with the incidence of 57.2%, followed by assault (21.6%) and fall (10.9%). Only least number cases were reported due to injuries caused by animals (1.0%) and others (blasts, gunshot) (0.6%).

Distribution of Injuries by Type of Vehicle (Table 6 and Graph 6)
Regarding vehicle involved RTA, two-wheeler was the leading cause with the incidence of 51.8% followed by four-wheeler 27.7%, three-wheeler 13.1%, and least percentage of cases were reported due to bicycle-related accident 7.4%, respectively.

Distribution of Alcohol Influence (Table 7)
Majority cases were affected under the influence of alcohol with the occurrence of 66.1% (n = 876).

Distribution of Pattern of Maxillofacial Fractures (Table 8 and Graph 7)
Increased number of cases were affected with mandibular fracture (27.9%), followed by ZMC (24.2%), and dentoalveolar fracture (16.1%). NOE complex fracture showed 0.7% which was found to be least among the all.

Distribution of Mandible Fracture (Table 9 and Graph 8)
Patients affected of parasymphysis fracture showed greater incidence with 37.6% followed by condylar fracture (27.3%), symphysis (11.6%), and angle (10.3%). Least number of cases were reported with coronoid fracture with 2.4%.

Distribution of Associated Injuries (Table 10)
Head injury (72.9%) accounted for the greater majority of associated injuries followed by lower limb fracture (10.6%),
upper limb fracture (5.7%), cervical spine injury (4.7%), chest and abdominal injury (4.2%), and pelvic fracture (2.0%).

**DISCUSSION**

The etiological factors and pattern of maxillofacial injuries have been reported to vary from one country to another depending on the socioeconomic status, geographic condition, and cultural characteristics.

**Sex and Age Distribution**

In this study, males (72.3%) were predominately affected than females (27.6%); the male to female ratio was 3:1. The most of the studies showed similar to as the present one. The sex ratio in various studies ranges from 2.3:1 to 11.8:1. In most of the studies it was around 3:1. The preponderance of male because the males are more likely the earners of the family and also plays an active role in social work; therefore, they are more prone to be affected by accidents, violent contact, and sports. Age of the patients suffering from maxillofacial trauma ranged from 1 year to 95 years (mean age 47.5 years) the most commonly affected peoples in the age group was 21-30 years (33.5%), similar results showed in various studies. The people in this age group are more active regarding sports, fights, violent activities, industrial work, and high-speed transportation. In the study, second commonly affected age groups were 31-40 (21.3%) and 41-50 (18.7) (Tables 1 and 2; Graphs 1 and 2).
Time and Monthly Distribution
This study shows peak incidence of fractures occurring at late evening particularly 6 pm-12 am (40.3%). This is mainly due to people rushing back home from office, colleges, and schools, and from various other works. It was followed by incidences at 12 pm-6 am (24.7%), 6 am-12 pm (21.6%), and 12 am-6 am (13.4%). Chandra Shekar and Reddy, Kapoor and Kalra reported a maximum number of trauma has occurred in the late evening.

The number of maxillofacial trauma cases was significantly high in the months of September (20.8%) and October (14.6%) in this study. This is because of the rainy season and increased consumption of alcohol. In contrast, Ogundare et al. reported facial injuries were a peak in summer (31%) and winter (28%) months (Tables 3 and 4; Graphs 3 and 4).

Etiology of Trauma
This study shows that the most common etiological factor of maxillofacial injuries was RTAs (57.2%). Similar to ours, RTA was the major cause in various studies. However, contrast to other studies carried out in developed countries, which reported assaults as the most common cause of maxillofacial injuries. The high number of maxillofacial injuries attributed to RTA in the present study was due to recklessness and negligence of the driver, often driving under the influence of alcohol and complete disregard of traffic laws, over speeding, overloading, underage driving and poor conditions of roads and vehicles. Assault (31.0%) was the second most common cause of injury followed by fall (10.9%), sport-related injury (5.2%), and occupational injury (4.4%), injuries caused by animals (1.0%). In contrast to other studies carried out in developed countries, reported assaults as the most common cause of maxillofacial injuries.

Regarding vehicles involved in RTA, two-wheelers (51.8%) were the predominant cause of injury followed by four-wheelers (27.7%), three-wheelers (13.1%), and bicycle (7.4%). Two-wheeler was the main causative factor as reported by Chandra Shekar and Reddy, Subhashraj et al., Calderoni et al. In contrast, four wheeler remains to be the major cause for RTA in developed countries. Verification of the etiological factors of maxillofacial fractures may help to assess the proficiency of road safety measures such as speed limits, drunk driving, seat belt laws, and behavioral patterns (Tables 5 and 6; Graphs 5 and 6).

Influence of Alcohol
Excessive consumption of alcohol is strongly associated with facial injuries. Alcohol impairs judgment, cognitive ability and once ability to assess the risk and protect them which probably brings out aggression, often leads to interpersonal violence and is also a major factor in motor vehicle accident and assault. The prevalence of alcohol consumption among the middle-aged group was due to high income, peer pressure, lack of parental supervision, and unemployment. In this study, alcohol consumption before the injury was recorded in 66.1% of cases. In contrast, Al Ahmed et al. reported alcohol does not play a major role for facial fracture etiology in the Middle East where it is forbidden in some countries (Saudi Arabia, Iran, and Libya) and consumed minimally in the other countries due to religious and cultural beliefs. This discrepancy may be explained by differences between one country to another, in the strictness of laws governing the sale and consumption of alcohol which may be effective in preventing alcohol-related injuries (Table 7).

Site, Nature, and Pattern of Fractures
Mandible was the most common site of fracture followed by mid-face. Various studies have supported this result. This preponderance could be because the mandible is the most prominent and only moveable facial bone, and hence has a greater chance of being fractured than the well-articulated mid-facial bones.

In this study, also mandibular fractures (27.9%) were the major one; particularly para-symphysis (37.6%) was the most common site followed by the condyle area (27.3%) similar to other studies. The most common combination of fracture in this study was parasymphysis with sub condyle accounting for 2.4%, probably due to the horizontally directed impact to parasymphysis resulting fracture at the site of impact. This axial force of impact against parasymphysis proceeded along the mandibular body to the cranial base through the condyle leading to the concentration of the tensile strain at the condylar neck, hence resulting in its fracture. In this study, symphysis (11.6%), angle (10.3%), body (7.6%), ramus (3.2%), and coronoid (2.4%) in descending orders (Table 8 and Graph 7). The primary causes of mandible fractures were RTA and falls. Other significant causes were assault and sports injuries.

Among fractures of the mid-facial region, ZMC fracture (24.2%) was the most common site of the fracture, similar results were also reported by other studies. Followed by dento-alveolar (16.1%), orbit (8.7%), frontal (5.5%), nasal (4.9%), zygomatic arch alone (4.9%), Le Fort I (3.7%), II (2.3%), III (1.1%), and NOE (0.7%). Orbital fracture was third most common site of fracture in the present study, similar report were obtained in other studies.

Associated Injuries
Head injury (72.9%) accounted for the greater majority of associated injuries followed by lower limb fracture (10.6%),...
upper limb fracture (5.7%) cervical spine injury (4.7%) chest and abdominal injury (4.2%), and pelvic fracture (2.0%) (Table 10).

CONCLUSION

Since RTAs continue to be the leading cause for the maxillofacial injury with increased predominance in male population, certain criteria are need to be followed such as public awareness about RTAs and importance of road traffic legislation, legal prohibition of drunk and driving, usage of cell phone while driving, incorporation of safety factors such as seat belt, helmet should be recommended compulsorily to reduce the incidence of maxilla-facial injuries.

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Congenital Ichthyoses in Pediatric Age Group: A Cross sectional Study

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Abstract

Background and Objectives: Ichthyoses comprise a heterogeneous group of disorders due to defect in keratinization. Establishing the correct clinical diagnosis in a patient with ichthyosis is a prerequisite for making prognostic predictions, therapeutic decisions, and offering genetic counseling. However, a specific diagnosis can be challenging in certain patients due to clinical heterogeneity. In this study, we analyzed the clinical presentation of various types of congenital ichthyoses in pediatric age group.

Materials and Methods: A cross-sectional observational study was conducted in dermatology outpatients department. History was elicited with regard to the age of onset, blistering of the skin, seasonal variation, and similar lesions in other family members followed by detailed dermatological and systemic examination and necessary investigations.

Results: A total of 64 patients were included in this study and relative incidence of different types of ichthyoses was noted. 13 cases of collodion babies were followed and 70% of them developed lamellar ichthyosis. A significant proportion of cases with autosomal recessive inheritance had a history of consanguineous marriage in the parents.

Conclusion: A number of well-defined types of ichthyoses have characteristic feature and can be reliably diagnosed. A thorough family history and clinical examination are a prerequisite for making correct diagnosis and for recognizing the inheritance pattern which is necessary for therapeutic decision and offering genetic counseling.

Key words: Congenital ichthyosis, Collodion baby, Ichthyosis vulgaris

INTRODUCTION

Ichthyoses are heterogeneous group of disorders due to defect in keratinization or cornification with abnormal differentiation and desquamation of epidermis which is clinically characterized by dry-rough skin with scaling over much or the entire body surface.¹ The primary function of the stratum corneum is to provide a barrier to water loss without which terrestrial life is not possible. Defective barrier function leads to increased transepidermal water loss, a characteristic feature of ichthyosis.² The terminology and nosology of congenital ichthyosis have continuously evolved and has led to a confusing medley of different terms and classifications.³ A number of well-defined ichthyoses have characteristic features and can be reliably diagnosed. However, a specific diagnosis can be challenging in certain patients and families due to clinical heterogeneity. In general, determination of whether an ichthyosis is inherited or acquired, presented at birth or later in life, and whether it is limited to the skin or part of multisystem disorder helps in making a diagnosis. Quality and distribution of scales, presence or absence of blistering, erythroderma, and associated abnormalities of skin adnexa are other useful clinical features. A thorough family history is essential for recognizing the inheritance pattern. Establishing a correct clinical diagnosis in a patient with ichthyosis is a prerequisite for making prognostic prediction and therapeutic decision.⁴ Recent advances in the molecular genetics have provided tools to categorize ichthyosis on the basis of their underlying genetic defect which helps in offering genetic counselling.⁵

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Aim
To study the clinical presentation of various types of congenital ichthyosis in pediatric age group.

MATERIALS AND METHODS

This cross-sectional observational study was conducted at Department of Dermatology at Tirunelveli Medical College. Institutional Ethics Committee approval and informed consent from parents were obtained. In eliciting the history, a set pattern of questionnaire was followed. Enquiries were made with regard to symptoms, age of onset, duration, itching, diminished sweating and heat intolerance, history of collodion baby, blistering of skin, seasonal variation, cyclical shedding of skin, photosensitivity, and photophobia. History regarding involvement of other systems such as central nervous system (CNS), skeletal system was taken. History of any maternal illness and medication during antenatal period, prematurity and prolonged labor was elicited. Patients’ developmental history and family history of similar lesions in the parents and siblings were elicited. History regarding consanguineous marriage of parents was recorded. A detailed general examination was conducted with specific reference to CNS and skeletal system. Measurement of head circumference was performed and evidence of short stature, microcephaly, cataract, and gait were noted. On dermatological examination, skin lesions were examined and nature of scales whether polygonal or lamellar, color of scales, and whether loose or adherent were noted along with distribution of scales with sparing of certain areas. The presence of blisters, erythroderma, lichenification, ectropion, eclabion, eczematization, and impetiginization were noted. Hair and nails were examined for alopecia, brittle hair, and nail dystrophy. Palms and soles were examined for hyperlinearity, palmoplantar keratoderma, sclerodactyly, and digital contractures. Apart from routine hematological examination, skin biopsy and microscopic examination of hair were done wherever indicated. Referral to other specialists such as neurology and ophthalmology was done to confirm or rule out associated feature of some syndromes as and when suspected. All the data were compiled and analyzed statistically and inference was drawn.

RESULTS

Table 1 presents the relative incidence of different types of congenital ichthyosis. Out of 64 patients with congenital ichthyosis, ichthyosis vulgaris constituted 72% of cases followed by lamellar ichthyosis 14%. Non-bullous ichthyosiform erythroderma (NBIE) constituted 6% followed by bullous ichthyosiform erythroderma (BIE) and Sjogren–Larsson syndrome each constituted 3%. The incidence of ichthyosis vulgaris was almost equal in both sexes. Incidence of lamellar ichthyosis was more in females. Equal sex distribution was seen in NBIE. All except two cases of ichthyosis vulgaris had age onset from 3 to 6 months (Table 2). Lamellar ichthyosis, NBIE, BIE, and other ichthyosiform syndromes had age of onset since birth. Table 3 shows that out of 13 collodion babies, 70% of cases evolved into lamellar ichthyosis and 30% evolved with NBIE. In ichthyosis vulgaris, 73% of patients had no history of consanguineous marriage of the patients, and in 24% of patient history of second- and third-degree consanguineous marriage was present. In lamellar ichthyosis, NBIE, Sjogren–Larsson syndrome and Netherton's syndrome, all the patients had consanguineous parents. In ichthyosis vulgaris 41% of patients had family history of ichthyosis. In lamellar ichthyosis, positive family history was present in 22% of patients.

DISCUSSION

In our study, the incidence of ichthyosis vulgaris was 1 in 200 which complies with that of study by Wells and Kerr which showed that the incidence of ichthyosis vulgaris...
maybe as common as 1 in 250.\(^5\) The age of onset of ichthyosis vulgaris was around 3-6 months in 98% of patients. In lamellar ichthyosis, NBIE and BIE the age of onset of the disease were from birth. This complies with that of the description about the age of onset of the disease given by Traupe et al., in the guide to clinical diagnosis of ichthyosis.\(^7\) In the Van Gysel et al. study of follow-up to 17 cases of collodion baby, 60-80% of the infants developed NBIE, and lamellar ichthyosis.\(^8\) In our study of follow-up of 13 cases of collodion babies, 70% of the patients developed lamellar ichthyosis and 30% of the patients developed NBIE with the ratio 2.3:1. The most common presenting complaints of patients were dryness, roughness, and disfigurement. Itching was present in patients with associated atopy. Winter exacerbation of the disease was present in 46% of ichthyosis vulgaris patients. A study by Kuokkanen showed an association of atopy in 37-50% of patients which was 6.5% in our study.\(^9\) In ichthyosis vulgaris, 76% of patients had no history of consanguineous marriage of the parents and in 24% patient history of second-degree and third-degree consanguineous marriage was present. In lamellar ichthyosis second-degree, consanguineous marriage was present in 44% of patients and third-degree consanguineous marriage was present in 55% of patients. This complies with that of autosomal recessive inheritance. In BIE 50% had consanguinity of parents. In Netherton's syndrome second-degree consanguineous marriage was present in the parents and it complies with that of autosomal recessive inheritance. In ichthyosis vulgaris, family history of ichthyosis was present in 41% of patients. In lamellar ichthyosis, positive family history was present in one family whose two siblings were affected. As it is an autosomal dominantly inherited disorder, the risk of having a further affected child is 25% which is seen in this case. In BIE, no family history of ichthyosis was present. Because it is an autosomal dominantly inherited disorder, it can be presumed that the patient suffered a new keratin gene mutation.

**CONCLUSION**

A number of well-defined types of ichthyoses have characteristic features and can be reliably diagnosed. However, a specific diagnosis can be challenging in certain patients and families due to great clinical heterogeneity. In general, determination of whether an ichthyosis is inherited or acquired, present at birth or later in life, and whether it is limited to the skin or part of multisystem disorder helps in diagnosis. Quality and distribution of scale, presence of absence of erythroderma, blistering, and associated abnormalities of skin adnexa are other useful clinical features. A thorough family history is essential for recognizing the inheritance pattern. Establishing the correct clinical diagnosis in a patient with ichthyosis is a prerequisite for making prognostic prediction, therapeutic decision, and offering genetic counseling.

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Effect of Temperature Variation on Orthodontic Composite: An *In Vitro* Study

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**Abstract**

**Introduction:** One problem that clinicians face during treatment is bracket failure. This is usually the consequence of either a patient’s accidentally applying inappropriate force to the bracket or a poor bonding technique. However, the effect of temperature variation on the tensile strength and hardness of composite resin had been also a considering factor during bonding.

**Materials and Methods:** A total of 45 freshly extracted human premolars were collected and stored in normal saline. Teeth were cleaned and separated into three groups. Each group contains 15 samples. Group I: Composite refrigerated at (−10°C); Group II: Composite at room temperature (25°C). Group III: Composite heated at temperature (45°C). Teeth were bonded accordingly and tested after 30 min with universal testing machine at cross head speed of 0.5 mm/min. the residual adhesives was been evaluated under microscope of ×10 magnification and scoring index had been made. The analysis of variance was used to determine whether significant differences existed between the various groups. Multiple range tests were used to identify which of the groups were different. The Chi-square test was used to determine significant differences in the adhesive remnant index scores between the different groups.

**Results:** Statistically significant results are obtained with respect to Group III composite heated at 45°C. Bond failure at enamel adhesive interface is seen and 90% of composite remained on the tooth.

**Conclusion:** Composite heated at high temperature had increased its bond strength. Amount of residue on enamel tooth interface with 90% remained on tooth.

**Key words:** Adhesive remaining index, Bonding, Composite, Cryopreservation, Debonding, Etchant

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**INTRODUCTION**

Brackets are bonded to the surface of teeth with orthodontic adhesive. Bonding of orthodontic brackets to the tooth enamel has been an important issue since the introduction of direct bonding in orthodontics. Many new bonding agents have been developed such as composite resins, conventional glass ionomer cements, resin-modified glass-ionomer cements, and polyacid modified composites (compomers) with different polymerization mechanism such as chemically, light or dual curing. Composite resins are one of the most frequently used adhesives in orthodontic bonding. Although they provide sufficient bonding strength and are easy to handle, they adhere to the tooth enamel only by microretention, require dry field and amount of fluoride release have not been found to be sufficient for anticaries effect.

Composite resins and acid-etch techniques are presently an integral part of orthodontic treatment. To increase the shelf life of adhesives, some manufacturers recommend storing the material in the refrigerator before use. The temperature of the adhesive can vary significantly, depending on the time period between the removal of the
bonding kit from the refrigerator (4-5°C) until it reaches room temperature (22-25°C). Bishara et al. the variation in the temperature of the composite, within the limits tested, does not seem to adversely affect the bonding strength of the bracket to the enamel.\textsuperscript{1} Bishara \textit{et al.} temperature variation affects the resin-reinforced glass-ionomer adhesive more than the composite adhesive in the first 30 min after bonding.\textsuperscript{2} Awlia \textit{et al.} the composite consumed heat during its manipulation and, in turn, initiated further cross-linking once the temperature was increased, raising the temperature increased the intrinsic strength of the composite.\textsuperscript{3} Temperature variation might affect the viscosity of composites, but this appears to have little effect on the tag length of composites. The literature is scarce concerning the effects of such temperature variation of the composite during orthodontic bonding.

It has been also suggested that the temperature variation might affect the viscosity of the composites, but this appears to have little effects on the tag length of the composites. That is, temperature change has no effect on penetration of a composite.

The purpose of this study is to compare the bonding strength of two groups of teeth and to determine the effect of various temperature changes on the mechanical and adhesive properties of orthodontic composite.

**Aim and Objectives**

1. Aim: To determine effect of temperature on bond strength of composite adhesive.
2. Objectives:
   - To evaluate effective temperature range for composite adhesive.
   - To evaluate amount of residual adhesives after debonding.

**MATERIALS AND METHODS**

The \textit{in vitro} study contains 45 extracted human premolars, all in good condition, were collected from Bharati Vidyapeeth Dental College, Sangli, stored in normal saline. The teeth were cleaned and then polished with a non-fluoride pumice. They were assigned randomly to three groups of 15 each. The preparations for bonding the brackets in the two groups were essentially similar: The teeth were air-dried, conditioned with 37% orthophosphoric acid for 15 s, and followed by immediate rinsing for 20 s. Teeth were air-dried for 5 s. The total time duration for this study was 2 months approximately:

- Group I: For group of 15 teeth, the temperature of the bonding material was maintained at −10°C using cryopreservation (Figure 1).
- Group II: For group of 15 teeth, the temperature of the bonding material was maintained at room temperature 25°C.
- Group III: For group of 15 teeth, the temperature of the bonding material was maintained at 45°C using hot air oven (Figure 2).

To maintain a constant temperature, the bonding kit was kept in the refrigerator and oven accordingly for 15 min before bonding under normal office conditions; these would be the outer limits of temperature variation to which any bonding system would be subjected. Bonding system to the three groups of teeth was performed according to the standardized instructions (Figures 3-5).

The teeth were mounted in acrylic blocks and stored in normal saline for 24 h before they were debonded. The Instron Universal Testing Machine was used to determine the shear bond strengths at cross head speed of 0.5 mm/min (Figure 6).

![Figure 1: Cryopreservation](image1)

![Figure 2: Hot air oven](image2)
Evaluation of the Residual Adhesive

After bond failure, the teeth and brackets were examined under ×10 magnification adhesive remaining after bracket removal was assessed using a modified adhesive remnant index (ARI).

The ARI scale has a range between 5 and 1:

- 5 - Indicating that no composite remained on the enamel;
- 4 - <10% of composite remained on the surface;
- 3 - More than 10% but <90% of the composite remained;
- 2 - More than 90% of the composite remained;
- 1 - All of the composite remained on the tooth, along with the impression of the bracket base.

Statistical Analysis

Basic statistics were calculated for the shear bond strengths of the three groups of teeth. The analysis of variance was used to determine whether significant differences existed between the various groups. Multiple range tests were used to identify which of the groups were different. The Chi-square test was used to determine significant differences in the ARI scores between the different groups.

RESULTS

The descriptive statistics for the shear bond strength are presented in Tables 1-3.

- Comparison of both the shear bond strengths between the two groups indicated that no significant differences were present between the bonding strength of composite used at −10°C (refrigerated) and that used at 25°C (room temperature).
- As compared with group I and II, there is significant difference were present in the bonding strength of composite used at 45°C (heated).

The test results indicated the presence of a significant difference between the Group I and II. Examination indicated that the group bonded with the refrigerated composite adhesive had a greater ARI score of 4. This indicated that bond failure in this group occurred more frequently at the enamel-adhesive interface. The group bonded with the composite adhesive at room temperature had an increased incidence of ARI score of 2. Indicating that more than 90% of the composite remained on the
Girme, et al.: Effect of Temperature Variation on Orthodontic Composite: An In Vitro Study

Table 1: Shear bond strength of the groups tested

<table>
<thead>
<tr>
<th>Groups tested</th>
<th>n</th>
<th>Mean±SD</th>
<th>Variance (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td>15</td>
<td>10.9</td>
<td>9.8</td>
</tr>
<tr>
<td>Group II</td>
<td>15</td>
<td>11.9</td>
<td>10.2</td>
</tr>
<tr>
<td>Group III</td>
<td>15</td>
<td>14.6</td>
<td>12.2</td>
</tr>
</tbody>
</table>

Mean±SD: Sample size, F ratio: 23.20, P: 0.0001. ANOVA: Analysis of variance, SD: Standard deviation

Table 2: Statistics and the result of analysis of variance comparing the shear bond strength of the groups tested

<table>
<thead>
<tr>
<th>Groups tested</th>
<th>n</th>
<th>Mean±SD</th>
<th>Variance (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td>15</td>
<td>9.89±2.189</td>
<td>4.739</td>
</tr>
<tr>
<td>Group II</td>
<td>15</td>
<td>10.14±1.337</td>
<td>1.788</td>
</tr>
<tr>
<td>Group III</td>
<td>15</td>
<td>15.35±3.442</td>
<td>11.85</td>
</tr>
</tbody>
</table>

n: Sample size, F ratio: 23.20, P: 0.0001. ANOVA: Analysis of variance, SD: Standard deviation

Table 3: Frequency distribution of the adhesive remaining index of the three groups tested

<table>
<thead>
<tr>
<th>Groups tested</th>
<th>ARI scores</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Group I</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Group II</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Group III</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

n: Sample size, P: 0.0001. ARI: Adhesive remaining index

The present findings indicate that temperature variation affects the composite adhesive. As compared with refrigerated and room temperature composite, heated composite had high strength. The evaluation of the ARI scores indicated a significantly higher frequency of bond failure at the enamel-adhesive interface with the refrigerated composite group. Results of this study can only be used as a guideline in choosing the right adhesive for clinical practice and a sound base for further investigation. It is possible to simulate conditions that are close to those in clinical use, but the potential for unrecognized factors to influence the outcome should always be borne in mind. Randomized clinical trials for testing performance of the adhesives in oral environment should be performed in the future to obtain more precise results.

CONCLUSION

The present findings indicate that temperature variation affects the composite adhesive. As compared with refrigerated and room temperature composite, heated composite had high strength. The evaluation of the ARI scores indicated a significantly higher frequency of bond failure at the enamel-adhesive interface with the refrigerated composite group.

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Evaluation and Comparison of Color Stability of Recent Esthetic Archwires: An In Vitro Study Under Spectrophotometer

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Abstract

Introduction: Invisible orthodontics is in demand in today’s times of esthetic dentistry. Metal bracket or steel appliances are being replaced by either esthetic brackets or lingual appliances.

Objective: The objective of the study is to evaluate the color stability of five esthetic archwires at different time periods.

Materials and Methods: A total of 120 samples were evaluated after 7, 14, and 21 days of immersion in staining coffee solution. Color measurements were performed using a spectrophotometer according to the CIE L*a*b* system, and color changes (ΔE*) and National Bureau of Standards units were computed. Statistical differences were investigated using analysis of variance and Tukey’s post-hoc test.

Results: All wires showed staining after 7th day, but at different intensities which change it’s stability with different period except Galaxy archwire which remains constant till the long period.

Conclusion: All the esthetic archwires assessed showed noticeable color change after 21 days. The JJ orthodontics archwire showed the highest amount of color alteration. The rabbit force archwires presented appreciable color change till 14 days which becomes less after that.

Key words: Esthetic archwires, Color stability, Spectrophotometer

INTRODUCTION

Invisible orthodontics is in demand in today’s times of esthetic dentistry. Metal bracket or steel appliances are being replaced by either esthetic brackets or lingual appliances.

Metal archwires coated with plastic resins are used to resemble tooth color. However, the color of the wire tends to change over time, and the coating may also split during use in mouth.

There are many causes for discoloration of coated wires. It can be caused by food dyes or mouth washes. Our daily consumption of tea, coffee and cola drinks promotes discoloration of these wires.

Coffee is considered as the most chromogenic agent in comparison to other drinks. Considering this, the study was planned to compare the color stability of esthetic archwires along with the use of coffee.

MATERIALS AND METHODS

In this study, five brands (Orthodirect, JJ Orthodontics, Rabbit Force (G & H), Galaxy, Prime Ortho) of esthetic archwires were assessed. In this study, 6 samples from each brand at every group were taken (Figure 1 and Table 1)
Each sample was 10 mm long wire segment.

**Staining Solution Preparation**

A staining coffee solution was prepared by pouring 500 ml of boiled distilled water over 15 g of coffee powder. The solution was stirred every 30 min for 10 s until it cooled down to 37°C and then was filtered through a paper filter (Figure 2). This liquid mixture was then poured into a pot and kept in an incubator during the entire experiment. The solution was freshened once every 7 days. In addition, to reduce the precipitation of particles, the mixture was stirred once a day for 1 min.

Before the specimens were immersed into the solution, they were stored in distilled water at 37°C for 24 h. After 24 h of immersion (T0), the color of each sample was measured using the spectrophotometer (Figure 3). After the first measurement (T0), the samples were placed in a container with the prepared staining coffee solution. Color measurements were repeated after 7 days (T1), 14 days (T2), and 21 days (T3) of immersion in the solution. Before each measurement, samples were removed from the solution and rinsed with distilled water in an ultrasonic cleaning bath for 5 min. Excess water on the surfaces was removed with tissue papers, and the samples were allowed to dry.

Before performing the measurements, the spectrophotometer was calibrated according to the manufacturer's instructions. Six measurements of each sample were recorded by the examiner. Color changes were characterized using the Commission Internationale de l’Eclairage L*a*b* color space (CIE L*a*b*).

These systems represent adequately the visual perception of color differences. Total color differences are expressed by the formula \( \Delta E^* = (\Delta L^*)^2 + (\Delta a^*)^2 + (\Delta b^*)^2)^{1/2} \).
where $\Delta L^*$, $\Delta a^*$, and $\Delta b^*$ are differences in $L^*$, $a^*$, and $b^*$ values before (T0) and after immersion at each time interval (T1, T2, T3). To relate the amount of color change ($\Delta E^*$) to a clinical environment, the data were converted to National Bureau of Standards (NBS) units as follows:

$$\text{NBS units} = \Delta E^* \times 0.92.$$  

## RESULTS

Table 2 shows the total color difference ($\Delta E^*$) of the esthetic archwires after 7, 14, and 21 days of immersion in the staining solution. The data were converted into NBS units, to relate the amount of color change ($\Delta E^*$) recorded by the spectrophotometer with that of the clinical environment. The results of this conversion are shown in Table 3 and described in terms of the NBS defined color differences in Table 4. All brands showed staining after 7 days, but at different intensities which changes it’s stability with different period accept Galaxy archwire which remains constant till the long period.

## DISCUSSION

In addition to the color differences initially observed between the different existing esthetic archwires, the color stability of coated archwires during orthodontic treatment is also clinically important. In this study, the color stability of these archwires could be reliably evaluated. Ideally, the color of esthetic archwires should match that of natural teeth and esthetic brackets. However, the colors of natural teeth vary according to the color measurement protocols used and also by race, gender, and age.\(^7,8\)

Color changes were characterized using the CIE $L^*a^*b^*$ color space. The CIE $L^*a^*b^*$ color space is currently one of the most popular and widely used systems of color measurement, and it is well suited for the determination of small color differences. Many authors\(^9,10,12\) have used $\Delta E^*$ values to evaluate the “perceptibility” of color differences, but criteria used for perceptibility was different. To find out such differences and disagreements in the criteria used, the NBS rating system is used to evaluate the degree of color difference since there is an absolute criteria by which $\Delta E^*$ values can be converted to definitions with clinical significance.

Some studies\(^9,10,13\) concluded that coffee was the most chromogenic agent when it was compared with other staining substances such as tea and cola drinks. For this reason, a coffee solution was used in this study to determine the effect of staining.

## CONCLUSION

All the esthetic archwires assessed showed noticeable color change after 21 days. The JJ orthodontics archwire showed the highest amount of color alteration. The rabbit force archwires presented appreciable color change till 14 days which becomes less after that.

## REFERENCES


Source of Support: Nil, Conflict of Interest: None declared.
Prevalence of Prehypertension and Hypertension and its Determinants among Adolescent School Children of a Semi-urban Area in Erode District, Tamil Nadu

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Abstract

Introduction: As a consequence of industrialization and globalization, the humankind is exposed to great challenges in daily life. Rapid communication and stiff competition everywhere has made the man greatly stressful. Uniquely in the past two decades, children are losing real childhood enjoyments because of parental anxiety and peer group influences.

Objective: The objective of this study is to evaluate the prevalence of prehypertension and hypertension among adolescent school students, and to determine the association of various risk factors with hypertension, in a semi-urban setting of Erode district.

Study Design: A cross-sectional assessment of blood pressure (BP), height, weight was performed in 631 school students (332 - private, 299 - government school) aged 14-17 years. Details regarding physical activity, stress, frequent junk foods intake, mode of transport to school (motor vehicle) was got before the assessment, using a pretested questionnaire.

Results: Among the students, 85.9% had BP in normal range, 14.1% had prehypertension. The mean systolic and diastolic BP in our study was found to be 108.72 and 70.50 mmHg, respectively. There was a significant association between the prevalence of prehypertension and increasing age (adjusted odds ratio [OR] = 3.902 [1.570-9.697]). Male gender (adjusted OR = 2.024 [1.224-3.349]) and increased body mass index (BMI) (adjusted OR = 6.108 [2.953-12.635]) were independent predictors of prehypertension. Other risk factors which had a statistically significant association with prehypertension were frequent junk foods [adjusted OR = 2.141 (1.232-3.722] and stress [adjusted OR = 6.108 (2.953-12.635)].

Conclusion: Increased BMI, along with changing dietary habits are major risk factors for prehypertension in our study population. Stress in school students, as a risk factor for prehypertension is alarming. Hence, routine screening of school children for prehypertension and these risk factors is warranted with initiation of lifestyle modifications for at risk individuals.

Key words: Adolescent school-based, Determinants, Prehypertension, Prevalence

INTRODUCTION

As a consequence of industrialization and globalization, the humankind is exposed to great challenges in daily life. Rapid communication and stiff competition everywhere has made the man greatly stressful. Uniquely in the past two decades, children are losing real childhood enjoyments because of parental anxiety and peer group influences. This may have a negative influence on their health as well. Hypertension is one of the leading causes of death and disability worldwide. Although hypertension is a problem of adults, the etiologic process and risk behaviors start early in life. Studies of societies undergoing acculturation and studies of migrants from a less to more urbanized setting indicate a profound environmental contribution to blood pressure (BP). The prevalence of prehypertension and
hypertension among children and adolescents is on the increase and underdiagnosed. This condition continues into adult hypertension wherein the young adults and youth suffer from cardiovascular and cerebrovascular disorders even before the age of 45 or 40 years. This leads to severe morbidity and mortality which in turn causes heavy socioeconomic burden on the society. Keeping in view the seriousness of the problem, this study is undertaken to find out the prevalence of prehypertension and hypertension and its risk factors in school children.

Aim and Objective
The aim and objective of this study is to study the prevalence of prehypertension and hypertension, and its risk factors among adolescent school students in a semi-urban area of Erode district, Tamil Nadu.

METHODS

The study was a cross-sectional, school-based study. After obtaining the Institutional Ethical Committee Clearance, permission from the school authorities and consent from parents were obtained. The study was conducted in three schools (1 - government and 2 - private schools) from Perundurai, Erode District, Tamil Nadu. In our study, 631 students, aged 14-17 years, studying in class 9-12 were included in the study. Among them, 332 students were from private schools and 299 students from government schools. Information of each student was collected in a pretested questionnaire with details of age, sex, class studying, address, duration of physical activity, dietary habits with junk foods, mode of transport to school (motor vehicle or not), and stress. Physical activity was defined as more than 1 h of outdoor activity per day for at least 5 days/week, in the form of play or walk or domestic helps like household chores. Stress was measured on basis of subjective questions such as exam fears, school pressure, peer pressure, family tensions, suicidal tendencies, and loss of close relatives. Junk food was defined as food that has high calories and low nutritional content such as samosa, chips, other fried items, and soft drinks. Increased frequency of junk foods was considered as more than two times in a week.

Height was measured to the nearest 0.5 cm using a non-elastic measuring tape, fastened to a vertical wall, with the student standing on bare feet. Weight was measured with the student on bare feet and with light clothing using electronic weighing balance to the nearest 0.1 kg.

From the height and weight obtained, body mass index (BMI) was calculated using the formula, BMI = Weight (kg)/height (m²).

A Hawksley random-zero sphygmomanometer was used, for all recordings, with a cuff of appropriate sizes. Readings were taken with the student sitting down and having rested for at least 10 min. Medical interns, who were well trained, took BP measurements in all locations. All BP readings were obtained at a single examination visit. Our study design had access to single BP measurement per survey participant. If the single BP measurement was in prehypertension BP range, it was labeled as prehypertension an approach taken as in Din-Dzietham et al. Systemic examination was also done to exclude cardiovascular, renal, and other diseases. Students being adolescents, hypertension was defined according to 7th report of Joint National Committee (Indian Scenario) 2003 for detection, evaluation and treatment of high BP, as systolic BP (SBP) more than or equal to 140 mmHg or diastolic more than or equal to 90 mmHg. Prehypertension was defined as SBP more than or equal to 120 mmHg or diastolic more than or equal to 80 mmHg.

Statistical Analysis

Data entry and analysis of the variables was done using Statistical Package for Social Sciences version 16 software. Descriptive statistics of proportion, mean, standard deviation were calculated for the background characteristics, nutritional status based on BMI and BP level. For analytical statistics, odds ratio (OR) was calculated and Chi-square test was done for test of proportions and student’s t-test for test of means. Logistic regression was done to find the adjusted OR for association of various background characteristics with prehypertension. Variables which had P ≤ 0.20 were included in the model. Those with P ≤ 0.05 was considered statistically significant.

RESULTS

There were a total of 631 students. Table 1 gives the background characteristics of the group studied. Majority of the students were in 16 years age group followed by 15 years age group. The least number of students were in 17 years age group.

The mean SBP and diastolic BP (DBP) for age 14 were 104.90 mmHg (standard deviation ± 10.5) and 67.66 mmHg (± 8.35), age 15 were 108.31 mmHg (± 11.27) and 70.75 mmHg (± 7.82), age 16 were 110.31 mmHg (± 11.91) and 71.35 mmHg (± 8.93), and age 17 were 111.83 mmHg (± 14.40), 72.70 mmHg (± 9.84). The mean BP was found to be increased significantly with age (P < 0.01) as shown in Table 2.

Males had a mean SBP and DBP of 109.81 (± 13.12) and 71.45 (± 8.92) mmHg, respectively. Mean SBP and DBP among females were 107.67 (± 10.58) and
69.58 (± 8.52) mmHg. Males had a significantly higher mean BP as compared to females (P value for SBP 0.03 and DBP 0.01). The mean SBP and DBP of government schools were almost similar. The difference was not statistically significant (P value for SBP 0.46 and DBP 0.56).

In this study, the prevalence of prehypertension was found to be 81 (12.83%) and that of hypertension was found to be 8 (1.26%) among school children of ages 14-17 (Figure 1). As the group of hypertensive students was too small to compare with normotensive students, we have combined the hypertension and prehypertension students into a single group for cross tabulation in our study.

The percentage of adolescents with prehypertension was highest in 17 years age group (23.9%) and least in 14 years age group (7.7%). Prehypertension was found to be increasing with increasing age, and this association was statistically significant (P = 0.008) (Table 3).

The risk of prehypertension was found to be higher in males (17.1%), compared to females (11.1%) and this difference was statistically significant (P = 0.029).

As compared to government schools, private schools had more number of prehypertensive students (P = 0.010) and physical activity of <1 h/day (P = 0.094) were not associated with the prevalence of prehypertension.

Students with stress were found to be more prehypertensive than normal students, P = 0.004.

The proportion of prehypertension was more among students with frequent junk foods intake, but the P = 0.087 was insignificant.

