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## CASE PICTORIAL

Original Article

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# Thyroid Stimulating Hormone and Hemoglobin Status in Patients Suffering from Chronic Obstructive Pulmonary Disease

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## Abstract

**Introduction:** Chronic obstructive pulmonary disease (COPD) is a respiratory disease characterized by chronic airflow limitation due to the destruction of lung parenchyma and airways. COPD is associated with several extrapulmonary manifestations that could be the expression of the systemic inflammatory state of COPD.

**Materials and Methods:** Serum thyroid stimulating hormone (TSH) assay and hematologic investigations such as hemoglobin, hematocrit, blood indices and peripheral smear examination were performed in 50 patients with COPD and 51 healthy age-matched volunteers (control group).

**Result:** The study result showed that a significant proportion of COPD patients had an imbalance in TSH level in blood and majority were suffering from a normocytic normochromic type of anemia.

**Conclusion:** COPD is associated with an imbalance in TSH level in blood. Although COPD was thought to cause polycythemia, the current study showed that a significant proportion of patients have normocytic normochromic type of anemia.

**Key words:** Anemia, Chronic obstructive pulmonary disease, Hemoglobin, Thyroid stimulating hormone

## INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is the chronic inflammatory airways diseases with partially or fully irreversible airflow obstruction.[1] Altered endocrine function can worsen the clinical manifestations of COPD through several mechanisms.[2] Several characteristics of COPD patients could increase their likelihood of developing altered thyroid hormone level in blood. Only few studies and data are available on the prevalence of thyroid diseases among patients suffering from COPD.[3] Thyroid dysfunction has been influential known effects on respiratory system, including upper airway obstruction, respiratory muscle weakness, sleep apnea, alveolar hypoventilation, and pleural effusion.[4] Anemia seems to be a common feature in COPD, although its real prevalence remains to be determined. Recent data support that; low haemoglobin (Hb) concentrations can also have a detrimental impact on mortality in COPD patients.[5]

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## MATERIALS AND METHODS

This study was accomplished by examining the COPD patients attending medicine outpatient department and pulmonary clinic of the tertiary referral hospital at coastal Karnataka. Informed, written consent from the patients and control group were taken, before including them to this study. Ethical Clearance from the College Ethics Committee has been obtained.

### Subjects

A total of 50 patients were selected randomly as the subjects (Group 1) who came to the hospital during a period from June 2013 to June 2014.

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Detailed medical history was taken, followed by physical examination and chest X-rays (postero-anterior view) in order to establish the diagnosis of COPD.

Criteria for selection of study group (Group 1) are as follows:

### Inclusion Criteria

Diagnosis of COPD based on current Global Initiative for Chronic Obstructive Lung Disease guidelines.

### Exclusion Criteria

- Patients with known chronic chest diseases other than COPD
- History of malignancy or hematologic disorder
- Those had clinical or diagnosed evidence of thyroid disease or previous thyroid surgery
- History of gastrointestinal or other hemorrhage
- History of chronic alcoholism and liver disease
- We also excluded patients with anemia related vitamin B12 and folate deficiency or other chronic disorders by taking thorough clinical history and physical examination.

Control group (Group 2) consisted of 51 apparently healthy individuals. The control group was recruited with their voluntary consent from the outpatient clinic of other departments who came for minor ailments or minor surgical procedures. Detailed medical history, through physical examination were also done on Group 2 as on Group 1 before selection.

Venous blood samples for hormonal assay were collected into plane blood collection tube, following an overnight fast. Using mini Vidas biomeriux analyzer, thyroid stimulating hormone (TSH) level was measured. Meanwhile hemoglobin (Hb), hematocrit and blood indices were estimated by collecting blood in ethylene diamine tetraacetic acid anticoagulant and test performed using lab life hematology three-part differential premier analyzer. Peripheral smears were prepared from each sample and reported after staining with leishman's stain.

TSH level of 0.25-5 μ IU/ml is taken as normal reference range for both the sexes. Hb level of 13.5-16 g/dl for male whereas, 12.5-15 g/dl for female is taken as normal reference limits, and if Hb is less than its lower reference limit for the sex of the individual, then it is considered as anemia.

Statistical analysis was performed using the SPSS computer package version 20.0. The mean ± standard deviation (SD) was used for quantitative variables. Independent samples *t*-test was applied, to assess the differences in means of quantitative variables between patients and controls. *P*-value and confidence intervals were calculated. $P < 0.05$ was considered as statistically significant.

## RESULTS

Mean age of the sample was 52.7 ± 5.75 SD years. In study grupy (Group 1) 40 patients were male and 10 were female. majority of the patients (66%) were ex-smokers and they were clinically stable at the time of inclusion to study (Table 1), 35 patients had been clinically stable for at least 3 months and 15 had clinical signs of COPD exacerbation. 80% were male and 20% were female. In the control group (Group 2) 19.6% gave a history of smoking, 35.3% were male and 64.7% were female (Table 1). Significant thyroid hormonal abnormalities were detected among established moderate to the severe COPD patients. The mean ± SD of TSH, in the focus population, was 1.04 ± 0.41 μ IU/ml (Table 2).

The mean ± SD of Hb, in the study population was 10.07 ± 0.72 g/dl (Table 3). Out of 50 patients (Group 1), 35 showed decreased Hb in blood, of which 32 were the normocytic normochromic type and 2 were macrocytic anemia and one was the dimorphic type of anemia. Nine patients showed polycythemia and rest with Hb within normal reference range.

**Table 1: Characteristics of patients and control group**

| Characteristics | COPD patients | Control |
|---|---|---|
| Sex | | |
| Male | 40/50 | 18/51 |
| Female | 10/50 | 33/51 |
| Smoking (%) | | |
| Yes | 66 | 19.6 |
| No | 34 | 80.4 |

COPD: Chronic obstructive pulmonary disease

**Table 2: Comparison of thyroid stimulating hormone level in COPD patients and control population**

| TSH | COPD patients | Control |
|---|---|---|
| TSH in μ IU/ml | | |
| Range | 1.64 | 3.64 |
| Mean±SD | 1.04±0.41 | 1.89±0.82 |

COPD: Chronic obstructive pulmonary disease, SD: Standard deviation

**Table 3: Comparison of Hb level in blood in COPD patients and control population**

| Hb | COPD patients | Control |
|---|---|---|
| Hb in g/dl | | |
| Range | 3.60 | 3.90 |
| Mean±SD | 10.07±0.72 | 12.92±0.96 |

COPD: Chronic obstructive pulmonary disease, SD: Standard deviation, Hb: Hemoglobin

Statistical analysis showed *P*-value were $P < 0.05$ for both TSH and Hb and were considered statistically significant.

TSH was within normal limits in both groups however, in the study group (Group 1) the values were toward upper normal limits when compared to their values in the control group (Group 2).

## DISCUSSION

COPD was estimated to become the third leading cause of death and fifth leading cause of disability by the year 2020.[6] Abnormalities in thyroid hormone regulation are encountered frequently in non-thyroidal diseases.[7] Since thyroid hormones regulate the metabolic rate, impaired thyroid function is associated with respiratory workload.[8] The thyroid hormone augments metabolic rate by enhancing mitochondrial oxidation.[9] There is also a significant relationship between TSH levels and COPD exacerbation frequency which suggests that the detection of impairment in thyroid function can decrease exacerbation number and improve the quality of life in COPD patients.[10] Study conducted by El-Yazed *et al.* showed that COPD is associated with the impairment of thyroid gland function with increased mean values of free T3 in these patients but with no significant change in TSH level. Whereas in our study, there was a significant change in TSH level in COPD patients compared to control group.[11]

Study by Madhuri *et al.* showed that Mean serum TSH was within normal limits but had lower values than controls in COPD patients, in the present study we got the similar findings with respect to TSH level in blood.[8]

As far as Hb level in blood is concerned, it has since long been known that COPD causes polycythemia secondary to erythrocytosis caused by hypoxia present in advanced cases of COPD.[12] Contrary to common thinking, recently some studies have shown that some COPD patients had anemia rather than erythrocytosis.[13,14] However, the prevalence of anemia in COPD remains unclear and varies widely. This variability depends on the population under study (stable COPD or patients hospitalized for acute exacerbation), the tools to identifying anemic subjects, and the definitions used for anaemia.[15] It occurs relatively frequently in COPD patients and is related to the presence of inflammation; it is an understudied issue in COPD, but may be of great importance in this disease.[16] Inadequate Hb levels could aggravate tissue hypoxia, worsen dyspnea, and limit exercise tolerance in COPD patients.[17,18] Anemia of chronic disease is an immune disorder with an inflammatory component, which is seen in numerous chronic diseases. Inflammatory cytokines interfere with the normal process of erythropoiesis by exerting various effects on pathogenesis of this form of anaemia.[6] It has considered that COPD is a disease likely to be associated with anemia of chronic disease or anemia of inflammation.[13] The underlying mechanisms of this type of anemia is complex, could be attributed to dysregulation in iron homeostasis, production of erythropoietin and impaired proliferation of erythroid progenitor cells.[6]

Study conducted by El-Korashy *et al.* showed that almost half of patients with COPD have anemia which is in accordance with our study.[19]

Study by Attaran *et al.* also showed that anemia is an underestimated issue in COPD and occurred relatively frequently in these patients.[14]

In our study, we have highlighted the incidence of TSH imbalance and anemia in COPD patients and were based on hypothesis that correction of TSH imbalance and anemia in COPD may improve the outcome and quality of life in COPD patients. Another study with a larger sample size is required for better determination of the correlation between TSH, anemia and COPD. Furthermore, extensive studies are also required to identify the exact underlying mechanism of TSH imbalance and cause of anemia in COPD patients.

## CONCLUSION

COPD is associated with an imbalance in TSH level in blood. Although COPD was thought to cause polycythemia, the current study showed that a significant proportion of patients have the normocytic normochromic type of anemia. Further studies with larger sample sizes are required for better determination of these correlations and to confirm our conclusions.

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Original Article

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# Pseudobasophilia in Pediatric Age Group

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## Abstract

**Background:** Automated instruments show elevated basophil counts in some cases in which the peripheral smear examination does not reveal any basophilia. This study tries to analyze the correlation between the pseudobasophilia in children of age ≤9 years, reported by the hematology auto analyzers, AcT.5Diff and HmX, and the coexisting hematological abnormalities, if any.

**Samples and Methods:** A sample of 70 cases and an equal number of controls matched for age group, machine and sample processing day were included in this study. The peripheral smear of each case was examined and 500 cell differential leukocyte counts were made. In 16 of the 70 cases, absolute basophil count was calculated manually. Analysis of the parameters such as age, sex, time taken to process the sample, percentage and absolute count of basophils automated as well as manual, any abnormality flagged by the auto analyzers and abnormalities detected on peripheral smear examination was done. The mean, standard deviation, standard error, 95% confidence interval were computed for cases and controls. To test the equality of two means, Independent samples *t*-test was used and to compare two groups based on categorical data, Mann–Whitney tests were applied. Statistical analysis was performed using IBM SPSS Version 21 software.

**Results:** The basophilia reported by the automated instruments in the cases was found to be spurious. The $P < 0.05$ with pseudobasophilia in cases of neonates as compared to the other age groups; in cases having Hb ≥ 15 g/dl, nucleated red blood counts (nRBC), neutrophilia, neutrophilic shift to left, reactive lymphocytes, lymphocytosis, standing time ≥ 2 h.

**Conclusions:** The associations of pseudobasophilia with neonatal age, Hb ≥ 15 g/dl, nRBCs, neutrophilia, neutrophilic shift to left, reactive lymphocytes, lymphocytosis and prolonged standing time are significant.

**Key words:** Basophils, Child, Hematology, Leukocyte disorders

## INTRODUCTION

Automated instruments show elevated basophil counts in some cases in which the peripheral smear examination does not reveal any basophilia. This discrepancy is evaluated and corrected in many laboratories before the final report is issued. However, in certain instances, physicians do get false results though these may not have an impact on the health care given to the patients.[1-3] Studies have proven that basophils are not increased in the count during childhood and the counts are comparable to those of adults.[4,5] Further, hematology automated counters are expected to give relatively precise results, as they count some thousand leucocytes; however, studies have shown a low correlation between the basophil count of various instruments, as well as between instruments and the reference method.[2,6] We have observed auto analyzers giving falsely elevated basophil percentage i.e. pseudobasophilia especially in the pediatric age group. In this study, the basophil count given by the hematology auto analyzer is counterchecked by peripheral smear examination and manual basophil counts. Though, many stains including toluidine blue, neutral red, alcian blue can be used to stain the basophils, toluidine blue is found to be particularly useful and hence it is used in this study to do manual basophil count.[7,8] This study tries to analyze the correlation between the pseudobasophilia in children of age less than or equal to 9 years, reported by the hematology automated instruments, AcT.5Diff and HmX, and the coexisting hematological abnormalities, if any.

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### Objectives

This study attempts to cross check automated counter (Beckman Coulter Act.5 diff and Beckman Coulter HMX) generated basophilia by peripheral smear examination and to assess the hematological factors significantly associated with pseudobasophilia.

## SAMPLES AND METHODS

Cases of age ≤9 years, which fulfill both the following criteria: (i) Automated counter generated basophil percentage of ≥2% of white blood counts (WBCs) (on two successive readings), (ii) peripheral smear basophil differential count <2% (when the WBC differential count is done on 500 cells by two independent observers) and controls matched for age group, automated instrument in which the sample was processed and the day of processing of sample, which show basophil percentage of <2% in both the automated results and the peripheral smear examination were included in the study.

Cases and matched controls whose automated results and the peripheral smear examination are concordant with the diagnosis of basophilia were excluded.

A sample of 70 cases and an equal number of controls, as defined by the inclusion and exclusion criteria during a one year period from December 2012 to November 2013 were included in the study. The study had been approved by the Institutional Ethics Committee. As the study was done only on the samples submitted for routine laboratory investigations, consent was not obtained from the patients' and the controls' attenders. The auto analyzers (AcT.5 Diff and HmX) were being calibrated periodically as recommended; commercial quality control samples were being run once every day and integration of the values of the patient samples was being checked every day. The coefficient of variation (CV%) calculated for absolute basophil counts using commercial quality control samples run on 20 consecutive days once daily in each counter was 0.00% and 2.46% for HmX and AcT.5Diff respectively.

The peripheral smear of each case was examined by two independent observers (Dr. Femela Muniraj and Dr. Vijay Amritraj) and 500 cell differential leucocyte counts were made.

In 16 out of the 70 cases, absolute basophil count was calculated manually, using the following staining and diluting fluid, which is a modification of that used by Moore and James.[5,6]

0.05% toluidine blue in 0.9% saline - 10 ml
95% ethyl alcohol - 2.75 ml
Saturated solution of saponin in 50% ethyl alcohol - 0.25 ml.

The blood sample of the cases anti-coagulated with ethylenediaminetetraacetic acid was diluted with the fluid mentioned above, in the ratio of 1:10, since basophils are relatively fewer in number. Improved neubauer chamber was charged with this sample, ensuring that both the chambers in the hemocytometer were charged. The hemocytometer was allowed to stand for a few minutes to allow the leukocyte to settle. With this fluid, the basophils were stained reddish-violet in color, whereas the nuclei of other leukocyte stained bluish-violet. Since, the dilution factor, the fluid used, and the chambers used, were the same for both the basophil count and the total leukocyte count (TLC), both were calculated simultaneously.

Eight corner squares (having 16 smaller squares each) (each measuring 1 mm × 1 mm × 0.1 mm) from two chambers (each having four corner squares) were used for counting both the basophils and the TLC.

Dilution factor = 10
Number of squares counted = 8
Dimension of each square = 1 mm × 1 mm × 0.1 mm
Depth of the chamber = 0.1 mm
n = Number of basophils/total leukocytes in eight corner squares

Absolute basophil count/total leukocyte
count = (n × 10)/(8 × 0.1) = n × 12.5 per cubic mm

Analysis of the parameters such as age, sex, time taken to process the sample, percentage and absolute count of basophils automated as well as manual, any abnormality flagged by the auto analyzer and abnormalities detected on peripheral smear examination was done. Summary statistics such as the mean, standard deviation, standard error, 95% confidence interval were computed for cases and controls. To test the equality of two means, independent samples *t*-test was used and to compare two groups based on categorical data, Mann-Whitney tests were applied. Statistical analysis was performed using International Business Machines Statistical Package for the Social Sciences Version 21 software.

## RESULTS

The mean percentages of basophils on automated counters (AcT.5Diff and HmX) for cases and controls are 7.973 (95% confidence interval [CI] = 6.511-9.435) and 0.851 (95% CI = 0.728-0.974) respectively; the mean difference is 7.122 and the $P < 0.001$. The mean absolute count of basophils on automated counters (AcT.5Diff and HmX) for cases and controls are 1160.143 per cubic mm (95% CI = 907.217-1413.069 per cubic mm) and 109.571

per cubic mm (95% CI = 88.405-130.737 per cubic mm) respectively; the mean difference is 1050.572 and the $P < 0.001$. The mean percentage of basophils on peripheral smear of the cases is 0.191% (95% CI = 0.122-0.260). The mean of the absolute counts of basophils counted manually in the 16 cases is 27.344 per cubic mm (95% CI = 13.159-41.529 per cubic mm). The $P = 0.002$ and the range is between 0 and 87.5 per cubic mm. The difference between the means of absolute counts of basophils calculated by the automated counter and the manual method for those 16 cases is 1038.29 (Table 1).

### Correlation with Machine Model

AcT.5Diff hematology auto analyzer reported basophilia in the majority (90%) (63/70) of the cases, and the rest (10%) (7/70) was reported by the HmX hematology auto analyzer; $P < 0.001$ (Table 2).

### Correlation with Age

The majority (67.1%) of the cases (47/70) belong to the neonatal age group (0-28 days of age), out of which 40/70 cases were 0-1 day old babies; whereas, among the controls, 15.7% (11/70) were neonates. The mean age of the cases is 14.11 days and that for the controls is 36.50 days; $P = 0.049$ (Table 2).

### Correlation with Sex

42/70 (60%) of the cases were males, 28/70 (40%) were females. 39/70 (55.7%) and 31/70 (44.3%) of the controls were males and females respectively; $P = 0.608$ (Table 2).

### Correlation with Red Blood Cells (RBCs)

RBCs were macrocytic normochromic in 45/70 (64.3%) of the cases and 9/70 (12.8%) of the controls; microcytic hypochromic in 5/70 (7.1%) of the cases and 13/70 (18.6%) controls; normocytic normochromic in 20/70 (28.6%) cases and 48/70 (68.6%) controls; the $P < 0.001$. Hemoglobin was ≥ 17g/dl in 28/70 (40%) of cases and 7/70 (10%) of controls; $P < 0.001$. Of these, 24 cases and 6 controls were 0 to 1 day old. Hemoglobin was ≥15 g/dl, but <17 g/dl in 14.3% (10/70) cases and 1.4% (1/70) controls; $P = 0.005$; out of these, 7/10 cases and 0/1 control were 0-1 day old. Nucleated red blood count (nRBCs) were present in 27/70 (38.6%) of cases and were not seen in case of controls; $P < 0.001$ (Table 2).

### Correlation with Leukocyte

Reactive lymphocytes were present in the peripheral smears of 23/70 (32.9%) cases and in 3/70 (4.3%) controls; the $P < 0.001$. Neutrophilia (relative and absolute) was seen in 4/70 (5.7%) cases and 18/70 (25.7%) controls; $P = 0.001$. Neutrophilic shift to left was present in 19/70 (27.1%) cases and 2/70 (2.9%) controls; $P < 0.001$. Lymphocytosis was seen in 15/70 (21.4%) cases and 5/70 (7.1%) controls; $P = 0.025$. Leukocytosis was seen in 10/70 (14.3%) cases and 14/70 (20%) controls; leukopenia in 3/70 (4.3%) cases and 2/70 (2.9%) controls; the count was normal in 57/70 (81.4%) cases and 54/70 (77.1%) controls; $P = 0.578$. Eosinophilia was observed in 5.7% (4/70) cases and 5.7% (4/70) controls; $P = 1.000$ (Table 2).

### Correlation with Platelet Count

54/70 (77.1%) cases and 60/70 (85.7%) controls had normal platelet count. Thrombocytopenia was observed in 13/70 (18.6%) of cases, and 3/70 (4.3%) of controls; thrombocytosis in 3/70 (4.3%) of cases, and 7/70 (10%) of controls; the $P = 0.122$ (Table 2).

**Table 1: Descriptive analysis of Basophils**

| Parameter | % of basophils as per counter (*n*=70) | Absolute count of basophils as per counter (per cu.mm) (*n*=70) | % of basophils on PS (*n*=70) | Manual absolute count of basophils (*n*=16) |
|---|---|---|---|---|
| Cases | | | | |
| Mean | 7.973 | 1160.143 | 0.191 | 27.344 |
| Median | 4.750 | 690.000 | 0.000 | 12.500 |
| 95% CI | | | | |
| Lower | 6.511 | 907.217 | 0.122 | 13.159 |
| Upper | 9.435 | 1413.069 | 0.260 | 41.529 |
| SD | 6.240 | 1079.656 | 0.292 | 28.946 |
| Min | 2.1 | 50 | 0 | 0 |
| Max | 27.9 | 4590 | 1.2 | 87.5 |
| Controls | | | | |
| Mean | 0.851 | 109.571 | - | - |
| Median | 0.800 | 80.000 | | |
| 95% CI | | | | |
| Lower | 0.728 | 88.405 | | |
| Upper | 0.974 | 130.737 | | |
| SD | 0.530 | 90.353 | | |
| Min | 0 | 0 | | |
| Max | 1.9 | 350 | | |

Min: Minimum, Max: Maximum, SD: Standard deviation, CI: Confidence interval

**Table 2: Descriptive analysis of other parameters**

| Parameter | Cases | | Controls | | *P* value |
|---|---|---|---|---|---|
| | Frequency | Percent | Frequency | Percent | |
| Descriptive analysis of age (*n*=70) | | | | | |
| NB (0-28 days) | 47 | 67.1 | 11 | 15.7 | 0.049 |
| 29 days-9 years | 23 | 32.9 | 59 | 84.3 | |
| Descriptive analysis of gender (*n*=70) | | | | | |
| Female | 28 | 40 | 31 | 44.3 | 0.608 |
| Male | 42 | 60 | 39 | 55.7 | |
| Descriptive analysis of machine model (*n*=70) | | | | | |
| HmX | 7 | 10 | 7 | 10 | 0.000 |
| AcT 5Diff | 63 | 90.0 | 63 | 90.0 | |
| Descriptive analysis of RBC predominant morphology (*n*=70) | | | | | |
| Microcytic hypochromic | 5 | 7.1 | 13 | 18.6 | 0.000 |
| Macrocytic normochromic | 45 | 64.3 | 9 | 12.8 | |
| Normocytic normochromic | 20 | 28.6 | 48 | 68.6 | |
| Descriptive analysis of Hb≥17 g/dl (*n*=70) | | | | | |
| Yes | 28 | 40 | 7 | 10 | 0.000 |
| No | 42 | 60 | 63 | 90 | |
| Descriptive analysis of Hb≥15 g/dl, <17 g/dl (*n*=70) | | | | | |
| Yes | 10 | 14.3 | 1 | 1.4 | 0.005 |
| No | 60 | 85.7 | 69 | 98.6 | |
| Descriptive analysis of nRBCs (*n*=70) | | | | | |
| Present | 27 | 38.6 | 0 | 0 | 0.000 |
| Absent | 43 | 61.4 | 70 | 100 | |
| Descriptive analysis of total leucocyte count (*n*=70) | | | | | |
| Normal count | 57 | 81.4 | 54 | 77.1 | 0.578 |
| Leukocytosis | 10 | 14.3 | 14 | 20 | |
| Leukopenia | 3 | 4.3 | 2 | 2.9 | |
| Descriptive analysis of neutrophilic shift to left (*n*=70) | | | | | |
| Present | 19 | 27.1 | 2 | 2.9 | 0.000 |
| Absent | 51 | 72.9 | 68 | 97.1 | |
| Descriptive analysis of neutrophilia (*n*=70) | | | | | |
| Present | 4 | 5.7 | 18 | 25.7 | 0.001 |
| Absent | 66 | 94.3 | 52 | 74.3 | |
| Descriptive analysis of eosinophilia (*n*=70) | | | | | |
| Present | 4 | 5.7 | 4 | 5.7 | 1.000 |
| Absent | 66 | 94.3 | 66 | 94.3 | |
| Descriptive analysis of lymphocytosis (relative/absolute) (*n*=70) | | | | | |
| Present | 15 | 21.4 | 5 | 7.1 | 0.025 |
| Absent | 55 | 78.6 | 65 | 92.9 | |
| Descriptive analysis of reactive lymphocytes on PS (*n*=70) | | | | | |
| RL | 23 | 32.9 | 3 | 4.3 | 0.000 |
| Nil | 47 | 67.1 | 67 | 95.7 | |
| Descriptive analysis of platelets on PS (*n*=70) | | | | | |
| Thrombocytopenia | 13 | 18.6 | 3 | 4.3 | 0.122 |
| Thrombocytosis | 3 | 4.3 | 7 | 10 | |
| Adequate | 54 | 77.1 | 60 | 85.7 | |
| Descriptive analysis of standing time of sample ≥2 h (*n*=70) | | | | | |
| Yes | 15 | 21.4 | 0 | 0 | 0.000 |
| No | 55 | 78.6 | 70 | 100 | |

RBC: Red blood count

### Correlation with Standing Time

The mean standing time of the samples of the cases and controls is 88.014 min (95% CI = 68.334-107.694 min) and 21.871 min (95% CI = 19.515-24.227 min) respectively. The standing time of the sample before being fed into the auto analyzer was more than 1 h and 2 h in 38/70 (54.3%) and 15/70 (21.4%) of the cases respectively; none of the control samples were standing for more than 1 h; the maximum time being 45 min; $P < 0.001$ (Table 2).

## DISCUSSION

Beckman Coulter uses Volume, Conductivity, and Scatter technology for differential counting of WBCs. AcT.5diff analyzer uses sequential dilution system, in which the basophils as well as the other WBCs are analyzed simultaneously in the "WBC/Basophil bath" (WBC/Baso bath). The basophils are differentiated from other leucocytes using specific cell lysis, impedance

technology and histogram thresholds. Focused flow impedance is used for the measurement of the volume and absorbance cytochemistry to analyze the internal stained structure of the leucocytes. Counting of basophils employing light scatter is considered to be more specific in terms of lesser frequency of pseudobasophilia.[7,8]

According to Clinical and Laboratory Standards Institute, for cells fewer than 5% of the total leucocyte count, manual count cannot be considered as a reference method. Automated hematology instruments are considered to give results with better precision, compared to manual methods, owing to the great difference in the number of cells counted, but as yet, have not been proved to be reliable.[7]

Moore and James tested the various metachromatic stains for counting basophils and found toluidine blue to be the most suitable. He used the following staining and diluting fluid for absolute basophil count:[5,6]

0.05% toluidine blue in 0.85% saline - 40 ml
95% ethyl alcohol - 11 ml
Saturated solution of saponin in 50% ethyl alcohol - 1 ml

Mitchell modified this fluid and used for counting the basophils in the capillary blood of new-born infants. He used 0.075% toluidine blue instead of 0.05% and he further reduced the volume of 95% ethyl alcohol to half i.e., 5.5 ml.[4,5] In this study, the basophils could be identified easily and differentiated from the other leucocytes with the use of this fluid.

In the study by Mitchell on 20 healthy term new-born infants, circulating basophil count increased after birth reaching a maximum at 24 h (mean absolute basophil count = 52 per cubic mm; range = 13-35 per cubic mm) in 17 of the 20 infants. The count fell down between 1 and 3 days reaching a minimum on 5$^{th}$ day; the count increased again reaching a value at 6 weeks that is twice that recorded at 1 week.[4] In his another study on 67 healthy children in the age range of 6 months to 12 years, the mean absolute count of basophils was 45 $\pm$ 2.5 per cubic mm.[5] In the present study, pseudobasophilia was found significantly in the neonatal period, especially during 0-1 day of birth. This is in concordance with the observation made by Mitchell, who confirmed that basophils are numerous in the new-born period, reaching a peak in 24 h, and declining thereafter.[4]

Gender difference does not have any statistical significance among the cases as well as the controls. Even in adults, absolute basophil counts do not differ between males and females, as observed by Moore and James.[6]

AcT.5Diff auto analyzer reported basophilia in more number of cases in this study as compared to HmX counter and the difference is statistically significant. This is because, AcT.5Diff employs absorbance cytochemistry and volume to give a differential leucocyte count and the cytoplasmic granules of only the neutrophils, eosinophils, monocytes are stained by the fix reagent leaving out the basophils. The HmX auto analyzer uses light scatter along with volume and conductivity to analyze the surface characteristics and internal structure of the cell.[7,8]

In our study, we found a statistically significant association of pseudobasophilia with cases which had a hemoglobin level of $\geq$ 15 g/dl; more so in cases with Hb $\geq$ 17 g/dl. WBC differential counting in auto analyzers is done after RBC lysis. Automated counters are known to give erroneous WBC counts and differentials in case of inadequate lysis of the RBCs.[9] The presence of nRBCs only in the cases and not in the controls and the high value of hemoglobin seen in more number of cases compared to the controls are related to the age. A report of pseudobasophilia by the auto analyzer can be explained by the fact that WBC counts including differentials are done after lysis of the RBCs. RBC morphology did not differ significantly between the cases and the controls. Most of the cases had macrocytic RBCs and most of the controls had normocytic normochromic RBCs because of the age factor, that is, most of the cases were neonates.

Neutrophilic shift to left and neutrophiliawere significantly associated with the pseudobasophilia. Eosinophilia did not have statistically significant association with pseudobasophilia. Eosinophilia was not found to be associated even with the true basophilia in the study by Mitchell.[5] The granules, whether exhibiting toxic change or not, are misinterpreted as that of basophils. Pseudobasophilia was observed in cases which showed reactive lymphocytes in the peripheral smear. Automated counters are known to misinterpret pathologic leucocytes as basophils. Sysmex (Sysmex, Kobe, Japan), ADVIA (Siemens Healthcare Diagnostics, Deerfield, IL), and Horiba (Horiba Medical, Kyoto, Japan) instruments report spurious basophilia, when pathologic leucocytes are present in the sample.[7] Pseudobasophilia in the presence of reactive lymphocytes has already been documented and the finding in this study is in accordance with it.[2,10] Lymphocytosis being significantly associated with pseudobasophilia can be explained by the fact that reactive lymphocytes are seen in many cases of lymphocytosis.

Platelet count did not have any significant association with pseudobasophilia in the present study.

Prolonged standing time had been significantly associated with pseudobasophilia and it is a documented cause of spurious basophilia.[11,12]

## CONCLUSION

In this study, spuriously elevated basophil counts were given by the automated counters AcT.5Diff and HmX in the cases and their associations with neonatal age group, Hb ≥ 15 g/dl, nRBCs, neutrophilia, neutrophilic shift to left, reactive lymphocytes, lymphocytosis and prolonged standing time are significant.

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Original Article

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# Prevalence of Skin Infection and Personal Hygiene Practices amongst Primary School Children: A Community Based Cross-Sectional Study in Kamrup (Rural) District of Assam

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## Abstract

**Background:** In our day to day life, role of school is important for cognitive, creative and social development of children. Education regarding proper sanitation and hygiene practices are necessary for the safe, secure and healthy environment so that children can learn better and face the challenges of future life.

**Objectives:** (a) To assess the prevalence of skin infection among primary schoolchildren and association with socioeconomic status, (b) to assess the personal hygiene practices of the school children.

**Methodology:** A community based cross-sectional study was done amongst the primary school children in Boko-Bongaon block of Kamrup district, Assam from August 2012 to July 2013 with the help of a predesigned and pretested proforma, clinical examination.

**Statistical Analysis Used:** Data analysis was done in Microsoft Excel and by using Chi-square test and proportions.

**Results:** Out of all skin disorder, majority was found to be scabies with the prevalence of 21.7% among the students, followed by pityriasis 19.6%. Prevalence of pediculosis was found to be 18.5% and the prevalence of tinea infection among the children was 16%. The majority 33.8% belong to Class IV socioeconomic status. This association is highly significant at 5% level of significance. 337 (84.25%) reported of washing their hands before eating and 342 (85.5%) of hand washing after defecation with soap and water. 34.25% of the children were found to wear footwear. 320 (80%) of the school children practiced daily bath; 82.25% had the habit of brushing their teeth daily while only 47.25% children were found to change their clothes daily.

**Conclusion:** In this study, prevalence of skin infection found to be clubbed in the lower socioeconomic group. Hence, health education among the children as well as their parents and proper awareness regarding various skin-related health problems and to improve the personal hygiene of the children is necessary.

**Key words:** Personal hygiene, Primary school children, Skin infection

## INTRODUCTION

Schools lay the foundation for the future and have a major effect on a host of the issue including health. Providing easy access to health, nutrition and hygiene education and services to school children is a simple and cost effective tool that can go a long way in the prevention and control of communicable and non-communicable diseases.[2]

People of rural areas have developed various unhygienic health practices and undesirable health attitudes because of poverty, illiteracy, ignorance, misconception and superstition. Rural school children have suffered various skin infections due to poor hygienic practices.[3]

In the process of active learning health education is an essential part. It includes personal hygiene, home, and environmental

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sanitation or nutritional hygiene. Personal hygiene education is one of the important aspects. If proper measures are not taken for making the body parts clean, the body is liable to various skin infections and it may hamper the physical well-being of the individual. Due to ignorance or lack of proper education, personal hygiene may not be taken care properly.[4]

This study was done to find out the prevalence of skin infection and their relationship with socioeconomic status as well as to assess the personal hygiene practices amongst the rural primary school children in Kamrup district, Assam.

## METHODOLOGY

The study was conducted among the primary school children in the age group of 6-11 years during the period August 2012 to July 2013 in Boko-Bongaon block of Kamrup district, Assam. This study was a community-based cross-sectional study.

### Criteria for Inclusion and Exclusion

All children from Class 1 to 5 in the age group of 6-11 years attending school were included in the study.

Children those were absent in the class during the study period and those having age more than 11 years and <6 years were excluded from the study.

For sample size estimation, prevalence of any morbidity at a given point of time was assumed to be 50% to yield the largest value of "*n*" while fixing the level of precision.[5] prevalence of any morbidity among primary school children for the study is taken to be 50% with a relative error of 10% and after calculation the sample size for the study comes out to be 400 ($n = 400$).

Primary sampling units in this study are the schools. The lists of primary schools are collected from the block office, and 20 schools are selected randomly for the study. From Class 1 to 5, four children was selected randomly from every class by using the class register, and all total 20 children were selected from each school to get the sample size. All the children meeting the inclusion criteria were included only in the study. If the child selected randomly was absent on the day, and then the child next to him was selected for the study according to the school register.

Data collection was done by using a pre-designed pre-tested semi-structured proforma. By using school records, sample selection and estimation of age was done.

Ethical approval was obtained from the Institutional Ethics Committee of Gauhati Medical College and Hospital before commencing the study.

Information regarding various skin disorder as well as personal hygiene practices amongst the school children was obtained by proper interview and clinical examination. To find out demographic characteristics and socioeconomic status of the study group, house to house visit was done.[6] Socioeconomic status was assessed by using B.G Prasad's socioeconomic status classification for October 2012.

### Statistics

Analysis of data was done in Microsoft Office Excel. Analysis of categorical variables was done using Chi-square test. Criteria of significance used in the study were $P < 0.05$.

## RESULTS

Out of 400 school children, 24.25% have suffered from various skin disorders. 39.5% female children have suffered skin disorder and 13.8% male school children have suffered skin disorder out of the total 400 children (Table 1).

Out of total 97 skin disorder, the majority was found to be scabies with a prevalence of 21.7% among the students followed by pityriasis 19.6%. The prevalence of pediculosis was found to be 18.5%, and tinea infection among the children was 16% (Table 2).

Out of total 97 skin disorder among the children, majority 33.8% belong to Class IV socioeconomic status, followed by 21% in Class III status. This association is highly significant at 5% level of significance (Table 3).

Out of 400 school children surveyed, 337 (84.25%) reported of washing their hands before eating and 342 (85.5%) of hand washing after defecation with soap and water. Only 34.25% of the children were found to wear footwear. 320 (80%) of the school children practiced daily bath; 82.25% had the habit of brushing their teeth daily while only 47.25% children were found to change their clothes daily. 37% school children had clean and trimmed nails, whereas 70% had clean and combed hair (Table 4).

## DISCUSSION

This study was carried out to find the prevalence of skin infection and personal hygiene practice of a representative group of school children in rural areas of Boko-Bongaon block, Kamrup district Assam.

About 24.25% school children have suffered from a various skin disorder. 39.5% female children have suffered skin disorder and 13.8% male school children have suffered disorder out of the total 400 children (Table 1).

**Table 1: Skin infection amongst school children according to gender**

| Gender | Morbidity present (%) | Morbidity absent (%) | Total (%) |
|---|---|---|---|
| Male | 33 (13.8) | 205 (86.2) | 238 (100) |
| Female | 64 (39.5) | 98 (60.5) | 162 (100) |
| Total | 97 (24.25) | 303 (75.75) | 400 (100) |

$\chi^2$=33.116, *P*<0.0001, significant

**Table 2: Pattern of skin disorder amongst the children having skin disorder (*n*=97)**

| Skin disorder | *N* (%) |
|---|---|
| Scabies | 21 (21.7) |
| Tinea | 16 (16.5) |
| Pityriasis versicolor | 19 (19.6) |
| Pediculosis | 18 (18.5) |
| Acne vulgaris | 13 (13.4) |
| Furuncle/boil | 10 (10.3) |

**Table 3: Association of skin disorder and the socioeconomic status**

| Socioeconomic status | *N* (%) | | Total (%) |
|---|---|---|---|
| | Children with morbidity | Children without morbidity | |
| Class I | 2 (14.3) | 12 (85.7) | 14 (100) |
| Class II | 17 (18.7) | 74 (81.3) | 91 (100) |
| Class III | 27 (21) | 101 (79) | 128 (100) |
| Class IV | 49 (33.8) | 96 (76.2) | 145 (100) |
| Class V | 2 (9.1) | 20 (90.8) | 22 (100) |

$\chi^2$=12.928, df=4, *P*=0.0116 significant

**Table 4: Distribution of school children according to the status of personal hygiene**

| Habits of the school children | *N* (%) | |
|---|---|---|
| | Yes (*n*=400) | No (*n*=400) |
| Washing hands before eating | 337 (84.25) | 63 (15.75) |
| Washing hands after defecation | 342 (85.5) | 58 (14.5) |
| Wearing footwear | 137 (34.25) | 263 (65.75) |
| Taking daily bath | 320 (80) | 80 (20) |
| Brushing teeth daily | 329 (82.25) | 71 (17.75) |
| Changing clothes daily | 189 (47.25) | 211 (52.75) |
| Clean and trimmed nails | 148 (37) | 252 (63) |
| Clean and combed hair | 282 (70) | 128 (30) |

Prevalence of scabies was 21.7% among the students followed by pityriasis 19.6%. Prevalence of pediculosis was found to be 18.5%, and tinea infection among the children was 16% (Table 2).

Out of total 97 skin disorder among the children, majority 33.8% belong to Class IV socioeconomic status followed by 21% in Class III status. This association is highly significant at 5% level of significance (Table 3).

A study conducted in Wardha amongst tribal school children by Dongre *et al.* found that prevalence of head lice (42.8%), scabies (36.6%), and multiple boils (8.9%) amongst the school children.[7]

In a school survey in Varanasi city by Valia *et al.* 12481 children were examined. More than half (54%) had one or more skin diseases. The commonest ones were pediculosis capitis (35%), pityriasis alba (12%) acne vulgaris (8%), miliaria (4%), and pyodermas (3%).[8]

In a study conducted among primary school children in Eastern Nepal by Shakya *et al.* the prevalence of skin disease was 20%. Common skin diseases were pediculosis (21%) followed by tinea (19.5%), scabies (14%), impetigo (11%) and eczema (10.5%). Pediculosis was significantly higher in girls (29.8%) than in boys (14.4%) while tinea and scabies were high in boys.[9]

In one study conducted in Nagpur by Charuhas *et al.* 236 (32.1%) school children were found to suffer various skin disorder. 155 (21.1%) had pyoderma while scabies and pediculosis capitis was observed in 41 (5.6%) and 26 (3.5%) respectively. Only 14 (1.9%) had fungal infection.[10]

In another study among primary school children in Baghdad by Khalifa *et al.* the overall prevalence of skin disorder was 40.9%. No significant association have been found between the prevalence of skin diseases and age ($P = 0.06$), sex ($P = 0.74$), residence ($P = 0.06$). There was significant association between education level of parents with the prevalence of skin diseases ($P = 0.04$).[11]

Out of 400 school children surveyed, 337 (84.25%) reported of washing their hands before eating and 342 (85.5%) reported of washing their hands after defecation with soap and water. 34.25% of the children were found to wear footwear. 320 (80%) of the school children practiced daily bath; 82.25% had the habit of brushing their teeth daily while only 47.25% children were found to change their clothes daily. 37% school children had clean and trimmed nails whereas 70% had clean and combed hair (Table 4).

In a study in Puducherry by Ganapathy *et al.* amongst rural school children, it was found that untrimmed and dirty nails were more common problems among boys 42.2% as compared to 38.1% in girls. 13.3% of boys were found to have unclean and uncombed hair as compared to 4.7% of girls. Boys (16%) showed a marginal decreased prevalence of unclean teeth as compared to girls (18.6%).[12]

One study conducted in Doiwala Block, Dehradun by Kakkar *et al.* it was found that healthy habits like daily bathing (82.6%), daily teeth brushing (61.1%) and hair

clean/combed (80.2%) were higher among girls as compared to boys daily bathing (72.9%), daily teeth brushing (48.4%), hair clean/combed (74.4%). While trimmed nails were equally (55%) noticed among both the groups.[13]

## CONCLUSION

Prevalence of skin disorder among the school children was found to be 24.25%. Out of this prevalence of scabies was 21.7% among the students followed by pityriasis 19.6%. The majority of school children (33.8%) belong to Class IV socioeconomic status, followed by 21% in Class III status, and there is a significant association.

Regarding personal hygiene, majority 337 (84.25%) reported of washing their hands before eating and 342 (85.5%) of hand washing after defecation with soap and water. Only 34.25% of the children were found to wear footwear. 320 (80%) of the school children practiced daily bath; 82.25% had the habit of brushing their teeth daily while only 47.25% children were found to change their clothes daily. 37% school children had clean and trimmed nails whereas 70% had clean and combed hair.

Health education among the school children regarding personal hygiene and oral hygiene should be given. Regarding various morbidities among the school children, proper education and necessary support should be given by the class teachers. While maintaining health status and personal hygiene of the school children, socioeconomic factors are seen to play an essential role so proper approach in the community to improve the socioeconomic status as well as personal hygiene practice is necessary.

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Original Article

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# Conjunctival Autografting in Recurrent Pterygium: A Retrospective Study

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## Abstract

**Background:** Pterygia are relatively common in the general population and typically follow an indolent course, with changes in appearance but little effect on vision and the eye itself. Because early pterygia are usually asymptomatic, there has been little research on their natural history and treatment, and most ophthalmologists commonly consider them an insignificant problem until the lesions encroach on the visual axis.

**Aim:** The aim of this study is to evaluate the success rate of conjunctival autografting in recurrent pterygium.

**Materials and Methods:** The data analysis of the surgeries conducted was analyzed in the Department of Ophthalmology, Mysore Medical College and Research Institute, Mysore over a period of 2 years from January 2013 to December 2014. A total number of 20 patients were diagnosed to have had recurrent pterygium following initial surgeries were included in our study. The study excluded patients for whom conjunctival autografting was not possible since the donor conjunctiva in the superotemporal region was not healthy.

**Results:** Out of 20 cases with recurrent pterygium our study shows a higher incidence of recurrent pterygium among the age group of 30-41 years (60%) with a male preponderance (55%). Previously done "bare sclera technique" showed higher recurrence of pterygium (75%) compared WITH previous conjunctival autografting (25%). Higher success rate was seen in conjunctival autografting with 0.02% mitomycin C.

**Conclusion:** Our study showed distinctly higher success rates in patients undergoing conjunctival regrafting with mitomycin C 0.02%.

**Key words:** Conjunctival autograft, MITOMYCIN C, pterygium

## INTRODUCTION

Pterygium takes its name from the Greek word,[1] pterygos meaning "wing" which was described by Hippocrates and later by Singh.[2] The term pterygium was introduced to English language in 1875 by Walton.[3]

Pterygium is a degenerative condition of the subconjunctival tissues, which proliferate as vascularized granulation tissue to invade the cornea, destroying the superficial layers of the stroma and Bowman's membrane, the whole being covered by conjunctival epithelium.[4]

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It remains an ophthalmic enigma, as the actual pathogenic mechanism of this condition remains unknown.[3] Pterygium has a worldwide distribution but is more common in warm, dry climates. Incidence and prevalence rates are highest in the "pterygium belt," which ranges from 30° north to 30° south of the equator, and lower prevalence rates are found at latitudes >40°. The prevalence of pterygium for Caucasians residing in urban, temperate climates is estimated at 1.2%.

The difficulty in treating this deceptively benign disease stems from our lack of understanding of this condition and its propensity of recurrence after surgical excision. There is plethora of surgical and medical measures currently available for pterygium, with no consensus regarding the "ideal" treatment.[5] Conjunctival autograft after pterygium excision is associated with very low rates of recurrence and complications when compared with other technique.[6]

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In 1985, Kenyon *et al.* described their procedure of conjunctival autograft for the management of recurrent or advanced pterygium with a low recurrence rate of 5.3%. Although more time consuming, this surgical technique was found to be safe and effective in reducing the number of recurrences while avoiding the risk of potentially serious complications. However, studies performed in high-risk populations observed higher recurrence rates using the same surgical technique.[7]

Regrowth of the pterygium after primary excision is called recurrent pterygium. Pathologically it differs from primary pterygium; it is fibrovascular tissue growing onto the cornea without elastotic degeneration. It involves underlying sclera, episclera and Tenon's capsule and grows onto corneal stroma, where it is firmly adherent to the underlying tissues. Recurrence is more common in younger patients with thick aggressive primary pterygium and patients with an aggressive post-operative inflammatory reaction.[2]

Kunitoma and Mori and later Choon and Fong reported favorably on the efficacy of mitomycin C eye drops in preventing pterygium recurrence after resection of pterygium that had recurred many times. Singh and Foster confirmed these observations, and also studied giving smaller doses of the drug than had been previously employed in an effort to avoid toxicity, and they compared the efficacy of topical mitomycin C with that of conjunctival transplantation for treatment of recurrent pterygium. It is clear that topical Mitomycin C is effective in this role. It is clearly simpler and cheaper than either conjunctival transplantation or b-irradiation. The smallest effective dose and shortest duration of therapy are not yet clear, however. Foster currently uses a single application of 0.02% at the end of surgery.[8]

## MATERIALS AND METHODS

### Source of Data

Patients who underwent surgery for recurrent pterygium in the Department of Ophthalmology, Krishna Rajendra Hospital, Mysore between January 2013 and December 2014. Ethical Clearance and Informed Consent was obtained.

### Method of Data Collection

The sample size for this retrospective study was taken as 20 patients. The sample was selected with the use of convenience sampling method. Data were collected using a piloted proforma meeting the objectives of this study. A retrospective analysis of the data obtained from patients who underwent surgery for recurrent pterygium fulfilling the criteria done at the Department of Ophthalmology, Krishna Rajendra Hospital from January 2013 to December 2014.

### Surgical Technique

All 20 cases were taken up under peribulbar block. The involved eye underwent sterile preparation and draping. Rigid lid speculum was applied. Superior rectus bridle suture was put. Pterygium scar tissue excision was either done by avulsion technique or, head of the scar tissue dissected from apex using surgical blade No. 15, taking care to follow the surgical plane, followed by excision of the conjunctival extent. Minimal cautery was used when indicated and mitomycin C 0.02% was used intraoperatively soaked in surgical sponges and applied to the scleral bed and thorough wash was given with a minimum of 50 ml of saline.

About 2 cc of saline was injected subconjunctively in the superotemporal quadrant to harvest the graft. Then a thin tenon's free conjunctival graft was harvested taking care not to buttonhole the conjunctiva and to include limbal stem cells in the graft. Care was also taken to see to it that harvested graft was about 1 mm larger than the size of the bare sclera. The graft was placed on the bare sclera and was secured with 4-6 sutures using 10-0 Nylon. Subconjunctival dexamethasone along with gentamycin was injected away from the graft area and eye was bandaged.

Inclusion criteria:

- All patients with recurrent pterygium.

Exclusion criteria:

- Recurrent pterygium patients for whom conjunctival autografting was not possible.

## RESULTS

Table 1 shows the incidence of recurrence of pterygium in various age groups. The incidence was highest among the age group 31-40 years (60%) and least above 51 years. Table 2 shows a higher incidence of recurrent pterygium in males (55%). Table 3 shows a higher incidence of recurrent pterygium in bare sclera technique 15 (75%) compared to conjunctival autografting, which is about 5 (25%). Table 4 shows 100% success rate in conjunctival autograft with mitomycin C 0.02%.

**Table 1: Age distribution among recurrent pterygium**

| Age | Number of recurrent pterygium patients | % |
|---|---|---|
| 31-40 years | 12 | 60 |
| 41-50 years | 6 | 30 |
| 51-60 years | 1 | 5 |
| 61-70 years | 1 | 5 |
| Total | 20 | 100 |

**Table 2: Sex distribution among recurrent pterygium**

| Sex | Number of patients | % |
|---|---|---|
| Male | 11 | 55 |
| Female | 9 | 45 |
| Total | 20 | 100 |

**Table 3: Previous surgery which resulted in recurrence**

| Sex | Bare sclera excision (%) | Conjuctival autograft (%) | Total |
|---|---|---|---|
| Male | 8 (40) | 3 (15) | 11 |
| Female | 7 (35) | 2 (10) | 9 |
| Total | 15 (75) | 5 (25) | 20 (100%) |

**Table 4: Success rate in recurrent pterygium surgery**

| Sex | Conjunctival autograft with mitomycin c 0.02% | Recurrence |
|---|---|---|
| Male | 11 | 0 |
| Female | 09 | 0 |
| Total | 20 | 0 |

## DISCUSSION

Twenty patients who underwent recurrent pterygium excision and conjunctival autografting with 0.02% mitomycin C were studied.

The majority of the patients were in the age group 31-40 years (12 patients, 60%). 6 (30%) patients were aged between 41 and 50 years. 2 patients (10%) was aged above 50 years. Out of 20 patients 11 (55%) were male 9 (45%) were female patients, this shows that there is male preponderance in pterygium (Graph 1).

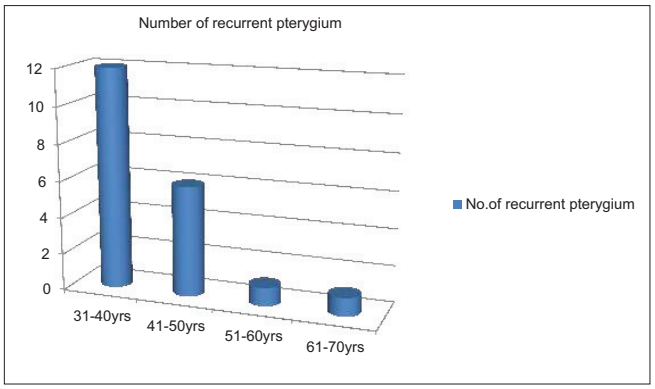
Previous surgery which resulted in recurrence is mainly bare sclera technique, which is about (75%) and conjunctival autografting (25%) (Graph 2).

Success rate in recurrent pterygium surgery with conjunctival autograft with 0.02% mitomycin C is 100%.

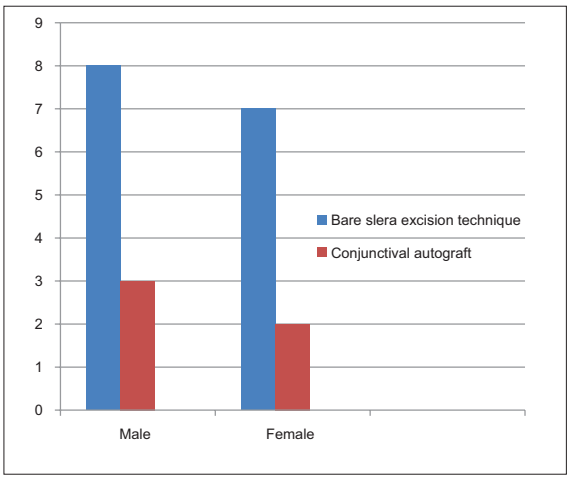
Hirst *et al.* in their study showed that there was a 50% chance of recurrence within the first 120 days and a 97% chance there would be a recurrence by 12 months after surgery.[9]

A study conducted by Ti *et al.* were conjunctival autografting was done for both primary and recurrent pterygim 29 out of 139 cases of primary pterygia recurred (20.8%) while 20 out of 64 cases in the recurrent group (31.2%) recurred.[10]

A study conducted by Tan *et al.* suggested that conjunctival autografting for primary and recurrent pterygium is




**Graph 1: Age distribution among recurrent pterygium**




**Graph 2: Previous surgery which resulted in recurrence**

effective in reducing pterygium recurrence compared with bare sclera excision.[11]

According to study conducted by Kenyon *et al.* conjunctival autograft transplantation is a safe and effective means of treating pterygium complicated by conjunctival scarring with extraocular muscle involvement, recurrent pterygium and requiring concurrent fornix reconstruction. Hence, this study was conducted with the aim to study the success rate of conjunctival autografting in recurrent pterygium.[7]

## CONCLUSION

Among the various techniques, pterygium excision combined with conjunctival autografting including limbal stem cells has been associated with lowest recurrence rates (10-20%) compared to that of bare sclera technique where it is about (70-80%).

Our study showed conjunctival autografting with topical mitomycin C 0.02%, proved to be an effective, simple and economical option in the management of recurrent pterygium.

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Original Article

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# A Prospective Randomized Double-Blind Study to Evaluate the Effects of Intrathecal Nalbuphine in Patients of Lower Abdominal Surgeries under Spinal Anaesthesia

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## Abstract

**Introduction:** Various adjuvants are used for the prolongation of anesthesia during the subarachnoid block. Opioids are very commonly used, and it is commonly associated with many benign risks, although nalbuphine proposed to be a safer alternative as it is an opioid receptor agonist-antagonist. We designed this randomized study to evaluate the effects of intrathecal (IT) nalbuphine in patients of lower abdominal surgeries under spinal anesthesia.

**Materials and Methods:** A total of 70 patients of either sex, aged between 18 and 60 years, American Society of Anaesthesiologists physical status Grade I and II undergoing elective lower abdominal surgeries under spinal anesthesia were enrolled in this study. Patient was randomly assigned to two groups (35 patients each); Group B, injection heavy bupivacaine 0.5% (2.5 ml) + normal saline (0.5 ml) administered IT and in Group N, heavy bupivacaine 0.5% (2.5 ml) + nalbuphine 0.8 mg (diluted to 0.5 ml normal saline) administered IT. Patients hemodynamic/sensorimotor variables were noted.

**Results:** The onset time of sensory in Group B was 3.78 ± 1.31 min whereas in Group N was 1.29 ± 0.43 min ($P < 0.05$). The duration of sensory block in Group B and Group N was 123.65 ± 21.23 min and 166.24 ± 29.84 min ($P < 0.05$) while similar statistical significance was observed in between groups for duration of motor blockade (Group B; 178.67 ± 28.34 min and Group N; 256.41 ± 33. 41 min). Duration of analgesia in Group B (201.31 ± 34.31 min) and Group N (298.43 ± 30.92 min) was statistically significant among groups ($P < 0.05$). The patients recorded a mean visual analog scale score of 2.87 ± 0.29 min at 180 min (Group B) while 2.89 ± 0.47 min at 270 min (Group N) after starting of spinal anesthesia.

**Conclusion:** IT nalbuphine improved the quality of intraoperative and post-operative analgesia, with minimal side effects.

**Key words:** Nalbuphine, Post-operative analgesia, Spinal anesthesia

## INTRODUCTION

Spinal anesthesia is a very popular and common technique for lower abdominal surgeries. However, due to the short duration of action and early arising post-operative pain the role of various adjuvants has been proposed and evaluated. Post-operative pain and tissue injury associated with surgery initiate a systemic stress response that has neuroendocrine, immunological, and hematological responses.[1] Intrathecal (IT) administration of adjuvants drugs to local anesthetics improves quality and duration of the spinal blockade, and prolongs post-operative analgesia. Moreover, the dose and amount of local anesthetic drugs are also reduced during the subarachnoid block (SAB).

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IT opioids (morphine, fentanyl and sufentanil), alpha 2 adrenergic agonists (clonidine and dexmedetomidine) are the most commonly utilized to improve the quality and duration of neuraxial anesthesia. The common problems encountered with the use of intraspinal opioids are their side-effects that include nausea/emesis, pruritis, constipation, undesirable sedation, respiratory depression and the development of tolerance/dependence.[2] However, nalbuphine (a mixed opioid agonist-antagonist) can prove to be particularly advantageous because of the potential to maintain or even enhance opioid-based analgesia while simultaneously eliminating the common μ-opioid side-effects.[3,4] Kappa receptors are distributed throughout the brain and spinal cord involved in nociception. Nalbuphine binds avidly to kappa-receptors in these areas to produce analgesia.[5]

Limited literature regarding the use of IT nalbuphine with hyperbaric bupivacaine is found and thus the aim of our study is to observe the possible prompt onset of sensory/motor block and the duration of action with the use of this drug. Our primary outcome is the duration of analgesia. We also evaluated the side-effects with the addition of nalbuphine IT.