Logistic regression analysis (Table 4) revealed older age (adjusted OR = 3.902 [1.570-9.697]; P = 0.003), male sex (adjusted OR = 2.024 [1.224-3.349]; P = 0.006), and increased BMI (adjusted OR = 6.108 [2.953-12.635]; P < 0.001) were independent risk factors for prehypertension. There was no significant association between private schools and prehypertension after adjustment in the regression model.

Stress (adjusted OR = 1.807 [1.097-2.978]; P = 0.020) and frequent intake of junk foods (adjusted OR = 2.141 [1.232-3.722]; P = 0.007) were associated with prevalence of prehypertension even after inclusion in the regression model with statistical significance.

**DISCUSSION**

Prehypertension and hypertension in pediatrics is largely underestimated, underdiagnosed and hence untreated. Essential hypertension in adults is found to have its roots in childhood and adolescence.\(^{5,12-15}\) Hence, early recognition of prehypertension in childhood is crucial.
of adolescents with prehypertension and hypertension aid in the initiation of lifestyle modifications, thereby preventing morbidity and mortality among adults.

In our study, 81 (12.83%) students were found to have prehypertension and 8 (1.26%) had hypertension. In a study conducted by McNiece et al. on 6790 adolescents (11-17 years), the prevalence of prehypertension was reported as 15.7%, Stage I hypertension as 2.6% and Stage II hypertension as 0.6%.14 Patil and Garg in their study, on prevalence of hypertension had a prevalence of 3%.16 While in a study done by Bute et al. at rural area of Indore, the overall prevalence of hypertension among adolescents was 5.25% and prehypertension was 17.4%.17 Other studies done in different parts of India reported a vast range in the prevalence of hypertension in children and adolescents showing as high as 21.5% to as low as 3.67%.18,19 The prevalence of hypertension was 10.1% and prehypertension was 20.7% among school going children in Congo, the study by Mbolla et al.20 The variations in the percentage of prehypertension and hypertension may be attributed to the difference in geographical location, sociocultural and socioeconomic backgrounds.

In our study, the mean increase in SBP and DBP was found to rise significantly with increase in age (P > 0.01). This spurt in BP is attributed to certain biological and psychological factors in puberty.21,22 Older age is found to be significantly associated with prehypertension (adjusted OR = 3.902 [1.570-9.697]; P = 0.003). Borah et al., in their study on hypertension in school children in North East India, also had significant association of older age and hypertension.23 Male gender had more number of prehypertension than females (P = 0.029). Furthermore, male sex was found to be an individual risk factor for prehypertension in our study (adjusted OR = 2.024 [1.224-3.349]; P = 0.006).

### Table 3: Prevalence of prehypertension by age, sex, types of school, BMI and other factors

<table>
<thead>
<tr>
<th>Background characteristics</th>
<th>n</th>
<th>n (%)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>631</td>
<td>542 (85.9)</td>
<td>89 (14.1)</td>
</tr>
<tr>
<td>Age in years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>142</td>
<td>131 (92.3)</td>
<td>11 (7.7)</td>
</tr>
<tr>
<td>15</td>
<td>166</td>
<td>146 (88.0)</td>
<td>20 (12.0)</td>
</tr>
<tr>
<td>16</td>
<td>252</td>
<td>211 (83.7)</td>
<td>41 (16.3)</td>
</tr>
<tr>
<td>17</td>
<td>71</td>
<td>54 (76.1)</td>
<td>17 (23.9)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>315</td>
<td>261 (82.9)</td>
<td>54 (17.1)</td>
</tr>
<tr>
<td>Female</td>
<td>316</td>
<td>281 (89.9)</td>
<td>35 (11.1)</td>
</tr>
<tr>
<td>Type of school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government</td>
<td>299</td>
<td>268 (89.6)</td>
<td>31 (10.4)</td>
</tr>
<tr>
<td>Private</td>
<td>332</td>
<td>274 (82.5)</td>
<td>58 (17.5)</td>
</tr>
<tr>
<td>BMI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight</td>
<td>165</td>
<td>161 (97.6)</td>
<td>4 (2.4)</td>
</tr>
<tr>
<td>Normal</td>
<td>427</td>
<td>363 (85.0)</td>
<td>64 (15.0)</td>
</tr>
<tr>
<td>Overweight/obese</td>
<td>39</td>
<td>18 (46.2)</td>
<td>21 (53.8)</td>
</tr>
<tr>
<td>Stress</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>248</td>
<td>201 (81.0)</td>
<td>47 (19.0)</td>
</tr>
<tr>
<td>No</td>
<td>383</td>
<td>342 (89.3)</td>
<td>41 (10.7)</td>
</tr>
<tr>
<td>Mode of transport to school (motor vehicle)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>510</td>
<td>442 (86.7)</td>
<td>68 (13.3)</td>
</tr>
<tr>
<td>No</td>
<td>121</td>
<td>100 (82.6)</td>
<td>21 (17.4)</td>
</tr>
<tr>
<td>Low physical activity(&lt;1 h/day)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>174</td>
<td>156 (89.7)</td>
<td>18 (10.3)</td>
</tr>
<tr>
<td>No</td>
<td>457</td>
<td>386 (84.5)</td>
<td>71 (15.5)</td>
</tr>
<tr>
<td>Frequent Junk foods(&gt;2 times/week)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>153</td>
<td>125 (81.7)</td>
<td>28 (18.3)</td>
</tr>
<tr>
<td>No</td>
<td>478</td>
<td>417 (87.2)</td>
<td>61 (12.8)</td>
</tr>
</tbody>
</table>

*P<0.05. BP: Blood pressure, BMI: Body mass index

### Table 4: Logistic regression analysis for association of background variables and prehypertension

<table>
<thead>
<tr>
<th>Background characteristics</th>
<th>Unadjusted OR</th>
<th>Adjusted OR</th>
<th>95% CI for Adjusted OR</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>1.631</td>
<td>2.132</td>
<td>0.940-4.831</td>
<td>0.070</td>
</tr>
<tr>
<td>16</td>
<td>2.314</td>
<td>2.473</td>
<td>1.171-5.227</td>
<td>0.018*</td>
</tr>
<tr>
<td>17</td>
<td>3.749</td>
<td>3.902</td>
<td>1.570-9.697</td>
<td>0.003*</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1.661</td>
<td>2.024</td>
<td>1.224-3.349</td>
<td>0.006*</td>
</tr>
<tr>
<td>Nutritional status</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Normal weight</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Overweight and obesity</td>
<td>7.096</td>
<td>6.108</td>
<td>2.953-12.635</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Stress</td>
<td>1.945</td>
<td>1.807</td>
<td>1.097-2.978</td>
<td>0.020*</td>
</tr>
<tr>
<td>Frequent Junk foods</td>
<td>0.653</td>
<td>2.141</td>
<td>1.232-3.722</td>
<td>0.007*</td>
</tr>
</tbody>
</table>

*P<0.05. CI: Confidence interval, OR: Odds ratio
hypertension on Iranian children documented significant gender difference in the frequency distribution of high BP, with higher prevalence rates of prehypertension and hypertension in boys than in girls. Similarity, Michalsky et al., in their study, on cardiovascular risk factors among adolescents found elevated BP (adjusted relative risk = 1.48 [95% confidence interval: 1.16-1.89]; P < 0.01) were more likely in adolescent boys compared with adolescent girls. Testosterone, which increases during puberty, is proposed to lower the natriuretic peptide, and therefore, leads to the postpubertal increase of BP in boys.

The mean BMI was significantly reported higher with increasing age (P < 0.01), female gender (P < 0.01), and private schools (P < 0.01). Furthermore, there was a significant association of increased BMI with prehypertension (adjusted OR = 6.108 [2.953-12.635]; P < 0.001). There are several studies in literature with results showing significant association of increased BMI with prehypertension and hypertension.

Mode of transport to school by motor vehicle did not make any statistical difference in the occurrence of prehypertension. The proportion of prehypertension in adolescents with low physical activity was not significantly high when compared to normal subjects (P = 0.094). This is in contrast to the study by Bute et al., with a significant association of low physical activity with prehypertension and hypertension. This may be due to the difference in the duration of physical activity taken in the study. Our study had a limit of 1 h/day for low physical activity, but other comparable studies had 1/2 h/day. Hence, there is a chance of including even adolescents with moderate physical activity into this group and thereby diluting the results.

Significantly, prehypertension was more frequently observed among adolescents with stress (adjusted OR = 6.108 [2.953-12.635] P = 0.020). Moussa et al. had observed a significant association of stress with hypertension among undergraduate students.

Furthermore, intake of junk foods had significant association with prehypertension (adjusted OR = 2.141 [1.232-3.722]; P = 0.007]. In a similar study carried out in Bihar, among 5-19 years adolescents, by Kumar et al., hypertension was significantly associated with type of diet (P < 0.001). Several studies conducted in Kerala also had similar associations between junk foods and prehypertension.

Limitations

Our study had some limitations. Classification of hypertension was based on measurement of BP in a single visit. It is recommended that students with BP >95th percentile on first screening should undergo a second screening 1-2 weeks later and then the third screening if BP is noted >95th percentile at the second screening. Due to academic engagements and administrative issues, we could not practice the second and third screening.

CONCLUSION

In our study, the prevalence of prehypertension and hypertension among school children in a semi-urban area is 14.01%. Increasing age, male sex, overweight and obesity, stress, and junk foods were independent risk factors for prehypertension. Hence, it would be logical to advise schools to carry out daily physical education sessions for at least one period of their daily schedule with emphasis on yoga and education on healthy nutritional habits to maintain normal BMI among students. In addition, we recommend screening of school children for high BPs yearly. Special sessions to tackle with stress are warranted in schools.

ACKNOWLEDGMENT

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Comparison of Merits and Demerits of Manual Small Incision Cataract Surgery with Phacoemulsification

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Abstract

Introduction: In developing countries with limited health resources and large populations, cataract extraction should comprise the following features: Inexpensive and affordable, early rehabilitation to avoid economic loss, near emmetropic visual status postoperatively, minimal complications, minimal wound suturing, faster (for increased surgical coverage), and safe and effective.

Aim: The aim is to study the safety, reliability, and effectiveness of phacoemulsification and manual small incision cataract surgery (MSICS) techniques.

Materials and Methods: This observational comparison study was conducted in 100 patients with cataract. The study groups were randomly allocated into 2 groups, 1 group underwent MSICS and the other group underwent phacoemulsification with posterior chamber intraocular lens. On the 40th post-operative day and 6th month of post-operative follow-up visit, uncorrected visual acuity (VA), best-corrected VA, and corneal astigmatism by keratometry were studied in both groups.

Results: In the present study, VA outcome of both groups was comparably the same. Mean induced astigmatism after cataract surgery and intra- and post-operative complications such as corneal edema and posterior capsular rupture were found to be slightly higher in MSICS than in phacoemulsification group.

Conclusion: To conclude, both surgical procedures are equally safe and effective in skilled hands.

Key words: Best-corrected visual acuity, Manual small incision cataract surgery, Uncorrected visual acuity

INTRODUCTION

Cataract remains the leading cause of avoidable blindness worldwide. In most developing countries, blindness is associated with considerable economic and social implications, which impacts on the current difficulties of vulnerable populations who reside in underserved areas. Over the past decade, manual small incision cataract surgery (MSICS) has become an established surgical alternative to phacoemulsification. Numerous randomized controlled clinical trials have proved both techniques to be safe and effective for rehabilitating the vision of cataract patients. The advantages of both techniques are sutureless, require small incisions, and result in faster visual rehabilitation. Studies on the efficacy and safety of MSICS for cataract surgery show that, being a variant of extracapsular cataract surgery, MSICS also has similar intra- and post-operative complications. The considerable handling inside the anterior chamber during nucleus delivery increases the chances of iris injury, striate keratitis, and posterior capsular rupture. Proper care is needed for scleral tunnel construction. Post-operative inflammation and corneal edema are rare if surgeons have the expertise and patience. The final astigmatism is less than that in the extracapsular cataract surgery and almost comparable to that in phacoemulsification. Endothelial cell loss and intra- and
post-operative complications are relatively similar between procedures. In phacoemulsification, an ultrasonic probe is used to emulsify the cataractous crystalline lens, and the debris is aspirated with high vacuum through 3.2 mm wound. In MSICS, the entire crystalline lens is removed through a self-sealing scleral tunnel incision (5-7 mm) and rigid intraocular lens (IOL) implanted.

**Aim**
The aim is to study the safety, reliability, and effectiveness of phacoemulsification and MSICS surgical techniques.

**MATERIALS AND METHODS**

The present study was a randomized prospective study of comparing two cataract extraction procedures. A total of 100 patients with cataract were randomly selected for this study. Inclusion criteria: All patients between 35 and 70 years, normal anterior chamber depth, and adequate pupillary dilatation. Exclusion criteria: Patients with Grade IV cataract, traumatic cataract, subluxated nucleus, complicated cataract, and corneal disorders. After completing pre-operative evaluation, the study groups were randomly allocated into 2 groups, 1 group underwent MSICS and the other group underwent phacoemulsification with posterior chamber IOL (PCIOL). On the 40th post-operative day, uncorrected visual acuity (UCVA), best-corrected visual acuity (BCVA), and corneal astigmatism by keratometry were studied in both groups.

**RESULTS**

A total of 100 patients were selected for this study; 40 underwent phacoemulsification with PCIOL and 60 underwent MSICS. In phacoemulsification group, most of the patients were in the age group of <50 years, and in MSICS group, most of the patients were in the age group of 50-60 years (Table 1). In phacoemulsification group, 25 were females and 15 were males. In MSICS group, 30 were females and 30 were males (Table 2).

On the 40th post-operative day, mean surgically induced astigmatism in phacoemulsification group was around 1.100476, and in MSICS group, it was 1.124333. On the 6th month of post-operative follow-up visit, mean astigmatism was 1.1125, whereas in MSICS group, it was 1.333125. It shows that mean induced astigmatism is higher in MSICS than in phacoemulsification group. Intraoperative complications were around 4.4% in phacoemulsification group and 10% in MSICS group. All patients in both groups had IOL implanted.

**DISCUSSION**

The phacoemulsification group had most number of patients in the age group of <50 years, and in the MSICS group, most number of patients were in the age group of 51-60 years. There was a female preponderance over male patients (45 versus 55). On the 40th day post-operative follow-up visit, 92 out of 96 patients had visual acuity (VA) ≥6/18 and the other 4 had deteriorated vision. On the 6th month of post-operative follow-up visit, 50 out of 52 patients had VA ≥6/12 and the other 2 had deteriorated vision. VA outcome of two surgical groups was comparatively the same which is comparable to that of Balent et al.’s study. Induced astigmatism in the 40th day and 6th month follow-up was comparatively less in phacoemulsification (Tables 3 and 4). In the phacoemulsification group, 2 cases out of 40 had intraoperative complications, and in the manual phacoemulsification group, 6 out of 60 cases had intra- and post-operative complications in the form of corneal edema, posterior capsular rent, and zonular dialysis. Hence, in this study, phacoemulsification group produced

| Table 1: Distribution of the study patients according to age group |
|-------------------|-------------------|
| Age               | Phacoemulsification | Manual phacoemulsification |
| <50               | 25                | 10                   |
| 51-60             | 10                | 30                   |
| >60               | 5                 | 20                   |
| Total             | 40                | 60                   |

| Table 2: Distribution of the study patients according to gender |
|-------------------|-------------------|
| Sex               | Phacoemulsification | Manual phacoemulsification |
| Male              | 15                | 30                   |
| Female            | 25                | 30                   |

| Table 3: Distribution of VA after 40-days follow-up |
|-----------------|-----------------|
| Vision          | Phacoemulsification | MSICS |
| 6/6-6/9         | 30               | 46     |
| 6/12-6/18       | 2                | 10     |
| 6/24-6/36       | 2                | -      |
| 6/60            | 2                | 2      |
| <6/60           | -                | 2      |

MSICS: Manual small incision cataract surgery, VA: Visual acuity

| Table 4: Distribution of VA after 6-month follow-up |
|-----------------|-----------------|
| Vision          | Phacoemulsification | MSICS |
| 6/6-6/9         | 17               | 27     |
| 6/12-6/18       | 2                | 3      |
| 6/24-6/36       | 1                | -      |
| 6/60            | -                | 2      |
| <6/60           | -                | 2      |

MSICS: Manual small incision cataract surgery, VA: Visual acuity
fewer complications than the MSICS group which is slightly varying from that of Gogate et al.’s study which states that there was no difference in intraoperative complications among the both surgical techniques. Despite lower post-operative astigmatism after phacoemulsification, the UVA of these patients was not significantly better. Notably, the increased astigmatism in small incision cataract surgery (SICS) in one series from Miraj, India, was responsible for better UCVA compared to phacoemulsification. Although the lack of post-operative astigmatism improved distance UCVA in phacoemulsification patients, it was associated with impaired UCVA at near. The unaided near vision was important even in illiterate, rural communities for daily activities and for differentiating currency and not just for reading and writing. Hence, astigmatism is an issue in differentiating the two techniques; it does not seem to have much impact on functional vision. The comparable results in UCVA and BCVA, intra- and post-operative complications, and endothelial cell loss make SICS an equivalent technique to phacoemulsification. The smaller incision size during phacoemulsification resulted in statistically lower post-operative astigmatism. However, this did not translate into a clinically significant difference in UCVA. 6/18 is considered to be normal vision by the WHO for most tasks, and 6/9 is the international driving license standard in many countries. Normal vision (6/18) post-operatively (UCVA and BCVA) was reported in relatively equivalent number of SICS and phacoemulsification patients. Against the rule, myopic astigmatism helped more patients achieve better UCVA at near after SICS. SICS was almost half the cost of phacoemulsification with easier learning curves. The duration of surgery was also lower. In a limited resource setting with large number of beneficiaries awaiting cataract surgery/backlog of cataract blind, MSICS is the technique of choice over phacoemulsification. With MSICS, the expenses are vastly reduced as compared to considerable expenses in acquiring and maintaining phacoemulsification machine. There is no need to spend on consumable items such as the phacoemulsification tip, sleeves, tubing, and probe. Further, in SICS, always polymethylmethacrylate IOLs are used which are much cheaper than foldable IOLs. MSICS and phacoemulsification have similar clinical efficacy, but MSICS costs less.

**CONCLUSION**

Both techniques achieved excellent visual outcomes with low complication rates. Phacoemulsification group produced slightly less mean induced astigmatism. In this study, visual outcomes were comparably same in phacoemulsification and MSICS groups. Both are equally safe and effective in skilled hands to acquire better visual outcome. Since MSICS is significantly faster, less expensive, and less technology dependent than phacoemulsification, it may be a more appropriate technique in eyes with mature cataract in government setups.

**REFERENCES**


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Prevalence of Oral Lesions and Measurement of Salivary pH in the Different Trimesters of Pregnancy

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Abstract
Introduction: Pregnancy is the physiological condition, in which hormonal changes will predispose for salivary changes and many oral problems such as gingival, periodontal problems, mucosal ulcers, increased melanin pigmentation, and fissured tongue.

Aims and Objectives: To assess the prevalence of oral lesions correlating with the measurement of salivary pH during different trimesters of pregnancy.

Methods: Screening was done in the Obstetrics and Gynecology Department of K.A.P.V Medical College and Hospital, Trichy. Screening comprised 40 patients in each trimester and 40 in the control group. The pH of each sample was determined using digital pH meter.

Results: All parameters assessing the dental health progressively increased from the control group through the 1st and 2nd trimester groups to the 3rd trimester groups, but mean salivary pH progressively decreased from the control group through the 3rd and 2nd trimester groups to the 1st trimester groups.

Conclusion: Salivary pH plays a major role in the occurrence of oral lesions during different trimesters of pregnancy. This study reinforces the need for specific oral hygiene (OHI) practices and the need for educating the pregnant patients for the improvement of OHI.

Key words: 1st, 2nd, and 3rd Trimesters, Mucosal lesions, Oral hygiene status, Salivary pH

INTRODUCTION
Pregnancy is the physiological condition, in which hormonal changes will predispose for salivary changes and many oral problems such as gingival, periodontal problems, mucosal ulcers, increased melanin pigmentation, and fissured tongue.

Many studies have been conducted so far based on the occurrence of oral lesions and the correlation to the dental health status in pregnant women.1-5 However, there is a scarcity in studies correlating dental status within different trimesters of pregnancy. Therefore, this study was undertaken to assess the prevalence of oral lesions and measurement of salivary pH in different trimesters of pregnancy and to correlate the changes in oral cavity during different trimesters of pregnancy such as dental caries, gingival, and periodontal inflammation with changes in salivary pH.

METHODS
The study group comprised a total of 160 members comprising 40 patients in each trimester ranging from 18-35 years old pregnant women who attended the Obstetrics and Gynecology Department of K.A.P.V Medical Hospital, Trichy, Tamil Nadu. The patients were grouped as below:

Group I - 1st trimester
Group II - 2nd trimester
Group III - 3rd trimester.
The control group (Group IV) comprised 40 nonpregnant women in the same age group. Saliva samples were collected from each patient at least 1 h after breakfast, which would yield unstimulated saliva. They were instructed to allow saliva to flow into the test tubes provided. In all, 8-10 ml of sample was collected for each participant. The pH of each sample was determined within first half an hour after collection using digital pH meter. The data were systematically tabulated and subjected to statistical analysis (Table 1). Statistical correlation among all parameters within the 1st, 2nd, and 3rd trimester group and control group was determined using Pearson’s coefficient correlation. Chi-square test was used to determine differences in the prevalence of oral mucosal lesions between 1st, 2nd, and 3rd trimester groups.

Intraoral examination was carried out to allow a thorough evaluation of individual tooth structures and soft tissues of lip buccal mucosa, palate, alveolar mucosa, and gingiva. The dental status was evaluated based on oral hygiene (OHI); gingival index; decayed, missing, and filled teeth (DMFT); and periodontal index.

**OHI Index**
The combined debris index and calculus index were recorded and included the examination of the tooth numbers are 11, 16, 26 (labial surfaces) and 31, 46, 36 (lingual surfaces) were examined. It was examined by running the probe along the tooth surfaces. The soft tissue deposits and supragingival and the subgingival calculus were examined. The results were tabulated and mean values were calculated (Table 2).

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<th>16 (buccal surface)</th>
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<td>46 (lingual surface)</td>
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OHI = Debris index + Calculus index (the total of U/L buccal scores + total of U/L lingual scores).

**Gingival Index**
The gingival bleeding was assessed by probing gently along the walls of soft tissue of gingival sulcus and looking for any changes in consistency of gingiva and the tendency for active bleeding. The grading was done as noted below:
- 0 - Normal
- 0.1-1 - Mild gingivitis, slight change in color
- 1.1-2 - Moderate gingivitis, glazing, redness, bleeding on probing
- 2.1-3 - Severe gingivitis, marked redness and hypertrophy, ulceration, spontaneous bleeding.

**DMFT**
In-field examination of individuals using probe and mouth mirror to count the decayed, missing (due to caries), and restored teeth and colored in the chat as below:

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This index is represented using red, black, and green colors, in which red indicates missing teeth, black indicates decayed teeth, and green indicates filled teeth.

**Periodontal Index**
The gingival sulcus was probed with a WHO probe. The sulcus depth, presence of calculus, and bleeding were noted, and the results were recorded in community periodontal index of treatment needs index.
- 0 - No periodontal disease
- 1 - Bleeding on probing
- 2 - Calculus with plaque seen by probing
- 3 - Pathological pocket 4-5 mm
- 4 - Pathological pocket 6 mm or more than.

**Mucosal Lesions**
Mucosal lesions prevalent in pregnant women are gingivitis, fissured tongue, periapical abscess, pyogenic granuloma (pregnancy tumor), frictional keratosis, lichen planus, candidiasis, oral submucous fibrosis, leukoplakia, pemphigus vulgaris, etc.

The oral mucosal surfaces including gingiva, alveolar mucosa, buccal mucosa, vestibular mucosa, palate, and tongue mucosa were thoroughly examined for the presence of any of the above-mentioned lesions.

**RESULTS**
The results of the study were tabulated in Tables 1 and 2 and graphically represented in Figures 1-3.

Salivary pH for each individual involved in the study was recorded using digital pH meter. The results were collected, and mean value was calculated and tabulated (Table 1). The results show that the pH recorded was lowest in the 1st trimester (5.5 - acidic) and gradually increased through the 2nd and 3rd trimester to attain a maximum of 6.5 in the 3rd trimester. However, this value was acidic when compared to the non-pregnant group who showed a basic pH of 7.5.

Scores for all parameters assessing the dental health progressively increased from the control group through the 1st and 2nd trimester groups to the 3rd trimester groups, but mean salivary pH progressively decreased from the control group through the 1st and 2nd trimester groups to the 3rd trimester groups.
Pearson’s correlation coefficient measuring the strength and the linear relationship between the dental health status and salivary pH shows a strong positive relation between the worsening of the OHI, gingival, and periodontal status of patients and the decrease in salivary pH.

Out of 120 pregnant women, 47 had mucosal lesions. No mucosal lesions were found in the remaining 73 pregnant women. Mucosal lesions were seen in 7 patients in 1st trimester, 20 patients in 2nd trimester, and 20 patients in 3rd trimester. No oral lesions were observed in control group. The occurrence of pregnancy tumor and periapical abscess was predominant in 3rd trimester group. The incidence of gingival inflammation occurred mostly in 2nd trimester and had an almost equal incidence in the 3rd trimester. The difference in the oral mucosal lesions’ prevalence between the 2nd and 3rd trimester was not comparable, as the prevalence of mucosal lesion was similar in these 2 groups. In the 3rd trimester group, fissured tongue occurred the most.

DISCUSSION

Pregnancy is the physiological condition, in which hormonal changes occur during different trimesters of pregnancy. These changes also have far-reaching systemic effects that extend beyond the reproductive system.

This study was designed to assess the occurrence of oral lesions and changes in salivary pH in different trimesters of pregnancy. Some of the most frequent and important pathological conditions of the oral cavity are strongly dependent on salivary pH changes. In spite of determining the changes in salivary pH, the study also assessed the decayed tooth, inflammation of gingiva, periodontium, access, and fissured tongue. The participants’ age ranged from 18 to 35 years old.

Saliva maintains the pH of the mouth. Saliva is supersaturated with various ions. These ions act as a buffer, keeping the acidity of the mouth within a certain range, typically pH 6.2-7.4. Decreased salivary pH in pregnant women has been recorded since there is an increase in dental plaque, cariogenic microflora resulting in increased acid secretion. Dietary changes in early pregnancy, such as regular consumption of sugary snacks and drinks to satisfy cravings or to prevent nausea, may cause a decrease in salivary pH. Decreased oral care in pregnant women leads to gingivitis and periodontitis. Buffering capacity of saliva mainly distributed by bicarbonates. Since the level of bicarbonate decreases, salivary pH gets decreased during pregnancy. Regular episodes of vomiting induce cariogenic bacteria; thus, there is a decrease in salivary pH.
Mucosal lesions are benign lesions, not premalignant. In our study, oral mucosal lesions were seen predominantly in pregnant women during 2nd and 3rd trimester groups when compared to the non-pregnant women. However, the possible factors are (a) local irritants such as dental plaque, (b) effects of hormones on gingival vasculature, (c) subgingival microbiota, and (d) local immune system during pregnancy. Another contrary study given by Vittek et al. found that significantly higher mean gingival score predominantly seen in women in 3rd trimester group.

OHI status progressively decreased from 1st to 3rd trimesters due to a decrease in OHI practice. Similar results are given by Jain and Kaur in their study in the year 2015 who suggested that OHI in pregnant women was found to deteriorate progressively and gradually from 1st to 2nd to 3rd trimester groups.

Periodontal abscess is a collection of pus, usually caused by an infection that has spread from a tooth to the surrounding tissues. In our study, periodontal abscess was predominately seen in 3rd trimester group. Pregnancy tumor is one of the inflammatory hyperplasias is seen in oral cavity. In our study, pregnancy tumor was predominant during 3rd trimester in pregnancy. Nevertheless, in the study by Sarifakioğlu, there are no reported cases of pregnancy tumor. Lichen planus is a common inflammatory disease involving skin and mucous membranes. It is a chronic recurrent rash of unknown cause that is due to inflammation of skin and mucous membranes. Oral thrush is mainly due to the fungus Candida albicans which accumulates in mouth. Leukoplakia is a predominantly white lesion of oral mucosa which cannot be characterized as any other definable lesion.

Higher incidence of caries in pregnant women was seen than in non-pregnant women. This could be due to increased levels of Streptococcus and Lactobacillus are found in 3rd trimester. Since decrease in OHI practice during pregnancy was observed, there is decrease in salivary pH which results in increase in occurrence of dental caries. Decreased OHI practice during pregnancy leads to poor periodontal status because of bacterial accumulation. In other study, Lenander-Lumikari and Loimaranta concluded that decreased concentration of salivary buffer (carbonic anhydrase enzyme) has been seen to lead to increase in the prevalence of dental caries. Similarly, a higher incidence of caries in pregnant women than in non-pregnant women has been seen in different studies.

CONCLUSION

The present study was undertaken to determine the changes occurring in oral cavity during different trimesters of pregnancy. The study correlated the changes against non-pregnant women. It can be concluded that salivary pH decreased in 1st trimester and the acidity of saliva progressively reduced through the 2nd and 3rd trimester. Furthermore, changes were noted in the OHI, alterations in oral structures of gingival and periodontium throughout pregnancy. Mucosal lesions such as fissured tongue and pregnancy tumor were more prevalent in 3rd trimester of pregnancy. A further correlation can be attained between the prevalence of oral lesions and alterations in salivary pH.
This study reinforces the need for specific OHI practices and the need for educating the pregnant patients for the improvement of OHI.

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Source of Support: Nil, Conflict of Interest: None declared.
Comparative Study of Ropivacaine 0.5% and Ropivacaine 0.5% with Dexmedetomidine 50 µg in Ultrasound Guided Supraclavicular Brachial Plexus Block for Upper Limb Orthopedic Surgery

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Abstract

Background and Objectives: The purpose of our study was to evaluate the effect of adding dexmedetomidine 50 µg to ropivacaine 0.5% in ultrasonography guided supraclavicular brachial plexus block. The primary end points were the onset and the duration of sensory and motor block and duration of analgesia.

Methods: A total of 50 American Society of Anesthesiologists (ASA) I and II patients scheduled for elective mid humerus, forearm, hand surgery were divided into two equal groups in a randomized double-blind fashion. In Group R (n = 25), 30 ml of 0.5% ropivacaine + 1 ml saline and in Group RD (n = 25), 30 ml of 0.5% ropivacaine + 1 ml (0.5 ml of dexmedetomidine 50 µg mix with 0.5 ml of saline) were given. Onset time of sensory and motor block, duration of sensory and motor block, and duration of analgesia were recorded.

Results: Demographic parameters were comparable in both groups. Onset time of sensory and motor block were shorter in Group RD than in Group R (P = 0.001). Duration of sensory and motor blockade were longer in Group RD than in Group R (P = 0.001). Duration of analgesia was longer in Group RD than in Group R (P = 0.001). Systolic blood pressure in Group RD at 15, 30, 45, 60, 90, 120, 180, 240, and 300 min was significantly lower than those in Group R (P = 0.001). Diastolic blood pressure in Group RD at 15, 30, 45, 60, 90, 120, 180, 240, and 300 min was significantly lower than those in Group R (P = 0.001). Heart rate in Group RD except basal measurements was significantly lower than those in Group R (P = 0.001).

Conclusions: Dexmedetomidine when added to ropivacaine for brachial plexus block shortens the onset time and prolongs the duration of the block and the duration of post-operative analgesia.

Key words: Dexmedetomidine, Ropivacaine, Supraclavicular brachial plexus block, Ultrasound

INTRODUCTION

Brachial plexus blockade by supraclavicular approach is rapid, complete and predictable anesthesia for mid humerus, forearm and hand surgery. This approach is also known as spinal anesthesia of the upper limb because of its common application for upper limb surgical procedures. The anatomic characteristics are the key factor its high success rate. The compact structure of the plexus is an added advantage to nerve block at these levels. Peripheral nerve blocks provide good operating conditions when it used optimally. They not only provide excellent intraoperative analgesia but also good post-operative analgesia. They cause the least interference with the vital physiological functions of the body, reduction in stress response, systemic analgesia requirements, avoiding polypharmacy, opioid-related side effects and general anesthesia requirements. Regional blocks have traditionally been performed by eliciting paresthesia, anatomical landmarks, and fascia clicks. Serious
complication like pneumothorax occurs due to blind technique because it is mainly dependent on anatomical landmarks. Over the past two decades, neurostimulation was the gold standard technique for nerve identification in regional blocks. However, it does not ensure the required level of nerve block. It also causes damages to the nerve structures by a direct puncture. Ultrasound visualization of anatomical structures facilitates safe methods for regional blocks.\textsuperscript{1,2} This technique enables the anesthetist to secure an optimal needle positioning and to monitor the distribution of local anesthetic in real time. The amount of local anesthetic required for effective nerve block can be minimized by directly monitoring its distribution. Most of the local anesthetic agents developed in the first half of the 20\textsuperscript{th} century (1900-1940) were basically amino ester compounds. They lost their importance due to their shorter duration of action and associated allergic reactions and systemic side effects. This paved the way for synthesis of newer agents, namely, the amino amide compounds such as bupivacaine, levobupivacaine, and ropivacaine. Ropivacaine\textsuperscript{3,4} is considered to be superior over bupivacaine, as it provides more differential block when given via epidural route. Motor block is not preferable during epidural labor and post-operative analgesia. In these situations, ropivacaine offers greater sensory and motor separation. Ropivacaine causes less cardiovascular and central nervous system toxicity than bupivacaine. The decreased systemic toxicity is better when a potential for high concentrations of local anesthetic agents is used in peripheral nerve block and epidural anesthesia. Because of its advantages, ropivacaine may be a better choice to bupivacaine. To prolong the duration of analgesia various drugs has been studied as adjuvants to local anesthetic solution and techniques such as the continuous catheter placement in the brachial plexus have evolved. These adjuvant drugs added to peripheral nerve block are expected to enhance the duration of analgesia without causing any systemic adverse effects and prolonging motor blockade. Novel α-2 adrenergic agent, dexmedetomidine\textsuperscript{5,7} is eight times more selective for α-2 adrenoceptor than clonidine. It has an analgesic, sedative and good cardiovascular stabilizing effect.

Aim
To compare ropivacaine and ropivacaine with dexmedetomidine in ultrasound guidance supraclavicular brachial plexus block scheduled for the upper limb orthopedic surgery.

MATERIALS AND METHODS
After obtaining Institutional Ethics Committee approval, 50 patients belonging to ASA I and II of either sex, aged between 20 and 60 years scheduled for upper arm orthopedic surgeries were included in this study. The patients were randomly assigned using “slips in the box technique” to either of the following groups.

Group R: 25 patients received 30 ml of 0.5% ropivacaine + 1 ml saline.
Group RD: 25 patients received 30 ml of 0.5% ropivacaine +1 ml (1/2 ml of dexametomidine with 1/2 ml of saline).

Inclusion Criteria
ASA I and II, 20-60 years, both sexes, weight 50-70 kg, mid humerus, elbow, forearm and hand surgeries were included.

Exclusion Criteria
Patient refusal, coagulopathy, ASA III and above, H/O severe cardiovascular, pulmonary, kidney, liver disease, neurological, psychiatric, neuromuscular disorder, infection/sepsis/allergy, pneumothorax, and peripheral neuropathy were excluded.

All patients were preoperatively evaluated, clinically examined and proper investigations were done before assessment. Procedures were explained to the patient, and informed consent was obtained. They were assessed with particular attention to any contraindications. Before the procedure, visual analog scale (VAS) on 0-10 cm was clearly explained to the patient.

On arrival of the patient in the operation room, pre-procedure parameters blood pressure, heart rate, and oxygen saturation were recorded and noted. In the opposite limb, an intravenous access was obtained with 18G cannula and Ringer’s lactate was started. The patients were positioned supine with arm placed by the side and the head turned 45\degree to the contralateral side to be blocked. The anesthesiologist stands at the head end of the patient. Under sterile aseptic precautions, in the coronal oblique plane the probe was kept in the supraclavicular fossa. The pulsating hypo echoic subclavian artery was identified. While maintaining the view of the artery the probe was angled until both first rib and the pleura were seen simultaneously to visualize these two structures. Once the artery, rib, pleura, and plexus were simultaneously in view, the aim was to guide the needle inferior to the first rib, medial to the subclavian artery and superior to the nerves. After local skin infiltration, the needle was entered in-plane from lateral plexus was visualized as a group of hypo echoic nodules. The local anesthetic solution was injected after careful aspiration, and spread was seen encircling the trunks. After injecting the local anesthetic, the block was tested for both sensory and motor and was.
compared with the contralateral side. Sensory block was evaluated using 3-point scale by the pin prick method. After injecting the local anesthetic drug, the sensory block was assessed at every minute in the dermatome areas corresponding to median nerve, radial nerve, ulnar nerve and musculocutaneous nerve until the completion of sensory blockade (Table 1).

Evaluation of motor block was done at every minute until complete motor blockade after drug injection. Evaluation of motor block was done by thumb abduction (radial nerve), thumb adduction (ulnar nerve), thumb opposition (median nerve), flexion of the elbow in supination, and pronation of the forearm (musculocutaneous nerve) (Table 2).

Sedation of patient was assessed by the Ramsay sedation scale.

Patients were assessed for duration of analgesia as per VAS. After the surgery, it was monitored every 1 h until the score reaches 5. The rescue analgesia was given with parental use of diclofenac injection when the VAS reaches 5 and the time of the injection was recorded.

All patients are observed for any side effects such as nausea, vomiting, dryness of mouth and complications such as pneumothorax, hematoma, local anesthetic toxicity and post-block neuropathy in the intra and post-operative periods.

The parameters of age, weight, total time taken for surgery, heart rate, blood pressure, oxygen saturation, time taken for sensory and motor blockade, offset time for sensory and motor blockade and total time of analgesia were analyzed by independent \( t \)-test. Chi-square test was used for sex and ASA. A \( P < 0.05 \) was considered statistically significant.

### RESULTS

There were no differences between the two groups with regard to demographic data (age, sex, and weight), ASA grades and duration of surgery (Figure 1).

The mean onset of sensory block was 9.2 min in Group R and 6.8 min in the Group RD, there is statistical significance \( (P < 0.0001) \) (Figure 2).

The mean onset of motor block was 13.12 min in Group R and 9 min in the Group RD, there is statistical significance \( (P < 0.0001) \) (Figure 3).

The mean duration of sensory block was 506.2 min in Group R and 709 min in the Group RD, there is statistical significance \( (P < 0.0001) \) (Figure 4).

The mean duration of motor block was 478.8 min in Group R and 669.2 min in the Group RD, there is statistical significance \( (P < 0.0001) \) (Figure 5).

The mean duration of analgesia was 568.2 min in Group R and 831.8 min in the Group RD, there is statistical significance \( (P < 0.0001) \) (Figure 6).

The mean time of rescue analgesia was 588 min in Group R and 850.4 min in the Group RD, there is statistical significance \( (P < 0.0001) \) (Figure 7).

The mean VAS of the Group R when compared to Group RD at 6, 10, 14, 18, and 24 h was found to be statistically significant (Figure 8).

There is no difference in heart rate in both groups till 10 min. From 15 min Group RD shown drop in the heart rate which all statistically significant (Figure 9).

There is no difference in systolic blood pressure in both groups till 10 min. From 15 min Group RD shown drop in the heart rate which all statistically significant (Figure 10).

There is no difference in diastolic blood pressure in both groups till 10 min. From 15 min Group RD shown drop in the heart rate which all statistically significant (Figure 11).

The mean sedation score of Group R was 1 and the mean sedation score in Group RD was 2.12. The difference was found to be statistically significant (Figure 12).

### Table 1: Grading for sensory blockade

<table>
<thead>
<tr>
<th>Grade</th>
<th>Sensory blockade</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Sharp pin felt</td>
</tr>
<tr>
<td>1</td>
<td>Analgesia, dull sensation</td>
</tr>
<tr>
<td>2</td>
<td>Complete anesthesia, absence of sensation</td>
</tr>
</tbody>
</table>

### Table 2: Grading for motor blockade

<table>
<thead>
<tr>
<th>Grade</th>
<th>Motor blockade</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Full flexion, extension of elbow, wrist and fingers, normal</td>
</tr>
<tr>
<td>1</td>
<td>Decreased motor power, can able to move the fingers only</td>
</tr>
<tr>
<td>2</td>
<td>Inability to move the fingers, complete block</td>
</tr>
</tbody>
</table>
DISCUSSION

Brachial plexus blockade provides an excellent alternative technique to general anesthesia for the upper limb surgical procedures. It not only offers excellent intraoperative pain relief but also good post-operative analgesia. Supravascular technique was chosen for this study because it provides a rapid onset, dense and predictable anesthesia with high success rate. In our study, we used ultrasound guided supravascular blocks. This technique allows the direct visualization of nerves, anatomical structures, avoidance of complication and reduces the dose of local anesthetic agents. Abrahams et al. concluded that ultrasound method improves the quality of blockade when compared to peripheral nerve stimulator for nerve identification. Chan et al. conducted study in 188 patients and demonstrated that axillary brachial plexus block significantly improved the success rate under the guidance of ultrasound with or without nerve stimulation. Hickey et al. studied subclavian perivascular brachial plexus block using 30 ml of 0.5% ropivacaine under elicitation of paresthesia technique for localization of nerve. They found that the peak onset of sensory blockade was 28 min. In this study, the peak onset of sensory blockade was 9.2 min. The difference may be due to difference in technique used for the localization of brachial plexus. They used elicitation of paresthesia for...
localization of nerve plexus, which is not as accurate as the use of ultrasound in our study. Ropivacaine is a long-acting regional anesthetic that is structurally related to bupivacaine. It is a pure S (−) enantiomer, unlike bupivacaine. It developed for the purpose of reducing potential toxicity and improving relative sensory and motor block profiles. Ropivacaine has lower lipid solubility and has produced less central nervous system and cardiac toxicity than bupivacaine for which it is gaining popularity over bupivacaine for peripheral neural blockade when large volumes of local anesthetic are required. Ropivacaine is also used in the chronic pain management. Ropivacaine is as effective as bupivacaine and levobupivacaine when used in peripheral nerve blocks. However, it is less potent than bupivacaine when used in epidural or intrathecal route. Clinically adequate doses of ropivacaine appear to be associated with a lower grade of motor block than bupivacaine.9

Ropivacaine is considered as an important option for regional anesthesia, post-operative pain management and labor analgesia due to the following reasons. (1) Efficacy, (2) lower propensity for motor block, (3) reduced potential for central nervous system toxicity and cardio toxicity. In our study, the mean onset time of sensory and motor was quicker in Group RD. The mean duration of sensory (709 min), motor (669.2 min) in Group RD, whereas in Group R the mean duration of sensory (506 min), motor (478.8 min). The duration of analgesia was extended in ropivacaine dexmedetomidine group than in ropivacaine group. El Saied et al.10 concluded that the adding additives like clonidine (150 µg) to ropivacaine for brachial plexus blockade extends the duration of sensorimotor and that of analgesia without any side effects.
Klein et al.\textsuperscript{11} compared the efficacy of bupivacaine 0.5\%, and different concentration of ropivacaine 0.5\%, ropivacaine 0.75\%. They used 30 ml in each group. They explored that there wasn't any significant difference in time of onset and recovery. On increasing the concentration from 0.5\% to 0.75\% of ropivacaine, it does not show any improvement in the onset or duration of analgesia. In this study, we used 0.5\% of ropivacaine 30 ml which was similar to Klein et al.\textsuperscript{11} study. Post-operative analgesia can be extended by continuous catheter-based technique. But it needs extra time, skill, cost, and catheter-related complications. Pharmacologically active d-isomer of medetomidine is known as dexmedetomidine.\textsuperscript{6} It is more selective toward \(\alpha-2\) adrenoceptor agonist with \(\alpha-2:\alpha-1\) binding selectivity ratio of 1620:1 and decreasing the unwanted side effect of \(\alpha-1\) receptors. High selectivity for \(\alpha-2\) receptors mediates analgesia, sedation, and anxiolysis. Memis et al.\textsuperscript{1} and colleagues first proposed dexmedetomidine, \(\alpha-2\) adrenoceptor agonist when used as an additive agent to local anesthetics with an ability of prolonging the sensory and motor block duration. Esmaoglu et al.\textsuperscript{12} added dexmedetomidine to levobupivacaine for axillary brachial plexus block and showed that it shortens the time taken for onset of sensorimotor block and prolongs the time of blockade and that of post-operative analgesia. A study by Obaya et al.\textsuperscript{15} and colleagues during greater palatine nerve block for cleft palate surgery added an adjuvant dexmedetomidine\textsuperscript{2} to bupivacaine solution. When bupivacaine mixed with dexmedetomidine provided lower pain scores and prolonged analgesia with no negative effects on hemodynamics when compared to bupivacaine alone.

Several animal studies have investigated the analgesic effects of dexmedetomidine as an adjuvant. A study by Brummett et al.\textsuperscript{2} showed that when dexmedetomidine used with bupivacaine, increases the duration of bupivacaine anesthesia and analgesia of sciatic nerve block in rats without any damage to the nerve. The above studies show that selective \(\alpha-2\)-adrenoceptor agonist like clonidine or dexmedetomidine, when added as adjuvant to ropivacaine in different peripheral nerve blocks, potentiates the sensorimotor blockade. The mechanism of action is probably due to activation of \(\alpha-2\) receptors in the locus coeruleus, inhibition of substance P release in the nociceptive pathway (central action) and also by decreasing the norepinephrine release (peripheral action). Adding adjuvant like dexmedetomidine\textsuperscript{9,14} to ropivacaine prolonging the analgesia with one shot block can result in a longer time of post-operative analgesia and can avoid continuous catheterization. The added advantage of conscious sedation, hemodynamic stability and the lack of significant side effects like respiratory depression make dexmedetomidine better choice as an adjuvant for supraclavicular brachial plexus block.\textsuperscript{9,14} None of the patients in Group RD required sedation intraoperatively. They were comfortable throughout the surgery with arousable sedative effect. This is due to partial vascular uptake of the drug and its transport to the central nervous system. As \(\alpha-2\) agonists produce sedation by central action and in the nociceptive pathway at the level of dorsal root neuron causes substance P release inhibition and in the locus coeruleus \(\alpha-2\) adrenoceptor activation. The limited duration of sedation could be explained by the fact that it is highly lipophilic and diffuses faster into the blood vessels by rapid clearance and short half-life. In our study, the highest sedation score was 3. No patient required airway assistance due to sedation. Hemodynamic variables such as heart rate, blood pressure, oxygen saturation were significantly low in Group RD from the 15\textsuperscript{th} min of the onset of blockade. They were stable throughout the surgery. Only 2 patients had heart rate <60/min. But no patient required injection. Atropine or vasopressor support. The hypotension was only mild and corrected with intravenous crystalloids. No complications were observed.

**CONCLUSION**

In conclusion, dexmedetomidine 50 \(\mu\)g when added as an adjuvant to ropivacaine 0.5\% for supraclavicular brachial plexus block, hastens the onset of sensory and motor blockade, and prolongs the duration of sensorimotor blockade and provides a longer pain-free period when compared to ropivacaine alone. The use of ultrasound aids in real-time visualization reduces drug volumes and also reduces complication rates of pneumothorax and intravascular injections.

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A Comparative Study on Sleep SpO$_2$ between Normal and Early Emphysematous Patients

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Abstract

**Background:** Emphysema is one of the disastrous maladies across the globe. The principal causes of this disease are air pollution, toxic gas inhalation, and habitual smoking. Early detection of this condition which principally affects the middle-aged persons might halt the progression of this disease. Hence, this simple study was undertaken to evaluate the practicability of this novel method.

**Materials and Methods:** Using a pulse oximeter, SpO$_2$ was determined in 30 early emphysematous patients of both sexes. They were diagnosed clinically by a competent chest physician and also correlated with computerized pulmonary function tests and chest computed tomography scans. The test (pulse oximetry) was done when the person was sleeping. This was compared with age-matched normal healthy persons whose pulse oximetry was also done during sleep.

**Result and Discussion:** Study showed a significant difference in SpO$_2$ percentage during sleep between normal and early emphysematous persons ($P < 0.05$). Observation showed that this was more intense during rapid eye movement stage of sleep.

**Conclusion:** Since sleep hypoxemia as reflected by simple SpO$_2$ determination is more pronounced in emphysematous patients, it can be used as a simple test for susceptible persons for early detection of emphysema and taking early preventive measures.

**Key words:** Emphysema, Sleep hypoxemia, SpO$_2$

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is now regarded as a global malady of grave concern because of its persistently increasing morbidity and mortality.$^1$ In 2000 alone more than 2.5 million deaths occurred globally because of COPD.$^2$ Furthermore, at the present moment it ranks as the third leading cause of death in the United States.$^3$ This disease is supposed to be the fifth leading disease burden worldwide by the year 2020.$^4$ COPD basically encompasses two distinct clinicopathological entities, viz., emphysema and chronic bronchitis.$^5$ A progressive, persistent airflow obstruction as revealed by progressively increasing forced expiratory volume 1 (FEV$_1$) and FEV$_1$/forced vital capacity ratio, is the hallmark of COPD.$^1$

Although a minor reversible component of airflow obstruction is noted occasionally, but for the most part the airflow obstruction is irreversible in COPD.$^6$ The disease “emphysema” is a pathological diagnosis and is defined as “a state of the lungs in which there is gross alveolar wall destruction with irreversible enlargement of the air spaces distal to the terminal bronchioles and without any evidence of fibrosis.”$^7$$^8$ In COPD airflow obstruction is almost always associated with an abnormal inflammatory response of the lungs to gases or noxious inhaled particles.$^9$ Pathologically speaking, the hallmark of emphysema is the breakdown of yellow elastic tissue of the lungs which is mainly made of the protein “elastin.” Loss of elastin leads to loss of integrity of the alveolar wall. The initial trigger is an insult with noxious particles and gases of which cigarette smoke is the most common factor. However, this happens in an accelerated way in the susceptible persons, that is, those who are genetically predisposed to this
disease. It has long been observed that a severe deficiency of the enzyme α₁-antitrypsin leads to a preponderance of panacinar emphysema. Normally, a full blown emphysema occurs in the sixth or seventh decade of life, and that also mostly in smoking (in 90% of case). However, in persons with severe deficiency of α₁-antitrypsin, emphysema sets by fourth or fifth decade of life. Both a loss of protease-antiprotease balance and oxidative stress are implicated in the etiology of pulmonary emphysema.

It has long been postulated that in the pathophysiology of emphysema, the initial insult begins with the destruction of alveolar walls. However, recently McDonough et al. have challenged this concept, giving a new suggestion that the narrowing and disappearance of the terminal bronchioles precede alveolar destruction and lead to the latter condition, thus giving rise to the occurrence of centrilobular and panlobular emphysema. In their study, 78 patients were investigated with microcomputer tomography to track their alveoli and terminal bronchiolar walls phase wise in different stages of the disease.

During sleep, even in a normal person, there is a decrease in ventilation, tidal volume and chemo-responsiveness to blood CO₂. However, this does not result in hypoxemia, because the drop in PaO₂ occurs on the flat potion of the oxyhemoglobin dissociation curve. However, in emphysema, oxygenation during wakefulness may already be on the steep portion of the oxyhemoglobin dissociation curve, leading to hypoxemia during sleep as tidal volume falls. The most pronounced hypoxemia occurs during the rapid eye movement (REM) stage of sleep because of the generalized muscle hypotonia that accompanies this stage.

Having thought of this affair, the authors decided to measure SpO₂ during the REM stage of sleep in normal and emphysematous patients using a pulse oximeter which is so simple a device that even a nurse can apply it correctly on patients.

**MATERIALS AND METHODS**

**Study Design**
It was an institution-based, observational and cross sectional study.

**Study Setting**
The study was done in the indoor of the General Medicine and Chest Medicine Wards, in MGM Medical College and LSK Hospital, Kishanganj, Bihar, India.

**Time Line**
The study was done between the periods January 01, 2016 and December 31, 2016.

<table>
<thead>
<tr>
<th>Table 1: The mean±SD of percentage SpO₂ (sleep time) in normal and emphysematous populations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
</tr>
<tr>
<td>-------------------------------</td>
</tr>
<tr>
<td>Control</td>
</tr>
<tr>
<td>Early emphysematous patients</td>
</tr>
</tbody>
</table>

**Study Population**
The study was done in normal adult healthy subjects of both sexes (as control) and on patients with proven diagnosis of emphysema but without any other obvious illness. The age limit was 40-60 years.

**Methodology**
After taking permission from the Heads of the Departments of Medicine and Chest Medicine, the Principal, the Director and the Chairman of the Ethical Committee, the study was formally commenced. Formal written consents of all subjects were also taken after explaining the procedures and the purpose of the study.

For each subject through clinical examination was done followed by routine blood testing to exclude any unwanted disease and also plasma α₁-antitrypsin was estimated. Then, digital spirometry was performed in all controls and patients as also routine chest X-ray (posterior-anterior), electrocardiogram and thoracic computed tomography scan. Other relevant tests were done as and when necessary.

In confirmed early emphysematous patients and in controls, sleeping SpO₂ especially during REM stage of sleep was performed by a standard pulse oximeter. The whole data obtained were then analyzed and compared.

**RESULTS**
The results obtained are given in Table 1 and Figure 1.

**DISCUSSION**
Our studies show that as expressed in Table 1 and Figure 1, the emphysematous population has a significantly lower sleep time SpO₂ as compared to that in normal healthy population.

Sleep time hypoxemia is observed in several pulmonary and other disorders. Palma et al. observed in a 2008 publication that there is significant sleep time hypoxemia in hepatopulmonary syndrome (HPS). Furthermore, observations in patients with primary pulmonary
Sleep produces several alterations in respiratory mechanics and gas exchange, including breathing pattern instability, hypoventilation, upper airway obstruction, ventilation-perfusion mismatch, and decreased hypoxic and hypercapnic ventilatory responses. The initial studies focused almost entirely on patients with emphysema as also in healthy subjects for comparison. All patients with "blue bloaters syndrome" bronchitis and emphysema as also in healthy subjects for comparison. All patients with "blue bloaters syndrome" were investigated during sleep in patients with chronic bronchitis and emphysema as also in healthy subjects for comparison. All patients with ‘blue bloaters syndrome’ had episode of sleep transient hypoxemia lasting 1-100 min, during which time their oxygen saturation reduced more than 10% than day time resting stage. On the contrary, patients with “pink puffer syndrome” did not show such hypoxemia nor did the healthy subjects. Hypoxemia episode in their studies also occurred mainly during the REM stage of sleep. It was suggested by these workers that the cause of these hypoxemia episodes resides in a combination of hypoventilation and impaired ventilation/perfusion (V/Q) ratio. It was also suggested that these phenomena might also lead to pulmonary hypertension and secondary polycythemia.

The key drivers of hypoxemia are V/Q mismatch, respiratory muscular hypotonia, exercise, sleep, and chronic emphysema. Since, along with exercise, sleep is also an exaggerating factor, concomitant sleep disorder may place further increased risk of pulmonary as well as secondary cardio-vascular complications.

CONCLUSION

Sleep hypoxemia as reflected by the simple test “pulse oximetry” with the determination of sleep time SpO₂, is found to be quite significant and more pronounced in patients with emphysema as compared to normal subjects. This phenomenon is noticeable even in early emphysematous patients, and therefore this test can be applied for early detection of emphysematous patients. However, further studies on a massive scale might be envisaged to come to a more conclusive evidence.

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Incidence of Dry Eye Syndrome in Patients with Type II Diabetes Mellitus

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Abstract

Background: Keratoconjunctivitis sicca or dry eyes is a multifactorial disorder affects the tear film and ocular surface due to abnormalities in the quality or quantity of the tear film. Though diabetic retinopathy (DR) and diabetic cataracts are well-known complications, dry eye syndrome (DES) is also common in the diabetic population.

Aim: Aim of our study is to know the incidence of dry eyes in diabetes and other systemic factors which affects progression of the disease.

Methods: This is a prospective cohort study conducted in 50 diabetic patients using various tests to diagnose and grade dry eyes. In this study, Schirmer’s test type I and type II, Tear meniscus height, Tear film break up time, Fluorescein stain were used to diagnose and grade dry eyes. Results: DES having 56% incidence, common age group affected is 60 years and above (61%). Hypertension was an important comorbid systemic association found in our study. We concluded that diabetes is the important risk factor for DES.

Conclusion: Examination of the ocular surface and tear function also become part of the routine diabetic ophthalmic assessment and follow-up.

Key words: Diabetes, Dry eyes, Dry eye syndrome

INTRODUCTION

Diabetes mellitus (DM) is a disease which is often followed by microvascular complications, such as nephropathy, neuropathy, and retinopathy. It is one of the main causes of blindness in people aged between 20 and 74. DM has been identified as one of the leading systemic risk factors for dry eye syndrome (DES).

DES is major tear deficiency disorder which causes discomfort, visual disturbances, and tear film instability with potential damage to the ocular surface.¹ DM has been identified as a risk factor for DES and which is further complicated by recurrent epithelial erosions, epithelial defect, and corneal ulcer. The prevalence of DES in diabetes is around 54%.² Hence, it is important to make early diagnoses of this disease.³

Diabetic patients have classic symptoms of dry eye, including irritation, foreign body sensation, burning, itchiness, pain, or redness; autonomic dysfunction may be the mechanism responsible for dry eye in the diabetic patient and aldose reductase, the first enzyme of the sorbitol pathway may also be involved.⁴ Jin et al. showed that Type II diabetic patients have a greater tendency to develop tear dysfunction.⁵

Aim

The aim of this study is to study the incidence of dry eyes in Type II diabetic patients.

MATERIALS AND METHODS

It is a prospective cohort study of 50 patients of diabetes conducted at Tirunelveli Medical College Hospital. In
this study, Schirmer’s test Types I and II, tear meniscus height, tear film breakup time, fluorescein stain were used to diagnose and grade dry eyes. Its severity is classified into mild, moderate, severe, and very severe (level 1-4) according to DEWS dry eye grading system. Duration of diabetes, other associated ocular disorders, and systemic comorbid conditions was also included in this study.

RESULTS

Among 50 patients of Type II diabetes, 38 were females and 12 were males. Among 38 females, 22 had dry eyes and among 12 males, 6 had dry eyes. Females had higher incidence of dry eyes of about 58%. Common age group affected is 60 years and above (Table 1). Out of 28, 14 had mild dry eyes, 10 had moderate dry eyes, and 4 had severe dry eyes. Among 50 patients of diabetes, 5 had diabetic retinopathy (DR) ranging from mild non-proliferative DR (NPDR) to severe NPDR of which 4 had dry eyes, 2 mild, 1 moderate, and 1 severe dry eye. About 13 of 28 dry eye patients had associated systemic hypertension, 4 patients had associated ischemic heart disease, 2 patients had connective tissue disorder rheumatoid arthritis, and 1 had chronic kidney disease (Table 2). Among 12 males, 6 had smoking history of which 5 had dry eyes (Table 3).

DISCUSSION

In our study, among 50 patients of diabetes, 28 (56%) had dry eyes which is comparable with Manaviat et al. study. Female patients (58%) had higher incidence of dry eyes than males (50%). Dry eyes found to be higher in the age group above 60 years. Diabetes affects ocular surface by variety of mechanisms. It causes lacrimal gland dysfunction and tear film dysfunction by abnormal enzymatic activity. It also causes corneal and conjunctival epithelial damage, inducing reduction of the number of goblet cells thus it reduces mucin production. Diabetes associated DES severity further increased by the presence of comorbid conditions like hypertension. The cause of this correlation may be autonomic neuropathy and damage to microvasculature of the lacrimal gland as well as sensorial corneal neuropathy. Effect of smoking was found to be an important risk factor in dry eyes by retarding tear secretion which is similar to Uchino et al. study. Significant associations have been identified between DR and DES. Dry eye symptoms are typically severe in patients with diabetes whose glycemic control is poor. Inflammation and immunity have been shown to play a prominent role in the pathogenesis of DES. Riordan-Eva and Vaughan studied that diabetic patients had lower values of tear secretion and values of tear breakup time test than the control group. If this syndrome is diagnosed at first stage and treated, it would be protected from its complications.

CONCLUSION

As the patients may have corneal hypesthesia might be asymptomatic. Screening, early diagnosis, and treatment of dry eye are essential to avoid ocular surface complications and visual morbidity. Hence, dry eye screening should be a part of the visual assessment of diabetic patients.

REFERENCES

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<p>| Table 1: Distribution of patient’s age |</p>
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<td>50-60</td>
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<p>| Table 2: Distribution of comorbid of study patients |</p>
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<tr>
<td>IHD</td>
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<td>CTD</td>
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<td>HT: Hypertension, IHD: Ischemic heart disease, CTD: Connective tissue disease</td>
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<p>| Table 3: Distribution of smoking history of study patients |</p>
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<td>Non smokers</td>
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Source of Support: Nil, Conflict of Interest: None declared.
Emergency Internal Iliac Artery Ligation in Control of Postpartum Hemorrhage: A Life-saving Procedure

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Abstract

Introduction: Hemorrhage during pregnancy and postpartum hemorrhage (PPH) is one of the leading causes of maternal mortality in developing countries. Although internal iliac artery is a life-saving procedure, it is not commonly performed by obstetricians and gynecologists. In this study, we emphasize the importance of internal iliac artery ligation (IIAL) in intractable pelvic hemorrhage.

Objectives: To find out the utility of emergency IIAL in intractable pelvic hemorrhage.

Materials and Methods: A retrospective study of women undergoing IIAL for PPH or prophylactic IIAL for risk of PPH in a tertiary care hospital, Cuttack between January 2014 and January 2016.

Results: Out of the 45 women who had undergone IIAL 21 patients had atonic PPH, 14 patients had undergone because of traumatic PPH (rupture uterus, lacerations of lower genital tract following vaginal delivery, and broad ligament hematoma), placenta previa (6) and abruptio placentae (4). Hysterectomy was performed in 12 cases. Hysterectomy was mostly required in cases of traumatic PPH rather than non-traumatic PPH. Except 4 deaths, the rest of the patients were treated successfully.

Conclusion: Internal iliac artery is an effective procedure in treatment and prevention of PPH. It is important to know this life-saving procedure as it is more conservative in young women with intractable PPH and gives a chance for preserving fertility.

Key words: Broad ligament hematoma, Internal iliac artery ligation, Intractable postpartum hemorrhage, Tertiary care hospital

INTRODUCTION

Postpartum hemorrhage (PPH) is a major cause of worldwide maternal mortality ranging from 13% in developed countries to 34% in developing countries.¹ When PPH continues despite aggressive medical management early consideration should be given to surgical intervention. The choice of the procedure will depend on the parity of the women and her desire for childbearing, the extent of hemorrhage and most importantly, the experience and judgment of the surgeon.² Internal iliac artery ligation (IIAL) has been advocated as an effective means of controlling intractable PPH and preventing maternal death.² The rationale for this is based on the hemodynamic studies of Burchell,³ which showed that IIAL reduced pelvic blood flow by 49% and pulse pressure by 85%, resulting in venous pressures in the arterial circuit thus promoting hemostasis. However, the reported success rate of IIAL varies from 40% to 100%,⁴ and the procedure averts hysterectomy in only 50% of cases.⁵ This study is aimed at emphasizing the usefulness of IIAL and its role as a life-saving procedure.

MATERIALS AND METHODS

This is a retrospective study conducted from January 2014 to January 2016 in Shri Ramachandra Bhanjia (SCB) Medical College, Cuttack, Odisha which is a tertiary care hospital treating majority of the complicated and high-
risk obstetrical cases. During the study period of 2 years, 45 cases of IIAL were done. Maximum cases were that of atonic PPH (n = 21). The women who had atonic PPH during delivery either vaginally or during cesarean section were treated sequentially with uterine massage, oxytocin infusions, injection 0.2 mg IV mephentermine repeated every 15 min till a maximum of 5 doses (total 1.0 mg), injection carboprost 0.25 mg IM repeated every 15 min till a maximum dose of 2.0 mg and administering tablet misoprostol up to 1000 µg per rectally. When still not controlled by bimanual uterine compression, compression of the aorta and uterine tamponade was tried. Meanwhile, blood transfusion is arranged assessing the approximate blood loss and antibiotics are administered. Then uterine tamponade was tried with Foley’s catheter. When the blood loss was still not controlled, and the uterus remained flabby the patient was shifted to the theater for IIAL. The procedure is usually performed under general anesthesia after providing a central line.

During a cesarean section in cases of placenta previa (n = 6), prophylactic uterine artery ligation was done. However, when there is still bleeding from the placental bed even after applying pressure or hemostatic sutures in the placental bed, IIAL was done. In cases of abruptio placenta (n = 4), all the patients had atonic PPH during cesarean section which did not respond to oxytocics, and hence IIAL was proceeded.

In cases of traumatic PPH due to rupture uterus (n = 10), colporrhaxis (n = 2), and broad ligament hematoma (n = 2), IIAL was done to salvage the uterus and as a lifesaving measure.

The procedure is usually done under general anesthesia, and the abdomen is opened by midline infraumbilical incision in high risk cases and Pfannenstiel incision in cesarean section. The uterus was evantrated and bowels were packed. Transperitoneal approach was used for IIAL. A vertical incision on the peritoneum is made, and the retroperitoneal space is entered bluntly with finger dissection in such a way that the ureter remains attached to the medial fold of peritoneum and away from the vessels. The internal iliac artery is traced downward. Then, the fascia over the artery is dissected. A right-angled clamp is passed from lateral to medial about 3-4 cm away from the division beneath the internal iliac artery with delayed absorbable sutures. The first suture is placed below the origin of the posterior branch of internal iliac artery. A second suture is placed below the first to avoid post-operative recanalization. The femoral artery is palpated for pulsations, and perfect hemostasis is secured. An intraperitoneal drain is given. If the bleeding is still not controlled decision for hysterectomy is taken. Repair of the rupture, colporrhaxis and vaginal lacerations are done following IIAL.

RESULTS

About 45 cases of IIAL were done over a period of 2 years in SCB Medical College, Cuttack. Nearly 71.1% (n = 32) of the cases were referred from other hospitals. Atonic PPH was the most common indication for IIAL (46.6%), followed by traumatic PPH (31.1%), then placenta previa and abruptio placenta (Table 1).

Out of the 14 cases with traumatic PPH, 10 women had rupture uterus. IIAL was performed after assessing the stability of the patient and whether the rupture can be repaired. Hysterectomy was done in 7 women, and the repair of the uterus was done in remaining 3 women. However, performing IIAL helped reducing the amount of blood lost. With experienced surgeon, the time required for IIAL does not exceed 5-7 min after opening the abdomen. 2 women had colporrhaxis and vaginal lacerations which were repaired after controlling the bleeding by IIAL. IIAL was done even after hysterectomy, and uterine repair in cases of broad ligament hematoma as the bleeding vessel had retracted into the hematoma.

Hysterectomy was done in 4 women who had atonic PPH. None of the women required relaparotomy after the initial procedure. Out of the 45 women for whom IIAL was done 12 women underwent hysterectomy, so the uterine salvage rate was 73.4%. Among 10 cases of rupture uterus, hysterectomy was performed in 7 cases giving a uterine salvage rate of 30% (Table 2). Prophylactic IIAL was done

<table>
<thead>
<tr>
<th>Table 1: Indications for IIAL</th>
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<tbody>
<tr>
<td>Indication</td>
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<tr>
<td>Uterine atony</td>
</tr>
<tr>
<td>Placenta previa</td>
</tr>
<tr>
<td>Abruptio placenta</td>
</tr>
<tr>
<td>Rupture uterus</td>
</tr>
<tr>
<td>Lower genital tract injury</td>
</tr>
<tr>
<td>Broad ligament hematoma</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2: Uterine salvage rate and hysterectomy in women undergoing IIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indication</td>
</tr>
<tr>
<td>Uterine atony</td>
</tr>
<tr>
<td>Rupture uterus</td>
</tr>
<tr>
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</tr>
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<td>Lower genital tract injury</td>
</tr>
<tr>
<td>Broad ligament hematoma</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>
in 16 cases where none of the women needed hysterectomy. 31 women with non-traumatic PPH who underwent IIAL had a uterine salvage rate of 87.09% where hysterectomy was performed in 4 women.

Complications like injury to external iliac vein or internal iliac vein did not occur intraoperatively. Bladder atony or ischemia of the gluteal muscles did not occur in any of the cases followed up to a 6 weeks post-operative period. There were four deaths of which one died because of HELLP syndrome on post-operative day six and three because of hepatorenal dysfunction and sepsis.

DISCUSSION

Bilateral IIAL is a life-saving method which every pelvic surgeon should know to control obstetrical hemorrhage to salvage the uterus. Ligation of internal iliac artery was first performed by Sir Kelly in 1893 in control of hemorrhage during hysterectomy for uterine carcinoma. The procedure was later introduced by Mengert et al. in 1969 and extensively investigated by Burchell in 1968. Pelvis is highly vascular during pregnancy. Obstetric hemorrhage management poses a real threat to the managing obstetrician. Problems like poor exposure/tissue friability/retraction of vessels may be encountered in isolation and ligation of bleeding vessels during the management of PPH or operative hemorrhage. This leads to failure of the conventional methods to control hemorrhage. Hence bilateral/unilateral IIAL may be the procedure of choice.

Uterine artery ligation is a promising technique in the management of PPH as occlusion of uterine artery reduces 90% of the blood flow. It is useful in uterine atony but in uterine trauma, when the avulsed uterine artery retracts into the broad ligament forming hematoma, it is difficult to do the uterine artery ligation and salvage the uterus. IIAL in such situations is helpful as the pressure and flow of circulation decrease distal to the ligation and readily enabling one to locate the bleeder and ligate it securely. Similarly, in cases of deep fornical tears and hematomas, uterine artery ligation or even hysterectomy does not stop the hemorrhage. In such cases, blood loss could be arrested after IIAL as vaginal artery is a direct branch of anterior division of internal iliac artery.

In complete placenta previa, the placental site receives a significant proportion of its arterial supply from descending cervical and vaginal arteries. These arteries continue to perfuse the lower segment even after uterine artery ligation, which fails to control hemorrhage. In these circumstances, IIAL is more effective by diminishing blood flow in the uterine, cervical, and vaginal vessels. This technique of stepwise devascularization of uterus which includes bilateral uterine and ovarian artery ligation is effective in decreasing the blood loss, but uterine ischemia followed by synechiae formation, premature ovarian failure, and secondary amenorrhea has been reported subsequent to this procedure.

Angiographically directed arterial embolization has also been reported to be very effective in controlling hemorrhage, but this modern facility is not available in most of our country. We were able to control the hemorrhage in all 45 cases. However, even when the uterus is preserved, ligation of these arteries does not hamper future reproductive function. Wagaarachchi and Fernando observed future pregnancy in 50% of the cases following bilateral ligation of internal iliac artery.

In this study, we have analyzed 45 cases of IIAL over a period of 2 years with a uterine salvage rate of 73.4%. Bangal et al. had done an analysis of 54 cases over a period of 15 years in a tertiary care center, Loni. Mukherjee et al. performed 36 cases of IIAL with a success rate of 83.3% in 6 years. Joshi et al. did a study on 110 women who had undergone bilateral IIAL over a period of 13 years with a uterine salvage rate of 60.7%.

CONCLUSION

Bilateral IIAL is an effective, safe and fast method to control obstetrical hemorrhage. With proper training and experience the procedure hardly takes 5-7 min and it is an efficient technique for uterine salvage. Hence, exposure to this technique is a must for all pelvic surgeons in the coming days.

REFERENCES


Source of Support: Nil, Conflict of Interest: None declared.
Limited Role of Platelet Transfusion in Dengue Management and the Value of Reticulocyte Production Index as a Measure of Clinical Improvement

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Abstract

Introduction: Dengue hemorrhagic fever is a painful, debilitating mosquito-borne disease caused by one of the four closely related dengue viruses. These viruses are related the viruses that cause West Nile infection and yellow fever. An estimated 390 million infections occur worldwide with about 96 million resulting in illness. Dengue is characterized by fall in platelet count and rise in the hematocrits. This could be due to increase in plasma capillary permeability. If the platelet count falls critically low (<10,000/cumm), the physicians opt to go for fresh platelet transfusion even if it’s signs such as subcutaneous petechial hemorrhages are absent. One of the biggest challenges that treating physicians face today in the treatment of dengue fever is, have the ability to tell if the patient’s bone marrow is adequately healthy enough to regenerate the depleted blood platelet elements.

Methods: This was an open-labeled observational study to show that platelet transfusion has a limited role in determining the clinical outcome in a patient suffering from dengue. This was an open-labeled observational study conducted during the period of April-September 2016 on NS1 antigen-positive patients with high-grade fever (103°-104° F). Comparison was made between the hemoglobin, hematocrits, and platelet counts of patients when they first arrived, and later, comparison was made between the platelet counts and reticulocyte production indices (RPIs) of the patients on 3 consecutive days after the treatment was complete and the patients were afebrile.

Results: It was concluded that on day 1 after becoming afebrile, platelet count 35,000-40,000/cu were in 10 patients (9.26%), platelet count 30,000-35,000/cu in 42 patients (38.89%), and platelet count 25,000-30,000/cu in 56 patients (51.85%). On day 2 after becoming afebrile, platelet count 35,000-40,000/cu were in 8 patients (7.41%), platelet count 30,000-35,000/cu in 36 patients (33.33%), and platelet count 25,000-30,000/cu in 64 patients (59.26%). On day 3 after becoming afebrile, platelet count 35,000-40,000/cu were in 56 patients (51.85%), platelet count 30,000-35,000/cu in 42 patients (25.93%), and platelet count 25,000-30,000/cu in 24 patients (22.22%). The RPI of the same patients on same occasion that on the day 1, RPI 2.5-3.5 in 11 patients (10.19%), RPI 3.5-4.5 in 74 patients (68.52%), RPI 4.5-5.5 in 22 patients (20.37%), and RPI >5.5 in 1 patient (0.93%). On the day 2 after being afebrile, RPI 2.5-3.5 in 2 patients (1.85%), RPI 3.5-4.5 in 83 patients (76.85%), RPI 4.5-5.5 in 21 patients (19.44%), and RPI >5.5 in 2 patients (1.85%), and on the day 3, RPI 2.5-3.5 in 0 patient (0.00%), RPI 3.5-4.5 in 92 patients (85.19%), RPI 4.5-5.5 in 14 patients (12.96%), and RPI >5.5 in 2 patients (1.85%).

Conclusion: The study showed that there was no significant improvement in the clinical outcome of patients who received platelet transfusion during the course of treatment. The RPIs of the patients became high even before the rise in platelet counts was observed in the recovering afebrile patients. It could be used as an inexpensive surrogate marker for assessing the recovery of the patient after the fever subsides.

Key words: Dengue, Platelet transfusion, Reticulocyte production index, Thrombocytopenia

INTRODUCTION

Dengue hemorrhagic fever is a painful, debilitating mosquito-borne disease caused by one of the four closely related dengue viruses. These viruses are related the viruses that cause West Nile infection and yellow fever. An estimated 390 million infections occur worldwide with
about 96 million resulting in illness. Most cases occur in tropical areas of the world with the greatest risk occurring in the Indian subcontinent and South East Asia. Dengue fever endemic to the city of Surat in Gujarat.

Dengue is characterized by fall in platelet count (thrombocytopenia), leukopenia, and rise in the hematocrits. This could be due to increase in plasma capillary permeability. If the platelet count falls critically low (<10,000/cumm), the physicians opt to go for fresh platelet transfusion even if it’s signs such as subcutaneous petechial hemorrhages are absent.

One of the biggest challenges that treating physicians face today in the treatment of dengue fever is, have the ability to tell if the patient’s bone marrow is adequately healthy enough to regenerate the depleted blood platelet elements. On discharge, the study of reticulocyte production index (RPI) could be used as a potential surrogate marker to indicate sufficient bone marrow regenerative capacity. This would then reassure the treating physician that the platelet count would come back to normal, post-discharge. This would also ensure that the patient would not go into complete bone marrow failure.

In this study, we investigate the effect of platelet transfusion on the clinical outcome of the patients. We also assess the utility of RPI for assessing the improvement of patients who are recovering from dengue and are afebrile. The study that was conducted also had the scope to decrease the duration of hospitalization and prevent any exposure to unwanted nosocomial infections. In addition, stored or processed blood products are generally far from a high standard and pose a substantial risk of transfusion reactions and transmission of infectious diseases.

**METHODS**

This was an open-labeled observational study. Samples were collected from various hospitals and nursing homes in Surat and processed at Tejas Clinical Laboratory, Surat, during the period of April-September 2016 on NS1 antigen-positive patients with high-grade fever (103°-104°F). 3,112 cases of high-grade fever were reported, out of which 108 tested positive for NS1 dengue antigen.