## MATERIALS AND METHODS

After taking due consent from 70 patients of either sex, aged between 18 and 60 years, American Society of Anaesthesiologists physical status Grades I and II, we designed a prospective, randomized, double-blinded study to be performed in a Teerththanker Mahaveer Medical College and Research Center, undergoing elective lower abdominal surgeries (*viz*. urological and general surgical procedures) under spinal anesthesia. Patients not given consent, infection at the injection site, prior history of spine surgery, hypovolemia, coagulopathy, spinal deformities, increased intracranial pressure, indeterminate neurologic disease, communication problems, known hypersensitivity to local anesthetics and opioids are excluded from our study.

A sample size calculation was done using the standard deviation of the time to the first request for analgesics. To find a 30 min difference in the mean duration of the first request for analgesics (two sided - alpha of 5% and beta of 10%), 23 subjects enrolled per group. We decided to include 35 patients per group to allow for possible dropouts.

Patients were divided into two groups (35 patients each) using computer generated randomization. In Group B, injection heavy bupivacaine 0.5% (2.5 ml) + normal saline (0.5 ml) administered IT. In Group N, heavy bupivacaine 0.5% (2.5 ml) + nalbuphine 0.8 mg (diluted to 0.5 ml normal saline) administered IT.

All patients were premedicated with injection ondansetron (4 mg intravenous [IV]) and preloading was done by Lactate Ringers (10 ml per kg). Standard monitors (pulse oximeter for $SpO_2$, heart rate (HR), non-invasive blood pressure, respiratory rate and EKG) were applied. Preparation of IT drugs was done by an independent anesthesiologist not involved in the study and the drug mixture to be administered by another anesthesiologist who will be blinded and performing spinal anesthesia. The volume of the drug, the size of the syringe and color of the drug of interest would be similar in both groups.

Spinal anesthesia would be performed in all patients in the sitting position. Under strict aseptic precautions, using 25G Quincke needle mid-line spinal puncture was performed at the L3 L4/L4-L5 level. After observing the free flow of cerebrospinal fluid, a total volume of 3 ml of spinal solution was administered to each patient over approximately 10-15 s. Patients were moved to the supine position immediately after administering the spinal block. The completion of the injection was taken as zero time of the induction of anesthesia.

Hemodynamic variables in the form of systolic blood pressure (SBP), diastolic blood pressure (DBP), and HR were noted every 3 min up to 15 min and then every 15 min up to 300 min irrespective of the duration of surgery. Hypotension (SBP <90 mm Hg or >30% fall from the baseline value) was treated by injection mephentermine 6 mg IV and an extra bolus of 100 ml of Ringer lactate. Bradycardia (HR <50 beats/min or >30% decrease from the baseline value) was treated with IV atropine (0.5 mg). Surgery would be allowed to proceed when T10 block level achieved.

Sensory block level (loss of pain sensation to pinprick test in the midclavicular line) was measured every 1 min until it reached T10 level, and the surgeons were asked to start. Duration of sensory block defined as the time to two segment regression time from the highest level of the sensory blockade. Modified Bromage scale[6] was used to assess the degree of motor block and the duration of motor blockade as the time required for motor blockade return to Bromage's Grade I from the time of onset of motor blockade was measured. Post-operatively, sensory level, and motor block, pain was evaluated every 30 min during the first 2 h, every 60 min for the next 6 h, and at 12 and 24 h after entrance in the recovery room.

The intensity of pain was assessed by visual analog scale (VAS)[7] at every 10 min for 60 min and then after every

30-min intervals till 300 min after injection or until rescue analgesic was given to the patient. Patients reporting a VAS score (more than 3) received rescue analgesics in the form of injection diclofenac (75 mg im). Nausea and vomiting were managed with injection ondansetron 4 mg IV and pruritus was treated with chlorpheniramine maleate (4 mg IV).

Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) for windows version 21.0 software, Chicago, SPSS Inc. Student's *t*-test was used for the analysis of parametric data while fisher/Chi-square test for nonparametric data. $P < 0.05$ was considered as statistically significant.

## RESULTS

Demographic data (age, weight, height, duration of surgery) of both the groups were found to be comparable ($P > 0.05$) (Table 1). There was no case of failure/inadequate blockade after SAB.

The onset time of sensory block in Group B was 3.78 ± 1.31 min while in Group N was 1.29 ± 0.43 min ($P < 0.05$), but statistically insignificant result was observed in between groups in onset of motor blockade (Table 2). The duration of sensory block in Group B and Group N was 123.65 ± 21.23 min and 166.24 ± 29.84 min ($P < 0.05$) (Table 2) while similar statistical significance was observed in between groups for duration of motor blockade (Group B; 178.67 ± 28.34 min and Group N; 256.41 ± 33. 41 min) (Table 2). Duration of analgesia in Group B (201.31 ± 34.31 min) and Group N (298.43 ± 30.92 min) was statistically significant among groups ($P < 0.05$) (Table 2).

**Table 1: Demographic data (mean±SD)**

| Variable | Group B (*n*=35) | Group N (*n*=35) | *P* value |
|---|---|---|---|
| Age (years) | 42.67±13.93 | 44.63±12.81 | 0.54 |
| Weight (kg) | 69.45±9.65 | 71.71±10.82 | 0.36 |
| Height (cm) | 166.36±7.59 | 163.47±8.89 | 0.14 |
| Sex (M:F) | 14:21 | 18:17 | |
| Duration of surgery (min) | 107.35±18.11 | 111.15±20.17 | 0.41 |

SD: Standard deviation

**Table 2: Block characteristics (mean±SD)**

| Variable | Group B (*n*=35) | Group N (*n*=35) | *P* value |
|---|---|---|---|
| Onset of sensory block (min) | 3.78±1.31 | 1.29±0.43 | 0.0001* |
| Onset of motor block (min) | 4.91±1.50 | 5.45±1.32 | 0.11 |
| Duration of sensory block (min) | 123.65±21.23 | 166.24±29.84 | 0.0001* |
| Duration of motor block (min) | 178.67±28.34 | 256.41±33.41 | 0.0001* |
| Duration of analgesia (min) | 201.31±34.31 | 298.43±30.92 | 0.0001* |

SD: Standard deviation, *: <0.05

After SAB, the results were comparable with respect to the intraoperative mean HR, systolic/DBP, $SpO_2$, respiratory rate between the groups.

The patients recorded a mean VAS score of 2.87 ± 0.29 min at 180 min (Group B) while 2.89 ± 0.47 min at 270 min (Group N) after starting of spinal anesthesia and were given rescue analgesics when VAS was 3 or more (Table 3 and Figure 1). Only two patients reported nausea/vomiting in Group B, but five patients complaint about the same in Group N, thereby injection ondansetron (4 mg IV) given and patients were relieved (Table 4).

## DISCUSSION

SAB is a more popular technique of anesthesia for lower abdominal surgeries. Bupivacaine added to various adjuncts prolongs the duration of analgesia and hence take care for better post-operative analgesia. Reduction in the dosages of local anesthetics holds the key for better anesthesia and to prevent high spinal blocks. With the addition of various adjuncts, the local anesthetic toxicity and the chances of dreadful high spinal blocks are minimized.

Culebras *et al*.[8] conducted a study where they compared IT morphine with different doses of nalbuphine and concluded that 0.8 mg dose of nalbuphine was appropriate for effective analgesia without any side effects. Based on similar results we also incorporated similar dose (0.8 mg of nalbuphine) for our study.

The onset of sensory block was significant among patients receiving nalbuphine as compared to Group B, because

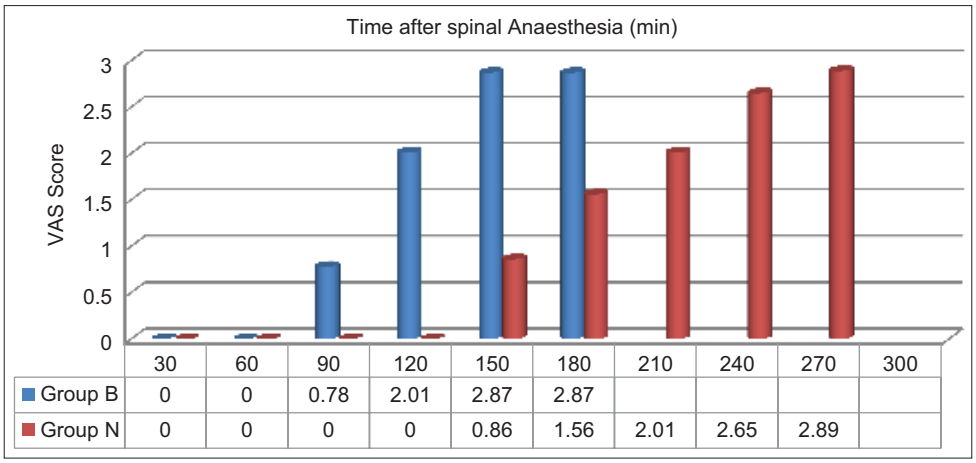
**Table 3: VAS scores comparison (mean±SD)**

| Time (from induction in min) | Group B (*n*=35) | Group N (*n*=35) |
|---|---|---|
| 30 | 0 | 0 |
| 60 | 0 | 0 |
| 90 | 0.78±0.67 | 0 |
| 120 | 2.01±0.34 | 0 |
| 150 | 2.87±0.29 | 0.86±0.24 |
| 180 | 2.87±0.29 | 1.56±0.38 |
| 210 | R | 2.01±0.46 |
| 240 | | 2.65±0.39 |
| 270 | | 2.89±0.47 |
| 300 | | R |

R: Rescue analgesic given, VAS: Visual analog scale, SD: Standard deviation

**Table 4: Side-effects**

| Side-effects | Group B (*n*=35) | Group N (*n*=35) |
|---|---|---|
| Nausea/vomiting | 2 | 5 |
| Urinary retention | 0 | 0 |
| Respiratory depression | 0 | 0 |
| Pruritus | 0 | 0 |




| | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 | 270 | 300 |
|---|---|---|---|---|---|---|---|---|---|---|
| Group B | 0 | 0 | 0.78 | 2.01 | 2.87 | 2.87 | | | | |
| Group N | 0 | 0 | 0 | 0 | 0.86 | 1.56 | 2.01 | 2.65 | 2.89 | |

**Figure 1: Vas score after spinal anesthesia**

of the high lipophilic nature of nalbuphine.[9] Although, the onset of motor block was found to be comparable in between groups. This observation is further supported by Shakooh and Bhosle[10] as they found the similar better onset of the sensory block of nalbuphine mixed drug in their study. Fournier *et al*.[11] had also demonstrated that after total hip replacement IT administration of nalbuphine through an indwelling catheter resulted in a significantly faster onset of pain relief as compared to IT morphine. Culebras *et al*.[8] observed the similar faster onset of pain relief by using nalbuphine in spinal anesthesia in caesarean patients as compared to morphine. Gomaa *et al*.[12] observed that patients given fentanyl had the more rapid onset of the motor block as compared to nalbuphine as fentanyl has high lipid solubility and rapid tissue uptake. However, Tiwari *et al*.[13] observed on 75 patients posted for lower limb and lower abdominal surgeries that onset of sensory/motor blockade was not affected by adding nalbuphine IT.

We observed that the duration of sensory/motor block was significantly greater in Group N than Group B. The time for first rescue analgesic requirement was 270 min for the nalbuphine mixed drug and 180 min for bupivacaine only group, thereby improving the duration of analgesia. Mukherjee *et al*.[14] also observed the prolongation of the duration of analgesia and similarly found that the patients who received 0.8 mg of IT nalbuphine had longest duration of post-operative analgesia. Shakooh and Bhosle.[10] observed the increase in post-operative analgesia by the use of 0.8 mg IT dose of nalbuphine and Tiwari *et al*. (0.2 mg of IT nalbuphine).

In our study, five patients' complaint of nausea/vomiting for which injection ondansetron (4 mg IV) was given, and the patients were relieved. No other side effect were noted during the study and well tolerated by the patients studied. Yoon *et al*.[15] concluded that post-operative analgesia was prolonged in the morphine group and morphine with nalbuphine group, but the incidence of pruritus was significantly lower in the nalbuphine group, while the incidence of nausea and vomiting did not differ in the different groups. Culebras *et al*.[8] noted increase in complications by the use of 1.6 mg of IT nalbuphine while the duration of post-operative analgesia is statistically insignificant among the groups receiving 0.8 mg and 1.6 mg of IT nalbuphine, again justifying our choice of 0.8 mg dose of IT nalbuphine.

In 2005, FDA advised that nalbuphine should be used judiciously in patients of labor and delivery. No signs of neurotoxicity are reported till now with the use of Nalbuphine. Although this drug is still having issues regarding its safety but Rawal *et al*.[16] reported no psychomotor and histopathologic abnormalities with the use of 0.75 mg/kg of nalbuphine.

## CONCLUSION

From our study, we concluded that post-operative analgesia was better taken care off with 0.8 mg IT nalbuphine with minimal side-effects. We recommend 0.8 mg as the optimal dose of nalbuphine if used IT along with 12.5 mg (0.5% heavy bupivacaine) for SAB in patients undergoing lower limb abdominal surgeries.

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Original Article

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# Role of Culture in Cases of Perforated Peptic Ulcers Due To *Helicobacter Pylori*

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## Abstract

**Background:** The role of *Helicobacter pylori* infection in uncomplicated peptic ulcer disease has been definitively established through various studies since its identification. However, its association with perforated peptic ulceration is uncertain.

**Purpose:** This study was undertaken to establish the association of *H. pylori* in patients with perforated peptic ulcers and evaluate the role of culture for confirmation.

**Materials and Methods:** Intra-operative biopsy specimens from the site of peptic ulcer perforation, which tested positive by rapid urease test (RUT) in patients presenting to the hospital during the period of the study were aseptically collected and transported to the laboratory in Stuart's transport medium. The specimen was homogenized and primary smears were made for Gram-staining and plating done on Blood agar and Modified Thayer Martin agar. Incubation was done in a McIntosh Fildes' jar under micro-aerophilic environment for 7 days and any growth was identified using standard biochemical tests.

**Results:** Curved, Gram-negative bacilli morphologically resembling *H. pylori* were seen in 41.86% (18/43) specimens. Culture positivity of *H. pylori* was 18.60% (08/43).

**Conclusion:** Although the role of *H. pylori* infection in complicated cases seems to be less significant that in the causation of uncomplicated peptic ulcer disease, there is some degree of association between the two as evidenced by *H. pylori* positivity on RUT, Gram-staining and culture. However, this relationship between infection and perforation can be established upon undertaking further studies.

**Key words:** *Helicobacter pylori,* Perforated peptic ulcer, Modified Thayer Martin Medium

## INTRODUCTION

*Helicobacter pylori* is a small, Gram-negative, curved bacillus with a predilection for infecting the gastric mucosa. It is one of the most common bacterial pathogens of human beings and is found in the gut of half the population of the world. However, most of the infected persons are asymptomatic, only <30% are symptomatic.[1] Its prevalence is highly variable in relation to geography, ethnicity, age, and socioeconomic factors, being high in developing countries and lower in the developed world. In developing countries, *H. pylori* infection is a public-health issue as it is markedly more prevalent at younger ages than in developed countries.[2] Annual incidence of *H. pylori* infection is 0.3-0.7% in developed countries as opposed to a much higher rate of 6-14% in developing countries.[1] *H. pylori* is implicated in the causation of many gastro-duodenal diseases including gastric and duodenal ulcers, active chronic gastritis and gastric cancer.[3] The ability of the organism to survive in the stomach despite the acidic pH can be attributed to the production of a strong, urease enzyme, which produces an alkaline microenvironment around the bacterium.

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Although the role of *H. pylori* in the causation of uncomplicated, peptic ulceration is well established, the same does not hold true for perforated ulcer disease. Some studies have demonstrated a close relationship between ulcer perforation and *H. pylori* infection on histopathological examination. Demonstration of higher density of *H. pylori* in cases of perforated peptic ulcers indicates an underlying etiological connection.[4] Moreover, the presence of the organism in the mucosa and ulcer walls and a positive urea breath test in patients of acute ulcer perforation also indicates a significant role in the causation of the disease.[5] Culture is the gold standard for identification of *H. pylori*. However, the fastidious nature of the organism precludes the use of this method to demonstrate it in biopsy specimens. In this study, we aimed to identify the role of *H. pylori* in perforated peptic ulcer disease and evaluated culture as a modality for identification of *H. pylori* in biopsy specimens from such cases.

## MATERIALS AND METHODS

### Study Design

Place of study - Department of Microbiology, Lokmanya Tilak Municipal Medical College and General Hospital, Mumbai.

Duration of study: 1 year
Sampling method: Convenient sampling

All consenting patients presenting to the hospital with perforated peptic ulcer during the study period were included in this study.

### Methodology

Intra-operative biopsy specimens from cases of perforated peptic ulceration, which tested positive by rapid urease test (RUT) were taken and sent to the laboratory for identification of *H. pylori*.

### Sample Collection

Edge biopsy from the perforation site was collected after thorough toilet using sterile normal saline. The sample was put in Stuart's transport medium and transferred to the laboratory for processing within 30 min.

### Microbiological Processing

The biopsy specimen was homogenized by grinding it in a ground glass grinder and divided into two parts - one for Gram-staining and one for culture.

For Gram-staining, the biopsy sample was taken on a clean slide over an area of 2 $cm^2$ × 1 $cm^2$ with one drop of sterile normal saline. Gram-staining was done using freshly prepared Gram's reagents (Gram's crystal violet and Safranin 0.5% w/v, Hi Media Labs Pvt. Ltd., Mumbai, India). Gram-negative, pale staining, short, plump, curved bacilli were considered to be suggestive of *H. pylori*[6] (Figure 1).

For culture, the homogenized biopsy specimen was streaked on freshly prepared blood agar and Modified Thayer-Martin agar (Thayer Martin Hi Veg Medium Base MV, Hi Media Labs Pvt. Ltd., Mumbai, India) augmented with 7% sterile, lysed blood and VCN supplement (Vancomycin, Colistin and Nystatin, Hi Media Labs Pvt. Ltd., Mumbai, India) to inhibit the growth of contaminant gut flora.[7] The plates were incubated in a McIntosh Fildes' anaerobic jar under micro-aerophilic condition for 7 days. The plates were examined for growth every 48 h. Growth generally appeared by Day 5.[6] If no growth of *H. pylori* appeared by Day 10, plates were discarded, and the specimen labeled as negative for *H. pylori*. *H. pylori* isolates were identified by typical colony morphology. Small, gray, translucent colonies were seen on Modified Thayer Martin Medium[6,8] (Figure 2) and blood agar. Biochemical identification was done by a positive catalase test, oxidase test and urease test and the inability of the isolate to hydrolyze hippurate and reduce nitrates to nitrites. Resistance to nalidixic acid was also seen.[6,8]

## RESULTS

Out of the forty-three intra-operative biopsy samples received, 62.79% (27/43) were from duodenal perforations and 37.21% (16/43) were from gastric perforations. Of these, 41.86% (18/43) showed bacilli morphologically resembling *H. pylori* on primary smear and 18.60% (08/43) were culture positive. Duodenal perforations showed more positivity with 48.15% (13/27) on direct staining and

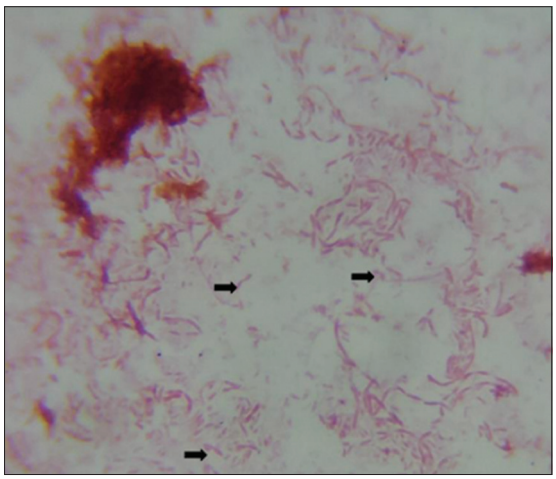

**Figure 1: Gram-stain showing pale staining, Gram-negative, curved bacilli morphologically resembling *Helicobacter pylori* (Magnification ×1000)**

25.93% (07/27) by culture. Gastric perforations showed presence of *H. pylori* in 31.25% (05/16) specimens on direct staining and 6.25% (01/16) on culture (Table 1).

Eight isolates were recovered on Modified Thayer Martin medium yielding a culture positivity of 18.60%. Blood agar grew five isolates with a positivity of 11.62%.

## DISCUSSION

*H. pylori*, as a fastidious organism requires an enriched medium with the appropriate micro-aerophilic environment to grow. Culture has been considered the gold standard in confirmation of the diagnosis of *H. pylori* infection in an individual. Although there are many non-invasive tests available for the rapid detection of the organism, like 13C urea breath test, 14C urea breath test, rapid urease detection test, stool antigen detection test etc., these tests provide only a provisional diagnosis of infection and culture is needed for confirmation.[9]

Very few studies have been carried out to demonstrate the role of *H. pylori* in the causation of peptic ulcer perforation. In this study, a total of fifty biopsy specimens were processed for the detection of *H. pylori*. Total specimens from duodenal perforations (62.79%) were more than gastric perforations (37.21%). *H. pylori* infects the mucus-secreting epithelial cells of the stomach. Hence, infection and ulceration of the duodenum occurs only in cases of gastric metaplasia of the of duodenum.[10]

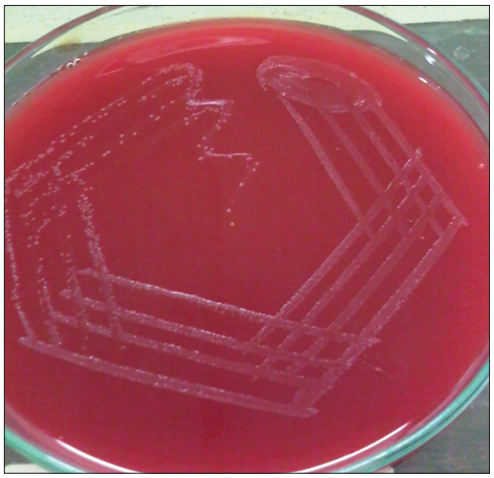

**Figure 2: Small, gray, translucent colonies of *Helicobacter pylori* on Modified Thayer Martin Medium**

**Table 1: Direct Gram-stain and culture positivity in biopsy specimens from duodenal and gastric perforations**

| Total samples *n*=43 | | Direct Gram-stain positivity (41.86%) | | Culture positivity (18.60%) | |
|---|---|---|---|---|---|
| Duodenal | Gastric | Duodenal | Gastric | Duodenal | Gastric |
| 27 | 16 | 13 (48.15%) | 05 (31.25%) | 07 (25.93%) | 01 (6.25%) |

RUT is a screening test which can be used to predict *H. pylori* infection. In this study, all biopsies from perforated ulcers, which were positive on RUT were taken for further microbiological processing. Various methods have been employed for detection of *H. pylori* in biopsies from perforated ulcers like RUT, immuno-histochemical staining, histo-pathological examination (HPE) using hematoxylin-eosin stain or Giemsa stain and urea breath test.[4,5,11]

Mihmanli *et al.* showed the presence of the bacterium in mucosa and walls of perforated duodenal ulcers in 38.8% patients using hematoxylin-eosin staining.[5] Kumar *et al.* also reported *H. pylori* positivity on HPE of 33.72%.[12] Dogra *et al.* reported 42% biopsies from perforated ulcers as being positive for *H. pylori* on Giemsa staining.[11] These figures correlate well with the findings of this study where 41.86% of the ulcer perforations show bacteria morphologically resembling *H. pylori* on direct Gram-staining (Table 1). Culture for detection of the organism in perforated ulcers is not routinely done. Studies carried out by Chowdhary *et al.* in 1998[13] and Kumar *et al.* in 2004[12] used culture methods to identify the organism. However, in both studies, no *H. pylori* was isolated. Dogra *et al.* conducted a study in 2014 and reported a culture positivity of 20% from perforated ulcers.[11] This figure is similar to that seen in this study where 18.60% culture positivity for *Helicobacter pylori* was seen (Table 1).

Culture positivity in only 18.60% cases maybe due to the fastidious nature of the organism, presence of dead bacilli, overgrowth of contaminants from gut flora[14] or transformation of the bacteria from a cultivable, curved form to a non-cultivable coccoid form.[15]

Various factors such as biopsy site preparation, sample collection, transportation to the laboratory, delay in sample processing and the media used for isolation also influence the yield of the bacterium on culture.[14] These factors become even more important when potentially contaminated samples are to be processed, for example, in the present study, the sample was a biopsy specimen from perforated peptic ulceration. Such samples may be contaminated by the gut flora and primary isolation of *H. pylori* may be more difficult. Screening tests like RUT may be less specific in such cases due to the presence of other urease producing organisms such as *Klebsiella* spp., *Proteus* spp. and *Pseudomonas* spp. which may contaminate the perforation site. The use of selective, enriched media containing serum or lysed blood and antibiotics such as vancomycin, colistin, and nystatin helps to improve the

rate of isolation of the organism from such contaminated samples.[14,16] This may explain the higher efficacy of Modified Thayer Martin medium (18.60%) when compared to non-selective blood agar (11.62%) for the isolation of *H. pylori* in this study. Sang *et al.* also conducted a study where Modified Thayer Martin agar showed best results for the primary isolation of *H. pylori*.[17] However, Cuchí *et al.* reported that there is no significant difference in the isolation rates from Blood agar and Modified Thayer Martin agar.[18]

## CONCLUSION

Perforated peptic ulcers are a common cause of morbidity and mortality in the young population. *H. pylori* is implicated in a substantial number of these cases. While RUT maybe recommended as a screening test for *H. pylori* in uncomplicated ulcers, presence of urease producing contaminant flora in perforated ulcers reduces the specificity of the test in such cases. Therefore, Gram-staining and culture should be recommended for the diagnosis of *H. pylori* in cases of perforated peptic ulcers.

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Original Article

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# Early Enteral Feeding Versus nil by Mouth after Intestinal Resection and Anastomosis: A Study of 60 Cases

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## Abstract

**Background:** As per routine protocol, patients operated for resection and anastomosis of intestine, are kept nil by mouth till intestine starts functioning. But evidence from clinical studies and animal experiments suggests that initiating enteral feeding early is beneficial to patient. The study was performed to compare standard nil by mouth versus early start of enteral feeding following intestinal resection and anastomosis.

**Objectives:** This study was conducted to compare the feasibility, safety and efficacy of early enteral feeding versus nil by mouth (delayed enteral feeding) after elective intestinal resection and anastomosis and emergency traumatic intestinal perforation repair with resection and anastomosis.

**Methods:** The comparative study includes 60 cases of intestinal resection and anastomosis, operated at tertiary care hospital, during year 2010 to 2012, from which randomly 30 patients were selected for conventional nil by mouth approach and rest of 30 patients were given early enteral feeding within 1st 24 hours post operatively.

**Results:** In the study most common age group, who undergone surgery in both case and control groups was between 21-30 years with male predominance in both groups. Most common surgery performed was ileostomy closure in both groups. Case group had statistically significant low rate of wound infection, paralytic ileus and post operative pain with less hospital stay. No significant difference in incidence of anastomotic dehiscence, intra abdominal abscess or pneumonia was found.

**Conclusion:** Compare to conventional nil by mouth approach, early enteral feeding significantly reduces the incidence of wound infection, paralytic ileus and pain in post operative patients of resection and anastomosis of intestine, thereby reducing length of hospital stay, which suggest that early enteral feeding is safe, effective and feasible in post operative patients of resection and anastomosis of intestine.

**Key words:** Enteral feeding, Ileostomy, Intestines, Paralytic Ileus, Postoperative Pain, Surgical Anastomosis, Wound Infection

## INTRODUCTION

Resection and anastomosis is often done in malnourished patients[1-3] and in severe cases, is known to increase the post operative morbidity.[4] Additionally these surgical patients are subjected to post operative stress and hypercatabolic state; hence these patients require some form of early nutrition, enteral or TPN. Routinely after intestinal resection and anastomosis for various reasons nil by mouth is advised and oral/enteral feeding is started after the passage of flatus and appearance of bowel sounds. Idea behind nil by mouth is to prevent post operative nausea and vomiting and to protect the anastomosis.

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Post operative dysmotility mainly affects stomach and colon but small intestine recovers within 4-8 hours after surgery.[5] Hence feeding within first 24 hours after surgery is very well tolerated.[6,7] Contrary to widespread opinion, evidence from clinical studies and animal experiments suggests that initiating feeding early is advantageous. In animals,

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starvation reduces the collagen content in anastomotic scar tissue[8,9] and diminishes the quality of healing,[9,10] whereas feeding reverses mucosal atrophy induced by starvation[11] and increases anastomotic collagen deposition and strength.[12] Experimental data in both animals and humans suggest that enteral nutrition is associated with an improvement in wound healing[13] Finally, early enteral feeding may reduce septic morbidity. Based on these findings present study is designed.

## METHODOLOGY

This prospective randomized comparative study was carried out at tertiary care hospital for a duration of 2 years ranging from 2010 till 2012. A total of 60 patients of intestinal resection & anastomosis were included in the study. From these, 30 patients were randomly offered conventional nil by mouth approach and other 30 patients were selected randomly for early enteral feeding within 1st 24 hours postoperatively after taking their written informed consent. Approval from the local ethical committee was obtained regarding the study.

### Inclusion and Exclusion Criteria

Patients were selected preoperatively from age group between 1-70 years. Patients of both sex were included in both group randomly. All elective small and large intestinal resection and anastomosis were included. All ileostomy or colostomy closure, in which more than half of the circumferencial luminal defect present, were included in our study. Emergency traumatic intestinal perforation presented within 1st 24 hrs were included. Preoperatively blood transfusion was given to patients of both case and control groups before elective resection and anastomosis of intestine, if Hb was <10 gm%. Blood sugar and blood pressure level were kept within normal limit with the help of insulin and antihypertensive drugs before operation and continue in post op period. Preoperative prophylactic antibiotic, injection ceftriaxone (dose according to weight) was given 45 minutes before surgery.

Post operatively 30 patients were offered Ryle's tube blockade and enteral feeding within first 24 hours, starting with sips of water as decided pre operatively in randomly selected patients. Ryle's tube was taken out as patients tolerate liquids in first 24 hours. Other 30 patients were kept nil by mouth until the passage of flatus and appearance of active bowel sounds. The outcomes were compared in the terms of post operative pain, paralytic ileus, anastomotic dehiscence, wound infection, pneumonia and intra abdominal abscess, length of hospital stay after operation.

## OBSERVATION AND RESULTS

- Case group was designed as patients kept in early enteral feeding group and control group was designed as patients kept in nil by mouth group.
- In this study of 60 patients, most common age group in case and control group was 21-30 years and there were 9(30%) in case group and 10(33.3%) in control group(Table 1).
- In this study of 60 patients, there were 17(56.7%) male in case group and 25(83.3%) male in control group. There were 13(43.3%) female in case group and 05(16.7%) females in control group(Table 2).
- In this study of 60 patients, most commonly performed procedure in case (14 patients) group and control (13 patients) group was Ileostomy closure(Table 3).
- In this study of 60 patients, only 1 patient had intra abdominal abscess, 1 patient had wound infection, 1 patient had vomiting and 2 patients had paralytic ileus in case group. While in control group, 2 patients had anastomotic dehiscence, 7 had wound infection, 2 had pneumonia, 2 had intra abdominal abscess, 2 had vomiting and 8 had paralytic ileus(Table 4).

**Table 1: Age distribution**

| Category | Number | | Percentage | |
|---|---|---|---|---|
| Age (years) | Case | Control | Case | Control |
| 0-10 | 01 | 00 | 3.3 | 00 |
| 11-20 | 03 | 05 | 10 | 16.6 |
| 21-30 | 09 | 10 | 30 | 33.3 |
| 31-40 | 06 | 05 | 20 | 16.7 |
| 41-50 | 05 | 06 | 16.7 | 20 |
| 51-60 | 02 | 02 | 6.7 | 6.7 |
| 61-70 | 04 | 02 | 13.3 | 6.7 |
| Total | 30 | 30 | 100 | 100 |

**Table 2: Sex distribution**

| Category | Number | | Percentage | |
|---|---|---|---|---|
| Sex | Case | Control | Case | Control |
| Male | 17 | 25 | 56.7 | 83.3 |
| Female | 13 | 05 | 43.3 | 16.7 |
| Total | 30 | 30 | 100 | 100 |

**Table 3: Procedures**

| Category | Number | | Percentage | |
|---|---|---|---|---|
| Procedures | Case | Control | Case | Control |
| Right hemicolectomy | 05 | 01 | 16.7 | 3.3 |
| Left hemicolectomy | 00 | 01 | 00 | 3.3 |
| IA anastomosis | 02 | 02 | 6.7 | 6.7 |
| DJ anastomosis | 00 | 01 | 00 | 3.3 |
| JJ anastomosis | 03 | 01 | 10 | 3.3 |
| II anastomosis | 01 | 02 | 3.3 | 6.7 |
| Ileostomy closure | 14 | 13 | 46.7 | 43.3 |
| Colostomy closure | 05 | 09 | 16.7 | 30 |

- Visual analogue score was 3 in most of the patients of case group and 5 in most of the patients of control group on 2nd post operative day.VAS was 1 and 2 in case and control group, respectively in most of the patients on 4th post operative day. VAS was 1 in both case and control groups in most of the patients on 6th post operative day. VAS was 0 in both case and control groups in most of the patients on 7th post operative day(Table 5).
- In this study of 60 patients, most of the patients (28 patients) discharged on 7th post op day in case group. While 17 patients discharged on 7th post op day, 6 on 10th post op day, 2 on 12th post op day, 5 on 14th post op day(Table 6).

**Table 4: Complications**

| Category | Number | | Percentage | |
|---|---|---|---|---|
| **Complications** | **Case** | **Control** | **Case** | **Control** |
| Anastomotic dehiscence | 00 | 02 | 03.3 | 06.7 |
| Wound infection | 01 | 07 | 03.3 | 23.3 |
| Pneumonia | 00 | 02 | 00 | 06.7 |
| Intra-abdominal abscess | 01 | 02 | 00 | 06.6 |
| Vomiting | 01 | 02 | 03.3 | 06.7 |
| Paralytic ileus | 02 | 08 | 06.7 | 26.6 |

**Table 5: Post-operative pain**

| Visual analogue pain score | Post-operative day | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Case | | | | | | | Control | | | | | | |
| **Days→** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| Score↓ | | | | | | | | | | | | | | |
| 0 | 00 | 00 | 00 | 00 | 02 | 08 | 28 | 00 | 00 | 00 | 00 | 00 | 03 | 20 |
| 1 | 00 | 00 | 02 | 18 | 23 | 19 | 02 | 00 | 00 | 00 | 03 | 16 | 17 | 03 |
| 2 | 00 | 01 | 15 | 06 | 03 | 02 | 00 | 00 | 00 | 04 | 14 | 05 | 08 | 07 |
| 3 | 00 | 14 | 10 | 04 | 02 | 01 | 00 | 00 | 07 | 16 | 06 | 09 | 02 | 00 |
| 4 | 08 | 12 | 03 | 02 | 00 | 00 | 00 | 01 | 09 | 07 | 07 | 00 | 00 | 00 |
| 5 | 20 | 02 | 00 | 00 | 00 | 00 | 00 | 13 | 14 | 03 | 00 | 00 | 00 | 00 |
| 6 | 02 | 01 | 00 | 00 | 00 | 00 | 00 | 16 | 00 | 00 | 00 | 00 | 00 | 00 |
| 7 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 8 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 9 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 10 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |

**Table 6: Length of hospital stay**

| Category | Numbers | | Percentage | |
|---|---|---|---|---|
| **Length of hospital stay (days)** | **Case** | **Control** | **Case** | **Control** |
| 7 | 28 | 17 | 93.3 | 56.7 |
| 8 | 00 | 00 | 00 | 00 |
| 9 | 00 | 00 | 00 | 00 |
| 10 | 01 | 06 | 3.3 | 20 |
| 11 | 00 | 00 | 00 | 00 |
| 12 | 00 | 02 | 00 | 6.7 |
| 13 | 00 | 00 | 00 | 00 |
| 14 | 01 | 05 | 00 | 16.7 |

## DISCUSSION

In this study, we included benign and malignant etiologies for resection and anastomosis of small and large intestines. And the most common procedure done was ileostomy closure. Ileostomies were done primarily after ileal perforation, which were common in young aged male patients. Reported animal experiments indicated that tissue defenses against infection were established within 1 to 3 hours after bacterial inoculation and that factors influencing the wound response to such a challenge were virtually inoperative after that time. This information laid the groundwork for use of systemic agents during the perioperative time.[14,15]

Gastrointestinal surgery is often undertaken in patients who are malnourished[4-6] which in severe cases is known to increase morbidity.[7] As previously mentioned systemic and local factors may affect the outcomes after resection and anastomosis of intestine.[16] In animals, starvation reduces the collagen content in anastomotic scar tissue[8,9] and diminishes the quality of healing[9,10], whereas feeding reverses mucosal atrophy induced by starvation[11] and increases anastomotic collagen deposition and strength.[12] Experimental data in both animals and humans suggest that enteral nutrition is associated with an improvement in wound healing. Anastomotic dehiscence is the most dreadful complication after intestinal resection and anastomosis. In this study, no patient had anastomotic dehiscence in case group and 2 patients (6.7%) had anastomotic dehiscence in control group. P value was 0.150, which is insignificant. In Reissman et al study,[17] 2.5% patients had anastomotic dehiscence in case group and 3.75% had anastomotic dehiscence in control group. P value was >0.05, which is also insignificant.

Wound infection is common complication after resection & anastomosis of bowel, but its incidence has decreased after invention of novel antibiotics. In this study, 1 patient (3.3%) had wound infection in case group, which was due to intra abdominal abscess after proximal perforation in meckel's diverticulum resection and anastomosis and no patient had wound infection in stoma closure and 7 patients (23.3%) had in control group, 6 patients had wound infection after stoma closure and 1 patient had wound infection after ileoileal anastomosis for koch's ileal stricture. P value was 0.023. Data of this study was suggestive that early enteral feeding decreased wound infection rate with statistical significance.

The incidence of post operative respiratory infection was found to be elevated in advanced age group, pre existing poor chest condition, immune-compromised patients or as a consequences of anastomotic dehiscence. No patient

had pneumonia in our case group and 2 patients had post operative respiratory infection in control group. Of these 2 patients, 1 patient had advanced age with pre existing respiratory infection which recovered with antibiotic and oxygen support and another patient developed pneumonia related to anastomotic dehiscence. P value was 0.150. No statistical significance found between case and control group.

Intra abdominal abscess occurs frequently as a consequence of anastomotic dehiscence, proximal perforation due to obstruction or inadequate peritoneal lavage. Only 1 patient (3.3%) had intra abdominal abscess, which was due to proximal perforation due to anstomotic obstruction and treated by re exploration and resection of ileal perforation and previous anastomosis with ileoileal anastomosis. 2 patients had intra abdominal abscess in control group, both due to anastomotic dehiscence and both died. P value was 0.554. No statistical significance was found between case and control group.

Livingston and Passaro[18] define ileus as the functional inhibition of propulsive bowel activity, irrespective of pathologic mechanism. Many factors are believed to contribute to paralytic ileus, including intra operative bowel manipulation, anesthetic agents, peri operative use of narcotics and post operative sympathetic hyperactivity and electrolyte imbalance. Early enteral feeding induces bowel motility. In this study, 2 patients (6.7%) had paralytic ileus in case group and 8 patients (26.6%) had paralytic ileus in control group, all of which were managed conservatively. P value was 0.038. Data suggested that early enteral feeding was found to decrease incidence of paralytic ileus.

In this study, most of the patients(93.3%) were discharged on the 7$^{th}$ postoperative day in case group, as patients had increased well being and less post operative complications. While in control group, 17 patients (56.7%) were discharged on 7$^{th}$ postoperative day, 6 patients (20%) were discharged on 10th postoperative day, 2 patients (6.7%) were discharged on 12$^{th}$ postoperative day, 5 patients (16.7%) were discharged on 14$^{th}$ postoperative day, because of increased complication rate. P value was <0.05(significant) according to Levene's T test, which indicates early enteral feeding significantly decreased length of hospital stay after operation. In this study, pain was scored according to "Visual Analogue Scale" from post op day 1 to 7. According to Mann Whitney test, P value was <0.05 from post op day 1 to 7, which indicates early enteral feeding also reduced patient's post operative pain level, which may be due to improved general well being of patients pain perception is less in case group compared to nil by mouth, control group.

## CONCLUSION

From present study, it can be concluded that, early enteral feeding significantly reduces the incidence of wound infection, paralytic ileus and pain in post operative patients of resection and anastomosis of intestine. No significant increase the incidence of anastomotic dehiscence, intra abdominal abscess, or pneumonia was found in patients put on early enteral feeding after resection and anastomosis of intestine, as the sample size was small.

Post operatively early enteral feeding is well tolerated in the presence of co-morbid conditions also and may also be beneficial**.** Early enteral feeding significantly reduces the length of hospital stay in the post operative patients of resection and anastomosis of intestine due to less post operative pain, less complications and improvement in general well being.

No significant change in incidence of anastomotic dehiscence, intra abdominal abscess or pneumonia was found in patients put on early enteral feeding after resection and anastomosis of intestine, as the sample size was small.

So, early enteral feeding is safe, effective and feasible in post operative patients of resection and anastomosis of small and large intestine but further studies are needed with large sample size to support the above findings and to calculate frequency, type and amount of feed to be given early post-operatively.

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Original Article

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# Bacteriological Study of Urinary Tract Infection in Ante-natal Patients in Teerthanker Mahaveer University, Moradabad

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## Abstract

**Introduction:** Urinary tract infection (UTIs) is an infection caused by the presence and growth of microorganisms anywhere in the urinary tract. UTI has been reported among 20% of the pregnant women and it is the most common cause of admission in obstetrical wards.

**Materials and Methods:** A mid-stream clean catch urine was collected from 150 antenatal patients carefully then transported to laboratory and culture and antibiotic susceptibility was performed.

**Results:** A total of 52 antenatal patients showed significant bacteriuria while 98 showed no significant bacteriuria from 150 patients. Bacterial agents were isolated from 52 pregnant women and were identified as: *Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa, Staphylococcus aureus* and *Enterobacter aerogenes*. *E. coli* (46%) was the commonest bacterial pathogen isolated. Other bacterial pathogens incriminated in this study were *S. aureus* (20%), *K. pneumoniae* (22%), *P. aeruginosa* (8%), *E. aerogenes* (8%).

**Discussion:** UTI in antenatal patients can lead to significant complications *viz.* fetal growth retardation and even still birth or abortion. In our study, UTI was seen in 34.66% antenatal women and *E. coli* (46%) was most common pathogen. Early diagnosis and treatment in UTI during antenatal period can prevent serious complications and lead to healthy outcomes for both mother and baby.

**Key words:** Antenatal care, Significant bacteriuria, Urine culture

## INTRODUCTION

Urinary tract infection (UTIs) is an infection caused by the presence and growth of microorganisms anywhere in the urinary tract. Urinary tract includes the organs that collect and store urine and release it from the body which include: Kidneys, ureters, bladder, and urethra. UTIs are among the most common bacterial infections in humans, both in the community and hospital setting and have been reported in all age groups in both sexes.[1-3] It is a serious health problem affecting millions of people each year and is the leading cause of Gram-negative bacteremia. UTIs are also the leading cause of morbidity and health care expenditures in person of all ages.

UTI accounts for a significant part of the work load in clinical microbiology laboratories and enteric bacteria (in particular, *Escherichia coli*) remain the most frequent cause of UTI, followed by *Staphylococcus aureus, Klebsiella pneumoniae, Pseudomonas aeroginosa, Enterobacter aerogens*.[4,5]

UTI has been reported among 20% of the pregnant women and it is the most common cause of admission in obstetrical wards. UTI is defined as the presence of

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at least 100,000 organisms per milliliter of urine in an asymptomatic patient, or as more than 100 organisms/ml. of urine with accompanying pyuria (>5 white blood counts/HPF) in a symptomatic patient. Particularly in asymptomatic patients, a diagnosis of UTI should be supported by a positive culture for a uropathogen (Tamalli et al. 2013).[6]

Numerous reports have also suggested that UTI can occur in both male and females of any age, with bacterial counts as low 100 colony forming units (CFU) per millimeter in urine.[2,4] Female are however believed to be more affected than males except at the extremes of life.[2,6] Untreated upper UTI in pregnancy carries well documented risk of morbidity, and rarely, mortality to the pregnant women.[5] Sexually active young women are disproportionately affected. An estimated 40% of women reported having had a UTI at some point in their lives.[7]

Therefore, we conducted this study to evaluate the epidemiology of UTI in antenatal women attending own Teerthanker Mahveer Medical College &Research Center in Moradabad.

## MATERIALS AND METHODS

### Study Area and Duration

This study was conducted from February 2014 to January 2015 in Department of Microbiology at Teerthanker Mahaveer Medical College.

### Study Population

Urine samples were collected from a total of 150 pregnant women between the aged ranges from 18 to 40 years. All these persons were out patients attending the Teerthanker Mahaveer College. The urine samples were obtained by informed consent of the pregnant women used for this study and the permission to that effect was obtained from the Ethical Committee of the hospital.

### Urine Specimen Collection

Early morning clean-catch midstream urine was collected from each pregnant woman into a wide-mouthed sterile screw capped container.

### Urine Culture and Antibiotic Susceptibility Test

With a calibrated micro-loop, 0.001 ml of urine was cultured on to a cystine lactose electrolyte deficient agar, blood agar, MacConkey agar and Muller Hinton Agar plates. After overnight incubation at 37°C for 24 h, colony counts yielding bacterial growth of $\geq 10^5$/ml was taken as being significant in both symptomatic and asymptomatic pregnant women. Antibiotic susceptibility of an isolated species namely, *E. coli, Klebsiella* spp., *Proteus* spp., and *P. aeruginosae* and *E. aerogens* were tested for their susceptibility to some antibiotics (amikacin, ciprofloxacin, cefotaxime, ofloxacin, norfloxacin, nitrofurantoin, ampicillin and cotrimoxazole (Hi-Media Lab, India) by modified disc-agar diffusion technique (Kirby-Bauer method).[8]

## RESULTS

Table 1 show various bacteria isolated from the urine sample E. coli (44.20%), K. pneumonia(19.20%), *S. aureus* (21.10%), *P. aeruginosa* (7.60), *E. aerogens* (7.60). Table 2 show incidence of UTI by parity (no. of pregnancy), in 1st pregnancy (19.2%) positive , 2nd pregnancy (32.6%), 3rd pregnancy (48%). Table 3 show antibiotic sensitivity pattern of isolated organisms. In this table *E. coli* highly sensitive to nitrofurantoin , *K. pneumoniae* highly sensitive to ciprofloxacin, *E. aerogens* highly sensitive to ceftazidine , *P. aeruginosa* highly sensitive to ceftazidine, *S. aureus* highly sensitive to levofloxacin and nitrofurantoin. Figure 1 shows distribution of isolated organisms which causing urinary tract infection. The highest percentage of isolated organism is *E. coli* (44.20%). Figure 2 shows graph of incidence of urinary tract infection by parity.19.2 % in Ist pregnancy, 32.66% in IInd pregnancy, 48% in IIIrd pregnancy. Figure 3 shows antibiotic sensitivity pattern with isolated organisms.

## DISCUSSION

During the period from February 2014 to January 2015, a total of 150 urine specimens were collected from pregnant women and processed. Significant bacteriuria $>10^5$ CFU per ml was found in 52 patients among 150 patients examined.

**Table 1: Various bacteria isolated from the urine sample**

| Isolated organisms | Numbre of positive sample (*n*=52) (%) |
|---|---|
| *E. coli* | 23 (44.20) |
| *K. pneumoniae* | 10 (19.20) |
| *S. aureus* | 11 (21.10) |
| *P. aeruginosa* | 4 (7.60) |
| *E. aerogens* | 4 (7.60) |

*E. aerogens: Enterobacter aerogens, P. aeruginosa: Pseudomonas aeruginosa, S. aureus: Staphylococcus aureus, K. pneumonia: Klebsiella pneumonia, E. coli: Escherichia coli*

**Table 2: Incidence of UTI by parity (number of pregnancy)**

| Parity | Number tested | Number positive (%) |
|---|---|---|
| 1st pregnancy | 45 | 10 (19.2) |
| 2nd pregnancy | 55 | 17 (32.6) |
| 3rd pregnancy | 50 | 25 (48) |
| Total | 150 | 52 (34.66) |

UTI: Urinary tract infection

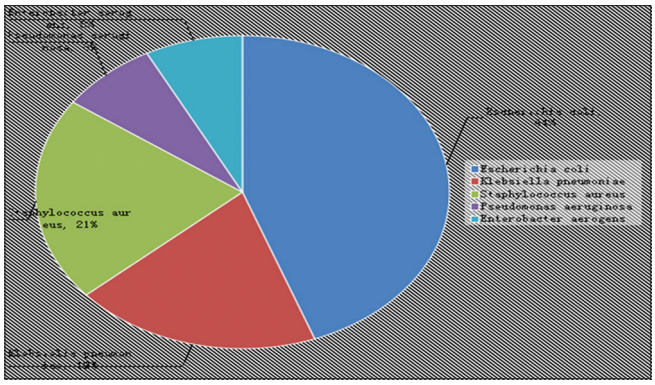


**Figure 1: Distribution of bacteria causing urinary tract infection, in this chart *Escherichia coli* shows (44.20) the highest pathogenic organism which isolates in our study**

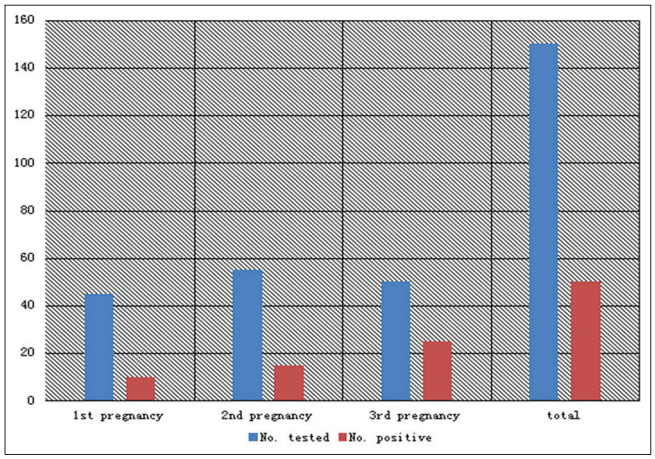


**Figure 2: This graph shows incidence of urinary tract infection (UTI) by parity, in this graph shows incidence of UTI by parity. 19.2 % in I$^{st}$ pregnancy, 32.66% in II$^{nd}$ pregnancy, 48% in III$^{rd}$ pregnancy**

The most commonly isolated bacteria were *E. coli* 23 (44.2%), *K. pneumoniae* 11 (21.1%), *S. aureus* 10 (19.2%), *P. aeruginosa* 4 (7.6%), *E. aerogens* 4 (7.6%).

In the present study, out of 52 positive urine sample from 150 cases, Gram-negative bacteria were more prevalent 41 (78%) than Gram-positive bacteria, which constituted 11 (22%) which was similar from previous study by Sabrina *et al.* who found that 38.1% of the total UTI were cause by Gram-negative bacteria. Similar findings have been reported by Blomberg *et al.*[9-12]

*E. coli* was major pathogen isolated from the urine cultures and accounted for one-third of the positive cultures with significant bacteriuria. *E. coli* is considered uropathogenic due to a number of virulence factors specific for colonization and invasion of the urinary epithelium, such as the P-fimbria and S-fimbria adhesions.[13] *K. pneumoniae* and Staphylococci were the second and third most common bacteria isolated. In our study, out of 52 positive samples, *E. coli* seen 23 (44.2%) so it was major uropathogen of UTI.

In the present study, women in their 2$^{nd}$ and 3$^{rd}$ trimester were found to have the higher incidence of UTI; 32.6% and 48%, respectively. A higher prevalence of UTI in antenatal women was found in an earlier study by Okonko *et al.* They observed that the prevalence of UTI was41.4% in 2$^{nd}$ trimester and 55.1% in 3$^{rd}$ trimester.[14]

The most implicating organism causing UTIs among these pregnant women in this study was *E. coli* and it was responsible for (44.2%) of the cases of UTI. This

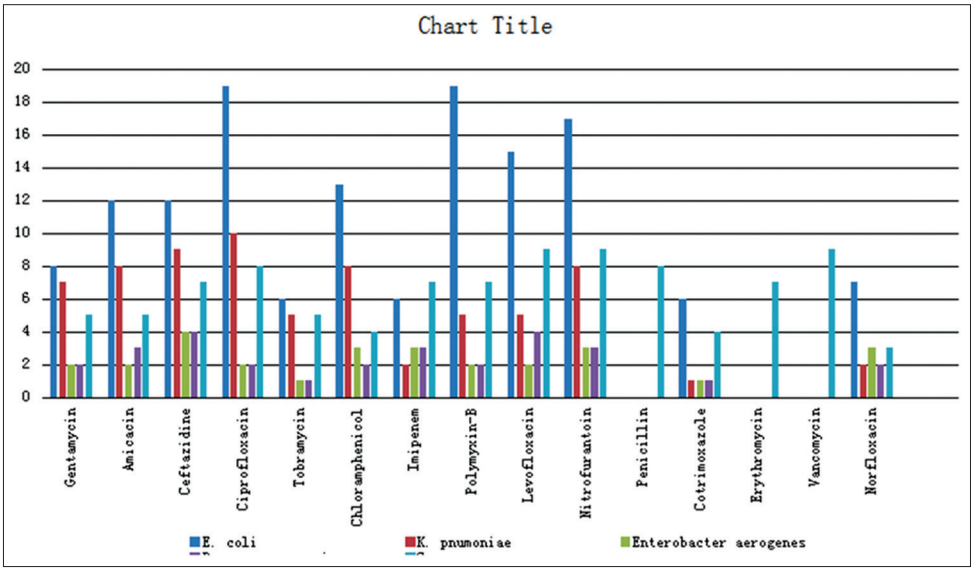


**Figure 3: This graph shows antibiotic sensitivity pattern of isolated organisms, in this graph shows antibiotic sensitivity pattern with isolated organisms**

**Table 3: Antibiotics susceptibility pattern of isolated organisms**

| Antibiotics | *E. coli* | *K. pneumoniae* | *E. aerogenes* | *P. aeruginosa* | *S. aureus* |
|---|---|---|---|---|---|
| Gentamycin | 8 | 7 | 2 | 2 | 5 |
| Amicacin | 12 | 8 | 2 | 3 | 5 |
| Ceftazidine | 12 | 9 | 4 | 4 | 7 |
| Ciprofloxacin | 19 | 10 | 2 | 2 | 8 |
| Tobramycin | 6 | 5 | 1 | 1 | 5 |
| Chloramphenicol | 13 | 8 | 3 | 2 | 4 |
| Imipenem | 6 | 2 | 3 | 3 | 7 |
| Polymyxin-B | 19 | 5 | 2 | 2 | 7 |
| Levofloxacin | 15 | 5 | 2 | 4 | 9 |
| Nitrofurantoin | 17 | 8 | 3 | 3 | 9 |
| Penicillin | - | - | - | - | 8 |
| Cotrimoxazole | 6 | 1 | 1 | 1 | 4 |
| Erythromycin | - | - | - | - | 7 |
| Vancomycin | - | - | - | - | 9 |
| Norfloxacin | 7 | 2 | 3 | 2 | 3 |

*E. aerogens: Enterobacter aerogens, P. aeruginosa: Pseudomonas aeruginosa, S. aureus: Staphylococcus aureus, K. pneumonia: Klebsiella pneumonia, E. coli: Escherichia coli*

was followed by *S. aureus* (19.2%), *K. pneumoniae* (21.1%), *P. aeruginosa* (7.6%) and *E. aerogenes* (7.6%). This finding is similar to other reports which suggest that gram negative bacteria, particularly *E. coli* is the commonest pathogen isolated in patients with UTI.[15-19]

## CONCLUSION

UTI is one of the most common bacterial infections in the human population, and more frequent infection during pregnancy. With due consideration that most of UTIs during pregnancy are asymptomatic, they could lead to serious complications such as prematurity, low-birth weight, hypertension, and higher fetal mortality rates if untreated. This study was aimed to diagnose the asymptomatic or symptomatic bacteriuria, bacterial agents and their antibiotic sensitivity pattern in pregnant women attending from Jan 2014 to Feb 2015 in the Department of Microbiology at Teerthanker Mahaveer Medical College & Research Center, Moradabad.

In the present study, clean catch mid-stream urine samples were collected and cultured on Cystine Lactose Electrolyte Deficient agar by Standard loop method. Suspected colonies were identified, antibiotic susceptibility tests were done. Of 52 positive samples, 30 women suffered from asymptomatic bacteriuria while 22 women were suffering from symptomatic UTI.

The bacterial isolate were *E. coli* (44.2%), *S. aureus* (19.2%), *K. pneumoniae* (21.1%), *P. aeruginosa* (7.6%), *E. aerogenes* (7.6%).

Gram-negative bacteria were more prevalent 39 (78%) than Gram-positive bacteria which constituted 11 (22%). The most commonly isolated bacteria was *E. coli*, which is similar to the findings of many other similar studies. Although antibiotic susceptibility of isolated bacteria in this study does not show significant differences with other studies.

Therefore, early diagnosis and treatment of UTI in antenatal women should be done to prevent complications and improve pregnancy outcomes for both the mother and the baby.

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Original Article

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# Comparative Study of Functional Outcome of Intra-articular Corticosteroid Injection, Manipulation under Anesthesia with Supervised Physical Therapy in Adhesive Capsulitis of Shoulder Joint: A Prospective Clinical Study

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## Abstract

**Introduction:** Adhesive capsulitis of shoulder is disabling and presents with progressive pain and restriction of movement of shoulder joint mostly in geriatric patients. Hence, this study was conducted to interpret better modality of conservative treatment in adhesive capsulitis of shoulder joint.

**Materials and Methods:** A prospective clinical study was conducted on 50 carefully selected patients, dividing into 2 groups, i.e., Group A (receiving intra-articular corticosteroid injection) and Group B (receiving manipulation under anesthesia) with supervised physical therapy.