Platelet counts, hematocrits, and hemoglobin were tested for all patients at the time of diagnosis. All patients were managed by the standard fluid management protocol as mentioned in standard textbooks (Flow Charts 1 and 2).
Inclusion Criteria
2. High-grade fever.
3. NS1 positivity was the inclusion criteria for the study.

Exclusion Criteria
1. Comatose patients.
2. Patients with comorbidities.

The INTERCEPT blood system was deployed rapidly. This demonstrates the utility of the INTERCEPT blood system to facilitate the availability of apheresis-derived pathogen and leukocyte inactivated platelet concentrates while reducing the risks of transfusion-transmitted infections. Hence, their platelet counts and RPI were done on 3 consecutive days after the patients became afebrile and were showing clinical improvement. Most patients became afebrile within 7-10 days. The final readings were taken as the end point for the study.

RESULTS
From the Table 1 and 2, author found that 3112 patients admitted with the history of fever in only 108 patients were NS1 positive, i.e., was 3.47%. Moreover, the patients whose platelets counts were more than 10,000/cu were 103 which was 95.37% while those having platelets more than 10,000/cu were only 5 patients (4.63%).

From Table 3, it was concluded that on day 1 after becoming afebrile, platelet count 35,000-40,000/cu were in 10 patients (9.26%), platelet count 30,000-35,000/cu in 42 patients (38.89%), and platelet count 25,000-30,000/cu in 56 patients (51.85%). On day 2 after becoming afebrile, platelet count 35,000-40,000/cu were in 8 patients (7.41%), platelet count 30,000-35,000/cu in 36 patients (33.33%), and platelet count 25,000-30,000/cu in 64 patients (59.26%). On day 3 after becoming afebrile, platelet count 35,000-40,000/cu were in 56 patients (51.85%), platelet count 30,000-35,000/cu in 42 patients (25.93%), and platelet count 25,000-30,000/cu in 24 patients (22.22%).

Author found the RPI of the same patients on same occasion and draw Table 4 and concluded that on the day 1, RPI 2.5-3.5 in 11 patients (10.19%), RPI 3.5-4.5 in 74 patients (68.52%), RPI 4.5-5.5 in 22 patients (20.37%), and RPI >5.5 in 1 patient (0.93%). On the day 2 after being afebrile, RPI 2.5-3.5 in 2 patients (1.85%), RPI 3.5-4.5 in 83 patients (76.85%), RPI 4.5-5.5 in 21 patients (19.44%), and RPI >5.5 in 2 patients

Flow Chart 2: Management of severe dengue with shock
Table 1: At the time of diagnosis

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Number of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients in which fever present</td>
<td>3112 (100.00)</td>
</tr>
<tr>
<td>NS1 positive patients</td>
<td>108 (3.47)</td>
</tr>
</tbody>
</table>

Table 2: Treatment, the patients, received

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Number of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NS1 positive patients</td>
<td>108 (100.00)</td>
</tr>
<tr>
<td>Patients whose platelet counts were more than</td>
<td></td>
</tr>
<tr>
<td>10,000/cumm</td>
<td>103 (95.37)</td>
</tr>
<tr>
<td>Patients whose platelet counts were less than</td>
<td></td>
</tr>
<tr>
<td>10,000/cumm</td>
<td>5 (4.63)</td>
</tr>
</tbody>
</table>

Table 3: Platelet count of patients on 3 consecutive days after they became afebrile

<table>
<thead>
<tr>
<th>Platelet count</th>
<th>Number of patients (%)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Day 1</td>
</tr>
<tr>
<td>35,000-40,000/cu</td>
<td>10 (9.26)</td>
</tr>
<tr>
<td>30,000-35,000/cu</td>
<td>42 (38.89)</td>
</tr>
<tr>
<td>25,000-30,000/cu</td>
<td>56 (51.85)</td>
</tr>
<tr>
<td></td>
<td>108 (100.00)</td>
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</table>

Table 4: RPI values of the patients during the 3 days mentioned in Table 3

<table>
<thead>
<tr>
<th>RPI</th>
<th>Number of patients (%)</th>
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<tr>
<td></td>
<td>Day 1</td>
</tr>
<tr>
<td>2.5-3.5</td>
<td>11 (10.19)</td>
</tr>
<tr>
<td>3.5-4.5</td>
<td>74 (68.52)</td>
</tr>
<tr>
<td>4.5-5.5</td>
<td>22 (20.37)</td>
</tr>
<tr>
<td>&gt;5.5</td>
<td>1 (0.93)</td>
</tr>
<tr>
<td></td>
<td>108 (100.00)</td>
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</table>

DISCUSSION

The study showed that 3112 patients had fever, but when N1 test was done, only 108 patients were found positive for NS1; it was 3.47% of total cases of fever studied. The study showed that 103 patients recovered from just standard fluid management protocol. Out of these patients, five patients had critically low platelet counts (<10,000/cumm). They still did not have much cutaneous bleeding. These patients received platelet transfusion. Platelet transfusion for the most part is unnecessary for clinical management of a diagnosis of dengue because they may lead to unwanted transfusion-transmitted infection. On the other hand, a fluid and electrolyte management protocol prescribed by the WHO, and standard textbooks are adequate as therapy in these patients.

Despite the falling platelet count in all patients of dengue, we observed that the clinical features of lack of mucocutaneous bleeding served as our biggest clue for not transfusing patients with platelets.

Therefore:

1. Platelets were given only when we saw evidence of clinical bleeding.
2. During the recovery phase, we used RPI as the surrogate marker for improvement in bone marrow function. The results showed that there was a good correlation between the increase in RPI and increase in post-dengue platelet count.

During the recovery phase of dengue, there is often a time period, in which the patient becomes afebrile and the platelet counts become normal. Hence, to understand if the bone marrow starts functioning normally, the best option would be to perform a bone marrow biopsy and study megakaryocytes. However, this method is invasive, painful, and expensive, and it causes immunocompromised patients, susceptible to infections. For this reason, we decided to use RPI which is an equally accurate surrogate marker and is minimally invasive. It also gives a proper indication of the functionality of the bone marrow.

RPI was a good surrogate marker to predict that those patients with an RPI greater than the cutoff criteria indicated a good bone marrow regenerative capacity and reassured the physicians that the platelet count would eventually go upon discharge.

- On day 1 after become afebrile, when platelet counts were low, RPI values had returned to normal for most patients.
- On day 2 after become afebrile, when the platelet counts dropped for many patients, the RPI values were still rising.
- On day 3 after become afebrile, the platelet counts showed improvement for all patients while the RPI values remained high.

While Ahmed et al. had found platelet increment on the 7th day while Francisca et al. observed only by 11 days of disease. Suman et al. had also found that immature platelet fraction is an additional parameter that can be monitored to predict platelet recovery so that prophylactic platelet
transfusion can be deferred and also the hazards associated with it, supporting our study. Prophylactic platelet transfusion in clinically stable dengue fever patients with a platelet counts more than 10,000/cumm is not indicated.\(^7\)

**CONCLUSION**

RPI was measured after the treatment to evaluate the prognosis of the patients when they were afebrile, and their other blood parameters were still low. The study showed that there was no significant improvement in the clinical outcome of patients who received platelet transfusion during the course of treatment.

The RPIs of the patients became high even before the rise in platelet counts was observed in the recovering afebrile patients. It could be used as an inexpensive surrogate marker for assessing the recovery of the patient after the fever subsides.

**REFERENCES**

A Vital Role of Magnetic Resonance Imaging in Pregnancy-related Neurological Complications

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Abstract

Introduction: Any neurological problem occurring during pregnancy has serious complications for both mother and child. Headache remains the most common symptom of intracranial disease, encountered by most of the women during pregnancy and puerperium.

Aim: To evaluate and characterize the various neurological conditions of the central nervous system and pituitary gland that occurs during pregnancy and postpartum period with the help of 1.5 tesla magnetic resonance imaging (MRI).

Place and Duration of Study: The study was conducted in the Department of Radiology, Chettinad Hospital and Research Institute, Chennai from May 2014 to May 2016.

Materials and Methods: A retrospective analysis of all pregnant and postpartum patients presenting with neurological manifestations of the central nervous system and pituitary gland were included in this study. Patients imaged in GE signa1.5Hdxt MRI. The images obtained were subjected for radiological interpretation.

Results: The cases included cerebral venous thrombosis (CVT), posterior reversible encephalopathy syndrome (PRES), eclamptic encephalopathy, ischemic stroke, and less common entities like pituitary apoplexy.

Conclusion: MRI plays a very crucial role in early diagnosis of neurological and pituitary-associated complications in pregnancy and postpartum period. The most common neurological complications which cause increased maternal mortality are eclamptic encephalopathy and CVT. Hence, early imaging can help in early and appropriate management of serious pregnancy-related neurological complications.

Key words: Magnetic resonance imaging, Maternal health, Maternal mortality, Neurological disorder, Pregnancy disorder, Puerperium

INTRODUCTION

Adequate maternal care in the antenatal period and also after delivery can resolve many pregnancy related complications and fetal problems.¹ During this time, physiological and physical changes take place in the woman, to prepare her body for delivery. These changes include coagulation, hemodynamic, and hormonal changes as well as changes in mechanical pressure due to an enlarged uterus. Usually, these changes are not pathologic, but sometimes it leads to various adverse effects. A series of neurological disorders may be encountered during pregnancy and puerperium.² Headache remains the most common symptom encountered due to intracranial disease during the course of pregnancy and the puerperium.³ Thus, the development of acute headache should be taken seriously. Epilepsy, migraine and stroke are the most common neurological diseases which complicate pregnancy. Other nonspecific but occur more often in pregnant women (e.g.: Cerebral infarction, dural venous...
thrombosis, and pituitary apoplexy). Series symptoms of cerebral venous thrombosis (CVT) usually appeared in the first 3 weeks after delivery, women who had home deliveries and poor prenatal care were more often affected. Even when imaging changes are nonspecific, knowledge of those entities associated with pregnancy and awareness of the increased likelihood of certain diseases in pregnancy will allow a more informed differential diagnosis. Magnetic resonance imaging (MRI) has proved to be a boon in the early and accurate diagnosis of pregnancy-related neurologic complications. By knowing the prevalence and spectrum of neurologic complications in pregnancy, appropriate treatment can be initiated in early, thus improving maternal and fetal outcomes.

MATERIALS AND METHODS

The study was a hospital based cross-sectional study, conducted in the Department of Radiology, Chettinad Hospital and Research Institute, Chennai from May 2014 to May 2016.

Clinically suspected cases of neurological disorders of the central nervous system and pituitary gland associated with pregnancy, who were referred to the Department for Radiological evaluation and who had positive imaging findings were taken up for the study. Most common presenting symptoms were headache, vomiting, seizures, altered sensorium, neurological deficits, visual disturbances, and symptoms of pituitary hypofunction. MR sequences along with time of flight (TOF), magnetic resonance angiography (MRA), and magnetic resonance venography (MRV) were done.

Sample Selection

Inclusion criteria

- Neurological manifestations of the central nervous system and pituitary gland are precipitated because of the pregnancy and postpartum state were included.
- Patients of second, third trimester and postpartum were included because most of the disorders occur in this period.

Exclusion criteria

- Claustrophobic patients.
- Neurological disorders not directly related to pregnancy were excluded from the study.
- Patients presenting in the first trimester were not included.

Consent

All authors declare that “written informed consent was obtained from the patient (or other approved parties)” for publication of this case report and accompanying images.

RESULTS

A total number of deliveries in the hospital during the study period was 8400. A total number of antenatal and puerperal patients who presented with neurological symptoms during that period was 150. The cases included eclamptic encephalopathy, CVT, posterior reversible encephalopathy syndrome (PRES), ischemic stroke, subarachnoid hemorrhage (SAH), pituitary apoplexy, and pituitary adenoma (Table 1).

DISCUSSION

In both pregnancy and puerperium, number of pathologic manifestations involves the central nervous system and pituitary gland. The most common presenting complaint of patients in both pregnancy and peripartum phase is headache. History of seizures for the first time in peripartum period causes biggest diagnostic muss. Peripartum seizures contribute significant problems to both maternal morbidity and mortality including their unborn children. The incidence of eclampsia has been dramatically increasing in the worldwide and reported as 2 in 100 to 18 in 1700 pregnancies. Usually, eclampsia may result in PRES.

Some neurologic conditions are related to the physiologic modifications in pregnancy, such as:
- Eclampsia
- Reversible cerebral vasoconstriction syndrome
- Sheehan syndrome.

Some of the cerebrovascular diseases occur more frequently in pregnancy and postpartum women, particularly:
- Cerebral infarction
- Dural venous thrombosis
- Pituitary apoplexy.

Neoplastic Disorders

- Primary intracranial tumors
- Intracranial metastasis.

Few of these conditions may remain subtle and go unnoticed during the pregnancy and postpartum. MRI

<table>
<thead>
<tr>
<th>Table 1: Pregnancy patients affected with Neurological complications</th>
</tr>
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<tbody>
<tr>
<td>Diagnosis</td>
</tr>
<tr>
<td>--------------------------------</td>
</tr>
<tr>
<td>Eclamptic encephalopathy</td>
</tr>
<tr>
<td>Cerebral venous thrombosis</td>
</tr>
<tr>
<td>PRES</td>
</tr>
<tr>
<td>Ischemic stroke</td>
</tr>
<tr>
<td>Subarachnoid hemorrhage</td>
</tr>
<tr>
<td>Pituitary apoplexy</td>
</tr>
<tr>
<td>Pituitary adenoma</td>
</tr>
</tbody>
</table>

PRES: Posterior reversible encephalopathy syndrome
plays an important role in recognition and characterization of these lesions and helps in future management. Additional diagnostic merit of MRI can be performed with the help of MRV with contrast or without contrast using time of flight sequences. MRI is the preferred imaging option in pregnancy. There is no documentation of hazardous fetal effects in humans due to the magnetic field exposure.

**Ischemic stroke**
The most important leading cause of maternal mortality is a stroke. It usually mimic other complications such as eclampsia, so it should be taken into serious consideration whenever neurological deterioration is observed. In pregnant women, the incidence of ischemic stroke is gradually increased by 3 times when compared to non-pregnant women. The risk of stroke in most of the patients is reported in 2 days before delivery and 1 day after delivery. The most commonly reported etiology is cardio embolism. Other risk factors include lupus, blood transfusion, and migraine. Major benefits of MRI are acquired through diffusion-weighted imaging (DWI), with the use of this sequence radiation exposure is eliminated. The risk of ischemic stroke increases with age, particularly after age 35 years. Black women are at a higher risk. The risk of both ischemic infarction, which accounts for 60% of all strokes. There are two types of infarcts:

- **Thrombotic infarcts**
- **Embolic infarcts.**

**Thrombotic infarcts**
Results from hypercoagulable states and thrombosis on top of existing atherosclerotic plaques. Factors leading to hypercoagulability of blood include low levels of inhibitors of the coagulant protein S; elevated levels of inhibitors of protein C; increased levels of fibrinogen, factor VII, factor VIII, and factor X; and an enhanced ability to neutralize heparin. Infarctions typically occur in the major arterial distributions.

**Emboli infarcts**
Results from dissections due to prolonged difficult labor, cardiac valvular disease, and the rare dilated peripartum cardiomyopathy. Watershed infarcts can result from dissections and significant obstetric hemorrhage. Frontal and parietal regions were the most common site of infarcts (Figures 1 and 2).

**Eclamptic encephalopathy**
The most serious complication that occurs in pregnancies is eclampsia, and it accounts for about 10% of the deaths related to pregnancy. Clinically, eclampsia is defined as seizure or coma associated with pregnancy-induced hypertension, and more than 30% of cases are diagnosed postpartum. Antenatal women present with tonic-clonic seizures or coma who have developed pregnancy-induced hypertension. The exact diagnosis is made by the presence of hypertension, proteinuria, and edema along with seizures occurring after 20 weeks of pregnancy. About 70% of patients were diagnosed in antepartum, and more than 90% made after 27 weeks of gestational age. More then 50-75% of patients presents with occipital or frontal headaches that usually precede the attack of seizures, and 20-30% have visual blurring or cortical blindness. The most commonly involved brain regions in eclamptic encephalopathy are parieto-occipital, frontal, temporal, and sometimes even cerebellar hemispheres. In atypical cases even basal ganglia, thalamus and brainstem are involved. The exact mechanism remains unknown. It is likely to be multifactorial, and it causes cytotoxic effects on the vascular endothelium.
leading to increased permeability and vasogenic edema. Cerebral auto regulation impairment eventually leads to disruption of the blood-brain barrier in the posterior circulation. The predilection for the posterior circulation and watershed zones is believed to be related to its sparse vasomotor sympathetic innervation. The most important complication associated with eclampsia is PRES.\textsuperscript{5} Lesions typically show no diffusion restriction. DWI is particularly useful in distinguishing the reversible vasogenic edema from the cytotoxic edema of complete infarction. Catheter angiography typically shows vasospasm in the medium and large cerebral arteries, particularly of the basilar artery. Treatment of eclampsia is supportive, with controlling of seizures and hypertension, as well as maintaining a stable hemodynamic state. Magnesium sulfate is the drug of choice to prevent recurrent convulsions in eclampsia.

**PRES**

Eclampsia is one of the most important causes of PRES.\textsuperscript{5} This condition is likely induced by endothelial dysfunction leading to increased permeability. Clinical features are headache, altered consciousness, visual abnormalities, and seizures in conjunction with the neuroimaging findings of vasogenic edema, typically involving the posterior circulation. Four major types of radiological presentation of PRES are holohemispheric watershed pattern, superior frontal sulcus involvement pattern, predominant parieto-occipital involvement, and asymmetric presentation of primary pattern.\textsuperscript{5}

A typical MRI finding on T2-weighted image and fluid-attenuated inversion recovery (FLAIR) associated with PRES is hyperintensity of the parieto-occipital cortices and subcortical white matter, usually indicating vasogenic edema. Usually, the regions of calcarine and paramedian occipital lobe structures are spared. It should be differentiated from infarction in the bilateral posterior cerebral artery territory, where the calcarine, thalamic, and midbrain regions are usually affected. The most important complications of PRES are cerebral ischemia, cerebral herniation, and cerebral hemorrhage. Clinically, PRES resolves after 3-8 days. The most ideal time to repeat MRI in PRES patients is 7-10 days. In follow-up MRI, more frequent complete resolutions of edema were observed (Figure 3).

**CVT**

CVT may occur anytime during the course of pregnancy and the puerperium, but the risk of developing of CVT is increased twice during the first 2 weeks of the puerperium.\textsuperscript{9}

There is a high risk of developing CVT in young mothers and after cesarean section. About 6% of maternal deaths is due to CVT. Hypercoagulable state provokes CVT during pregnancy and puerperium. The condition that provokes hypercoagulable states are clotting factors, factors II, VII, and X are increased during the pregnancy, the level of protein S is decreased, but the level of protein C remains unchanged.\textsuperscript{9} The hypercoagulable state, along with dehydration during labor and puerperium, is responsible for thrombotic complications such as CVT in pregnancy. The most common symptom of CVT that occurs in 95% of patients is headache. Other manifestations are focal seizures, paresis, papilledema, altered consciousness, and isolated intracranial hypertension. The associated risk factors with pregnancy-related cerebral venous sinus thrombosis are increased maternal age, hyperemesis, delivery by cesarean section, maternal infection, and maternal hypertension. The most commonly involved sinus in nonseptic patients is superior sagittal sinus, and in sepsis patients most commonly involved sinus is cavernous and lateral sinus thrombosis. On MRI, usually, it shows the high signal intensity of the venous sinuses with all routine sequences (usually on T1-weighted, T2-weighted, and FLAIR). On contrast enhanced T1W, it usually shows high signal intensity with a corresponding filling defect after gadolinium enhancement may develop within the first week after clinical onset. Early detection can be done with MRI within 7 days of clinical onset. Other parenchymal signs of CVT include diffuse mass effect, localized sulcal effacement, and venous infarcts. Venous infarcts are often associated with hemorrhage at the gray-white matter interface. MRV helps us to understand involvement of the major cerebral veins tributaries, dural venous sinuses, and anatomic variants\textsuperscript{6} catheter angiography has more significance in the treatment of CVT rather than diagnostic purpose (Figures 4 and 5).\textsuperscript{10}

![Figure 3: A 36-week pregnant woman presented with a history of eclampsia. (a) Axial fluid-attenuated inversion recovery (FLAIR) magnetic resonance imaging (MRI) shows symmetric edema in the thalami and basal ganglia. (b) Axial FLAIR MRI shows diffuse edema in the pons. Follow-up MRI obtained 2 months later was normal posterior reversible encephalopathy syndrome](image-url)
SAH
The occurrence of SAH during pregnancy is dramatically increased, 85% of SAHs occur in the second or third trimester. The risk of developing SAH is 5 times higher than in non-pregnant women. Most commonly occurs in young primigravidas during the third trimester. Straining during the time of delivery usually increases the bleeding during the puerperal period. The most common cause of SAH during pregnancy is rupture of an intracranial aneurysm. Other causes include pregnancy-induced hypertension, failure of cerebral autoregulation with propagation of the increased arterial pressure waves to the relatively thin-walled pial veins, ruptured berry aneurysm, arteriovenous malformation, anticoagulant toxicity, bleeding disorders, and cocaine use. Treatment of ruptured aneurysms is same as in the case of non-pregnant women. Unruptured aneurysms should be left as such, they should be treated only if they are symptomatic or enlarging. Patients undergoing endovascular treatment for ruptured aneurysms in the first trimester should be advised to terminate the pregnancy because of high risk to fetus. During second and third trimester successful endovascular coil treatment of ruptured aneurysms has been reported. An early and precise diagnosis is critical, and it is highly recommended to perform MRI on these patients. In few cases, FLAIR is useful in the detection of SAH. MRA plays a very crucial role in identifying the causes of hemorrhage, e.g., aneurysm, moyamoya disease, or arteriovenous malformation, without the use of contrast material.

Pituitary disorders
The rising levels of estrogen during pregnancy results in enlargement of the adenohypophysis. This is compensated by the rising levels of prolactin in the circulation. Prolactin levels may reach 35 ng/mL during the first trimester, 175 ng/mL during the second trimester, and up to 210 ng/mL during the third trimester. There is a chance of pituitary hemorrhage, infarction, and accelerated prolactinoma growth during the course of pregnancy and the puerperium.

Pituitary apoplexy
Pituitary apoplexy is an acute syndrome. It is usually characterized by acute hemorrhagic infarction in an existing pituitary adenoma or physiologically enlarging pituitary gland. The patients may present with a severe headache, vomiting, and visual disturbances including visual field defects and restricted eye movements. Incidence of pituitary apoplexy increases during pregnancy, and postpartum period, due to increased pituitary stimulation from placental estrogens, the enlargement of the adenohypophysis, rapid growth of tumors, and may also result from ischemia. On MRI, the pituitary gland is enlarged with variable T1 and T2 signal intensities, depending on the age of the hemorrhage. On DWI, an apoplexy secondary to infarction may also be detected earlier. All patients with apoplexy do not show intrasellar hemorrhage. Treatment of pituitary apoplexy is supportive, usually hormonal replacement is done. Transsphenoidal surgery although safe is rarely needed (Figure 6).

Neoplastic disorders
During pregnancy, there will be a change in the hormonal level which usually enhances the rate of growth of prolactinomas. Usually, symptoms of these tumors are masked by other existing pathologic processes such as migraine or pre-eclampsia. During pregnancy, there is gradual increase in the size of the tumor. The most common symptoms of primary brain tumors are headache, vomiting, visual symptoms, focal neurologic deficits, and seizures. MRI plays a very crucial role in diagnosis. Usually, MRI is preferred because of proper tissue resolution and the use of magnetic field is safe and does not affect the fetus. The contrast material used for MRI in pregnancy is gadolinium, and it is safe in pregnancy.
**Pituitary adenoma**

Pituitary adenomas are the most common pituitary tumors occurring during pregnancy. The elevated level of prolactin is recognized during pregnancy. During pregnancy evaluation of a pituitary mass poses an interesting challenge, because of continuously rising level of prolactin. In the presence of a prolactinoma, prolactin levels may vary. Hence, periodic measurements of prolactin give us a little clue in diagnosis. Evaluation of pituitary tumor is further hindered by administration of gadolinium during pregnancy. The optic chiasm and optic nerves symptomatically compressed by pituitary macroadenoma. Clinically pituitary adenoma is defined as the height of the pituitary gland exceeds by 12 mm. If imaging becomes necessary, high-resolution MRI sequences without contrast material can be performed. Medications such as bromocriptine a dopamine agonist are considered the treatment of choice for prolactin-secreting microadenoma and adenomas confined to the sella and it can decrease the size of the tumor by up to 50% in pregnancy. Transsphenoidal resection is considered in pregnant patients in whom the tumor continues to grow, causing worsening visual symptoms. Adrenocorticotropic hormone secreting adenomas should always be surgically removed. In growth hormone secreting adenomas and nonfunctioning adenomas surgery and medication are not indicated. In thyroid-stimulating hormone secreting tumors should receive only antithyroid medications to control hyperthyroidism (Figure 7).1

**CONCLUSION**

Pregnancy is a natural phenomenon, various central nervous system, and pituitary disorders can occur during the course of pregnancy and postpartum period. Good prenatal care, safety of drugs, and use of proper diagnostic modalities during pregnancy can prevent many of these neurologic complications.1 Accurate diagnosis is crucial, in acute neurologic disorders and pituitary disorders during pregnancy and postpartum period because appropriate and timely treatment can reverse the disease process and it plays a crucial role in reducing the risk of acute complications and long-term sequelae. These disorders when failure to diagnose at the earliest can lead to life-threatening complications, such as ischemia, massive infarction, and death. Common complications to occur in this period are eclamptic encephalopathy, followed by CVT, PRES, and ischemic stroke. Superior sagittal and sigmoid sinuses are more frequently involved in CVT. The most common pattern of PRES is parieto-occipital. Use of appropriate imaging modality potentially helps to diagnose serious neurological illnesses early thus helping the obstetrician to institute appropriate treatment strategies. MRI plays a very important role in depicting these disorders and complications arise due to these disorders at earliest.1 The radiologist may be the first person to propose the correct diagnosis on the basis of the imaging findings. Therefore, it is important that radiologists working in the emergency department setting be familiar with these entities to minimize the time to diagnosis.

**REFERENCES**


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Bull Gore Injury - Rural Indian Scenario

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Abstract

Introduction: Bull horn injuries are defined as lesions resulting from collision with the horns of a bull/cow. Bull horn injuries are commonly observed in rural areas where there is a large livestock population and the oxen are frequently employed for ploughing the fields and various domestic works. The injuries sustained include the direct penetrating injuries caused by horns of the animal and blunt injuries sustained such as chest and spine injuries and long bone fractures. Hence, these patients must be thoroughly examined for all the injuries followed by specific treatment for the injured region or affected organ.

Materials and Methods: This is a study of 15 patients admitted to B.L.D.E University, Shri. B. M. Patil Medical College Hospital and Research Centre, Vijayapur, between January 2014 and June 2016, with a history of bull horn injury.

Results: It was observed that, out of the total 15 patients in our study, majority of the patients (80%) were males. All the injuries were unprovoked and had occurred as a result of the animal becoming aggressive all of a sudden. Majority of the injuries (6) were lacerated wounds (40% in the current study), followed by penetrating abdominal injuries (4), degloving injuries (2), blunt chest trauma with multiple rib fractures (1), blunt abdominal trauma (1), and vulval hematoma (1). About half of the patients had injuries over the abdomen and the percentage rises to about 75% when the chest and perineum are also included, thereby making the trunk the most susceptible part for bull horn injuries. The average length of hospital stay was 7.2 days, the shortest being 2 days and the longest being 16 days. The post-operative period of all the patients in our study was uneventful and no major complications were reported and none required any repeat surgery.

Conclusion: Management of bull gore injuries which are commonly encountered among the livestock rearing population of rural India is a challenge and surgeons need to assess the injury and take a call on the type of management, keeping in mind the limited available resources.

Key words: Bull gore injury, Bull horn injury, Penetrating trauma, Chest trauma

INTRODUCTION

Bull horn injuries are defined as lesions resulting from collision with the horns of a bull/cow. Bull horn injuries are commonly observed in rural areas where there is a large livestock population and the oxen are frequently employed for ploughing the fields and various other domestic works. Bull horn injuries are very frequently encountered in villages and rural areas and the incidence is very less in the urban areas.¹,² The bull, normally a docile and easily domesticated animal, may become aggressive for no apparent reason. The injuries sustained include the direct penetrating injuries caused by horns of the animal and blunt injuries sustained such as chest and spine injuries and long bone fractures. Since these animals have very aggressive characteristics, any patient who is a victim of bull gore injury must be evaluated and treated as a case of polytrauma right from the time when he/she presents to the treating facility.¹ A distinctive feature of domestic bull horn injuries is that prolapse of the bowel through the abdominal wall is common but rarely associated with damage to or perforation of the intestine itself. Bull gore injuries distinguish themselves from other penetrating injuries due to some special characteristics such as muscular tearing, several wound paths, introduction of foreign bodies, discrepancy between the apparent and actual wounds, massive inoculation of germs, and others. Hence, these patients must be thoroughly examined for all
the injuries followed by specific treatment for the injured
region or affected organ.

**MATERIALS AND METHODS**

A retrospective study of patients admitted to B.I.D.E.
University, Shri. B. M. Patil Medical College Hospital and
Research Centre, Vijayapur, between January 2014 and June
2016, with a history of bull horn injury was conducted, and
the data were analyzed. The data collected included patient
particulars, date of admission, discharge date, location of
the main wound, type of surgery, anesthesia, use of drains,
antibiotics, tetanus vaccination, presence of fever during
admission period, need for blood transfusions, need for and
repeat surgery, days of hospitalization, and complications.
The injuries were grouped based on the anatomical region
into upper and lower limbs, axilla, neck, chest, abdomen,
and perineum.

**RESULTS AND OBSERVATIONS**

It was observed that majority of the patients (80%) were
males (Table 1). All the injuries were unprovoked and had
occurred as a result of the animal becoming aggressive all
of a sudden.

All the patients came from rural areas and were associated
with livestock rearing or dairy activities or farming in some
or the other manner.

Majority of the injuries (6) were lacerated wounds (40%
in the current study), followed by penetrating abdominal
injuries (4), degloving injuries (2), blunt chest trauma with
multiple rib fractures (1), blunt abdominal trauma (1), and
vulval hematoma (1) (Table 2).

We encountered four cases of penetrating abdominal
injuries with herniation of bowel loop in three cases.
Figure 1 shows a lacerated wound in the inguinal region
with no herniation of bowel. Figure 2 shows herniating
bowel loop.

We have included four patients with injury in the perianal
region (Figures 3 and 4). All the injuries were superficial
and could be managed by primary suturing alone. Injuries
to the anal canal and rectum were not reported in our
study (Table 3).

<table>
<thead>
<tr>
<th>Table 1: Gender distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
</tr>
<tr>
<td>12</td>
</tr>
</tbody>
</table>

About half of the patients had injuries over the abdomen
and the percentage rises to about 75% when the chest and
perineum are also included, thereby making the trunk the
most susceptible part for bull horn injuries.

Figure 1: Laceration in iliac fossa without herniation of bowel

Figure 2: Herniating bowel loop

Figure 3: Laceration in perianal region
Table 2: Table showing patient particulars, Injuries and Surgical Interventions

<table>
<thead>
<tr>
<th>Case no.</th>
<th>Age</th>
<th>Sex</th>
<th>Hospital stay</th>
<th>Mode of injury</th>
<th>Location</th>
<th>Description of injury</th>
<th>Surgery</th>
<th>Anesthesia</th>
<th>Use of drains</th>
<th>Tetanus vaccine</th>
<th>Blood transfusion</th>
<th>Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>28</td>
<td>M</td>
<td>16</td>
<td>Unprovoked</td>
<td>Axilla</td>
<td>Lacerated wound in the right axilla</td>
<td>Primary suturing</td>
<td>Ga</td>
<td>No</td>
<td>Given</td>
<td>No</td>
<td>Subcutaneous emphysema</td>
</tr>
<tr>
<td>2</td>
<td>45</td>
<td>M</td>
<td>5</td>
<td>Unprovoked</td>
<td>Gluteal region</td>
<td>Lacerated wound over the left gluteal region</td>
<td>Primary suturing</td>
<td>La</td>
<td>No</td>
<td>Given</td>
<td>No</td>
<td>Nil</td>
</tr>
<tr>
<td>3</td>
<td>35</td>
<td>M</td>
<td>2</td>
<td>Unprovoked</td>
<td>Neck</td>
<td>Lacerated wound over the neck</td>
<td>Primary suturing</td>
<td>La</td>
<td>No</td>
<td>Given</td>
<td>No</td>
<td>Nil</td>
</tr>
<tr>
<td>4</td>
<td>22</td>
<td>M</td>
<td>3</td>
<td>Unprovoked</td>
<td>Abdomen (RIF)</td>
<td>Penetrating abdominal injury. No prolapse of bowel</td>
<td>Exploratory laparotomy</td>
<td>Ga</td>
<td>Yes</td>
<td>Given</td>
<td>No</td>
<td>Nil</td>
</tr>
<tr>
<td>5</td>
<td>65</td>
<td>M</td>
<td>2</td>
<td>Unprovoked</td>
<td>Abdomen</td>
<td>Blunt abdominal injury</td>
<td>Conservative</td>
<td>No</td>
<td>Given</td>
<td>No</td>
<td>Nil</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>35</td>
<td>F</td>
<td>6</td>
<td>Unprovoked</td>
<td>Abdomen (LIF)</td>
<td>Traumatic interparietal hernia</td>
<td>Primary suturing</td>
<td>Sa</td>
<td>Yes</td>
<td>Given</td>
<td>No</td>
<td>Nil</td>
</tr>
<tr>
<td>7</td>
<td>40</td>
<td>M</td>
<td>4</td>
<td>Unprovoked</td>
<td>Perianal region</td>
<td>Perianal laceration</td>
<td>Primary suturing</td>
<td>Sa</td>
<td>No</td>
<td>Given</td>
<td>No</td>
<td>Nil</td>
</tr>
<tr>
<td>8</td>
<td>35</td>
<td>F</td>
<td>4</td>
<td>Unprovoked</td>
<td>Abdomen (LIF)</td>
<td>Penetrating wound in the left iliac fossa</td>
<td>Primary suturing</td>
<td>La</td>
<td>No</td>
<td>Given</td>
<td>Subcutaneous emphysema</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>65</td>
<td>M</td>
<td>12</td>
<td>Unprovoked</td>
<td>Chest</td>
<td>Left hemothorax with multiple rib fractures</td>
<td>ICD insertion</td>
<td>La</td>
<td>Yes</td>
<td>Given</td>
<td>Yes</td>
<td>Nil</td>
</tr>
<tr>
<td>10</td>
<td>80</td>
<td>M</td>
<td>9</td>
<td>Unprovoked</td>
<td>Axilla</td>
<td>Degloving injury in the left axilla</td>
<td>Primary suturing</td>
<td>Ga</td>
<td>Yes</td>
<td>Given</td>
<td>No</td>
<td>Nil</td>
</tr>
<tr>
<td>11</td>
<td>50</td>
<td>M</td>
<td>15</td>
<td>Unprovoked</td>
<td>Abdomen (RIF)</td>
<td>Penetrating abdominal injury</td>
<td>Exploratory laparotomy</td>
<td>Ga</td>
<td>Yes</td>
<td>Given</td>
<td>No</td>
<td>Surgical site infection</td>
</tr>
<tr>
<td>12</td>
<td>35</td>
<td>M</td>
<td>7</td>
<td>Unprovoked</td>
<td>Perianal region</td>
<td>Laceration scrotum</td>
<td>Primary suturing</td>
<td>Sa</td>
<td>No</td>
<td>Given</td>
<td>No</td>
<td>Nil</td>
</tr>
<tr>
<td>13</td>
<td>60</td>
<td>M</td>
<td>10</td>
<td>Unprovoked</td>
<td>Arm</td>
<td>Laceration right arm</td>
<td>Local exploration + suturing</td>
<td>La</td>
<td>No</td>
<td>Given</td>
<td>No</td>
<td>Nil</td>
</tr>
<tr>
<td>14</td>
<td>45</td>
<td>F</td>
<td>4</td>
<td>Unprovoked</td>
<td>Perianal region</td>
<td>Vulval hematoma</td>
<td>Conservative</td>
<td>No</td>
<td>Given</td>
<td>No</td>
<td>nil</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>60</td>
<td>M</td>
<td>9</td>
<td>Unprovoked</td>
<td>Axilla</td>
<td>Left axilla degloving injury</td>
<td>Primary suturing</td>
<td>Ga</td>
<td>Yes</td>
<td>Given</td>
<td>No</td>
<td>Nil</td>
</tr>
</tbody>
</table>

RIF: Right iliac fossa, LIF: Left iliac fossa, ICD: Intercostal chest drain

![Graphical representation of types of injuries observed in our study](image-url)

Most of the lacerated wounds (5) could be sutured under local anesthesia whereas the three axillary injuries were repaired under general anesthesia and spinal anesthesia being employed for the perianal lacerations and degloving injury of the scrotum.

Abdominal drains were used in all the laparotomies, and suction drains were employed during primary repair of the axillary injuries.

Only one patient in our study required blood transfusion. None of the patients required any repeat surgery.

The average length of hospital stay was 7.2 days; the shortest being 2 days and the longest being 16 days.

We had a case of interparietal hernia (Figures 5 and 6) following bull gore injury over the right inguinal region which was repaired after an interval of 2 weeks after the primary suturing of a laceration over the iliac crest. The fascial defect was closed, and polypropylene mesh of appropriate size was placed over it.

Two patients in our study developed extensive subcutaneous emphysema which was controlled over a period of 1-2 days. One patient who underwent laparotomy developed surgical site infection. The post-operative period of all the patients in our study was relatively uneventful with complete recovery and no mortality reported in our study (Figure 7).

### DISCUSSION

In India, bull gore injuries are frequently observed in the rural setup where frequently people come in contact with these animals. The horn of bull is long, curved, and directed forward with smooth tapering ends that produce lacerations and can also penetrate the body cavities. The patterns of injuries sustained by the victim vary depending on the height of the victim, the height of the bull, and position of the animal and the victim at the time of the attack by the bull.