**Results:** There was male predominance in both Group A and Group B. Prevalence was noted more in the non-dominant limb. There is improvement in abduction, external and internal rotation, and shoulder pain and disability index (SPADI) score in both groups but Group A has significant improvement as compared to Group B ($P$ <0.05).

**Conclusion:** Both the modalities are highly effective in improving pain and disability in the patients with adhesive capsulitis of the shoulder joint. Spontaneous recovery does not necessarily occur even after a long period so we recommend that these cost-effective modalities should be offered to all patients with of adhesive capsulitis and teach them that these modalities would be of more value if carried out an early stage of disorder.

**Key words:** Capsulitis, Physical therapy modalities, Steroids

## INTRODUCTION

Adhesive causalities of the shoulder joint have been very commonly seen in a good number of patients from the geriatric age group with complains of pain with progressive restriction of both active and passive shoulder joint movement. It was first described by Dupley[1] in 1872 as humeroscapular periarthritis caused by subacromial bursitis. Neviaser[2,3] based on clinical observation and pathological findings coined it as "adhesive capsulitis."

The incidence of adhesive capsulitis is approximately 3-5%, but several conditions are associated with increased incidences including female gender, diabetes mellitus, cervical disc disease, prolong immobilization, hyperthyroidism, stroke or myocardial infarction, autoimmune disease, and trauma.

Although typically described as a self-limiting disease process, the natural history[4-7] of adhesive capsulitis have

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shown that it can lead to long-term disabilities over the course of several years. Treatment modalities described in literature includes supervised physical therapy, NSAIDS, oral corticosteroids, intra-articular steroids injections, distension arthrography, close manipulation under anesthesia, open surgical release, and arthroscopic capsular release. Our study includes intra-articular corticosteroids injection with anti-inflammatory properties and manipulation under anesthesia, which disrupts capsular fibrosis. Both group of patients received supervised physical therapy with specific stretching and strengthening the program.

### Aim and Objectives

To assess better modality of conservative management of adhesive capsulitis of shoulder joint between 2 groups in terms of:

- Increase in range of motion of joint (abduction, external rotation, internal rotation)
- Increase in shoulder pain and disability index (SPADI) score.

## MATERIALS AND METHODS

A prospective clinical study was conducted on 50 carefully selected patients, dividing into 2 groups, i.e., Group A (receiving intra-articular corticosteroid injection) and Group B (receiving manipulation under anesthesia) with supervised physical therapy.

### Patient Inclusion Criteria Includes

Age more than 18 years, giving informed consent, a trial of opiate analgesia or non-steroidal anti-inflammatory drugs was given by their consultant prior to referral, at least 1-month history of pain and stiffness of the shoulder for which no other cause could be identified. Documented restriction of passive glen humeral and Scapulothoracic motion of: Abduction ≤100°, external rotation <50% of the total range of movement (<40*), internal rotation only to the sacrum or less.

### Exclusion Criteria Includes

Patient with Intrinsic pathologies of the shoulder: Biceps tendinitis, calcified tendonitis, history of fracture and dislocation of shoulder, arthritis of glenohumeral joint or acromioclavicular joint, sympathetic dystrophy, rotator cuff tear, patient with extrinsic problems: Neuromuscular disorder (parkinsonism), referred pain from an associated condition: Extrusion of a cervical disc with radiculopathy, history of previous surgery of affected shoulder.

Clinical history, pain assessment, shoulder range of movement were noted, standard radiographs in true AP, lateral, 10° caudal outlet Y radiograph were taken to rule out any bony and soft tissue pathology with allotment of SPADI scores to all patients.

Group A patients received intra-articular corticosteroids-methyl prednisolone 40-80 mg with 2% lignocaine hydrochloride, 1 ml injected into glenohumeral joint by the anterior approach, and similar amount injected into the subacromial bursa. Group B patients received manipulations performed in a controlled manner. Arm is grasped close to the axilla; forward flexion is initially undertaken rupturing the inferior capsule adhesions. This is followed by an external rotation, first with the arm close to the body and then in abduction. Internal rotation is the final maneuver performed with the arm in abduction (Acronym - Fear). This maneuver will be repeated 2 or 3 times till adequate movement is obtained. Then the patient will be sent to home with an arm sling support. Analgesics and anti-inflammatory medicines were given. Supervised physical therapy was given immediately as per tolerance of the patients. Patients with severe roentgenographic osteopenia and recurrence group were not included in this method. This maneuver is used in patients with severe restriction of glenohumeral joint movement. In supervised physical therapy, adhesive capsulitis is treated with specific four directions stretching and strengthening exercise programs. Both procedures were done as outdoor procedures and patient discharged on the same day.

### Physical Therapy Includes

Stretching exercises (weight pendulum stretch, wall climb, rotator cuff stretch, back of shoulder stretch, overhead stretch, towel stretch internal rotation, towel stretch external rotation, armpit stretch, finger walk, and strengthening exercises: Outward rotation exercises, inward rotation exercise, lifting exercises.

Post procedural regular follow-up at 1, 2, 3, and 6 months. Clinical evaluation was done for any specific complaints, evaluation of a range of movement by SPADI score. Final outcome assessment was done after comparing observations at the first visit, 1, 3 months, and final follow-up at 6 months.

## RESULTS AND OBSERVATIONS

Group A consists of 25 patients comprising 16 males and 9 females with mean age of 55.7 (standard deviation [SD] = 6) year, Group B consists of 25 patients comprising 18 males and 7 females with mean age of 49.9 (SD = 6.7) year. Adhesive capsulitis of shoulder is considered a disease of middle-aged persons common in 40-70 years. There was male predominance in both Group A and Group B. It may reflect health awareness of the society and female

literacy rate. Maximum belonging to middle class (72% in Group A, and 52% in Group B). Prevalence was noted more in the non-dominant limb. Average duration of pain in Group A = 3.8 months, (SD ± 1.4, and in Group B = 4.8 months, (SD ± 2). Average duration of restriction of range of movement in Group A = 2.4 months, (SD ± 1.2) and in Group B = 3 months, (SD ± 1.5). 16% (4 patients) of the patients were diabetic and in Group B: 20% (5 patients) of the patients were diabetic. According to literature patients with diabetes have more severe affection and high recurrence rate. In our study, it was found that 18% (of total 50 patients) of total patients were diabetic. It was also found that patients with diabetes had more severe affection than other patients, but no recurrence was observed in these patients.

### Range of Movement (Base Value)

*Pretreatment status was noted as*

In Group A: It was found that mean abduction was 68.8, (SD ± 14.8), mean external rotation was 38.8°, (SD ± 7.4), internal rotation 12% (3 patients) had infrared (IR) not up to sacrum, 88% (22 patients had IR up to sacrum and SPADI score 69.6% (SD ± 6.8).

In Group B: It was found that the mean abduction was 65.2°, (SD ± 11.9). Inclusion criteria for a range of abduction were ≤100°. Patients of Group B had more compromised abduction movement than the group. Mean external rotation was 39.2°, (SD ± 8.1). Inclusion criteria for external rotation were ≤50°. Mean internal rotation 28% (7 patients) had IR not up to sacrum, 72% (18 patients) had IR up to sacrum inclusion criteria were for internal rotation was up to or not up to sacrum. Patient's in Group B had a more compromised internal rotation, i.e., not up to the sacrum as compared to Group A. with SPADI score was 75.6% (SD ± 9). Maximum value was 92% and the minimum value was 60%.

This score is based on a questionnaire and is directly proportional to pain score and disability index. As the severity of disease increases SPADI score also increases and vice versa.

### Improvement in Abduction

Average improvements in Group A, at 1-month = 109.2° (SD ± 10.2), at 3 months = 142.7° (SD ± 12.5), at 6 months = 169.6° (SD ± 8.5). Average improvements in Group B, at 1-month = 103° (SD ± 10.2), at 3 months = 128° (SD ± 10.9), at 6 months = 160.2° (SD ± 10.2) (Graph 1) (*P* value at 1-month = 0.0396, at 3 months = 0.001, at 6 months = 0.0010).

### Improvement in External Rotation

Average improvements in Group A, at 1-month = 38.8° (SD ± 6.1), at 3 months = 65.8° (SD ± 7.2), at 6 months = 80° (SD ± 6.6). Average improvements in Group B, at 1-month = 50° (SD ± 7.1), at 3 months = 60.4° (SD ± 7.3), at 6 months = 70.8° (SD ± 6.4) (Graph 2).

*P* value in between Group A and Group B is not significant at 1-month of follow-up, but were significant at 3 months and 6 months of follow-up as per value of, at 1-month = 0.5111, at 3 months = 0.0118, at 6 months = 0.0000.

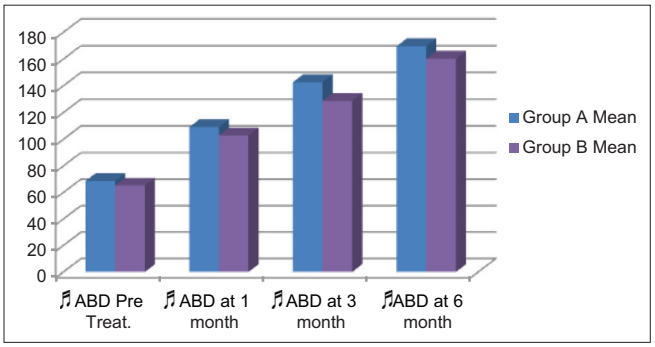
### Improvement in Internal Rotation

Both groups achieved normal range of internal rotation at 3 months follow-up, which continued up to final follow-up. A full range of painless internal rotation achieved uniformly in both groups.

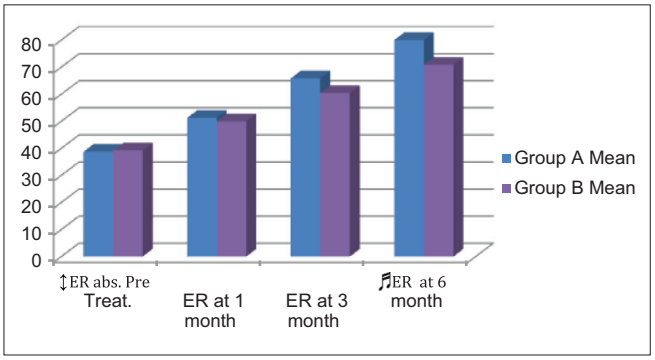
### Improvement in SPADI Score

Average improvements in Group A were: At 1-month = 29.5% (SD ± 7.5), at 3 months = 16.9% (SD ± 9), at 6 months = 3.3% (SD ± 5.5). Average improvements in Group B: At 1-month = 34.7 (SD ± 8.5), at 3 months = 22.4% (SD ± 6.8), at 6 months = 11% (SD ± 5.2) (Graph 3).

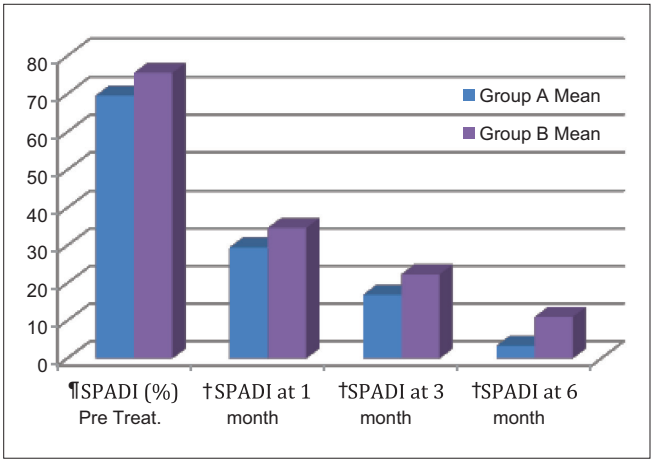
All groups achieved significant improvement in pain and restriction of movement (disability) and achieved almost normal day-to-day activity.




**Graph 1: Improvements in abduction (mean) in Group A and Group B**




**Graph 2: Improvements in external rotation (mean) in Group A and Group B**




**Graph 3: Improvements in shoulder pain and disability index score (mean) in Group A and Group B**

*P* value in between Group A and Group B is significant as per values, at 1-month = 0.0281, at 3 months = 0.0215, at 6 months = 0.000.

## DISCUSSION

There is always a disagreement in the conservative management of idiopathic adhesive capsulitis of shoulder. Pain, disability to perform day-to-day activity with social, psychological, economical need of a human being creates urgency to devise a simple, safe, direct, economical (cost effective) method for treatment of adhesive capsulitis.

In this study, we prospectively evaluated the subjective and objective outcomes of the treatment of idiopathic adhesive capsulitis with two treatment modalities, i.e., intra-articular corticosteroid injection and manipulation under anesthesia both supervised physical therapy.

Frozen shoulder is considered to be a disease of middle age group. It is rare before 40 years with a peak incidence between 40 and 70 years and is unusual after 70 years of age (except secondary traumatic frozen shoulder). In our study, average age was 53.72 year with an almost similar age distribution in each group. It was well supported by most of the previous study.[3-8] Most of the patients in our study belong to lower and middle socio economic class. This indirectly explains poor health concern and low literacy rate. Unlike the previous study, there was male preponderance (68%) more in comparison with the female group. The lower percentage of the female population in our study was because of poor female literacy rate, poor health awareness, dependency on others in seeking medical help, lack of self-confidence, poor motivation toward disease and treatment. It is also well supported in literature.[9]

Maximum patients in our study presented after mean pain duration in 3.8 months (Group A) and duration 4.8 months (Group B). It was almost similar to most of the previous studies.[8,9] This suggests chronicity of disease (benign condition) and indicates neglect on the part of the patient because of which the disease gradually progressed to a severe state with gradual restriction of shoulder range of movement in all planes limiting day-to-day activities.

The average restriction of movement in our study was 2.7 months ranges from 1-month to 6 months. It indicates the early presentation of patients. Patients in Group B had longer mean duration of restriction than Group A. In was seen that patients with severe restriction of shoulder movement were getting difficulties in performing physical therapy, so we included these patients under Group B. It had provided them a help to overcome the initial intra- and extra capsular fibrosis.

In our study, a total 9 patients (18%) of 50 patients were found to be diabetic. Other studies had also shown similar affection.[7,10]

We found a significant correlation with the severity of the disease with diabetes but finally there were no differences in the subjective and objective outcome in these patients compared with the results that were non-diabetic. Literature suggests increase incidences of recurrence of frozen shoulder in these groups, but we did not found any recurrence in any group.[10]

In our series, restriction of movement was as per previous studies,[11] the global loss of all active and passive shoulder movement in all direction. We had chosen restriction of three major movements - abduction, external rotation, internal rotation as inclusion criteria for patient selection.

The average abduction in the series was 67° (Group A = 68.8°, and Group B = 65.2°), which was similar to previous studies.[9,11] Most of the patients in our study had moderate to severe restriction in abduction. It was painful in all patients.

The average abduction in Group A was 68.8°, it was less compromised than in Group B (65.2°). We used a single steroid injection accompanied with supervised physical therapy to reproduce their results. Our dosage and method of injection were similar to the study of Bulgen *et al.*[11] with the additional combination of supervised physical therapy.

90% of our patients were pain-free after the first visit and almost all patients achieved this stage at 8 weeks duration. 40% our patient achieved 150° or more abduction within 8 weeks. In Roy *et al.*[12] study group 73% had achieved

150° or more abduction within 8 weeks, and only 18% of Bulgen *et al.*[11] had achieved this after 10 weeks. We achieved excellent improvement in results at follow-up for 6 months mean (169.6° ± 8.5°), with better results than previous studies.[13-18]

We compared this data with improvement in Group B. There was a significant difference between the results in follow-up (at 1, 3, and 6 months). We found that patients of steroid group achieved a normal range of painless movement in earlier follow-up in comparison of manipulation under anesthesia group. More than half of the patient in Group B achieved ≥150° of abduction at their final follow-up. Results were comparative with previous studies.[19-21]

The mean external rotation in the series was 39° (Group A = 38.8° and Group B = 39.2°). The patients in Group B had a more compromised external rotation.

Improvements in the range of external rotation were almost similar in initial follow-up but were statistically better after 3 months and 6 months in Group A than Group B. The improvement in the internal rotation range of movement was similar in both groups.

In young patients to measure full internal rotation, the patient is asked to reach behind his or her back as if trying to scratch an itch in mid-back. This maneuver is often called Apley scratch test. This is a complex motion, as some extension of the shoulder is necessary to move the hand into this position. It is a very useful functional motion, as it required in daily activities such as washing the back, scratching the back, reaching the back pocket, cleaning the perineum, fastening clothes (putting bra in Indian female). Identifying the spinous process of the highest vertebra reached usually quantitates this motion. This is normally T 7 for women and T 9 for men.

We used spinal level for assessment of internal rotation in younger and sacrum level in elderly patients.

The stiffness of joint was associated with significant disability in activity of daily life such as dressing, washing back and perineum, combing, etc.

The most authentic system for frozen shoulder that has taken in most of the previous newer studies was SPADI score system.[13-15] Most of the previous studies did not considered this score for evaluation of pain and disability in the patients of adhesive capsulitis.

It was developed by Roach *et al.*[13] in 1991. By inclusion of 13 different questionnaires related to pain and disability for the functional assessment of affected shoulder, the score become very authentic and thorough. The severity of affection is directly proportional to the score which is expressed in percentage.

The base values of SPADI score in our study was 72.6%. Total score in Group A was lesser than Group B (mean in Group A = 69.6% and in Group B = 75.6%), i.e., the patient in Group B was more severely affected.

After an average follow-up of 6 months, the improvements in pain and range of movement was good to excellent, which was highly appreciable in each group. The average improvement in Group A (−66.3%) was better than Group B (−64.6%).

Although there was some residual deficit in abduction and external rotation in group B, the finally achieved movement was quite sufficient and painless to perform day-to-day activity specially.

The cause behind these differential statistical data could be the most severe affection and association of diabetes mellitus in these groups.

After manipulation under anesthesia, there was a transient painful episode after intervention, which lasts for 24-72 h. In this period, we did not advised any patient to start any physical therapy, and non-steroidal anti-inflammatory medications were given to these patients. After the subsidence of pain, supervised physical therapy was given to these patients. Although manipulation under anesthesia is highly effective in the treatment of primary frozen shoulder, we observed that supervised physical therapy, when followed by manipulation under anesthesia could be extremely beneficial in patients with primary frozen shoulder with severe affection.

We also noted that timing of presentation of patient does not play much role in final outcome similar to other studies.[22,23]

In our study, all patients achieved good to excellent painless range of movement and it was not influenced by age and sex distribution in these patients. It usually affects non-dominant extremity. In our study, none of the patients had bilateral affection and percentage of involvement of non-dominant limb was in higher percentage.

## CONCLUSION

We found that in both the modalities intra-articular corticosteroid, manipulation under anesthesia were highly

effective in improving shoulder pain and disability in the patients with adhesive capsulitis of the shoulder joint.

We concluded that in those patients in whom the condition is diagnosed in early stages (mild to moderate affection) when capsulitis is developing, the rationale of would be for use of intra-articular steroids to prevent subsequent inflammatory fibrosis. In these patients, performance of post interventional physical therapy is not a problem; a single dose of intra-articular corticosteroid injection with supervised physical therapy is highly effective.

However, in later stages when an adhesive capsulitis had developed (moderate to severe), a manipulative under anesthesia will be probably more appropriate to overcome intra-and extra capsular fibrosis. Combining it with supervised physical therapy it will give excellent results.

Faster symptomatic relief decreases in long-term morbidity and earlier return to normal day-to-day activity are the key points in the adoption of these treatment modalities for treatment of frozen shoulder.

As good numbers of patients are diabetic, arthroscopic, and open release of adhesions carries increased risk of infection.

These procedures are simple, safe and cost effective, and patients may not need to go for costly surgical procedure unless it does not respond to conservative management.[22]

In our impression, spontaneous recovery does not necessarily occur even after a long period, so we therefore recommend that these modalities should be offered to all patients with frozen shoulder due to adhesive capsulitis and teach them that these modalities would be of more value if carried out an early stage of disorder.

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Original Article

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# Microbial Profile and Antibiotic Susceptibility Pattern of Surgical Site Infections in Orthopedic Patients at a Tertiary Hospital in Bilaspur

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## Abstract

**Introduction:** The most dreaded complication in the minds of all orthopedicians is the fear of infection. Once frank infection develops then it is extremely difficult to eradicate. One of the proven measures to prevent infection is early deployment of appropriate antibiotic before the development of frank infection.

**Purpose:** To find out and study the microbial profile amongst the orthopedic surgical site infections (SSIs) in Chhattisgarh Institute of Medical Sciences (CIMS) and find out the appropriate antibiotics for empirical therapy in orthopedic cases.

**Study Design:** Retrospective study.

**Protocol and Procedure:** All cases which underwent orthopedic procedure or surgery from 1st March 2014 to 31st February 2015 were segregated and their culture and sensitivity reports were collected. The common infecting organisms were identified based on the culture and sensitivity reports and the most appropriate antibiotic to which most of the infecting bacteria were sensitive was found out.

**Observation and Results:** Culture reports of 308 post-operative patients who underwent orthopedic procedure revealed SSI in 37 cases (12%). We found out that the most common infecting bacteria causing most of the orthopedic SSIs was *Staphylococcus aureus* (24.3%) and was followed by *Escherichia coli* (18.9%), *Pseudomonas* (18.9%), then *Enterobacter* spp. (8.1%) and *Achromobacter* (8.1%) and others in that order. Most of the *Staphylococci* were sensitive to linezolid and sensitivity to amoxicillin + clavulanic acid was also good. For Gram-negative infection (*Enterobacteriacae*) piperacillin + tazobactam, cefoperazone + sulbactam and amikacin were found highly sensitive. For *Pseudomonads* again piperacillin + tazobactam was found out to be very effective.

**Conclusion:** *S. aureus* is the most common organism responsible for SSIs. A combination of piperacillin-tazobactam or cefoperazone sulbactam along with amikacin should be used as empirical therapy in orthopedic cases at CIMS to reduce SSIs.

**Key words:** Antibiotic susceptibility pattern, Microbiological profile, Orthopaedic surgery, Surgical site infections

## INTRODUCTION

Infections in orthopedics are difficult to treat. It is always better to prevent the infection rather than to treat it. Once frank infection develops the management becomes primarily surgical with repeated debridements and may even lead to implant removal. Not only it is a physical ailment for the patient, but also adds to his psychological and financial load.[1] The patient, if untreated or irrationally treated goes in for serious life-threatening and limb-threatening consequences and may also land up in an emotional breakdown.

The management of these infections requires a close collaboration of the surgeon or treating doctor and his team. The infecting organism has to be identified as early as

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possible and the drugs to which the organism is susceptible have to be instated.[2]

Generally in any orthopedic case a pair of antibiotics covering both the Gram-negative and Gram-positive infections are employed.[3] Whenever there is suspicion of an anaerobic infection, another antibiotic for anaerobes is added.[4] This is a practical protocol followed in many institutes. However, injudicious use of antibiotics may lead to antibiotic resistance and decreased patient immune response. Prompt use of the most sensitive antibiotics as early as possible as empirical therapy, to which most of the common infecting bacteria would succumb will help us in preventing frank life and limb-threatening infections.

So, we conducted this study jointly in the Department of Orthopaedics and Microbiology in Chhattisgarh Institute of Medical Sciences (CIMS) to establish the microbiological profile of the bacterial infections and to find the most appropriate antibiotics against these organisms.

## PROTOCOL AND PROCEDURE

This was a retrospective study conducted jointly in the Department of Orthopaedics and Microbiology. A blanket consent was taken from all patients, at the time of admission, that they are willing for any type of medical and surgical procedure and that their treatment information will be used for study and research purposes also, warranting them of the complete privacy of their entrusted personal information. Before starting the study, an Ethical Clearance certificate was taken from the Ethical Committee of our Medical College. The culture and sensitivity reports of all orthopaedic cases operated between 1st March 2014 and 28th February 2015 were collected. All operated orthopaedic cases in our institute have their swab sent from the surgical site for microbiological analysis.

The samples in the lab were inoculated in blood agar and MacConkey agar and incubated at 37°C in candle jar.[5] The growth then obtained was put to tests for identification of the bacteria. The tabulation of the data was done to find out the commonly infecting organisms and the frequency of these infections was found. The data were organized in decreasing order of the frequency of infection with the most commonly infecting organism first followed by the others.

The next step was to identify the antibiotics to which most of these organisms were susceptible. The sensitivity in the institute is done by the Kirby–Bauer disc diffusion method. In this method lawn culture on Muller Hinton Agar media is prepared with the microbes from the samples. Antibiotic impregnated discs are kept on the surface of the plates before incubating these plates for 24 h at 37°C in a candle jar. The interpretation of the test was done according to CLSI guidelines as sensitive, intermediate and resistant (Figure 1).[6]

After identification of the commonly affecting micro-organism the most sensitive antibiotics were identified. The data were organized and the antibiotics to which most of the organisms were sensitive and had least resistance were identified.

## OBSERVATIONS AND RESULTS

A total of 308 operated patients whose swab was sent for culture and sensitivity as a standard protocol were identified in the desired time period and their reports traced. Of them, 37 patients had growth of organisms indicating surgical site infections (SSI). The overall rate of surgical site orthopedic infections was found to be 12%.

The organisms were broadly divided into 3 groups - Gram-positive staphylococci, the Gram-negative *Enterobacteriacae* and the *Pseudomonads*. The Gram-positive *Staphylococci* included *Staphylococcus aureus* and Coagulase negative *Staphylococci*. The Gram-negative *Enterobacteriacae* included the *Enterobacter*, *Escherichia coli*, *Klebsiella* and *Proteus*. The *Pseudomonads* included *Peudomonas* spp., *Achromobacter* and *Acinetobacter*. There were 11 (29.7%) infections out of 37 caused by the Gram-positive *Staphylococci*. The Gram-negative infections caused by *Enterobacteriacae* dominated the list with 15 (40.54%) infections and the *Pseudomonads* caused 11 (29.7%) infections. The distribution of these organisms is depicted in Table 1.

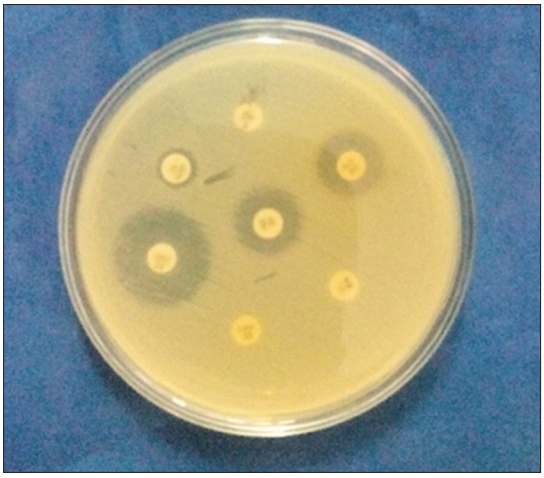

**Figure 1: A photograph of antibiotic disc in carpet growth over Muller Hinton Agar, showing zone of inhibition for the antibiotics. A Kirby–Bauer disc diffusion method**

The single most commonly infecting organism was found to be *S. aureus* which had been isolated from 9 samples (24.3% cases). It was followed by *E. coli* and *Pseudomonas* in 7 cases each (18.9% cases). Then, it was *Achromobacter*, *Enterobacter* spp., and *Klebsiella* with 3 cases each (8.1% cases) followed by *Proteus* and Coagulase negative Staphylococci with 2 (5.4%) cases each. One SSI was attributable to *Acinetobacter* (2.7%) (Table 2).

It is evident that the most effective antibiotics for the treatment of Gram-positive infections (caused mostly by *S. aureus* and Coagulase negative Staphylococci) are linezolid and vancomycin effective against 90.9% and 81.8% bacteria respectively. However, we do not recommend the empirical use of these antibiotics for the fear of emerging drug resistance. These are higher antibiotics and are to be used only in life-threatening infections or when an infectious agent is insensitive to other commonly used drugs. The other drugs which were found extremely useful for the treatment of Gram-positive infections are amoxicillin + clavulanic acid (72.3%) and cefoperazone + sulbactam (72.3%). Ofloxacin also had similar results (sensitive in 72.3% cases) (Table 3).

**Table 1: Distribution of organisms causing SSI in orthopedics**

| Infecting *Microbacteria* | Number of cases | Percent |
|---|---|---|
| *S. aureus* | 9 | 24.3 |
| *E. coli* | 7 | 18.9 |
| *Pseudomonas* | 7 | 18.9 |
| *Achromobacter* | 3 | 8.1 |
| *Enterobacter* | 3 | 8.1 |
| *Klebsiella* | 3 | 8.1 |
| *Proteus* | 2 | 5.4 |
| Coagulase negative *Staphyloccoccus* | 2 | 5.4 |
| *Acinetobacter* | 1 | 2.7 |
| Total | 37 | 99.9 |

*S. aureus: Staphylococcus aureus*

**Table 2: Antibiotic susceptibility pattern of Gram-positive *Staphylococci***

| Antibiotic | Sensitive (%) | Intermediate (%) | Resistant (%) |
|---|---|---|---|
| Piperacillin - tazobactam | 7 (63.6) | 1 (9.1) | 3 (27.3) |
| Cefoperazone sulbactam | 8 (72.73) | 1 (9.1) | 2 (18.2) |
| Ampicillin+sulbactam | 8 (72.73) | - | 3 (27.3) |
| Amoxicillin+clavulanic acid | 8 (72.73) | 1 (9.1) | 2 (18.2) |
| Ciprofloxacin | 7 (63.6) | 1 (9.1) | 3 (27.3) |
| Ofloxacin | 8 (72.73) | 1 (9.1) | 2 (18.2) |
| Amikacin | 6 (54.54) | 1 (9.1) | 4 (36.4) |
| Gentamycin | 6 (54.54) | - | 5 (45.45) |
| Linezolid | 10 (90.9) | 1 (9.1) | - |
| Vancomycin | 9 (81.81) | 2 (18.2) | - |
| Amoxicillin | 5 (45.45) | 1 (9.1) | 5 (45.45) |
| Oxacillin | 9 (81.81) | - | 2 (18.2) |

*n*=11 (total)

It can be seen that, if the growth yields a Gram-negative *Enterobacteriacae* (*E. coli*, *Enterobacter*, *Proteus* and *Klebsiella*) then the sensitivity pattern is different. The Gram-negative rods are more sensitive to piperacillin + tazobactam. About 73.3% of all Gram-negative *Enterobacteriacae* were found sensitive to piperacillin + tazobactam and cefoperazone + sulbactam. Furthermore, amikacin was found sensitive against 73.3% Gram-negative *Enterobacteriacae*. Highest sensitivity with low resistance were obtained with imipenem and cilastatin (93.3%), but they are not recommended for empirical use (Table 4).

The emerging trend of infection shows an alarming rise in the *Pseudomonad* infections. The *Pseudomonads* include *Pseudomonas* Spp., *Achromobacter* and *Acinetobacter*. The *Pseudomonads* are also highly sensitive to piperacillin + tazobactam which was found effective in 82.8% infections with *Pseudomonads*. The other drugs with high sensitivity against the *Pseudomonads* were cefoperazone + sulbactam (72.23% cases) and amikacin (54.5% cases).

A supplementary finding in the study was that the risk factors for development of SSI when traced back were duration of the surgery, open fractures, crowding of the operating room, presence of co-morbid conditions,

**Table 3: Antibiotic susceptibility pattern of Gram-negative *Enterobacteriacae***

| Antibiotic | Sensitive (%) | Intermediate (%) | Resistant (%) |
|---|---|---|---|
| Amikacin | 11 (73.3) | 1 (6.7) | 3 (20) |
| Gentamycin | 7 (46.7) | 3 (20) | 5 (33.3) |
| Cefoperazone sulbactam | 11 (73.3) | 2 (13.3) | 2 (13.3) |
| Ciprofloxacin | 7 (46.7) | 3 (20) | 5 (33.3) |
| Ofloxacin | 8 (53.3) | 2 (13.3) | 5 (33.3) |
| Piperacillin+tazobactam | 11 (73.3) | 2 (13.3) | 2 (13.3) |
| Ceftriaxone | 8 (53.3) | 3 (20) | 4 (26.7) |
| Amoxicillin+clavulanic acid | 7 (46.7) | 2 (13.3) | 6 (40) |
| Imipenem | 13 (86.7) | 1 (6.7) | 1 (6.7) |
| Imipenem+cilastatin | 14 (93.3) | 1 (6.7) | - |
| Meropenem | 11 (73.3) | 1 (6.7) | 3 (20) |

*n*=15 (total)

**Table 4: Antibiotic susceptibility pattern of *Pseudomonads***

| Antibiotic | Sensitive | Intermediate | Resistant |
|---|---|---|---|
| Ciprofloxacin | 4 (36.4) | 1 (9.1) | 6 (54.54) |
| Ofloxacin | 5 (45.5) | 1 (9.1) | 5 (45.5) |
| Gentamycin | 5 (45.5) | 1 (9.1) | 5 (45.5) |
| Amikacin | 6 (54.54) | 1 (9.1) | 4 (36.4) |
| Cefoperazone+sulbactam | 8 (72.73) | - | 3 (27.3) |
| Meropenem | 8 (72.73) | 1 (9.1) | 2 (18.2) |
| Piperacillin+tazobactam | 9 (81.81) | 1 (9.1) | 1 (9.1) |
| Imipenem | 9 (81.81) | - | 2 (18.2) |
| Imipenem+cilastatin | 10 (90.9) | - | 1 (9.1) |

*n*=11 (total)

duration of drainage tube insertion and general hygiene of the patient.

## DISCUSSION

In this study, we have found out that the rate of SSI in orthopedics in our institute is 12%. This is better than those reported by Maksimovic *et al*.[7] where they reported an infection rate of 22.7%. They had 63 patients out of 277 operated patients who developed infection.

The results of the study show that most of the orthopedic SSIs in CIMS are caused by *S. aureus* followed by *E. Coli*. Others include *Pseudomonas*, *Achromobacter*, *Enterobacter*, Coagulase negative *Staphylococci* and *Acinetobacter*. Overall Gram-negative bacteria are responsible for most of the SSIs.

With the overall drug sensitivity pattern it is recommended that for empirical therapy we should start with a combination of cefoperazone + sulbactam or piperacillin + tazobactam along with amikacin as these drugs have been found to be uniformly sensitive against all bacteria including the Gram-positive *Staphylococci* or the Gram-negative *Enterobacteriacae* or the *Pseudomonads*. If resistance against these antibiotics is found then the drugs we recommend are linezolid or vancomycin for Gram-positive *Staphylococci* and imipenem + cilastatin for resistant *Enterobacteriacae* and *Pseudomonads*.

When we have identified the type of growth and infecting organism then we recommend the empirical use of amoxicillin + clavulanic acid or cefoperazone + sulbactam along with ofloxacin in cases of Gram-positive *Staphylococcal* infections as each of them were found effective in 72.73% of infections with Gram-positive *Staphylococci*.

For Gram-negative infections our recommendation is to start with a combination of piperacillin + tazobactam or cefoperazone + sulbactam and amikacin. The same combination is to be used in the case of *Pseudomonads*.

A point worth mentioning here is that the Gram-negative *Enterobacteriacae* and the *Pseudomonads* both show extremely high sensitivity to imipenem + cilastatin, but these drugs are extended spectrum beta-lactams and relatively newly emerged drugs with less known resistance. So, empirical therapy with imipenem + cilastatin is not recommended for the fear of emergence of drug resistance. They, like linezolid for Gram-positive *Staphylococci*, are to be kept as reserved drugs to be used in infections caused by organisms resistant to other drugs or life-threatening infections.

Our results are in accordance with the study of Benabdeslam *et al*.[1] wherein they also had isolated *S. aureus* as their most commonly infecting organism in 33.1% cases.

Also, the results are concurrent with the study of Dhawan *et al*.[3] wherein they also found out that the most common micro-organism causing orthopedic infection is *S. aureus*. They found out that almost 40% of the inpatient wound infections and 62% of out-patient wound infections in orthopedics in their institute were caused by *S. aureus*.

Also in another study by Mundhada and Tenpe[2] similar results were obtained and *S. aureus* was the most common bacteria isolated from the SSIs.

The results of our study are contradictory to the results of Thool *et al*.[8] wherein they had found that 12 out of 51 isolated staphylococcus samples were resistant to linezolid. However, in our study we found linezolid resistance *S. aureus* (LRSA) was not found in the *Staphylococci*. We also conclude that linezolid is one of the most effective therapeutic agents against *S. aureus*.

In another study in India Agrawal *et al*.[9] found out that the most common infecting organism in their institute was *E. coli* (34.4% cases) followed by *Pseudomonas* (26.1% cases) and then *S. aureus* in 21.6% cases. This is in contrast to our study wherein we found *E. coli* and *Pseudomonas* each in 18.9% cases only. However, their study was a broad study dealing with all sorts of orthopedic infections including bedsores, osteomyelitis, open fractures etc. This might be a reason for the difference in organism pattern obtained. They had also recommended that the first drug of choice to be used in orthopedic infections is cefoperazone which is partly in accordance to our study where we have recommended a combination of cefoperazone + sulbactam and amikacin for empirical treatment in orthopaedic cases.

With the great increase in the level of orthopedic surgery and with the evolution of techniques such as arthroscopy, recent advances in spine surgery and evolution of the modern arthroplasties the risk of infection is a great threat. It is always better to prevent the development of frank infection with prompt drugs and know the microbial profile of the infections in that area so that measures could be taken to prevent them. We all know that implant infections and osteomyelitis might just be the most difficult morbidities to treat. Osteomylitic patients may even land up in amputations.

In all centers antibiotics to prevent infections in the post-operative period are given and the chances of developing an infection after giving these empirical antibiotics are

still present. With the results of our study, by starting a combination of piperacillin + tazobactam or cefoperazone + sulbactam and amikacin, orthopedic infections in our institute can be prevented and taken care of in the early and subclinical phase and the chances of development of suppurative frank infections would be grossly lowered.

## CONCLUSION

The data suggests that there is preponderance of Gram-negative infections in operated orthopedic patients, but *S. aureus* predominates the infectious agents as the sole pathogen.

Administration of empirical antibiotic should be based on the local microbiological data. In first study of this kind in the tribal dominated region of Chhattisgarh it is obvious that by starting a combination of piperacillin + tazobactam or cefoperazone + sulbactam along with amikacin would definitely bring about a decrease in the rate of SSIs in our institute.

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Original Article

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# Role of Laparoscopy in the Management of Acute Abdomen in Pregnancy

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## Abstract

**Background:** Acute abdomens during the pregnancy due to both non-obstetric and obstetric conditions are though rare often results in late diagnosis and complications. Laparoscopic surgery in pregnancy was felt to be more dangerous and, in fact, was contraindicated due to the fear of injuring the pregnant uterus, hypercapnea and impaired fetal outcome. This prospective study is carried out with the objective that with the surgical skills improved in laparoscopy and the availability of high-tech smart instrumentations the laparoscopy shall be a feasible and safe approach for the early diagnosis and management of acute abdomen.

**Materials and Methods:** All the patients admitted with the non-obstetric acute abdomen are evaluated and subjected to appropriate laparoscopy management. The surgical complications, difficulties, progress of labor and the fetal outcome were studied. Out of 10 patients presented with acute abdomen nine patients were managed by laparoscopy and the outcomes are studied.

**Results:** Out of 9 patients underwent surgical treatments there were no rate of conversion and difficulty in the procedure encountered. Laparoscopic surgery in pregnant women significantly reduce abdominal scars, days of hospitalization, infectious complications, post-operative pain, use of analgesics, and an early return to the normal life. Early ambulation results in the reduction of the risk of thromboembolic events and ateletctasia. Fetal outcome in 8 patients were uneventful except one case with appendicular perforation went for early abortion.

**Conclusion:** Based on the various published studies and the present study the author recommend that laparoscopy in pregnancy for the management of acute abdomen is a safe procedure, in all trimesters.

**Key words:** Acute abdomen, Fetal outcome, Hassan technique, Insufflation pressure, Laparoscopy

## INTRODUCTION

Non-obstetrical abdominal surgeries during pregnancy for the acute abdomen are carried out approximately 1 in 500 - 1 in 635 women.[1,2] Appendicitis is the most common non obstetrical acute abdomen occurring during pregnancy. Other conditions are acute cholecystitis, small bowel obstruction, ovarian cyst with or without torsion, obstructed hernias, abdominal pregnancy, splenic disorders etc. Laparoscopy has become increasingly popular in the treatment and evaluation of acute abdomen.

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When surgical management carried out through laparoscopy during pregnancy it helps the women to get cosmetic scar, lesser days of hospitalization, much reduced surgical site infection (SSI), reduced post-operative pain resulting in reduced usage of analgesics and enable the patient to get back to normal life early. Laparoscopy minimizes adhesions and possible intestinal obstruction. Early ambulation results in the reduction of the risk of events and ateletctasis.

In acute abdomen during pregnancy, it is much difficult to make correct diagnosis. The symptoms and signs of acute abdomen can present physiologically in normal pregnant women. The nausea and vomiting are frequent.

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Leukocytosis, low grade pyrexia, hypotension, anorexia can occur in normal pregnancy and will not arose the suspicion of acute abdomen. The site of pain will not correspond to the normal anatomical site as the pregnancy progresses the uterus enlarges and moves cephaloid, hence push and alter the anatomical position of the viscera. Clearly, these changes can alter the clinical picture.[3]

The potential possibility of trocar induced injury to the enlarged gravid uterus can be prevented by Hasson technique, an open approach to enter the peritoneum. $CO_2$ pneumoperitoneum can produce hypercapnia and it is a potential hazard to the fetus. Keeping the insufflations pressure lower than 12 mmHg, monitoring the end tidal $CO_2$ to be below 35 mmHg by hyperventilation of the mother and continuous $PO_2$ saturation measurement can avoid the potential hazards of hypercapnia.[4,5]

In the past, pregnancy was considered a contraindication for laparoscopy. However, in this modern era multiple reports recommend the successful use of diagnostic and therapeutic laparoscopy during pregnancy. Though the procedure is performed as late as at 34 weeks of gestation, the optimal time is the early second trimester.

In this study, pregnant women with various acute abdomen conditions were managed by laparoscopy. The post-operative period progression of labor and fetal outcome is correlated. The study also postulates the various precautionary measures and modifications for each condition.

Based on the various published studies and this study the author recommends that laparoscopy during pregnancy is a safe procedure, in all trimesters.

## MATERIALS AND METHODS

This prospective study of laparoscopic surgery for non-obstetric causes during pregnancy presenting as acute abdomen are carried out in Annammal Hospital from January 2013 to January 2015.

### Inclusion Criteria

All the pregnant women with normal viable gestation attending the hospital with acute pain abdomen are evaluated with basic diagnostic criteria protocol and patient requiring surgical intervention irrespective of gestational age are included in this study.

### Ethical Aspects

The study proposal was approved by the Ethical Committee of our institution. All participants were provided and obtained written informed consent after explaining all the features of the study.

### Procedure

Totally 10 cases of the acute abdomen during pregnancy underwent operative management. Nine were by laparoscopy and one by an open method. Nine cases were in second-trimester gestation and one in the first trimester. The results of the study were studied using simple statistical analysis.

The etiology for the acute abdomen, gestational age of occurrence, the modality of management, the progression of labor, mode of delivery and fetal outcome are measured and tabulated in Table 1.

## RESULTS

Nine out of ten patients had laparoscopic management and one by the open method. No surgical complications were encountered. One case with appendicular perforation and local peritonitis at the first-trimester pregnancy operated by laparoscopy resulted with abortion in the following week.

All the other nine cases were followed up till term and normally delivered. All the babies delivered by both caesarean and assisted labor had good Apgar and no adverse events in the neonatal period. In the post-operative period, the entire patient treated with laparoscopy had shown significant early ambulation, lesser pain, and good wound healing with no SSI. All patients had a smooth recovery and uneventful post-operative period.

**Table 1: Case details and management outcome**

| Pathology | Number of patients | Mean gestational age | Nature of treatment | Mode of delivery | Baby outcome |
|---|---|---|---|---|---|
| Acute appendicitis | 4 | 18 weeks | Laparoscopic appendicectomy | Caesarian | Normal |
| Appendicular perforation | 1 | 8 weeks | Laparoscopic appendicectomy | Abortion | Applicable |
| Ovarian cyst torsion | 3 | 21 weeks | Laparoscopic cystectomy | Caesarian 2 full term normal delivery - 1 | Normal |
| Acute cholecystitis | 1 | 20 weeks | Laparoscopic cholecystectomy | Full term normal delivery | Normal |
| Umbilical hernia/obstructed | 1 | 23 weeks | Hernioplasty | Caesarian | Normal |
| Total | 10 | | | | |

## DISCUSSION

### Acute Abdomen

The acute abdomen is defined by Stedman's medical dictionary, 27th edition, as "any serious acute intra-abdominal condition presenting with pain, tenderness, vomiting and muscular rigidity, and requiring emergency surgical intervention." Though all the known causes of the acute abdomen can occur with pregnancy, certain clinical conditions are more likely to occur in pregnancy.

The approach to pregnant patients with severe abdominal pain is very similar to that for non-pregnant patients with acute abdomen. However, the physiological symptoms and signs of pregnancy can mimic like symptoms and signs pertinent to acute abdomen such as nausea, vomiting, leukocytosis, mild pyrexia, hypotension, and anorexia. A structured approach in history taking and meticulous clinical examination are mandatory.

The acute abdomen can be due to non-pregnancy related and also pregnancy related. The causes are tabulated in Tables 2 and 3.

### Incidence

During pregnancy incidence of non-obstetric surgeries varies from 1.5% to 2%. The common presentations can be seen in Table 4.

### Safety

After 1990, the laparoscopic modality for surgical management became much popular in Gynecology. However, the safety and feasibility of laparoscopy during pregnancy often evolved much debate and controversy. Though elective surgeries are preferred for laparoscopy for an emergency, it is used with caution.

**Table 2: Non-pregnancy-associated causes of acute abdominal pain**

| Non-pregnancy-associated causes of acute abdominal pain | |
|---|---|
| **Intra-abdominal** | **Extra-abdominal** |
| • Appendicitis | • Sickle-cell crises |
| • Cholecystitis | • Cardiac pain |
| • Pancreatitis | • Lower lobe pneumonia |
| • Adnexal masses | • Referred pleuritic pain from pulmonary embolism |
| • Intestinal obstruction | • Psychological disturbance |
| • Inflammatory bowel disease | |
| • Urinal tract infections | |
| • Renal calculi | |
| • Trauma | |
| • Splenic artery aneurysms | |
| • Hernia | |
| • Meckel diverticulum | |

Potential concerns include:

- Pneumoperitoneum induced rise in intra-abdominal pressure may induce fetal hypoxia by decreasing uteroplacental blood circulation.
- Absorption of carbon dioxide can lead to fetal acidosis.
- Premature rupture of membrane and preterm delivery can happen during uterine manipulations or iatrogenic uterine perforation.
- Using trocar or veress needle can directly injure the fetus inside the uterus.

Corneille *et al.* concluded with their study carried out with 94 patients and reported there is no difference between laparoscopic or open approach for appendicitis and cholecystitis in terms of safety during pregnancy. However, both laparoscopy and open surgeries during pregnancy will have perinatal complications.[6]

Reedy *et al.* in their retrospective study on the safety of laparoscopy surgeries on pregnant women, concluded after comparing 2181 laparoscopy procedures done on pregnant women (<20 weeks gestation) with 1552 open procedures on pregnant women (<20 weeks) there is no difference among two group on birth weight, gestational duration, congenital malformation or growth potential.[7]

**Table 3: Pregnancy related acute abdomen**

| Pregnancy related acute abdomen | |
|---|---|
| **1st trimester of pregnancy** | **Late 2nd and 3rd trimester of pregnancy** |
| • Abortion | • Abruptio placentae |
| • Trophoblastic disease | • Uterus rupture |
| • Ectopic pregnancy | • Fibroid degeneration |
| • Ovarian cysts | • Liver pain due to Glinsson's membrane |
| • Fibroid degeneration | • Distension (HELLP syndrome) |
| • Amniocentesis complications | • Symphysisdiastasis |
| • Acute fatty liver of pregnancy | • Lumbar pain |
| • Rupture of rectus abdominis | • Placenta percreta |
| • Torsion of uterus | |
| • Septic abortion with peritonitis | |

**Table 4: The rate of incidence of non-obstetric surgeries during pregnancy**

| Indications | Incidence |
|---|---|
| Appendicitis | 1:1500 pregnancies |
| Cholecystitis | 1:1500-1:10,000 pregnancies |
| Bowel obstruction | 1:1500-1:3500 pregnancies |
| Adnexal torsion | 1:3000-1:4000 pregnancies |
| Cervical disease | 1:3000-1:5000 pregnancies |
| Trauma | Variable (trauma complicates 4-8% of all pregnancies, but the incidence of severe, life-threatening trauma possibly requiring surgery is 0.3-0.4%) |

Jung *et al.* recommended in obese pregnant women appendicitis laparoscopy approach is much preferred. He also suggested using direct approach using Hassan technique or optical trocar and choosing the port site according to fundal height safety is ensured.

In pregnancy, diaphragm is displaced upwardly by the growing fetus, which results in decreased residual lung volume and functional residual capacity. Pneumoperitoneum cause upward displacement of the diaphragm resulting in restrictive pulmonary physiology. Intra-abdominal insufflation pressure is maintained at <12 mmHg to avoid worsening pulmonary physiology in gravid women.

### Indications

The indications for the laparoscopic management of acute abdomen during pregnancy are same as non-pregnant women. Whenever, the clinical presentations warrants acute interventions laparoscopy can be performed depending upon the skills and optimum training of the surgeon and the team.

### Timing

During pregnancy in all trimesters, the laparoscopy procedures can be carried out. However, due to the fear of teratogenicity, due to drugs in the first trimester and difficult ergonomics, due to an enlarged uterus, the optimal time to operate shall be early second trimester. In the event of a direct threat to the mother or the fetus, surgical intervention should be conducted regardless of gestational age.

### Thromboprophylaxis

Pregnancy promotes hyper-coagulable state and hence warrants thromboprophylaxis. Laparoscopy surgery takes more operating time resulting in prolonged duration of immobilization and hence will promote thrombosis. The use of pneumoperitoneum and reverse trendelenberg position will also promote venous stasis inducing thrombosis. Hence, thromboprophylaxis is useful in all surgeries during pregnancy. Pneumatic compression devices indicated for all women undergoing surgery during pregnancy. Pharmacologic thrombo-prophylaxis should be individualized based on additional risk factors for venous thromboembolism length of procedure and scope of the procedure.[8]

### Prophylactic Tocolysis

Tocolytics should not be used prophylactically in pregnant women undergoing surgery. However, peri operatively when signs of preterm labor are present, better to use tocolytics. The use of monopolar electrocautery must be avoided in order to minimize the uterine contractility. The glucocorticoids are also not indicated for surgery during pregnancy.

The specific agent and indications for the use of tocolytics should be individualized and based on the recommendation of an obstetrician.[9]

### Patient Position

Both lithotomy and supine positions can be used. However, it is preferred to have left ward to avoid potential compression to abdominal vessels.

### Appendicitis in Pregnancy

Acute appendicitis occurs at the frequency of 1/600-1/1000 pregnancies and it is the most common acute abdomen during pregnancy. Physiological leukocytosis, anatomic changes due to enlarged uterus associated nausea and vomiting results in the delay for the diagnosis of appendicitis.[10]

Abbasi *et al.* in their study in 2014 have proved appendiceal rupture occurs more frequently during third-trimester pregnancy due to delay in diagnosis and treatment.[11]

Andersen and Nielsen in their epidemiological study in 2001 with 53,000 women undergoing appendectomy stated in the age-matched study pregnant women are less likely to develop appendicitis than the non-pregnant women and in pregnancy it is more common in second trimester.[12] The incidence of appendicitis was slightly higher in the second trimester.

Zingone *et al.* through their cohort study of over 350,000 pregnancies reported during antepartum period incidence of appendicitis is lowered by 35% and it is least common during the third trimester of antepartum period and in elderly patients.[13]

Pregnancy does not affect the overall incidence of appendicitis, but the severity may be increased in pregnancy. During pregnancy, appendicitis may present with perforation in 25% of patient. If surgery delay occurs more than 24 h the incidence of perforation increases to 66%. Appendicitis seems to be more common in the second trimester. The perforation results in high incidence of a fetal loss and maternal morbidity. Even if on surgery appendix is found to be normal, it is better to remove appendix as:

1. Though the appendix is grossly normal early disease may still present
2. Right iliac fossa pain will produce diagnostic dilemma.

The various symptoms and signs with which appendicitis can present are tabulated Table 5.

Right lower quadrant pain close to McBurney's point is the most common symptom of appendicitis, irrespective of the

gestational age.[14] During third trimester, due to the enlarged uterus the pain may shift upwards in the hypochondrium.[15]

Laboratory: Leukocytosis (white cells >10,000 cells/μL) and left shift in the differential count is the feature of appendicitis. Mild leukocytosis can normally present in pregnant women: Mourad *et al.* in their retrospective study on 66993 deliveries, including 67 pregnancy with appendicitis, analyzed the leukocyte count in both pregnant women with and without appendicitis stated mean leucocyte count on patient with appendicitis were 16400 cells/ml and women having normal appendix 14000 cells/ml.[16]

Microscopic hematuria and pyuria may occur when the inflamed appendix is close to the bladder or ureter. Mild elevations in serum bilirubin (total bilirubin >1.0 mg/dL) have been described as a marker for appendiceal perforation (sensitivity 70% and specificity 86%. An elevated C - reactive protein level occurs in appendicitis, but is a nonspecific sign of inflammation.

Magnetic resonance imaging is ideal for excluding acute appendicitis during pregnancy when clinical, and ultrasound examinations are inconclusive.[17] A meta-analysis evaluating magnetic resonance imaging in pregnant women with suspected appendicitis included six studies of 12-148 patients of whom 2-14 patients subsequently had confirmed acute appendicitis.[18]

Surgical approach: When the diagnosis is relatively certain, both open and a laparoscopic appendectomy are considered. No randomized trials have been performed to suggest that one technique is better than another, and the choice of technique should be based on the surgeon's experience level.

Laparoscopic appendectomy: Laparoscopy can be performed successfully during all trimesters but for the uterine volume in the last trimester that could interfere with the visualization and laparoscopic instrumentation.

### Procedure

Preferred adoptions for safe appendicectomy are:

- Using open Hassan technique or optic port
- Left lateral positioning of the patient to avoid abdominal vessel compression
- Not to use any cervical instruments,
- Insufflation pressures not more than 10-12 mm Hg
- Port position as per fundal height as depicted in Figure 1.

Wilasrusmee *et al.* in 2012 stated the risk of fetal loss was greater for laparoscopic appendicectomy versus open appendicectomy in pregnant women.[19] In 2014 Walker *et al.* stated laparoscopic appendectomy during pregnancy may be associated with higher rates of fetal loss. However, it is a low-grade evidence and not strong enough to determine the modality of appendectomy in pregnant women.[20]

In our study, use of laparoscopy is safe, provided adequate monitoring done and no overt signs of preterm labor present. Laparoscopy offers optimal visualization and early recovery. We use slightly lower intra-abdominal pressures of 10-12 mmHg (which provides excellent visualization), an open entry technique, and directly visualized trocar insertion.

### Cholecystitis in Pregnancy

Gallstones are more common during pregnancy due to decreased gallbladder motility and increased cholesterol saturation of bile. Cholecystitis can occur due to gallstones (up to 90% of the cases of cholecystitis in pregnancy).[21]

The major independent risk factor for gallstones is pre-pregnancy obesity. Gallstones are prevalent more in multiparous women than nulliparous and in fatty women of more than 40 years old.

Acute cholecystitis: Definitive, prompt surgical therapy is required for any patient with cholecystitis and signs of sepsis, suspected gangrene, or perforation. Even in the

**Table 5: Symptoms and signs of appendicitis**

| Symptoms (%) | Signs (%) |
|---|---|
| • Abdominal pain: 96 | • Right lower quadrant tenderness: 85 |
| • Right lower quadrant: 75 | • Rebound tenderness: 80 |
| • Right upper quadrant: 20 | • Abdominal guarding: 50 |
| • Nausea: 85 | • Rectal tenderness: 45 |
| • Vomiting: 70 | • Right upper quadrant tenderness: 20 |
| • Anorexia: 65 | • Temperature >37.8°C (100°F): 20 |
| • Dysuria: 8 | |

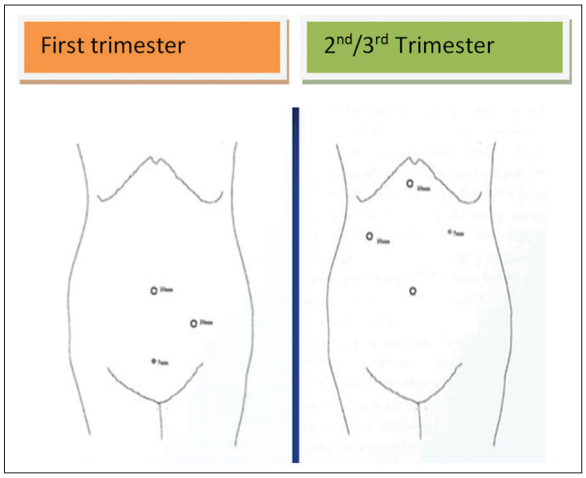


**Figure 1: Port positioning in the 1st and 2nd - 3rd trimester**

absence of indications for urgent or emergent surgery, pregnant women with acute cholecystitis should undergo cholecystectomy. Although symptoms of cholecystitis may abate within 7-10 days of initiating supportive care, there is a high risk of recurrence or serious complications.

Studies comparing conservative and surgical management of cholecystitis revealed the incidence of preterm delivery (3.5 vs. 6.0%) and fetal mortality (2.2% vs. 1.2%). It is ironical to note medical treatment not only fails often, but also it will reoccur in 92% of patients in the first trimester, 64% at the second trimester and 44% in the third trimester. Surgery is best. A study reports when cholecystitis is managed by surgery incidence of fatal mortality is only 2.6%. However, on conservative management it is 8.0%.[22]

Cholecystectomy during pregnancy: With appropriate attention to the altered anatomy and physiology of pregnancy, laparoscopic cholecystectomy can be done safely.[23]

Silvestri *et al.* in a review of data from the American College of Surgeons database from 2005 to 2009, stated pregnancy do not increase post-operative morbidity for cholecystectomy. Composite 30 days major morbidity was similar after cholecystectomy between pregnant and non-pregnant women at 1.8%.[24]

Enlarged uterus and relatively smaller abdominal cavity result in difficulties in doing lap cholecystectomy during advanced gestation. Insertion of the trocar under vision or sonographic guidance is preferred. As high intra-abdominal pressure will decrease venous return and cardiac output, resulting in the reduction of uteroplacental blood perfusion the insufflations pressure must be kept 10-12 mm of Hg. Trendelberg position and operating table left tilt to avoid caval compression can minimize the risk of this complication. The first port entry is adjusted according to the fundal height as per Figure 2.

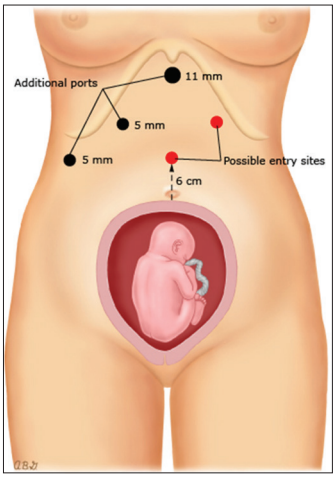


**Figure 2: Port sites as per fundal height**

### Adnexal Masses Complications in Pregnancy

Adnexal masses are common but asymptomatic in most of the time 25 and may occur from 1 in 81 to 1 in 1000.[25] Cystic masses detected during early pregnancy disappear within the first trimester.

Common causes for adnexal mass are persistent corpus luteal functional cysts, benign dermoid cysts, and serous or mucinous cystadenomas. If the mass is more than 6 cm and or torsion happen laparoscopy cystectomy is done. If the mass is solid, has surface excrescences, is associated with ascites, or has other features suggesting malignancy, then bilateral salpingo-oophorectomy is appropriate. Contra lateral ovary should not be resected unless bilateral disease is identified.[26]

Pregnancy predisposes to adnexal torsion. 20% of adnexal torsions occur during pregnancy. The adnexal torsion is a serious condition.[27] Dermoid ovary often ends in torsion, more so on the right side especially in the third trimester. The surgery must be performed as soon as possible having in mind the necessity to save as much more ovarian tissue as possible, however, in cases of ovarian necrosis the only option is salpingo-oophorectomy.

Mathevet *et al.* in their review of 47 patients who had laparoscopic ovarian cystectomy one pregnancy loss occurred 4 days after the procedure, suggesting that the laparoscopic approach remains a safe option even in pregnancy.[28]

In our study, three patients with ovarian cyst underwent laparoscopy surgery. Two of them are dermoid and one mucinous cyst. All in the second trimester and post-surgical period were uneventful.

## CONCLUSION

Based on our experience and the literature review we conclude that laparoscopy is both, a safe and a better outcome promising procedure in pregnancy. Laparoscopy is the surgical method of the future, and it is a feasible, safe and advantageous surgery in pregnancy provided that we follow long established and proven principals of good surgery. These include early diagnosis and treatment, a multidisciplinary assessment and approach, avoidance of unnecessary trauma, strict asepsis, and hemostasis.

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Original Article

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# Ocular Manifestations of Hyperhomocysteinemia and their Response to Therapeutic Modalities

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## Abstract

**Introduction:** Hyperhomocysteinemia (hHcy) is observed in approximately 5% of the general population. hHcy can be associated with increased risk of ocular vascular and neuro-ophthalmology disorders in par with that of cardiovascular and central nervous system diseases.

**Purpose:** To evaluate the ocular manifestations of hHcy and their therapeutic response to treatment.

**Materials and Methodology:** It is an interventional study done between June 2012 and February 2015. This study includes the (1) patients with hHcy referred from other departments for ophthalmic evaluation, (2) the patients who presented in the ophthalmology department with various vascular and neuro-ophthalmology findings associated with hHcy. All the patients with hHcy with ocular manifestations were started on vitamin B6 20 mg, B12 500 µg, folic acid 5 mg and glycine 500 mg along with other supportive treatment. Their serum homocysteine levels were repeated after 6 months.

**Results:** Out of 59 cases of hHcy 25 patients (42.3%) showed ocular findings such as branch retinal vein occlusion, papilledema, visual field defects, non-arteritic anterior ischemic optic neuropathy and optic disc pallor. Among the patients with ocular manifestations 32% (8 cases) of patients had intermediate, 60% (15 cases) had moderate and 2 patients (8%) had severe hHcy. Treatment of these cases with vitamin supplementation showed a decrease in fasting serum homocysteine levels by 10 ± 4 µmol/L (range 6-15 µmol/L) after 6 months and resolution of the clinical findings in vaso occlusive disorders and papilledema. Out of the 7 neuro ophthalmology patients 2 patients showed worsening of the neurological defects.

**Conclusion:** hHcy treated with vitamin B12 and folic acid shows a decrease in the risk of hHcy complications. All detected cases of hHcy should undergo an ophthalmic evaluation at the earliest.

**Key words:** Branch retinal vein occlusion, Hyperhomocysteinemia, Non-arteritic anterior ischemic optic neuropathy, Optic disk pallor, Papilledema, Visual field defects

## INTRODUCTION

Homocysteine, an intermediate in the methionine metabolism, if increased in the plasma can produce an increased risk of thrombosis and endothelial defect.[1] S adenosyl methionine, a biochemical precursor, is involved in transfer of one carbon (methyl) groups during many biochemical synthesis. S adenosyl methionine is synthesized from the amino acid methionine by a reaction that includes the addition of methyl group and purine base (from ATP). When S adenosyl methionine donates methyl group for the synthesis of thiamine, choline, creatinine, epinephrine, protein and DNA methylation it is converted to S adenosyl homocysteine. After losing the adenosyl group the remaining homocysteine can either be converted to cysteine by vitamin B6 dependent trans sulfuration pathway or converted back to methionine in a reaction that depends on folate and vitamin B12. When either folate or vitamin B12 is lacking the homocysteine to methionine reaction is virtually blocked causing homocysteine to build up in the effected tissues and spill into circulation. Vitamin B6 dependent transulfuration

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pathway can metabolize excess homocysteine.[2] Although the homocysteine plays an important role in synthesis of methionine the bulk of current research suggest that when the cellular homocysteine leaks into circulation even in slight elevated amounts the risk of coronary heart disease, peripheral vascular disease, venous thrombosis and pulmonary embolism increases. The mechanism of effects of homocysteine on atherogenesis are not known.[2] Thus, serum levels of folate, vitamin B6 and B12 levels are inversely related to the plasma total hyperhomocysteinemia (hHcy) levels. hHcy can be either acquired or inherited type. Inherited hHcy occurs due to various causes mainly - cystathionine β synthase, methionine synthase and 5-methytetrahydrofolate reductase deficiency.[3]

hHcy is observed in approximately 5% of the general population and is associated with an increase in risk of many disorders, including vascular and neurodegenerative diseases, autoimmune disorders, birth defects, diabetes, renal diseases, osteoporosis, neuropsychiatric disorders and cancer.[3] The thrombo embolic effect of raised total plasma homocysteine level has been documented as early as 1968.[4] The idea that elevated homocysteine was associated with arterial thrombotic disease was first put forth in 1969.[5] The risk of venous thrombotic disease in patients with hHcy was first addressed in 1991.[6] Possible mechanisms by which homocysteine may contribute to thrombosis include activation of factor V, increased oxidation of low-density lipoprotein, and inhibition of plasminogen activator binding and of protein C activation, or direct damage to the vascular endothelium.[7]

In the ocular system, many lines of evidence indicate that hHcy is a risk factor in a variety of disease including retinal arterial atherosclerosis, macular degeneration and optic atrophy due to retinal micro vascular occlusions, non-arteritic ischemic optic neuropathy (NA-ION), cataract, glaucoma and exudative age related macular degeneration.[8]

The primary goal of treatment is to lower blood levels of homocysteine to normal. Therapy with folic acid, vitamin B6, and vitamin B12 has been shown to lower homocysteine levels and may prevent occlusive disease. Vitamin treatment was associated with a significant fall in thrombin-antithrombin III complexes and prothrombin fragment 1 + 2 concentrations in peripheral venous blood.[9] Supplementation of folic acid, vitamin B12, and vitamin B6 can efficiently lower plasma hcy levels, in most patients, regardless of the underlying cause.[10,11] Further folic acid supplementation improves arterial endothelial function in adults with relative hHcy, with potentially beneficial effects on the atherosclerotic process. Daily folate and vitamin B12 supplements of 500 μg or less can reduce plasma total homocysteine levels up to 15%.[12,13] Furthermore, anticoagulant medications may be added to treat and prevent thrombosis.

In this study, we treated and followed up hHcy patients with ocular manifestations and observed their response to the treatment.

## MATERIALS AND METHODOLOGY

This interventional study was conducted between June 2012 and February 2015 in Kempegowda Institute of Medical Sciences and Research Centre, Bengaluru India. Ethical Clearance for this study was obtained from the Institutional Ethical Committee and Helsinki guidelines were followed during this study. Informed consent was obtained for all the patients or from the attendants' who were included in this study. Patients included in this study were cases of branch retinal vein occlusions (BRVOs) associated with hHcy, papilledema with hHcy and referred cases of hHcy for ophthalmology opinion from medicine, neurology and cardiology department with systemic manifestations like hemiplegia, gait abnormalities, headache, vomiting, cardiovascular diseases and coma. hHcy was defined as having a serum level >15 μmol/L. It was further categorized as moderate, intermediate, and severe if the level was 16-30, 31-100, and more than 100 μmol/L, respectively. Serum homocysteine levels were estimated using enzymatic recycling method. Visual acuity was tested by Snellens chart. The best corrected visual acuity was recorded. If the person could not correctly recognize the top letter of the chart, visual acuity was noted using the finger counting method at various distances. Anterior segment evaluation was done using slit lamp and refraction was done by using Huwitz autorefractometer. Intraocular pressure was recorded using Perkins tonometer. Posterior segment evaluation was done after dilating with tropicamide - phenylephrine eye drops using indirect ophthalmoscope (Keeler), 90 D panfundoscopy lens and Goldmann 3 mirror examinations. Visual field analysis (where possible) was done using humphrey visual field analyzer. In selected cases, we performed fluorescein angiography. Other investigations like radiological investigations such as computed tomography, magnetic resonance (MR) imaging (MRI), MR venogram, and lumbar puncture were reviewed from the records. Hematological workup such as lipid profile, hemogram, biochemistry and serology were reviewed.

All the cases with ocular manifestations were treated with tablet homocyst (vitamin B6 20 mg, B12 500 μg, folic acid 5 mg and glycine 500 mg) along specific treatments like oral acetazolamide 1-g/day in cases of papilledema, injection heparin 5000 IU intravenous 6$^{th}$ h for 1-week

with oral acenocoumarol 2-3 mg OD starting on day 6 in cases of cerebral venous thrombosis, intravitreal bevacizumab 1.25 mg/0.05 ml for branch retinal vein and vein occlusions, oral steroids 1-mg/kg/body weight for 2 weeks then tapered along with oral pentoxyphyllin 400 mg once a day for NA anterior ION (NA-AION), oral anticoagulants aspirin 150 mg with clopidogrel 75 mg OD along with atorvastatin 20 mg OD for patients with ischemia or infarcts. All the patients were followed up for a period of 6 months - 2 years. Serum homocystein levels were measured again after 6 months.

## RESULTS

Totally 59 patients with hHcy underwent ophthalmological evaluation. Out of this 40 (67.8%) were male patients and 19 (32%) were females. The mean age group of presentation was 34.8 years (ranging from 19 years to 60 years). 54.3% of the patients had additional co morbid conditions diabetes and hypertension. 45.7% (27 patients) presented with headache and giddiness, 37.3% (22 patients) presented with various visual disturbances like detective vision, field loss and 17% (10 patients) had no-ocular symptoms. 42.3% (25 patients) showed ocular findings such as BRVO, papilledema, visual field defects, NA-ION and optic disc pallor and 57.6% (34 patients) had no ocular findings.

Out of the 25 patients with ocular morbidities with hHcy 32% (8 cases) of patients had intermediate hHcy, 60% (15 cases) had moderate hHcy and 2 patients (8%) had severe hHcy (Table 1a and b). Table 2 shows the various ocular manifestations of hHcy with respect to their serum levels.

All patients were treated with folic acid 5 mg in combination with 20 mg pyridoxine, mecobalamin 500 mcg and 500 mg glycine (tab homocyst). Along with this patient were given specific treatment for their ocular manifestations. Patients were followed up for a minimum period of 6 months to 2 years and their response to treatment was observed. The response of the various manifestations to treatment is listed in Table 3.

**Table 1a: Severity of hHcy**

| hHcy | Number of cases | Percentage | Levels (μmol/L) |
|---|---|---|---|
| Moderate | 26 | 44.1 | 19-28 |
| Intermediate | 29 | 49.1 | 35.5-58 |
| Severe | 4 | 6.8 | 100-115 |
| Total | 59 | 100 | |

hHcy: Hyperhomocysteinemia

**Table 1b: Severity of hHcy in patients with ocular morbidities**

| hHcy | Number of cases | Percentage |
|---|---|---|
| Moderate | 15 | 60 |
| Intermediate | 8 | 32 |
| Severe | 2 | 8 |

hHcy: Hyperhomocystinemia

Serum homocysteine levels, of 23 patients with ocular manifestations due to hHcy on treatment, were repeated after 6 months. There was a decrease in fasting serum homocysteine levels by 10 ± 4 μmol/L (range 6-15 μmol/L). One patient was lost during follow-up and one patient died due to neurological complications. Table 4 compares the levels of homocysteine before and after treatment after a period of 6 months.

## DISCUSSION

hHcy is reported as an independent risk factor for systemic and ocular vasoocclusive disorders, including NA-ION, central retinal artery occlusion, and central retinal vein occlusion, especially in young patients.[14,15]

High levels of plasma homocystine are toxic to the vascular endothelium, presumably by directly injuring the vessel's endothelium by the release of free radicals, creating an environment of hypercoagulability, and by modifying the vessel wall.[16] There are other conditions that may increase plasma homocystine levels: Age, gender, renal failure, medications, and decrease in uptake of vitamins B6, B12, and folic acid. A unique aspect of hypercoagulability associated with hHcy is that homocysteine levels can be decreased simply by administrating vitamin B12 (100 mcg/day), vitamin B6 (3 mg/day) and folate (400 mcg/day).[17,18] These three vitamins are important cofactors in the processing and conversion of homocysteine to either methionine or cysteine. Recent studies have demonstrated that oral folic acid in a daily dose of 1-10 mg consistently reduces Hcy levels by 10-20%.[19-21] It is assumed that by reducing the toxic effect of homocysteine on the blood vessels, the probability of decreasing the disease course and resolution of the manifestations can occur and can prevent further vascular occlusions, therefore the resulting morbidity, will be reduced.

However, in a few studies low levels of serum folate, but not vitamin B12, have been associated with retinal vascular occlusive disease due to hHcy.[22-25] vitamin B6 is primarily a cofactor in the transsulfuration pathway of homocysteine metabolism, and its effect on lowering plasma tHcy levels may only be apparent after methionine loading. Nevertheless, all three of these supplements are inexpensive, available over the counter, and combined

**Table 2: Ocular presentations of hHcy with their levels**

| Manifestation | Numbers | % | Moderate | Intermediate | Severe |
|---|---|---|---|---|---|
| Papilledema (CVT, BIH) | 6 | 12.2 | 4 | 2 | 0 |
| Branch retinal vein occlusion | 10 | 20.4 | 6 | 3 | 1 |
| NA-AION | 2 | 4.1 | 2 | 0 | 0 |
| Temporal optic disc pallor (MCA or PCA occlusion) | 4 | 8.2 | 3 | 0 | 1 |
| Normal fundus with field defects (infarcts in temporal/parietal/occipital lobe) | 3 | 6.1 | 0 | 3 | 0 |
| Normal no ocular manifestations | 34 | 57.6 | 11 | 21 | 2 |

NA-AION: Non-arteritic anterior ischemic optic neuropathy, CVT: Cerebral venous thrombosis, BHI: Breath-holding index, hHcy: Hyperhomocystinemia

**Table 3: Manifestations of hHcy with the treatment given and its response**

| Manifestations | Treatment given | Response to treatment after 6 months |
|---|---|---|
| Papilledema (CVT, BIH) | Tab homocyst along with tab acetazolamide 1-g/day till symptomatically better. For patients with CVT injection heparin 5000 IU IV 6$^{th}$ h for 1-week with oral acenocoumarol 2-3 mg once daily starting on day 6 till life long | Patients with CVT had a good response to treatment with complete resolution of papilledema after 6 months. However, patients with BIH had resolutions of symptoms but not complete resolution of papilledema in 50% |
| Branch retinal vein occlusion | Tab homocyst along with intravitreal bevacizumab 1.25 mg/0.05 ml | Fundus examination revealed good response to treatment with no reoccurrences |
| NA-AION | Tab homocyst along with oral steroids 1 mg/kg/ body weight for 2 weeks then tapered along with oral pentoxifylline 400 mg once a day | There was improvement in the visual acuity by 1 line in one case, but defect persisted. No reoccurrences |
| Temporal optic disc pallor (MCA or PCA occlusion) | Tab homocyst along with oral anticoagulants aspirin 150 mg with clopidogrel 75 mg OD along with atorvastatin 20 mg OD lifelong | One patient despite all treatment died during the study period due to repeat CVA |
| Normal fundus with field defects (infarcts in temporal/ parietal/occipital lobe) | Tab homocyst along with oral anticoagulants aspirin 150 mg with clopidogrel 75 mg along OD with atorvastatin 20 mg OD lifelong | Field defects persisted one patient despite oral anticoagulant had another episode of stroke |

CVT: Cerebral venous thrombosis, CVA: Cerebrovascular accident, NA-AION: Non-arteritic anterior ischemic optic neuropathy, BHI: Breath-holding index, hHcy: Hyperhomocystinemia, IV: Intravenous

**Table 4: Comparison of the serum homocystine levels before and after treatment**

| hHcy levels | Number of patients before treatment | Number of patients after treatment |
|---|---|---|
| Moderate | 14 (19-28 μmol/L) | 18 (13-29 μmol/L) |
| Intermediate | 8 (35.5-58 μmol/L) | 5 (30-86 μmol/L) |
| Severe | 1 (102 μmol/L) | 0 |
| Total patients | 23 | 23 |

hHcy: Hyperhomocystinemia

folate and B12 supplementation would avoid the theoretical risk of neuropathy secondary to unopposed folate therapy in B12-deficient patients.[26]

This study shows that there was a decrease of $10 \pm 4$ μmol/l in serum homocysteine levels following supplementation of vitamins. As our patients were started and maintained with full dose of vitamin supplementation clinical presentations such as venous and cerebral sinus thrombosis and papilledema resolved over a period of 6-8 months and did not show new presentations of Hhcy in eye in 2 years follow-up.

In our study, we came across 6 patients with papilledema and hHcy, 4 of which had a normal MRI and the other 2 had venous sinus thrombosis diagnosed on MR venogram (4 moderate and 2 intermediate). A study done by Martinelli *et al.*[27] shows that hHcy increases the risk of cerebral vein thrombosis by approximately 4-fold. The other possible mechanism which can cause papilledema in a case of hHcy can be due to increase viscosity of blood in the veins leading to venous stasis and papilledema. In the present study, 7 patients with neuro ophthalmology manifestations such as disc pallor and field defects showed previous or present cerebral vascular catastrophes' involving optic tract and radiations. Out of this one patient developed progressive vascular thrombosis and succumbed in spite of all medical treatments. Another patient developed cerebro vascular accident in the course of treatment and recovered.

## CONCLUSION

hHcy can be the cause for venous occlusive disorder and venous stasis causing various ocular manifestation. In all cases of veno occlusive disorders and atherosclerosis evaluation of homocysteine levels plays an important role. If high homocysteine levels are detected treating them with vitamin B12 and folic acid can reduce the pathological role of homocysteine, thereby reducing the vascular catastrophes of ocular and other systems. It also reduces

the severity and frequency of future complications of hHcy. In all cases of hHcy should be supplemented with lifetime vitamin B12 and folic acid as in our study showed the fall of homocysteine levels following treatment. All detected cases of hHcy should undergo ophthalmic evaluation for early detection of the various manifestations and their prevention.

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Original Article

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# Nutritional Status and the Factors Associated with it among Children Aged 1-5 Years in a Rural Area of Jammu

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## Abstract

**Purpose:** Malnutrition has long been a major public health concern globally leading to high morbidity and mortality in under-five children. Prevalence of underweight children in India is highest in the world; nearly double that of Sub-Saharan Africa. Therefore, this study was done with the objectives of: (i) To study burden of under-nutrition among children 1-5 years of age, and (ii) to study its association with selected socio-demographic factors and feeding practices.

**Methods:** A total of 750 children aged 1-5 years were studied with 50 subjects each from 15 villages using multi-stage random sampling technique. Caregivers (mostly mothers) of the eligible participants were interviewed to determine association of under-nutrition (as determined by mid-upper arm circumference) with variables like age, gender, socio-economic status of the family, breast-feeding and complementary feeding practices, number of doses of vitamin A prophylaxis received, along with the episodes of common morbidities in the children.

**Results:** More than one-fourth of the study children were suffering from of under-nutrition with the majority in 1-3 years. Exclusive breastfeeding for 6 months and age at which the child started complementary feeding were found to have significant association with the nutritional status of children. Significant association was also observed between under-nutrition and morbidities such as diarrhea, acute respiratory infections (ARIs) and measles.

**Conclusion:** Under-nutrition continues to be a significant public health problem in under-fives. Multi-pronged approaches aimed at improving maternal and child health care, including nutrition education, growth monitoring, exclusive breastfeeding, complementary feeding, standard case management of diarrhea and ARI would be beneficial to combat the problem of malnutrition.

**Key words:** Acute respiratory infections, Children, Diarrheal diseases, Mal-nutrition, Measles, Risk-factors, Under-five, Under-nutrition

## INTRODUCTION

Malnutrition has long been a major public health concern globally leading to high morbidity and mortality among under-five children. It is associated with one-third of all deaths in the age - group of 1-5 years. Each year nearly 2.3 million deaths among 6-60 months aged children in developing countries are associated with malnutrition.[1] 99 million children, that is, 15% of total under-five children in the world, are under-weight and 25% are stunted. Prevalence of under - weight children in India is highest in the world; nearly double that of Sub-Saharan Africa.[2] According to National Family Health Survey-3 reports, 40% children under 3 years of age are under-weight and 45% are stunted in India.[3]

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Malnutrition in children is multidimensional; governed by biological, behavioral and environmental factors.[4] It places a huge burden by not only increasing mortality, but also imposes significant national health and development costs

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due to associated morbidities, including reduced cognitive ability.[5] It reduces children's resistance to infection and increases the burden of disease in the communities.[5]

In view of above, need was felt to conduct a study with the specific objectives of: (i) To study the burden of under-nutrition among children 1-5 years of age, and (ii) to study its association with selected socio-demographic and feeding practices. Findings from this study would not only help in estimating the current burden but also help in framing new strategies and recommendations for prevention and control of under-nutrition.

## METHODS

The present cross-sectional study was carried out in block R.S. Pura, a rural field practice area of Postgraduate Department of Community Medicine, Government Medical College (GMC), Jammu, located at a distance of 23 km from GMC Jammu. The population of the block was 1,80,560 as per Census 2001, spread over 198 villages.[6] The block is divided into 8 zones for the purpose of administration. The study was conducted between January and December 2011. Ethical Clearance for the study was obtaining from the Institutional Ethics Committee of GMC and Hospital, Jammu.

Multistage random sampling technique was used, wherein zones formed the 1st Stage units, villages 2nd stage units and eligible children formed the 3rd Stage units. Two villages from each of the first 7 zones were picked up randomly while only one village was picked up from the last remaining eighth zone thus providing all the 15 clusters needed for the study. A total of 750 subjects were studied with 50 subjects drawn from each of the 15 clusters. In case a sample of 50 households with children 1-5 years was not available in that village, remaining children were taken from next geographically closest village.

The study was conducted to assess the nutritional status of children 1-5 years of age and to identify the factors associated with it in the study population. Among the various methods available for assessment of nutrition status, most of them fraught with technical and logistic difficulties.[1] This study employs a simple and easy to use anthropometric method, mid-upper arm circumference, to estimate overall nutritional status of children aged 1-5 years.[7]

Mothers of eligible participants (or another responsible care-giver) were interviewed at their place of residence after taking prior consent from them in the language that was easier for them to comprehend (Dogri). Information was collected regarding age and gender of the child, socio-economic status (SES) of the family (determined using modified Uday Pareek Scale),[8] breast-feeding and complementary feeding (weaning) practices adopted for the child, number of doses of vitamin A prophylaxis received in the last 6 months along with history of common morbidities.

Histories of diarrhea, acute respiratory infection (ARI) were ascertained within 14 days prior to the day of interview whereas history or evidence of measles was recorded within 1-month prior to the date of interview. In this study, diarrhea was defined as passage of loose, liquid or watery stools passed more than 3 times a day. ARI was identified with history of running nose, cough, fever, sore throat, difficult breathing or ear problem depicting both upper and lower respiratory tract infection. The operational definition used for diagnosing measles was if a child had a history of fever, catarrhal symptoms of upper respiratory tract (coryza, cough) and a macular or maculo - papular rash.[9]

The questionnaire used in the present study was pre-tested and then modified based on difficulties in understanding or interpretation that were encountered. The questionnaire, which was written in English, was translated to local language (Dogri) and again translated back to English to ensure its accuracy.

The data were analyzed using SPSS software for windows (version. 11.5). Chi-square test was used to determine the statistical significance of the difference in prevalence of under-nutrition with various risk factors. A probability of $<0.05$ was considered statistically significant.

## RESULTS

Table 1 depicts the socio - demographic characteristics of study population of the total 750 children studied in 15 villages of block R.S. Pura, Jammu, most subjects (65.5%) were in the age group of 1-3 years. About 58.4% of the study population comprised of boys and 41.6% were girls. The mean age of study subjects was $33.45 \pm 12.7$ months. The majority (84.5%) of subjects belonged to middle SES (upper middle 24.3%, middle 44.1% and lower middle 16.1%) families as per modified Uday Pareek Scale.

The association of nutritional status of the study subjects with the socio - demographic characteristics has been shown in Table 1. The majority (71.3%) of the study subjects with under - nutrition were in the younger age group (41.3% in 1-2 years; 30% in 2-3 years). The nutritional status was found to be significantly associated

with age of the child ($P = 0.029$) and the prevalence of under-nutrition was found to decrease with advancing age. However, no significant association with the gender of the child was found ($P = 0.168$). SES also showed no significant association with the nutritional status of the study subjects ($P = 0.199$).

Table 2 shows the association of various factors with the prevalence of under-nutrition in study population. Exclusive breastfeeding for 6 months was found to be significantly associated with their nutritional status ($P = 0.048$). The duration of breastfeeding was found to have no significant association with prevalence of under-nutrition. The age at which weaning was initiated found to have a significant association ($P = 0.006$) with the nutritional status of children. Intake of supplementary doses of vitamin A had no significant association ($P = 0.352$) with the nutritional status of the study subjects.

Prevalence of various morbidities and their association with the nutritional status of study children is depicted in Table 3. 39.1% of study subjects had an episode of ARI in the last 15 days while 44.6% of the children with under-nutrition had a history of ARI in the past. Significant association was seen between the nutritional status and ARI in the children ($P = 0.05$). Statistically significant association between diarrhea and under-nutrition was found ($P = 0.01$). Although the prevalence of measles in children studied was low (1.2%), it had a significant association with under-nutrition ($P = 0.01$).

Figure 1 shows the overall nutritional status of the children in the 15 study villages. The prevalence of under-nutrition in the study villages of R.S. Pura block ranges from 68% in Tanda and Mahlowal to 8% in Simbal. Disaggregated analysis revealed 28.4% of them suffering from under- nutrition; with 19% having mild-moderate under-nutrition, and 9% had severe under-nutrition. Higher proportions of girls (31.1%) as compared to boys (26.5%) were suffering from various grades of under-nutrition.

**Table 1: Socio-demographic characteristics of the study population**

| Characteristics | Nutritional status of study subjects (*n* [%]) | | | *P* value |
|---|---|---|---|---|
| | Normal *n*=537 | Under-nutrition *n*=213 | Total *n*=750 | |
| Age (in months) | | | | |
| 12-24 | 163 (30.4) | 88 (41.3) | 251 (33.5) | 0.029 |
| 25-36 | 177 (33.0) | 64 (30.0) | 241 (32.1) | |
| 37-48 | 137 (25.5) | 40 (18.8) | 177 (23.6) | |
| 49-60 | 60 (11.2) | 21 (9.9) | 81 (10.8) | |
| Gender | | | | |
| Boys | 322 (59.9) | 116 (54.5) | 438 (58.4) | 0.168 |
| Girls | 215 (40.1) | 97 (45.5) | 312 (41.6) | |
| SES | | | | |
| Upper | 55 (10.2) | 19 (8.9) | 74 (9.9) | 0.199 |
| Upper middle | 142 (26.4) | 40 (18.8) | 182 (24.3) | |
| Middle | 226 (42.1) | 105 (49.3) | 331 (44.1) | |
| Lower middle | 85 (15.8) | 36 (16.9) | 121 (16.1) | |
| Lower and BPL | 29 (5.4) | 13 (6.1) | 42 (5.6) | |

BPL: Below poverty line, SES: Socio-economic status

## DISCUSSION

Analysis of the study sample results does not reveal gross discrepancy with respect to socio-demographic profile

**Table 2: Factors associated with nutritional status of children in the study area**

| Characteristics | Nutritional status of study subjects (*n* [%]) | | | *P* value |
|---|---|---|---|---|
| | Normal *n*=537 | Under-nutrition *n*=213 | Total *n*=750 | |
| Exclusive breast feeding | | | | |
| Present | 237 (44.1) | 111 (52.1) | 348 (46.4) | 0.048 |
| Absent | 300 (55.9) | 102 (47.9) | 402 (53.6) | |
| Duration of breast feeding (months) | | | | |
| None | 42 (7.8) | 17 (8.0) | 59 (7.9) | 0.091 |
| 1-6 | 130 (24.2) | 41 (19.2) | 171 (22.8) | |
| 7-12 | 100 (18.6) | 40 (18.8) | 140 (18.7) | |
| 13-24 | 173 (32.2) | 89 (41.8) | 262 (34.9) | |
| >24 | 92 (17.1) | 26 (12.2) | 118 (15.7) | |
| Age at weaning (months) | | | | |
| <4 | 14 (2.6) | 5 (2.3) | 19 (2.5) | 0.006 |
| 4-6 | 52 (9.7) | 20 (9.4) | 72 (9.6) | |
| 6-8 | 374 (69.9) | 126 (59.2) | 500 (66.7) | |
| 8-10 | 35 (6.5) | 13 (6.1) | 48 (6.4) | |
| 10-12 | 4 (0.7) | 2 (0.9) | 6 (0.8) | |
| >12 | 58 (10.8) | 47 (22.1) | 105 (14.0) | |
| Vitamin A supplementation* | | | | |
| Received | 65 (14.1) | 31 (17.0) | 96 (14.9) | 0.352 |
| Not received | 395 (85.9) | 151 (82.9) | 546 (85.1) | |

*Percentage calculated out of 642 children. For rest of the 108 children, documented evidence of having received vitamin A was not available

**Table 3: Prevalence of common morbidities and their association with nutritional status of study subjects**

| Characteristics | Nutritional status of study subjects (*n* [%]) | | | *P* value |
|---|---|---|---|---|
| | Normal *n*=537 | Under-nutrition *n*=213 | Total *n*=750 | |
| ARI | | | | |
| Present | 198 (36.9) | 95 (44.6) | 293 (39.1) | 0.05 |
| Absent | 339 (63.1) | 118 (55.4) | 457 (60.9) | |
| Diarrhoeal disease | | | | |
| Present | 101 (18.8) | 58 (27.2) | 159 (21.2) | 0.01 |
| Absent | 436 (81.2) | 155 (72.8) | 591 (78.8) | |
| Measles | | | | |
| Present | 3 (0.6) | 6 (2.8) | 9 (1.2) | 0.01 |
| Absent | 534 (99.4) | 207 (97.2) | 741 (98.8) | |

ARI: Acute respiratory infection

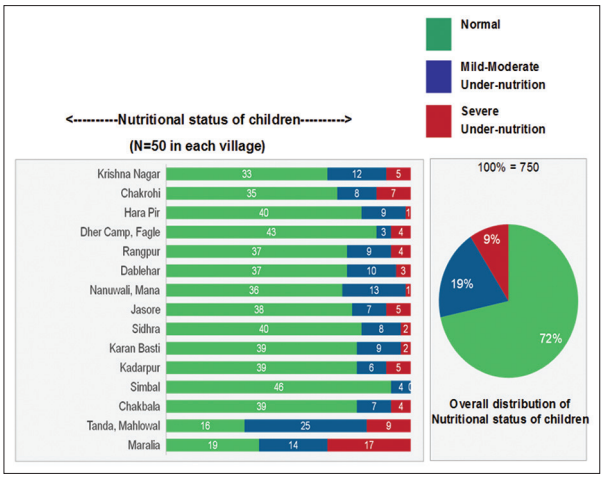


**Figure 1: Nutritional status of children in 15 cluster villages of study area**

with the census data. As a corollary, this seems to ensure representativeness of the study results. In the present study, it was observed that younger children had a higher prevalence of poor nutritional status. The results obtained in our study are consistent to those reported by Thakur *et al.* who observed that the prevalence of under-nutrition decreased significantly with increasing age.[10] Avachat *et al.* also observed that the majority of children in ages of 1-3 years were significantly suffering from under-nutrition as compared to older children.[11] Studies conducted by other authors including, Bisai *et al.* and Ray *et al.* also suggested similar findings.[1,12]

No gender differentials in the prevalence of under-nutrition were observed in our study. Our findings are in conformity to those made by National Family Health Survey-3 which states that the prevalence of under-nutrition was almost same in boys and girls.[3] Narkhede *et al.* also observed that under-nutrition was uniformly distributed in both the genders.[13] Bhavsar *et al.* conducted a study in urban slums of Mumbai also found that gender was not associated with the prevalence of under-nutrition in children.[14] Studies conducted by other authors, including Bisai *et al.* and Wong *et al.* also suggests similar findings.[1,4]

SES was found to have no significant association with the increased risk of under-nutrition in the study children. Narkhede *et al.* and Anuradha *et al.* also in their studies observed no significant association between under-nutrition and SES.[13,15]

This study also revealed that children who were given exclusive breastfeeding for 6 months had a lower prevalence of under-nutrition in them. The findings of the present study are similar to those reported by Bhavsar *et al.* (Mumbai) and Rasania and Sachdev who found that exclusive breastfeeding had a significant association with prevalence of under-nutrition in children.[14,16] It was also observed by Anuradha *et al.* that the breastfeeding practices had a significant impact on the prevalence of under-nutrition ($P = 0.02$).[15] Fuchs *et al.* conducted a study in Bangladesh and observed that lack of breastfeeding was significantly associated with under-nutrition in children ($P = 0.01$).[17]

In this study, 66.7% of children started complementary feeding (weaning) around 6 months of age as recommended by World Health Organization. It was further observed that age at which the children started weaning was significantly associated with the prevalence of under-nutrition in them. Our findings are in conformity with those of Rasania and Sachdev who observed a significant association between malnutrition in children when weaning was delayed ($P < 0.05$).[16]

Analysis of common morbidities of the study population revealed that children with diarrhea, ARI and measles were at a significant risk of under-nutrition. The findings are in accordance with that of National Nutrition Monitoring Bureau which stated that presence of common morbidities in children like diarrhea and ARI was associated with the prevalence of under-nutrition in them.[18] Bhavsar *et al.* also observed that morbidities like diarrhea and ARI were significantly associated with prevalence of under-nutrition in children.[14] A study conducted by Rice *et al.* concluded that there is a strong and consistent relationship between malnutrition and increased risk of death due to diarrhoea.[19] Gupta conducted a study in Punjab and had found that 46% of under-five children with diarrhea suffered from malnutrition ($P < 0.001$).[20] Bisai *et al.* reported that children with prevalent morbidities like diarrhea, ARI or measles were more likely to be under-nourished (odds ratio - 3.7, 95% confidence interval - 1.57-8.74).[1] Wong *et al.* and Ray *et al.* also observed a significant association between malnutrition and recurrent history of childhood morbidities like diarrhea, ARI, etc.[4,12]

The overall prevalence of under-nutrition in the study population was observed to be high affecting about one-fourth of them. The findings of our study are very close to those reported by National Family Health Survey-3, which states that wasting is present in 20% of under-five children in India and 43% of them are under-weight.[3] The prevalence of under-nutrition has been reported to range from 50.46% in Maharashtra (Avachat *et al.*), 52.3% in Nagpur (Narkhede *et al.*) and 56.3% in Miraj (Thakur *et al.*).[10,11,13] Sahu *et al.* observed that the prevalence of under-nutrition among under-five children in India was high and varies from 10.6% to 42.3% depending on the assessment methodology adopted.[21]

## CONCLUSIONS

The prevalence of under-nutrition was high in the study population thus highlighting yet again that under-nutrition continues to be a public health burden. Multi-pronged approaches like maternal and child health care, nutrition education, growth monitoring will be beneficial to combat this problem. The practice of exclusive breast feeding, the introduction of timely complementary feeding, standard case management of diarrhea and ARI are required to reduce malnutrition of under-five children.

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Original Article

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# Visual Outcome and Complications of YAG Laser Therapy for Posterior Capsular Opacification Following Cataract Surgery

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## Abstract

**Introduction:** Cataract is one of the most leading cause of curable blindness all over the world. In the developing world, most popular method of cataract operation is extracapsular cataract extraction with posterior chamber intraocular lens (IOL) (PCIOL). Posterior capsule opacification (PCO) is caused by a proliferation of lens epithelial cells which causes fibrotic changes and wrinkling of the posterior capsule. PCO is one of the common complications of extracapsular cataract extraction surgery and develops usually within 2 years after cataract extraction in the majority of the cases. Neodymium yttrium aluminium garnet (Nd: YAG) laser posterior capsulotomy is a good technique for making an opening in the opacified posterior capsule.

**Materials and Methods:** Retrospective analysis of all patients who underwent cataract surgery and presented with visually significant PCO were included in the study.

**Results:** 50 eyes of 50 patients that had undergone extracapsular cataract extraction underwent Nd: YAG laser posterior capsulotomy, out of which majority was Elschnig pearl type of PCO. Complications like inadvertent corneal burn, IOL pitting, cystoids macular edema, intraocular pressure spikes and floaters were seen.

**Conclusion:** Nd: YAG laser capsulotomy is a safe and effective method to treat PCO.

**Key words:** Cataract surgery, Neodymium-doped yttrium aluminium garnet laser, Capsular opacification

## INTRODUCTION

A cataract is one of the most leading cause of curable blindness all over world. In the developing world, most popular method of cataract surgery is extracapsular cataract extraction with posterior chamber intraocular lens (IOL) (PCIOL). An estimated 18-50% late capsular opacification has been reported after extracapsular cataract extraction. Sir Harold Ridley documented this complication in his first case. Posterior capsule opacification (PCO) is a common long-term complication of cataract surgery that causes decreased vision, glare and other symptoms similar to that of the original cataract.[1] PCO is caused by a proliferation of lens epithelial cells which causes fibrotic changes and wrinkling of the posterior capsule.[2,3] PCO is one of the common complications of extracapsular cataract extraction surgery and develops within 2 years after cataract extraction in 50% of the cases.[4-7] It causes a reduction in visual acuity (VA) and contrast sensitivity by obscuring the view or by scattering the light that is perceived by patients as glare.[4,5,8] It also decreases the field of view during therapeutic and diagnostic procedures and also causes uniocular diplopia.[9] In younger age group, it develops earlier but in elderly, its incidence declines.[10]

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The development of the neodymium yttrium aluminium garnet (Nd: YAG) laser as an ophthalmic instrument and its application in discussion of the posterior capsule coincided with the conversion from intracapsular to extra capsular surgical techniques in cataract surgery. Before the introduction of the Nd: YAG laser, only surgical cutting or polishing of the posterior capsule could

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manage opacification of the posterior capsule following extracapsular cataract extraction. Nd: YAG laser posterior capsulotomy introduced a technique for closed-eye, effective, and relatively safe opening of the opacified posterior capsule, and laser capsulotomy rapidly became the standard of care.

It should be noted that capsular opening created with Nd: YAG laser tends to increase in size with smoothing of edges from capsular tag retraction and may become circular.[10,11]

Complications of Nd: YAG laser posterior capsulotomy causing decreased vision are uncommon but include elevated extraocular pressure, cystoids macular edema (CME), retinal detachment, IOL damage, endophthalmitis, iritis, vitritis, macular holes, and corneal edema.

This prompted us to conduct this study so as to observe, document and analyse such events.

## MATERIAL AND METHODS

### Type of Study

Retrospective analysis of the patients with PCO who underwent Nd:YAG capsulotomy during the study period.

### Source of Data

All patients who had visually significant PCO and underwent Nd:YAG laser capsulotomy following cataract surgery during the study period in the Department of Ophthalmology, K. R. Hospital, Mysore.

### Sampling Method

Convenient sampling.

### Inclusion Criteria

All patients who were previously operated for cataract by small incision cataract surgery (SICS)/phacoemulsification with visually significant PCO like Elschnig pearls and fibrous PCO and presented to Department of Ophthalmology, K. R. Hospital, Mysore from October 2012 to 2014 were included in the study.

### Exclusion Criteria

Patients with thick PCO who needed surgical intervention were excluded from the study. Patients with ocular co-morbidities like corneal opacities, retinal or optic nerve pathologies, and high myopia were also excluded from the study.

### Methodology

The extent of PCO needing laser capsulotomy was determined clinically and by its functional impairment and symptoms of patients. After a thorough history, all patients were evaluated clinically. After recording VA (Snellen's), slit lamp examination, fundoscopy, and applantaion tonometry (Goldman's) were carried out. The type and extent of PCO were carefully noted after pupil dilation. NIDEK YC-1600 Ophthalmic Nd:YAG laser was used for capsulotomy. The Helium-Neon laser beam was used for accurate aiming and focusing of the invisible therapeutic beam. The parameters of laser system were adjusted accordingly to the needs of patients depending upon the type and extent of PCO. As capsulotomy was done for the optical purpose, its size was restricted to 2-3 mm in diameter. Post laser evaluation was carried out including slit lamp examination and intraocular pressure (IOP) examination. Topical fluorometholone (FML eye drops) was advised four times daily. If IOP was found raised, then topical brimonidine was advised. After control of IOP and inflammation, post laser best corrected VA (BCVA) was recorded after 1-week.

## RESULTS

We used the Nd:YAG laser to perform posterior capsulotomies on 50 eyes of 50 patients that had undergone extracapsular cataract extraction.

31 (62%) of our cases were male and 19 (38%) were female. The average age of these patients was 52 years, the range being from 18 years to 83 years (Figure 1).

The posterior capsulotomy was performed on an average of 23 months after cataract extraction (Figure 2).

Out of 50 patients, 94% was Elschnig pearl and 6 % was fibrous PCO (Table 1).

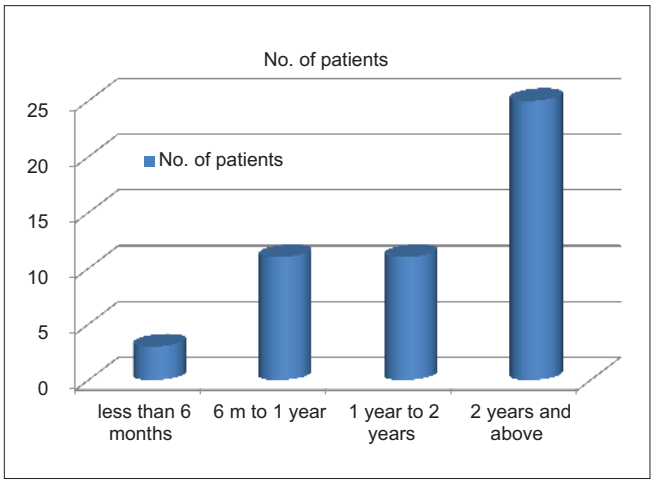


**Figure 1: Time period between cataract extraction and neodymium yttrium aluminium garnet laser capsulotomy (*n* = 50)**

Maximum PCO frequency was seen in patients who had undergone MSICS previously (Table 2).

It affected PCO frequency with rigid/PMMA as 96% cause of PCO postoperatively (Figures 3 and 4).

Post laser BCVA improved to 6/12 to 6/24 in the maximum number of patients followed by 6/6-6/12 (Table 3).

It showed the maximum number of patients had IOP spikes followed by IOL pitting. Inadvertent corneal burns, floaters, and CME were seen in few (Table 4).

Maximum IOP spikes were in the range of 21-27 mm Hg.

## DISCUSSION

The incidence of PCO varies with different studies. Sinskey and Cain reported that 43% of their patients required discussion, with an average follow-up of 26 months and a range from 3 months to 4 years. Emery, Wilhelmus, and Rosenberg found opacification in 28% of their patients with 2-3 years of follow-up. Late opacification of the posterior capsule after 3-5 years has been reported to be approximately 50%. In our study, we found average time period between cataract extraction and Nd:YAG laser capsulotomy as 23 months.

Phacoemulsification is associated with lower rates of PCO than extracapsular cataract extraction which is similar to the finding in our study.

Elevated IOP is recognized as the most common, although usually transient, complication following Nd: YAG laser capsulotomy. This is similar to our study where we found increased IOP in 30% patients, but the rise was mostly in the range of 21-27 mm Hg.

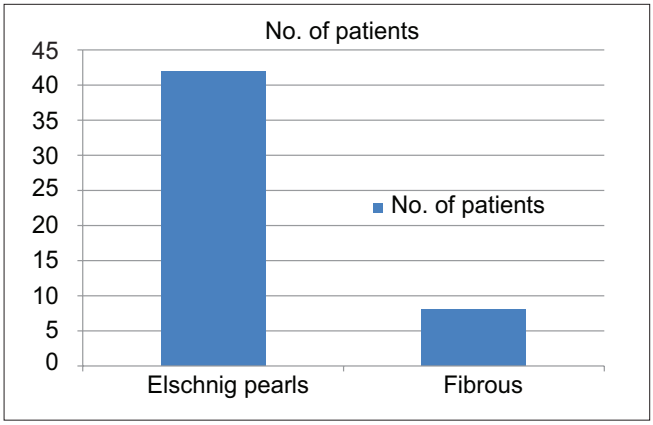


**Figure 2: Types of posterior capsule opacification**

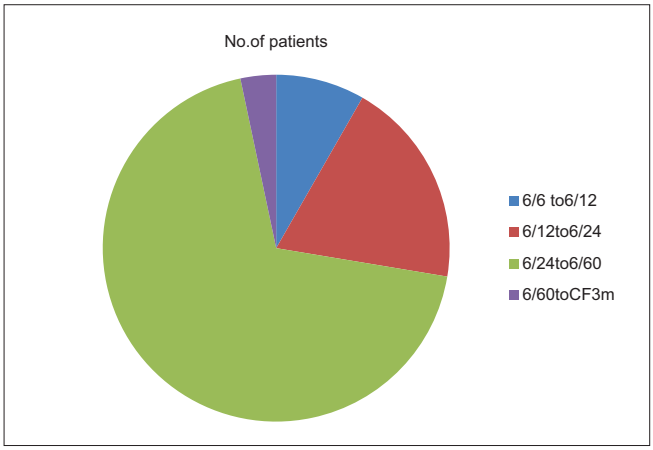


**Figure 3: Pre laser best corrected visual acuity and number of patients showed maximum number of patients having vision of 6/24 to 6/60 followed by 6/12 to 6/24**

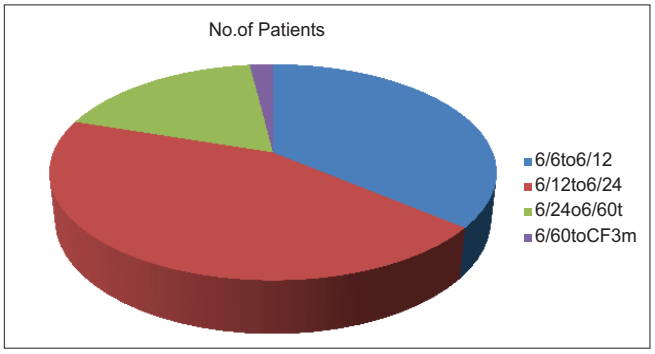


**Figure 4: Post laser best corrected visual acuity and number of patients**

**Table 1: Type of cataract surgery and PCO frequency**

| | |
|---|---|
| MSICS | 47 |
| Phacoemulsification | 3 |

PCO: Posterior capsule opacification, MSICS: Manual small incision cataract surgery

**Table 2: Type of IOL implantation during cataract surgery**

| | |
|---|---|
| Rigid/PMMA IOL in the bag | 48 |
| Foldable IOL in the bag | 2 |

IOL: Intraocular lens, PMMA: Polymethyl methacrylate

**Table 3: Complications and number of patients**

| | |
|---|---|
| Inadvertent corneal burn | 3 |
| IOL pitting | 10 |
| Floaters | 3 |
| CME | 1 |
| Post laser IOP spikes | 15 |

IOP: Intraocular pressure, IOL: Intraocular lens, CME: Cystoids macular edema

**Table 4: Post laser IOP spikes and pressure range**

| | |
|---|---|
| 21-27 mm Hg | 11 |
| 27-35 mm Hg | 4 |

IOP: Intraocular pressure

The IOP typically begins to rise immediately after the laser capsulotomy, peaks at 3-4 h, decreases but may remain elevated at 24 h, and usually returns to baseline at 1-week.[12] Rarely, the IOP may remain persistently elevated, causing visual field loss or requiring glaucoma surgery or both.

CME has been reported to develop in 0.55-2.5% of eyes following Nd: YAG laser posterior capsulotomy.[13] CME may occur between 3 weeks and 11 months after the capsulotomy. In our study, CME was seen in 2% of patients.

Pitting of IOLs occurs in 15-33% of eyes during Nd: YAG laser posterior capsulotomy.[13] We found pitting of IOL in 20% of our patients. The pitting usually was not visually significant.

Retinal detachment may complicate Nd: YAG laser posterior capsulotomy in 0.08-3.6% of eyes. However, in our study we had not found any patient with RD.

## CONCLUSION

Nd: YAG laser capsulotomy is a closed-eye, safe and effective method to treat PCO. It is non-invasive and avoids all the complications associated with surgical capsulotomy and local anaesthesia. However, Nd: YAG laser capsulotomy also carries risks like IOL pitting, CME, IOP spikes, inadvertent corneal burns and retinal detachment. Thus by minimising energy and number of precisely focused shots with proper follow-up, Nd: YAG capsulotomy becomes the management of choice for PCO.

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Original Article

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# Pregnancy Outcome in Amniotic Fluid Index Less than 5 in Term Low-Risk Pregnancy

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## Abstract

**Background:** To know the adverse pregnancy outcome in term low-risk pregnancy with oligohydramnios (amniotic fluid index [AFI] <5).

**Materials and Methods:** A case-control study on pregnancy outcome in 50 women with the ultrasound diagnosis of oligohydramnios after 37 completed weeks of gestation compared with 50 controls with no oligohydramnios matched with age and parity.

**Results:** Increased chances of fetal heart rate decelerations, thick meconium, low Apgar score at 5 min, birth weight <2.5 kg, admission to neonatal intensive care unit seen in study group but not statistically significant. However increased the incidence of labor induction and increase in the cesarean section for fetal distress seen in the study group and was statistically significant ($P$ = 0.01).

**Conclusion:** Determination of AFI is valuable for predicting fetal distress in labor requiring cesarean section used as an adjunct to other fetal surveillance methods. An AFI of <5 detected after 37 weeks of gestation is an indicator for poor pregnancy outcome.

**Key words:** Amniotic fluid index, Apgar score, Oligohydramnios

## INTRODUCTION

Amniotic fluid plays a major role in the fetal growth and development. It provides the fetus with a protective low resistance environment suitable for growth and development. It provides a cushion against the constricting confines of the gravid uterus, allowing the fetus room for the movement and growth and protecting it from external trauma. It helps to maintain the fetal body temperature and plays a part in the homeostasis of fluid and by permitting extension of the limbs it prevents joint contractures. It prevents compression of the umbilical cord and thus protects the fetus from vascular and nutritional compromise. The abnormalities of the fluid volume can thus interfere directly with the fetal development or may be an indirect sign of underlying disorder such as fetal hypoxia, neural tube defect or gastrointestinal obstruction. Amniotic fluid index (AFI) of ≤5 cm defines oligohydramnios as, originally described by Phelan *et al.*[1]

Many studies[2-5] show that oligohydramnios is associated with a variety of ominous pregnancy outcomes, such as fetal distress, low birth weight, perinatal morbidity, perinatal mortality and increased incidence of cesarean section.

However, some studies[6-8] show that AFI is a poor predictor of adverse outcome, and even the existence of an entity like isolated term oligohydramnios has been questioned by some authors. Thus, this study is conducted to determine whether an antepartum AFI of 5 cm or less as a predictor of adverse pregnancy outcome.

### Objective of the Study

To determine whether an antepartum AFI of 5 cm or less as a predictor of adverse pregnancy outcome.

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## MATERIALS AND METHODS

This study consists of an analysis of pregnancy outcome in 50 cases with diagnosis of oligohydramnios (AFI <5) by ultrasound after 37 completed weeks of gestation compared with 50 controls with no oligohydramnios (AFI more than 8) and matched for other variables such as age, parity, gestational age and any pregnancy complication.

The study and control group consist of women admitted to Vijayanagar Institute of Medical Sciences Hospital, Bellary. This is a prospective case-control study done over a period of 22 months (November 2010 to September 2012). All the cases that were available up to the study period have been taken for the purpose of the study. Consent from the patient was taken and ethical clearance taken from the Ethical Committee.

Women who had 4 or more visits at our hospital were considered as booked cases. Women with 3 or less visits and referred cases were considered as unbooked cases.

For all the selected cases, thorough history was taken, and complete examination was done. Clinical evidence of oligohydramnios was looked for. The previous obstetric records and ultrasound reports were reviewed. The good dates and excellent dates women with 37 completed weeks of gestation were studied. For all the women, ultrasound examination was done, and AFI was calculated by four quadrant amniotic fluid volume measurement technique.

For all women baseline investigations like hemoglobin%, blood group and Rh typing, urine examination was done. Non-stress test (NST) was done for all patients.

Oligohydramnios is defined as AFI ≤5 cm. The amniotic fluid volume is considered normal if AFI is between 5.1 cm and 20 cm. For each case a control was taken with similar gravidity, parity, gestational age but the AFI of more than 8 cm and <20 cm.

Inclusion criteria:
1. AFI ≤5
2. Single live intrauterine gestation with cephalic presentation
3. 37 completed weeks of gestation
4. Intact membrane.

Exclusion criteria:
1. AFI more than 5
2. Gestational age <37 completed weeks
3. Post-term
4. Associated fetal malformations
5. Ruptured membranes
6. Malpresentation and multiple gestation
7. High-risk pregnancy
   a. Placental insufficiency
      - Hypertension
      - Preeclampsia
      - Diabetes
      - Chronic renal disease
      - Connective tissue disorders

   b Abruption
   c. Prostaglandin synthetase inhibitors therapy
   d. Angiotensinogen converting enzyme inhibitors therapy
8. Uterine scar due to previous lower segment caesarean section (LSCS), myomectomy, hysterotomy.

The cases in which amnioinfusion was done were also excluded from the study to avoid confounding the outcome.

The management protocol was similar in both study group and control group.
- If patient is in labor (i.e., <3 cm in primigravida and <4 cm in multigravida are included in study), oxytocin drip started.
- For post-dated pregnancy (<41 weeks), If not in labor Bishops scoring done. Start oxytocin if the cervix is favorable. Induce with dinoprostone gel in the case of unfavorable cervix. Reassess the Bishops score after 12 h of instillation. If in labor, start oxytocin drip. If not in labor watch for another 12 h. Case will be taken for emergency LSCS if no progress.
- All cases will be monitored by continuous electronic fetal monitoring in labor. Any signs of fetal distress emergency LSCS done.
- After 3 cm dilatation of the cervical os in primigravida and 4 cm dilatation in multigravida artificial rupture of membranes done and will be classified as clear and meconium stained liquor.
- Cases with meconium stained liquor will be taken for emergency LSCS.
- All newborns will be attended by pediatrician.
- Various outcome measures recorded are induced versus spontaneous labor, nature of amniotic fluid, fetal heart rate (FHR) tracings, mode of delivery, indication for caesarean section or instrumental delivery, Apgar score at 1 min and 5 min, birth weight, admission to neonatal ward, perinatal morbidity and mortality.

## OBSERVATIONS AND RESULTS

This study is performed in 50 pregnant women with AFI of ≤5 cm and has completed 37 weeks of gestation and is compared with 50 pregnant women with AFI between 8 cm and 20 cm. These groups were similar with regard

to antepartum variables, i.e., maternal age, gravidity, parity and gestational age.

The maximum number of study and control group belongs to the age group of <20 years. The mean age for the study group was 23.1 years, and that of the control group was 22.6 years. There was no difference in the age distribution between two groups statistically.

The mean gravidity was 1.83 and 1.75 and mean parity was 0.6 and 0.6 respectively for cases and controls. Maximum numbers of patients were primigravidas in both study and control groups, and there exist a statistical significant difference in both the groups.

The mean gestational age was 39.4 weeks for the study group and 39.5 weeks for the control group which was similar.