According to all the series reviewed, the most frequent wound is the goring wound (81% in the study of Monferrer-Guardiola), although bull horn wounds can occur anywhere on the body, the anatomic regions that

<table>
<thead>
<tr>
<th>Location of injury</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck</td>
<td>1</td>
</tr>
<tr>
<td>Chest</td>
<td>1</td>
</tr>
<tr>
<td>Abdomen</td>
<td>5</td>
</tr>
<tr>
<td>Perineum</td>
<td>4</td>
</tr>
<tr>
<td>Upper and lower limbs</td>
<td>1</td>
</tr>
<tr>
<td>Axilla</td>
<td>3</td>
</tr>
</tbody>
</table>

Figure 4: Sutured perianal laceration

Figure 5: Interparietal hernia being repaired with mesh placement

Figure 6: Interparietal hernia repaired
could be affected more commonly are the abdomen, perineum, pelvis, chest, and upper limbs.

The largest series of bull goring injuries published to date have been obtained from Spain and Latin America, but these injuries as they occur during bull fighting events and are mostly provoked injuries with a probably higher intensity are much different from the injuries in the Indian rural scenario.

The injuries occur more commonly on the abdomen and perineum. In the abdomen, the horn first enters the skin and subcutaneous tissues and later muscles, and further if the violence is more, the peritoneum is punctured with the involvement of viscera with tear.

A distinctive feature of domestic bull horn injuries is that prolapse of the bowel through the abdominal wall is common but rarely associated with damage to or perforation of the intestine itself. Knowledge of the mechanism of horn injuries is of particular interest for understanding the magnitude of these wounds. When the bull charges, it flexes its neck and then extends it, pressing one or both horns into the body of its opponent. The curved nature of the horns and the extension of the neck by the bull result in an upward wound path preventing extensive injury to deeper abdominal viscera.

The anatomy of the perineal region is complex, and visualization and access to various structures in the region is difficult. Hence, the repair of injury in the area needs a complete knowledge about the anatomy of the region and expert surgical skills. Usually, these injuries are associated with injury to abdominal and urological structures. In females, the anatomy of the perineum is further complicated by the presence of the uterus, vagina, and the various supporting ligaments. Most of the time, when an injury is missed or when a patient undergoes primary repair, the patient end up coming back to hospital with complications such as anovaginal fistula and urethrorectal fistula, thus causing more morbidity to the patient in terms of physical, mental, social, and economical sufferings.

CONCLUSION

Management of bull gore injury is a challenge and surgeons need to assess the injury and take a call on the type of management. Most of the injuries are sustained over the abdomen and perineum and hence a thorough knowledge of anatomy of these regions would aid the surgical skills of the surgeon in the management of bull horn injuries.

REFERENCES

Ophthalmological Manifestations of Dengue Fever During an Epidemic in a Tertiary Care Hospital of West Bengal

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Abstract

Introduction: Dengue is a fast resurging arthropod-borne viral infection causing ocular complications which has not been classically described in literature. Here, ocular findings in patients suffering from were studied.

Materials and Methods: This study was conducted on 90 cases diagnosed with dengue fever (DF) from the 1st May to the 30th September, 2015 at R. G. Kar Medical College and Hospital during an epidemic. All the patients were evaluated with regard to thorough systemic and ophthalmological examination.

Results: Out of the 90 patients diagnosed with DF, 54 (60%) were males and 36 (40%) were females. Mean age group was 34 years (Range: 10-70 years). 73 (81.11%) patients were having bilateral visual symptoms; 17 (18.88%) noted unilateral symptoms. 38(42.22%) had a vision 6/60 or worse. 74 (82.22%) patients were presented with defective central vision (relative scotoma). The anterior segment findings were subconjunctival hemorrhage in 73 (81.11%) and anterior uveitis in 3 (6%) cases, respectively. The posterior segment changes were macular edema in 74 (82.22%), retinal vasculitis in 24 cases; among this, there were involvement of macular vasculature in 6 cases and pan retinal vasculitis in 18 patients, respectively. All the ocular changes resolved on 8-12 weeks follow-up along with a normal platelet count.

Conclusion: With the rise in the frequency of varied and serious oculocutaneous complications, each and every case of DF requires an immediate thorough ophthalmological assessment and follow-up for prevention of sight-threatening dread consequences.

Key words: Dengue fever, Ophthalmologic manifestations, Retrobulbar pain, Subconjunctival hemorrhage

INTRODUCTION

Dengue virus is the fastest reemerging flavivirus infection in humans today. It is transmitted to human arises by bite of Aedes aegypti mosquito. It has become a worldwide public health problem, especially affecting the Southeast Asia and its illness exceeds approximately 100 million/year.¹,² The clinical symptoms of dengue are sudden onset of fever along with symptoms of malaise, headache, rhinitis, sore throat, cough, generalized body ache, retroorbital and lumbosacral pain, and rash. The clinical signs ranging from subconjunctival hemorrhage to vision-threatening complications such as optic neuropathy and panophthalmitis have been reported in literature.³,⁴,⁵,⁶ The classical descriptions of ophthalmic manifestations have not yet been reported except a few isolated case reports.⁷,⁸,⁹ However, the ocular involvement in patients with dengue has been observed in recent times. Owing to the warm and temperate climate in Kolkata of West Bengal, there is an increased surge of dengue cases every year; thus, our attention was attracted to study the ocular findings associated with dengue fever (DF).

MATERIALS AND METHODS

This was a prospective, observational study comprising 90 patients with DF during an epidemic between the 1st May and the 30th December, 2015 at R. G. Kar Medical
College and Hospital in Kolkata, West Bengal, a state from Eastern India.

The DF and dengue hemorrhagic fever was made on the basis of WHO guidelines, i.e., fever with thrombocytopenia (<100 × 10^9 cells/L) and hemoconcentration (hematocrit >20% above baseline). Further confirmation was done by serological assay, i.e., immunoglobulin (IgM) and IgG antibody assay and markedly reduced platelet counts. A detailed and meticulous clinical history with emphasis on visual symptoms was taken in all patients. Recording of unaided and aided visual acuity was measured with Snellen charts. Following this, a detailed anterior and posterior segment evaluation with the help of Slit-lamp biomicroscopy and direct and indirect ophthalmoscopy, respectively, was carried out for significant ocular changes. The fundus photograph was taken using the fundus camera. All the patients underwent testing of visual fields by Humphrey automated visual field analyzer (HVF) and ocular coherence tomography (OCT), Amsler charting, and fundus fluorescein angiography. Recruited cases were followed up for 12 weeks. Prior informed consents were taken from all the patients.

**RESULTS**

Out of the 90 patients diagnosed with DF, 54 (60%) were males and 36 (40%) were females with a mean age of 35 years (10-70 years) as mentioned in Table 1 and Figure 1. All of the patients presented with fever.

**Symptoms**

Defective vision was the most common presentation, 73 (81.11%) patients were having bilateral visual symptoms; 17 (18.88%) noted unilateral symptoms. Visual acuity ranged from 6/9 to fingers counting only. 38 (42.22%) had vision 6/60 or worse. 74 (82.22%) patients, who presented with reduced central vision (relative scotoma) confirmed by Amsler charting and automated HVF testing.

**Signs**

In majority of cases, the most common anterior segment findings among the patients with DHF were subconjunctival hemorrhages in 37 (81.11%) patients depicting in Table 2 and Figure 1. Anterior uveitis was found in 3(6%) patient as showing in Table 2 and Figure 2. The most common posterior segment findings were macular edema in 74 (82.22%) patients. There was retinal vasculitis in 24 cases; among these patients, 6 (6.66%) involved the macular vasculature and 18 patients had pan retinal vasculitis. Other findings with lesser importance were perifoveal telangiectasia and cotton wool spots at the peripheral retina. Two patients were lost to follow-up, may be due to restoration of vision to premorbidity level. In all the above-mentioned cases, the ocular features resolved over the next 8-12 weeks.

**DISCUSSION**

The mechanism of the wide spectrum of ocular findings in DF is not well known. However, it clearly depicts immune-mediated process and possibly infective etiology. The possible causes of hemorrhage could be reduced platelet count, i.e., thrombocytopenia with coagulation defects, capillary fragility, consumptive coagulopathy, and platelet dysfunction. In this study, we assumed that the increased incidence of visual morbidity was due to the complications
located in macula leading to visual impairment resulting from poor central vision. However, increased number of dengue-related complications was seen, including changes in the retinal periphery without any associated significant visual impairment. Macular edema with subtle microangiopathy with minimal functional disturbance may also be unreported by the patient. OCT and FFA would be helpful to detect these subtle findings. The chemical mediators causing capillary leakage may form the basis for resulting macular edema and breakdown of the aqueous blood barrier, resulting in anterior uveitis and periphlebitis.7

There was a male preponderance which is similar to the earlier study by Kapoor et al.5 and Hussain et al.17 The mean age group of patients included in our study was found to be 35 years which is corroborative with the study of Halstead3 and Haritoglou et al.8 The most notable finding was subconjunctival hemorrhage followed by retinal hemorrhages which were similar to studies of Kapoor et al.5 and Hussain et al.17

In the present study, ophthalmic findings varied involving both anterior segment and posterior segment in contrast to the study of Lim et al.7 whose study depicted features mainly confined to the macula.

In our study, subconjunctival hemorrhage was in 73 (81.11%) patients which is corroborative with the earlier findings noted by Kapoor et al.5 In another study, it has been reported that subconjunctival hemorrhage was in 3 eyes of 50 patients (65 eyes) suffering from DF.18

However, Kapoor et al.5 and Hussain et al.17 reported bilateral periorbital ecchymosis or unilateral ptosis and proptosis secondary to anterior orbital and retrobulbar hemorrhage, respectively, which was not found in any case among our sample of study population with dengue.

All our patients with ocular complications had platelet count <50,000/µl. The association of such thrombocytopenia with the development of ocular features has been supported by several other studies.19,17,17 It was also noted that ocular morbidity was in close to the day of the lowest serum platelet level.

**CONCLUSION**

Dengue is an old disease and is endemic in tropical countries. Dengue virus results in a spectrum of ocular manifestations, ranging from non-specific symptoms to severe vision-threatening complications. Although most common manifestation is subconjunctival hemorrhage, retinal hemorrhages can also occur. With increasing epidemicity and cocirculation of multiple dengue serotypes, an increase in the occurrence of DF and dengue-related ophthalmic morbidity can be expected. An awareness for ocular complications and hence, prompt referral for ophthalmologic assessment and management is required. Increased awareness regarding early treatment of ocular complications and institutionalization is of utmost importance.

**REFERENCES**

Rising Trends of Cesarean Section - Fetal Sake: A Retrospective Study

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Abstract

Introduction: Cesarean section rates are increasing worldwide. The proportion of cesarean section at the population level is a measure of the level of access to and uses this intervention. At the same time, rising cesarean section rates is a matter of concern.

Purpose: The purpose of this study is to find the primary cesarean section rate and to find out the most frequent indications for primary cesarean section.

Materials and Methods: Retrospective study conducted at Government Medical College and ESI Hospital, Coimbatore in Department of Obstetrics and Gynecology from January 2016 to December 2016.

Results: During the 1-year study, there were 354 deliveries of which 251 delivered by cesarean section. Primary cesarean rate is 54.18%. 92.64% are emergency cesarean of which most frequent indications are fetal distress which accounts for 68.25% followed by cephalopelvic disproportion. The elective primary cesarean rate is 7.35%.

Conclusion: Most primary cesarean sections are done for fetal sake.

Key words: Cesarean section, Elective, Emergency, Fetal distress, Primary cesarean

INTRODUCTION

Cesarean delivery has become a commonly used measure for delivery of fetus. Rates of both primary and repeat cesarean section have been on rise.¹ Cesarean section is recommended when the life of mother or fetus is at risk. One of the main goals of every medical team dealing with childbirth is performing safe delivery. The primary cesarean section is when it is performed for the first time on pregnant women. According to 1985WHO, International Health-care Community has considered the ideal rate of cesarean section to be between 10% and 15%. However, every effort should be made to provide cesarean section to women in need, rather than to achieve a specific rate. The proportion of cesarean section at the population level is a measure of the level of access to and uses this intervention. Determining the adequate cesarean section rate at the population level, that is the minimum rate for medically indicated cesarean section while avoiding medically unnecessary operation is a challenging task. In this study, we will discuss the common indications of the primary cesarean section and most frequent indications contributing to rise in cesarean section.

MATERIALS AND METHODS

It is a retrospective study conducted at Government Medical College and ESI Hospital, Coimbatore in Department of Obstetrics and Gynecology from January 2016 to December 2016 among antenatal women attending for delivery. Information about all the cesarean section was obtained from the parturition register. At our hospital, non-progress of labor diagnosed by partogram, abnormal fetal lie and placental position by clinical signs and confirmation by ultrasonogram, fetal distress by fetal heartbeat count and sometimes with meconium stained liquor. Hospital does not use cardiotocography.
Those patients with a single indication for lower segment caesarean section are grouped under primary indication, and those with multiple indications are grouped under additional indications.

A study done to look at the trends for cesarean section at our hospital and find out common indications for primary cesarean section.

**RESULTS**

There were 354 deliveries during the study of which 251 delivered by a cesarean section giving cesarean section rate of 70.90%. Among 251 cesarean deliveries, 136 is primary cesarean section giving primary cesarean section rate of 54.1% and remaining is repeat cesarean section with 45.8%. Results are shown in Tables 1-10.

**DISCUSSION**

Globally, cesarean section rates have increased during last decades. There is no general agreement on optimal cesarean section rate. In our study, primary cesarean section rate is 54.1%. Among primary cesarean section, 93 are nulliparous with 68.38%, and 43 are multipara with 31.61%. This is comparable with study of Moni et al.\(^2\) where cesarean section rate in primigravida is 82.7% and in multigravida is 17.3%.

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<th>Table 1: Distribution of patients according to age</th>
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<th>Table 6: Indications in elective cesarean section</th>
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<td>CPD 2 degree</td>
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<td>Placenta previa</td>
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<td>Malpresentation</td>
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<td>Twins</td>
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<th>Table 7: Indications in emergency cesarean section</th>
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<td>Additional indication</td>
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<th>Table 8: Distribution of primary indications</th>
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<td>Indication</td>
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<td>Fetal distress on admission</td>
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<td>CPD 2 degree in obstructed labor</td>
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<td>Malpresentation</td>
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<td>Twins</td>
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<td>Previous myomectomy in labor</td>
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<th>Table 9: Distribution of additional indications</th>
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<td>Fetal distress</td>
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<td>Emergency indications</td>
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<td>Failed induction</td>
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<td>Fetal distress</td>
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<td>Non progress of labor</td>
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<td>Malpresentation</td>
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<td>Previous myomectomy</td>
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CPD: Cephalopelvic disproportion
Furthermore, study by Boyle et al. where primary cesarean section rate is 30.8% in primi and 11.5% for multigravida.

Regarding age group, most common is 20-35 years. This is the age group where women complete the family.

Furthermore, cesarean increased in educated and employed group than the counterpart.

Among total 251 cesarean sections, 158 are multipara of which 43 is primary cesarean with 27.21% and 115 are repeat cesarean with 72.78%.

Among primary cesarean in multigravida, most frequent is cephalopelvic disproportion (CPD) (30.23%) followed by oligoamnios (16.27%), failed induction (13.9%), and fetal distress (13.9%). This is comparable with the study of Rao and Rampure. Study of the primary cesarean section in multi where most frequent indication is malpresentation (33.5%) followed by CPD and fetal distress.

In a study by Desai et al., most frequent indication of primary cesarean in multigravida is fetal distress (25.58%) and antepartum hemorrhage (22.09%).

Among primary cesarean, elective is 7.35%, and emergency is 92.64%. This is comparable with study of Moni et al. in the study of obstetric profile of mothers undergoing primary cesarean where the emergency cesarean rate is 88.7%, and the elective rate is 11.3%.

Among emergency cesarean, most are performed to benefit the fetus 68.25%. Except for 4 babies all babies had APGAR score of 8/10 and above. Studies on rising cesarean section and studies by saga and choudry show majority of emergency cesarean done to benefit the fetus.

Studies by Luis-Sanchez et al. and studies by Ehrenthal et al. show most indications that lead to emergent cesarean section is fetal factors - fetal distress, non-reassuring fetal heart rate, malpresentation.

Cesarean done for maternal sake is mainly for pre-eclampsia is 5.5%. According to Kuklina et al., preeclampsia is increased as an indication for cesarean section.

**CONCLUSION**

Indication for performing cesarean section have changed a lot in recent years and keep on changing for varied circumstances. Low cesarean rate might indicate poor access to cesarean section when obstetric complication occurs while high rate increased risk of maternal and neonatal morbidity. It is acknowledged that when cesarean access is increased in areas where access is limited, maternal and neonatal mortality rate decrease. In this study, primary cesarean mainly done for fetal distress and neonatal mortality is reduced.

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Comparative Study of Anesthetic Efficacy of 0.2% Ropivacaine Alone and 0.2% Ropivacaine with Fentanyl 50 µg in Intravenous Regional Anesthesia

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Abstract

Background: Ropivacaine for intravenous regional anesthesia (IVRA) provides prolonged analgesia over lidocaine and have a lower toxicity compared with bupivacaine. To reduce the amount of local anesthetic and to improve the quality of the block additives like opioids are used.

Aim: The present study was designed to assess the anesthetic efficacy and post-tourniquet analgesia of adding fentanyl with ropivacaine for IVRA.

Materials and Methods: A total of 50 patients undergoing hand surgery were randomized to receive IVRA with 40 ml of either ropivacaine 0.2% (Group 1, n = 25) or ropivacaine 0.2% with fentanyl 50 µg (Group 2, n = 25). The anesthetic efficacy regarding, onset of sensory block, onset of motor block, and duration of post-tourniquet analgesia were noted and compared.

Results: In this study, the sensory block onset time was lesser in ropivacaine plus fentanyl group (6.24 ± 1.714 min) when compared to ropivacaine group (7.88 ± 1.363 min). The onset time of motor block also more in ropivacaine group (11.8 ± 1.825 min) when compared to ropivacaine with fentanyl group (9.88 ± 1.691 min). The duration of post-tourniquet analgesia was higher in ropivacaine plus fentanyl group (137.52 ± 24.036 min) when compared to ropivacaine group (120.76 ± 20.755 min).

Conclusion: Ropivacaine 0.2% with fentanyl 50 µg in IVRA has good anesthetic efficacy, lengthened post-tourniquet analgesia, and less incidence of intraoperative tourniquet pain when compared to ropivacaine 0.2% alone.

Key words: Fentanyl, Intravenous regional anesthesia, Post tourniquet analgesia, Regional anesthesia, Ropivacaine

INTRODUCTION

Intravenous regional anesthesia (IVRA) was first described in 1908 by A.G. Bier; hence, the procedure is named Bier’s block.² IVRA involves the intravenous administration of a local anesthetic into a tourniquet occluded limb. The local anesthetic diffuses from the peripheral vascular bed to nonvascular tissue such as axons and nerve endings.

IVRA is a simple, effective method of providing anesthesia for short duration surgical procedures on the extremities.² Limitation of this block include anesthetic toxicity, slow onset, poor muscle relaxation, tourniquet pain, and minimal post-operative pain relief.³

Various drugs such as procaine, prilocaine, lignocaine, and bupivacaine have been used in IVRA. Among these, lignocaine is the drug commonly used, and it does not have post-tourniquet analgesia.⁴ Bupivacaine provides post-tourniquet analgesia, but cardiovascular (CV) collapse reported after its use in IVRA. Ropivacaine is an amide local anesthetic that is structurally related to bupivacaine with duration of anesthesia almost as long as that of bupivacaine, however, with less CV toxicity presumably because it is pure S-enantiomer.⁵ To reduce the amount of...
local anesthetic required or to improve the quality of the block or both, various additives such as opioids, muscle relaxants, alpha-2 agonists have been tried in IVRA with various results. Among this fentanyl, a synthetic opioid is used in this study along with ropivacaine.

In the present study, we have evaluated and compared anesthetic efficacy and post-tourniquet analgesia during IVRA using ropivacaine alone and ropivacaine with fentanyl for hand surgery.

**MATERIALS AND METHODS**

This study was a randomized, prospective controlled double-blinded study. It was done at K.A.P. Viswanatham Government Medical College from June 2016 to December 2016 after approval from the Medical Ethics Committee. 50 patients of American Society of Anesthesiologists physical status I and II of either sex, between the ages of 18 and 60 years undergoing hand surgery were assigned into two groups each containing 25 patients.

- Group 1: Patients in this group received 40 ml of 0.2% ropivacaine
- Group 2: Patients in this group received 40 ml of 0.2% ropivacaine with fentanyl 50 µg.

Pre-operative evaluation included history, general physical examination, and routine investigations. The procedure and the visual analog scale scoring system (VAS) were explained to the patient preoperatively, and a written informed consent was obtained. In VAS, the patient was asked to grade his/her pain on a numeric scale of 0-10 (0 = no pain and 10 = the worst pain). Patients with a history of any CV, respiratory, or central nervous system disorders were excluded from the study. Patients with hematological disorders such as sickle cell anemia and thalassemia, patients with known hypersensitivity to ropivacaine, patients with difficult airway, were also excluded from the study.

The patients were shifted into the operation theater. No premedication was given. The pulse oximeter, non-invasive blood pressure monitor, and electrocardiographic monitor were connected to the patient. The vital parameters were recorded. A separate intravenous line was started in the non-operated limb.

A vein in the dorsum of the hand of the operated limb was cannulated with 22G intravenous cannula. If the dorsum of the hand was involved in the surgery, a vein higher up in the forearm was chosen. It was firmly fixed, flushed with normal saline and stopper applied. Exsanguination was accomplished by elevation of the limb for 5 min followed by use of Esmarch bandage from fingertip to arm. In subjects where the application of Esmarch bandage was not feasible, emptying of veins was facilitated with compression of axillary artery with the limb elevated. At the proximal end of the Esmarch bandage, the first tourniquet was applied around the upper part of the arm over cotton wool padding. Proximal tourniquet was inflated to 150 mmHg above the patient's systolic blood pressure. The absence of radial artery pulsations and failure of pulse oximetry tracing in ipsilateral index finger was confirmed. Then 40 ml of local anesthesia solution was injected through the cannula at a rate of 1 ml/s by an anesthesiologist who was blinded to the study drug.

The sensory block was assessed by pinprick with a 23G hypodermic needle every 30 s. Patient response was evaluated in dermatomal sensory distribution of medial cutaneous, lateral cutaneous, median, radial, and ulnar nerves. Sensory block onset time was noted as time interval after completion of injection of study drug to sensory block achieved in all dermatomes.

Motor function was assessed by asking the patient to flex and extend the wrist and fingers, and motor block onset time was noted when no voluntary movement was possible following injection of study drug.

After ensuring complete analgesia below the first tourniquet, the second tourniquet was applied distal to the first tourniquet and inflated to 150 mmHg above the patient's systolic blood pressure. The first tourniquet was then removed. The patients were observed for any toxic manifestations of local anesthetics after release of the first tourniquet. The surgery was started only after sensory block was achieved. If a patient had no sensory or motor block, it was considered a failure of block and the patient was administered general anesthesia.

Intraoperative tourniquet pain, if perceived was noted and documented. Tourniquet was deflated following a minimum of 30 min after inflation and was not inflated for more than 90 min. The tourniquet was deflated by cyclic deflation technique at 10 s intervals.

At the end of surgery, post-tourniquet analgesia time was noted as time elapsed from tourniquet deflation to recovery of pain (VAS >5) in all dermatomes of the operated limb. Side effects after tourniquet release if any was noted.

Data are expressed as mean ± standard deviation. Independent samples t-test was used for evaluation of demographic data, duration of surgery and tourniquet, onset of sensory and motor block, and duration of post-
RESULTS

Demographic variables such as age, weight, and sex were comparable between the two groups (Table 1). The difference between both groups was statistically not significant ($P > 0.05$). The meantime of duration of surgery and tourniquet duration of both groups showed statistically no significant difference ($P > 0.05$).

In this study, the mean time of onset of sensory block was quicker in Group 2 ($6.24 \pm 1.714$ min) when compared to Group 1 ($7.88 \pm 1.363$ min) (Figure 1 and Table 2) and this difference was extremely statistically significant ($P = 0.0005$). The mean time of onset of motor block also more in Group 1 ($11.8 \pm 1.825$ min) when compared to Group 2 ($9.88 \pm 1.691$ min) (Figure 2 and Table 2). This was extremely statistically significant ($P = 0.0003$).

The mean duration of post-tourniquet analgesia was higher in ropivacaine plus fentanyl group ($137.52 \pm 24.036$ min) when compared to ropivacaine group ($120.76 \pm 20.755$ min), and this difference was statistically significant ($P = 0.011$) (Figure 3 and Table 2).

No side effect was reported in the intraoperative period in either of the groups except that tourniquet pain was reported in 4 patients in Group 1 and none in Group 2. The incidence of nausea and vomiting was slightly higher in Group 2 (Table 3). None of the patients had significant bradycardia or hypotension to require any intervention.

DISCUSSION

Ropivacaine use has increased in popularity because of its potential to offer prolonged and improved analgesia compared to lidocaine, but its onset of sensory and motor block is delayed compared to lignocaine. To improve the onset of the block and improve the post-operative analgesia fentanyl was used in our study.

In this study, the mean time of onset of sensory block was lesser in ropivacaine plus fentanyl group ($6.24 \pm 1.714$ min) when compared to ropivacaine group ($7.88 \pm 1.363$ min). These values were consistent with the findings of Niemi et al. The peripheral analgesic effect of opioids is still controversial. Perineural fentanyl decreases the action potential in unshathed peripheral nerves like that produced by local anesthetics. Opioids suppress nerve conduction, and this may potentiate the effect of local anesthetic in IVRA. This action is not related to opiate receptors as naloxone failed to inhibit this effect.

The mean time of onset of motor block also longer in ropivacaine group ($11.8 \pm 1.825$ min), when compared to ropivacaine with fentanyl group ($9.88 \pm 1.691$ min). This finding correlated with the results of Lim and Ong. They found that the addition of fentanyl and mivacurium to the prilocaine enhances the onset of motor blockade. Acalovschi et al., studied the effect of meperidine alone in IVRA. They concluded that the use of meperidine in IVRA developed sensory and motor block, demonstrating the local anesthetic action of the drug. The motor-blocking activities were more marked than the sensory blocking activities. Gobeaux et al., added 100 μg of fentanyl to lignocaine for brachial plexus block and reported enhanced intensity of the sensory and motor block.

In this study, the incidence of tourniquet pain is higher in ropivacaine group. Four patients in ropivacaine group perceived intraoperative tourniquet pain while this was nil in patients who received fentanyl along with ropivacaine. This finding correlated with the findings made by Hartmannsgruber et al., who compared ropivacaine 0.2% and lignocaine 0.5%. Puttappa and Patkar observed that addition of fentanyl has shown excellent to good intraoperative analgesia.

### Table 1: Demographic variables, duration of surgery, and tourniquet

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<th>Variables</th>
<th>Group 1</th>
<th>Group 2</th>
<th>$P$ value</th>
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<tr>
<td>Age</td>
<td>35.20±8.431</td>
<td>37.70±7.929</td>
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<td>Weight</td>
<td>55.00±6.843</td>
<td>58.12±6.629</td>
<td>0.1081</td>
</tr>
<tr>
<td>Sex (M:F)</td>
<td>18:7</td>
<td>16:9</td>
<td>0.805</td>
</tr>
<tr>
<td>Duration of surgery (min)</td>
<td>30.6±10.033</td>
<td>31.36±11.365</td>
<td>0.803</td>
</tr>
<tr>
<td>Duration of tourniquet (min)</td>
<td>37.4±7.921</td>
<td>38.00±9.574</td>
<td>0.810</td>
</tr>
</tbody>
</table>

### Table 2: Sensory and motor characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Group 1</th>
<th>Group 2</th>
<th>$P$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onset of sensory block (min)</td>
<td>7.88±1.363</td>
<td>6.24±1.714</td>
<td>0.0005</td>
</tr>
<tr>
<td>Onset of motor block (min)</td>
<td>11.8±1.825</td>
<td>9.88±1.691</td>
<td>0.0003</td>
</tr>
<tr>
<td>Duration of post tourniquet analgesia (min)</td>
<td>120.76±20.755</td>
<td>137.52±24.036</td>
<td>0.0112</td>
</tr>
</tbody>
</table>

### Table 3: Side effects

<table>
<thead>
<tr>
<th>Side effects</th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intraoperative tourniquet pain</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Light headedness</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Perioral numbness</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nausea/vomiting</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Dizziness</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Vertigo</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
The duration of post-tourniquet analgesia was higher in ropivacaine plus fentanyl group (137.52 ± 24.036 min) when compared to ropivacaine group (120.76 ± 20.755 min). Lim and Ong\(^1\) studied the effect of fentanyl with lignocaine and found postoperative pain was significantly reduced in patients receiving fentanyl 1 μg/kg. This finding also correlated with the results of Puttappa and Patkar.\(^10\) In a similar study conducted by Sztark \(et\ al.\)\(^11\) showed that the postoperative analgesia in fentanyl group was significantly prolonged as compared to lignocaine. Pitkänen \(et\ al.\)\(^6\) conducted the study on the effect of the addition of fentanyl to prilocaine in IVRA and found that postoperative analgesia was excellent.

The incidence of side effects was similar in both the groups. Patients who received fentanyl along with ropivacaine showed higher incidence of nausea and vomiting when compared to ropivacaine group. This side effect probably due entirely to the effect of fentanyl.\(^16\) This result is like that of Pitkänen \(et\ al.\)\(^6\) who studied the effect of fentanyl along with prilocaine in IVRA and found that the incidence of nausea and vomiting is higher in fentanyl group. The vital signs such as pulse rate and blood pressure were stable in all patients. There were no complications during and after the release of the tourniquet in all groups of patients. Our study results were also like study conducted by Puttappa and Patkar,\(^10\) and Santhosh \(et\ al.\).\(^17\)

**CONCLUSION**

We conclude that ropivacaine 0.2% with fentanyl 50 μg in IVRA has well anesthetic efficacy, lengthened post-tourniquet analgesia and less incidence of intraoperative tourniquet pain with minimal side effects after tourniquet release when compared to ropivacaine 0.2% alone.

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Clinical Profile of Brucellosis - A Cross-sectional Study

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Abstract

Background: Human brucellosis is an important but neglected disease in India. It is traditionally described as a disease of protean manifestations.

Aim: The aim of this study was to assess the epidemiological, clinical, and laboratory characteristics of brucellosis.

Materials and Methods: In this cross-sectional study, all the patients admitted with symptoms and signs suggestive of brucellosis were screened serologically for brucellosis by standard agglutination test. A total of 30 cases diagnosed as brucellosis were investigated in terms of the spread of infection, age and sex distribution, clinical and laboratory characteristics and response to different treatment regimens.

Results: Our study revealed a prevalence of 0.61% in adults and 0.1% in children. Fever with drenching sweats remained one of the most important symptoms of brucellosis. Other common symptoms were a generalized weakness, anorexia, body ache, joint pain, and headache. Among the signs, hepatomegaly and splenomegaly were more common, whereas lymphadenopathy was seen in only a few cases. All patients responded to either of the drug regimens, namely, rifampicin plus doxycycline or rifampicin plus streptomycin. Overall, the prognosis was good, and none of the patients expired.

Conclusion: It is concluded that brucellosis is a disease with protean manifestation with no single diagnostic symptom or sign. Brucellosis should be considered as a differential diagnosis in all cases of pyrexia of unknown origin, low backache, arthralgia, sciatica and in all cases of progressive weight loss.

Key words: Brucellosis, Diagnosis, Epidemiology, Prevention, Treatment

INTRODUCTION

Brucellosis is a zoonosis widely distributed around the world. Gram-negative bacteria of the genus Brucella cause it and Brucella melitensis is the leading cause of brucellosis in humans. It is transmitted directly or indirectly to humans from infected animals predominantly domesticated ruminants and swine. The illness is characterized by fever, sweats, weakness, malaise, and weight loss often without localized findings.

Brucellosis is also called undulant fever, Malta fever or Mediterranean fever.¹⁻⁵

Human brucellosis is an important but neglected disease in India. Only a few and recent studies have addressed the prevalence and importance of human brucellosis as a human disease problem in India.⁶⁻⁷

Human brucellosis is traditionally described as a disease of protean manifestations. Patients are often labeled pyrexia of unknown origin and subjected to various laboratory tests which do not include Brucella serology. This is because of the general perception that brucellosis is only seldom encountered in this part of the world.⁸⁻¹¹

As the disease has a wide variety of clinical presentation, an attempt is made in this study to know the clinical
presentation, diagnosis, and complications of the disease in D Y Patil School of Medicine.12-15

Aims and Objectives
In our study, we aim to determine the epidemiological factors, clinical features and laboratory diagnosis and complications of brucellosis.

Depending on the time duration, the disease is classified into 3 types.
1. Acute brucellosis
2. Subacute brucellosis
3. Chronic brucellosis.

Complications of brucellosis
1. Osteoarticular - most common complication and exists in three distinct forms peripheral arthritis, sacroilitis, and spondylitis.
2. Neurobrucellosis - it is uncommon and diverse and can affect any part of the central or peripheral nervous system.
3. Cardiovascular - endocarditis is the most seen cardiac involvement. Endocarditis and vegetations may develop on damaged valves, prosthetic heart valves, and especially normal valves, there seems to be a high incidence of heart failure.
4. Hepatic complications - hepatitis is common, usually manifesting as transaminasemia. Granulomas can be found.
5. Genitourinary complications - epididymo-orchitis in men and spontaneous abortion in pregnant females.

The absolute diagnosis of brucellosis requires isolation of the bacterium from blood or tissue samples. Bone marrow cultures are considered the gold standard for the diagnosis of brucellosis since relatively the high concentration of *Brucella* in reticuloendothelial system makes it easier to detect the organism.

The treatment of human brucellosis should involve antibiotics that can penetrate macrophages and can act in the acidic intracellular environment. In 1986, the WHO issued guidelines for the treatment of human brucellosis. The guidelines discuss two regimens, both using doxycycline for a period of 6 weeks, in combination with either streptomycin for 2-3 weeks or rifampicin for 6 weeks.

Alternative drug combinations have been used, including other aminoglycosides (e.g., gentamicin and netilmicin). Trimethoprim - sulfamethoxazole is a popular compound in many areas, usually used in triple regimens.

MATERIALS AND METHODS
We studied a total of 30 patients of brucellosis and observed for various clinical manifestations of patients with brucellosis presented to us and also tried to look for various laboratory parameters and complications of brucellosis.

Study Design
1-year cross-sectional study.

Selection Criteria
A clinical compatible case presenting with any of the followings
1. Fever of more than 10 days
2. Joint pains
3. Low backache
4. Body ache
5. Generalized weakness.

Other diseases known to produce the symptoms in these cases were ruled out by all possible investigations.

A diagnosis of brucellosis was made according to the Centers for Disease Control (CDC) criteria. Case classification: A clinically compatible case that is epidemiologically linked to a confirmed case or that has supportive serology (i.e., *Brucella* agglutination titer of ≥160 in one or more specimens obtained after onset of symptoms).

Patients who are diagnosed to have brucellosis were examined according to the pro forma and other relevant investigations carried out after obtaining informed written consent.

The patient underwent the following investigations:
1. Complete blood count
2. Urine routine
3. Serology (SAT, 2ME, PS for MP, QBC for MP, VDRL, Widal, ASO)
4. Blood culture
5. Chest X-ray (CXR)
6. Other relevant and special investigations were carried out as and when required.

RESULTS
About 576 cases were screened for brucellosis, and 30 cases of brucellosis were diagnosed. Out of these 30, 27 were
from the medical wards, and 3 cases were from pediatric wards.

In the total of 30 patients, more number of cases, i.e., 7 cases each (23.33%) were in the age groups of 41-50 years and 21-30 years. Out of 30 cases, 6 cases (20%) were in the age group 41-50 years, 5 cases (16.6%) in the age group 21-30 years, 3 cases (10%) in the age group 0-10 years, and 2 cases (6.66%) in the age group 51-60 years.

We observed that males are more commonly affected with brucellosis than the females. In our study, 23 (76.66%) patients were males while 7 (23.33%) were females, male to female ratio been 3:1.

In this study, brucellosis was seen more commonly among farmers, shepherds and butchers.

We observed that the rural dwellers, 26 patients (86.66%) were commonly affected than the urban dwellers, 4 patients (13.33%).

In this study, 27 patients had a history of contact with animals, while 3 patients did not have a history of contact with animals.

In this study, history of raw milk consumption was present in 9 patients, whereas 21 patients did not have a history of raw milk consumption.

In this study, acute presentation of brucellosis was seen in 19 patients (63.33%), subacute in 9 patients (30%) and chronic in 2 patients (6.66%).

**Laboratory Parameters**

This study revealed that total leukocyte count is not much altered in brucellosis.

It was found that erythrocyte sedimentation rate was between 20 and 40 mm at the end of 1st h in 12 patients and more than 40 mm at the end of 1st h in 14 patients. It was <20 mm at the end of 1st h in only 4 patients.

In this study, 21 patients had titers in the range of 1:160-1:640 and titers of 1:1280 and above were seen in 9 patients.

Blood culture was done in all the patients. It was positive in 11 (36.66%) cases and negative in 19 patients (66.66%).

Cerebrospinal fluid cultures which were done in 2 cases of chronic meningitis were negative.

CXR did not show any signs specific for brucellosis in all the 30 patients.

Bone marrow study was conducted in 1 patient, although diagnosis of brucellosis was already established serologically.

Electrocardiography was normal in 29 patients, and only 1 patient who was diagnosed to have aortic regurgitation with infective endocarditis showed evidence of the left ventricular hypertrophy.

**Treatment**

All patients were treated with a standard regimen of rifampicin plus doxycycline for 6 weeks or streptomycin for 3 weeks plus doxycycline for 6 weeks. 14 patients were treated with rifampicin plus doxycycline.

**Complications**

Neurobrucellosis and skeletal brucellosis, each of which were seen in 6 patients (20%) were the most common complications.

Among the 6 patients of neurobrucellosis, three had radiculopathy, two had chronic meningitis, and 1 patient had myelopathy secondary to brucellosis. Among the 6 patients of skeletal brucellosis, four had sacroilitis, one had elbow arthritis, and 1 patient had polyarthritis. Brucellar infective endocarditis was seen in 1 patient with rheumatic aortic regurgitation, and 1 patient had epididymo-orchitis.

**DISCUSSION**

About 576 cases were investigated clinically, serologically, bacteriologically, and with other laboratory investigations to confirm the diagnosis of brucellosis. Out of the 576 cases, 30 cases were diagnosed as brucellosis according to CDC criteria. Of the 30 cases, 27 were in adult patients, and 3 cases were in the pediatric age group.

In this study, more number of cases were seen in the age group of 11-50 years. In this study, males were more commonly affected than females.

Most cases were from rural areas; indicating that brucellosis is stills a disease of the rural population.

We made an attempt of finding the source of infection in our study patients and found that 90% had a history of close contact with animals and 30% of the patients had a history of raw milk consumption.

In this study, acute and subacute type of presentation was more commonly seen than chronic presentation.

In our study, symptoms such as fever, sweating, generalized body ache, arthralgia, headache, and low backache were more commonly observed symptoms.
Less commonly observed symptoms were cough, dyspnea, and vomiting.

In our study, signs such as fever, hepatosplenomegaly, hepatomegaly, and splenomegaly were common observations. Osteoarticular signs were also seen.

Standard agglutination titers were positive in all the patients.

In our study, neurobrucellosis was seen in 20% of the patients. Musculoskeletal involvement is seen as the most frequent complication.

In our study, all the patients responded to both drug regimens, and no relapses were noted. No mortality was noted among the patients which in accordance the other studies.

CONCLUSION

Brucellosis was of acute type in 63%, subacute type in 30%, and chronic in 6.6% of the patients. Total leukocyte counts were not much altered in majority of cases of brucellosis.

REFERENCES


Source of Support: Nil, Conflict of Interest: None declared.
Clinical Study of Perioperative Nutritional Status and Post-operative Fluid Management Related Complications in Gastrointestinal Surgeries at a Tertiary Hospital in Thiruvananthapuram

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Abstract

Introduction: Gastrointestinal surgery patients are at risk of nutritional depletion from inadequate nutritional intake, surgical stress, and dehydration. Reasonable selection of proportion and infusion order of crystalloid and colloid is necessary in fluid and nutrition support. In this study, we evaluated perioperative nutritional status of patients and post-operative fluid management related complications in gastrointestinal surgery.

Aims of the Study: (1) To assess the perioperative nutritional status of the patients undergoing gastrointestinal surgery, (2) to correlate nutritional status and the incidence of fluid management related complications postoperatively, (3) post-operative fluid management, the role of colloids and crystalloids.

Materials and Methods: Source of data: This study was a prospective analysis conducted on 51 patients who underwent gastrointestinal and biliary surgery in the Department of Surgery, Medical College, Thiruvananthapuram, during the period 2003-2004.

Results: In emergency surgeries, of 29 bowel perforation surgeries, 13 patients postoperatively developed pulmonary edema and hypotension. In elective surgeries, most of the cases were malignancies with chronic starvation, weight loss, and dehydration showed low blood parameters and had a higher incidence of complications. In long duration surgeries, patients having duration of surgery >4 h had more complications compared to a shorter duration. 7 of 8 carcinoma stomach and all pancreas carcinoma patients developed post-operative complications. Malnourishment and low albumin levels affected the post-operative outcome. Mortality rate in emergency cases (12) was more than the elective ones (7).

Conclusions: Complications were more in emergency and long duration surgeries than in elective and short duration surgeries. Malnourishment and low albumin levels affected the post-operative outcome. Pre-operative nutritional assessment is highly valuable in determining the type and amount of fluid to be administered for a particular patient to prevent complications. Reducing duration of surgery and correction of blood parameters with titrated fluids can reduce the post-operative complications.

Key words: Complications, Fluid, Nutritional status, Perioperative, Post-operative

INTRODUCTION

Pre-operative nutritional status of the patient and subsequent preoptimization before gastrointestinal surgery significantly affects the post-operative morbidity and mortality. The aim of all treatment during the pre-operative period is to prepare the patient to withstand the stresses of surgery and to minimize the risk of surgical procedure. Factors such as the chronological and physiological age of the patient, the degree of physiological derangement and nutritional deficits, the presence of organ system failure or insufficiency, the presence of obesity and the stage of the primary disease must be considered in the decision of when, how, and why to perform an operative procedure. Months of chronic under nutrition cannot be corrected in
a matter of hours, but anemia, dehydration and electrolyte abnormalities can be ameliorated with early initiation of intensive intravenous support and appropriate laboratory monitor.

Perioperative fluid therapy remains a highly debated topic. Its purpose is to maintain or restore effective circulating blood volume during the immediate perioperative period. Maintaining effective circulating blood volume and pressure are key components of assuring adequate organ perfusion while avoiding the risks associated with either organ hypo- or hyperperfusion.

The post-operative management of patients with an acute abdominal catastrophe remains a major challenge for surgeons, anesthetists, and intensivists. One important aspect of gastrointestinal surgery is fluid management either pre-operative, perioperative or post-operative. Intravenous volume replacement given before, during, and after surgery has significantly reduced the mortality. Pre-operative fluid management is normally a hallmark of preparation for urgent or emergency operation, in which one needs to replenish existing fluid or electrolyte deficits and ongoing abnormal losses resulting from the patient’s disease or therapy. The goal of nutritional support during malnutrition is to replete protein deficits and lean body mass and attains positive nitrogen balance and weight gain. In the metabolic support of the critically ill is to limit nitrogen and nutrient losses with the aim of preserving organ structure and function.

The nutritional history and physical examination provide only a gross qualitative picture of nutritional status that is limited by the patients recall and by the accuracy of hospital records, which often neglect the potential effect of malabsorption or lifestyle.

Lab investigations such as serum albumin and serum transferrin levels give a rough index of nutritional status.

**Pre-operative Nutritional Support**

Pre-operative nutritional support for 7-10 days before surgery considered in:

1. Patients with weight loss more than 15%
2. Serum albumin <3 g/dl
3. Nutritional risk index <83.5
4. More than 5 days starvation.

**Post-operative Nutritional Support**

Post-operative nutritional support has been advocated in following patients:

1. Those who are not going to eat for more than 7 days after surgery
2. Patients with weight loss >15% in the pre-operative period, particularly if there is physiological dysfunction
3. Patients who have experienced severe sepsis and trauma and whether have increased metabolic requirement
4. Patients with enterocutaneous fistula particularly of the high output variant.

All the above indices were based on serum albumin levels and it is important in all quantitative measurements of nutritional status. Along with that total protein and hemoglobin levels of the patient give a fairly good idea about the nutritional status.

However, many important issues still remain unresolved in terms of fluid resuscitation. Fluid therapy controversies often arise from a common misconception; the failure to diagnose deficient plasma volume clinically in the presence of excessive interstitial water.

Frequently post-operative shock patients have maldistributed flow with contracted plasma volume but increased interstitial water. Therapy should be aimed at improving circulatory function by restoring plasma volume, not overloading an already expanded interstitial space. Restoration of blood volume is the most important correctable therapeutic problem in acute circulatory shock.

**Effect of Crystalloids in Fluid Resuscitation**

Fluid retention in critically ill patients may be partly due to the administration of saline or carbohydrate as the sole caloric intake, particularly in those who are chronically depleted. Intravenous glucose administration produces acute fluid retention in fasting but otherwise healthy young man by reducing sodium excretion. The effect is increased when sodium chloride is given simultaneously.

Because an expanded extracellular water may contribute to respiratory failure in critically ill patients, the routine administration of 5% glucose and electrolyte solutions should be replaced with adequate parenteral nutrition mainly composed of amino acids, fat, vitamins, minerals, and carbohydrates in quantities that maintain the blood glucose between 100 and 200 mg/dl.

**Advantage of Colloids**

Comparison of hemodynamics and oxygen transport responses to colloid and crystalloid solutions in early adult respiratory distress syndrome (ARDS)/pulmonary edema in which the physiological effects of 1000 ml of crystalloid solutions were compared with those of 100 ml of 25% albumin in 23 patients who developed ARDS showed that 100 ml of 25% albumin solution increased the plasma volume by 450 ml by dragging 350 ml of interstitial
water into the intravascular space. By contrast, 1000 ml of Ringer lactate given to the same patients expanded blood volume by <200 ml at the end of infusion. Crystalloids and colloids should be given in a ratio 3:1 to produce the same volume expansion.

Furthermore, any restoration of blood volume produced by colloids will be nullified by over administration of crystalloids. The successful outcome of surgery depends on comprehensive pre-operative evaluation, patient preparation, skilled surgical technique, and meticulous post-operative care. A better understanding of the natural history of disease allows for improved pre-operative and post-operative management. Although perioperative fluid management remains a highly debated subject, data suggests that goal-directed fluid therapy with the objective of hemodynamic optimization can reduce complications after major surgery. Hence, fluids should be treated as any other intravenous drug therapy, and thus, careful consideration of its timing and dose is mandatory.

In this study, we evaluated the perioperative nutritional status of patients and post-operative fluid management related complications in gastrointestinal surgery.

**Aims of the Study**
1. To assess the perioperative nutritional status of the patients undergoing gastrointestinal surgery based on serum albumin, hemoglobin, and total protein levels and their post-operative outcome
2. To study the incidence of fluid management related complications postoperatively in elective and emergency surgeries
3. Post-operative fluid management, the role of colloids and crystalloids.

**MATERIALS AND METHODS**

**Source of Data**
This study was a prospective analysis done on 51 patients who underwent gastrointestinal and biliary surgery in the Department of Surgery, Medical College, Thiruvananthapuram, during the period 2003-2004.

**Period**
12 months.

**Inclusion Criteria**
Patients who underwent gastrointestinal surgery, both elective and emergency surgery, with:
- Serum albumin <3.5 g/dl.
- Serum total protein <6 g/dl
- Blood hemoglobin <10 g/dl.

**Exclusion Criteria**
Patients with cardiac diseases, renal dysfunction, and respiratory diseases were excluded from the study.

Pre-operative assessment of hemodynamic variables and nutritional status was done, which included routine blood and urine tests, renal function test, serum electrolytes, serum albumin, and total protein.

Preoperatively the type of anesthesia, duration of surgery, use of hypotensive anesthetic drugs was observed. As per the blood loss, the type and the quantity of fluids given by the anesthetist were noted, and the final input and output were assessed.

Post-operative management of these patients was done in the surgical intensive care unit and critical unit. Re-estimation of blood parameters was done.

These patients were monitored based on variables such as central venous pressure, arterial blood gas, urine output, and blood pressure.

Incidence of fluid management related complications such as hypotension and pulmonary edema were assessed. Patients were followed up to the final outcome.

**OBSERVATIONS AND RESULTS**

**Complications in Emergency Surgeries (Table 1 and Figure 1)**
Among 10 duodenal ulcer perforations, 4 developed pulmonary edema and hypotension. Among 11 gastric ulcer perforations, 3 developed pulmonary edema and hypotension (Table 1).

In 2 patients with gall bladder perforation, 1 patient developed pulmonary edema. 1 patient with jejunal perforation developed pulmonary edema and hypotension. 1 patient who underwent emergency cholecystectomy developed pulmonary edema and hypotension.

About 2 patients with sigmoid growth perforation developed pulmonary edema and 1 had associated hypotension. 2 patients with obstructed inguinal hernia perforation developed pulmonary edema and hypotension.

**Complications in Elective Surgery (Table 1 and Figure 1)**
Most of these cases were malignancies. They all had a history of chronic starvation, weight loss, and dehydration. Their blood parameters were low and had a higher incidence of complications.

**Emergency versus Elective Laparotomy (Table 2 and Figure 2)**
Emergency cases showed more complications than elective since the urgency of surgical intervention limited the length.
of pre-operative preparation and the time for correcting pre-existing abnormalities. In 23 patients who developed fluid overload related complications, 14 were emergency 9 were elective.

### Albumin Level and Complications (Table 3 and Figure 3)

1. Among the 51 patients, 22 patients had severe malnutrition, 21 of them developed complications, only 5 recovered (Table 3)

2. Among the 15 patients who were moderately malnourished, 2 patients developed complications and later expired

3. No complications were seen in the mildly malnourished group.

In those patients who had low albumin levels in the perioperative period developed more complications than others.

**Duration of Surgery**

Duration of surgery was <2 h in 14 patients and post-operative period was relatively uneventful.

### Mortality and Recovery (Table 4 and Figure 4)

Out of 51 patients, mortality was 19. Cause of death in 15 patients was respiratory failure. The 32 patients who recovered from complications were duly managed by titrated fluid correction, adequate nutritional correction with nutritional supplements, fresh frozen plasma, albumin, and blood transfusion. 2 needed ventilatory support for recovery (Table 5 and Figure 5).

In this study, it was found that the complications were less and recovery was better in patients who were given both...
crystalloids and colloids in adequate proportion with due importance to colloids wherever required.

**DISCUSSION**

Modern resuscitation of the acutely ill began during the conflicts which occurred in the early and middle parts of the 20th century. Walter B. Canon, professor of physiology at Harvard introduced the term “homeostasis” to describe the “coordinated physiological processes” that maintain a steady state for most systems. He could well be called “the father of critical care.”

Francis D. Moore (1913-2001) defined objectives of metabolism in surgical patients and in 1959 published his widely quoted book “Metabolic Care of Surgical Patients.” In 1960, Jonathan E. Rhoads (1907-2002) in collaboration with colleagues Hars Vars and Stan Dudrick described the technique of total parenteral nutrition, which has become an important lifesaving treatment in the management of the critically ill patients who cannot tolerate standard enteral feedings. As in studies about the total parenteral nutrition of Veterans Affairs 1991 evidences to support pre-operative nutrition support is limited but suggests that if malnourished individuals are adequately fed for at least 7-10 days preoperatively, then the surgical outcome can be improved.

**Table 4: Post-operative outcome**

<table>
<thead>
<tr>
<th>Cases</th>
<th>Mortality</th>
<th>Recovered</th>
</tr>
</thead>
<tbody>
<tr>
<td>DU perforation</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>GU perforation</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Sigmoid growth perforation</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>GB perforation</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Obstructed hernia</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Carcinoma pancreas</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Multiple resection</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>APR</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Right hemicolectomy</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Cholecystectomy and CBD exploration</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Carcinoma stomach</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Jejunal perforation</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Appendicular perforation</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

DU: Duodenal ulcer, GU: Gastric ulcer, GB: Gall bladder, APR: Abdominoperineal resection

**Figure 3: Albumin level and complications**

**Figure 4: Post-operative outcome**

**Figure 5: Management of recovered patients**

**Table 5: Management of recovered patients**

<table>
<thead>
<tr>
<th>Cases</th>
<th>Total number Duration of surgery&lt;2 h</th>
<th>Titrated fluid correction and nutritional parameters correction</th>
<th>Ventilator support</th>
<th>Life-saving surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>DU perforation</td>
<td>6 (6)</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GU perforation</td>
<td>8 (8)</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sigmoid growth perforation</td>
<td>1 (1)</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>GB perforation</td>
<td>2 (2)</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Carcinoma pancreas</td>
<td>1 (1)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right hemicolectomy</td>
<td>3 (3)</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fecal fistula</td>
<td>3 (3)</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>APR</td>
<td>3 (2)</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carcinoma stomach</td>
<td>5 (4)</td>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DU: Duodenal ulcer, GU: Gastric ulcer, GB: Gall bladder, APR: Abdominoperineal resection
Surgeons have been at the forefront in practically all the major developments in nutritional support down through the ages. In 1970 John Hunter first described the use of a tube to feed a patient enterally and almost a century later, the first successfully performed surgical gastrostomy was reported in 1876 (Gauderer and Stellato). Fleming and Remington in 1981 described the concept of intestinal failure, which is defined as a reduction in functioning gut mass below the minimum necessary for the adequate digestion and absorption of nutrients.

In this study, 62.7% patients recovered from complications postoperatively and 32.3% mortality was present.

Pre-operative assessment of hemodynamic variables and nutritional status was done, which included routine blood and urine tests, renal function test, serum electrolytes, serum albumin, and total protein. With respect to albumin levels it was found that 95% patients with albumin levels <2.5 g/dl had complications; 13.3% patients with albumin levels between 2.5 and 3 g/dl had complications. These findings are in consistent with the studies of Gibbs et al.1 in which they quote albumin also have been found to predict post-operative mortality and morbidity for patients undergoing elective surgery and post-operative morbidity for those undergoing gastrointestinal tract surgery. Also in studies by Rich et al.2 and group it’s said that increased complications and prolonged hospital stay are in elderly cardiac surgical patients with low serum albumin.

In our study, it was found that 48.27% of patients undergoing emergency surgeries had complications when compared to 40.9% of patients undergoing elective surgeries. This is in consistent with studies conducted by Kumar et al.3 where they quote that compared with the elective patients, the emergency patients had a higher rate of morbidity and mortality.

Post-operative fluid management related complications were mainly hypotension (35.29%) and pulmonary edema (41.17%). 2 patients needed ventilatory support. Rest of the patients recovered from complications with titrated fluid correction and correction of nutritional parameters. This is in consistent with studies of Brandstrup et al.4 where hypotension and cardiopulmonary complications postoperatively were managed by restricted fluid therapy. In this study it was found that the complications were less and recovery was better in patients who were given both crystalloids and colloids5-7 in adequate proportion with due importance to colloids wherever required. According to studies by Choi et al.,8 there is no apparent difference in pulmonary edema, mortality, or length of stay between isotonic crystalloid and colloid resuscitation which was different from our observations.

Out of 32 patients recovered 14 underwent surgery for <2 h duration that is about 43.75%. Prolonged surgeries show more complications than surgeries of short duration. According to studies by Qaseem et al.,9 patients with prolonged surgeries show higher risk of post-operative pulmonary complications which was in consistent with our studies.

**CONCLUSION**

1. Perioperative nutritional status of the patients undergoing gastrointestinal surgery did affect the outcome. In patients with poor albumin levels, complications were more.
2. Prolonged surgeries had more complications than surgeries of shorter duration.
3. Fluid management related complications postoperatively in emergency surgeries were more than elective due to lack of time for adequate correction of blood parameters and nutritional status.
4. Pre-, per-, and post-operative fluid management complications such as hypotension and pulmonary edema were duly corrected with titrated fluid correction and correction of nutritional parameters.
5. In this study, it was found that the complications were less and recovery was better in patients who were given both crystalloids and colloids in adequate proportion with due importance to colloids wherever required.

**REFERENCES**


Source of Support: Nil, Conflict of Interest: None declared.
English Language Training to Improve Comprehension among Undergraduate Medical Students from Vernacular Language Schooling: A Randomized Waitlist-controlled Study

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Abstract

Introduction: Every year about 15-20% of students joining MBBS in our institution come from a background of schooling in vernacular medium of instruction. These students find it difficult to cope with the rigors of medical education that is fully in English. If an English language bridge course could be formally organized before initiation of 1st-year medical education, it could help such students understand and perform better in their medical curriculum.

Objectives: To evaluate the effectiveness of English language classes for 1st MBBS students from vernacular language schooling in improving their ability to understand and express science concepts.

Materials and Methods: 14 students from a background of schooling in vernacular medium of instruction were recruited into the study. They were randomly divided into two equal groups. Baseline language assessment was done for both groups. The intervention group attended 10 English language classes of 45 min duration in addition to regular 1st MBBS class. The control group attended regular 1st MBBS classes only. Post-test language assessment made for both groups by custom-designed written test which consists of listening skills, comprehension skills, and translation.

Results: 14 students randomized into two groups. No dropouts. Baseline, post-test, and change in score comparisons between the groups done using two-sample t-test. Baseline language performance was comparable in both groups. Post-intervention, no significant difference was found between the groups in the primary outcome language comprehension test. Mean difference between the groups in score change was 4.24%, 95% confidence interval (CI) (−15.46% to +23.94%), and P > 0.05.

Conclusion: It is uncertain whether a 10-day English language training program improves language comprehension among 1st MBBS students from vernacular schooling. Adequately powered studies that employ a more structured training with a longer follow-up are needed to address this knowledge gap.

Key words: Medical English, Language training, Undergraduate medical students

INTRODUCTION

English competence is an essential prerequisite in medical education, especially in countries that do not have a medical curriculum in non-English native languages.¹ Lack of adequate competence in English among medical students has been linked to significant difficulties at all aspects of medical education. Such difficulties could lead to reduced self-esteem and poor performance in their university examinations.² There is a potential need for provision of language-learning opportunities to these students.³ Every year about 15-20% of students joining MBBS in this state-run tertiary care university teaching institution come from a background of schooling in vernacular medium of instruction. These students find it difficult to cope with the rigors of medical education that is fully
in English. It could take months for some to understand and express the basic concepts during assessment tests. In Indian medical education, there are no established norms to conduct formal bridge courses for such students. If such a course could be formally organized before initiation of 1st-year medical education, it could help such students understand and perform better. This study was conducted to evaluate the effectiveness of English language classes for 1st MBBS students from vernacular language schooling in improving their ability to understand and express the concepts in science.

MATERIALS AND METHODS

Study Population
Fourteen students from a background of schooling in vernacular medium of instruction were recruited into the study.

Study Period
The study period was 2 months.

Study Design
This study design was a randomized, waitlist control trial.

Intervention
Participants were randomly allocated to two groups. Random sequence was determined by flipping a coin method. Baseline language assessment was done for both groups.

The intervention group then received 10 sessions of English language training in basic grammar. Each session lasted about 45 min; the entire training spread over 3 weeks. This language training was in addition to regular 1st MBBS classes.

The control group attended only the regular 1st MBBS classes during this initial three-week intervention period. After the completion of post-test for both the groups, the control group participants received English language training sessions similar to those provided to the intervention group. This was done primarily as a way of not denying them an opportunity to learn the basics of medical English. No assessment was done after these sessions.

Outcomes
Pre- and post-test language assessment for both the groups was done by custom-designed written evaluation which consisted of listening, comprehension, and translation skills. The test included multiple-choice, fill-the-blanks, and short passages. Maximum possible score for each test was 17 for pre-test and 22 for post-test and was converted to a 100-point scale for the purpose of analysis. Assessment was done by either of the authors. The groups were compared with each other based on the difference in mean “change in score” from pre-test to post-test.

Baseline, post-test, and “change in score” comparisons between the groups was done using two-sample t-test.

RESULTS

14 students were randomized into 2 groups. There were no dropouts. Baseline language performance was comparable in both groups (Table 1). Post-intervention, no significant difference was found between the groups in the primary outcome language comprehension test. Mean difference of “change in score” between the groups was 4.24%, 95% CI (−15.46% to +23.94%), and \( P > 0.05 \).

DISCUSSION

To the best of our knowledge, this is the first trial in India to assess the feasibility of administering such an intervention. We have demonstrated that English language training imparted through additional sessions for medical students is feasible in the setting of a state-run tertiary care teaching institution. While reports from other countries indicate the need for training in medical English, efficacy of interventions to achieve this has hardly been studied. Although the focus is on language training, the role of medical teachers in such interventions is critical since the ultimate long-term goal is to train better doctors.  

In our trial, intervention could not be proven, informal feedback from the participants was overwhelmingly positive. Inadequate sample size precludes drawing definitive conclusions about the effectiveness of the intervention.

There is scope to standardize the content of training imparted, assess outcomes using validated tools, reduce bias.
by blinding outcome assessment, and improve the power of the study by recruiting participants from successive years of new entrants to the course.

CONCLUSION

It is uncertain whether a 10-day English language training program improves language comprehension among 1st MBBS students from vernacular schooling. Adequately powered studies with structured training and assessment tools and with a longer follow-up could address this knowledge gap.

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Microvascular Reconstruction in the Revascularized Diabetic Foot

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Abstract

Introduction: The reconstruction of diabetic foot after the revascularization is a challenge. Functional reconstruction means to reconstruct the mechanical design to bear weight. This includes reconstruction of skin to the bone of the foot.

Aim: The aim of this study is to study the methods of foot salvage by reconstruction procedures instead of amputation in diabetic foot patients.

Methods: This is the retrospective study of the diabetic foot patients who had undergone revascularization and subsequent reconstruction of foot from January 2003 to February 2014 in Rajiv Gandhi General Hospital and Madras Medical College, Chennai.

Results: Diabetic foot patients who underwent revascularization (angioplasty/bypass) were subjected to debridement (2-3) and followed up after an average latency period of 35-day with appropriate reconstruction procedures.

Conclusion: Following revascularization of the diabetic foot, infection is controlled by debridement and antibiotics. Vacuum-assisted closure therapy is also used in the latency period followed by microvascular free flaps or local flaps to provide stable cover for the diabetic foot. Patient education and orthotic footwear help in preventing recurrences.

Key words: Autonomic neuropathy, Callus formation, Free flaps, Functional microangiopathy, TA Lengthening, Subtotal calcaneectomy, Tendo achilles

INTRODUCTION

Diabetes mellitus is diseases with metabolic, vascular, and neuropathic components that are interrelated.¹ One of the largest populations of diabetics in the world is currently in India.² Diabetic foot infections are a frequent clinical problem. About 50% of patients with diabetic foot infections who have foot amputations die within 5 years. Properly managed most can be cured, but many patients needlessly undergo amputations because of improper diagnostic and therapeutic approaches.³ The reconstruction of the diabetic foot after the revascularization is a challenge. Functional reconstruction means to reconstruct the mechanical design to bear weight. This includes reconstruction of skin to the bones of the foot. The decreased vascularity of the foot should be recognized first as this delays the normal healing of the wound. Next step is revascularization and establishment of wound healing potential. Revascularization is done by endovascular or surgical techniques.⁴,⁵ The first option is endovascular. Regional vascular deficiency following revascularization is corrected, and then the functional reconstruction is carried out.⁶

Aim

The aim of this study is to study the methods of foot salvage by reconstruction procedures instead of amputation in diabetic foot patients.

MATERIALS AND METHODS

Retrospective study was conducted in Department of Plastic and Reconstructive Surgery, Rajiv Gandhi Government
General Hospital and Madras Medical College, Chennai, over a period from January 2003 to February 2014. All the diabetic foot patients who got admitted and had undergone revascularization, and subsequently, had foot defects in need of reconstruction of foot or foot remnants were included. Exclusion criteria: Those who have undergone revascularization but with comorbid illness complicating anesthesia for foot reconstruction. Patients with renal failure, age more than 70 years were excluded from the study. A detailed proforma was made which includes general information of the patient, any comorbid illness, smoking history, treatment history, provisional diagnosis, general and local examination and investigations undergone. Following information are noted from the case records: type of revascularization procedure, latency period (period before embarking on reconstruction following revascularization), number of debridement done before reconstruction, adjuvant procedures performed, foot reconstruction procedure.

RESULTS

Out of 78 patients included in the study, maximum number of patients, i.e., 34 (43.58%) were in the age group between 56 and 60 years, 27 (34.6%) were in the age group of 51-55 years, 10 (12.82%) were in the age group of 45-50 years, and the remaining 7 (8.97%) fall in the age group between 61 and 65 years. Mean age found in the study is 57.2 years. In our study, the majority of the patients, i.e., 68 (69.23%) were males and the rest 10 (13%) were females. The majority of the patients were smokers, i.e., 49 (62.98%) and 29 (37.17%) were nonsmokers.

Of the 78 patients, 42 (53.84%) underwent angioplasty and 36 (46.15%) underwent bypass procedures for revascularization (Table 1).

Most of the patients in our study have undergone two debridements 54 (69.23%), while 22 (28.2%) has undergone 3 debridements and 2 of them has undergone single debridement (Table 2).

The average latency period found in our study is 35.36 days. Most of the patients 28 (35.89%) in our study show a latency period between 21 and 30 days (Table 3). In our study, 42 (53.8%) of the cases underwent negative pressure wound therapy in the latency period.

Of the 78 cases, 59 did not undergo any adjuvant procedures, while 7 (8.97%), 9 (11.53%), 3 (3.84%) has undergone tendo-Achilles lengthening, osteotomy, tenotomy (Table 4).

Complications were found in 7 (9%) of the patients, of which 2 of them had ulcer recurrence, 2 of them had hematoma, 1 had wound dehiscence, 1 had partial flap necrosis, and 1 had flap necrosis (Table 5).

DISCUSSION

The mean age found in our study group is 57.2 years. This is similar to other studies such as Oh et al., Randon et al., and Lee et al., conducted a study in 121 patients which

<table>
<thead>
<tr>
<th>Type of revascularization</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angioplasty</td>
<td>42 (53.84)</td>
</tr>
<tr>
<td>Bypass</td>
<td>36 (46.15)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of debridement</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2 (2.56)</td>
</tr>
<tr>
<td>2</td>
<td>54 (69.23)</td>
</tr>
<tr>
<td>3</td>
<td>22 (28.2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Latency period in days</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤20</td>
<td>2 (2.56)</td>
</tr>
<tr>
<td>21-30</td>
<td>28 (35.89)</td>
</tr>
<tr>
<td>31-40</td>
<td>27 (34.61)</td>
</tr>
<tr>
<td>41-50</td>
<td>13 (16.66)</td>
</tr>
<tr>
<td>51-60</td>
<td>8 (10.25)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Adjuvant procedures</th>
<th>Number of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAL</td>
<td>7 (8.97)</td>
</tr>
<tr>
<td>OST</td>
<td>9 (11.53)</td>
</tr>
<tr>
<td>TEN</td>
<td>3 (3.84)</td>
</tr>
<tr>
<td>Nil</td>
<td>59 (75.64)</td>
</tr>
</tbody>
</table>

TAL: Tendo-Achilles lengthening, OST: Ostectomy, TEN: Tenotomy

<table>
<thead>
<tr>
<th>Complications</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hematoma</td>
<td>2</td>
</tr>
<tr>
<td>Flap necrosis</td>
<td>1</td>
</tr>
<tr>
<td>Partial flap necrosis</td>
<td>1</td>
</tr>
<tr>
<td>Wound dehiscence</td>
<td>1</td>
</tr>
<tr>
<td>Ulcer recurrence</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>7</td>
</tr>
</tbody>
</table>
included the patients of age group 26-78 years and found the mean age to be 54.6 years in their study on diabetic foot reconstruction using free flaps. This is in correlation with the factor that most of the people with diabetes develop peripheral neuropathy 10 years after the onset of the disease leading to the maximum incidence of diabetic ulcers from 50 years onward.\(^7\)\(^9\)

The majority of the patients were males 68 (87.17%) and 10 (12.82%) were females in our study. This is in accordance with Randon et al. study. In Indian scenario, males are mostly the breadwinners working in fields or as laborers mostly barefoot predisposing to repeated trauma in the neuropathic foot leading to ulcerations.\(^8\)

Majority of the patients, i.e., 49 (62.82%) are found to be smokers in our study. In the study conducted by Oh et al., 34.25% were found to be smokers. Smoking habits are higher in Indian men which predisposes to the peripheral arterial disease, more so in diabetic patients leading to ulcerations.\(^7\)

Revascularization procedures are needed to improve the vascularity to the critically ischemic limb in the diabetics. In non-healing ulcers failing conservative therapy revascularization aids in limb salvage. In our study of the 78 patients, 42 (53.84%) had undergone angioplasty and 36 (46.15%) had undergone bypass procedures. Revascularization improves the limb salvage rate by more than 50%, Illig et al.\(^10\)

In our study, the majority of patients underwent two or more debridement to achieve a good wound bed and to reduce infection preceding the reconstructive procedure (Picture 2). The latency period is the time period between the revascularization and reconstruction. This is the period in which wound healing is established due to the improvement in vascularity of the foot. In our study, the average latency period is 35.36 days ranging between 20 and 60 days.

Reconstruction of the foot after the revascularization is necessary as revascularization alone is not sufficient for the healing and to prevent limb loss. In our study, the reconstruction was carried out by locoregional flaps and free flaps. Microvascular free flap surgery is proven to be a safe procedure for providing stable cover to the wounds after revascularization. In our study, 30 patients underwent locoregional flaps and 48 of them underwent free flaps for reconstruction. L. Scott Lewin, Duke University Medical Center, Durham, have found regional flaps to be viable option in treating foot defects with impaired vascularity.\(^11\) In our study, the locoregional flaps done were superiorly based fasciocutaneous flaps were done in 11 cases, inferiorly based fasciocutaneous flaps were done in 5 cases, reverse superficial sural artery flap in 9 cases, perforator flap in 5 cases.

de Blacam et al. in her study conducted in Royal College of Surgeons, Dublin, found a flap loss of about 3.2%
with reverse superficial sural artery flap. They also found that distal tip necrosis problem in the reverse superficial sural artery flap in 15.3%. Cohen et al. conducted a study in 33 patients with medial plantar artery flap and found that it provides excellent like tissue reconstruction of the foot providing good weight bearing ability. 6 cases had complications in their study. 13

Free flaps used for reconstruction in our study are free latissimus dorsi muscle flap used in 19 cases (Picture 1), free gracilis muscle flap in 6 cases, radial free forearm flap in 12 cases, para scapular free flap in 5 cases, and free anterolateral thigh flap in 4 cases (Picture 4). Free medial plantar artery flap taken as a free flap from the opposite foot was used in 2 cases to give a like tissue reconstruction. Sunar et al., in the study conducted in Trakya University, Turkey, found that the free flap done after revascularization in a delayed setting had benefits like assessment of the patency of the grafts improving wound conditions and reducing the operating time. 14 Oh et al. conducted a study of 121 cases with 90 free anterolateral thigh flaps and reported a complication rate of 9% (Picture 5). Prantl et al., conducted a study in University of Regensburg, Germany, found that the para scapular flap to be useful to cover defects in the weight bearing area. 15 Czerny et al., University Medical School, Vienna, Austria, conducted a study and found the gracilis muscle flap to be a good option as it can be done under regional anesthesia and minimal morbidity of the donor site. 16 In case of large foot defects latissimus dorsi free muscle flap is the preferred flap. In our study, complications like hematoma were seen in 2 cases; flap necrosis is seen in reverse superficial sural artery flap. Partial flap necrosis is seen in 1 anterolateral thigh flap, wound dehiscence in 1 perforator flap, ulcer recurrence was found in 2 latissimus dorsi flaps. The overall complication rates were 9%. This is similar to the study done by Oh et al. 7

CONCLUSION

Revascularization of the diabetic foot which is the key to establish the vascularity in ischemic foot also helps in controlling the infection. Infection is also controlled by appropriate antibiotics and wound debridement to remove the necrotic tissues which help in the healing by the formation of granulation tissue. Negative pressure wound therapy is used in the latency period to help in the faster healing. Microvascular free flaps bring in well-vascularized tissue for the stable cover of the diabetic foot with minimal complications where there is a paucity of locally available flaps. Handheld Doppler is adequate for the planning of the reconstructive procedures. Angiogram may not be needed. Adjuvant procedures form an important part in the reconstruction process. Prevention of recurrences is by proper education is the most important. The use of orthotic footwear, silicone gel insoles, and proper off-loading helps in preventing the recurrences.
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Clinical and Microbiological Profile and Treatment Outcome of Infective Corneal Ulcers: A Study in Central India

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Abstract
Background: Corneal ulceration is a leading cause of corneal blindness world over. The underlying microbiological etiology of infective corneal ulcer shows a wide regional variation. An understanding of the clinical and microbial profile of corneal ulcers in a particular region helps us in improved management of this sight-threatening condition.

Materials and Methods: Our study is a prospective, analytical, hospital-based study conducted in the Eye Department of R. D. Gardi Medical College, Ujjain, India. 60 patients with a clinical diagnosis of infective corneal ulcer were enrolled for the study. A complete demographic profile, associated risk factors, and microbial etiology were studied. Treatment outcome was also noted.

Results: In our study, 60 patients with infective keratitis were enrolled. 46 (76.7%) were male patients while 14 (23.3%) patients were females. A history of vegetative injury during crop harvesting was the leading cause seen in as many as 17 (28.3%) patients. 47 (78.3%) patients in our study had an ulcer involving the center of the cornea. 43 (71.67%) patients were found to be culture positive. Among the 43 culture positive patients, 29 (67.44%) patients were positive for fungi, while 14 (32.56%) patients gave a positive yield for bacteria. The majority of our patients, i.e., 37 (61.66%) out of 60 showed clinical improvement, while 11 (18.36%) patients recovered. 4 (6.66%) of our patients worsened even after appropriate management.

Conclusion: Fungal corneal ulcers were the most common type found in our study. Timely detection and appropriate management are recommended to prevent prolonged ocular morbidity and blindness.

Key words: Bacterial, Blindness, Corneal ulcer, Fungal, Infective keratitis, Microbial

INTRODUCTION
Corneal blindness ranks next to cataract among the major causes of blindness. Ocular trauma, as well as corneal ulceration, is responsible for most of these cases of corneal blindness. In the developing world, infectious corneal ulcer is a leading cause of prolonged ocular morbidity and visual loss.1 Corneal blindness is responsible for 1.5-2 million new cases of monocular blindness every year.2 In India, approximately 6.8 million people are suffering from corneal blindness. Out of these, about 1 million have bilateral corneal blindness. It has been estimated that the number of people afflicted from corneal blindness in India will increase to 10.6 million by 2020.3

There is a significant variation in the prevalence of corneal ulceration in different parts of the world. This can be attributed to difference in climatic conditions, difference in occupation as well as other socioeconomic factors.4,5 Population-based studies conducted in India and in the USA have found that the incidence of corneal ulceration is 10 times higher in India as compared to the incidence of corneal ulceration in USA.6,7

The causative organism responsible for infective corneal ulcer varies considerably by region. In the Western population, viral corneal infections account for the majority of cases of corneal blindness. On the other hand, fungal and bacterial infections of the cornea predominate in the Asian sub-continent. Thus, practitioners need to
be aware of local epidemiological patterns of corneal infection.

In this study, we aim to understand the epidemiology, the predisposing factors, microbiological profile and the outcome of management of infective corneal ulcers presenting to our hospital, which is a tertiary care hospital located in the state of Madhya Pradesh in Central India.

**MATERIALS AND METHODS**

This study is a prospective, hospital-based study that was conducted at R. D. Gardi Medical College, Ujjain, Madhya Pradesh, India, over a period of 1-year from April 2015 to March 2016. Before the commencement of the study, approval was sought and obtained from the Institutional Ethics Committee. 60 patients with a clinical diagnosis of infective suppurative corneal ulcer were enrolled in the study.

Corneal ulceration was defined as a loss in the continuity of corneal epithelium with underlying stromal necrosis along with associated signs of inflammation, with or without hypopyon.

**Exclusion Criterion**

- Cases presenting as non-infectious keratitis such as peripheral ulcerative keratitis due to systemic autoimmune diseases, Mooren's ulcer, pterygium, keratitis, vernal keratoconjunctivitis associated shield ulcer, contact lens related sterile infiltrates, marginal keratitis, interstitial keratitis, and atheromatous corneal ulcer were excluded from this study.
- Cases of corneal ulcer who presented with excessive corneal thinning and impending perforation, as well as perforated corneal ulcers were excluded, as taking a corneal scraping and subsequently establishing a microbiological etiological diagnosis was not feasible in such patients.
- Typical viral corneal ulcers.
- Pediatric patients, as corneal infection in the pediatric age group differs from the adult disease in risk factors, treatment and complications.8

A detailed history was obtained from each patient, with special emphasis on the patient’s occupation and any prior history of trauma. If present, the mode of injury, as well as the details of previous treatment taken, was noted. Special inquiry was made regarding the use of steroid eye drops, use of indigenous medications and if any self-medication had been resorted to. History of any antecedent febrile illness as well as the history of contact lens wear was also sought. History of any associated systemic illness such as diabetes was taken. The nature and duration of complaints was noted.