The AFI was measured by four quadrant amniotic fluid volume assessment technique. The mean AFI for the study group was 3.55 cm and for the control group was 9.25 cm.

The outcome parameters analyzed include NST, FHR decelerations on Cardiotocography, nature of amniotic fluid, induction rate, mode of delivery, occurrence of LSCS for fetal distress, Apgar score at 1 min and 5 min, birth weight, admission to neonatal ward and perinatal mortality, induction delivery interval.

The NST was non-reactive in 5 (10%) women with AFI <5 cm compared to only 1 (2%) in the control group. There was no significant difference between two groups in the occurrence of non-reactive and reactive NST pattern ($P = 0.09$).

Most common FHR abnormality included variable decelerations found in 2 (4%) woman in the study group. Late deceleration in 1 (2%) of women of the study group. In the control group, no FHR decelerations were found. However, these ominous FHR were seen in those women of the control group who had an AFI in the lower range. There was no significant difference in two groups in the occurrence of FHR decelerations statistically ($P = 0.24$).

The amniotic fluid was meconium-stained in 9 (18%) and clear in 41 (82%) women in the study group. In the control group, only 4 (8%) women had meconium stained amniotic fluid and 46 (92%) had clear amniotic fluid. The difference in the occurrence of meconium-stained amniotic fluid between two groups was not statistically significant.

The labor was induced in 28 (56%) women with AFI ≤5 cm and 18 (36%) women with AFI >8 cm. The decision for induction or allowing for spontaneous labor was made depending upon AFI, gestational age, NST, and favorability of the cervix. The difference between two groups in this category was statistically significant ($P < 0.01$).

Induction delivery interval was <6 h in 14 (50%) in the study group and 8 (44.4%) in the control group. It was not statistically significant ($P = 0.59$).

Number of women delivered by LSCS was 11 (22%) among study group compared to 2 (4%) in the control group. There was a statistical significant difference among two groups in this category ($P = 0.001$). Indication for LSCS in both groups was fetal distress in both groups.

Maximum number of LSCS occurred in a study group with AFI <1 that is 5 (55.6%). This observation is statistically significant ($P = 0.01$).

Non-reactive NST cases were taken up for LSCS in both study and control groups. Five women in the study group and one woman in the control group underwent LSCS.

Among 45 women in the study group who were initially had reactive NST, 6 (13.3%) were taken up for LSCS since they had meconium stained liquor as labor progressed. This observation is statistically significant ($P = 0.04$).

The mean Apgar score was not statistically significant and the difference in the occurrence of Apgar score <7 was statistically not significant ($P = 0.90$). The mean birth weight between the two groups was not statistically significant as shown in Table 1.

Two neonates of the study group were admitted to the neonatal ward for morbidities like birth asphyxia and meconium aspiration. No control group were admitted to the neonatal ward. The difference in the two groups was not statistically significant ($P < 0.24$).

No neonatal deaths occurred in both study and control groups. The relationship between low AFI and abnormal FHR, meconium stained liquor, caesarean section, neonatal intensive care unit (NICU) admission and perinatal mortality are shown in Table 2.

**Table 1: Comparison of birth weight and Apgar score**

| Parameters | Study group (mean±SD) | Controls (mean±SD) | *P* value* |
|---|---|---|---|
| Birth weight (kg) | 2.64±0.24 | 2.74±0.28 | 0.51 |
| Apgar score 1 min | 6.8±0.6 | 6.7±0.6 | 0.62 |
| Apgar score 5 min | 8.8±0.6 | 8.7±0.5 | 0.06 |

*Student's *t*-test, SD: Standard deviation

## DISCUSSION

The various outcome results are comparable to results of similar studies done both in India and abroad.

The non-reactive NST rates are high in women with AFI <5 cm. The rate of non-reactive NST is 10% in present study and is less compared to that in similar study by Chandra *et al.*,[9] Sriya and Singhai[10] and Kumar *et al.*[11] with 69.23%, 41.55% and 40% respectively.

The FHR decelerations, during intra-partum period suggestive of fetal distress, are common in pregnant women with AFI ≤5 cm. Most common are variable decelerations due to cord compression. The ominous FHR pattern noted in 8% in the present study is less compared to 48% and 36.11% in studies by Casey *et al.*[12] and Sriya and Singhai[10] respectively.

The occurrence of meconium-stained amniotic fluid is high in women with AFI ≤5 cm. The thick meconium stained liquor was noted in 18% in the study group in the present study, which is less compared to other studies. Rutherford *et al.*[13] had 54% in his study and Sriya and Singhai[10] had 38.88% and Chandra *et al.*[9] had 23.7% in his study. In a study by Grubb and Paul 99% of women with AFI ≤ cm and prolonged deceleration had meconium stained liquor.

Various studies show different rates of LSCS for fetal distress in pregnant women with AFI of ≤5 cm. The LSCS for fetal distress was 76.92%, 51% and 43.05% in studies done by Chandra *et al.*,[9] Casey *et al.*[12] and Sriya and Singhai[10] respectively. It was 22% in our study.

The efficacy of oligohydramnios (AFI ≤5 cm) in predicting fetal distress and requirement of LSCS had a sensitivity of 84.6% and negative predictive value of 94.0%. However, the specificity and positive predictive value were poor. So, this can be considered as a screening test for the occurrence of fetal distress in the intra-partum period requiring a cesarean delivery.

The rate of LSCS was more in those with oligohydramios and non-reactive NST (100%). Even with reactive NST 13.3% develop fetal distress and LSCS was done and it is comparable to Kumar *et al.*[11] study. In the control group (AFI 8-20 cm) 2% had non-reactive NST. 8% had thick meconium stained liquor and 4% cesarean section rates.

The 5 min Apgar score <7 is seen in 4% of oligohydramnios group which required NICU admission. 4% of newborns were admitted in the neonatal ward for various morbidities like birth asphyxia, meconium aspiration, etc. This is consistent with studies by Magann *et al.*[14] (1995) and Casey *et al.*[12] (1999). A study by Sriya and Singhai[10] (2001) showed a higher incidence of (88.88%) admission to NICU as shown in Table 3.

Among cases and controls, there was no neonatal death. In Chandra *et al.*[9] study, neonatal death occurred in one case. In a study by Casey *et al.*[12] there was no mortality probably because of good NICU facilities.

The limitation of study includes the following:

1. Only 50 cases were available during the study period which exactly satisfied inclusion and exclusion criteria
2. The diagnosis of fetal distress was made depending on FHR tracings. However, the fetal acidosis was not proved by fetal scalp blood sampling or other methods because of non-availability
3. The use of backup surveillance methods like scalp blood sampling and acoustic stimulation and amnioinfusion would have altered the outcome
4. Neonatal follow-up after 7 days was lacking.

## CONCLUSION

An AFI of <5 cm detected after 37 completed weeks of gestation in a low risk pregnancy is an indicator of poor pregnancy outcome.

- In presence of oligohydramnios, the occurrence of non-reactive NST, abnormal FHR tracings during labor, thick meconium stained liquor, development of fetal distress, the rate of LSCS, low 5 min Apgar score, low birth weight and perinatal mortality are high. In

**Table 2: Relationship between AFI and various parameters**

| Parameters | Study (%) | Control (%) | *P* value |
|---|---|---|---|
| Abnormal FHR | 4 (8) | 0 | 0.24 |
| Meconium stained liquor | 9 (18) | 4 (8) | 0.23 |
| Caesarean section | 11 (22) | 2 (4) | 0.001 |
| NICU admission | 34 (68) | 25 (50) | 0.18 |
| Perinatal mortality | 0 | 0 | 0.24 |

AFI: Amniotic fluid index, FHR: Fetal heart rate, NICU: Neonatal intensive care unit

**Table 3: Comparison of neonates in different studies according to low Apgar score, birth weight<2.5 kg and NICU admission in percentage**

| Studies | Apgar score <7 (%) | | Birth weight <2.5 kg (%) | NICU admission (%) |
|---|---|---|---|---|
| | 1 min | 5 min | | |
| Chandra *et al.* | - | 23.07 | 61.53 | 46.15 |
| Sriya and Singhai | 38.88 | 9.72 | 58.38 | 88.88 |
| Casey *et al.* | - | - | 35.0 | 7.0 |
| Present study | 10 | 4.0 | 68 | 4.0 |

NICU: Neonatal intensive care unit

our study the rate of LSCS, meconium stained liquor, non-reactive NST, abnormal FHR tracing during labor, development fetal distress, NICU admission are more. However, except increased LSCS rates, in rest all parameters no statistical significant difference exist between study and control groups

- Determination of AFI can be used as an adjunct to other fetal surveillance methods
- Determination of AFI is a valuable screening test for predicting fetal distress in labor requiring cesarean section. It has a sensitivity of 84.6% and negative predictive value of 94% specificity of 54% and positive predictive value of 22%.

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Original Article

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# Probing under Local Anesthesia for Congenital Nasolacrimal Duct Obstruction

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## Abstract

**Background:** Obstruction of the nasolacrimal duct is the most common abnormality of the lacrimal system in childhood leading to epiphora. It is found in about 20% of newborns. If not treated in time, it may be complicated by recurrent conjunctivitis, chronic dacryocystitis, and lacrimal abscess formation.

**Objectives:** To study the outcome and complications of probing for congenital nasolacrimal duct obstruction under local anesthesia.

**Materials and Methods:** In this hospital based prospective interventional study, probing was done under topical anesthesia (lidocaine 4%) in 100 patients (124 eyes) in the age group of 6 months to 12 months, over a period of 2 years in which conservative treatment with antibiotic drops and sac massage had failed.

**Results:** Success rate of this procedure was 93.5% with first and 96.8% after second probing without any untoward complication.

**Conclusion:** Probing under topical anesthesia is a safe, quick and convenient method of treatment for congenital nasolacrimal duct obstruction.

**Key words:** Anesthesia, Dacryocystitis, Nasolacrimal duct

## INTRODUCTION

Obstruction of the nasolacrimal duct is the most common abnormality of the lacrimal system in childhood. It is found in about 20% of newborns, but only 1-6% of these children become symptomatic.[1,2] The obstruction is mostly due to membranous occlusion at the lower end of the duct, near the valve of Hasner.[3] Other causes of congenital nasolacrimal duct block are the presence of epithelial debris, membranous occlusion at its upper end near lacrimal sac, complete non-canalization and rarely bony occlusion.[4] If not relieved, it leads to epiphora and dacryocystitis. The epiphora usually presents after 7 days of birth and is followed by mucopurulent discharge from the eyes along with conjunctival hyperemia and crusting of eyelid margins.[5] The regurgitation test is usually positive, i.e. when pressure is applied over the sac area, purulent discharge regurgitates from the lower punctum, and eventually a swelling may appear over the sac area. If not treated in time, it may be complicated by recurrent conjunctivitis, acute on chronic dacryocystitis, lacrimal abscess, and fistulae formation.[6]

Fortunately, nasolacrimal duct obstruction clears spontaneously with time; about 89-96% of congenitally obstructed ducts open by 1-year of age.[1,7,8] During this period, conservative treatment with local massage over the lacrimal sac area combined with topical antibiotic drops may be used as needed for control of infection.[8,9] The rest of the cases which do not respond to conservative treatment are advised syringing and probing. Probing is time proven treatment of congenital nasolacrimal duct obstruction.[10] Results of probing are excellent and if performed properly, a single probing is successful in 70-96% of cases with many reports around 90%.[11-17]

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Most of the studies advise probing under general anesthesia to reduce the potential for trauma to delicate structures of the lacrimal drainage system.[18-20] Though it is convenient for the surgeon, it has its own problems such as fear of general anaesthesia, 1-day hospitalization, about 8 h of fasting and preparation of the child for general anaesthesia. Due to these reasons, the parents generally avoid this procedure and instead go on changing the doctors. Some authors also preferred topical anesthesia for probing in children <12 months of age for its ease of performance and avoidance of general anesthesia.[13,17,21] In view of above reasons, we had undertaken this study to perform probing under topical anesthesia and studied its safety, success rate and complication.

## MATERIALS AND METHODS

This hospital based prospective interventional study was undertaken in the upgraded Department of Ophthalmology, Government Medical College, Jammu over a period of 2 years from 1-1-2013 to 31-12-2014. 100 patients (124 eyes) in the age group of 6 months to 12 months, in whom conservative treatment had already failed, were included in this study. The parents were advised to use antibiotic drops and sac massage for at least 15 days before taking the child for probing.

The surgical procedure in the form of probing was done under topical anesthesia after obtaining informed written consent from the parents. Lidocaine 4% topical drops were instilled in the eye of the patient 3 times before the procedure. The child was then taken to Operation Theater. His legs were wrapped in a towel and his head was immobilized by holding his arms on the sides of his head. The lower punctum was dilated with punctum dilator under the microscope, and Bowman #00 or #0 probe was passed through the passages. The probe was first passed vertically through the punctum and then shifted horizontally through the canaliculus until the lacrimal bone was felt. The lower lid was pulled laterally while passing the probe through the lower canaliculus. With the tip on the bony wall, the probe was shifted to inferior, posterior and lateral position. After passing the probe for about 8-10 mm, a resistance of the membrane was usually met. Applying direct pressure on the probe creates an opening in the membrane. The probe was then removed after 5 min.

Post-operatively, the patient was given steroid-antibiotic eye drops QID and saline nasal drops BD for 4 weeks, and decongestant oral drops for 2 weeks. He was examined again on 2nd day, after 1-week, 2 weeks, 4 weeks and 6 weeks. Cure was defined as complete remission of watering, discharge and reflux of contents of the lacrimal sac. If after 6 weeks, there is no improvement repeat probing was done.

## RESULTS

Out of 100 patients in the study group, 63 (63%) were of the age group of 6-9 months and 37 (37%) of 9-12 months (Table 1). Of 100 patients, 54 (54%) were males and 46 (46%) were females (Table 2). 76 (76%) were affected unilaterally, out of which left eye was affected in 43 patients (43%) and right eye in 33 patients (33%). Both eyes were affected in 24 patients (24%) (Table 3).

Out of 124 eyes, 116 improved with single probing, obtaining a success rate of 93.5%. Four more eyes (3.2%) were improved with second probing thus obtaining a total success rate of 96.8% (Table 4). Third probing was not tried in the rest of the cases (4 eyes).

Complications such as a punctal tear, false passages, ecchymosis or excessive bleeding from the nose were not seen during this study.

## DISCUSSION

Probing is the method of choice for the treatment of congenital nasolacrimal duct obstruction who fail to respond to conservative treatment. In this prospective study, a total of 124 eyes of 100 children between 6 months

**Table 1: Age distribution of patients**

| Age group | Number of patients | Percentage |
|---|---|---|
| 6-9 months | 63 | 63 |
| 9-12 months | 37 | 37 |
| Total | 100 | 100 |

**Table 2: Sex distribution of cases**

| Sex | Number of cases | Percentage |
|---|---|---|
| Males | 54 | 54 |
| Females | 46 | 46 |
| Total | 100 | 100 |

**Table 3: Predominance of eye affected**

| Eye affected | Number of patients | Percentage |
|---|---|---|
| Right eye | 33 | 33 |
| Left eye | 43 | 43 |
| Both eyes | 24 | 24 |
| Total | 100 | 100 |

**Table 4: Results of probing**

| Probing | Number of eyes | Percentage |
|---|---|---|
| Improved with single probing | 116 | 93.5 |
| Improved with two probing | 120 | 96.8 |
| Not improved | 04 | 3.2 |

and 1-year of age were treated by probing under topical anesthesia.

In our study, out of 124 eyes, 116 eyes were cured by the first probing. It gave a success rate of 93.5%. The present study is comparable to studies conducted by Robb[11] who reported a success rate of 90%, and El-Mansoury *et al.*[12] who reported 93.5% cure rate after the first probing. Similarly, Stager *et al.*[13] reported a 94% cure rate in patients <9 months of age with one office probing under topical anesthesia and Katowitz and Welsh[14] noted a success rate of 96% in children between 6 and 13 months of age. In another study, Baker[15] reported 860 eyes of children aged 3-14 months of age, probed in office without general anesthesia and 94% were cured with initial probing. Kushner[16] probed 148 eyes at an average age of 8 months and reported that 89% of eyes were relieved of the symptoms by one probing, whereas Shrestha *et al.*[17] reported a success rate of 92.7% with first attempt of probing in the age group of 7-12 months under topical anesthesia. Perveen *et al.*[22] reported a cure rate of 100% in the age group of 4-6 months and 94% in the age group of 7-12 months. Similarly, Medghalchi *et al.*[23] reported a 91% cure rate in patients aged 9-12 months of age, and Isaza and Arora[24] noted a success rate of 90.2% (46/51 eyes) in children <2 years of age.

In our study, four more eyes were improved with second probing thus obtaining a total success rate of 96.8%. This percentage was comparable to studies done by other authors.[11,17] The third probing was not tried in the remaining 4 cases. The cause of failure in the 4 cases could be either scarring due to chronic infection, anatomical abnormalities of duct or bony occlusion.

Some authors advised to delay the probing until the age of 1-year as spontaneous opening occurs in 89-96% of cases by 1-year.[1,7,8] However delaying probing for such period may cause agony to the parents of the child, increase the risk of complications due to chronic dacryocystitis and decrease the success rate of probing as reported by various studies. Robb[11] reported a success rate of 84% with probing after 12 months of age and Katowitz and Welsh[14] noted a success rate of 77% after 13 months of age. Due to these reasons, we advise probing after 6 months of age. Also, it is easy to perform probing in younger children under topical anesthesia.

In this study, all probing were performed under topical anesthesia. Some authors recommended that the probing procedure should be done under general anesthesia to reduce the potential for trauma to delicate structures of the lacrimal drainage system. Koke[18] reported that probing is not an office procedure and that general anesthesia is essential. Honavar *et al.*[19] did all probing procedures under general anesthesia in their studies. Similarly, MacEwen[20] performed probing in children under general anesthesia so that the procedure could be controlled, and attention paid to the site and the nature of the obstruction. El-Mansoury *et al.*[12] recommended probing after 13 months of age under general anesthesia. Though it is convenient for the surgeon, it has its own disadvantages such as fear of general anesthesia, 1-day hospitalization, about 8 h of fasting and complications of general anesthesia.

Probing under topical anesthesia, though appears quite difficult due to the unpredictable mobility of the child, is quite easy and safe. Also, it is of shorter duration and free from complications of general anesthesia. Its other advantages are compliance of the parents is more as there is no fear of general anesthesia, hospital stay is less i.e. only 30 min to 1 h as compared to 1-day in general anesthesia and no pre-operative preparation or fasting is required. Stager *et al.*,[13] Shrestha *et al.*,[17] Basar *et al.*[21]and Schnall[25] also preferred topical anesthesia for probing in children <1-year of age for its ease of performance and avoidance of general anesthesia.

Complications such as punctum tear, false passages, ecchymosis, excessive bleeding which were expected due to the unpredictable mobility of the child were not faced during this study.

## CONCLUSION

Probing under topical anesthesia is a safe, quick and convenient method for the treatment of congenital nasolacrimal duct obstruction. The success rate of this procedure was 93.5% with first and 96.8% after second probing without any untoward complication.

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Original Article

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# Incidence of Tubercular Breast Abscess in a Tertiary Care Hospital in Kolkata: A Prospective Study

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## Abstract

**Introduction:** Tubercular breast abscess is one of rare tuberculosis affecting women. Breast tuberculosis most commonly presents as a lump in the central or upper outer quadrant of the breast and discharge from nipple.

**Materials and Methods:** This hospital-based prospective study was carried out at our tertiary care hospital from March 2013 to February 2015 on 197 female patients presenting with clinical features of a breast abscess.

**Results:** Out of 197 cases, 59 (29.9%) cases were routine, ordinary culture negative. Out of which 9 cases were diagnosed as a tubercular breast abscess.

**Conclusion:** From our study it appears that 4.8% cases (9, *n* = 197) are suffering from tubercular breast abscess, adequate treatment with anti-tubercular drug is essential to cure these patients.

**Key words:** Breast abscess, *Mycobacterium tuberculosis*, Nipple discharge

## INTRODUCTION

Breast abscess is a common condition in female patients affecting 4.6-11% of the female population in both developed and developing countries.[1] It is broadly of two types-lactational and non-lactational. Lactational breast abscesses are encountered mostly in the post-peurperal period with Staphylococcus aureus as the most common causative agent.[2] On the contrary, the exact etiology of non-lactational breast abscess, which is more common in perimenopausal age group, remains largely unknown.[3]

Tuberculosis of the breast is a rare occurrence accounting for <1% of all the breast diseases in developed countries and about 4% of all the breast diseases in endemic areas.[4] Although *Mycobacterium tuberculosis* primarily causes disease of the lung, it can affect any organ of the body and resemble other diseases. Some organs like spleen and breast show considerable resistance to this disease as they do not provide a suitable environment for the survival and multiplication of tubercle bacilli.[5] The incidence of tuberculosis is still quite high in India and so is expected of the breast tuberculosis. Breast tuberculosis most commonly presents as a lumpin the central or upper outer quadrant of the breast.[6-8] Other common forms of clinical presentation include tubercular ulcer over the breast skin and tubercular breast abscess with or without discharging sinuses.[8] Purulent nipple discharge or persistent discharging sinus may be rare presenting features. Tuberculosis of breast disease is often misdiagnosed as carcinoma or pyogenic abscess.[9] Hence, a high level of suspicion is required to make the diagnosis of tubercular breast abscess.

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## MATERIALS AND METHODS

After taking consent from patient and ethical clearance from our college, this study was started from March 2013

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to February 2015 on 197 female patients presenting with clinical features of breast abscess. Majority of the patients were presented with lump in the central or upper outer quadrant of the breast .The lump was hard, painful and at times, fixed to either skin or muscle or even chest wall and there was ulcer over the breast skin. Few patients were visited with features of tubercular breast abscess with or without discharging sinuses. On examination there were localized breast erythema, warmth, induration, edema, tenderness, fluctuant swelling, nipple discharge or inversion, with or without associated fever or axillary lymphadenopathy (Figure 1). After obtaining a detailed history from each patient, they were subjected to laboratory workup for hemoglobin, total white blood cell count, C-reactive protein, erythrocyte sedimentation rate, fasting, and postprandial blood glucose.

Pus sample collected in or sent to our laboratory after surgical procedures were subjected to analysis for a bacteriological profile by Gram-stain, Zeihl-Neelsen (Z-N) staining and culture. Histopathology of breast tissue was performed to detect chronic granulomatous changes.

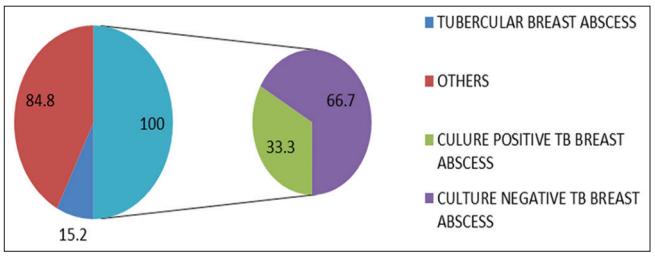
Breast abscess in malignant cases was not included in the study.

## RESULTS

Out of the total 197 cases, there were 59 cases routine culture negative. Among these 9 cases were diagnosed as tubercular breast abscess. All of them had a prior history of contact with cases of tuberculosis and duration of symptoms for more than 6 months. 7 of these cases were identified as primary tubercular breast abscess as no other foci could be detected elsewhere. Of the other two cases, one had primary pulmonary tuberculosis and the other, tuberculosis of axillary lymph nodes. Out of the 9 patients, 2 patients had recent lactation history at the time of presentation. One of the patients with primary breast tuberculosis had presented with nipple discharge and enlargement of ipsilateral axillary lymph nodes. Z-N stain of the nipple discharge showed the presence of acid-fast bacilli. Culture for *M. tuberculosis* after 4 weeks of incubation at 37°C was positive for 3 cases of breast tuberculosis - two primaries and the other secondary (Graph 1).

All these 9 cases were confirmed to be tuberculosis by histological examination of the breast tissues. Histologic examinations in all these cases revealed the presence of degenerated neutrophils, lymphocytes, plasma cells, histiocytes, cyst macrophages, epithelioid granuloma in a caseous necrotic background suggesting the tubercular origin of the breast abscesses (Figure 2).

Apart from *M. tuberculosis* breast abscess, 70.1% i.e. 138 cases were diagnosed as non-tubercular breast abscess. *Staphylococcus aureus* was found to be the predominant organism accounting for 45.2% ($n$ = 89) of all culture positive cases. Other organisms included *Streptococcus pyogenes*




**Graph 1: Percentage of tubercular breast abscess out of the total number of routine culture negative cases**

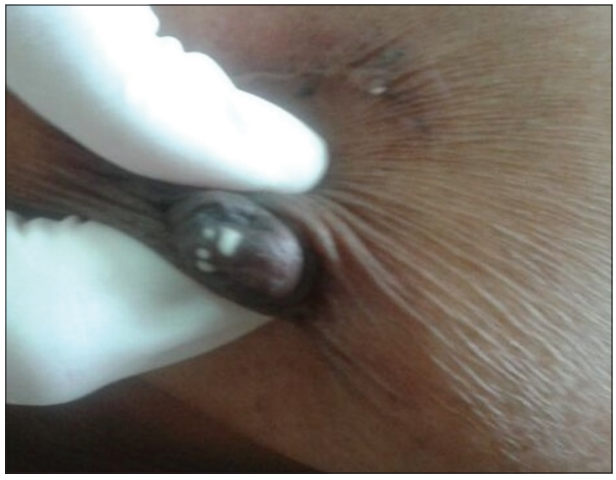


**Figure 1: Nipple discharge in a case of tubercular breast abscess with ulcer over areola**

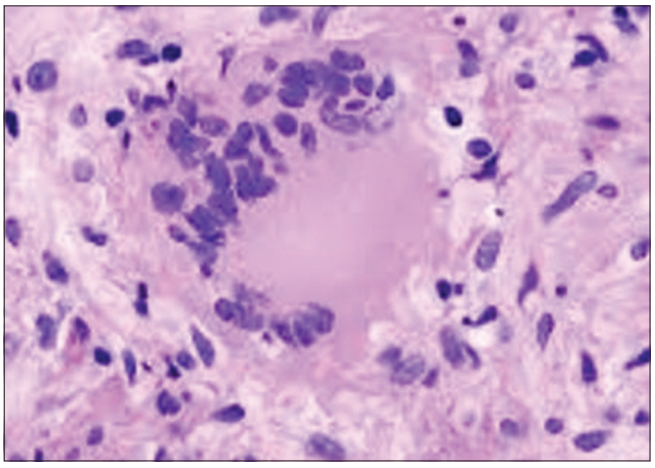
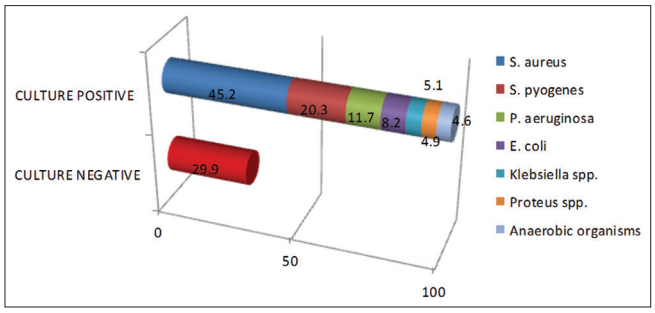


**Figure 2: Histopathology of tubercular breast tissue characterized by granuloma formation**




**Graph 2: Percentage of culture positive and culture negative breast tuberculosis (%)**

(20.3%), *Pseudomonas aeruginosa* (11.7%), *Escherichia coli* (8.2%), *Klebsiella* spp. (5.1%), *Proteus* spp. (4.9%) and anaerobic organisms (4.6%) (Graph 2).

## DISCUSSION

In our study, tubercular breast abscess accounts for 15.2% of total routine culture negative breast abscess. Among these 22.2% of our cases had recent lactation history whereas Shinde *et al.* and Banerjee *et al.* respectively reported that 7% and 33% of their patients were lactating at the time of presentation with breast tuberculosis.[5,10] Mycobacterial culture remains the gold standard for diagnosis of tuberculosis. However, the time required and frequent negative results in pauci-bacillary specimens are important limitations.[11] However in our study, 33.3% cases of tubercular breast abscess were positive for culture. Similar to the observations made by Khanna, who found fine needle aspiration cytology to be 100% reliable for diagnosis of breast tuberculosis, all our patients showed features of tuberculosis on histopathological examination of breast tissue.[12]

Among non-tubercular pathogen, *S. aureus* have been found to be the commonest pathogen for breast abscess accounting for 72.1% of all culture positive cases. This finding fairly coincided with other studies done on breast abscesses.[13,14] Other organisms isolated in order of frequency are *S. pyogenes* (20.3%), *P. aeruginosa* (11.7%), *E. coli* (8.2%), *Klebsiella* spp. (5.1%), *Proteus* spp. (4.9%) and anaerobic organisms (4.6%). These observations were similar to those of Sandhu *et al.* in 2014.[15]

## CONCLUSION

From the above study, we can conclude that tubercular breast abscess still remains a problem in developing country like India. Inadequate intake of anti-tubercular drug and delays in treatment are most common causes of the persistence of tubercle bacilli in breast tissue. Proper knowledge about the importance of anti-tubercular drug use is needed to control tuberculosis infection.

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Original Article

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# Assessment of Anthropological and Physiological Indices in Diabetes Mellitus: A Prospective Tertiary Care Center Level Evaluation

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## Abstract

**Introduction:** For proper risk assessment for diabetic syndrome status, it is first and foremost priority to observe and understand any disparities between the predisposing factors in both diabetic and non-diabetic individuals and their role risk for development of diabetes.

**Materials and Methods:** A total of 300 subjects aged between 25 and 60 years were included for study. Waist circumference, body mass index, blood pressure, hemoglobin, and fasting blood glucose levels were measured by appropriate methods. Based on the obtained data subjects were divided into diabetic and non-diabetic groups. We observed 28 subjects out of 300 were diabetics based on fasting glucose levels. Hence, we compared anthropometric and other hematological parameters between 28 diabetic subjects and rest 272 individuals.

**Results:** There is statistically significant increase in the mean body mass index of diabetic individuals (28.64 ± 6.43) than normal healthy subjects (23.87 ± 5.67). Waist circumference also showed the statistically significant difference (more in the diabetics than normal subjects). Significant difference was found in systolic blood pressure of two groups. Whereas, diastolic blood pressure did not show any significant difference. The hemoglobin statistics also did not show any significant change between two groups.

**Conclusion:** In the present study, we can conclude that a positive association exists in hyperglycemia and waist circumference, body mass index and systolic blood pressure.

**Key words:** Body mass index, Diabetes mellitus, Obesity

## INTRODUCTION

Rapid economic development and urbanization made a profound effect on the scenario of health problems in the community. Particularly in developing countries like India it led to a shift in paradigm from communicable to non-communicable diseases like diabetes. Diabetes prevalence is increasing worldwide. According to World Health Organization (WHO) statistics, 347 million people around the world are having diabetes. WHO predicted that India would contribute nearly 57 million people to the global burden of diabetes by the year 2025. WHO projects that Diabetes will become the 7th leading cause of death by 2030 in the world. WHO states that more than 80% of the deaths reported due to diabetes and its complications are occurring in low and middle-income countries.[1,2] Because of its high prevalence, India is infamously known as the Diabetes capital of the world.[3] More prevalent Type 2 diabetes is predominantly dependent on the individual's lifestyle.[4]

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It can be seen, that predisposing factors of diabetes mellitus have a profound effect in causation of disease and these factors can be monitored through assessment of body mass index, lipid profile and blood pressure of the population.

Body fat distribution and lipid profile are the important predicting parameters for various metabolic disturbances

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such as diabetes, hypertension, and dyslipidemia.[5] Risk of development of diabetes is more if waist circumference of is more than 80 cm in case of females and 90 cm in case of males.[6] Anemia can occur in 25% of diabetic cases. Also, it increases the risk of developing diabetic complications like retinopathy and cardiovascular diseases.[7]

Diabetes is also one of the most preventable non-communicable diseases. According to known risk factors for diabetes, prevention strategies for health promotion can be planned and implemented. As the risk of development of diabetes varies between different ethnic populations, therefore, it is necessity of medical science to have population-based data to identify the risk factors for diabetes to control and treat the diabetes and its complications according to local ethnicity.[1,8]

Hence, for proper risk assessment for diabetic disease status, it is first and foremost priority to observe and understand any disparities between the predisposing factors in both diabetic and non-diabetic individuals and their role risk for development of diabetes.

## MATERIALS AND METHODS

The study was conducted in the department of Physiology in association with department of Anatomy, Gold Field Institute of Medical Science and Research, Ballabgarh, Faridabad, Haryana (India) on healthy 300 subjects aged between 25 and 60 years after taking informed written consent from all the participants. Known cases of diabetes, hypertension, and any other chronic disease status were not included for study. Ethical approval for the study was taken from Institutional Ethics Committee.

All the anthropometric measurements and laboratory samples were collected from subjects in the morning after overnight fasting. Subject's Height was measured with the help of stadiometer (nearest to 0.1 cm) and weight with the help of standard weighing machine with minimal clothing (nearest to 0.01 kg). The body mass index was calculated with above two measurements. Blood pressure was taken by sphygmomanometer in sitting position and waist circumference was measured with the help of a measuring tape in standing position. Venous blood samples of blood were collected. Fasting plasma glucose levels and hemoglobin values were measured by appropriate laboratory methods. Data collected and then analyzed and statistical values of mean and standard deviation were calculated.

## RESULTS

In the present study, we observed 28 subjects out of 300 were diabetics based upon fasting glucose levels. So, we compared anthropometric and other hematological parameters between 28 diabetic subjects and rest 272 individuals.

A significant difference was found in the body mass index (BMI) of two groups. There is statistically significant increase in mean BMI of diabetic individuals (28.64 ± 6.43) than normal healthy subjects (23.87 ± 5.67). Statistically significant difference was found for waist circumference (more in the diabetics than normal subjects) (Table 1).

Significant difference was found in systolic blood pressure (BP) of two groups (mean systolic BP of diabetics were −137.57 than normal healthy subjects −126.42). Whereas diastolic BP did not show any difference. The hemoglobin statistics also did not show any significant change between two groups (Table 2).

## DISCUSSION

In the present study, we observed statistically significant increase in the mean values of BMI and the waist circumference in the diabetic subjects when compared to the non-diabetic normal healthy subjects. Similar findings were observed by other researchers in literature.[6,9,10]

No significant difference in hemoglobin levels were found in the present study. Cawood *et al.*[7] observed that diabetics are prone to anemia. They stated that due to decreased kidney functions in diabetes, less erythropoietin hormone production and eventually it leads to decreased red blood cells in the body that will lead to anemia. Our findings were inconsistent with findings of Cawood *et al.*[7]

**Table 1: Anthropological parameters of study population**

| Parameters | Mean±SD | | *P* value |
|---|---|---|---|
| | Normal subjects *n*=272 | Diabetics *n*=28 | |
| Age | 42.37±11.43 | 46.36±12.41 | >0.05 |
| BMI* | 23.87±5.67 | 28.64±6.43 | <0.05 |
| Waist circumference** | 79.05±11.33 | 90.02±12.83 | <0.05 |

*BMI: Body mass index, **in centimeters, SD: Standard deviation

**Table 2: Hematological parameters of study population**

| Parameters | Mean±SD | | *P* value |
|---|---|---|---|
| | Normal subjects *n*=272 | Diabetics *n*=28 | |
| BP* | | | |
| Systolic | 126.42±46.58 | 137.57±17.83 | <0.05 |
| Diastolic | 77.69±12.83 | 80.42±8.43 | >0.05 |
| Hb** | 10.11±1.97 | 9.98±2.07 | >0.05 |

*BP: Blood pressure, **Hb: Hemoglobin (g%), SD: Standard deviation

Various researchers pointed out the increased prevalence of hypertension in diabetics than in the non-diabetic individuals. They stated that a direct, toxic effect on vascular endothelial cells can be produced by chronic hyperglycemia and these can lead to increased vasoconstriction and vascular remodeling.[11]

## CONCLUSION

In the present study, we have observed statistically significant increase in systolic BP in diabetics than normal healthy subjects and we conclude that a positive association exists in hyperglycemic status and BMI, waist circumference, and systolic BP.

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Original Article

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# Efficiency of Topical Phenytoin on Healing in Diabetic Foot Ulcer: A Randomized Controlled Trial

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## Abstract

**Introduction:** One-third of patient with diabetic seek hospital admission due to a diabetic foot ulcer. About 15% of diabetic patients will have foot amputation following diabetic ulcer.

**Objective:** The objective of this study was carried out to assess the efficiency of tropical application of phenytoin powder on healing in diabetic foot ulcer Category I and II.

**Materials and Methods:** Totally, 60 patients with diabetic foot ulcer attending the Government Medical College Hospital are randomized into two groups, assigned regular saline and betadine dressing for the control group and phenytoin powder application for the study group. Patient with vascular impairment (or) uncontrolled diabetes are not included. Both the control and study group are compared for the reduction in the slough, granulating tissue formation, pain, duration of hospital stay mean surface reduction of ulcer, to assess the healing process.

**Results:** The wound healing was assessed by the formation of granulation tissue, decrease in the slough and wound size at weekly interval. At the end of 14 days, the presence of healthy granulation tissue were markedly noted in 60% of study group with phenytoin, and it was present only in 10% of control group. Moreover, also wound reduction was 66% in the study group, and 44% in control group. Mean duration of time in the hospital is also significantly reduced in phenytoin group. Pain score was also good in the study group.

**Conclusion:** Based on this study cut come and literature review, we conclude phenytoin sodium powder tropical application on diabetic foot ulcer promotes early wound healing.

**Key words:** Diabetic foot ulcers, Granulation tissue, Tropical phenytoin, Wound healthy

## INTRODUCTION

Diabetes is becoming a disease of modern world and India is marching toward to be the capital of diabetes. India has more than 62 million diabetic individuals. In the world, 7% of the population have diabetes. India is followed by China and USA on the top ranking diabetic country list.[1]

Diabetic foot syndrome is a most common and preventable complication of diabetes. About 15% of diabetic individual will develop diabetic foot syndrome in their life time.[2] Diabetic foot ulcer precedes 85% amputation in individuals with diabetics. This can be related to many social and cultural patterns in India such as walking with bare foot, lack of knowledge and facility for adequate diabetic care, poverty, and other socioeconomic conditions.[3]

Various therapeutic methods are applied for the healing of diabetic ulcer such as honey, placental gel, vacuum assisted devices, epidermal growth factor cream, and betadine dressing; and each has its own positive and negative factors. Delay in wound healing causes economic burden to the individual and family.

In 1908, the 5-5 dipenyl2-4 imidazolidinone sodium with generic name of phenytoin was synthesized and used as antiepileptic drug since 1937.[4]

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Gingival hyperplasia due to connective tissue growth was noted as an unwanted side effect of phenytoin as an anticonvulsant medication.[5]

However, this property of connective tissue growth is presumed to have the advantage of wound healing. Various studies have shown a good result of usage of tropical phenytoin in promoting healing of decubitus ulcer,[6] venous stasis ulcers,[7] burns,[8] traumatic wounds,[9] and Hanson's trophic ulcers.[10]

Phenytoin is used as a topical application in many studies on diabetic foot ulcers, and it is found to stimulate the formation of granulation tissue as early as 2-7 days. The phenytoin has antibacterial activity against *Staphylococcus aureus*, *Escherichia coli*, *Klebsiella*, and *Pseudomonas*.[11]

Phenytoin increases proliferation of fibroblasts, enhances collagen deposition, neovascularization, promotes granulation tissues formation, reduces the collagenase action, and contamination of bacteria.[12]

However, there are some contradictory reports on the use of phenytoin as topical agent.[13]

This study is done to understand and postulate the efficiency of phenytoin, a much cheaper drug readily available in the market, on its property of wound healing in diabetic individuals with Grade I and II ulcer as per Wagner criteria.

## MATERIALS AND METHODS

This study was conducted as a randomized case-control prospective study in the Department of Surgery Kanyakumari Government Medical College Hospital from 2014 January to 2014 December. Totally, 60 patients with diabetic foot ulcers of more than 4 weeks duration without any co-morbid conditions and ulcers belong to Grade 1 and 2 as per Maggot - Wagner diabetic foot ulcers were inducted into the study.

### Ethical Aspects

The study proposal was approved by the Ethical Committee of our Institution. All participants were provided and obtained written informed consent after explaining all the features of the study.

### Diabetic Foot Ulcer Wagner Classification

Grade 0 → No risk
Grade I → Superficial ulcers
Grade II → Deep ulcers
Grade III → Deep ulcers with abscess
Grade IV → Gangrene - Limited
Grade V → Gangrene - Extensive

Inclusion criteria:

- Diabetic foot ulcer more than 4 weeks of Grades I and II with fasting blood sugar 110-130 mg/100 ml on two consecutive days
- Age group 18-80, both male and female
- Consent for inclusion in the study.

Exclusion criteria:

- Diabetic ulcer with Grades III, IV, V
- Uncontrolled diabetics
- Presence of vascular impairment
- Presence of osteomyelitis
- Associated co-morbidity such as hepatic and renal diseases
- Patient on steroids
- Nonwilling patients.

### Ethical Concerns

The study proposal was approved by the Ethical Committee of our college. All the patients included in the study were explained all the factors of this study and their informed written consent obtained.

### Sample Selection and Grouping

Using the World Health Organization, sample size calculated with the values of 5% as the level of significance and 90% as the power of the test. The inducted patients were divided into two equal groups randomly using lottery method. A total of 30 patients inducted as a study group for the use of topical phenytoin powder, and the rest 30 were followed with a classical wound dressing with p-iodine and saline wash with magnesium sulfate dressing are taken as a control group.

### Procedure

Phenytoin powder is prepared from the capsule and amount of powder application depends upon the surface area of the diabetic foot ulcer.
Up to 5 cm → 100 mg
5-9 cm → 150 mg
9-15 cm → 200 mg
>15 cm → 300 mg

The foot ulcers are adequately cleaned with hydrogen peroxide-saline-betadine solution.

Phenytoin sodium capsule was opened and placed in 5 ml of normal sterile saline to form a suspension. Sterile gauze was soaked in the suspension and placed over the wound as a thin layer culture of wound done on induction and antibiotics are given to both the groups as per culture reports. Daily monitoring of blood sugar appropriate treatments are provided.

In the well cleaned and debrided wounds, the surface area of the ulcer is measured on day 1 using tissue paper

mapping. The proper wound care and phenytoin powder application is carried out daily. The wound is assessed in terms of healing shown by the reduction in surface area, formation of granulation tissue, amount of discharge, microbiological status, and pain factor by a blind observer at the end of every week and to the maximum of 6 weeks.

### Statistical Analysis

Chi-square test was used. The observer was calibrated by using Kappa coefficient (0.6)

## RESULTS

A demographic study of patients inducted into our study shows age ranges from 18 to 80. However, the majority of cases are from the age group of 51-70.

The mean age of study group was 52.63 ± 7.1 and the control group was 53.1 ± 683. Male constitute 60% of the inducted patients and female 40%. Age and gender distribution were similar between each group, $P = 0.413$ for age and $P = 0.578$ for male and female difference. Hence, it is proved the demographic variations cannot influence the efficiency of the treatment. The sites of the presence of an ulcer in each group were also studied. The findings are tabulated in Table 1 and Figures 1 and 2.

The surface area of the ulcer predominantly corresponds in each group, and the majority of ulcers were of 9-15 cm size and no significant variations among the group. Pus culture from the ulcer was carried out. The organisms present were tabulated in Table 2 and Figure 3. *S. aureus* was found to be the most common pathogen in both the group.

The reduction in the presence of slough and formation of healthy granulation tissues are assessed on the 14th day.

In the study group, with phenytoin use only 6 cases (20%) had slough, but in the control group slough continued to present in 24 patients (80). This is a statistically significant difference (Chi-square =16.4, $P < 0.005$, df = 1).

**Table 1: Demographic profile of patient in study/control group**

| Variables | Study group (30) | Control group (30) | Significant |
|---|---|---|---|
| Male | 20 | 16 | *P*=0.578 |
| Female | 10 | 14 | - |
| Mean age | 52.63±7.1 | 53.1±683 | *P*=0.413 |
| Ulcer in dorsum | 14 | 16 | |
| Ulcer in heal | 8 | 7 | |
| Other site | 8 | 7 | |

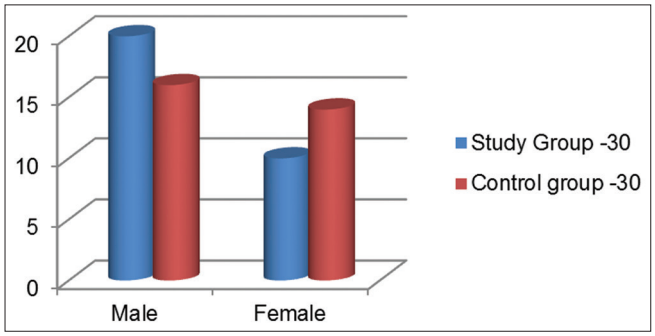


**Figure 1: Demographic profile of patient in study/control group**

**Table 2: Culture reports in diabetic foot ulcer**

| ??? | Study group (30) | Control group (30) |
|---|---|---|
| *Staphylococcus* | 15 | 14 |
| *Klebsiella* | 1 | 1 |
| *Citrobactor* | 1 | 1 |
| *Pseudomonas* | 4 | 5 |
| *E. coli* | 5 | 6 |
| *Streptococcus* | 1 | 0 |
| *Sterile culture* | 3 | 3 |

*E. coli: Escherichia coli*

| Phenytoin study group | Site of the ulcer | Control group |
|---|---|---|
| 14 | Dorsum of the foot  | 16 |
| 8 | Heel of the foot  | 7 |
| 8 | Other site  | 7 |

**Figure 2: Site of the ulcer in the foot**

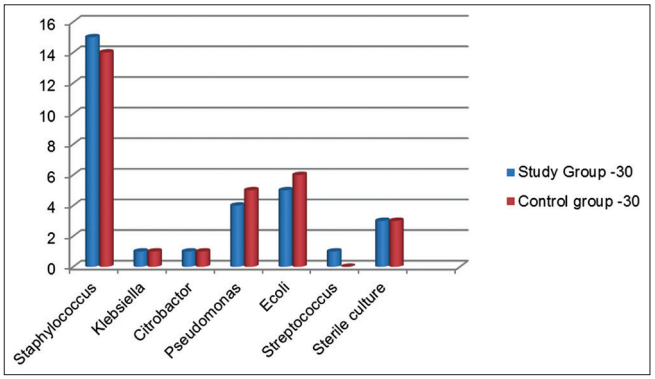


**Figure 3: Culture reports in diabetic foot ulcer**

The healthy granulation tissue formation was found in 18 patients (60%) in phenytoin group however, only 3 patient (10%) in the control group has good healthy granulation tissue on day 14. The difference is also statistically significant (Chi-square = 16.8, $P < 0.005$, df = 1).

The duration of hospital stay was prolonged in patient in the control group. The mean duration of stay for patient with diabetic foot using phenytoin topical application was 19 days for the control group it is 25 days. This also shows the economic burden on the family.

The reduction in surface area of the ulcer in the patient in a study group with phenytoin use was 66% and in the control group 46% on 21st day of therapy. This difference is also statistically significant ($P = 0.045$). The findings are shown in Table 3.

The results of the study on the reduction in the slough, formation of healthy granulation tissue, more than 50% reduction in wound size, and duration of hospital stay as shown, they are significantly different from study group and control group, shows patient with the use of phenytoin has better wound healing parameters.

Study on pain score for ulcer with visual analog scale shows 72% reduction in pain, by the 7th day of dressing in phenytoin group and 36% in control group.

## DISCUSSION

All over the world for every 30 s one foot is amputated due to diabetes and 85% this can be prevented if early detection and adequate care is provided at the appropriate time. A variety of treatment modalities is available from the treatment of diabetic foot ulcer. In 1934, Elliot said, "Diabetic gangrene is not heaven sent but is earth-born."[14]

Plethora of research monograph is available on the variety of care for a diabetic ulcer. The adequate wound debridement, appropriate antibiotic coverage, improvement of general well-being of individuals are paramount important for wound healing. Topical phenytoin has proved its worthiness as an inexpensive therapeutic agent in wound healing.

The phenytoin induces growth of granulation tissue, angiogenesis, and decreases wound size.

Modéer and Andersson in 1990, in their study, on regulation of epidermal growth factor receptor metabolism in gingival fibroblasts proved that phenytoin significantly increases epidermal growth factor receptors in the fibroblast resulting in the gingival hyperplasia.[15]

DaCosta *et al.* in 1998, by their experimental study proved phenytoin enhances the fibroblast infiltration with neovascularization and significantly increases the tensile strength of healed wounds.[12]

Anstead *et al.* reported that phenytoin has promoted healing in a massively necrotized Grade IV decubitus ulcer not responding to any other therapy.[16]

Various studies shows phenytoin stimulates proliferation of fibroblasts, significantly increase the receptors of epidermal growth factor and keratinocyte growth factor in the fibroblasts, reduces the activity of collagenase in the wound, accelerate the early inflammatory responses, induce the neovascularization, effectively reduces the burden of infective microbial and there by promotes healing.

Phenytoin has significant antibacterial properties. Pendse *et al.* have proved in their study 50% wounds treated with phenytoin had negative bacterial culture on 7th day of treatment, where as in the control group only 17% had negative culture (Figure 4).[17]

Diabetic foot ulcer usually shows a poly microbial infection pattern. However, the most common organism found is Gram-positive cocci. In a multicentric clinical trial conducted in ulcer, Citron *et al.* have shown 83.8% of the cultures are polymicrobial in nature with 48% only aerobic bacteria, 43% mixed with aerobe and anaerobe, and only 1.3% shows anaerobic bacteria.[18]

Our study also proves there are predominantly aerobic Gram-positive and negative organisms, and isolated anaerobes are less in number, more so in new cases. *Staphylococcus* and *E. coli* constitute the major organism group. The phenytoin reduces the organisms and decreases the slough as early as 7 days.

**Table 3: Comparison of ulcer healing parameter in two groups**

| Parameters | Study group (30) | Control group (30) | *P* value |
|---|---|---|---|
| Presence of slough on 14th day (%) | 6 (20) | 24 (80) | <0.005 |
| Presence of healthy granulation tissue on 14th day (%) | 18 (60) | 3 (10) | <0.005 |
| Duration of hospital stay | 19 days | 25 days | <0.005 |
| Percentage of reduction in ulcer area (%) | 66 | 46 | <0.045 |
| Efficiency as more than 50% reduction of ulcer (%) | 21 (70) | 12 (40) | 0.041 |


**Figure 4: Progression and response to phenytoin therapy,(a) On admission (b) On 7th day (c) On 14th day**

Many authors including Chincholikar and Pal. have shown the most common Gram-positive organisms are *S. aureus* and *Pseudomonas auruginosa*. The most common anaerobes are *Bacteroids fragilis*. Our study also shows increased percentage of *Staphylococcus* and *Pseudomonas*.[19]

The antibacterial property of phenytoin is manifested both as an intrinsic activity and also mediated by the effect of phenytoin on inflammatory cell and its property to induce neovascularization.[20]

Reduction on the wound surface area is the marked feature of phenytoin use. Pai *et al.* in their double blind control study on phenytoin in neuropathic diabetic foot ulcer demonstrated 78% of wounds treated by phenytoin had more than 50% reduction in the ulcer size.[21]

In our study, also 70% in the phenytoin group shows more than 50% reduction while only 14% of patient in the control group shown more than 50% reduction of the size.

Another advantage of phenytoin observed is the reduction in the pain score of the ulcer. The study shows a significant reduction in the pain score of the patient from 7th day resulting in less use of analgesia. This is explained by the effect of phenytoin on the membrane stabilizing property and its ability to reduce the inflammatory response.[22]

In a comparative study, of EUSOLVs phenytoin on the diabetic foot ulcer conducted by Carneiro and Nyawawa in 100 patients proved that phenytoin use has resulted in significant reduction in the pain score and quantity of ulcer discharge.[23]

Shaw *et al.* done a systematic review of role of phenytoin as topical agent in the healing of diabetic ulcers using PubMed, Medline, and Cochrane database with 14 available randomized controlled trials and concluded that use phenytoin has moderate evidence to confirm and support the use of phenytoin as topical therapeutic agents in not only diabetic ulcers but also varicose leg ulcers and necrotic wounds.[24]

Pitiakoudis *et al.* in their experimental study on pressure ulcer in a paraplegic person stated phenytoin enhances faster healing by stimulating lymphocyte chemotaxis and super regulation of angiogenesis.

Phenytoin is considered a safe, inexpensive, and effective in wound healing by several researchers.

## CONCLUSION

This prospective randomized control study shows enhanced wound healing and sense of well-being in individuals with diabetic foot ulcer treated with topical application of phenytoin than the other classical wound dressing materials.

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Original Article

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# A Case Cohort Study on Clinical Utility of Garenoxacin Mesylate in Typhoid: Retrospective Analyses

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## Abstract

**Purpose:** Typhoid is an important public health problem globally with the highest crude incidence in the Indian subcontinent. Rising incidence of multidrug-resistant *Salmonella typhi* strains in Asian countries including India is a therapeutic challenge.

**Aim:** The aim was to assess the clinical efficacy and safety profile of the drug garenoxacin in typhoid patients.

**Methods:** This retrospective case series cohort study was conducted at Chavi Medical Centre, Delhi comprised of patients suffering from typhoid who received fluoroquinolones including garenoxacin. Clinical response was evaluated by subjective assessment for control of presenting symptoms. All the patients were examined for side effects.

**Results:** Retrospective analyses among fluoroquinolone cases revealed 25 patients receiving garenoxacin as first line therapy after being diagnosed with uncomplicated typhoid. Therapy with garenoxacin was advised for 7-14 days in 95.4% cases. Clinical success was established in 100% patients. There is no case of therapy failure was reported. None of the cases reported any serious adverse event.

**Conclusion:** Fluoroquinolones remain the therapeutic choice of drugs in uncomplicated cases of typhoid. Garenoxacin is a structurally modified new generation quinolone offering clinical utility against *S. typhi* related infections with the better safety profile.

**Key words:** Fluoroquinolones, Garenoxacin, *Salmonella typhi*, Typhoid

## INTRODUCTION

Typhoid (enteric) and paratyphoid fever remain important public health problems globally and major causes of morbidity in the developing world.[1] Typhoid and paratyphoid fever are acute, invasive, and often life-threatening febrile illnesses caused by systemic infection with the bacterium Salmonella enterica serotype typhi and paratyphi, respectively. Ratio of incidence of disease caused by *S. typhi* to *Salmonella paratyphi* is about 10:1.[2] The World Health Organization (WHO) estimates annual global incidence of typhoid fever about 21.6 million cases and results in at least 215,000 deaths annually.[1] The Indian subcontinent has the highest incidence of typhoid worldwide. The crude incidence of typhoid in south central Asia is 622/1,00,00 cases/year.[1] A review article by Kothari *et al.* (2008) found the incidence of typhoid 9.8/1000 cases/year in Delhi and incidence of 2.14/1000 cases/year in Kolkata.[3]

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Humans are the only natural host and reservoir. The infection is transmitted by ingestion of fecally contaminated food or water. Hallmark features of typhoid are prolonged fever (38.8°C - 40.5°C) in >75% cases and abdominal pain in 30-40% cases at presentation.[4] In absence of appropriate treatment, typhoid fever has a case-fatality rate of 10-30%,

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however this number may be reduced to 1-4% with suitable therapy.[5] In last two decades multidrug resistant (MDR) strains of *Salmonella typhi* have emerged, resistant to chloramphenicol, ampicillin, and trimethoprim - antibiotics long used to treat typhoid fever.[4] Recent WHO Guidelines for management of typhoid fever recommends fluoroquinolones (ciprofloxacin or ofloxacin) as optimal therapy, in mild to severe illness caused by fully sensitive or MDR strains.[2] Increased the use of fluoroquinolones to treat MDR typhoid lead to emergence of *S. typhi* strains with reduced susceptibility and rising minimum inhibitory concentration (MIC) (0.125-1 ug/ml) to ciprofloxacin in the Indian subcontinent, southern Asia, and sub-Saharan Africa; and have been associated with clinical treatment failures.[4]

Garenoxacin a novel des fluoroquinolone offers long-lasting inhibition against both DNA gyrase and DNA topoisomerase IV due to modification structure activity relationship and also exhibits broad-spectrum coverage against both Gram-positive, Gram-negative, and also atypical pathogens including *S. typhi* with the $MIC_{90}$ value of 0.12 ug/ml while achieving high tissue concentrations and high tissue/fluid: Plasma concentration ratio in hepato-biliary tissues.[6-9]

## METHODS

A retrospective case series cohort was analyzed to evaluate the role of fluoroquinolones including garenoxacin as empirical therapy for adults with suspected typhoid infection. The case of typhoid was defined as patient with prolonged persistent fever (>38°C) with significant baseline widal test titers and with or without the negative peripheral smear for malarial parasite. Cases were identified from a database of all adult patients who were treated with fluoroquinolones for fever attending to Chavi Medical Centre, Delhi during July 2014 - September 2014, where the provisional diagnosis was made by treating physician. Patients were under observation for the entire therapy period. Epidemiological, demographic, microbiological, medical history, prior history of antibiotic or fluoroquinolone use, treatment, clinical outcome, and adverse event data were gathered from analyses. Therapeutic response was assessed as a clinical success or complete resolution signifying significant improvement or complete resolution at the end of suggested therapy of 5-14 days. Serious adverse event (SAE) defined as death, disability, hospitalization or prolonged hospitalization, congenital anomaly, or medical abnormality of significance was confirmed to be reported to central or regional pharmacovigilance center by the doctor.

### Statistical Analysis

Descriptive statistics were used to tabulate the data with percentage rate calculated for all categorical nominal and ordinal data variables.

## RESULTS

Between July 2014 and September 2014, 25 cases of typhoid treated with garenoxacin mesylate were analyzed among 114 cases of fever treated with fluoroquinolones at Chavi Medical Centre, Delhi.

### Baseline Demographics

Of 25 cases analyzed 52% were male, and 48% were female (Table 1). Totally, 28% of cases had significant comorbidities, included dyslipidemia, diabetes, and hypertension. There was no history of asthma, chronic obstructive pulmonary disease, tuberculosis. Totally, 24% cases had concomitant risk factors, included history of smoking and history of hypertension. Concomitant medication included antidiabetics, statins, antihypertensives, laxative, none of the cases were prescribed antibiotics or fluoroquinolones other than garenoxacin.

### Clinical Features

The cases included in the study presented with the complaint of prolonged fever (>38°C) (100%), loose motions (4%), burning micturition (16%), swelling (4%). All of these cases had Widal test titers for "O" and "H" agglutinin that were significantly higher than the suggested normal values for the geographic population ("O" agglutinin ≥1:40 and "H" agglutinin ≥1:40 or ≥1:80).[10] Peripheral smear for malarial parasite was negative in all cases. Garenoxacin was administered to these cases at a dose of 400 mg (200 mg × 2 tablets OD) for 5-14 days (Figure 1).

Therapy with garenoxacin was adviced for ≥7-14 days in 95.4% cases, and for <7 days in 4.6% cases. Clinical success was established in 32% cases at the end of 5 days of therapy, and 100% cases at the end of 7-14 days therapy. There is no case of therapy failure was reported (Figure 1).

**Table 1: Baseline demographic parameters of the study (*n*=25)**

| | |
|---|---|
| Total number of patients | 25 |
| Average age | 38.2 years |
| Average weight | 67.1 kg |
| **Study details** | **Number of patients *n* (%)** |
| Gender | |
| Males | 13 (52) |
| Females | 12 (48) |
| Medical history | |
| Dyslipidemia | 6 (24) |
| Diabetes | 5 (20) |
| Hypertension | 3 (12) |

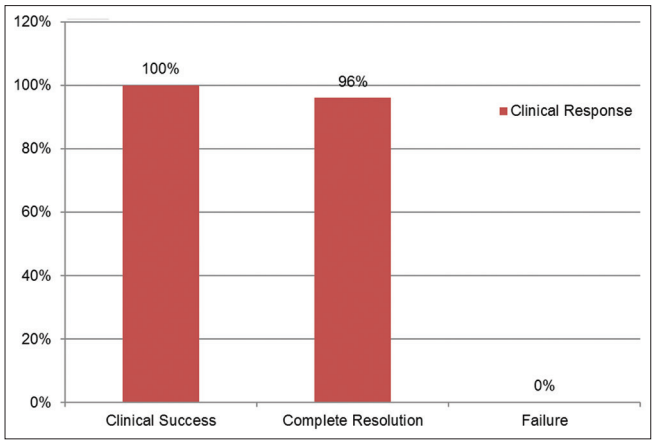


**Figure 1: Clinical response at end of 7-14 days therapy**

### Safety Profile

None of the cases reported any adverse event or SAE, which required discontinuation of therapy or hospitalization.

## DISCUSSION

Typhoid fever is a public health problem globally. Typhoid is endemic in India, south central Asia especially Indian subcontinent documents the highest crude incidence of typhoid worldwide.[1] The emergence of MDR strains (resistant to chloramphenicol, ampicillin, and co-trimoxazole) resulted in widespread use of ciprofloxacin as first-line therapy against both the susceptible and MDR strains of *S. typhi*, especially in Indian subcontinent over past two decades.[4] Recent WHO guidelines also recommend use of fluoroquinolones (ciprofloxacin or ofloxacin) as optimal therapy against both fully sensitive or MDR strains of *S. typhi*.[2]

Frontline use of ciprofloxacin has documented definite treatment failures. Studies have documented that increase in nalidixic acid resistant *S. typhi* strains associated with a consistent increase in ciprofloxacin MIC levels. Decreased susceptibility to ciprofloxacin is defined as ciprofloxacin MIC of 0.12-1 ug/ml. Current $MIC_{90}$ levels for ciprofloxacin have graduated from 0.12 ug/ml to 0.5 ug/ml against *S. typhi* based on updated Clinical and Laboratory Standards Institute (CLSI) evidence-based guidelines, 2012.[11] According to epidemiological surveillance data on reanalysis of 488 clinical isolates with interpretation based on 2012 CLSI evidence-based guidelines only 3% remained susceptible and majority (88%) fell in intermediate susceptible range,[11] where the role of novel therapies or quinolones can be considered.

Garenoxacin is a new generation fluoroquinolone launched in India by Glenmark Pharmaceuticals Ltd., Mumbai. Garenoxacin is desfluoroquinolone that is devoid of a fluorine molecule at the C-6 position and have fluorine incorporated through a C-8 difluoromethyl ether linkage.[8] The clinical efficacy of garenoxacin has been complimented by its dual action against both DNA gyrase and topoisomerase IV in both Gram-positive and Gram-negative pathogens,[6,7] thus requiring mutations in both enzymes for resistance to occur. The $MIC_{90}$ of garenoxacin against salmonella is 0.12 µg/ml.[8] Garenoxacin achieves high tissue concentrations (gall bladder 11.59 mcg/g, liver 1.84 mcg/g) and high tissue/fluid: Plasma concentration ratio (gall bladder 1.70, liver 1.92) in typhoid related tissues.[9] Tissue concentration achieved by garenoxacin in hepato-biliary tissues almost twice and sufficient to exceed $MIC_{90}$ requirements for *S. typhi*. The area under the curve (AUC)/MIC ratio is one of the most important predictors for clinical efficacy of fluoroquinolones.[7] Higher AUC/MIC values have been associated with reducing the emergence of resistance, while still higher values have been found to hasten bacterial eradication and clinical response.[12] At 400 mg daily dose garenoxacin demonstrates AUC/MIC ratio of that is clearly above 125 as stated by FDA guidelines,[7,13] on the other hand AUC/MIC ratio demonstrated by ciprofloxacin (500 mg) and ofloxacin (200 mg) are 23.2 and 117.5 respectively,[8,11,14,15] that is often considered inadequate to offer treatment while "stoking" resistance.

Garenoxacin was also found to be superior in terms of safety profile. A post-marketing surveillance study was done at Japan by Hori *et al.* in 6,412 patients confirmed the superior tolerability profile of garenoxacin with minimal or negligible incidence of gastrointestinal, cardiovascular or central side effects.[16]

The findings of these retrospective analyses are exploratory and need to be further confirmed in larger multicenter, randomized, double-blind clinical trial settings.

## CONCLUSION

Typhoid is currently a global burden to the community. The increase in the incidence of resistant strains appears to be a challenge to the treating physicians. Garenoxacin is a newer generation structurally modified des(f)-quinolone offering dual and persistent action against relevant target site enzymes involved in Gram-negative pathogens including *S. typhi*. With once a day dosing regimen along with better safety profile garenoxacin appears to have added to the armamentarium of the treating physicians.

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Original Article

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# A Comparative Study between Propofol and Thiopentone as Induction Agents in Myasthenia Gravis Patients for Thymectomy

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## Abstract

**Background:** Anesthetic management of patients with myasthenia gravis is challenging, particularly in regards to the goals of respiratory function and extubation. We sought to compare two induction agents in patients undergoing trans-sternal thymectomy, evaluating the intra and post-operative conditions including extubation in the operating room.

**Materials and Methods:** Ten consecutive myasthenic patients undergoing trans-sternal thymectomy were prospectively randomized into two groups: Propofol and thiopentone. In the propofol, group anesthesia was induced with propofol (2 mg/kg) and intubation performed after topical anesthesia of the airway with lignocaine. In thiopentone group, anesthesia was induced with thiopentone (5 mg/kg) and intubation performed after topical anesthesia of airway with lignocaine. In both groups, anesthesia was maintained with isoflurane in oxygen and nitrous oxide. Fentanyl was used for analgesia in both the groups. Intubating conditions, hemodynamic changes, neuromuscular transmission along with postoperative intensive care unit stay were evaluated. Data were evaluated using ANOVA, Chi-square test, and Student's *t*-test.

**Results:** Intubating conditions were good in all patients. No significant hemodynamic changes are observed. Recovery was complete in all the patients, and all were extubated in the operating room. No other significant differences were observed between the two groups.

**Conclusion:** Both of these induction techniques allow early extubation of myasthenic patients in the operating room.

**Key words:** Myasthenia gravis, Propofol, Thiopentone, Thymectomy

## INTRODUCTION

Myasthenia gravis is an autoimmune disorder of the neuromuscular junction. Autoantibodies against the α-subunit of the muscle-type nicotinic acetylcholine receptor destroy acetylcholine receptors of the neuromuscular junction and cause classic transmission failure with muscle weakness and fatigue. The number of active acetylcholine receptors get decreased either by a functional block, by increased rate of degradation of receptors or by complement mediated lysis.[1]

Sparing of other α-subunit of neuronal type nicotine acetylcholine receptors provides an explanation for the lack of autonomic or central nervous system involvement of the disease. In younger age groups, females are affected more often than males are, whereas in elderly age groups (>60 years), males are more frequently affected. There is a striking association between myasthenia gravis and hyperplasia of the thymus, with more than 70% of myasthenia gravis patients having thymus hyperplasia and only 10% having thymomas.

The diagnosis of myasthenia gravis is made by neurological examination and testing of the tendency to fatigue and exhibit increased weakness during exercise or

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repeated contractions. Pharmacologic treatment with anticholinesterases and immunosuppressants is aimed at manipulation of acetylcholine levels and the immune system, or by decreasing the circulating antibodies by plasmapheresis.[2,3]

Although the efficacy of thymectomy is based on retrospective data, it is a widely accepted therapy for myasthenic patients particularly those with thymoma and early-onset generalized myasthenia gravis.[4,5]

Post-operative complications may arise in these patients as a result of a stress-induced exacerbation of myasthenia gravis (myasthenic crisis) or due to an overdose of some drugs such as anticholinesterases (cholinergic crisis), antibiotics or antiarrhythmics.[6,7] Therefore, high-risk patients may require post-operative ventilators support in intensive care unit (ICU).[8]

Many anesthetic approaches have been reported in myasthenia gravis patients.[7,9,10] Here in this study, we compared two non-muscle relaxant anesthesia techniques in myasthenia patients undergoing trans-sternal thymectomy. The main objective was to evaluate the perioperative complications and feasibility of extubation in the operating room.

## MATERIALS AND METHODS

The prospective study was conducted in NRI General Hospital on ten consecutive patients (7 male, 3 female) in the age group of 40-50 years who underwent elective trans-sternal thymectomy.

### Preoperative Patient Demographics

Inclusion criteria: Osserman Stages I and II patients.

Exclusion criteria: Osserman Stages III and IV patients with concomitant respiratory complications.

According to the classification by Ossernman and Jenkins the clinical severity of myasthenia gravis myasthenia gravis was graded in five stages.

I - Only ocular muscle weakness
II - Mild weakness effecting other than ocular muscles
III - Moderate weakness effecting other than ocular muscles
IV - Severe weakness effecting other than ocular muscles
V - Defined by the need for intubation, with or without mechanical ventilation.

Besides routine tests, other pre-operative investigations included chest computed tomography scan, pulmonary functional tests, and detection of various circulating auto-antibodies (anti-acetylcholine receptor, anti-smooth cell, anti-nuclear factor).

All the 10 patients were divided into two groups: propofol and thiopentone. Before inducing the patients with propofol and thiopentone 10% xylocaine spray, is used for topical anesthesia of the pharynx and larynx. 3 min of pre-oxygenation with 100% oxygen by face mask was done, and propofol group is induced with fentanyl (2 μg/kg) and propofol (2 mg/kg). During laryngoscopy topical anesthesia of the vocal cords and trachea was obtained with the application of 4% xylocaine and intubated with adequate sized single lumen endotracheal tube. In thiopentone group, thiopentone 5 mg/kg was used, and the rest of the procedure was same.

In both the groups anesthesia was maintained with nitrous oxide, oxygen, isoflurane (End-tidal [ET] 1-1.5%), and propofol (3-10 mg/kg/h) infusion. Intraoperative monitoring included an electrocardiogram, invasive radial artery blood pressure monitoring, pulse oxymetry, $ETCO_2$, and neuromuscular transmission.

Baseline twitch amplitude of ulnar nerve is established after induction of anesthesia. First twitch (T1) was recorded as a percentage of baseline measure, and train of four was recorded as a ratio between the fourth and the first twitch (T4/T1).

During the intraoperative, we observed the intubating conditions (jaw relaxation and vocal cord abduction) and hemodynamic changes (mean arterial pressure and heart rate). After surgery, we recorded the ^T extubation (time from the end of anesthesia to extubation) and ^T awake (time from the end of anesthesia to eye opening). At the end of surgery, all patients were extubated in the operating room and transferred to the ICU for monitoring.

## RESULTS

Demographic and preoperative characteristics of patients were depicted in Table 1. In the propofol group, mean arterial pressure and heart rate decreased 10% compared

**Table 1: Demographic and preoperative characteristics of patients in the two groups**

| Patient characteristics | Propofol | Thiopentone |
|---|---|---|
| Gender: Male/female | 4/1 | 3/2 |
| Age (SD) | 44.2 (2.68) | 45.4 (2.30) |
| Body surface area (SD) | 1.514 (0.04) | 1.512 (0.08) |
| Osserman's staging | | |
| II a | 4 | 3 |
| II b | 2 | 1 |
| Pre-operative treatment | | |
| Pyridostigmine | 5 | 5 |
| Myasthenia gravis/day (SD) | 240 (60) | 240 (60) |
| Prednisolone (N) | 2 | 2 |
| FEVI (percentage of predicted value) | 83 | 85 |

Data are expressed as mean (SD), FEVI: Forced expiratory volume in the 1st second, No: Number of patients, SD: Standard deviation

to baseline during surgery and returned to the preoperative value at the end of anesthesia. In thiopentone group, no significant change was observed in mean arterial pressure and heart rate (Graph 1a and b). The neuromuscular transmission remained stable in the propofol group, but in the thiopentone group single twitch and train of four decreased 15-20% compared to baseline intraoperatively ($P < 0.05$) and recovered completely after anesthesia (Graph 2a and b).

Since, we combined topical anesthesia for vocal cords with xylocaine along with induction agents propofol and thiopentone the intubating conditions were excellent in both the groups. As we used propofol for maintenance of anesthesia in both the groups, the most striking feature were fast recovery from anesthesia, the rapid orientation, and the minimal interference with psychomotor activity and coordination after prolonged anesthesia.

Duration of surgery and anesthesia, time to extubation, awakening, and postoperative complications are presented in Table 2. Arterial blood gas analysis was taken ½ h after extubation were also within limits. None of the patients experienced postoperative complications like respiratory insufficiency or bleeding for which they were observed 24 h in the ICU.

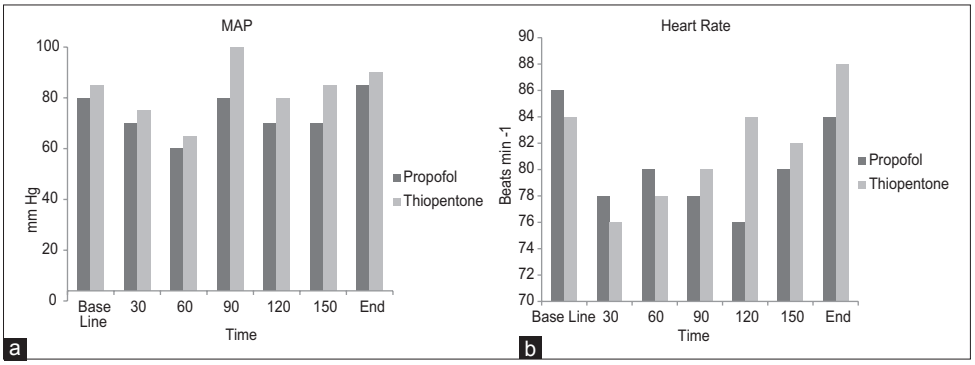
## DISCUSSION

Blalock first successfully introduced thymectomy as a surgical treatment for myasthenia gravis.[11] Early,

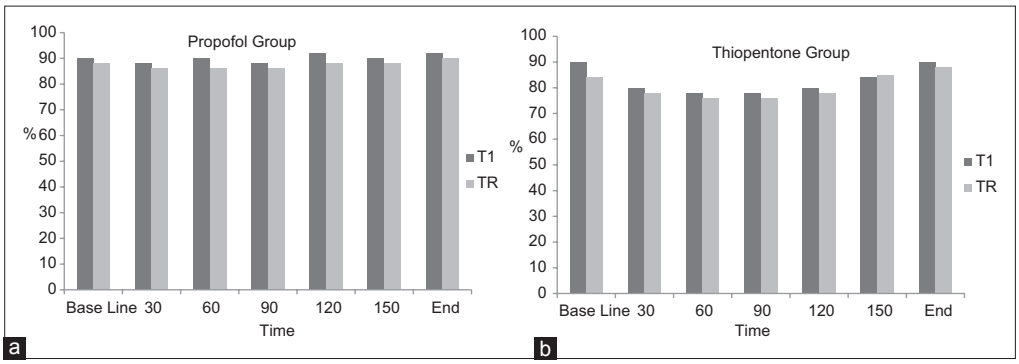
**Table 2: Perioperative patient data**

| Observed parameters | Propofol | Thiopentone/ myasthenia gravis grade |
|---|---|---|
| Duration of surgery (min) (SD) | 246 (24) | 218 (28) |
| Duration of anesthesia (min) (SD) | 278 (25.8) | 270 (22.36) |
| ^Extubation (min) (SD) | 18.6 (2.60) | 30 (3.80) |
| ^Awake (min) (SD) | 25.6 (3.78) | 39.6 (3.64) |
| ABG 0.5 h after surgery | | |
| $Pao_2$ (mmHg) (SD) | 85.2 (2.28) | 83.6 (1.67) |
| $Paco_2$ (mmHg) (SD) | 38.8 (2.28) | 38.4 (2.60) |
| $Fio_2$ | 0.4 | 0.4 |
| Postoperative complications | | |
| Respiratory insufficiency bleeding | | |
| Post-op ICU stay (h) | 24 | 24 |

Data are expressed as mean (SD), Magrade: Grade of myasthenia gravis (Osserman's staging), $F1o_2$: Inspired oxygen concentration, ICU: Intensive care unit, ABG: Arterial blood gas, SD: Standard deviation




**Graph 1: (a and b) Mean arterial pressure and heart rate in the propofol and thiopentone groups at O (baseline), 30, 60, 90, 120, 150 min (during surgery) and at the end of surgery (end). *P* <0.05 compared to baseline, compared to end, and compared to the same moment in the propofol group**




**Graph 2: (a and b) Neuromuscular transmission in the propofol and thiopentone groups O (baseline), 30, 60, 90, 120, 150 min (during surgery) and at the end of surgery. $T_1$ = first twitch (%); TR = T4/T1 ratio, *P* < 0.05 compared to baseline, compared to end, and compared to the same moment in the propofol group**

thymectomy is now the most preferable treatment of choice for most myasthenia gravis patients. The patient must ideally be admitted for thymectomy during the remission phase. As most of the patients are on pyridostigmine, the dose must be adjusted according to the individual need before surgery.

We observed in the present study, that using either propofol or thiopentone for induction and without using muscle relaxants throughout the surgery allows early extubation in the operating room without any postoperative complications. The intubating conditions were excellent in all patients, and no major hemodynamic disturbances were observed throughout the surgical procedure. Minimal changes were observed in the neuromuscular transmission throughout the surgery and showed complete recovery at the end of surgery in both propofol and thiopentone groups.

In myasthenia patients, use of muscle relaxants led to prolonged recovery time and increased the duration of postoperative ventilation.[8,12] Hence, non-depolarizing muscle relaxants were avoided in our study and to facilitate intubation we used the anesthetic spray to the vocal cords for better relaxation. Adequate surgical conditions were also provided intraoperatively during the entire procedure with the use of continuous propofol infusion and isoflurane. Propofol also attenuates skeletal muscle contractions by presynaptic inhibition of acetylcholine release thereby providing better surgical conditions intraoperatively. Though it is better to avoid muscle relaxants, several studies have reported the use of short-acting muscle relaxants (vecuronium, atracurium, cisatracurium) in association with short-acting inhaled anesthetics (sevoflurane, desflurane) provided early recovery and extubation.[13-15]

As myasthenia gravis patients are more sensitive to neuromuscular depression by the volatile agents,[16] we used low-fat soluble isoflurane in our study, so that it can be rapidly eliminated by the lungs and ensure complete neuromuscular recovery.

We compared two anesthetic techniques in ten myasthenia gravis patients coming from thymectomy. Good intubating conditions with acceptable jaw mobility and vocal cord relaxation were observed in the propofol group.[17] Good hemodynamic stability throughout the intraoperative period and mean time to awake and extubation were similar in both groups.

The patients in our stuffy group belong to Osserman's Class I or II, which have no preoperative respiratory involvement. Whether the determination of postoperative mechanical ventilation imply, preoperative Osserman's classification,[18] or the use of intraoperative muscle relaxants is debatable.

In our study, the management of myasthenia gravis patients with standardized anesthesia technique (without muscle relaxants) provided optimal intubating and operating conditions and also avoided the need for postoperative ventilatory support and shorter duration of hospital stay.

## CONCLUSION

This study with propofol and thiopentone as induction agents without the use of muscle relaxants throughout the surgical procedure for myasthenia gravis patients provided satisfactory anesthetic conditions for intubation and also allowed early extubation after the procedure.

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Original Article

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# Presence of Fungal Organisms in Chronic Rhinosinusitis with Nasal Polyposis: A Clinico Pathological Study from Kerala

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## Abstract

**Background:** Fungi have been implicated in the etiopathogenesis of chronic rhinosinusitis (CRS) with nasal polyposis (NP). Our aim was to determine the presence of fungal organisms and to identify the fungal species as this would help in the management of the condition.

**Materials and Methods:** The study design was descriptive. Totally, 60 immunocompetent patients of CRS with bilateral and or unilateral NP comprised the study group. Fungal culture of nasal washings, direct microscopy, fungal culture, and histopathology of the specimen were carried out. Nasal washings of 16 healthy volunteers who served as control were cultured for fungus.

**Results:** Nasal washings of 48 patients (80%) were positive for fungus and the most common organism isolated was *Aspergillus fumigatus*. Direct microscopy was positive in 15 cases (25%). Specimen culture was positive in 35 cases (58.33%), the most common organism being *A. fumigatus*. The histopathology for fungus was positive in 19 cases (31.7%). The fungus was positive in the nasal washings of 15 volunteers (93.75%) and the most common organism isolated was *Aspergillus niger.*

**Conclusion:** The fungal prevalence in our study was determined by the histopathological result since the majority of the volunteers also had a positive fungal culture of the nasal washings. *Aspergillus* species was the most common isolate, which was found to be different when compared with the western literature. With a moderate prevalence rate in various studies, antifungal therapy may be considered in the medical management of CRS with NP.

**Key words:** *Aspergillus fumigatus, Aspergillus niger*, Nasal polyposis, Rhinosinusitis

## INTRODUCTION

Chronic rhinosinusitis (CRS) is an inflammatory disease of the nose and paranasal sinuses which is present for at least 12 weeks, without complete resolution. The disease is characterized by the presence of symptoms such as nasal discharge or obstruction, facial pain, hyposmia; and with endoscopic features such as polyps, purulent discharge and mucosal edema.[1]

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Nasal polyposis (NP) is a chronic inflammatory disease of the mucous membrane of the nose and paranasal sinuses, presenting as smooth gelatinous, round or pear-shaped unilateral or bilateral pedunculated masses of inflamed mucosa prolapsing into the nose. The incidence of NP is between 1% and 4% of the population.[2] The main cause of polyp formation is not exactly understood, and the relationship between NP and chronic sinusitis is much debated.

Several factors have been implicated in the development of CRS. Ostial blockage by edema, inflammatory mucous and delayed recovery of mucociliary function, and mucous recirculation are some of the mechanisms that lead to a transition from an acute to chronic inflammatory process, while certain anatomical abnormalities may not be as much

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of a factor as believed earlier.[1] NP is considered as part of the spectrum of CRS.

Although NP is considered as a multifactorial disease with several different etiological factors, chronic persistent inflammation is the most significant factor in its formation.[3] Viral, bacterial, and fungal infection; and genetic factors have all been suggested as causes of inflammation in NP. Chronic inflammation leads to reactive hyperplasia of the mucous membrane, which can result in the formation of polyps.[4] Recently, fungal etiology has been proposed to underlie severe NP.[4] The presence of fungus in the nose and sinuses may be benign, or it may cause a spectrum of fungal diseases, which can range from noninvasive to invasive fulminant fungal diseases.[1]

Fungal specimen rates have been found to vary from 0% to 100% depending on the different techniques used for specimen collection and detection methods.[1] Ponikau *et al.*[5] have reported the presence of fungus in more than 90% among the controls, using his novel technique of collecting the nasal washings for fungal culture.

The purpose of this study was to determine the presence of fungal elements in the nasal washings and specimen of nasal polyps, the types of organisms and their role in the formation of polyposis in CRS.

### Objectives

1. To determine the presence of fungal organisms in CRS associated with NP by both culture and histopathology.
2. To identify the different types of fungal organisms in NP.

## MATERIALS AND METHODS

The study was conducted for a period of 2 years beginning from the first of January, 2013. A total of 60 patients with sinonasal polyposis who were treated surgically in the department of ENT at Government Medical College Alappuzha, Kerala during that period were included in the study.

The study design was descriptive.

### Eligibility Criteria

1. Cases of CRS with single or multiple, unilateral or bilateral NP from the age group of 15-65 years were included.
2. Totally, 20 volunteers with no symptoms of nasal or paranasal sinus disease, inhalant allergy, served as control group.
3. Patients and controls were instructed not to use any steroidal medication 1 month before the study to prevent any reduced eosinophilic inflammation.

### Exclusion Criteria

1. Patients with age below 15 years (to exclude congenital lesions) and above 65 years (to exclude tumor masses).
2. Immunocompromised patients.
3. Patients who had undergone surgery previously.
4. Patients who were on topical or systemic steroid for the past 1 month before the study period.

Ethical Committee clearance was obtained initially. The study included males and females. A total of 60 patients suffering from CRS with NP were enrolled. Totally, 16 healthy volunteers without any history of rhinosinusitis served as control. Informed consent was signed by all the patients and the volunteers for sharing in the scientific research. Specially designed proforma was used for data collection. All were subjected to the following:

- A full ENT examination including the face for any asymmetry or swelling in the sinus region and cheek. Nose and throat were examined to observe the effects of nasal obstruction. Eyes were examined by the ophthalmologist.
- Diagnostic nasal endoscopy to confirm the presence of the polyps and mucin.
- Computed tomography (CT) of the nose and paranasal sinuses with coronal and axial 5 mm thick cuts in both soft tissue and bone windows for hyperattenuation, calcification, bony erosion, and intracranial extension.

### Collection and Culture Techniques of Nasal Lavage

Specimens were collected using the nasal lavage method described by Ponikau in 1999.[5] This method allowed maximum collection of mucus and gave a better yield of fungus in the culture medium. Two puffs of oxymetazoline spray, 0.1% were sprayed into each nostril to produce vasoconstriction. The patient was asked to inspire deeply and hold it and then after 2 min, each nostril was flushed with 20 ml of sterile saline using a sterile curved blunt needle. The patient exhaled forcefully through the nose during the flushing. The return was collected in a sterile pan, put in a sterile centrifuge 50 ml tube and sent to the microbiology department in our college. This was processed and inoculated into the Sabouraud glucose agar media with chloramphenicol and cycloheximide. The dish was incubated at 30°C and 37°C, as dimorphic fungi will appear as mould at room temperature and as yeast at body temperature. The plates were examined at a 3 day interval for a period of 30 days for fungal growth. All the specimens provided by ENT Department with a clinical diagnosis of nasal polyp were included.

### Collection of Surgical Specimen and Histologic Examination

Endoscopic sinus surgery was tailored according to the need of the patient. Microdebriders were avoided, and suction devices were used discreetly. After surgery, samples were divided into two parts under sterile process in the operation room. Great care was taken to preserve the mucous over the inflamed tissue as fungus is generally found to colonize mucous. The specimen was placed in a nonstick sheet rather than on a towel to prevent absorption and loss of mucous.[5] One part was placed in formalin for histopathology, and the other in sterile normal saline and was sent to the microbiology department for the fungal culture of specimen with a complete history of the patient. Culture of the specimen was done as described earlier. Multiple serial sections of different specimens from each patient were stained with hematoxylin and eosin to identify the eosinophils in the mucous and gomori methenamine silver to identify the fungi.

Statistical analysis was performed with the use of SSPS 16.0 software, and Pearson's Chi-square test was used for comparing groups.

## RESULTS

Among the sixty patients of CRS with NP, 33 (55%) were male while 27(45%) were female, and their age ranged between 16 and 55 years. Maximum patients were between the age ranges of 46-55 (32%) years (Table 1).

The majority (44) belonged to the low socioeconomic group (73%). A total of 25 patients were manual laborers (41.7%), and 18 (30%) were housewives. Farmers, shopkeepers, and students formed the remaining group of 17 (28%) (Table 2).

A total of 36 patients (60%) are presented with bilateral nasal polyps, 20 with multiple unilateral polyposis (33.3%), and 4 with single unilateral polyp (6.7%). Proptosis was found only in 3 patients with multiple unilateral NP with corroborative CT scan findings of bony erosion of the infraorbital wall in 2 cases and of lamina papyracea in 1 case. In the majority of patients, more than one sinus was involved, with maxillary sinus being the most common.

Positive culture of the nasal washings was found in 48 patients (80%), among whom 25 (42%) were of bilateral multiple NP, 18 (30%) of unilateral multiple NP, and 5 (8%) of unilateral single polyp (Table 3). The most commonly isolated organism was *Aspergillus fumigatus* (58.3%) followed by *Aspergillus niger* (33.3%), *Candida* (4.2%), and *Fusareum* species (2.1%) (Table 4).

**Table 1: Age group distribution**

| Age in years | *n* | % age |
|---|---|---|
| 16-25 | 6 | 10 |
| 26-35 | 14 | 23 |
| 36-45 | 17 | 28 |
| 46-55 | 19 | 32 |
| 56-65 | 4 | 7 |

**Table 2: Occupation**

| Occupation | Frequency=*n* | Percentage |
|---|---|---|
| Manual laborer | 25 | 41.7 |
| Shopkeeper | 7 | 11.7 |
| Housewife | 18 | 30 |
| Farmer | 2 | 3.3 |
| Student | 5 | 8.3 |
| Nil | 3 | 5 |
| Total number | 60 | 100 |

Positive microscopy was found in 25%, 21.7% being from the multiple unilateral NP (Table 3). Direct microscopic examination of the specimens in the study showed branched septate hyphae ($n$ = 9) and beaded spherical spores ($n$ = 6) in 15 specimens (25%).

Allergic mucin was found in 12 (20%) consecutive surgical cases, among whom 11 patients were with multiple unilateral polyposis and 1 with bilateral multiple polyposis (Table 3). Mycological culture of the samples yielded pure growth of fungi in 35 cases (58.3%). The most commonly isolated fungi were *A. fumigatus* (45.7%) and *Niger* (22.9%) followed by *Aspergillus flavus* (11.4%), *Penicillium* (11.4%), *Candida albicans* (2.9%), *Fusareum* (2.9%), and *Alternaria* (2.9%) (Table 4).

The histopathological examination of these specimens revealed soft tissue invasion by fungal elements in 2 cases of multiple unilateral NP whose culture had yielded *A. flavus* in two cases and *Penicillium* in the other. Fungal elements like hyphae, conidiospores were found in 19 (31.7%) specimens.

Incidentally, the nasal washings of the volunteers yielded positive fungal culture in 15 cases (93.75%), *A. niger* was cultured in 14 (87.5%), *A. fumigatus* (6.25%) in one and one was culture negative (6.25%).

## DISCUSSION

CRS affects approximately 15% of the adult population. Several factors have been implicated in the development of CRS. Ostial blockage by edema, inflammatory mucous and delayed recovery of mucociliary function, and mucous recirculation are some of the mechanisms that

**Table 3: Clinical, endoscopic, CT, and culture results of the study group**

| Endoscopy findings | Total no of patient involved and % | Proptosis and facial swelling no of patients and % | CT scan bony erosion no of patients and % | Positive culture of nasal washing no of patients and % | Allergic mucin no of patients and % | Positive HPE no of patients and % | Positive HPE and tissue invasion no of patients and % | Positive microscopy no of patient and % | Positive culture of tissue specimen no of patients and % |
|---|---|---|---|---|---|---|---|---|---|
| Bilateral polyps | 31 (52) | 0 (0) | 0 (0) | 25 (42) | 1 (1.7) | 2 (3.3) | 0 (0) | 2 (3.3) | 11 (18.3) |
| Unilateral multiple polyps | 22 (37) | 3 (5) | 3 (5) | 18 (30) | 11 (18) | 12 (20) | 5 (8) | 13 (21.7) | 21 (35) |
| Unilateral single polyps | 7 (12) | 0 (0) | 0 (0) | 5 (8) | 0 (0) | 5 (8.3) | 1 (1.7) | 0 (0) | 3 (5) |
| Overall positivity | 100 | 5 | 5 | 80 | 20 | 31.67 | 9.7 | 25 | 58.3 |

CT: Computer tomography

**Table 4: Fungal organisms isolated in nasal washings and tissue specimens**

| Fungal organism isolated | No of culture positive nasal washings with % | No of culture positive specimen with % |
|---|---|---|
| *Aspergillus fumigatus* | 28 (58.3) | 16 (45.7) |
| *Aspergillus niger* | 16 (33.3) | 8 (22.9) |
| *Aspergillus flavus* | 0 (0) | 4 (11.4) |
| *Penicillium* | 0 (0) | 4 (11.4) |
| *Candida albicans* | 2 (4.2) | 1 (2.9) |
| *Fusareum* | 1 (2.1) | 1 (2.9) |
| *Alternaria* | 1 (2.1) | 1 (2.9) |
| Total number | 48 | 35 |

lead to a transition from an acute to chronic inflammatory process.[1]

NP affects 1-4% of the population.[2,4] Histologically NP is characterized by infiltration by inflammatory cells like eosinophils or neutrophils.[3] Frequently, nasal polyps are associated with asthma or aspirin sensitivity.[6] A genetic link has been demonstrated recently between HLA-A74 and NP but the current knowledge in this area remains very limited.[6]

In 1791, Reflaignaud[1] first reported fungal sinusitis.[5,6] The fungal spores in the environment on inhalation, settle down in the sinuses initiating a hypersensitivity reaction leading to the formation of polyps in certain individuals. At the same time, these spores get access to the nose or PNS of an individual already having nasal polyps. Chronic irritation of the narrow ostiomeatal complex, which is considered as the key area in development of polyps[2] causes mucosal edema, obstruction of natural ostia resulting in impeded mucociliary clearance, bacterial overgrowth, and release of chronic inflammatory mediators like cytokines which attract other inflammatory cells.[2] Polyps contain a high level of mast cells which release eosinophils. The inhaled fungal spores in the sinus mucous cause the eosinophils to be released into the lumen, which cluster around and attack the fungal elements, thereby leading to release of toxic mediators such as interleukins and ensuing secondary inflammation.[2,4]

There have been a number of reports of fungal infection in the immunocompetent people.[2] Polyps if left untreated, can become aggressive locally. They can cause bony erosion, extending intracranially, or orbit, causing proptosis, and visual impairment.[2] The presence of fungus in polyposis can lead to recurrence.[1]

Fungal rhinosinusitis (FRS) can range from benign localized fungal colonization to the extremely aggressive acute invasive FRS. Each of the clinicopathological variants of FRS is associated with unique climatic, geographical, and host-related risk factors, and different fungal organisms.[7]

FRS can affect both the immunocompetent and immunocompromised individuals. In immunocompetent people, it is usually indolent or chronic, whereas, in the latter, it is fulminant.[8] Once considered rare, the incidence of FRS has increased during the past two decades. Improved selection of patients based on clinical and radiological findings and newer methods of collection of the tissue samples have led to an increased evidence of fungal involvement in sinusitis.[9]

In the present study, the most common age group presenting with NP was 46-55 years with a slight male preponderance. All were immunocompetent. Manual laborers and housewives were the most commonly affected class.

In our study, the culture of the nasal washings was positive in 80% of cases, with *A. fumigatus* predominating (58.3%), followed by *A. niger* (33.3%). Incidentally, among the 16 volunteers, 15 individuals gave a positive fungal culture of the nasal washings, with *A. niger* in 14 cases and *A. fumigatus* in one case. It was noted that the presence of *A. fumigatus* in the culture of nasal washings among the patients with NP was statistically more significant when compared with that of the healthy, volunteers ($P < 0.04$).

Bony erosion was seen in 3 cases of multiple unilateral NP. Considering the number of bilateral multiple and unilateral single polyposis together, the bony erosion associated with multiple unilateral NP was statistically significant ($P < 0.05$).

About 18% of multiple unilateral polyposis had associated the presence of allergic mucin, which is considered as one of the diagnostic criteria for allergic fungal rhinosinusitis (AFRS).

Since, AFRS may not typically involve individuals with atopy, there have been suggestions to consider AFRS as eosinophilic fungal rhinosinusitis due to the predominance of eosinophils in the mucous,[3] which was similarly observed in the histopathology of the specimens in our study.

Positive HPE was seen in 31.67% of cases, with tissue invasion in 9.7% of cases, all of whom were of multiple unilateral NP, which was not statistically significant. Similarly, though *A. fumigatus* was the most commonly isolated fungal organism by the culture of the specimen, this was not found to be statistically significant.

In our study, an overall prevalence rate of 31.7% was noted histopathologically among the patients with clinical suspicion of FRS. Though fungal organisms were isolated by both cultures of nasal washings with a higher prevalence rate, the possibility of contamination could not be ruled out. Furthermore, nasal washings in volunteers had a high positivity rate of the fungal culture. Due to the presence of abundant fungal spores in warm, humid environment in Kerala, it is reasonable to assume that fungal colonization is present even in the normal nasal mucosa. Hence, histopathology seemed a more rational method to assess the association of fungal organisms in NP.

The prevalence rate by the study conducted by Amin and Kakru[10] at Srinagar was found to be 30%, and by Chakraborty *et al*.,[10] 42% at Chandigarh Venugopal *et al.*[11] in Tamil Nadu 45%, In a Malaysian study, the prevalence was found to be 26.7%,[9] Braun *et al.*[10] in Europe, found that 75.5% of specimens were positive fungal elements. Mayo clinical researchers diagnosed allergic fungal sinusitis in 93% of cases.[10]

Based on several studies in literature, fungal specimen rates have been found to vary from 0% to 100%.[1] Depending on the different specimen collection techniques and fungal detection techniques, and also influenced by geographical conditions both the prevalence rate and the type of organisms isolated have been found to vary from place to place.

In our study, the most common fungal organism isolated in fungal culture was *Aspergillus* species, with a predominance of *A. fumigatus* followed by *A. niger* and *A. flavus*. The prevalence of *Aspergillus* species was in accordance with the studies conducted by Lakshmanan *et al.*[9] in Tamil Nadu, Challa *et al.*[12] in Hyderabad, Deshmukh *et al.*[11] in Maharashtra and Garg *et al.*[13] in Delhi, being the various states of India, whereas, dematiaceous fungal organisms such as bipolaris and curvularia have been found to be prevalent in North America in these conditions.[9]

Among the *Aspergillus* species, *A. fumigatus* was the most frequently isolated organism followed by *A. niger* and *A. flavus* in our study, while *A. flavus* was most frequently isolated followed by *A. fumigatus* in fungal studies in Tamil Nadu, Srinagar, Maharashtra, Delhi. In Germany Vennewald *et al.* isolated *A. fumigatus* and in Malaysia, *A. niger* was most commonly isolated. This indicates that *Aspergillus* species has been found to vary from place to place.[10] It is interesting to note that *A. flavus* was isolated in tissue specimens with invasion histopathologically.

*Penicillium* species has been consistently found in FRS, 17.64% in Srinagar and Goh *et al.* isolated this in 14.3%.[10] In our study, *Penicillium* was isolated in 6.7% of cases.

Geographical variation has led to the isolation of different fungal species in different regions, as cited by various studies all over the world. In India, the most frequently reported genders are *Aspergillus* species, *Alternaria, Candida, Penicillium* and *Fusarium* in AFRS.[12] The fungal pattern isolated in Kerala was similar to other studies in India. Though no attempt was made to classify FRS clinically, presence of allergic mucin in 20% of the patients, predominantly in unilateral multiple NP, coupled with the fact that all the patients were immunocompetent, indicate that *Aspergillus* species is the most common fungus isolated in AFRS in India. On the contrary, dematiaceous fungal organisms are associated with AFRS in the western literature.[12] Therefore, the geographical pattern, climate and host factors play a significant role in the involvement of fungal organisms in CRS.

In the present study, FRS was more common among patients who lived in warm, humid environment. Unilateral multiple sinonasal polyposis was more implicated with fungal etiology than bilateral polyposis. The overall prevalence rate varies depending on the host factors, geographical conditions, and the methods of collection of specimen for fungal isolation.

The ubiquitous nature of fungal spores makes it difficult to determine their etiological role for fungal infection in CRS. Fungal spores are present in air, soil, and dust. The warm, moist environment of the upper respiratory tract is ideal for fungal colonization, and initiation of inflammation in susceptible individuals**.** Knowing the fungal flora and its prevalence helps in the diagnosis and management of FRS. It is believed that the presence of fungal organisms in sinonasal polyposis can lead to recurrence after treatment.[2] Considering the moderate, yet significant fungal prevalence rate in various studies in India, the use of antifungal drugs in the medical

management of CRS of selective cases may be considered to avoid serious complications associated with FRS.

## CONCLUSION

The mere presence of fungal organisms in association with NP is insufficient to implicate them as causative agents in CRS. Furthermore, the host resistance factors should be kept in mind as fungal infections are more aggressive in immunocompromised states. There is still a poor understanding of when fungi are present as pathogens or simply a part of the normal flora. Positive microscopy, histopathology, PCR assay may be considered more significant than culture alone as fungal spores are present everywhere in the environment. The different climatic pattern in India, when compared to the west, may account for the different pattern of organisms isolated in immunocompetent individuals as presented in the various studies conducted in India. As sinonasal polyposis recur frequently, further research is needed to determine the precise role of fungi in the pathogenesis of this condition and to the judicious use of specific antifungal drugs against FRS as this is associated with a prolonged morbidity among the sufferers.

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Original Article

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# Prediction of Post Phacoemulsification Visual Acuity in Patients with Different Degree of Lens Opacity using Heine Retinometer

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## Abstract

**Objective:** The objective was to find the usefulness in predicting the visual outcome in patients who are undergoing cataract surgery by using a convenient and standard instrument.

**Patients and Methods:** This retrospective cohort study was done using Heine lambda 100 retinometer to find the usefulness in predicting the visual outcome at the Eye Center in King Abdulla Medical City, Makkah, KSA.

**Results:** It is highly specific in the prediction of post-operative visual acuity (VA) (93.5%). It has higher accuracy 87.5%, sensitivity 86%, and specificity 100% in mild cataract than denser one.

**Conclusion:** The Heine lambda 100 retinometer appears to be a clinically useful device to use in patients with comorbid eye condition such as Amblyopia, macular degeneration, and a corneal disease in predicting the visual outcome.

**Key words:** Phacoemulsification, Retinometer, Visual acuity

## INTRODUCTION

The primary aim of cataract surgery was to improve visual acuity (VA). The prediction of post-operative VA needs to be accurate and precise. Some of the patients do not express a significant and satisfactory visual improvement because of ocular co-morbidities that affect the visual potential. Overestimation of the visual outcome will undoubtedly result in patient disappointment and should be avoided whenever possible. There are innumerable tests developed to assess to predict accurately potential VA after cataract surgery.

The purpose of these tests was to determine, if the calculated visual potential is effected by cataract opacity alone or other underlying ocular pathology. It is an important pre-operative test in identifying those patients in whom cataract extraction will not yield a satisfactory postoperative VA. Hence, it helps to inform properly and prepare those patients.

Cataract surgery may improve other aspects of visual function such as contrast sensitivity, color perception, reduction of glare, and visual field.[1] The potential visual test can help to determine, which part of the visual loss is because of macular retinal pathology seen preoperatively or because of lens opacity alone.

A number of different examination instruments have been used and described such as electroretinography, visual evoked potentials (Bertrand *et al.*; Odom *et al*; Sherman *et al.*), color saturation discrimination[2] critical flicker frequency, laser or white-light Interferometry, blue-field entoptic tests (Sinclair *et al.*; Morris and Missotten) B-scan ultrasonography[3], and potential acuity meter (PAM) other tests using routine eye examination equipment have also been proposed: Potential acuity pinhole test. Furthermore, illuminated near card assessment and

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reading speed test these have been compared to the more sophisticated methods.

A simple and inexpensive macular function test using a Parinaud near reading chart by Vryghem *et al*.[1] Consisting a +8 D trial lens and a Heine ophthalmoscope, which they called the Vryghem macular function test (VMFT). At the end of a study, consisting of 396 uneventful consecutive cataract surgeries, it was concluded that the VMFT test was a simple and reliable method of estimating the visual outcome after cataract surgery. Since the test is easily available and simple, we decided to compare it to the Lot mar-light interferometer, currently the instrument used in our clinic to predict VA after cataract surgery.

A very dense cataract does not permit satisfactory fundoscopic examination. In such cases, a reliable potential VA test may be helpful in the preoperative decision-making process.

A perfect potential visual test should be easy to use, precise, reproducible, and should require only minimal examination equipment. It should have fairly good accuracy and high predictive value.

A prospective study was done in 1994 to compare the Heine retinometer with the mentor Guyton-Minkowski[4] PAM to assess the potential VA before cataract surgery. Neither instrument was accurate in predicting actual final VA.

Another study to evaluate multiple pinhole accuracy and Heine retinometer[5,6] to assess the VA after lens extraction. It was found that the Heine retinometer has accuracy similar to the multiple pinholes in the prognosis of VA. The results concluded Lens extraction should not be deferred due to the large number of false negative results Reis.

However, another study in 2010 revealed that in most cases Heine retinometer underestimated or maintained best corrected VA (BCVA) 3 months postoperatively in patients. With regards to the morphological classification of cataracts, the higher the opacity of the lens, the greater the VA underestimation.[7]

In our study, we utilized the Heine lambda 100 retinometer, which is very easy to use clinically. We included patients with a comorbid eye condition such as amblyopia, macular degeneration, corneal disease, and to find the usefulness in predicting the visual outcome.

## PATIENTS AND METHODS

This retrospective cohort study was done at the eye center in King Abdulla Medical City, Makkah, KSA, between March 2011 and May 2013. The range of age of patients varied from 18 to 80 years with no predilection for sex. All cases with pre- and post-operative complications were excluded.

### Methodology

Chart review was performed, and data were collected for the following: Patients age, preoperative VA in decimal scale, potential VA using retinometer, post-operative BCVA.

VA of counting fingers was given a decimal value of 0.0140 and "hand movement" was given a value of 0.0052 according to the approximation of Kilian Bonsel, *et al*.

### Patients were Divided into 3 Groups

Those who had VA with Heine retinometer equal to the postoperative BCVA, patients in whom VA was overestimated and patients in whom VA was underestimated with Heine retinometer comparing to the postoperative BCVA.

### Statistical Analysis

Data were analyzed on SPSS 21.0 at King Abdullah Medical City Research Center. Numeric data were presented as a mean ± standard deviation or the median and range, according to distribution. For analysis purpose patient's data classified according to Heine retinometer or postoperative VA decimal values into those with values <0.5 and those with VA values of 0.5 or more. Between the groups, comparison was done using the independent sample *t*-test or ANOVA as appropriate for numeric variables and using Chi-squared test for categorical variables. A two-sided alpha was set at 0.05. The sensitivity, specificity, and accuracy of Heine retinometer in predicting post-operative VA of 0.5 or more was calculated as follows:

Sensitivity = (True positives)/(true positives + false negatives)

Specificity = (True negatives)/(true negatives + false positives)

Accuracy = (True positives + true negatives)/total number of cases

True positives = Cases correctly predicted by HR to have a post-operative BCVA of 0.5 or more.

True negatives = Cases correctly predicted by HR to have a post-operative BCVA of <0.5.

### Ethical and Confidentiality

The study was approved by KAMC IRB.

## RESULTS

The review of hospital records from March 2011 to May 2013 showed 164 eyes fulfilling the eligibility criteria.

Two eyes were excluded from the analysis because of having predicted post-operative VA of "light perception," and so a numeric value could not be assigned. The age of patients ranged from 28 to 93 years at the time of cataract surgery. However, only 6 eyes belonged to patients 40 years of age or less. Most of the eyes (68.5%) had a moderate cataract, (4.9%) had mild cataract, and (26.5%) had a severe cataract.

**Table 1: Post-operative VA by HR between mild, moderate and severe cataract density**

| | Cataract severity | | |
|---|---|---|---|
| | Mild *n*=8 | Moderate *n*=111 | Severe *n*=43 |
| Pre-operative VA (decimal scale) | | | |
| Mean±SD | 0.35 | 0.17 | 0.142 |
| Median | 0.30 | 0.10 | 0.014 |
| Interquartile range | | | Missing=1 |
| Pre-operative HR value (decimal scale) | | | |
| Mean±SD | 0.45 | 0.323 | 0.216 |
| Median | 0.50 | 0.30 | 0.15 |
| Interquartile range | | | |
| Post-operative BCVA (decimal scale) | | | |
| Mean±SD | 0.75 | 0.646 | 0.603 |
| Median | 0.75 | 0.70 | 0.60 |
| Interquartile range | | | |
| The difference between post-operative BCVA value and pre-operative HR value | | | |
| Mean±SD | −0.216 logmar | −0.323 | −0.911* |
| Pre-operative VA <0.5 (decimal scale) *n* (%) | 6 (75) | 104 (93.9) | 37 (86) |
| Pre-operative HR value <0.5 (decimal scale) *n* (%) | 2 (25) | 82 (73.9) | 37 (86) |
| Post-operative BCVA <0.5 (decimal scale) *n* (%) | 1 (12.5) | 19 (17.1) | 11 (25.6) |

BCVA: Best corrected visual acuity, SD: Standard deviation, VA: Visual acuity

There is a statistical significant difference in the prediction of post-operative VA by HR between severe and mild ($P = 0.002$), and severe and moderate cataract ($P = 0.000$) with better predication in case of mild and moderate cataract density. In contrast, there is no statistical significant difference in the prediction of post-operative VA by HR between Mild and moderate cataract density $P = 0.844$ (Table 1). The distribution of different cataract types is shown in (Table 2) almost 28% of eyes had all types of cataract while around 27% had nuclear and posterior subcapsular cataract, 18% had nuclear cataractn and only 13% had posterior cataract. At least one comorbidity was present in 28.6% of the eyes, Comorbidities took the form of amblyopia $n = 10$ (6.1%), macular diseases $n = 16$ (9.8%), corneal diseases $n = 14$ (8.5%), glaucoma $n = 13$ (7.9%). However, in the presence or absence of comorbidities there is a statistical significant difference in the predicted values by HR and BCVA $P = 0.001$ and $P = 0.002$, respectively (Table 3).

## DISCUSSION

The predication of post-operative VA needs to be accurate and precise.

Overestimation of the visual outcome will undoubtedly result in patient disappointment and should be avoided whenever possible.

This study showed a statistically significant difference between pre-operative Heine Retinometer VA and BCVA after phacoemulsification with $P = 0.002$.

**Table 2: Distribution of different type of cataracts**

| | Cataract type | | | |
|---|---|---|---|---|
| | Nuclear *n*=27 | Posterior *n*=21 | Nuclear and posterior *n*=44 | All *n*=45 |
| Pre-operative VA (decimal scale) | | | | Missing=1 |
| Mean±SD | 0.166 | 0.169 | 0.168 | 0.155 |
| Median | 0.05 | 0.15 | 0.10 | 0.05 |
| Interquartile range | | | | |
| Pre-operative HR value (decimal scale) | | | | |
| Mean±SD | 0.276 | 0.362 | 0.307 | 0.247 |
| Median | 0.30 | 0.30 | 0.30 | 0.30 |
| Interquartile range | | | | |
| Post-operative BCVA (decimal scale) | | | | |
| Mean±SD | 0.65 | 0.776 | 0.591 | 0.625 |
| Median | 0.70 | 0.80 | 0.70 | 0.70 |
| Interquartile range | | | | |
| The difference between post-operative BCVA value and pre-operative HR value | | | | |
| Mean±SD | −0.63 | −0.445 | −0.345 | −0.646 |
| Pre-operative VA <0.5 (decimal scale) *n* (%) | 26 (96.3) | 20 (95.2) | 41 (93.2) | 40 (90.9) |
| Pre-operative HR value <0.5 (decimal scale) *n* (%) | 19 (70.4) | 14 (66.7) | 32 (72.7) | 39 (86.7) |
| Post-operative BCVA <0.5 (decimal scale) *n* (%) | 5 (17.9) | 1 (4.8) | 9 (20.5) | 10 (21.7) |

BCVA: Best corrected visual acuity, SD: Standard deviation, VA: Visual acuity

**Table 3: Predicted values by HR and BCVA in presence or absence of co-morbidities**

| | Total *n*=162 | No eye co-morbidity *n*=114 | With one or more eye co-morbidities *n*=48 |
|---|---|---|---|
| Pre-operative VA (decimal scale) | Missing=1 | Missing=1 | |
| Mean±SD | 0.174 | 0.178 | 0.163 |
| Median | 0.1 | 0.1 | 0.075 |
| Interquartile range | | | |
| Pre-operative HR value (decimal scale) | | | |
| Mean±SD | 0.301 | 0.312 | 0.275 |
| Median | 0.3 | 0.3 | 0.3 |
| Interquartile range | | | |
| Post-operative BCVA (decimal scale) | | | |
| Mean±SD | 0.64 | 0.714 | 0.464 |
| Median | 0.7 | 0.7 | 0.5 |
| Interquartile range | | | |
| The difference between post-operative BCVA value and pre-operative HR value | | | |
| Mean±SD | −0.474 | −0.565 | −0.257 |
| Pre-operative VA <0.5 (decimal scale) *n* (%) | 147 (90.7) | 104 (91.2) | 43 (89.6) |
| | Missing=1 | | |
| Pre-operative HR value <0.5 (decimal scale) *n* (%) | 121 (74.7) | 83 (72.8) | 38 (79.2) |
| Post-operative BCVA <0.5 (decimal scale) *n* (%) | 31 (19.1) | 9 (7.9) | 22 (45.8) |

BCVA: Best corrected visual acuity, SD: Standard deviation, VA: Visual acuity

**Table 4: Differences between estimated and post-operative VA**

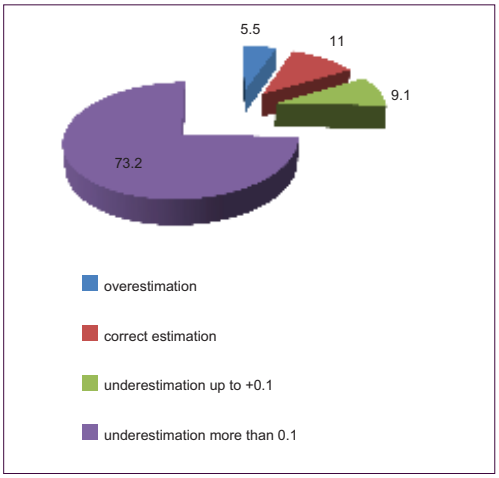
| Difference between post-operative BCVA and retinometer estimated VA (on logMAR scale) | In all included eyes | In eyes without co-morbidities | In eyes with one or more co-morbidities | *P* value |
|---|---|---|---|---|
| Minimum | −2.28 | −2.28 | −1.98 | 0.002 |
| Maximum | 1.03 | 0.05 | 1.03 | |
| Median | −0.33 | −0.39 | −0.19 | |
| Mean±SD | −0.47±0.59 | −0.57±0.59 | −026±0.52 | |

BCVA: Best corrected visual acuity, SD: Standard deviation, VA: Visual acuity

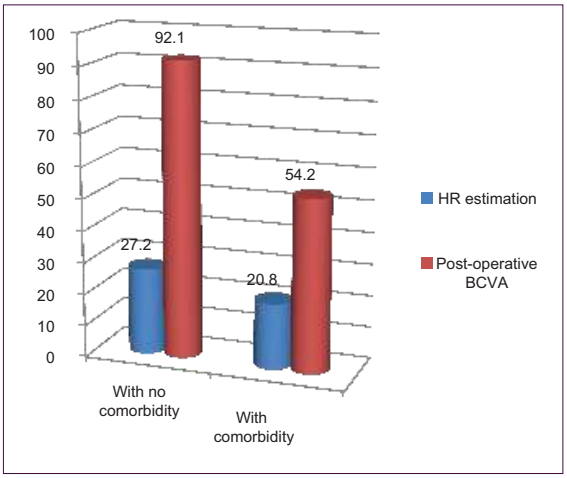
**Table 5: Differences between estimated and post-operative VA in relation to cataract severity**

| Difference between post-operative BCVA and retinometer-estimated VA (on logMAR scale) | Mild | Moderate | Severe | *P* value |
|---|---|---|---|---|
| Minimum | −0.3 | −1.76 | −2.28 | 0.002 |
| Maximum | −0.12 | 0.18 | 1.03 | (significantly |
| Median | −0.2 | −0.3 | −0.67 | different from |
| Mean±SD | −0.22±0.076 | −0.32±0.3 | −0.91±0.91 | the other two) |

BCVA: Best corrected visual acuity, SD: Standard deviation, VA: Visual acuity




**Graph 1: HR estimation**




**Graph 2: Estimated VA by HR in patients with and without ocular co-morbidities.**

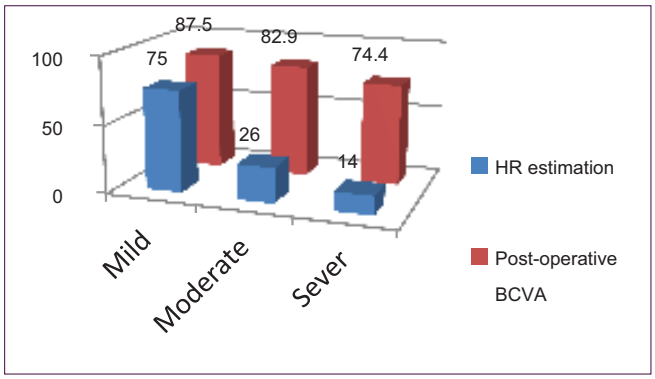
In spite of the less optimal accuracy of Heine retinometer, it is a highly specific device in a different degree of lens opacity.