The best-corrected visual acuity (BCVA) was recorded. Each patient was subjected to a detailed slit-lamp biomicroscopic examination, with special emphasis on the cornea. The details of the corneal ulcer - including the location, size, shape, depth of the ulcer, nature of infiltrate, margins of the ulcer, presence of any satellite lesions, immune ring, corneal vascularization, and hypopyon - were noted. Photographic documentation of the corneal ulcer on slit-lamp imaging system was done at the time of initial presentation, as well as on each follow-up visit. Ocular adnexal structures were also examined to look for meibomianitis, trichiasis, lagophthalmos, chronic dacryocystitis, etc. All the relevant ocular investigations were carried out. This included lacrimal syringing and testing for corneal sensation. Intraocular pressure by non-contact tonometry was recorded whenever feasible. Fluorescein stain of the corneal ulcer was also performed. B-scan ultrasound examination of the posterior segment was done to rule out endophthalmitis in suspicious cases.

Corneal scraping was performed with full aseptic precautions, after anesthetizing the cornea with 4% lignocaine, under slit-lamp visualization with a sterile No. 15 Bard-Parker blade. The material was obtained by gently scraping the leading edge and base of the ulcer. The material was smeared on two slides - one for Gram-stain and other as 10% potassium hydroxide (KOH) wet mount.9,10 For culture and sensitivity, the material was also directly inoculated by multiple C-shaped streaks, on blood agar, chocolate agar, nutrient agar and two tubes of Sabouraud dextrose agar (SDA) with chloramphenicol (50 mg/ml). The laboratory diagnosis was performed using standard protocols. All the inoculated media, i.e., blood agar, chocolate agar, and nutrient agar were inoculated at 37°C and were evaluated at 24 and 48 h. They were subsequently discarded at 48 h if no growth was observed. The inoculated SDA media for fungi was incubated at 25°C and 37°C and examined daily. It was discarded after 10 days if no growth was present. Identification of growth on SDA was done by lactophenol cotton blue stain, by pigment production and by the morphological appearance of hyphae and spores.11

All routine systemic investigations, including fasting blood glucose to rule out diabetes mellitus, were performed. Systemic examination to rule out any septic focus in the body was also done.

After obtaining the corneal scraping, the patient was empirically put on broad-spectrum antibiotic eye drops and/or antifungal eye drops depending on the clinical
presentation. Corneal ulcers with regular margins, wet appearance, mobile hypopyon, and with greater symptoms were primarily considered to be bacterial in nature and treated with broad-spectrum antibiotic eye drops. On the other hand, corneal ulcers having feathery margins, dry appearance, thick cheesy hypopyon, satellite lesions or with a history of vegetative injury were initially put on antifungal eye drops. The initial therapy was also guided by Gram-stain/KOH mount findings. Cycloplegic drops/ointment was started in all patients. The anti-microbial therapy was reviewed after obtaining the culture and sensitivity report. If no growth was obtained on culture, then the treatment of the patient was continued according to the clinical appearance of the ulcer (as discussed) as well as the clinical response to treatment.

Follow-up of the patient was documented at 1 week, 2 weeks and 1 month, respectively, though the actual follow-up was done more frequently.

On follow-up, we recorded the patient’s BCVA, corneal ulcer size, hypopyon (present/absent/decreased), infiltration (increased/decreased) and symptomatic relief as reported by the patient. The patient was said to have improved if the size of the ulcer, hypopyon, infiltration had decreased and patient’s symptoms had improved.

All the data obtained was entered in a pre-tested performa, and statistical analysis was performed using Statistical Package for Social Sciences version 16.0.

RESULTS

Our study was a prospective, hospital-based study of 60 patients suffering from infective suppurative corneal ulcer. 46 (76.7%) were male patients while 14 (23.3%) patients were females. 47 (78.3%) out of 60 patients belonged to age group 51-60 years while 7 (11.7%) patients belonged to age group of 41-60 years. Only 5 (8.3%) patients belonged to >60 years of age (Figure 1). 55 (91.7%) patients in our study belonged to the rural area, and only 5 (8.3%) patients were from urban background.

Socioeconomic status plays an important role in the causation as well as management of patients with corneal ulcer. Access to medical facilities as well as affordability of treatment becomes significant in the final visual outcome. In our study, 51 (85%) out 60 patients belonged to low socioeconomic group as they mostly came from surrounding rural areas, whereas only 9 (15%) patients belonged to the middle-income group. Occupation of a person also has a bearing on the causation of corneal ulcer in many cases. In our study, we found that 37 (61.7%) out of 60 patients were involved in farming activities and were thus predisposed to vegetative injury. 19 (31.6%) patients were involved in other outdoor activities such as manual labor or were employed in industries, and only 4 (6.7%) patients were working indoors such as in offices/shops or were home-makers (Figure 2).

Climatic conditions play a significant role in epidemiology of corneal ulcers. We found that 20 (33.3%) out of the 60 patients in our study presented during the months of March-April and 16 (26.6%) patients presented during the months of September-October (Figure 3). These four months (March-April, September-October) coincide with the harvesting season in Ujjain district, Malwa region. Thus, the large farming populace is more prone to suffer occupational injury to the eye during this period.

There are a large number of risk factors associated with the causation of corneal ulcers. Ocular injuries remain one of the major pre-disposing causes of infective corneal ulcers. In our study, we found that an antecedent history of ocular trauma before the onset of symptoms was seen in 40 (66.66%) out of 60 patients of corneal ulcer. Co-existing ocular disorders, such as chronic dacryocystitis and bullous keratopathy, were seen in 15 (25%) patients. In 3 (5.1%)
patients, there was a history of inadvertent use of topical steroids. 2 (3.3%) patients were found to be suffering from diabetes mellitus. Both of them were on irregular treatment with consequent very high blood sugar levels at the time of presentation.

Among the cases of ocular trauma, history of vegetative injury such as accidental thorn injury, by the stalk/leaf of wheat plant during crop harvesting was the leading cause seen in as many as 17 (28.33%) patients. A history of injury by other wooden material such broomstick and wooden splinter was seen in 15 (25%) patients. History of injury by animal matter, such as from the tail of domestic animals such as cow and goat or from accidental fall of cow-dung in the eye, was seen in 4 (6.66%) patients. Injury by materials such as stone/sand particles was seen in 3 (5%) patients. Among the coexisting ocular disorder, lid margin abnormalities like severe blepharitis/meibomianitis, trichiasis and entropion accounted for 7 (11.67%) cases. Pre-existing corneal opacity/degeneration such as climatic droplet keratopathy was present in 4 (6.67%) patients. In 1 (1.67%) patient bullous keratopathy was present and 2 (3.3%) patients were found to be having coexisting chronic dacryocystitis in the eye with corneal ulcer (Table 1).

Corneal ulcers profoundly affect the visual function of an individual, and if appropriate treatment is not administered in time irreversible loss of vision will occur. In our study, we found that 50 (83.4%) patients had an unaided visual acuity of <3/60 in the affected eye while only 10 patients had visual acuity of >3/60 in the affected eye. Location of corneal ulcer also influences the final visual outcome as central corneal ulcers are usually associated with marked visual impairment. 47 (78.3%) patients in our study had an ulcer involving the center of the cornea. This led to severe visual impairment in these patients. 6 (10%) patients had peripheral ulcers while 7 (11.7%) patients had ulcers involving the paracentral cornea. Decreased immunity from a comorbid systemic condition usually aggravates the clinical course of corneal ulcer. In our study, we found that 20 (33.3%) of our patients were anemic. This can be attributed to the poor nutritional status of the rural farming population. 2 (3.3%) patients suffered from diabetes mellitus, and 11 (18.4%) patients were found to be hypertensive.

In our study, 43 (71.67%) patients were found to be culture positive. While the remaining 17 patients failed to give a positive yield on culture examination (Figure 4). Among the 43 culture positive patients, 29 (67.44%) patients were positive for fungi, while 14 (32.56%) patients gave a positive yield for bacteria (Figure 5). *Aspergillus* species was identified in 16 (37.21%) patients, while *Fusarium* species was detected in 13 (30.23%) patients. Among the 14 patients testing positive for bacteria, *Staphylococcus aureus* was isolated in 9 (20.93%) patients, *Streptococcus pneumoniae* was identified in 3 (6.98%) patients, while 2 (4.65%) patients tested positive for *Pseudomonas* species (Table 2).

**Table 1: Risk factors associated with corneal ulcer (n=60 patients)**

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Number of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trauma</td>
<td>40 (66.66)</td>
</tr>
<tr>
<td>Vegetative trauma (leaf/grass/thorn)</td>
<td>17 (28.33)</td>
</tr>
<tr>
<td>Animal matter (cow dung/tail of animal)</td>
<td>04 (6.66)</td>
</tr>
<tr>
<td>Sand/stone</td>
<td>03 (5)</td>
</tr>
<tr>
<td>Wooden object (stick/chip)</td>
<td>15 (25)</td>
</tr>
<tr>
<td>Others</td>
<td>01 (1.67)</td>
</tr>
<tr>
<td>Coexisting ocular disorder</td>
<td>15 (25)</td>
</tr>
<tr>
<td>Lid margin abnormalities</td>
<td>07 (11.67)</td>
</tr>
<tr>
<td>Lagophthalmos</td>
<td>01 (1.67)</td>
</tr>
<tr>
<td>Associated corneal opacity/degeneration</td>
<td>04 (6.67)</td>
</tr>
<tr>
<td>Bullous keratopathy</td>
<td>01 (1.67)</td>
</tr>
<tr>
<td>Chronic dacryocystitis</td>
<td>02 (3.33)</td>
</tr>
<tr>
<td>Use of steroids</td>
<td>03 (5)</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>02 (3.33)</td>
</tr>
<tr>
<td>Total</td>
<td>60 (100)</td>
</tr>
</tbody>
</table>

**Figure 3: Seasonal distribution of cases in study group (n = 60 patients)**

**Figure 4: Culture results in the study group (n = 60 patients)**
Treatment of corneal ulcers has always posed to be a challenging task for the treating clinician. In our study, 29 (48.33%) patients were treated with antifungals + cycloplegics + intraocular pressure lowering agents. Topical antibiotics remained the primary anti-microbial therapy in 14 (23.33%) patients. 2 (3.33%) patients underwent therapeutic keratoplasty as they failed to respond to medical anti-microbial therapy and showed progressive clinical deterioration (Table 3).

The majority of our patients, i.e., 37 (61.66%) out of 60 showed clinical improvement, while 11 (18.36%) patients recovered. In 8 (13.3%) patients, the condition remained stationary. 4 (6.66%) of our patients worsened even after appropriate management (Figure 6).

**DISCUSSION**

Cornea, being the most anterior part of the eyeball, is exposed to the atmosphere and thus remains prone to infections. Corneal ulcer is a major health problem in developing world causing prolonged ocular morbidity and loss of vision. The major morbidity from infectious keratitis is due to corneal ulceration and subsequent perforation which can lead to endophthalmitis, or visual loss from severe scarring and vascularisation. Even with appropriate treatment, there is a high incidence of visual loss due to the development of dense corneal scar.

In our study, 47 (78.3%) out of 60 patients belonged to age group 51-60 years. Li *et al.* too found in their study that the age group with the highest prevalence of corneal infections was 50-59 years, accounting for 83.21% of all corneal disease. However, an almost equal distribution among both the sexes was found in a study by Upadhyay *et al.* in Nepal.

The higher incidence of corneal ulcers in female population in the Nepal study could be due to greater involvement of females in outdoor activities there, especially farming.

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found in the studies by Jatoi et al. and Gopinathan et al., thus suggesting that corneal ulcers are more prevalent in farmers and other outdoor workers.\textsuperscript{18,19}

In our study, 36 (60\%) patients presented during the harvesting months of September-October, March-April. Lin et al.\textsuperscript{20} too found in their study a higher incidence of fungal keratitis during the months corresponding to windy and harvesting seasons, during which time infection from vegetative corneal injury may be more likely.\textsuperscript{20} In our study, we found that an antecedent history of ocular trauma was seen in 40 out of 60 patients of corneal ulcer. Trauma was also found to be the major predisposing cause in the studies by Assudani et al., Sethi et al., and Ranjini and Waddepally.\textsuperscript{1,21,22} A history of injury by other wooden material was seen in as many as 15 (25\%) patients in our study group. A similar high incidence of vegetative injury was seen in the study by Chhangete et al. done in Kumaon region of Uttarakhand, where 23.7\% patients reported injury with vegetative matter.\textsuperscript{23} 2 (3.3\%) patients were found to be suffering from diabetes mellitus in our study group. A similar prevalence of diabetes in the study population was found in the study of Krishna et al.\textsuperscript{24} Contact lens use has been found to be a major predisposing factor causing infective ulcerative keratitis in a large number of studies conducted among the Western population. However, in our study, there were no contact lens users among the corneal ulcer patients. This is due to the fact that the majority of patients in our study group belonged to rural areas. This finding is similar to the study by Basak et al. who also found the number of contact lens users to be negligible.\textsuperscript{25}

In our study, 43 (71.67\%) patients were found to be culture positive. In a study by Tewari et al., microbiological etiology on culture examination could be determined in 60\% patients presenting with corneal ulcer.\textsuperscript{26} In another study by Gupta et al., 87.5\% cases showed growth on culture media.\textsuperscript{27} Among the 43 culture-positive patients in our study, 29 (67.44\%) patients were positive for fungi, while 14 (32.56\%) patients gave a positive yield for bacteria. Nath et al. in their study conducted in Assam found that a fungal etiology could be established in 60.6\% cases.\textsuperscript{28} The preponderance of culture positive fungal corneal ulcers in our study can be attributed to hot climatic conditions conducive to the growth of fungi and agriculture being the main occupation of the large farming populace in our study group. On the other hand, a study conducted in Nepal by Suwal et al. found bacterial isolates (56\%) outnumbering the fungal isolates (44\%). Furthermore, in their study, S. pneumoniae (31.1\%) was the commonest among the bacteria, while Fusarium (13.4\%) was the most common fungus isolated.\textsuperscript{29} Thus, the microbiological etiology differs not only from region to region but also varies with the occupational exposure of the study population to different microbes. Among the 29 patients testing positive for fungus in our study group, Aspergillus species was identified in 16 (55.19\%) patients, while Fusarium species was detected in 13 (44.83\%) patients. Amatya et al. in their study conducted in Nepal found that the commonest fungal pathogen was Aspergillus species (33\%) cases, followed by Fusarium species (12.66\% cases). S. aureus (44.53\% cases) was isolated as the most common bacterial agent.\textsuperscript{30} These results are comparable to our study.

In our study, 6.66\% patients worsened or progressed even with appropriate medical line of management. In a study by Prakash and Kemisetty, 10\% patients worsened with treatment and 4\% patients required emergency keratoplasty due to perforation.\textsuperscript{31} 3.33\% patients underwent therapeutic keratoplasty in our study due to non-responsiveness to treatment.

Corneal ulcer leads to permanent visual impairment in the vast majority of cases due to corneal scarring. In our study, we found that 50 (83.4\%) patients had a visual acuity of <3/60 in the affected eye. Keshav et al.\textsuperscript{32} also found in their study that 65\% patients had a visual acuity of <3/60.

**CONCLUSION**

Infective suppurative keratitis is a major cause leading to prolonged ocular morbidity and loss of vision. This is more so in developing countries like India, where the vast majority of people are socially and economically backward, dwelling in rural areas and pursuing agriculture and other manual work as their main source of livelihood. These individuals are at an increased occupational risk of ocular trauma. In addition, the problem is compounded by frequent late presentation of the patient due to lack of awareness, and inaccessibility to specialist ophthalmic care. It has been seen that the microbiological etiology of infective keratitis shows a wide regional variation. In our study, we found that that in our region fungal corneal ulcers predominate, as the majority of patients present with a history of antecedent vegetative trauma. The occurrence of corneal ulcers peaks during the harvesting season. Treating infective suppurative corneal ulcers as an ophthalmic emergency and quick administration of appropriate antimicrobial therapy is the need of the hour for saving the eye of the patient and preventing the catastrophe of lifelong blindness.

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Fixation of Posterior Cruciate Ligament Avulsion Fractures with Open Reduction and Cancellous Screw Fixation using Posteromedial Approach to Knee

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Abstract

Introduction: Avulsion fracture of the posterior cruciate ligament (PCL) is a relatively uncommon injury. Numerous techniques for treatment of PCL avulsion fractures have been described in literature from closed reduction to definitive fixation, both open and arthroscopically assisted fixation.

Purpose: This study aims to evaluate the clinical outcome of open reduction and cancellous screw fixation via posteromedial approach.

Materials and Methods: This retrospective study includes 28 patients with documented PCL avulsion fractures between 2011 and 2015. They all underwent open reduction and cancellous screw fixation using posteromedial approach by the same lead operating surgeon. The inclusion criteria were an isolated displaced PCL avulsion fracture presenting within 3 weeks of injury. All patients were assessed with a pre-operative magnetic resonance imaging to confirm the fracture.

Results: Radiographs taken postoperatively showed all avulsed fragments reduced were maintained and healing was evident in all cases by the end of 3 months. Clinically, no symptoms of instability were called for and no signs of PCL deficiency were elicited. The average lysolm knee score was 96.6 (86-100), and the average International Knee Documentation Committee score was 94.6 (91-98).

Conclusion: This study demonstrated open reduction and cancellous screw fixation as a successful surgical intervention procedure for treatment of PCL avulsion fractures.

Key words: Avulsion fracture, Internal fixation, Joint instability, Knee injury, Posterior cruciate ligament

INTRODUCTION

Avulsion fracture of the posterior cruciate ligament (PCL) is a relatively uncommon injury. For the Indian population, the most common mode of injury is due to motor vehicle accidents and contact sports.¹ The main mechanism involved in PCL injuries is the dashboard injury, from direct trauma to the tibia in the anteroposterior direction with the knee in flexion.² In sports mediated injuries, the main mechanism of injury is sudden excessive flexion of an extended knee or fall over a flexed knee.³

The PCL serves as a primary restraint to posterior translation of tibia over the femur and also as a secondary restraint to internal and external rotatory forces over the knee.⁴ If left untreated, a PCL deficient knee is prone to abnormal loading and is predisposed to cartilage damage and early degenerative changes.⁵

Over the past few years, a lot has been discussed about treating PCL avulsion fractures. The incidence of this subset of injury had increased over the past few years,
partly due to improved diagnostic techniques and increasing awareness of the necessity to treat these fractures.\textsuperscript{6} Although conservative management is no longer advocated for PCL avulsion fractures, there is a lot a debate over the favorable choice of surgical fixation technique. While open reduction and screw fixation have been in the forefront for a lot of years, recent advances in arthroscopic techniques have encouraged more surgeons to opt for arthroscopic assisted fixations. Although both techniques have their advantages and disadvantages, it is usually at the discretion of the operating surgeon toward choosing the technique of his choice and comfort. In our study, we have discussed the technique and results of open reduction and cancellous screw fixation of PCL avulsion fractures.

\textbf{MATERIALS AND METHODS}

The study was conducted from June 2011 to May 2015. 28 patients with PCL avulsion fractures were included in the study. The injury was diagnosed on clinical examination and plain radiographs taken in anteroposterior and lateral views. Magnetic resonance imaging evaluation was done to confirm the diagnosis, to document the size of the avulsed fragment and also to rule out any associated lesions in the affected knee. Those patients presenting within 3 weeks of injury were included in the study. Those cases presenting beyond 3 weeks, or those with multi-ligamentous injuries or those with fractures of the femur or tibia were excluded from the study. All the patients underwent open reduction and screw fixation using 4.5 mm partially threaded cancellous screws.

\textbf{Surgical Technique}

Spinal anesthesia was administered to all the patients. The procedure was performed in prone position with exsanguination of the lower limb and under tourniquet control. An inverted L-shaped incision taken with a horizontal limb just proximal to the flexion crease of the knee and a vertical limb overlying the medial aspect of the gastrocnemius muscle. Dissection carried to deep facial layer. An interval created between medial head of gastrocnemius and semimembranosus. Posterior joint capsule is reached through this interval via blunt finger dissection. Care is taken to identify and isolate the motor branch of the tibial nerve and the middle geniculate artery. A longitudinal cut in the capsule gives good exposure of the avulsed fragment. At this stage, slight flexion of the knee by keeping a leg roll beneath the ankle helps to improve visualization. The avulsed fragment is identified. The bony bed of the fragment is debrided and freshened. Following this, the bony fragment is reduced on its bed and provisionally fixed with a 2 mm Kirschner wire (K-wire). The position of this K-wire is confirmed under fluoroscopy and if satisfactory, a 4.5 mm partially threaded cancellous screw with washer is used for definitive fixation of the avulsed fragment. Following this, the position of the screw and the reduction is confirmed with fluoroscopy. Adequate wound wash is given and the wound is then closed in layers. Figures 1-3 illustrate one case example demonstrating the pre-operative lesion, post-operative reduction and intra-operative fluoroscopic images.

\textbf{Post-operative Management}

Postoperatively, the knee is immobilized in a long knee brace. At the end of 2 weeks, the extension knee brace is converted to a hinged knee brace and partial weight bearing is begun. During the period of immobilization, static quadriceps, hamstring flexion exercises, and straight leg raising exercises are performed. By the end of 4 weeks, full weight bearing is begun. Open chain quadriceps exercises are not initiated until 6 weeks postoperatively. Return to the previous full activities is achieved at the end of 4 months.

\textbf{RESULTS}

This study included 28 patients, 25 male (90.3%) and 3 female (9.7%), with the mean age of 29.8 years. The right knee was involved in 26 patients (92.8%) whereas the left knee was involved in 2 patients (7.2%). The mechanism of injury was divided into two major categories, road traffic accidents (64.3%) and sports injury (35.7%). The mean surgery time was 53.4 min (30-90 min). The mean intraoperative blood loss was 45 ml (30-60 ml). All the patients were followed up within a mean time period of 22 months (18-34 months). The characteristics of all the patients and the results are elaborated in Table 1.

At the end of 3 months, radiographs of the knee taken showed fracture healing in all patients. There were no major complications such as infection, deep vein thrombosis, or neurovascular deficit at 18 months follow-up. Few patients had Grade-I laxity on examination, however no patient had any complains of instability. Pre-operative mean lysolm score was 28.2 (17-40) which had significantly increased postoperatively to 96.6 (86-100). International Knee Documentation Committee score had also increased from a pre-operative mean of 31.6 (25-42) to post-operative mean of 94.6 (91-98).

\textbf{DISCUSSION}

A displaced PCL avulsion fracture leads to instability of the knee and functional compromise.\textsuperscript{7} Approaching such a fracture through an open technique ensures clear visualization of the fracture fragment with complete reduction and secure fixation.\textsuperscript{8} In this surgical era, there is
very little place for conservative management. Conservative management can lead to early degenerative changes, meniscus tears, and chondral damage. In 1975, Meyer had reported poor functional outcomes following conservative management of PCL avulsion fractures. An appropriately done PCL repair/fixation can prevent these complications.

Furthermore, in the recent years, there is more inclination toward arthroscopic techniques for fixation of such avulsed fractures. Although arthroscopy is considered the minimally invasive surgical approach, the surgical technique needs advanced instrumentation, longer duration of surgery, complicated surgical technique, and a long learning curve.

With regard to the open surgical approach, many different fixation methods have been described in literature. In 1997, Seitz et al. described fixation with K-wires and with cannulated screws, achieving comparable results. Dhillon et al. in 2003 also reported good functional results using cannulated screws in all of their 9 cases with complete fracture healing and no pain at 6 months follow-up. Similarly, Veselko et al. in 2003 reported good to excellent functional results using a cannulated screw with washer. In 2011, Fu et al. described a surgical technique using anchors along with cannulated screws. Chen et al. in 2016 described a technique using tooted plate and hollow lag screw. They achieved good functional results with average intraoperative blood loss of 54.3 ml, average surgery time of 65.5 min and average post-operative lysolm score of 93.6.

With the posteromedial open approach, we achieved satisfactory reduction with a mean surgical time of 53.4 min and mean intraoperative blood loss of 45 ml, results being comparable to the arthroscopic technique. Moreover, all patients included in our study were able to resume the previous athletic and strenuous activities at the end of 9 months. There are very few reported cases of complications associated with this technique. In 2016, Li et al. reported a case of a broken screw post fixation of the PCL avulsion fracture, which leads to the further meniscus and chondral damage. Khatri et al. in 2015 reported two of their 27 patients developed arthrofibrosis post fixation. In this study, none of the patients included had any post-operative complications.

**CONCLUSION**

This study demonstrates that PCL avulsion fractures can be effectively treated using the posteromedial open surgical approach and cancellous screw fixation.
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Do Orthodontic Bracket Designs Affect Streptococcus mutans Count with Conventional Fluoridated Toothpastes?

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Abstract

Introduction: Metallic orthodontic brackets have been found to induce specific changes in the oral environment such as reduced levels of pH, increased plaque accumulation, and elevated Streptococcus mutans colonization. This study ascertained if design differences created differences in microbiological counts of the organism being investigated.

Materials and Methods: A total of 30 orthodontic patients were included in the study with stainless steel (SS) bracket bonded on tooth number 15 and self-ligating bracket (SLB) on tooth number 25. The patients were examined at the 1st visit as baseline record, after 24 h and then after 6 days for comparison. Pooled plaque samples were collected from the buccal surface of both teeth and sent for culture.

Results: SLB bracket when used with conventional fluoridated toothpastes showed more reduction of S. mutans (±1.13333 with \( P = 0.000 \)) as compared to SS bracket (±0.66667 with \( P = 0.001 \)), but no statistically significant difference (\( P > 0.05 \)) was noted between both the brackets.

Conclusion: Conventional fluoridated toothpaste performed well and clinically efficient in reducing S. mutans colony counts around SS and SLB. This would be a useful innovation specially in patients who are periodontally compromised and those who have difficulty in maintaining oral hygiene during orthodontic treatment.

Key words: Fluoridated toothpaste, Self-ligating brackets, Stainless steel brackets

INTRODUCTION

Orthodontic patients are faced with the hazard of increased retention of food particles and plaque accumulation due to the presence of multiple attachments like brackets and other auxiliaries in the oral cavity forming catchment areas for plaque.¹ This results in oral ecological changes with the low pH environment and increased proportions and an absolute number of salivary mutans. Streptococcus mutans is a potent initiator of caries because there are a variety of virulence factors unique to the bacterium and play an important role in caries initiation.² First, S. mutans is an anaerobic bacterium known to produce lactic acid as part of its metabolism. Second, there is the ability of S. mutans to bind to tooth surfaces in the presence of sucrose by the formation of water-insoluble glucans, a polysaccharide that aids in binding the bacterium to the tooth. The most important virulence factor is the acidophil city of S. mutans. Unlike the majority of oral microorganisms, S. mutans thrives under acidic conditions and becomes the dominant bacterium in cultures with permanently reduced pH. Although brushing teeth twice a day is considered...
reasonably effective in plaque and bacterial count reduction, the common prevalence of gingival inflammation in orthodontic patients often suggests inadequate oral hygiene procedures in most patients. 

**Aim and Objective**

To ascertain if conventional fluoridated dentifrices and different bracket design combination could be effective in reducing *S. mutans* count in patients undergoing orthodontic treatment.

**MATERIALS AND METHODS**

Randomized, prospective, cross-sectional, single-blinded, microbiological assay study with each patient acting his/her own control in this study. Department of Orthodontics and Dentofacial Orthopedics, Divya Jyoti College of Dental Sciences and Research and Microbiological Assay were conducted in Divya Jyoti Hospital, Uttar Pradesh, India.

This study was approved by Institutional Committee (IEC No DJD/IEC/2014/A-001). A written consent was taken from each participating subject. 30 orthodontic patients were included in the study with stainless steel (SS) bracket bonded on tooth number 15 and self-ligating bracket (SLB) on tooth number 25. The patients were examined at the 1st visit as baseline record, after 24 h and then after 6 days for comparison. Pooled plaque samples were collected from the buccal surface of both teeth and sent for culture.

**RESULTS**

SLB, when used with conventional fluoridated toothpastes, showed more reduction of *S. mutans* (±1.13333 with *P* = 0.000) as compared to SS bracket (±0.66667 with *P*= 0.001), but no statistically significant difference (*P* > 0.05) was noted between both the brackets (Table 1 and Figure 1).

**DISCUSSION**

Plaque is composed of various microorganisms of which *S. mutans* is the most cariogenic. Loesche *et al.* showed a significant association between plaque levels of *S. mutans* and caries. Although white spot lesion (WSL) occurs in caries development irrespective of orthodontic treatment, it is during orthodontic treatment that they are extremely common and of prime concern for the clinician. The brackets, bands, arch wires and elastomeric modules of fixed orthodontic appliances provide additional surface area for bacteria to develop and thus accelerate the accumulation of plaque and the formation of lesions in areas that would normally have a low risk of caries.

Microorganisms play a major role in causation of WSL and dental caries. Entire removal of microorganism from the oral cavity is difficult, but their count can be reduced with the help of various preventive measures so that it becomes less cariogenic.

The market is flooded with numerous bracket types of different biomaterials. Literature evidences that adherence of plaque to the fixed appliance is largely contributed by the bracket material as it could play a role in the degree of bacterial adhesion and plaque accumulation as well as in the risk of development of WSL.

This study was unique in design as each patient acted as his/her own control as each quadrant of the mouth had a different bracket bonded on a designated tooth. SS bracket was bonded on tooth number 12, SLB on tooth number 25. The results of this study were in accordance to the study conducted by Pellegrini *et al.* and found that self-ligating attachments had fewer bacteria in plaque than teeth bonded with different brackets. This was also in consonance to the study conducted by Fadia *et al.* who found reduced bacterial colonization and better plaque control with SL orthodontic bracket appliance system as

<table>
<thead>
<tr>
<th>Days</th>
<th>Mean difference</th>
<th><em>T</em></th>
<th>d.f</th>
<th><em>P</em> value</th>
</tr>
</thead>
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<td>SS</td>
<td>Base line - after 24 h</td>
<td>0.16667</td>
<td>1.153</td>
<td>29</td>
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<tr>
<td></td>
<td>Day 1-8</td>
<td>0.66667</td>
<td>3.808</td>
<td>29</td>
</tr>
<tr>
<td>SLB</td>
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<td>0.00000</td>
<td>0.000</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>Day 1-8</td>
<td>1.13333</td>
<td>9.109</td>
<td>29</td>
</tr>
</tbody>
</table>

SLB: Self-ligating bracket, SS: Stainless steel

![Figure 1: (a) Four pass method of plaque collection. (b) Four pass method of plaque collection. (c) Ice box. (d) Spreading of plaque sample over petridish](image-url)
compared to conventional ligation method. The results of this study were also in consonance to the study conducted by Pandis et al.\textsuperscript{12} to investigate the effect conventional and SLB on the levels of \textit{S. mutans}. Statistical analysis showed no difference with respect to \textit{S. mutans} counts between the two bracket groups.

**CONCLUSION**

- Conventional fluoridated toothpaste performed well and clinically efficient in reducing \textit{S. mutans} colony counts around SS and SLB.
- This would be a useful innovation specially in patients who are periodontally compromised and those who have difficulty in maintaining oral hygiene during orthodontic treatment.

**REFERENCES**

Fine Needle Aspiration Cytology Features of Metastatic Deposits in Peripheral Lymph Nodes

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Abstract
Introduction: Metastatic malignancy is a more common etiology of peripheral lymphadenopathy than lymphoma, especially in patients over 50 years of age.

Materials and Methods: All the patients presenting with enlarged lymph nodes clinically, were included in the study. Fine needle aspiration cytology (FNAC) was done and the standard method for the procedure was adopted. All the slides were reviewed and diagnosis given for malignancy.

Results: Metastatic malignancy proved to be the most common diagnosis in our study the highest incidence of metastatic malignancy was seen in 6-7 decades of life and with a male predominance. 30 cases were found to have metastatic tumor cells.

Conclusion: Different cytomorphology of secondary deposits in lymph nodes FNAC, correlated with age and site of the lymph node.

Key words: Adenocarcinoma, Metastatic deposits, Squamous cell carcinoma

INTRODUCTION

The key to the diagnosis of lymph node metastasis is the presence of abnormal non lymphoid cells forming aggregates and clusters, among the normal lymphoid cells and absence of lymphoglandular bodies.¹⁴ In patients with enlarged lymph nodes and previously documented malignancy, fine needle aspiration cytology (FNAC) can obviate further surgery performed merely to confirm the presence of metastases. The cytological patterns seen in the aspirated smears of metastatic lymphnode are often clues to the site of primary malignancy.¹⁴

MATERIALS AND METHODS

All the patients presenting with enlarged lymph node clinically were included in the study. FNAC was done and the standard method for the procedure was adopted. All the slides were reviewed and diagnosis given for malignancy.

RESULTS

Metastatic malignancy proved to be the most common diagnosis in our study the highest incidence of metastatic malignancy was seen in 6-7 decades of life and with a male predominance.

30 cases were found to have metastatic tumor cells. 13 cases were diagnosed as metastatic squamous cell carcinoma. 10 cases were diagnosed as adenocarcinoma secondary deposits. Two cases were Malignant melanoma secondaries, and another was papillary carcinoma thyroid. Three were duct cell carcinoma breast to axillary lymph nodes. Two cases were diagnosed as poorly differentiated carcinoma (Tables 1-3 and Figures 1-4).

DISCUSSION

• Metastatic squamous cell carcinoma was the most common entity in our study. Tumor cells are seen mostly in sheets and singly
scattered the cells have dense cytoplasm with hyperchromatic nuclei with abundant cytoplasm.

- In well differentiated squamous cell carcinoma the tumor cells shows individual cell keratinization.
- In the study the adenocarcinoma was the common metastatic tumor.
- Well differentiated adenocarcinoma cells with acinar and occasionally papillary arrangement and also singly scattered. The individual cells are usually cuboidal to columnar with moderate amount of cytoplasm and nuclei with prominent nucleoli. Cells even show vaculoated cytoplasm indicating intracellular mucin secretion.
- In the study of papillary thyroid carcinoma shows metastatic deposit in lymph nodes where the cell clusters where in papillary pattern with central fibrovascular core along with the characteristics vesicular nuclei with nuclear grooving and intranuclear inclusions.
- Metastatic ductal carcinoma was seen in 3 cases where all the female patient presented with the breast lumps. Smear yeilds high cellularity with several loose clusters of tumour cells. Malignant ductal cells have moderate to abundant cytoplasm with pleomorphic nuclei and prominent single to multiple nucleoli.
- Melanoma can be seen anywhere in the body.

For example:

- Eye ball, head neck and great toe and it is can heavy metastasis to any specifically cervical or inguinal

| Table 1: Agewise distribution of FNAC on metastatic lesion of lymph node |
|--------------------|----------------------|
| Age group          | Number of cases (%)  |
| 0-15               | 0 (0)                |
| 16-30              | 0 (0)                |
| 31-45              | 6 (20)               |
| 46-60              | 10 (30)              |
| 61-90              | 14 (50)              |
| Total              | 30 (100)             |

| Figure 1: Fine needle aspiration cytology smear showing metastatic deposits of malignant melanoma |

| Table 2: Sitewise distribution of FNAC of metastatic lesion of lymph node |
|-----------------------------|----------------------|
| Site of involvement        | Number of cases (%)  |
| Cervical                   | 15 (50)              |
| Submandibular              | 2 (10)               |
| Submental                  | 1 (5)                |
| Axillary                   | 3 (15)               |
| Inguinal                   | 2 (10)               |
| Supraclavicular            | 7 (10)               |
| Total cases                | 30 (100)             |

| Figure 2: Fine needle aspiration cytology smears smear showing squamous type tumour cell |

| Table 3: Incidence of FNAC on metastatic lesion of lymph node |
|---------------------|-----------------|
| Metastases          | Number of cases (%) | Male | Female |
|                     |                  | 17   | 13    |
| Total               | 30 (100)         |      |       |

FNAC: Fine needle aspiration cytology
nodes. 2 cases of metastatic melanoma both in inguinal lymph nodes.

- These smear show discohesive pleomorphic cells with binucleate or multinucleated forms. The nuclei are large with characteristic prominent 1-2 micronucleoli. Intra and extracellular melanin pigment were seen only in 1 case.
- Primary was known only in 2 case of squamous cell carcinoma that is larynx and gastrointestinal tract and in one case of malignant melanoma that is great toe.
- Ductal carcinoma FNAC of breast and axillary nodes was done simultaneously the most common group for lymph node involvement is cervical lymph node.

**CONCLUSION**

In cytomorphology of secondary deposits from the lymph nodes, correlation with age and site of lymph node involved. In present study, cervical nodes were common groups involved. Male patients are slightly more than females. No case of metastasis was sent for histopathological confirmation thus proving that FNAC diagnosis can help surgeon in making a decision regarding the need for excision.

**REFERENCES**

Expert Opine: A Report on Acne Management in India

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Abstract

Background: Glenmark Enabled Expert Exchange, a platform that aims to bring together the clinical acumen of expert and experienced dermatologists in the management of acne, was started by Glenmark in 2014.

Methods: About 65 meetings were conducted on acne across India where 1050 dermatologists participated and shared their experiences on the use of retinoids, use of combination therapies and adherence to treatment.

Result: Retinoid and combination treatment in acne: (a) Cumulative dose of isotretinoin is important, (b) isotretinoin should not be used with topical retinoids, (c) isotretinoin can exacerbate depression, (d) detailed counseling regarding isotretinoin is imperative, (e) implications of pregnancy while on isotretinoin should be discussed with unmarried women too, (f) pregnancy test is mandatory but other blood tests have no role, (g) no other systemic drug for acne should be prescribed with isotretinoin, (h) adapalene is better than any other topical retinoid in terms of safety, (i) topical retinoids can be used in pregnancy, (j) combination treatment is superior to monotherapy, and (k) adapalene and benzoyl peroxide (BPO) combination is preferable over other combinations. Adherence in the treatment of acne: (a) Detailed counseling should be done regarding disease profile and diet; (b) follow-up visit after 1 week of treatment and minimum use of cosmetics should be advised; and (c) only prescribed cleansers/moisturizers should be used.

Conclusion: Among retinoids, oral isotretinoin remains the gold standard for acne therapy whereas adapalene and BPO combination is the preferred combination. Counseling also plays an important role in adherence to treatment.