The underestimation of VA by Heine retinometer within one line of post-operative BCVA in 9.1% of the cases and within two to three lines for 73.2% of the cases is not different than other reported studies (Graph 1 and Table 4). HR underestimates the visual acuity in the majority of our patients 82.3%, while the correct estimation was with only 11% and it overestimate in 5.5% of our population study Graph 1.

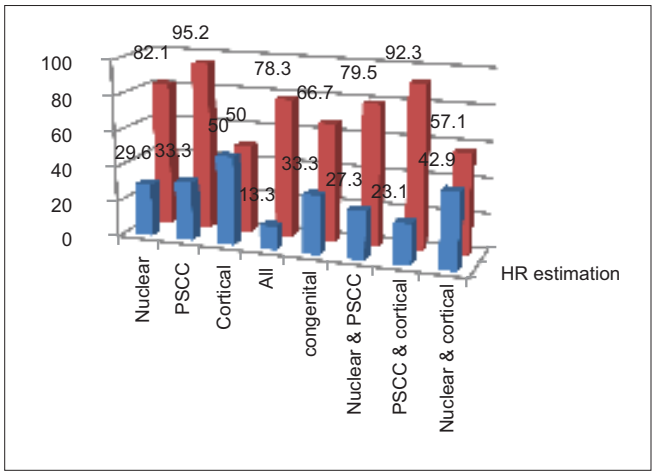
**Table 6: Sensitivity, specificity, and accuracy of HR in predicting post-operative VA 0.5 or more**

| Parameter | In all included eyes (%) | In eyes without co-morbidities (95% CI) | In eyes with one or more co-morbidities (%) | Mild (%) | Moderate (%) | Severe |
|---|---|---|---|---|---|---|
| Sensitivity | 29.8 | 30.0 (0.29-0.30) | 30.7 (0.29-0.32) | 86 (0.82-0.89) | 30.4 (0.29-0.30) | 15.6 (0.14-0.16) |
| Specificity | 93.5 | 100 (1-1) | 91.0 (0.90-0.91) | 100 (1-1) | 94.7 (0.94-0.95) | 90.9 (0.89-0.92) |
| Accuracy | 42 | 35 (0.34-0.35) | 58.3 (0.57-0.59) | 87.5 (0.84-0.90) | 41.4 (0.41-0.42) | 34.9 (0.33-35) |

BCVA: Best corrected visual acuity, CI: Confidence interval, VA: Visual acuity




**Graph 3: Estimated VA by HR and Post operative BCVA in different types of cataract**




**Graph 4: Estimated VA by HR and Post operative BCVA in cortical cataract in comparison with other types of cataracts**

## CONCLUSION

Graph 2 shows the estimated VA by HR in patients without ocular comorbidities was 0.5 or better in 27.2% while the post-operative BCVA was 0.5 or better in 92.1% in the same patients. In patients with ocular comorbidities, the VA was 0.5 or better in 20.8% estimated by HR and post-operative BCVA of 0.5 or better in 54.2%. Regarding the cataract density, in patient with mild cataract density the estimated VA was 0.5 or better in 75% using HR and post-operative BCVA of the same value in 87.5%. In contrast, patients with moderate cataract density 26% have estimated visual acuity of 0.5 or better using HR and 82.9% have post-operative BCVA of 0.5 or better Graph 3. Graph 4 shows the estimated VA in 50% of patients with cortical cataract was equal (0.5 or better) both by HR and post-operative BCVA, in contrast to other types of cataract where there was a statistical significant different in the percentage of patients with VA of 0.5 or better estimated using HR compared to post-operative BCVA with higher percent post operatively.

The Heine lambda 100 retinometer appears to be an easy device to use clinically. It is highly specific in the prediction of post-operative VA (93.5%) (Table 5). It has higher accuracy 87.5%, sensitivity 86%, and specificity 100% in mild cataract than denser one (Graphs 3 and 4, Table 6).

In the presence of ocular comorbidity, Heine retinometer is a good predictor for patients who will have poor improvement in VA post-phaco with high true positive results (Graph 2).

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Original Article

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# Role of Platelet Transfusion and its Misuse in Managing Dengue Fever

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## Abstract

**Background:** Dengue is a prevalent mosquito-borne acute viral infection with potential fatal complications caused by an arbovirus transmitted by the vector aedes aegypti. Thrombocytopenia is almost universally observed in dengue infection. These results from both reduced production and increased destruction of platelets. The guidelines stipulate that platelet transfusion should be given to patients with platelet count <20000. Platelet transfusion has a variety of risks including alloimmunization, platelet refractoriness, allergic reactions, febrile nonhemolytic reactions, bacterial sepsis, and less commonly transfusion-associated acute lung injury.

**Materials and Methods:** A retrospective study design was conducted in blood bank Sri Manakula Vinayagar Medical College Hospital, Pondicherry with about 41 dengue patients who were transfused with platelet as a supportive measure during epidemic of dengue from 2012 to 2013.

**Results:** Among the 41 dengue patients who have been platelet transfused, therapeutic transfusion with bleeding manifestation includes 12 patients and prophylactic therapy without bleeding manifestation constitutes 29 patients.

**Discussion:** The patients who were having a platelet count <20,000 and therapeutically transfused (who had bleeding manifestations) were around 50%. The percentage of therapeutically transfused decreases from 50% to 15% in patients having a platelet count more than 20,000. This puts them at more risk of getting transfusion-transmitted infections and also various transfusion related adverse events.

**Key words:** Dengue, Platelets, Transfusion

## INTRODUCTION

Dengue is a prevalent mosquito-borne acute viral infection with potential fatal complications caused by an arbovirus (arthropod - borne virus) transmitted by the vector aedes aegypti.[1] The term "break bone fever" was coined for dengue because of the symptoms of myalgia and arthralgia.[2] Dengue viruses (DV) comes under family *Flaviviridae* and there are four serotypes of the virus referred to as DV-1, DV-2, DV-3, and DV-4. DV is a positive-stranded encapsulated RNA virus and consists of three structural protein genes which encode the nucleocapsid or core (C) protein, a membrane-associated (M) protein, an enveloped (E) glycoprotein, and seven non-structural (NS) proteins.[2] It is endemic in more than 100 countries worldwide where around 50-100 million infections occur every year. All four serotypes can cause the full spectrum of disease from a subclinical infection to a mild self-limiting disease, the dengue fever (DF) and a severe disease that may be fatal, the dengue hemorrhagic fever/dengue shock syndrome (DHF/DSS).[3] Dengue is globally the most important arboviral infection and threatens an estimated 2.5 billion people worldwide. Thrombocytopenia is commonly observed in dengue infection. This result from both reduced production and increased destruction of platelets.[4] The epidemiology of DF in the Indian subcontinent has been very complex and has substantially changed over almost past six decades in terms of prevalent strains, affected geographical locations, and severity of disease. The first report of dengue in India was in 1946, and soon the whole country was involved with widespread epidemics,

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which was followed by the endemic prevalence of all the four serotypes of dengue virus.

Clinical presentation of DF is characterized by an abrupt onset of fever associated with frontal headache and retro-orbital pain, myalgia, arthralgia, vomiting, and weakness. A generalized maculopapular rash appears 1 or 2 days after fever defervescence. Minor hemorrhagic manifestations signs like petechiae may be observed in some patients. DF is generally self-limiting, and most patients recover without complications approximately 10 days after the onset of illness. However, some patients develop severe manifestations such as increased vascular permeability and plasma leakage that can lead to death. Signs of spontaneous bleeding are more frequent in severe forms of dengue.[5] Dengue patients generally have high levels of cytokines, chemotactic complement anaphylatoxins C3a and C5a, and histamine, which have the capability to induce vascular permeability. Evidence indicates that the endothelium itself plays a prominent role in immune-enhanced pathology, and that leads to increased vascular permeability in DHF and DSS. The detection of NS1 in dengue is the basis of commercial diagnostic assays.[6]

Dengue patients can be categorized into the four categories based on their platelet count at the time of admission:

1. High risk (platelet count <20,000/cu mm)
2. Moderate risk (platelet count between 21 and 40,000/cu mm)
3. Low risk (platelet count between 40 and 100,000/cu mm)
4. No risk (platelet count >100,000/cu mm).[7]

While the medical fraternity globally recognizes the importance of platelet transfusion in the management of hospitalized dengue patients, the indications to platelet transfusion may vary. The DHS guidelines state that platelet transfusion should be given to patients with platelet count <20000/cumm.[7] The optimal number of platelets in a prophylactic platelet transfusion is controversial. A standard dose for adults is considered to be approximately $3 \times 10^{11}$ to $6 \times 10^{11}$ platelets. Higher doses of platelets than these could also result in superior hemostasis.[8] Prophylactic platelet transfusion can result in various risks such as alloimmunization, platelet refractoriness, allergic reactions, febrile nonhemolytic reactions, bacterial sepsis, and less commonly transfusion-associated acute lung injury.[9]

## MATERIALS AND METHODS

A retrospective study design was conducted in blood bank Sri Manakula Vinayagar Medical College and Hospital Pondicherry with about 41 dengue patients who were transfused with platelet as a supportive measure during an epidemic of dengue from 2012 to 2013. The ethical clearance was obtained from the ethical committee, and the patient consent was obtained for the study. Only dengue seropositive (NS1 positive) patients who have undergone platelet transfusion were taken for the study. Nondengue patients and dengue patients who are not platelet transfused were not included in this study. The main objective was to determine whether prophylactic platelet transfusion is necessary and appropriate in dengue patients who have no bleeding manifestations.

## RESULTS

A total of 41 dengue patients who have been platelet transfused were taken in the study during the period of the epidemic. Among them, patients with age <10 years included 5 (12.2%) patients, of age group 11-20 includes 2 (4.9%) patients, 21-30 includes 15 (36.6%) patients, 31-40 includes 8 (19.5%) patients, and 41 and above includes 11 (26.8%) patients. Fever was the most common clinical presentation noted in all patients during the time of admission. Other clinical features included headache, bleeding gums, vaginal bleeds, myalgia, and bone pain. Hemorrhagic manifestations, which were seen in dengue patients includes epistaxis, hematemesis, and gum bleeding. Among the 41 dengue patients who have been platelet transfused therapeutic transfusion with bleeding manifestation includes 12 (29.3%) patients of which 6 (30.0%) were female patients and male were 6 (28.6%) patients. Prophylactic therapy without bleeding manifestation constitutes 29 (7.7%) patients of which 14 (70%) were female patients and 15 were (71.4%) male patients. In this study, patients with platelet count <10,000/cu mm, 2 patients have received prophylactic therapy and 2 patients have received a therapeutic transfusion. Between 10,000 and 20,000/cu mm 4 patients have received prophylactic therapy whereas 4 patients received a therapeutic transfusion. Patients between 20,000 and 40,000/cu mm 9 received prophylactic transfusion and 2 received a therapeutic transfusion. Moreover, patients with 40,000 and above 14 received prophylactic transfusion and 4 patients were therapeutically transfused.

## DISCUSSION

Of the 41 patients who were platelet transfused 29 (70.7%) were prophylactically transfused and the remaining 12 (29.3%) had bleeding manifestations and were therapeutically transfused. Pallavi *et al.* in her study reported that only 21 patients (6.12%) presented with hemorrhagic manifestations.[10] The most common age

group for platelet transfusion in dengue patients was between 20 and 30 years (36.6%). Makroo *et al.* similarly reported the majority of dengue cases were between the age group of 21-30 years while Nagerakha *et al.* observed that most dengue patients were in the age group <10 years.[11] In our study, 18 (43.9%) of those who were platelet transfused were in the platelet range of more than 40,000 whereas in Makroo *et al.* study the majority of dengue cases who were platelet transfused was between 20,000 and 40,000. In our study, the patients who were having a platelet count <20,000 and therapeutically transfused (who had bleeding manifestations) were around 50%. The percentage of therapeutically transfused decreases from 50% to 15% in patients having a platelet count more than 20,000. This is 56% (prophylactic transfusion and platelet count more than 20,000) of the total number of dengue patients who were transfused inappropriately with platelets. Pallavi *et al.* reported 36.6% of dengue patients to have been inappropriately transfused platelets. Studies conducted by Chaudhary *et al.* and Kumar *et al.* showed the patients transfused platelets inappropriately were 21.5% and 56.2%, respectively.[12,13] If we compare between age group and patients who were therapeutically transfused it was 43% in the age group of 0-20 years. It gets lower to 27% in the age group more than 20 years. This shows that the probability of bleeding in a patient aged more than 20 years is very low (platelet count more than 20,000) and platelet transfusion could have been avoided. There was no significant difference between the male and female group among those who were prophylactically and therapeutically transfused.

Mass media play a very important role in hyping up the role of platelet transfusion in dengue patients. Dengue patients get admitted to the hospital for the sole reason of platelet transfusion after reading these unproven reports from the media. The reason for platelet transfusion are not based on medical rationale, but as a result of an intense social pressure on the treating physicians by the patients and their relatives.[7] Kumar *et al.* also observed that the increased use of platelet transfusion were mostly due to a panic reaction during the epidemic of DF.[13] Clinician awareness is low in not knowing the more risk associated with platelet transfusion than the benefits of it. The blood bank is put under a lot of stress in getting more donors for this irrational platelet transfusion. This leads to more replacement donation than a voluntary donation. As most of the blood banks do not have an apheresis machine for obtaining single donor apheresis platelets they have to depend on only random donor platelets. Random donor platelets (prepared from 350 ml of blood) results in a very low increment (corrected count increment - 5,000) so these patients have to be repeatedly transfused with more number of platelets from different donors. This puts them at more risk of getting transfusion-transmitted infections and also various transfusion related adverse events. In economically under-developed and developing countries where the highly sensitive nucleic acid testing (NAT) cannot be done due to its high cost, platelet transfusion should be made more stringent.[9] The cost factor plays a predominant role in determining the type of screening tests in developing countries like India where rapid and ELISA testing are commonly employed which are not highly sensitive when compared to NAT.

Randomized controlled trials conducted by Mohammed *et al.* revealed that Platelet transfusion, despite increasing platelet count in half the recipients, neither stopped the progression to severe bleeding nor shortened the time to cessation of bleeding. This proves that a high baseline platelet count and a successful platelet transfusion cannot prevent progression to severe bleeding.[14] Similar studies by Krishnamurti *et al.* showed that vascular alteration and platelet activation present in dengue infection which is a separate, underlying process was also responsible for bleeding as well as thrombocytopenia.[15] Rather, early recognition of dengue with prompt correction of hemodynamic parameters, remains the cornerstone of avoiding hemorrhage and ensuring good clinical outcomes. As platelet products are scarcely available and precious, rational use of platelet transfusion should be advocated.

## CONCLUSION

Platelet transfusion could have been avoided in 56% of the dengue patients. Irrational use of platelets will put the patient at a huge risk from transfusion-transmitted infections as well as transfusion-related adverse events. In developing countries, platelet transfusion practices vary between clinicians, hospitals, and regions. There should be a clear set of guidelines regarding the use of platelets in dengue and proper co-ordination among clinicians and transfusion medicine specialist would be helpful in promoting rational use of platelets.

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Review Article

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# Verrucous Carcinoma of the Oral Cavity: Current Concepts

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## Abstract

Oral verrucous carcinoma (VC) is a rare locally invasive tumor. The histopathological diagnosis of verrucous carcinoma should be accompanied with careful identification of tumors with a greater chance to become frank cancers. A comprehensive Google and PubMed search was carried out using "oral, verrucous carcinoma and immunohistochemistry" as the key searching terms. All the articles till date were precisely reviewed and the article was judiciously compiled. It was observed that numerous histopathological, immunohistochemical and genetic studies have been carried on VCs to identify the basis for their non-carcinomatous nature and difference from oral squamous cell carcinomas. The present review elaborates the current concepts of oral VCs regarding the etiology, clinical and histopathological, immunohistochemical and genetic characteristics.

**Key words:** Carcinoma, Genes, Immunohistochemistry, Verrucous

## INTRODUCTION

Verrucous carcinoma (VC) is a rare oral tumor that is classified under carcinomas owing to characteristics that exists amid a benign verrucous lesion and malignant squamous cell carcinoma (SCC). It is a slow growing tumor, which presents predominantly as an exophytic growth with a pebbly, micronodular surface and tends to spread locally with no evidence of metastasis even in advanced cases. A precise diagnosis of VC histopathologically should be accompanied with a careful discrimination between the VCs with a fair and poor prognosis. The article carefully reviews the clinicopathological and immunohistochemical characteristics of VC carefully analyzing the tumors with poor prognosis.

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## ORAL VC

Oral VC is an uncommon tumor which presents as a tan/white, warty growth with a broad base attachment.[1] The most common sites for its occurrence include buccal mucosa, mandibular alveolar crest, gingiva, tongue with glottic larynx being the most frequent non-oral site.[2] The tumor rarely crosses 10 cm in its greatest dimension. Literature depicts that VC mostly occurs in males in 5-6$^{th}$ decade of life.[3] Use of tobacco in the smokeless and inhaled forms has been predominantly reported in the affected patients, followed by betel nut chewing and use of alcohol.[4] The oral hygiene is invariably poor in all the cases. The role of human papillomavirus (HPV) in VC has been a matter of debate.[2] The most common differential diagnoses encountered clinically include a spectrum of closely resembling lesions comprising of verrucous hyperplasia, proliferative verrucous leukoplakia and SCC. VC is a locally invading tumor and does not spread to the local lymph nodes. If lymph nodes are palpable, they usually present as an inflammatory reaction in large secondarily infected lesions.[4] When confronted with bony structures such as the mandible, the tumor tends to destroy the bony tissue on

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a broad front, and erodes with a sharp margin rather than infiltrating into the marrow spaces.[5] While surgery forms the widely accepted mode of treatment for VC, radiation is only employed in advanced cases due to reports of radiation induced anaplastic formation in literature.[6]

## HISTOPATHOLOGICAL CHARACTERISTICS

VC usually present with a hyperplastic epithelium with abundant keratin superficially projecting as exophytic church-spire keratosis and also depicting parakeratin plugging, which is believed to be characteristic of this tumor. The bulbous well oriented rete ridges show endophytic growth pattern with pushing borders.[7] Abrupt transition from normal epithelium to endophytic ingrowth is taken as an important parameter to differentiate it from benign verrucous growths.[8] The epithelium is well differentiated in all the rete pegs. A classic case of VC shows minimal or no pleomorphism of cells and no mitotic activity above the basal and suprabasal layers of the epithelium.[7] If focal atypia or dysplasia is evident, it must be limited to the basal layer of epithelium. Lymphoplasmacytic inflammatory host reaction is marked, especially in cases where keratin has plunged deep into the connective tissue inducing foreign body granuloma formation.[1] Inadequate biopsy and tangential sectioning often deviate the diagnosis. Insufficient depth of the section, the absence of adjacent normal epithelium, presence of dysplastic features and evidence of micro invasion creates a dilemma for the pathologist and the surgeon and in such cases repeating the biopsy becomes mandatory. In cases with a long tobacco habit history, non-tender or fixed locoregional lymph nodes and bland histopathological picture, it becomes mandatory to rule out SCC.

## HYBRID CARCINOMAS

"Hybrid verrucous-squamous carcinoma" term has seldom been used in the literature with most of the cases relating to the transformation of the VC to frank SCC post radiation treatment. The ionizing therapy has been attributed to the above transformation.[6] However, the above hypothesis is not very well supported by current literature where Fonts *et al.* (2006) in his case series reported that 6 of the 10 tumors were, in fact, SCCs and not VCs.[9] Medina *et al.* (1984) reported a coexistence of less differentiated foci of SCCs in VC and supported surgery as the preferred mode of treatment and the use of radiation to be restricted to only selected cases. It has been proved that 20% of the cases of VCs have small foci of well-differentiated SCCs within them and such tumors should be correctly recognized.[10] A correct biopsy with sufficient depth can lead to the precise differentiation between the comparatively better VCs and those with frank malignant foci. Evaluation of the epithelial-connective tissue interface is also a must to precisely rule out SCC foci.

## IMMUNOHISTOCHEMICAL SIGNATURE OF VC

VC exhibiting mild dysplastic features or SCC foci need to be carefully examined to rule out frank SCC in the connective tissue stroma. A complete histopathologic examination of an adequate biopsy is augmented with an immunohistochemical evaluation to be completely assured of the diagnosis. A variety of markers has been experimented and identified in VC in comparison with SCC and its benign counterparts.

## BASEMENT MEMBRANE CHARACTERISTICS

VC is known to be benign histologically with a locally invasive clinical course. The endophytic growth that is a hallmark of this tumor is due to its resilient basement membrane that probably acts as an effective barrier to prevent the carcinomatous growth. Prioleau *et al.* (1980) in their study on VC of rectum, plantar surface of the foot and oral cavity found marked focal thickening in certain areas of basement membranes and absence in other parts by immunofluorescent examination of anti-basement membrane antibody. They also reported that ultra-structural examination of the tumors revealed reduplicated as well as the normal basal lamina. A proliferative basal zone underlying a thick layer of well differentiated non-proliferating keratinocytes and reduplicated basal lamina were seen in all VCs, regardless of their location.[11] These findings emphasized that basement membrane could play an important role in determining the nature of VC. Jiang *et al.* (2001) detected that oral VC cases showed a thicker basement membrane with reduplication at abundant places and a noticeably greater inflammatory cell infiltration equated to the oral SCC (OSCC) and dysplasia cases.[12]

## HPV

The role of HPV in VCs has been a matter of debate since the last few decades. Brandsma *et al.* (1986) analyzed tissue specimens of VC (larynx) by using Southern and DNA dot blot hybridization for HPV DNA. They demonstrated a strong correlation between HPV-16 related sequences and VC of the larynx.[13] Fujita *et al.* (2008) found an inverse co-relation between p53 expression and HPV infection. The development of oral VCs may involve the inactivation of p53, which in turn is associated with HPV infection.[14] Samman *et al.* (2014) utilized next generation sequencing

to investigate the correlation between oral VCs and HPV and found it to be highly insignificant.[15] Lin *et al.* (2010) evaluated p53, murine double minute 2, p21, heat shock protein 70 and HPV 16/18 E6 proteins in 48 VCs and 30 oral verrucous hyperplasia samples. The expression of the above biomarkers was overlapping, and no statistical significant results could be arrived at.[16] Various studies have been done thereafter to correlate HPV and oral VCs, but all have been non-contributory.

## EPITHELIUM

Itoiz *et al.* (1993) observed little or no expression of 65-67 Kd keratins in SCC and adenocarcinoma while hyperkeratotic lesions such as VC, leukoplakia, and keratoacanthoma, showed enormous variations in the intensity of 65-67 bands and an irregular immunohistochemical staining pattern. Increased amounts of keratin were usually accompanied by an absence of, or decreased expression of 65-67 Kd keratins, thus indicating a change in the polypeptide composition of the keratin layer in pathological conditions of the oral epithelium.[17] Arduino *et al.* (2010) showed the differences in staining pattern in basement membrane zone of SCC, VCs and severe epithelial dysplasias (SED). The staining pattern of laminin was decreased in SCC compared to SED and VC while collagen IV expression was enhanced in VC as compared to the dysplasia cases.[18] Zargaran *et al.* (2011) demonstrated a significant difference in laminin-332 γ2 (Ln-332 γ2) chain expression in well-differentiated OSCCs and VCs describing their varied biological behavior.[19]

## TUMOR SUPPRESSOR GENES AND CELL CYCLE REGULATORS

Gimenez *et al.* (1996) described an overexpression of p53 protein in VCs as paralleled to benign lesions. They also reported an overexpression of cyclin D1 but no variations of Rb staining signifying that Rb may be functionally inactivated by overexpression of cyclin D1 or HPV infection in the low-grade lesions.[20] Saito *et al.* (1999) demonstrated in their study that VCs showed a higher average frequency of p16 positive cells and lower frequency of p53 positive cells than SCCs. The differences in p53 might point toward differences in cell proliferation or states of inactivation of p53 in both the tumors. All the VCs in their study revealed markedly more positive pRb cells than SCCs. Functional inactivation of pRB resulting in overexpression of p16 might pose an important link between VCs and HPV. The percentage of p27 cells was higher in VCs while Ki67 expression was much less as compared to SCCs. This demonstrates a difference in proliferative activity of VCs and SCCs.[21]

Drachenberg *et al.* (1997) tested the expression pattern of bcl-2, p53, and Her-2/neu, and in situ end-labeling of DNA to identify apoptosis in VC and SCC cases. Marked differences were recognized in the pattern of expression of oncogenes and the indexes of cell turnover in these two types of tumors. VC exhibited minimal apoptosis in rare keratinizing cells. P53-positive cells and Ki-67 expression were limited to the nuclei of the basal layers; and bcl-2 expression was observed only in the cytoplasm of tumor cells. In contrast, SCC cases presented higher apoptosis rates, whereas p53- and Ki-67 positive nuclei were dispersed throughout the lesion. SCC cases displayed patchy bcl-2 cytoplasmic staining or strong cytoplasmic and nuclear positivity in the less differentiated tumors. Her-2/neu was negative in all VC and SCC cases. The altered levels and arrays of gene expression and cell turnover amid the verrucous and SCC certainly correlate with the diverse biology and prognosis of the latter.[22]

Sakurai *et al.* (2000) showed an increased expression of c-erbB-3 and proliferating cell nuclear antigen overexpression in the development of VC of the oral mucosa.[23] Lessard and Robinson (2001) revealed a variation in expression of ras signal transduction mediators in VCs as compared to SCC. Raf-1 was strongly expressed in the basal portions of the epithelium in VCs while it showed minimal expression in the suprabasilar epithelial layers. Anti-Raf-1 staining was diffuse and patchy throughout the SCC and was comparatively weaker in intensity. ERK-1 and ERK-2 (extracellular signal-regulated kinases) expression was predominantly cytoplasmic and typically negative in the basal layers of the epithelium in the VCs but was positive in the suprabasilar epithelial layers. ERK-1 and ERK-2 were observed to be diffusely expressed in all the SCC cases.[24]

Wu *et al.* (2002) revealed a lack of noteworthy difference in TGF-α expression in VCs and SCC lesions, but EGFR and p53 expression was greater in OSCCs as compared to the VCs.[25] Chen *et al.* (2002) demonstrated that differential staining of inducible nitric oxide synthase could serve as a predictive marker to differentiate VCs from benign counterparts.[26] Tang *et al.* (2003) demonstrated an increased expression of E-cadherin in VC cases as compared to the poorly differentiated cancers.[27] Kobayashi *et al.* (2003) reported an increased cytoplasmic expression of moesin (a member of ERM [ezrin/radixin/moesin] family) in OSCC cases. They also witnessed a decreased cell membrane expression in the latter cases as compared with oral epithelial dysplasias and VCs. They also recommended the use of moesin as a screening marker in suspected oral mucosal lesions.[28]

Klieb and Raphael (2007) demonstrated a higher frequency of matrix metalloproteinase-1 in adjacent stromal cells

in oral VCs as compared to oral verrucous hyperplasia cases while Impola *et al.* (2004) demonstrated an absence of epithelial matrix metalloproteinases (MMPs) (3, 7, 9, 12 and 13) expression in all VC cases as compared to SCCs establishing their non-invasive behavior.[29,30] Adegboyega *et al.* (2005) reported coinciding patterns of p21 expression in both OSCCs and oral VCs.[31] Ogawa *et al.* (2005) demonstrated that CD44 variant 9 positive oral VCs were linked with lower risk of cervical lymph node metastasis.[32] Ray *et al.* (2011) demonstrated a weak basal expression of VEGF in VCs compared to SCCs. Also, MMP-2 and 9 expression was also very mild as compared to the SCC counterparts demonstrating a non-carcinomatous nature of VCs.[3] Angadi *et al.* (2007) found that cyclin D1 expression and staining pattern was similar in OSCCs and VCs.[33] Laxmidevi *et al.* (2010) studied the β catenin expression in different grades of OSCCs and VCs and reported predominant membranous expression in VCs, which was comparable with well differentiated SCCs. The reduced membranous expression and mainly cytoplasmic localization in poor grade tumors could be linked with loss of cell differentiation and attainment of a malignant phenotype.[34]

Terada (2012) demonstrated a higher Ki-67 labeling index in SCC (64%) as compared to VC (12%).[35] Zargaran *et al.* (2012) in their comparative study between well differentiated SCC and VCs did not find any significant difference in Ki67 expression. The stroma associated with invasive carcinoma is associated with loss of CD34+ dendritic cells and gain of alpha smooth muscle actin myofibroblasts.[36] Chaudhary *et al.* (2012) demonstrated a significant increase in myofibroblastic expression (α SMA) from premalignant lesions to VCs and SCC.[37] Majeed *et al.* (2014) demonstrated a lack of expression of α- smooth muscle actin (myofibroblasts) in oral VC cases as compared to complete positivity in OSCC cases which they attributed to the lack of inductive effect of genetically altered carcinomatous epithelium in VC cases.[38]

EI-Rouby (2010) investigated tumor associated macrophages (TAMs) to evaluate angiogenesis by using CD68 and microvessel density (CD31) in different grades of OSCCs and VCs. They found that increased TAMs were associated with higher grades of cancer as compared to VCs.[39] Quan *et al.* (2012) noted an increase in expression of αB crystallin along with decrease in expression of activated caspase-3 postulating the role of αB-crystallin in anti-apoptosis by inhibiting the activation of caspase-3 in oral VC.[40] Habiba *et al.* (2014) illustrated that the high expression of HuR (ARE mRNA-binding protein) along with a diffuse staining pattern in the epithelium may help in defining the malignant transformation in oral verrucous borderline lesions.[41]

### Genetic Studies

Loss of heterozygosity (LOH) studies comparing VCs with different grades of conventional SCCs revealed that VCs had an LOH incidence similar to the well differentiated SCCs as compared to the less differentiated counterparts. VCs were found to possess deletions at 9p and loss of LOH at 4q and 17p, which could contribute to the development of malignancy in the upper aerodigestive region.[42] Gene profiling studies to differentiate oral VCs and SCC showed differences at the level of certain genes, including ADAM metallopeptidase with thrombospondin Type 1 motif, 12 (human) (ADAMTS12), collagen, Type IV, alpha 1 (COL4A1), Collagen, Type IV, alpha 2 (COL4A2), inhibin, beta A (INHBA), MMP-1, plasminogen activator inhibitor-1 (SERPINE1) transforming growth factor, beta-induced (TGFBI) and hepatic leukemia factor (HLF), but the precise genetic abnormalities that could possibly contribute to development of frank carcinoma and the absence of metastasizing potential in VCs still requires more research.[43]

## CONCLUSION

VCs present a rare group of lesions in the oral cavity. The presence of malignant foci has been reported in oral VC cases. Consequently, it becomes mandatory for the pathologists to identify VCs, which have greater chance to turn into frank malignancy or with greater chances of recurrence to assist the surgeons in providing a better treatment.

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Case Report

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# Presence of Bilateral Accessory Renal Arteries: A Rare Case Report

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## Abstract

During the ascent to the final site, the embryonic kidneys receive their blood supply from superior vessels. Normally, the inferior vessels degenerate. When these vessels fail to degenerate remaining forms the accessory renal arteries. Hence, in the present case report one such variation was observed during routine dissection of undergraduate students in middle-aged male cadaver at Chhattisgarh Institute of Medical Sciences, Bilaspur, Chhattisgarh, India. Cadaver was preserved properly, and dissection was done stepwise. Bilateral accessory renal arteries are found originating from the abdominal aorta. The right accessory renal artery is originated higher than the left accessory renal artery. Knowledge of bilateral accessory renal arteries will be a help in surgical management during renal transplantation, aortic aneurysm, Urological procedures and for angiographic interventions.

**Key words:** Accessory renal arteries, Bilateral accessory renal arteries, Renal transplantation

## INTRODUCTION

The paired renal arteries arise as lateral branches from the abdominal aorta just below the origin of superior mesenteric artery. The right renal artery is longer than left renal artery and runs behind the inferior vena cava and right renal vein. The left renal artery runs behind the left renal vein. Renal artery near the renal hilum divides into anterior and posterior division.[1] Usually the renal artery is the lateral branch of the abdominal aorta but may emerge from the posterolateral, anterolateral and posterior surfaces with less frequency. Other sites of origin such as the celiac trunk, common iliac and inferior phrenic artery are also noted. Initially, the renal arteries are branches of the common iliac arteries. Later, the kidney receives its blood supply from the distal end of the aorta. Usually, the inferior vessels degenerate and superior vessels supply the kidney. Normally the caudal branches of the renal vessels undergo involution and disappear but at times they persist hence termed accessory renal arteries or additional renal arteries. Variations in the number and position of these vessels occur in approximately 30% of people.[2]

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Approximately 25% of the adult kidney has two to four renal arteries arising from the Aorta. It may be superior or inferior to the main renal artery following the main renal artery to the hilum of the kidney. Accessory renal arteries may also enter the kidney directly either into the superior or inferior poles.[3] It is important to know that accessory renal arteries are end arteries as a result if an accessory artery is damaged, the part of the kidney supplied by it will become ischemic. Accessory arteries are approximately twice as common as accessory veins.[3]

Most of the renal vessels anomaly remains unrecognized until they exposed to any surgical procedure, arteriography or autopsy. So, here a rare case found where right kidney as well as left kidney have an additional renal artery: "Bilateral accessory renal artery." Anatomical knowledge of the variations of the renal artery has grown in importance with increasing numbers of renal transplants, vascular reconstructions and various surgical and radiologic techniques being performed in recent years.

During routine dissection study of undergraduate students (MBBS) vascular abnormalities of right and left kidney

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were encountered in a unknown middle-aged male cadaver in Chhattisgarh Institute of Medical Sciences, Bilaspur, Chhattisgarh India in the year 2013. The cadaver was embalmed and preserved as per standard procedure. Abdominal viscera were removed to get clear access to posterior abdominal wall structure like kidney and associated blood vessels.

Dissection steps done carefully, and finally both kidney, renal vessels, aorta and accessory renal arteries removed intact and photographs were taken.

## CASE REPORT

In our study, we found a rare case of bilateral accessory renal arteries, arising as lateral branches from the abdominal aorta to the lower pole of right and left the kidney. Right renal artery originated from the right side of the aorta at the level of upper border of L2 vertebra and left renal artery originated from the left side of the aorta at the level of lower border of L1 vertebra.

The right accessory renal artery is arising 2 cm below the origin of the right renal artery, it measures 3.2 cm. It enters the right kidney at a distance of 3 cm below from the entrance of right renal artery at the hilum. Left accessory renal artery is arising 6 cm below the emergence of the left renal artery, measurement is 3 cm. Left accessory renal artery enters the kidney almost at the lower pole at the distance of 5 cm from the emergence of the left renal artery at the hilum of left kidney.

Left ureter lying behind the left accessory renal artery in close contact whereas the right ureter is completely separate (Figure 1).

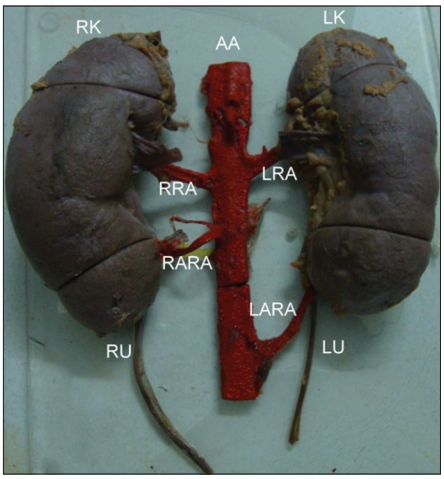


**Figure 1: RK: Right kidney, AA: Abdominal aorta; LK: Left kidney, RRA: Right renal artery, LRA: Left renal artery, RARA: Right accessory renal artery, LARA: Left accessory renal artery, RU: Right ureter, LU: Left ureter**

## DISCUSSION

Accessory renal arteries are common in 30% of individuals and usually arise from the aorta above or below, mostly below the main renal artery and follow it to the renal hilum.[1] Dhar and Lal studied the renal vasculature in 40 cadavers and revealed multiple renal arteries in 20% of cadavers, unilateral anomaly was more common (15%) than the bilateral (5%).[4] Khamanarong *et al.* conducted a study in 267 thai cadavers observed 17% double renal arteries and 1% of triple renal arteries.[5] Rao *et al.* have observed bilateral pre hilar multiple branching of renal arteries.[6] Bilateral additional renal arteries originating from abdominal aorta has been reported by Bayramoglu *et al.*[7]

Bordei *et al.* analyzed 272 kidneys for a study of renal vascularization and identified 54 (20%) double renal arteries and 3 (1.1%) triple renal arteries.[8] Ozkan *et al.* demonstrated an angiographic study on 855 cases of renal arteries variation, multiple arteries in 24%, bilateral multiple arteries in 5% and early division in 8% of cases. Moreover, additional renal arteries were found in 16% of the cases on the right side and 13% of the cases on the left side.[9]

The renal artery arises from the most caudal of the lateral splanchnic arteries.[10] The kidneys begin to develop in the pelvic cavity and during this time they receive blood from the neighboring vessels and, therefore, their blood supply changes sequentially as they ascend to occupy the adult position in the abdomen.[3,10]

In our present study, we found bilateral accessory renal arteries. Right accessory renal artery reaches the lower pole of the right kidney without crossing right ureter. Left accessory renal artery arises lower than a right accessory renal artery, obliquely passing to the lower pole of left kidney by crossing left ureter may cause obstruction, leads to hydronephrosis.[3] Interest in the surgical and medical aspects of accessory renal arteries has been high because of hemorrhage and loss of renal parenchyma. Kidneys with accessory renal artery have higher incidence of transplant failures than kidneys showing no variation.[11]

## CONCLUSION

Knowledge about variation is of immense importance in surgical aspects such as renal transplantation, laparoscopic nephrectomy, renovascular anastomoses, pyelolithotomy, and porto-renal shunts. It is also useful for radiologists performing various endourologic procedures and interventional techniques. Variation of bilateral accessory renal vessels prevents the inadvertent damage to them during renal surgeries, especially in transplantation. They may be mistaken for capsular arteries or aberrant

arteries, and inadequate ligation of these vessels may lead to hemorrhage. Hence, the possibility of this variation should be borne in mind before surgical and radiological interventions.

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Case Report

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# Supernumerary Teeth in Maxillary Anterior Region: Report of Three Cases and Their Management

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## Abstract

A supernumerary tooth is one that is additional to the normal series and can be found in any region of the dental arch. Most of the supernumerary teeth are located in the anterior maxillary region. These supernumerary teeth again are classified according to their presence where they are located and form. These teeth when present may give rise to a variety of clinical problems. The detection of these teeth can be achieved by thorough clinical and radiographic examination. Their management should be done by outlining a comprehensive treatment plan. Here we are discussing three different and unique cases, which brought different presentations by the patients, and the different treatment protocols were followed in each case. The first case deals with a 9-year-old female with non-eruption of maxillary incisors. The supernumerary teeth were surgically extracted and unerupted teeth exposed. The second case reported is of a 13-year-old boy having a problem in closing of mouth because of the extra tooth in the palatal side of the maxilla. Surgical extraction of the supernumerary tooth was done to treat the case. The third case is a 13-year-old child with non-eruption of maxillary incisors since exfoliation of deciduous teeth. The supernumerary teeth were surgically removed, and the incisors repositioned orthodontically.

**Key words:** Clinical, Maxilla, Mesiodens, Supernumerary

## INTRODUCTION

Supernumerary teeth may be found by the dental practitioner as an occasional finding on a radiograph or may be the cause of an impacted tooth. They can also be found intra-orally and can be located anywhere in the mouth. These can be present as a single tooth or multiple teeth, unilaterally or bilaterally, erupted or impacted and in mandible/maxilla or both the jaws (Tables 1 and 2).[1] The prevalence of supernumerary teeth varies between 0.1% and 3.8% and is usually seen more in the permanent dentition.[2-4] A study has shown that these extra teeth are mostly located in maxillary incisor region (64.3%) with mesiodens accounting for 32.4% of such cases. In other areas supernumeraries in the maxillary third molar region (29.6%), mandibular third molar region (7%), maxillary pre-molar region (4.2%) and mandibular incisor region (4.2%) accounted for the rest cases.[5] It was also noted that the prevalence of supernumerary teeth in the general Caucasian population ranged between 1% and 3%, with prevalence of 2.7% and 3.4% among Japanese and Hong Kong populations, respectively.[6-8] The low prevalence rate seen in cases of supernumerary teeth in primary dentition is because of being not taken seriously by the parents, mostly of normal shape (supplemental type), may erupt normally, and appear to be in proper alignment.[9] There are certain complications reported due to the presence of supernumerary teeth that may result in the failure in the eruption of adjacent permanent incisors.[10] Problems associated with supernumerary teeth are a failure of eruption,[11] displacement of permanent teeth,[12] crowding,[13] formation of the cyst,[14] compromise on implant site or it may be asymptomatic.[15,16] Early diagnosis of the presence and removal of supernumerary teeth is essential. The treatment is dependent on the type and position of the supernumerary tooth as well as its effect on adjacent teeth (Table 3). There are chances of delayed eruption of maxillary incisors due to the presence of supernumerary tooth or teeth.[11] After the removal of

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**Table 1: Supernumerary teeth based on location**

| | |
|---|---|
| Mesiodens | Located between maxillary central incisors (pre-maxillary regions) |
| Paramolar | Buccally/lingually or palatally in between 2nd and 3rd maxillary molars, rarely in between 1st and 2nd maxillary molars |
| Distomolar | Distal or distolingual to 3rd molars (maxillary or mandibular, in mandibular often impacted) |
| Parapremolar | Additional tooth in premolar region |
| Paramolar root | Additional root often in mandibular molar |
| Paramolar tubercle | Additional cusp present on buccal surface of a permanent molar |
| | *Parastyle*, if additional cusp if present in maxillary molar |
| | *Protostylid*, if additional cusp is present in mandibular molar |

**Table 2: Supernumerary teeth based on morphology**

| Morphology | Appearance |
|---|---|
| Conical | Small/peg shaped tooth with conical root |
| Tuberculate | Barrel shaped crown with rudimentary root, often paired |
| Supplemental | Duplication of tooth in normal series (often in deciduous dentition and in permanent maxillary lateral incisors and mandibular premolars) |
| Odontome | No regular shape, disorganized diffuse mass of dental tissue |

**Table 3: Supernumerary teeth based on eruption and orientation**

| Supernumerary teeth according to eruption | Supernumerary teeth according to orientation |
|---|---|
| Erupted: Complete coronal aspect is seen in oral cavity clinically | Vertical: Oriented as normal series of dentition |
| Partially erupted: Only occlusal part is visible | Inverted: Upside down |
| Impacted: Cannot be seen in oral cavity clinically, can only be diagnosed using radiographs | Transverse: Horizontally placed |

the obstacle from the path of eruption of incisors they erupt normally or sometimes they have to be extruded with the help of orthodontic forces.[12] Management in each case is varied, multiple supernumerary teeth present a challenge to the surgeon, and their effects create unusual orthodontic problems. The clinician is therefore, reminded always to take appropriate radiographs prior to orthodontic treatment to rule out, among other things, the presence of supernumerary teeth. It has been shown that premolars, both in the normal series and supernumeraries, may develop later than their usual anticipated times. This, therefore, means that radiographs should also be taken at some appropriate time during and after orthodontic treatment in children. Appropriate management of multiple supernumerary teeth requires careful planning and practitioners encountering this phenomenon are advised to seek appropriate interdisciplinary opinion to enable formulation of the best possible treatment plan for the patient. Here we discuss three cases of complications caused due to supernumerary teeth and their management either surgically or combined surgical and orthodontic interventions. The basic purpose of the case reports is to make the clinicians aware of the complications, which may arise from the supernumerary teeth and their management. Most of the cases require us to extract these teeth as soon as they are detected. An immediate surgical removal is indicated after diagnosis as inter- or post-operative complications are less likely to be encountered. However, when unerupted teeth are without symptoms, do not appear to affect dentition in any way, it is best to be left in place and kept under observation. The following disadvantages might be encountered following deferred surgical plan, which includes loss of eruptive force of adjacent teeth, loss of space and crowding of the affected arch, and possible midline shifts.

## CASE REPORTS

### Case 1

A 9-year-old female child visited the Department of Pedodontics and Preventive Dentistry with a complaint of no eruption of the upper left front tooth (Figure 1a). The child was asymptomatic and medically fit. Oral examination of this child revealed unerupted upper left central incisor along with non-eruption of lateral incisors on the same side. Central and lateral incisors of the right side were in different stages of the eruption. The patient had mixed dentition with other permanent teeth in various stages of the eruption. The parents of the child were worried about the non-eruption of teeth as well as the esthetic appearance of the child. The orthopantomograph (Figure 1b) revealed the presence supernumerary tooth. The occlusal view (Figure 1c) and intra-oral periapical radiographs (Figure 1d) confirmed the presence of an inverted supernumerary tooth between both the central incisors. Here we would like to add that although patient had orthopantommograph we advised maxillary occlusal view and peri-apical radiographs for accurate localization of supernumerary teeth which will benefit both the clinician, as it reduces the surgical time, as well as the patient, as it is less traumatic for patient. The major limitation of a single radiograph is its relative inability to demonstrate the relationship of two objects that are either side by side or superimposed. It is difficult to determine whether both are in the middle of the bone or buccal or lingual to each other. The supernumerary tooth was blocking the path of eruption of both central and lateral incisor of the left side. It was decided to remove surgically the supernumerary and thus facilitate the eruption of the incisor teeth. Informed consent was

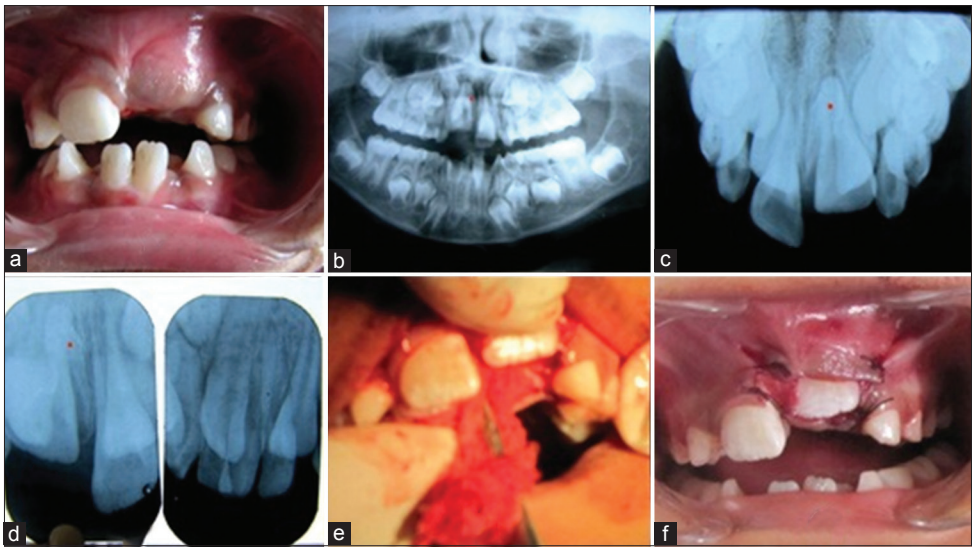


**Figure 1: (a) Unerupted left central incisor (b) Orthomantomograph showing the supernumerary teeth (c) Occlusal view, (d) Intra-oral periapical radiograph (e) Surgical exposure of central incisor (f) Post-operative**

taken from the parents. A palatal approach was planned to expose surgically (Figure 1e) the incisors and remove the supernumerary tooth after clinical and radiographic examination. Full thickness palatal flap was raised, and both incisors were exposed. Removal of bone with a round bur revealed the presence of supernumerary tooth which was extracted. Sutures were placed so as to expose both the incisors. The post-operative healing (Figure 1f) was asymptomatic and patient was healthy and happy. In this case, the complication elicited by supernumerary tooth was of non-eruption of permanent teeth and the change in the esthetic appearance of the child. The child also had a huge psychological impact as she was not able to talk and smile properly as reported by the parents. The child patient at this age is vulnerable to peer pressure and worried about their looks. Hence, the anterior teeth when not erupted till the long period of time usually causes the children to become shy and has an impact on his/her psychological makeup. The clinicians have to remove therefore the supernumerary teeth to facilitate the early eruption of anterior permanent teeth.

## Case 2

A 13-year-old male child reported to the department of pedodontics and preventive dentistry with complain of inability to close mouth and chew properly because of the extra tooth in the upper front region. The child was healthy and asymptomatic. Thorough oral and clinical examination revealed the presence of a supernumerary tooth at the palatal aspect behind the incisors (Figure 2a). The patient had a permanent set of teeth. On complete closure of both the jaws it was seen that the lower central incisors were in contact with the supernumerary tooth due to which the child was unable to close the mouth. The maxillary occlusal view (Figure 2b) radiographs revealed the presence of another supernumerary apart from the one seen clinically. Orthopantomograph also confirmed the presence of two supernumerary teeth. After routine blood investigations and taking informed consent from the parents of the child, it was decided to remove the supernumerary teeth causing complications. A palatal approach was taken to raise the flap and expose the supernumerary teeth (Figure 2c and d). Both the supernumerary teeth were surgically delivered (Figure 2e) and flap was repositioned in place with sutures. Post-operative healing was asymptomatic (Figure 2f) and child remained healthy and in good spirits.

## Case 3

A 13-year-old male patient came to the department of pediatric dentistry with the complaint of unerupted upper front teeth since the exfoliation of milk teeth. The patient had all other permanent teeth present for his age. There was no significant medical history. On visual examination (Figure 3a) and palpation a bulge was felt in the central incisors area confirming the presence of permanent teeth. Intra-oral peri apical radiographs (Figure 3b) revealed the presence of two conical supernumerary teeth. Routine blood investigations were advised. The parents of the child were explained about the supernumerary teeth and informed consent taken from them to proceed for the procedure. After proper local anesthesia, full thickness labial (Figure 3c) and lingual flaps were raised from maxillary right canine to the maxillary left canine regions. The crowns of maxillary right and left central incisors were seen after raising the labial flap, but the supernumerary were only visible after palatal flap (Figure 3d) with little bone removal was done. After an adequate bone removal, extraction of supernumerary teeth (Figure 3e) was done. At

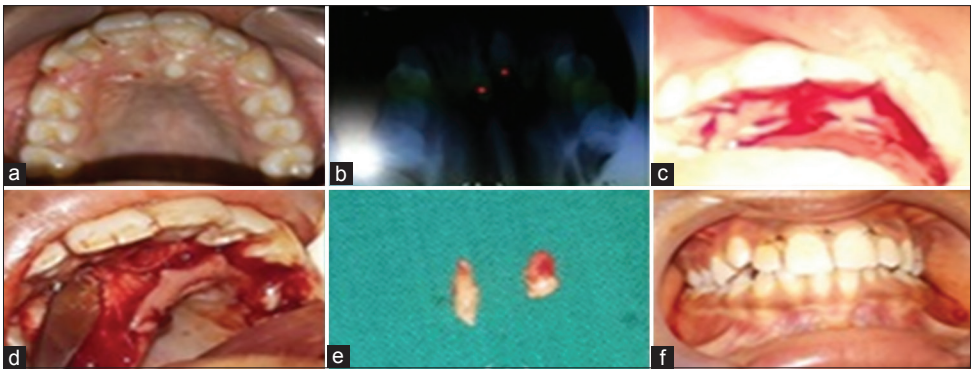

**Figure 2: (a) Pre-operative view (b) Occlusal view confirms two supernumeraries (c) Incision made, (d) Flap raised (e) Surgically removed supernumerary teeth (f) Post-operative**

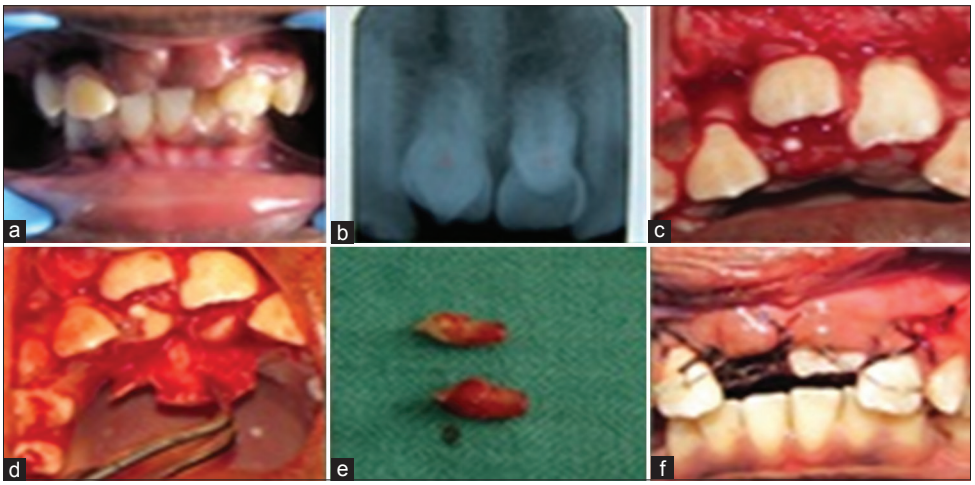

**Figure 3: (a) Pre-operative (b) Intra-oral radiograph showing two supernumerary teeth (c) Flap raised, (d) Supernumerary teeth exposed (e) Teeth removed (f) Traction by orthodontic wires**

the same appointment, it was decided to use orthodontic force to extrude the incisor teeth. Begg's brackets were placed and orthodontic traction (very light force at about 60-90 g) was given with the help of arch wire as elastics (Figure 3f). The teeth came into alignment within 2 months. Here in this case, we applied light orthodontic forces as the root completion had taken place, and we could have utilized the eruptive forces which s usually seen with young permanent teeth with incomplete roots.

## DISCUSSION

The etiology of these excess teeth is still not understood. Numerous factors can interfere with their formation. Few authors have reported that tooth anomalies can result from a complex interplay of genetic factors and developmental processes.[1] One interesting theory, suggests that the local and independent hyperactivity of dental lamina results in an excessive proliferation of cells, which results in the formation of extra tooth buds.[17] The most important step in the management of supernumerary tooth is to identify the complications associated with supernumeraries. These extra teeth can be localized using the intra-oral radiographs of varied methods. A periapical radiograph utilizing the paralleling technique gives the best localization compared to other radiographic views. If teeth are causing no complications and are not likely to interfere with tooth movement they can be monitored with only radiographic review. The supernumerary teeth can cause many complications such as prevention and delay in eruption of associated permanent teeth, displacement or rotation of permanent teeth, crowding, incomplete space closure during orthodontic treatment, dilaceration, delayed root development of adjacent teeth, formation of cysts etc.[18] In our cases also the first and third case reported had come to clinic with complaint of non-eruption of anterior teeth as reported in other cases too,[18] similarly second case came to us with complain of non-closure of mouth properly. The patient should be warned of complications of varied nature like cystic changes and migration of roots. If the patient does not want such complications, it is advisable to remove supernumerary teeth. If supernumerary teeth are associated with complications, it is usual to extract such teeth, which usually involves a minor oral surgical

procedure.[11] Early extraction of supernumerary teeth, causing incisor impaction, may have the benefit of minimizing loss of eruptive potential, space loss and center line displacement. Even in those cases where the un-erupted incisors are severely rotated, it is seen that removal of the causative supernumerary tooth can result in self-correction and correct alignment.[18] The greatest concern with early removal is the risk of affecting the formation of adjacent roots. In addition, a young child may not be able to tolerate such a procedure and may develop a dental phobia. In the presented cases, there was a low risk of iatrogenic damage to adjacent permanent incisors root according to the clinical and radiographic findings since root development of the central incisors was complete. Furthermore, the surgical procedure was simple; patients were cooperative and are more receptive to surgical management under local anesthesia and thus easier to manage. However, delayed eruption of maxillary central incisors can result in mesial movement of the lateral incisors, space loss and diminished development of dentoalveolar height. Furthermore, in situations where a supernumerary tooth is preventing the eruption of an incisor, the eruptive potential of the incisor may be lost if intervention is delayed. Following the removal of supernumerary teeth the un-erupted teeth usually erupts faster. The surgical removal of supernumerary teeth should be performed very carefully to avoid damage to the underlying permanent teeth, which might lead to ankylosis, displacement, rotation, and ectopic position. It also has been stated that the clinician should be cautious to prevent possible complications to blood vessels and the damaging of nerves during the manipulation of the tooth, fracture of the maxillary tuberosity, perforation of the maxillary sinus, the pterygomaxillary space, and the orbit. Clinicians should also pay more attention to the possibility of supernumerary teeth being fused with the adjacent tooth structure at the crown or root level, which may make the extraction difficult. Supernumerary teeth can also be kept under observation without extraction when satisfactory eruption of related teeth has occurred with no associated pathology, but most of the researchers[18-20] have opined that the extraction of erupted supernumerary teeth in almost all cases except in those patients who had missing teeth. Up to 91% of impacted permanent incisors erupt within 18 months following removal.[21] The patient's age and the availability of space in the dental arch are the two critical factors in determining whether spontaneous eruption occurs following the removal of a supernumerary tooth. In our case too spontaneous eruption occurred in one case as the patient was young but in other case (case 3) we had to take help of orthodontic traction which is also similar to cases reported in literature.[22-24] In all our cases, we performed extractions to alleviate the problems associated with these supernumerary teeth (Figure 4). The treatment depends on respective cases. These extra teeth may remain clinically symptomless and may be a chance finding or may cause complications. Unless a supernumerary tooth causes complications, it is best to follow a wait and watch procedure rather than trying to extract these teeth.[25] Two methods are followed for extraction of mesiodens; either early extraction before root formation of the permanent incisors or late extraction after root formation of the permanent incisors.[26] Some authors recommend extraction of mesiodens in the early mixed dentition in order to facilitate spontaneous eruption and alignment of the incisors.[27] In our cases also we saw that delay in the extraction of supernumerary teeth caused complications of non-eruption of permanent teeth. If indicated for extraction various anatomical structures in the vicinity of the supernumerary teeth have to be considered before extraction so that no complications arise later. Some authors have mentioned a decision support system for the extraction of these teeth.[28] In each of the cases discussed here, the authors have utilized sufficient caution while removing the supernumerary teeth so as to make the removal without post-operative complications.