Key words: Adherence, Glenmark Enabled Expert Exchange, Isotretinoin, Retinoids

INTRODUCTION

Acne vulgaris is a chronic multifactorial disorder of the pilosebaceous follicle with a prevalence of almost 95%. Although it affects people of all ages, but primarily occurs in adolescent age. It is characterized by various clinical presentations such as comedones, papules, pustules, and nodules. Its pathogenesis is multifactorial which includes increased sebum production, follicular hyperkeratinization, colonization of Propionibacterium acne and inflammation. Although it is not a life-threatening disease, it may have deleterious effects on the quality of life of affected individuals.

Due to a better understanding of the pathogenesis, new therapeutic options are available for acne and fortunately, acne is responsive to the wide-range of medications with the goals of therapy being to clear the lesions, prevent scarring and minimize treatment-related side effects. Currently available newer fixed-dose combination drugs target multiple acne pathogenic factors, ensure efficacy and improved tolerability and thus fulfill patient expectations. In spite of the wide availability of antiacne medications, successful management of acne needs careful selection of antiacne drugs according to clinical presentation and individual patient expectations. The purpose of this article is to review the treatment options available in India in this scenario.

Due to the availability of multiplicity of treatment options, every dermatologist treats acne based on clinical evidence.
and using his clinical acumen. Hence, a lot of new things are happening at individual level of doctor. Hence, to gain insights into the different treatment options for acne, Glenmark created Glenmark Enabled Expert Exchange (GEEX). GEEX, a platform that aims to bring together the clinical acumen of expert and experienced dermatologists in the management of acne in India.

About 70 meetings were conducted on acne across India between May 2014 and October 2015. A total of 1050 dermatologists participated in the meetings. Various topics on acne were discussed, but more focus was given on treatment and adherence in acne management. Under acne treatment, different topics were discussed such as use of retinoids, use of combination therapies, role of supportive modalities, and newer aspects in management of acne.

The key discussion points are summarized below:

**TREATMENT IN ACNE**

**Topical Retinoids**

Dermatologists are using retinoids for more than 30 years. Many guidelines suggest using topical retinoid as the first line therapy, alone or in combination, for mild to moderate inflammatory acne. For maintenance therapy; it is the most preferred agent. Topical retinoids target the microcomedo, normalizes follicular desquamation and reduces follicular plugging. The efficacy of topical retinoids is well-established in many clinical trials.\(^4\)\(^9\)

As a result, retinoids are both comedolytic and anticomedogenic, making them an effective treatment for open comedones, closed comedones, and papules. They also help in penetration of other topical medications, hence decreasing post inflammatory hyperpigmentation which makes them integral part of acne management.\(^10\)

Among available topical retinoids; tretinoin and adapalene are the most studied topical retinoids for acne management worldwide.\(^11\) Adapalene is generally well-tolerated and efficacious than all other retinoids.\(^8\)\(^12\) The common side effects with topical retinoid are dryness and irritant dermatitis which may vary depending on skin type, sensitivity, and formulations. Furthermore, retinoids can increase sensitivity to the sun, so sun screen use should be encouraged.\(^10\)

**Isotretinoin**

Isotretinoin is an oral retinoid that is indicated for moderate acne to severely cystic unresponsive to adequate conventional therapy.\(^13\)\(^14\) It is the only drug which affects all the pathogenic factors in the etiology of acne.

Despite many clinical studies, there is a lack of consensus on dosing schedule of isotretinoin. Although the approved dose is 0.50-2 mg/kg/day for 20 weeks,\(^15\)\(^17\) many dermatologists are using low dose for longer periods with a total cumulative dose of 120-160 mg/kg. Many of the doctors do not follow or use the cumulative dose concept for the management of acne.\(^16\)

The greatest concern regarding the use of isotretinoin is the teratogenic potential. Therefore, a negative pregnancy test is mandatory before isotretinoin treatment for women of child bearing age. Furthermore, implications of pregnancy while on isotretinoin should be discussed with unmarried women too. A strict contraceptive measure is essential during isotretinoin therapy. As a result, a new risk management program (iPLEDGE) has been developed in the U.S.\(^8\)\(^19\)

Depression is also one of the most important side effects of isotretinoin therapy. However, there is a debate about whether isotretinoin causes depression itself or it exaggerates underlying depression in acne patients. Other side effects include those of inflammatory bowel disease, musculoskeletal, cheilitis, and ophthalmic systems.\(^17\)\(^20\) Most of the side effects are temporary and resolves once the drug is discontinued. Hence, detailed counseling is imperative before isotretinoin therapy.

**Benzoyl Peroxide (BPO)**

BPO is a broad spectrum bactericidal agent which is effective due to its oxidizing activity with comedolytic and anti-inflammatory activity indicated in mild to moderate acne.\(^10\)\(^21\)\(^22\) It is available in different formulations and concentrations (2.5-10%) of which gels are more stable and effective.\(^23\)\(^25\)

At present, there is no documentation of bacterial resistance with BPO; hence it can be combined with topical antibiotics to minimize resistance.\(^29\) The major concern with BPO is its potential for irritation or dryness and bleaching of clothes and hair.\(^26\) It also induces irritant dermatitis.\(^27\) It mostly subsides with the continued use of BPO. For facial acne, the lower concentrations are better tolerable and higher concentrations are acceptable for chest, back, and arms. In addition, BPO washes seems to be effective in truncal acne.

**Topical Antibiotics**

Topical antibiotics such as erythromycin and clarithromycin are often prescribed in inflammatory acne. They act through inhibition of *P. acne* and also reduce inflammation. In India, they are available in conjunction with either zinc or nicotinamide, but there is no evidence of efficacy and safety.\(^28\)\(^30\)
The major problem with topical antibiotics is bacterial resistance; hence it is usually combined with other topical modalities such as BPO or topical retinoids to achieve therapeutic response. In India, other topical antibiotics such as clarithromycin, azithromycin, and nadifloxacin are also available, there is very scarce data regarding efficacy and safety.

COMBINATION THERAPY

For successful treatment of acne, new formulations in combination therapy have been developed. These formulations will not only increase the efficacy of the treatment but also boost the adherence. Furthermore, they minimize the resistance. Some of the examples include adapalene-benzoyl peroxide gel, clindamycin-adapalene gel, and clindamycin-benzoyl peroxide gel.

Other Topical Agents
- Salicylic acid: Although it is less potent than retinoid, it has been used in acne in peels.
- Azelaic acid: It is effective in inflammatory and comedonal acne. Some doctors use it in pregnant patients.
- Dapsone gel 5%: It has anti-inflammatory and antimicrobial properties. In mild to moderate acne, it is safe and effective. But due to availability of better drugs, the use of topical dapsone among dermatologists is minimal.

Oral Antibiotics
In moderate to severe acne, oral antibiotics are commonly prescribed. Tetracyclines and derivatives are commonly used antibiotics since they have antibacterial and anti-inflammatory properties. Azithromycin and cotrimoxazole/trimethoprim are other alternatives.

The most common side effect is gastrointestinal upset. Others include photosensitivity, pigment deposition in the skin, and autoimmune hepatitis. Due to increasing antibiotic resistant P. acne, there is a need to consider antibiotic prescribing practices and to promote the use of non-antibiotic or combination preparations wherever possible.

Antibiotic should be combined with topical retinoid or BPO to minimize resistance. Duration of therapy should be limited to 6-8 weeks. Concomitant use of oral and topical antibiotics is to be avoided.

HORMONAL TREATMENT

Hormonal therapy is relevant in females only. It is useful in premenstrual flares of acne. It is usually needed in female patients with severe seborrhea and geared toward the prevention of the effects of androgens on the sebaceous gland.

Oral contraceptives work by decreasing level of circulatory androgens. Spironolactone can also be used in the treatment of acne despite FDA approval. Hormonal therapy is very much beneficial in inflammatory papules of the lower face and neck. Duration of therapy is usually 3-6 months and should be combined with topical acne regime.

Diet
The myth about acne exaggeration with diet is widespread; hence the association between diet and acne needs to been lightened. Some studies support the link between milk products and exaggerated acne lesions. Furthermore, foods with high glycemic index, chocolates, and fried food are possible triggers for acne, but data are conflicting.

In-office Procedures

Intralesional corticosteroids
A single shot of corticosteroids like triamcinolone acetonide can be useful in acne but has to be used in conjunction with other acne treatment.

Acne surgery
Extraction of comedones and draining of pustules are usually done by comedone extractor tool, but care must be taken.

Chemical peels
Superficial chemical peels such as salicylic acid, glycolic acid, and Jessner’s solution are useful in acne treatment since they exert comedolytic, exfoliating, and anti-inflammatory actions. They are also useful in improvement of post inflammatory hyperpigmentation and skin texture. Peels should be considered as an adjuvant therapy in the treatment of all grades of acne since its addition leads to a quick clinical response and patient satisfaction.

Laser treatment and phototherapy
The usefulness of lasers and light therapy in the management of acne is still in the development stage. These treatments either work by decreasing the P. acne levels, decreasing the sebum excretion, or by reducing the inflammation. However, the long-term efficacy and safety is still to be clarified.

Adherence in treatment of acne
Irrespective of the treatment regime, detailed counseling should be done regarding the disease profile and diet. Furthermore, patients should be asked for follow-up visit
after 1 week of treatment and minimum use of cosmetics should be advised. In addition, non-comedogenic cleansers and moisturizers should be preferred. Treatment should be tailored as per patient’s schedule and lifestyle for adherence.

CONCLUSION

A wide range of treatment options is available for acne vulgaris. However, treatment should be aimed at patient wellbeing such as clearing lesions, improving appearance, and prevention of scars. Monotherapy with topical antibiotics often gives unsatisfactory results and can lead to resistance; hence combination therapy with adapalene and BPO should be preferred. In moderate to severe acne, oral therapies like isotretinoin are preferred. Cumulative dose of isotretinoin should be practiced. Since acne is a chronic disorder, response to treatment may take several weeks to months and this need to be counseled to the patients.

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A Child with Complicated Diphtheria in this Vaccine Era: A Case Report

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INTRODUCTION

In the pre-vaccination era, diphtheria was a leading cause of childhood mortality.¹ ² In developing countries, although the incidence has drastically declined, it still accounts for 80-90% of global burden. Disease in these countries affects both children and young adults.² Diphtheria, meaning leather hide in Greek, is an acute toxin-mediated disease caused by Corynebacterium diphtheriae and rarely by toxic strains of Corynebacterium ulcerans. The bacterium was first noted by Klebs, cultivated by Loeffler and hence called “Klebs-Loeffler bacilli.” Toxin absorption will lead to cardiomyopathy, demyelination and acute kidney injury. The aim of this report is to emphasize the importance of booster doses of immunization.

CASE REPORT

A 12-year-old male child admitted with swelling over the neck and difficulty in swallowing for 15 days, followed by nasal regurgitation of feeds and drooling of saliva. The child was immunized up to 1 and 1/2 years of age as per the Universal Immunization Programme (UIP). Child was not immunized after that. On admission, child was drowsy, febrile, severely dehydrated had dyspnoea, tachypnoea, tachycardia and subcutaneous emphysema extending to arms and the upper chest. Child had a symmetric weakness with absent reflexes of the lower limbs and palatal palsy. The child also had elevated renal parameters suggestive of acute kidney injury and also features of toxic cardiomyopathy with high troponin levels, PR prolongation and nonspecific ST changes with global hypokinesia. A provisional diagnosis of diphtheria was made based on clinical features, and throat swab was sent for culture. Throat swab showed the growth of Corynebacterium. Child’s treatment included dehydration correction with fluid boluses, diphtheria antitoxin 1 lakh units intravenous (IV), injection Clindamycin (IV), and oral erythromycin. With above measures, renal parameters normalized, troponin levels decreased, and palatal palsy

Abstract

Diphtheria is a disease of the respiratory tract caused by Corynebacterium diphtheriae with characteristic tonsillar membrane formation and bull neck. Its associated complications include acute kidney injury, cardiomyopathy, polyneuropathy, and respiratory failure. Mortality is due to respiratory and cardiac compromise. In recent times, re-emergence of diphtheria is being reported in India despite the widespread immunization coverage. Here, we report a case of diphtheria in a 12-year-old boy confirmed with a positive throat swab culture. He presented with clinical features of bull neck, subcutaneous emphysema, toxic cardiomyopathy, polyneuropathy with palatal palsy, and acute kidney injury. He was treated with antibiotics and diphtheria antitoxin (DAT) and recovered over a period of 4 weeks.

Key words: Corynebacterium, Diphtheria, Palatal palsy, Polyneuropathy, Subcutaneous emphysema, Toxic cardiomyopathy

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recovered. Repeat throat swab culture was negative. Child started taking orally well without regurgitation and was able to walk without support by 4 weeks of treatment. He was discharged with a booster dose of Tdap (tetanus, diphtheria, acellular pertussis).

**DISCUSSION**

*C. diphtheriae*, an exclusive inhabitant of mucous membrane and skin, spreads mainly by airborne respiratory droplets. Incubation period is 2-5 days. Its major virulence lies in its ability to produce potent polypeptide exotoxin which inhibits protein synthesis. The presence of tonsillar pseudomembrane which bleeds on removal is a characteristic finding in diphtheria. The local manifestations are due to the inflammatory reaction of the pathogen *per se*. Toxin absorption leads to systemic effects such as acute kidney injury, cardiomyopathy, demyelination of nerves, and palatal palsy.

Gram staining shows multiple club-shaped bacilli resembling chinese letters. Use of selective medium like tinsdale/cysteine tellurite blood agar is recommended. Specific antitoxin is the mainstay of treatment. Antitoxin is administered in a single empirical dose of 20,000-100,000 units based on the degree of toxicity, site, size of membrane, and duration of illness. IVIG (IV immune globulin) is not usually recommended because of inadequate antibodies against diphtheria. *C. diphtheriae* is usually susceptible to antibiotics such as penicillin, erythromycin, clindamycin, rifampicin, and tetracycline.

Primary immunization consists of three doses of DPT (diphtheria, pertussis, tetanus) given at 6, 10, and 14 weeks of age. Booster doses are at 15-18 months and 5 years of age. After primary immunization 94-100% of infants develop protective antibody titers. Disease in the previously immunized individuals is milder and less likely to be fatal.

**CONCLUSION**

In India, with the advent of Expanded Programme of Immunisation (EPI) in 1978 and Universal Immunisation Programme (UIP) in 1985, most of the vaccine preventable diseases have shown a decline but diphtheria is still endemic in our country. The recent resurgence of diphtheria is noted in southern parts of India, reasons being poor vaccination services, overcrowding, increase in migrant population and low awareness among parents. The case fatality rate ranged from 3% to 23%. Case fatality rate is high in children <5 years. A minimum immunization coverage of 90% in children and 75% in adults is required to prevent spread of diphtheria. Emphasis should be made on primary immunization along with booster doses every 10 years for diphtheria.

**REFERENCES**

Post Chemotherapy Histopathological Evaluation of Ovarian Carcinoma: A Case Study

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Abstract

Ovarian carcinoma is one of the most common female malignancies worldwide and is the second most common gynecological cancer after cervical cancer. Neoadjuvant chemotherapy is an upcoming treatment modality for ovarian carcinomas. However, the morphological changes after neoadjuvant chemotherapy have not been described in detail. There is a definitive need for the pathologists to understand and assess these histopathological changes as difficulty in tumor typing, grading, and identification of residual tumor arises.

Key words: Carcinoma, Chemotherapy, Ovary

INTRODUCTION

Ovarian carcinoma is one of the most common female malignancies worldwide and is the second most common gynecological cancer after cervical cancer.¹,² Among women in the United States, ovarian cancer is the eighth most common cancer and the fifth leading cause of cancer deaths.³ However, it causes more deaths than any other cancer of female reproductive system.³ In contrast, ovary is second leading site among gynecological malignancies in India.³ The conventional treatment modality for advanced ovarian carcinoma is primary cytoreduction surgery followed by chemotherapy. However, the new approach is neoadjuvant platinum-based chemotherapy followed by interval debulking surgery. National Comprehensive Cancer Network guidelines for 2012 recommend the approach as this treatment modality reduces surgical morbidity with equivalent survival times.⁴ Due to this new approach, various morphological changes are seen in the tumor cells and stroma. Various changes seen are nuclear enlargement, hyperchromasia, bizarre nuclei, nuclear clumping, cytoplasmic eosinophilia, vacuolization, and foamy cell change. The stromal changes observed are fibrosis, inflammation, necrosis, and dystrophic calcification including the presence of psammoma bodies. Minimal residual disease is defined by the presence of residual tumor ≤1 cm and is one of the best predictive good prognostic factors.⁵,⁷ There are two aims of the study. First is to highlight detailed post chemotherapy histopathological parameters, particularly residual tumor, inflammation, necrosis, fibrosis, and psammoma bodies, on hematoxylin and eosin stained sections.⁴,⁷,⁸ Second is to stress on the fact that there is need to change reporting formats of ovarian carcinoma incorporating these histopathological changes so that they can provide an extra tool to optimize patient management and care.

CASE REPORTS

Case 1

A 45-year-old female was a known case of carcinoma ovary post-chemotherapy (7 cycles).

Pre-chemotherapy investigations were found as:
1. Contrast-enhanced computed tomography (CECT) abdomen - Ovary of size 8 cm × 9.5 cm × 10 cm in the pelvis showing heterogeneous enhancement.
2. 5 ml pale yellow fluid from ovarian mass aspirated under ultrasonography (USG) guidance - Cytocentrifuge smear prepared from fluid showed tumor cells arranged in the clusters having pleomorphic nuclei.

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and abundant vacuolated cytoplasm, reported as adenocarcinoma of the ovary.
3. Serum CA-125 marker was very high (4954.2 U/Ml).
4. USG abdomen - Round to oval heteroechoic mass lesions showing mild vascularity in bilateral adnexae. Bilateral ovaries are not seen separately. The possibility of neoplastic etiology is likely. Enlarged left iliac lymph node, gross ascitis, and borderline splenomegaly.
5. 10 ml ascitic tapping done - Cytocentrifuge smear prepared from fluid showed tumor cells arranged in the clusters having pleomorphic nuclei and abundant vacuolated cytoplasm, reported as metastasis of adenocarcinoma from ovary.

Post chemotherapy investigations were found as:
1. CECT abdomen - In a known case of carcinoma ovary, post chemotherapy status shows huge residual disease of size 4.5 cm × 3.5 cm × 2 cm in the pelvis.
2. Histopathological examination:
   Gross - Received hysterectomy with bilateral salpingo-ophorectomy specimen with iliac lymph node and omentum. First container labeled as uterus with cervix with bilateral ovaries and fallopian tubes contain uterus of size 5 cm × 4 cm × 2.5 cm, endometrium was 0.2 cm in thickness, myometrium was 2 cm in thickness and endometrial cavity was empty. Cervix of length 3.5 cm. Right fallopian tube of length 5 cm; right ovary of size 3 cm × 2 cm × 1.5 cm. On cut-solid, gray-white with some cystic areas. Left fallopian tube of length 5 cm. Left ovary of size 4 cm × 2 cm × 1 cm. On cut-solid, gray-white with some cystic areas (Figure 1). Second container labeled as omentum contain fibrofatty tissue of volume 10 cc. altogether, 3 lymph nodes identified.

Microscopic findings - First container labeled as uterus with cervix with bilateral ovaries and fallopian tubes: Cervix showed chronic cervicitis with nabothian cyst, endometrial glands are in proliferative phase, myometrium showed adenomyosis, right ovary showed features of residual tumor (Figure 2), right fallopian tube showed no specific pathology, left ovary showed features of hemorrhagic cyst, left fallopian tube showed features of acute salpingitis. Second container labeled as omentum showed fibrofatty tissue free from tumor, vial labeled as right iliac lymph node showed 3/3 lymph nodes free from tumor.

Case 2

A 52-year-old female known case of carcinoma ovary post chemotherapy.

Pre-chemotherapy investigations:
1. Computed tomography (CT) abdomen - Right ovarian mass with ascitis, bilateral pleural effusion, fatty liver, omental caking, and degenerative changes in spine.
2. USG-guided fine needle aspiration cytology from ovarian mass-smears showed clusters of large pleomorphic malignant cells with high N: C ratio. Cells are arranged in an acinar pattern, good number of mononucleated giant cells are also present, reported as ovarian adenocarcinoma (Figure 3).
Post-chemotherapy investigations:

Histopathological examination:

Gross -Received hysterectomy with bilateral salpingo-ophorectomy specimen with bilateral pelvic lymph node, peritoneal tissue, and omentum. First container labeled as uterus with cervix with bilateral ovaries and fallopian tube contain uterus of size 6 cm × 7 cm × 3.5 cm, endometrium was 0.5 cm in thickness, myometrium was 1.2 cm in thickness, a globular mass of diameter 2.5 cm present showed the whorled pattern on cut. The endometrial cavity was empty. Cervix of length 4 cm. Right fallopian tube of length 4 cm; right ovary of diameter 2 cm. On cut-solid, gray-white. Left fallopian tube of length 5 cm. Left ovary of diameter 1.5 cm. On cut-solid, gray-white (Figure 4). Second container labeled as omentum contain fibrofatty tissue of volume 15 cc altogether. No lymph node identified. First vial labeled as peritoneal tissue contain tissue piece of size 0.3 cm × 0.2 cm × 0.1 cm. Second vial labeled as bilateral pelvic lymph node contain fibrofatty tissue of volume 5 cc altogether. 2 lymph nodes identified.

Microscopic findings - First container labeled as uterus with cervix with bilateral ovaries and fallopian tube: Cervix showed chronic cervicitis, endometrial glands showed atrophic changes, myometrium showed intramural leiomyoma both fallopian tubes showed acute salpingitis, both ovaries showed features of residual tumor (Figure 5). Second container labeled as omentum shows fibrofatty tissue free from tumor, first vial labeled as peritoneal tissue showed fibrocollagenous tissue only, second vial labeled as bilateral pelvic lymph node showed 2/2 lymph nodes free from tumor.

DISCUSSION

Neoadjuvant chemotherapy is an upcoming treatment modality for ovarian carcinomas. However, the morphological changes after neoadjuvant chemotherapy have not been described in detail. There is a definitive need for the pathologists to understand and assess these histopathological changes as difficulty in tumor typing, grading, and identification of residual tumor arises. There have been very few studies done to address this issue. Only one study carried out by Samrao et al. has objectively evaluated these morphological parameters. They had chemotherapy research and practice 3 largest series of 67 patients and the histological parameters chosen were easily reproducible, whereas in comparison the other studies had smaller case series of 18 patients and the parameters chosen included volume percentage of epithelium, mean nuclear area, and clinical response to chemotherapy which were difficult to reproduce. This study had comparatively larger number of patients and in comparison to Samrao et al. number of parameters was increased to five by the inclusion of psammoma bodies. According to a study carried out by McCluggage et al. presence of psammoma bodies without residual tumor was considered a good response to chemotherapy. Neoadjuvant therapy is an upcoming treatment modality and various studies have documented morphological changes induced by therapy in sites such as colon, breast, esophagus, and lungs. However, not much literature is available on neoadjuvant chemotherapy-induced histopathological changes of ovarian cancer. This leads to erroneous diagnosis particularly when the history of chemotherapy is not clearly stated. On the basis of guidelines published by College of American Pathologists recent American Joint Committee on Cancer staging manual has recommended change in reporting format with stress on morphological changes induced by chemotherapy in colorectal carcinoma. Authors want
to stress upon the fact that such changes should be done in ovarian carcinoma formats. In the present study, the tumor grading and subtyping were not done. Both are considered of prognostic value. Authors want to stress on the fact that neoadjuvant chemotherapy-induced changes make such evaluation impossible which has been confirmed by various studies. All prognostic markers become insignificant after chemotherapy so there is need to change reporting formats and our study wants to stress on post chemotherapy changes and make pathologists aware of such morphological changes. All the parameters considered in this study are easily reproducible and do not require much expertise on the part of pathologists, and their inclusion in the final histopathological report would help in patient management.

CONCLUSION

Accurate tumor typing and grading of ovarian cancer are impossible when preoperative chemotherapy is used. It can be difficult to confirm the presence of residual tumor, making it imperative that pre-chemotherapy tissue biopsies are obtained.

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A New Fracture Pattern of Noncontiguous Fracture of Dorsal Spine: A Case Report

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Abstract

Spinal injury at more than one level is not uncommon. Patients with severe trauma may have multiple noncontiguous vertebral (MNCV) injuries which are defined as injuries to vertebral column at more than one site with these sites being separated by an area of normal spine. A 30-year-old male laborer presented with a history of fall from staircase with sudden onset weakness of both lower limbs with bowel and bladder involvement. He was diagnosed to have fracture of D6 and D12 vertebrae by radiographs and computerized tomography scan. The patient was treated surgically at D12 level by decompression of spinal cord with D12 corpectomy and stabilization by pedicular screws at D10, D11, L1, L2 vertebrae and interbody cage at D12 by total posterior approach, whereas fracture at D6 level was treated non-operatively. Now 6 months postoperatively, the patient shows partial recovery in motor and sensory function of both lower limbs. This case is being presented on account of its unusual pattern of MNCV injuries involving D6 and D12. This type of fracture pattern has not been reported in previous literature.

Key words: Corpectomy, Dorsal spine, Fracture pattern, Noncontiguous

INTRODUCTION

Multiple noncontiguous vertebral (MNCV) fractures are special type of spinal injuries most frequently occurring due to fall from height or traffic accident. Diagnosis of second lesion is frequently delayed. In addition, definition of these injuries is not clear in the literature resulting in variable incidence rates varying from 1.6% to 16.7%¹⁻⁹. Previously, it was defined by the presence of at least 3 intact vertebrae between 2 injured or fractured vertebras.

However, Iencean² suggested that in MNCV fractures there should be at least a normal spinal segment between lesions of same structural type as injured segments. Such lesions are always caused by very high-energy trauma and have consequences ranging from local pain to quadriplegia and even death. In such type of injuries location of fractures were found primarily at extremes of junctures of the spine.

Gupta and el Masri³ described the level of injury as primary and secondary. The primary lesion is the lesion which seemed to be responsible for patient’s symptoms and neurological signs on admission. The secondary lesion is an injury which contributed to patient’s neurological deficit or symptoms.

Various patterns of injuries have been described. We are presenting a different type of pattern not described in previous literature.

CASE REPORT

A 30-year-old male chronic alcoholic presented with a history of fall from staircase under the influence of alcohol followed by sudden onset weakness in both lower limbs and unable to get up. There was no history of head injury or loss of consciousness.

Clinical examination revealed tenderness at upper dorsal spine and dorsolumbar junction and complete paraplegia
with motor and sensory involvement below D12 level with bowel and bladder involvement.

Radiographs and computerized tomography (CT) scan of whole spine showed fracture of D6 and D12 vertebrae. At D6 level, anterior wedge compression fracture with intact posterior cortex. At D12 level, burst fracture with retro pulsed fragment compressing spinal cord.

The patient was operated on next day under general anesthesia at D12 level by decompression of spinal cord and D12 corpectomy through posterior approach and stabilization with pedicular screws at D10, D11, L1, L2 level with reconstruction of D12 by interbody cage and bone graft. Patient managed conservatively for fracture D6. Therefore, advised bed rest for 6 weeks. After that, he was mobilized with Taylor’s brace and anterior spinal hyperextension (ASH) brace on wheelchair.

Currently, the patient is 6-month postoperative with partial recovery in the form of Grade 2 power in both lower limbs with recovery in touch, pain, and temperature sensation and is being mobilized with wheelchair and ASH and Taylor’s brace (Figures 1 and 2).

**DISCUSSION**

Various patterns have been described in multiple noncontiguous spinal injuries in literature. Calenoff et al. studied 35 multiple noncontiguous vertebral injuries. He did analysis of vertebral levels at which primary and secondary injuries occurred and found 3 definite patterns of injuries as described in Table 1 and Figure 3.

Gupta and el Masri studied 935 patients of spinal injuries, out of which 71 patients had multiple noncontiguous spinal injuries. He had found 7 patterns of multiple noncontiguous injuries as described in Table 2 and Figure 4.

Kewalramani and Taylor studied 5 types of MNCV injuries which showed cervical vertebrae as primary lesion and Dorsal and lumbar spine as secondary lesion.

We are presenting this case as a different pattern of MNCV injury as in this case primary lesion is at D12 and secondary lesion at D6 level. This pattern has not been described in literature.

Thus, we conclude that this is a new pattern of MNCV injury, in which there is primary lesion at D12 and secondary lesion at D6. In addition, it is least expected pattern as dorsal spine is relatively stable due to attachment of rib cage.

Thus, recognizable pattern of injury proved to be no substitute for careful examination of injury and total spinal radiography, including CT scan at initial assessment. In addition, early recognition of the secondary or tertiary level of injury is essential for appropriate therapy and to minimize the extent of neurodeficit. Care should be taken to include craniovertebral and lumbosacral junction in radiography.

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**Table 1: Definite patterns of injuries**

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Primary injury</th>
<th>Secondary injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>C5-C7</td>
<td>T12 or in lumbar spine</td>
</tr>
<tr>
<td>B</td>
<td>T2-T4</td>
<td>Cervical spine</td>
</tr>
<tr>
<td>C</td>
<td>T12-L2</td>
<td>L4-L5</td>
</tr>
</tbody>
</table>

**Table 2: Multiple noncontiguous injuries**

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Primary injury</th>
<th>Secondary injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>T1-T6</td>
<td>C1-C2</td>
</tr>
<tr>
<td>2</td>
<td>C1-C3</td>
<td>C6-C7</td>
</tr>
<tr>
<td>3</td>
<td>C1-C3</td>
<td>C4-C7</td>
</tr>
<tr>
<td>4</td>
<td>C6-C7</td>
<td>T4-T7</td>
</tr>
<tr>
<td>5</td>
<td>C3-C5</td>
<td>C1-C2</td>
</tr>
<tr>
<td>6</td>
<td>L1-L3</td>
<td>C4-T2</td>
</tr>
<tr>
<td>7</td>
<td>L1-L3</td>
<td>L5-Coccyx</td>
</tr>
</tbody>
</table>
Any suspicious areas should be clarified by additional projection, including tomography.¹

**CONCLUSION**

This is a new pattern of MNCV injury, in which there is primary lesion is at D12 and secondary lesion is at D6. In addition, it is least expected pattern as dorsal spine is relatively stable due to attachment of rib cage. Thus, to recognize the pattern of injury and its proper treatment total spinal radiography and screening with CT scan is essential in suspected cases.

**Clinical Message**

Radiographic screening with CT scan is essential in suspected cases for early appropriate diagnosis and treatment. Early recognition of the secondary or tertiary level of injury is essential for appropriate therapy and to minimize the extent of neuro deficit.

**REFERENCES**


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Multiple Diverticulosis of Whole Colon, Colonoscopy Finding: A Rare Case Report

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Abstract
Colonic diverticulosis, in general, is an acquired disease, developing as mucosal and submucosal herniations through the circular muscle layer at vulnerable weak points of the colonic wall. Diverticula are covered only by serosa. (1) Where the vasa recta penetrate the muscular layer, (2) the presence of anatomic and physiologic changes contributes to the development of diverticula, (3) combined barostat-manometry studies of the entire colon have demonstrated that compliance is lowest in the sigmoid and descending colon and greatest in the transverse and ascending colon. This difference in mechanical properties between the right and left sides might partly account for the left-sided predominance of diverticulosis, (4) low fiber diet increases the chances of intense, more frequent segmentation, thus predisposing to herniation of mucosa.

Key words: Barostat-manometry, Diverticulitis, Peritonitis

INTRODUCTION
Diverticulosis is the formation of numerous tiny pockets, or diverticula, in the lining of the bowel. Diverticula, which can range from pea-size to much larger, are formed by increased pressure on weakened spots of the intestinal walls by gas, waste, or liquid. Diverticula can form while straining during a bowel movement such as with constipation. They are most common in the lower portion of the large intestine (called the sigmoid colon).1-5

Diverticulosis is very common and occurs in 10% of people over age 40 and in 50% of people over age 60. Most people will have no or few symptoms from diverticula.

Complications can occur in about 20% of people with diverticulosis. One of these complications is rectal bleeding, called diverticular bleeding, and another is diverticular infection called diverticulitis.6-8

CASE REPORT
Patient name Thukuri Rout, aged about 56 years male Hindu from Jagatsinghpur, Odisha of low socioeconomic status working as a skill labor came to hospital with complaints of pain abdomen, increase frequency of defecation, and passing mucous which was off and on in nature subsiding with medicine for the past 2 years.

The initial assessment of patients with suspected acute diverticulitis comprised a thorough history and physical examination including abdominal, rectal, and pelvic examinations. Such as computed tomography (CT), water-soluble contrast enema, cystography, endoscopy, and ultrasound may be performed. The differential diagnosis of acute diverticulitis should also be considered.

Abdominal ultrasound, with a sensitivity of 84-98% and a specificity of 80-97%, is a noninvasive screening tool with the potential drawback of the interpretation of the study, which may differ from one examiner to another. It is helpful, especially in female patients, to exclude pelvic and gynecologic pathology. CT, with a sensitivity of 69-95%, a specificity of 75-100%, and a low false-positive rate, is generally superior to contrast studies. CT with triple contrast - oral, rectal, and IV contrasts - is being used more frequently as the initial imaging study, especially in the acute setting, particularly whenever...
moderately severe disease or abscess is anticipated. Complicated diverticulitis refers to acute diverticulitis accompanied by abscess, fistula, obstruction, or free intra-abdominal perforation.

Uncomplicated diverticulitis may be managed in the outpatient setting with dietary modification and oral antibiotics for those without fever, excessive vomiting, or marked peritonitis admission is required.\textsuperscript{9,10}

Surgical treatment is required in the following condition.
• Diffuse peritonitis
• Failure of conservative treatment
• Persistent sepsis despite percutaneous drainage
• Very low threshold, immunosuppressed, and immunocompromised patients who are likely to fail medical treatment and present with perforation.

CONCLUSION
• The incidence of diverticular disease, particularly diverticulitis, has increased in industrialized countries.
• Diverticular disease can be classified as symptomatic uncomplicated disease, recurrent symptomatic disease, and complicated disease.
• Conservative or medical management is usually indicated for acute uncomplicated diverticulitis. Indications for surgery include recurrent attacks and complications of the disease.
• Surgical treatment options have changed considerably over the years, along with the development of new diagnostic tools and surgical approaches.
• Indications and timing for surgery of diverticular disease are determined mainly by the stage of the disease. In addition, individual patient risk factors, along with the course of the disease after conservative or operative therapy, play a significant role in decision-making and treatment.
• In this context, the purpose of this chapter has been to review colonic diverticular disease and its treatment.

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Primary Eosinophilic Gastrointestinal Disorders: An Update of Presentations

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Abstract

Primary eosinophilic gastrointestinal disorders (EGID) affect mainly the stomach and duodenum. Other organs in gastrointestinal tract are rarely affected. It is a rare clinical entity with no definitive etiology. The varied presentations of EGID account for anxiety of surgeons. The most common presentation of EGID is pain in the abdomen, and high index of suspicion is required for the proper diagnosis of this entity in view of treatment differs on its presentations. In this short communication, we highlight the rare and unusual presentations of EGID.

Key words: Eosinophilia, Gastroenteritis, Gastrointestinal diseases

INTRODUCTION

Eosinophilic gastrointestinal disorders (EGID) referred to eosinophilic gastroenteritis (EG) which is a group of disorders including eosinophilic esophagitis, gastritis, enteritis, and colitis. EGID is a term coined by Rothenberg in 2004.

EGID is an uncommon gastrointestinal tract (GIT) disease and challenging task to diagnose. Physicians must maintain a high index of suspicion and a working knowledge of the natural history of EG is important to establish the proper diagnosis. The symptoms and signs of EGID can simulate an acute abdomen, acute appendicitis, obstructive cecal mass, pancreatitis, cholecystitis, duodenal ulcer, and intussusception. The combination of acute/recurrent abdominal pain with peripheral and tissue eosinophilia confirms the diagnosis of EGID. The etiology of EGID is unknown but the speculation has focused on the selective release of eosinophilic major proteins and causes intestinal epithelial damage.

Over a period of 10-year of histopathology practice, we encountered the three unusual presentations of the primary EGID. Primary EGID is defined as the involvements of GIT primarily with eosinophils rich inflammation in the absence of known cause of eosinophilia including drug reaction, parasitic infestations, and malignancy. The most common form of EGID presenting with chief complaints of “mucosal” form as nausea, vomiting, diarrhea, acute abdomen, malabsorption, anemia, protein-losing enteropathy, etc. The “muscular” form presented with fibrosis due to thickening of bowel wall in view of diffuse infiltration of eosinophils in the muscular layer. We have two cases of this form in the small intestine and appendix, respectively.

Exudative ascites is the main presentation in the serosal form. As per Talley et al., peripheral eosinophilia has been reported in 80% cases of EGID. However, definitive diagnosis requires histopathological evidence of eosinophilic infiltrations.

As per experience, first, we encountered with 54-year-old male presented to emergency department with acute abdominal pain and vomiting with no other positive and relevant history. Abdominal X-ray showed multiple air-filled levels in the small intestine. Emergency laparotomy revealed multiple strictures at the ileum with proximal dilatation. Histopathologically, EGID was confirmed and strictures due to muscular form of EG. Post-operative stool and occult blood test was negative.

The second case was 25-year-old male presented with the acute right iliac fossa pain below umbilicus. Provisionally diagnosed and operated for an appendectomy. To our surprise, obliterative eosinophilic appendicitis was noted on
Primary obliteratorive appendicitis was even rare and presented with unexplained symptoms.\textsuperscript{5}

The third case was even interesting with unusual presentation of EGID, eosinophilic appendicitis presented as mucocele.\textsuperscript{7} Mucocele is a rare condition and often diagnosed as abdominal malignancy. The proper diagnosis of mucocele is only made on laparotomy and histopathology. To the best of our knowledge, this was the first case of acute eosinophilic appendicitis presented as mucocele.\textsuperscript{7} The main precursor for the mucocele formation is the obstruction of the lumen due to muscular thickening and fibrosis.\textsuperscript{7}

Steroids, Na cromoglycate, ketotifen, and montelukcast are the mainstay of medical line of treatment. Complicated cases like ours with obstruction and perforation requires surgical intervention with resection and end to end anastomosis.\textsuperscript{4}

**CONCLUSION**

EGID are a diagnostic dilemma due to varied clinical presentations. Most of the time investigations are only contributory. The surgeons should be alert and vigilant with the unusual and rare presentations of EGID like stricture, obstruction, mucocele, and inflammation to avoid unnecessary surgical intervention.

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