Clinical significance: Treatment of hyperdontia depends on the respective case. In all the cases of our patients, supernumerary tooth extraction was performed. In the permanent dentition with regard to the possible complications, it is advisable to remove supernumerary teeth, including those not erupted. In cases of normal eruption and settings of supernumerary teeth, when they do not cause disturbances of the arch regularity it is possible to ignore from this rule.

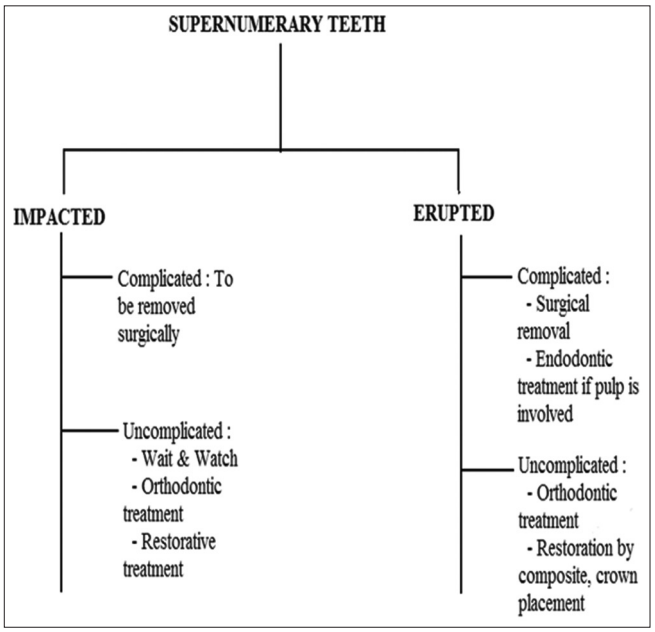


**Figure 4: Treatment options for supernumerary teeth[15]**

## CONCLUSION

Supernumerary teeth are relatively less common but can lead to varied complications. The clinician should be able to recognize the signs as early as possible suggesting the presence of supernumerary teeth, particularly those that cause problems in eruption as seen with our presented cases, and perform the relevant investigations and treatment. On being able to diagnose such cases, each case has to be dealt in best possible way and to allay the apprehensions of parents about the complications they can create.

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Case Report

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# Verrucous Carcinoma of the Leg – A Rare Variant of Squamous Cell Carcinoma in an Unusual Site: A Case Report

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## Abstract

Ulcero-proliferative growth over extremities is common in day to day surgical life. The presenting complaints and time of presentation may vary through an ulcer, ulcero-proliferative growth, and fungating growths. Most commonly diagnosed in such ulcero-proliferative growth is squamous cell carcinoma diagnosed by edge-wedge biopsy and histopathological examination. Among the variants of squamous cell carcinoma, verrucous carcinoma is a rare variant. Verrucous carcinoma is a variant of well-differentiated squamous cell carcinoma. Verrucous carcinoma grows gradually, has a tendency of local invasion and seldom metastasizes. Verrucous carcinoma may occur in various head and neck locations, as well as in the genitalia. The oral cavity is the most common site of this tumor. Here we are presenting such a case of verrucous carcinoma over the leg (unusual site). Surgical resection with sufficient safety margin is recommended.

**Key words:** Leg malignancy lesions, Squamous cell carcinoma, Ulcero-proliferative growth, Verrucous carcinoma

## INTRODUCTION

Verrucous carcinoma is a low-grade, well differentiated uncommon variant of squamous cell carcinoma.[1] It is also referred as Ackerman's tumor since it is first described by Ackerman in 1948.[2,3] It is also called as snuff dipper's carcinoma since this variant is often seen in snuff users and those who chew tobacco.[4] The age of presentation ranges from 50 to 80 years with a male predominance and the median age is 67 years. Males are more commonly affected.[5] Oral mucosa is the most common site of involvement.[6] It may occur in head, neck region and in the genitalia. The majority of cutaneous carcinomas are formed on feet.[7] Verrucous carcinoma may grow very large and can destroy adjacent tissue such as bone and cartilage. Surgery is considered as the treatment of choice. The extent of surgical margin and the adjuvant radiotherapy are still controversial. Verrucous carcinoma over the leg is unusual.

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## CASE REPORT

A 51-year-old male patient presented with chief complaints of growth over shin of the left leg for past 3 years gradually attained the present size and complaining pain for post month. Past history revealed that he is a smoker for past 35 years and alcoholic for past 28 years. He is known diabetic and hypertensive.

On clinical examination, patient is afebrile, pulse rate: 76/min, blood pressure: 140/80 mm of Hg and respiratory rate: 16/min. There is a tender cauliflower-like ulcero-proliferative growth of size longer diameter 4.5 cm × 4 cm × 3.5 cm over shin of left lower limb. It is not bleeding on touch and mobile over underlying structures with no palpable regional lymph nodes.

Laboratory findings indicated anemia (hemoglobin: 9.0 g/dl) total blood cell count: 7,800 cell/cu.mm, clotting time: 3 min 55 s, bleeding time: 1 min 35 s, blood urea: 36 mg/dl,

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serum creatinine 0.9 mg/dl and random blood sugar 126 mg/dl. X-ray of left leg with ankle and knee joints is normal.

A conservative surgical wide excitation with split thickness skin grafting done.

Specimen (Ranagaraya Medical College/Kakinada Biopsy. No. 408/15) is sent for histopathology. The diagnosis of verrucous carcinoma is confirmed (Figures 1 and 2).

## DISCUSSION

Verrucous carcinoma usually occurs over 60 years of age. Males are more prone. Usually, sites of involvement are gingiva, buccal mucosa, alveolar mucosa, hard palate floor of mouth, larynx, esophagus, penis and scrotum. The majority of cutaneous carcinomas (90%) are found on feet.[7] The incidence of verrucous carcinoma on the leg is unknown. Lesions are painful show multiple reggae like folds and deep clefts. It is a slow growing warty, well circumscribed exophytic lesion usually covered by leukoplakic patches. Lesion usually starts as verrucous hyperplasia then becomes vegetant resembling verrucous leukoplakia and finally it takes months to years to develop into Verrucous carcinoma.[8] It is locally malignant, if it is recurrent it is highly malignant than squamous cell carcinoma and that rarely metastasis. Verrucous carcinoma may grow large in size, resulting in destruction of adjacent tissue, such as bone and cartilage.[9] Reactionary regional lyphadenopathy may present due to inflammation.[10]

**Figure 1: Pre-operative verrocous carcinoma over leg**

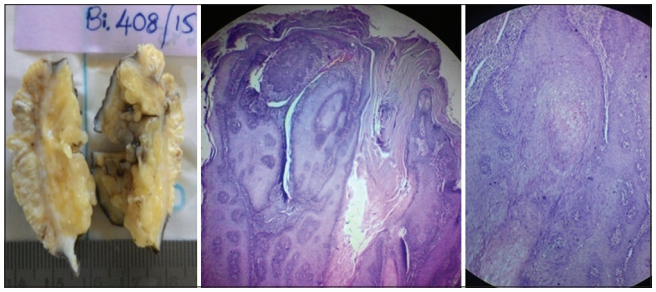


**Figure 2: Gross specimen and histopathologic pictures**

Based on site of occurrence it is classified into four types:

1) Ano-urogenital: Giant chondylomaaccuminatum, Buschke-Lowenstein tumor.
2) Oro-aerodigestive: Ackerman tumor, oral florid papillomatosis.
3) Feet: Carcinoma cuniculatum, epitheliomacuniculatum.
4) Other cutaneous sites: Cutaneous verrucous carcinoma, papillomatosis cutis carcinoids.

Major risk factors are smoking, snuffing of tobacco and alcohol consumption.[11] Betel nut chewing is an additional risk factor in Taiwan. Different gene mutation sites in the head and neck cancers between western countries and Taiwan have been reported.[12-15] Verrucous carcinoma may be associated with HPV infections may be with serotypes 16 and 18, but serotypes 6 and 11 have been reported.[16]

Grispan have divided Verrucous carcinoma into four types.[17]

Type $I_A$: Acanthosis, papillomatosis, luekoedema, moderate ortho or parakerstosis, hypertrophic interpapillary crests and stratification of basal layer.

Type $I_B$: Cryptic depression of epithelial surface, invagination of epithelium and fistulous tendency.

Type II: Areas with characteristics of Type-$I_A$ or Type-$I_B$ and areas with hyperchromatic nucleus and atypical mitosis.

Type III: Areas with Type-I or Type-II and features of squamous cell carcinoma. Anaplastic cells and metastasis are frequently observed in this type.

**Staging of Verrucous (squamous cell) carcinoma**

| | |
|---|---|
| TX | Primary tumor cannot be assessed |
| T0 | No evidence of primary tumor |
| Tis | Carcinoma *in situ* |
| T1 | Tumor ≤2 cm in greatest dimension |
| T2 | Tumor >2 cm, but not >5 cm, in greatest dimension |
| T3 | Tumor >5 cm in greatest dimension |
| T4 | Tumor invades deep extradermal structures (i.e., cartilage, skeletal muscle, or bone) |
| Regional lymph nodes (N) | |
| NX | Regional lymph nodes cannot be assessed |
| N0 | No regional lymph node metastasis |
| N1 | Regional lymph node metastasis |
| Distant metastasis (M) | |
| MX | Distant metastasis cannot be assessed |
| M0 | No distant metastasis |
| M1 | Distant metastasis |

| Stage grouping | | | |
|---|---|---|---|
| Stage 0 | Tis | N0 | M0 |
| Stage I | T1 | N0 | M0 |
| Stage II | T2 | N0 | M0 |
| | T3 | N0 | M0 |
| Stage III | T4 | N0 | M0 |
| | Any T | N1 | M0 |
| Stage IV | Any T | Any N | M1 |

Conservative surgical excision is the treatment of choice for Verrucous carcinoma.[18] Treating of regional lyphadenopathy is not mandatory because the metastatic spread is rare in Verrucous carcinoma.[19] Verrucous carcinoma is considered to be have a poor response to radiotherapy.[20] The combination of chemotherapy and surgery can be considered.

## CONCLUSIONS

Verrucous carcinoma is a rare variant of squamous cell carcinoma. Past history of hyperthyroidism (increased appetite, loss of weight, tremors, and menorrhagia) present Commonest location Verrucous carcinoma is the oral cavity, and extraoral sites are genitalia and feet, but on the leg is rare. Wide local excision is treatment of choice. Radiotherapy described but proved ineffective.

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Case Report

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# Psychiatric Manifestations of Silent Brain Abscess: A Case Report

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## Abstract

Sometimes intracranial lesions may present only with behavioral symptoms without any localizing neurological signs and symptoms. Usually, these lesions present with headache, drowsiness, confusion, seizures, hemiparesis or speech difficulties. Silent brain abscess may at times present only with subtle psychological symptoms of confusion, altered sensorium and behavioral problems without any localizing sign and symptoms. Development of brain abscess lesion may occur as the result of a variety of infections, trauma, surgery, etc and may be associated with significant morbidity and mortality. Mental status changes are a common but insensitive finding of a brain abscess. We present a case of an elderly male who presented with acute onset psychological symptoms only but on investigation it was found to be silent brain abscess.

**Key words:** Focal neurologic deficit, Headache, Silent brain abscess

## INTRODUCTION

As clinicians we often come across patients with vague sign and symptoms, which most of the times draw our provisional diagnosis toward the functional component. Number of cases have been reported wherein intracranial lesions have presented with psychiatric symptoms in the absence of any neurologic symptoms.[1-3] Morbidity and mortality[4] are quite high in intracranial lesions so rather than under-diagnosing any condition, the possibility of organicity should always be kept in mind and patient should be thoroughly examined and investigated. Intracranial lesion like brain abscess may present with psychological symptoms without any neurological sign and symptoms and cannot be defiantly localized by their psychiatric presentations. Rarely do they present with psychiatric symptoms only without any localizing signs.[5]

We present here a very rare case of silent brain abscess in an elderly male who presented with only subtle psychological symptoms without any localizing sign and symptoms.

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## CASE REPORT

A 72-year-old male presented to the Psychiatry outpatient department with the chief complaints of confusion, abnormal behavior, remaining perplexed, wandering around aimlessly for the past 8-10 days with sleepless nights. He was unable to identify and recognize his family members and earlier familiar objects. His son reported that he used to keep fidgeting with things, off and on calling out names of family members without any purpose. He had to be told repeatedly to take care of his personal hygiene and to have his food. He would remain withdrawn in his own self. All these symptoms started around 10 days back, which were of the acute nature and rapidly progressive in nature. He had also started self-muttering for the past 2-3 days and also became very aggressive on 2-3 occasions.

There was no history of any fever, headache, trauma, seizures, surgery or any other medical or surgical illness. He did not have any history suggestive of any focal neurological deficit. The patient did not have any past neurological or psychiatric illness. He was conscious, co-operative, but confused and somewhat disoriented. Neurological examination did not reveal any positive

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finding. Bulk, power, reflexes and plantar response were normal in all four limbs. Sensory and cerebellar examinations were also normal. There was no abnormality detected in the extrapyramidal system examination. Other systemic examinations were also normal.

Mental status examination (MSE) showed poor eye to eye contact, apathetic affect, increased reaction time, and perplexity. Attention was arousable but ill sustained. Memory was intact, abstraction impaired, insight was poor, and judgment was impaired in all the spheres. Mini MSE could not be performed.

Investigations namely complete blood count, hemogram, blood sugars, liver function tests, kidney function tests and serum electrolytes were within normal limits. Magnetic resonance imaging (MRI) brain (Figure 1) showed a hypodense peripherally enhancing abscess approximately 73 mm × 56 mm with thick and heterogeneous outer wall and thin inner wall in the left fronto-parietal region. Mass effect in the form of midline shift toward the right side measuring approximately 7.0 mm, causing compression of the ipsilateral lateral ventricle and mild dilatation of the contralateral lateral ventricle was also seen.

The patient was referred to the Neurosurgery Department for further management.

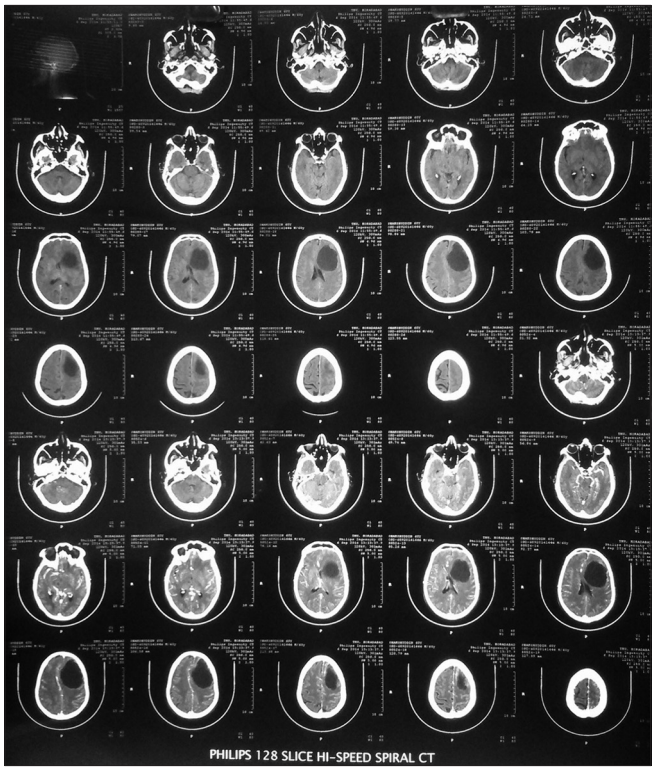


**Figure 1: Magnetic resonance imaging brain showing a hypodense peripherally enhancing abscess approximately 73 mm × 56 mm with thick and heterogeneous outer wall and thin inner wall in the left fronto-parietal region**

## DISCUSSION

Brain abscess is a focal intracranial infection that may present as a life-threatening emergency. It is caused by the inflammation and collection of infected material, coming from the local or remote infectious sources, within the brain tissue. Development of brain abscess lesion may occur as the result of a variety of infections, trauma, surgery, etc. and carries significant morbidity and mortality. Still there are around 15% of cases, which could not be associated with any identifiable source.[6]

Initial manifestations of this abscess may be nonspecific, and, therefore, delay in diagnosis is quite common. Mean time from symptom onset to diagnosis is 2 weeks. Symptoms of brain abscess are caused by a combination of raised intracranial pressure and focal neurologic brain tissue damage. Fever is usually present in approximately half of the presentations. Headache, drowsiness, confusion, seizures, hemiparesis or speech difficulties are the common presenting symptoms, generally with a rapidly progressive course. Focal neurologic deficits may be present in 40-60% of the patients. However, classic triad of fever, headache, and focal neurologic findings are found in only 20% of the population.[7] Clinical course of brain abscess may range from a few days to a number of weeks. Symptoms may occur depending on the size and location of the lesion. A ruptured brain abscess may present sudden worsening headache and severe mental status changes.

As seen in our case silent brain abscess presented with only subtle psychological symptoms of confusion, altered sensorium and behavioral problems without any localizing sign and symptoms. Mental status changes are a common but insensitive finding of a brain abscess.[8] As already mentioned above that clinical manifestations may initially be non-specific thus resulting in delayed diagnosis. Such rare cases again stress out the importance and necessity of imaging in early diagnosis and prompt treatment to limit morbidity and mortality as brain lesions may lead to poor to worse prognosis.[9,10] Contrast imaging can verify the presence, size, and number of abscesses.

## CONCLUSION

As the clinical manifestation of brain abscess may vary widely from apparently non-dangerous headache to severe behavioral changes a detailed history, complete examination and thorough investigation is essential to improve the clinical outcome in such cases. Hence acute onset change in behavior and rapidly progressing psychiatric manifestations should always alarm one to keep a possibility of a brain abscess.

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Case Report

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# Eyelid Cutaneous Sebaceous Horn: A Rare and Interesting Case Report

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## Abstract

Cutaneous horn also known by Latin name "Cornu cutaneum" are unusual tumors appearing like an animal horn. It is relatively rare conical tumor affecting mostly the elderly male population and often arising from the sun-exposed areas of skin. The important issue is not the horn itself which is a dead keratin, but rather its coalition with or as a reaction to a wide variety of underlying benign, premalignant and malignant skin diseases. Although often benign it is mandatory to determine the nature of the disease at the base of the lesion to rule out malignancy. Surgery is the treatment of choice. Here we report a rare case of cutaneous horn in 65-year-old elderly male, overlying a seborrheic keratosis of the left upper eyelid treated with surgical excision and primary closure of the wound.

**Key words:** Carcinoma, Cutaneous horn, Sebaceous cyst, Seborrheic keratosis, Squamous cell, Stratum corneum

## INTRODUCTION

Cutaneous horn (cornu cutaneum)[1] is a relatively uncommon lesion consisting of projectile, conical, dense, hyperkeratotic nodule, which resembles the horn of an animal but lacks the bone core. They are most common in Caucasians' and relatively less common in Arabic, Asian and rare in African descent.[1] The horn is a conical projection of hyperkeratotic epidermis composed of compact keratin. The cause of cutaneous horn[2] is still unknown, but the racial tendency can be endorsed to the relative protection of pigmented skin from ultraviolet rays. It arises on mostly sun-exposed areas of body as, UV rays triggers the condition, which is evidenced by higher rate of cases occurring on face, pinna, nose, dorsal forearms, scalp that are often exposed to UV rays. It can occur over chest and penis. Most of them have yellow - white color, they may be straight, curved or twisted.[3] They are usually small, localized but in very rare case be much larger. They are thought to result from underlying benign, premalignant, malignant pathology. Because of their malignant potential, the lesions must always be considered for histopathological evaluation.

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## CASE REPORT

A 65-year-old male farmer presented with a solitary firm horn like slow growing projective growth on the outer lateral marginal part of the left upper eyelid for the last 3 years duration.[2] Initially, patient noticed a small itchy, hyperpigmented nodular swelling over lateral 1/3 of the left upper eyelid about 2 years ago which gradually progressed to present horny growth over the swelling. There was no history of pain or discharge from swelling. There was no regional lymphadenopathy. The patient had a history of long term sun-exposure due to farming activities.

A detailed clinical examination demonstrated a cone shaped hyperkeratotic growth measuring (1 * 1) cm in size, arising over a lichenified plaque over the outer 1/3rd of the left upper eyebrow (Figure 1). It was mimicking a horn. There was no tenderness, discharge or bleeding from the swelling and no regional lymphadenopathy. A clinical diagnosis of solitary cutaneous sebaceous horn overlying hyperkeratotic sebaceous cyst was made. Complete excision of it with horizontal incision and primary closure of the defect with vicryl (6,0) was done

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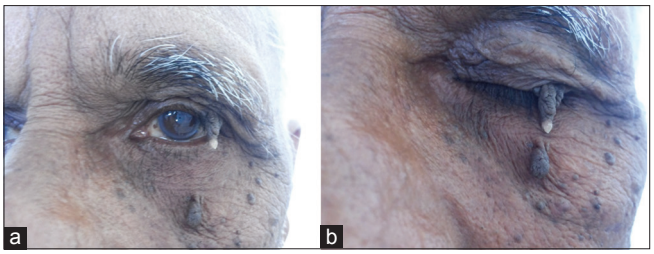


**Figure 1: (a and b) Sebacious cutaneous horn over lateral 1/3rd of left upper eyelid**

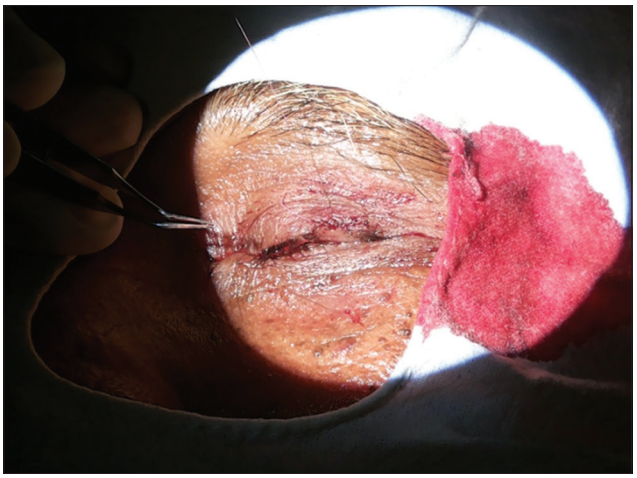

**Figure 2: Excision of the horn with primary closure of the wound**

under local anesthesia (Figure 2). Specimen was evaluated microscopically (Figure 3), which revealed concentric layers of cornified epithelial cells along with sebaceous cyst, areas of hyperkeratosis, parakeratosis, elongated rete pegs with chronic inflammatory cell infiltration in dermis.[3] All these features were suggestive of cutaneous horn over seborrheic keratosis (Figure 4). Associated lesions was found in the left lower eyelid too including viral warts, actinic keratosis. Swelling of the viral wart was removed simultaneously with the horn. On follow-up, patient had an uneventful course with no scar formation and no clinical relapse (Figure 5).

## DISCUSSION

Cutaneous horns[1] are elongated, keratinous, projections from the skin consisting of cornified material resembling an animal horn frequently occurring in rhinocerous, birds but uncommon in humans. An animal horn is composed of superficial hyperkeratotic epidermis, dermis with centrally positioned bone unlikely a human cutaneous sebaceous horn which is composed of compacted keratin with the base comprising of flat, nodular or crateriform seborrheic keratosis or actinic keratosis lesion commonly. The earliest well-documented case of cornu cutaneum[2]

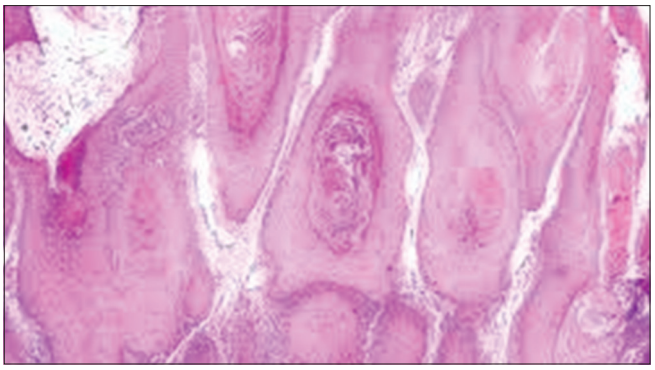

**Figure 3: Histopathology of the specimen horn showing concentric layers of cornified epithelial cells**


**Figure 4: Excised specimen of keratin horn**

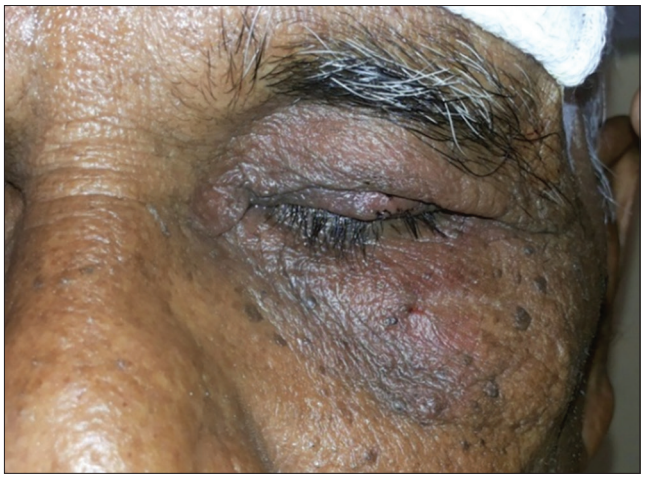

**Figure 5: Post-op follow-up of patient which was uneventful with no scar formation**

was reported from London in 1588 of an elderly Welsh woman. Cutaneous horns[3] are classified into four varieties: Sebaceous horns, wart horns, cicatrix horns and nail horns. (1) Sebacious horns arise from sebaceous cyst commonly on scalp; (2) Wart horns closely resembles sebaceous horns and arise from chest or penis; (3) Cicatrix horns are rare and grow from post burn; (4) Nail horns grow from big

toenail in unattended patients. Sebaceous horns of eyelid is desiccated secretions from the orifice of the sebaceous cyst (as in our case). The cutaneous horn usually occurs over sunexposed areas of the body, particularly face, eyelid, scalp, pinna, nose, forearm and dorsal aspect of the hand. They may also develop over areas not exposed to sunlight such as mucosal lower lip, chest, nasal vestibule, and penis.

In the study performed on 48 cases of eyelid horns which is very rare, by Mencia Gutierrez *et al.*[3] (61.6%) horns are benign lesions, (23.2%) of them are premalignant, (15.7%) are caused due to malignant lesion lying below it. Squamous cell carcinoma is most commonly associated with horn. The important consideration is not horn but the underlying pathology and associated conditions, which may be benign (seborrheic keratosis, viral warts, histiocytoma, inverted follicular keratosis, verrucous epidermal nevus, molluscum contagiosum, actinic keratosis, keratoacanthoma, etc.), premalignant (Solar keratosis, arsenical keratosis, Bowmen's disease) or malignant (squamous cell carcinoma, rarely basal cell carcinoma, granular cell carcinoma, Kaposi sarcoma). Pain, basal tenderness, and large size are common features of malignancy. Histopathologically there are thickened stratum corneum with scattered areas of parakeratosis.[4,5] The base of horn displays the characteristic features of the pathologic process responsible for it. Treatment depends on type of lesion and its malignant potential. Excision biopsy of the lesion including base and histopathological examination to rule out malignancy is mandatory. Complete removal of horn with curettage, down to normal tissue gives satisfactory result as in our case. Split skin graft can be used to cover big defects. Careful examination of the draining lymph nodes is done. Malignancies should be removed with appropriate margins. Other treatment options include electrocautery, cryotherapy, carbon dioxide or Nd Yag laser for the patients who refuse surgery.

## CONCLUSION

Cutaneous horn as in our case was excised carefully with the closure of the defect, and histopathogical examination[4] was done to rule out malignant potential at the base of the horn.

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Case Report

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# Early Oral Extrusion of Screw after Anterior Cervical Interbody Fusion and Plating: A Case Report

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## Abstract

We report a case of oral extrusion of screw in a 58-year-old male who underwent anterior cervical discectomy and fusion for traumatic C7/T1 protruded intervertebral disk. The extrusion took place in the early post-operative period and patient is absolutely asymptomatic except for a dysphagia for few days. There were no symptoms suggestive of esophageal perforation. Barium swallow study was negative for perforation or fistula. Upper gastrointestinal endoscopic studies showed small healing tear in lower esophagus. He was managed with nasogastric feeds for 1-week. Previous reports of similar cases described extrusion of screw in late post-operative period. Our case is first in the kind of extrusion of screw in early post-operative period with no symptoms of esophageal perforation.

**Key words:** Anterior cervical, Barium swallow, Esophageal perforation, Plating, Screw extrusion

## INTRODUCTION

Anterior cervical discectomy or corpectomy and fusion supplemented with plating and screw fixation is a well-established procedure for 6 decades. It is the choice of procedure for cervical spinal diseases such as cervical myelopathy, cervical radiculopathy, cervical spondylotic diseases, trauma, infective pathologies of cervical spine, and neoplasms in cervical spine.[1]

Oral extrusion of screw or plate after anterior cervical discectomy and fusion (ACDF) with plating was a described complication. All the previous reports described extrusion of screw in the late post-operative period with minimal symptoms and in some potentially serious life-threatening symptoms.[1-5]

Here, we report a case of extrusion of the screw in the early post-operative period with no symptoms suggestive of esophageal perforation except for dysphagia for few days.

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## CASE REPORT

A 58-year-old male patient sustained cervical spine injury due to stampede while traveling in bus. He presented with neck pain and weakness of all four limbs with more weakness in both upper limbs than the lower limbs suggestive of central cord like syndrome. Power in the upper limbs was 3/5 (MRC grading) and in the lower limbs 4/5.

Magnetic resonance imaging (MRI) cervical spine showed protruded intervertebral disc of C7/T1 causing indentation over the cord with cord edema.

Surgery was done through anterior cervical approach from right side. Discectomy of C7/T1 done and autologous iliac

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bone graft placed in the space and titanium plate fixed with screws in C7 and T1. Patient got improvement in the power in the upper limbs in the immediate post-operative period. Except for mild dysphagia there were no other complaints. After 5 days, he complained cough without expectoration and on coughing one of the screw placed in the cervical vertebra extruded from the mouth. Neck radiograph showed missing screw in Figures 1-3. Immediate barium swallow was negative for fistulae and perforation. Upper Gastro intestinal endoscopy showed small tear in lower esophagus, which was healing (Figure 4). He was kept on nasogastric feeds for 1-week. Dysphagia subsided. Regular follow-up imaging showed fusion of the segment, which was operated. Nine months post-operative imaging showed no displacement of the other parts of the implants.

## DISCUSSION

The use of internal stabilization devices has expanded the indications for cervical surgery. Cervical plating after graft placement had improved the results to a fusion rate of 98% and reduced graft related complications especially in multilevel fusions, also avoiding late deterioration of the cervical spine alignment obtained at surgery.[1] Overall complication rate with ACDF was approximately 5%.[1] Implant failure after anterior cervical plating has been well documented in that.

Complications related to implants include loosening, extrusion from the vertebral body, esophageal perforation, mediastinitis, aspiration pneumonia, abscess formation, fistula, sepsis, death, and missing of the implants leading to medico legal problems.[1-5] Instrumentation failure may be related to the hardware failure, purchase of an inadequate screw, purchase into osteoporotic bone, malpositioning of the screw into disc, incomplete fusion, excessive movements (e.g., long fusion grafts), subsidence related micro motion of the graft causing loosening of the screw, and existing medical problems of the patient.


**Figure 1: X-ray of the neck-AP**

**Figure 3: Computed tomography scan of the neck (three dimensional reconstruction)-right anterior oblique view**

**Figure 2: Computed tomography scan of the neck (three dimensional reconstruction)**

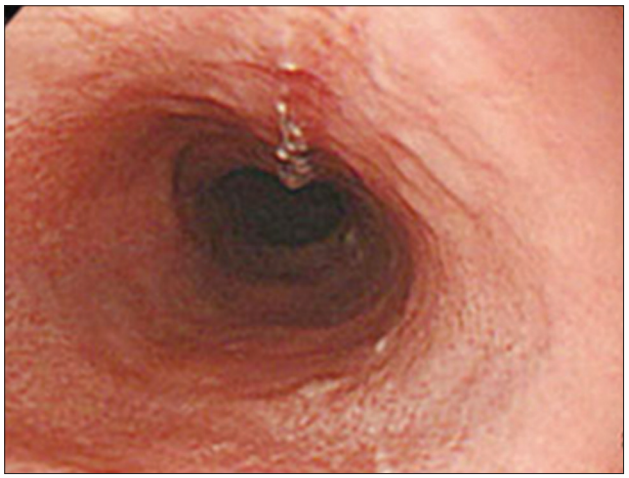

**Figure 4: The small scar in the anterior wall of the esophagus-endoscopic view**

Many authors suggested that main predisposing factor in the development of screw or plate extrusion is the initial malposition or suboptimal screw placement.[1]

Extrusion of screws from the mouth or gastrointestinal tract is a well-documented complication. The patients generally present with dysphagia, hoarseness of voice, swelling in the neck, neck pain, fever, cough, and dyspnea.[1-5] Frank esophageal rupture can lead to devastating complications and even death. Our patient presented with mild dysphagia and cough with no overt signs of esophageal rupture. Causes of minimal symptoms after screw penetration and extrusion through esophagus may be due to small diameter of the screw and slow movement of the backtracking screw causing spontaneous healing of the tract from another side.[2-4]

These symptoms need to be addressed and investigations should include complete blood counts, erythrocyte sedimentation rate, C-reactive protein. Radiological investigations include X-ray of the cervical spine, computed tomography, and MRI of the cervical spine. Barium studies can detect the rupture, fistula tract or other causes of dysphagia. Endoscopy is necessary to assess the rent size, state of healing, and location of the tear.[3-5]

Immediate action should be taken for frank rupture with symptoms related to esophageal perforation. Initial management includes the elimination of oral feeds, nasogastric feeding to restore fluid and nutritional balance, mouth gargles with antibiotic solutions, and intravenous antibiotics. Small tears in the esophagus will heal spontaneously, but large defects require closure primarily or sternocleidomastoid or pectoralis muscle flaps for repair.[2]

Extrusion of implants can be minimized by careful surgical techniques. Osteoporotic evaluation in elderly and use of mesh graft.[1] Single cortical purchase considered to be adequate for when lock screws are used, but the double cortical purchase is required for conventional screws. Plate should allow some space for the subsidence to occur. Dynamic semi-constrained plate is a third generation plate in cervical surgery, which prevents stress shielding and allows subsidence.[2,5] Screw loosening of more than 5 mm, radiological progression of screw loosening or plate alignment, and persistent dysphagia necessitates removal of implants.[5]

## CONCLUSION

ACDF is a well-established procedure since decades and stabilization with plating improves fusion rates. Implant failure with screw extrusion due to esophageal rupture can occur with symptoms ranging from minimal dysphagia to fatal complications including death. Screw extrusion trans orally with minimal dysphagia in a late post-operative period is described well in the literature.

Oral extrusion of the screw of anterior cervical instrumentation in the early post-operative period with mild dysphagia is reported for the first time.

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Case Report

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# Meibomian Gland Carcinoma of the Eyelid: A Rare Case Report

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## Abstract

The sebaceous gland carcinoma is a very rare, highly malignant tumor of the eyelid arising from sebaceous glands of the eyelid such as meibomian glands, glands of Zeis, and sebaceous glands of the caruncle. The tumor is more commonly seen in elderly individuals and more common in the upper eyelid where the meibomian glands are numerous. We present a case of meibomian gland carcinoma of the left upper eyelid in a 90-year-old man who came with a history of a slow growing swelling in the upper eyelid. Biopsy confirmed meibomian gland carcinoma. Tumor was removed by wide excision and reconstruction of the lid was done by Tenzel`s semilunar flap.

**Key words:** Lid reconstruction, Meibomian gland, Sebaceous gland carcinoma, Tenzel's semilunar flap, Upper eyelid

## INTRODUCTION

The sebaceous gland is a lethal highly malignant slow-growing tumor of the eyelid arising from meibomian glands located in the tarsal plate, glands of Zeis, sebaceous glands of caruncle, and periocular skin. It is third most common malignancy of the eyelid and the incidence rate is about 1-1.5%.[1] Prevalence is more in elderly individuals, usually females with a predilection in the upper lid where meibomian glands are numerous. Clinical diagnosis is very important in early stage and more difficult as it mimics chalazion or blepharoconjunctivitis. Intraepithelial spread and the ability to cause skipped lesions gives a special feature from other lid tumors.

The upper eyelid is the site of origin in about two-thirds of all cases, but sebaceous gland carcinoma may arise from any of the periocular structures previously mentioned[2] and may have a variety of clinical appearances.

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The carcinoma may exhibit multicentric spread to the other eyelid, conjunctiva or corneal epithelium. This neoplasm may spread through the canaliculus to the lacrimal excretory system and even to the nasal cavity.[3]

Dysplasia and anaplasia of the sebaceous lobules in the meibomian glands are exhibited by sebaceous gland carcinoma, with associated destruction of tarsal and adnexal tissues. Typically, sebaceous gland carcinoma shows highly pleomorphic cells arranged in lobules or nests with hyperchromatic nuclei and vacuolated (foamy or frothy) cytoplasm due to a high lipid content. Histologically, sebaceous gland carcinoma may resemble the appearance of squamous cell carcinoma. However, the cytoplasm in sebaceous gland carcinoma tends to be more basophilic compared with the eosinophilic appearance of squamous cell carcinoma.

## CASE REPORT

A 90-year-old man presented with a history of swelling in the left upper eyelid of 6 months duration that was gradually progressive and painless initially. Later he developed pain, yellowish discharge, and bleeding from the lesion past 2 weeks. The patient also gave the history of cataract surgery in the left eye 2 years ago.

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On examination, the patient had an ulcerative swelling in the left upper eyelid extending horizontally from the midpoint of the upper eyelid to the lateral canthus. The swelling extended vertically about 12 mm from upper eye lid margin to the lateral aspect of the lower fornix. The tumor involved 1 mm of the upper palpebral conjunctiva, and the surface was irregular with areas of necrosis, yellowish discharge, and active bleeding. The upper lid margin was distorted and was associated with a loss of eyelashes (Figure 1).

On slit lamp examination, there was diffuse corneal opacity of leukomatous grade, and other details were not visible. Perception of light was negative, and B-scan revealed a total retinal detachment in the left eye.

Visual acuity in the right eye was counting fingers 2 m with no pinhole improvement. There were grade three nuclear scleroses, and the fundus appeared normal.

On systemic examination, there was no regional or systemic lymphadenopathy.

A meibomian gland carcinoma was clinically diagnosed. A biopsy was done, sent for histopathological examination that revealed meibomian gland carcinoma (Figure 2).

**Figure 1: Left upper eyelid mass lesion**

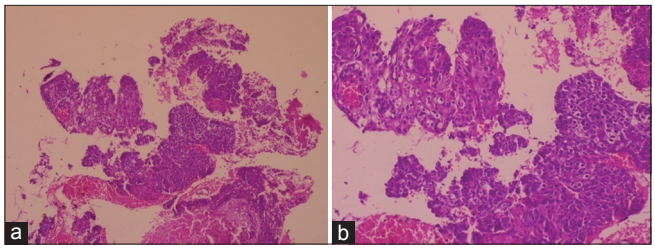


**Figure 2: (a and b) Vacuolated cytoplasm and hyperchromatic pleomorphic nuclei**

Magnetic resonance imaging of the orbits was done which showed well-defined soft tissue over the left orbit. There was no intraocular extension, underlying bones appeared normal, and there was no evidence of regional (cervical) lymphadenopathy.

Wide excision of the tumor was done, which included 5 mm of normal tissue margins. Reconstruction of the lid was done by using Tenzel's semilunar flap. The excised tissue was again sent for histopathological examination which confirmed meibomian gland carcinoma. The patient was followed up after 2nd and 4th week, and the flap was well taken up.

## DISCUSSION

Meibomian gland carcinoma is a slow-growing tumor arising from the meibomian glands. It is the third most common malignancy in the eyelid with an incidence of 1-5.5% of eyelid malignancies.[1] Some studies show an increased incidence of sebaceous gland carcinoma in the Asian population. The tumor has a poor prognosis when compared to other eyelid malignancies because of delayed diagnosis, as it is frequently mistaken for blepharoconjunctivitis or a chalazion.[4-6] Therefore, any recurrent chalazion or unilateral blepharoconjunctivitis in elderly individuals with features like a loss of lashes should be biopsied.

Treatment of sebaceous gland carcinoma is primarily surgical. Surgical treatment may range from a local excision to orbital exenteration. Radical surgical excision with frozen section control by a standard method or Mohs micrographic surgery is the most common and effective method of treatment.

An excision of 4-5 mm of normal tissue carries very good prognosis.[7] Approximately, 30% of SGCs recur after resection.[8] Other modalities of treatment are mitomycin C, cryotherapy, and radiotherapy.[9] Radical neck dissection is required if there is involvement of regional lymph nodes. Distant metastasis requires adjuvant chemotherapy and radiotherapy.

The mortality rate is 5-10% because of delay in making diagnosis and delay in the treatment. The distant metastasis carries 25% of mortality rate. The poor prognostic factors are involvement of upper or both eyelids and, tumor size of 10 mm or more. Others include a duration of symptoms more than 6 months (mortality 38%), poorly differentiated tumors, infiltration into blood vessels and lymphatics, orbital extension, multicentric origin, and finally pagetoid spread. Tumors <6 mm have an excellent prognosis.[9]

## CONCLUSION

Early diagnosis and treatment may decrease the long-term morbidity and extend the survival rate of such patients.

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Case Report

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# Large Ovarian Tumor: A Case Report

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## Abstract

Although ovarian masses are commonly found in gynecology, the patient reports for consultation only when it becomes too large in the absence of any other symptom. This could be partially attributed to complacence and partly, to the unaffordability of surgical treatment on the part of the patient. Presentation at advanced stages creates a psycho-physio-biological impact on the patient. Surgical removal of these tumors leads to good post-operative recovery and survival rates. Herein, we present a case where the patient neglected initial symptoms and presented with a huge abdominal swelling when it caused immense discomfort. This tumor was surgically removed and the post-operative period was uneventful.

**Key words:** Benign neoplasm, Cancer of ovary, Ovarian neoplasm, Serous cystadenoma

## INTRODUCTION

In the current era of medical practice, giant ovarian tumors have become rare due to early discovery on routine check-ups. Depending on the age of the patient, size and histopathology of the cyst, management is decided.[1] Detection of ovarian tumors causes panic amongst patients because of the fear of malignancy leading to psycho-somatic stress disorders. In addition to this, large size of these tumors causes mechanical pressure symptoms on the gastrointestinal, respiratory and urinary tract. Hence, a comprehensive approach to the management of such tumors is essential to negate the secondary effects along with treatment of the primary ovarian tumour.[2]

We report a case of a post-menopausal woman with a history of progressive abdominal swelling over a period of 6 months along with radiological reports suggestive of a large tumor arising from the right ovary.

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## CASE REPORT

A 65-year-old Indian housewife, P5L5, married since 40 years, postmenopausal since 20 years, weighing 65 kg, came to our outpatient department in March 2015 with complaints of a gradually increasing huge abdominal swelling which she had noticed 6 months back. The swelling was accompanied with dull aching pain in the lower back. She also complained of breathlessness, insidious in onset, which worsened on recumbency leading to decreased sleep. She had the sensation of fullness of abdomen, leading to decreased appetite. She also complained of incomplete voiding of urine and usually remained constipated. There was a history of generalized weakness. There was no history of vomiting or other gastrointestinal disturbances, colicky pain or fainting attacks. The patient had no history of the previous medial or surgical illnesses. There was no family history of malignancies. Despite all these symptoms, the patient did not seek for medical attention earlier owing to low socioeconomic status. It was only when she started having decreased appetite that her relatives brought her to the hospital.

The patient was found to be averagely built, weighing 65 kg. Physical examination revealed pale skin; the patient was afebrile with a pulse rate of 78 b/min, blood pressure of 128/66 mm Hg and respiratory rate of 22 cycles/min. Her abdomen was distended, and tense with an abdominal girth

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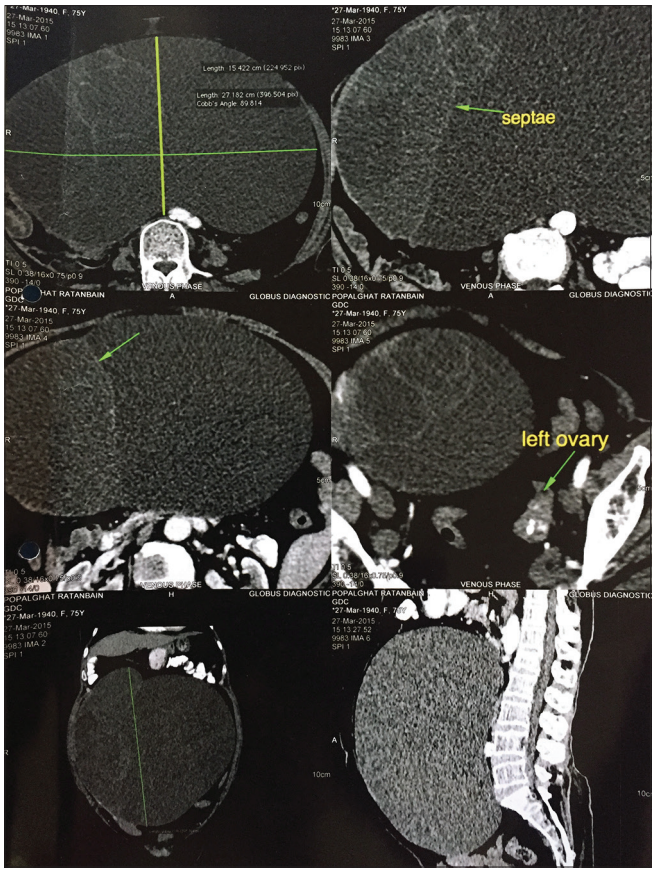


**Figure 1: Multidetector computerized tomographic images of the abdomen and pelvis (plain + Contrast) showing large cystic lesion with thin internal enhancing septations measuring approximately 15.4 cm × 27.1 cm × 27.5 cm**

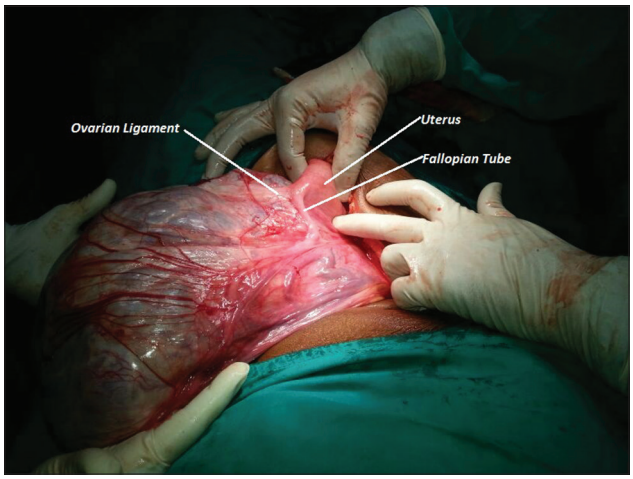


**Figure 2: Intra-operative image of the specimen showing an atrophied uterus with stretched out ovarian ligament**

of 125 cm with a dull note on percussion and presence of superficial dilated veins. Plain radiograph of the chest (P-A view) was within normal limits. CA-125 was 31.3 IU/ml.

An ultrasound done suggested a large well-defined cystic lesion of about 32 cm × 35 cm × 28 cm arising from pelvis,

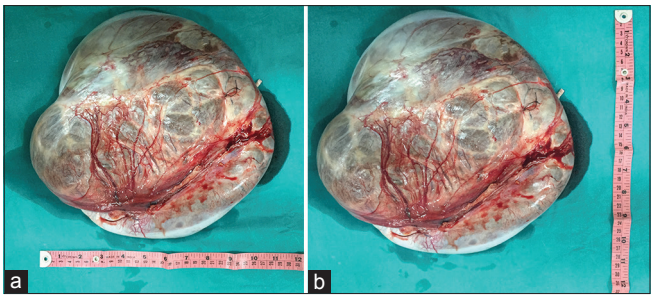


**Figure 3: (a and b) Post-operative specimen of right ovary measuring 28 cm × 27 cm × 15 cm after controlled drainage of 4 l of fluid**

reaching up to the epigastrium, displacing liver and spleen supero-laterally, and kidneys posteriorly and bowel loops peripherally. On Doppler, septa did not show vascularity. Peripheral low impedance with continuous vascularity was present. Uterus was seen separately. Ovaries were not seen separately.

Multiple detector computed tomography scan of abdomen and pelvis (plain + contrast) (Figure 1) was suggestive of a large cystic lesion with thin internal enhancing septations in abdomen and pelvis measuring approximately 25.4 cm × 27.1 cm × 27.5 cm. The right ovary was not seen separately from this lesion. Superiorly the lesion reached up to subhepatic region. Displacement of small bowel loops with compression of *inferior vena cava* (IVC) and left renal vein was seen. Left ovary measuring 32 mm × 26 mm with internal calcifications seen. CA-125 was 31.3 IU/ml.

Exploratory laparotomy was done. A huge multicystic tumor arising from the right ovary was seen occupying the abdomen, from the pelvis up to the diaphragm. The cyst was multiloculated, and tumor was seen displacing spleen, liver and bowel loops. The extent of the tumor was identified (Figure 2). Gross evidence of malignancy was ruled out. Decompression of the cyst was done by controlled drainage of 4 liters of fluid intra-operatively after which the tumor measuring 29 cm × 28 15 cm and weighing 7 kg was removed en bloc. Total abdominal hysterectomy along with bilateral salpingo-oophorectomy and partial omentectomy was done. Lymph nodes were not involved. The left ovary was seen measuring 3 cm × 2 cm. An abdominal drain was placed *in situ* for 3 days (Figure 3). The post-operative period was uneventful. Patient weighed 55 kg on day 7 post operation. Histopathological examination revealed serous cystadenoma of the ovary.

## DISCUSSION

In a women's lifetime, ovarian tumors can present at any age. The size of an ovarian cyst can range from a small ping pong ball to a mass larger than a full term pregnancy.

The definition of large ovarian cysts varies from those measuring more than 10 cm in diameter in preoperative scans to those reaching above the umbilicus.[3] On the basis of cell of origin, ovarian neoplasms are divided into epithelial, stromal and germ cell neoplasms. Ovarian epithelial tumors constitute about half of all the ovarian tumors. Of these, 40% constitute benign tumors and 86% constitute malignant tumors. Benign serous tumors comprise 25% benign ovarian neoplasms and 58% ovarian serous tumors. Depending on the age, 70% serous tumors are benign, about 10% have borderline malignant potential and about 20% are malignant. Serous tumors are bilateral in 10% cases.[4] The epithelium of cysts is cylindrical and mono- or multi-stratified. Cuboidal epithelium occurs due to the pressure inside the cyst. These cells have clear cytoplasm with the hyperchromatic nucleus at the base. Cancer antigen (CA)-125 helps in identifying and following malignant epithelial tumors of the ovary.[5] Cystadenomas are thin walled cysts, containing serum like fluid. Some papillary projections might appear on the internal surface of the cyst. Usually, serous cystadenomas are multilocular.[6] In approximately 25% cases of ovarian serous cystadenoma, some evidence of estrogenic activity has been found. 44% cases of serous cystadenoma present with postmenopausal bleeding and 73% have an abnormally high cornification index.[7] Tumors arise from within the pelvis, and patients commonly seek medical aid at advanced stages.[8] In the year 1922, Spohn reported a large ovarian cyst weighing 148.6 kg which are possibly the largest.[9] Many intra-operative complications occur during surgical removal of large ovarian tumors. Crossen and Crossen reported splanchnic dilatation and venous pooling after the sudden removal of large intra-abdominal masses.[10] Howard *et al.* showed that hypotension can occur due to decreased venous return resulting from obstructed IVCl.[11] Poulias and Prombonas showed that sudden re-expansion of a chronically collapsed lung, which occurred due compression by the elevated abdomen might result in pulmonary oedema.[12]

Various imaging modalities are used in making a diagnosis of ovarian tumors. Ultrasonography is used to diagnose and infer about possible malignancy. Computed tomography and magnetic resonance imaging scans can be used for larger masses and metastatic involvement. Serial measurements of the biomarker CA-125 can be of great help.[13] Surgery is inevitable for large tumors even if benign. Surgical management includes excision. The contralateral ovary should also be examined. Hunter *et al.* reported that rupture of the cyst capsule and greater dissemination can be prevented by gradual decompression. Repeated paracentesis have been associated with tumor seeding of the peritoneal cavity, bleeding, infection, and increased adhesions resulting in difficult cyst removal.[14]

## CONCLUSION

In developing countries, patients having ovarian tumors seek medical help usually during advanced stages of the disease. Fortunately in our case, the tumor was removed successfully without any dissemination despite a delay in diagnosis. Reporting such cases with unusual presentations helps to increase the suspicion of its possibility and avoid any misdiagnosis or improper treatment and its complications.

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Case Report

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# Schwannoma of Tongue: A Rare Case Presentation with Review of Literature

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## Abstract

Schwannomas, also known as neurilemmomas are uncommon neoplasms, derived from Schwann cells. They are benign, encapsulated, slow-growing, and usually solitary tumors. Approximately 25-48% of cases are seen in the head and neck region, of which 1% occurs in an oral cavity. These neoplasms, although rare, should be considered in the differential diagnosis of slow-growing masses of an oral cavity. Lingual schwannomas can develop at any age and with no gender predilection. Lingual schwannomas generally present as a painless lump and can affect all age groups with the peak incidence between the third and sixth decade. The growth of these tumors sometimes causes displacement and compression of the nerve of the origin, giving rise to clinical signs and symptoms. We report a rare case of schwannoma of the tongue in an 18-year-old female complaining of asymptomatic swelling over a posterolateral surface of the tongue, treated by complete surgical excision. The diagnosis was established on the basis of clinical, histopathological, and immunohistochemical examination.

**Key words:** India, Lingual, Schwannoma

## INTRODUCTION

Schwannoma is a benign encapsulated tumor of Schwann cells present in nerve sheath.[1] It is usually a solitary tumor with an unknown etiology. It is also named as neurilemmoma, neurinoma, and Schwann cell tumor.[2] The most common site of origin is in the head and neck region.[3] However, they are quite rare in the oral cavity, accounting just over 1% of benign tumors.[4] In the oral cavity tongue is the most common location followed by palate, floor of mouth, buccal mucosa, and mandible.[5] This tumor may present itself at any age, but is more frequent between second and fourth decade of life, with no predilection for gender or race. The goal for treatment is complete excision, which results in low rates of recurrence.

## CASE REPORT

We present an 18-year-old female who presented with an asymptomatic slow-growing painless mass on the right posterolateral tongue for several years. Examination revealed a well-circumscribed, non-tender, non-compressible, non-reducible, non-fluctuant palpable mass involving the lateral tongue on right side measuring 1.5 cm in size (Figure 1). Adjacent oral mucosa revealed no abnormalities. Tongue mobility was normal. Simple gustatory testing to sweet, sour, and salt yielded normal results. No difficulty in chewing, swallowing, and phonation. No cervical lymphadenopathy was evident. The clinical differential diagnosis included benign tumors such as fibroma, lipoma, and neurofibroma.

**Figure 1: Slow growing painless mass measuring 1.5×1.5cm on right posterolateral surface of tongue**

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Fine-needle aspiration (FNAC) was inconclusive. The patient underwent complete surgical excision and tissue was sent for histopathological examination.

On gross examination, one gray-white encapsulated soft tissue mass measuring 1.5 cm × 1.5 cm × 1 cm, cut surface was gray-white. Microscopic examination revealed well-circumscribed neoplasm (Figure 2) composed of spindle-shaped cells arranged in fascicles and palisading sheets (Figure 3). Both cellular and hypocellular areas (antoni A and antoni B) were seen with a predominance of cellular areas (Figure 4). Immunohistochemistry was applied and showed diffuse positivity for S-100 protein in (Figure 5). On the basis of routine hematoxylin and eosin staining along with immunohistochemical evaluation, the diagnosis of schwannoma was confirmed. Lack of necrosis, hyperchromatism, and atypical features helped in differentiating from other spindle cell tumors.

## DISCUSSION

Schwannomas is slow-growing neoplasm, which may be located anywhere in peripheral nervous system. It most commonly arises from peripheral nerves in the head and neck region and extensor aspects of extremities.[3] Schwannoma accounts for just over 1% of benign tumors reported in an oral cavity. It can occur at any age although when present in the oral cavity it tends to occur more often in adults than in children. They are typically slow-growing, solitary tumors.[6] The preoperative diagnosis is quite difficult because this is an infrequent tumor and is not usually suspected in the oral cavity.[7] Histopathological evaluations is the key to diagnosis of this tumor as FNAC gives negative results on microscopy.[5] Microscopic examination reveals well-circumscribed neoplasm composed of spindle-shaped cells arranged in fascicles and palisading sheets. Both cellular and hypocellular areas (Antoni A and Antoni B) are seen with a predominance of cellular

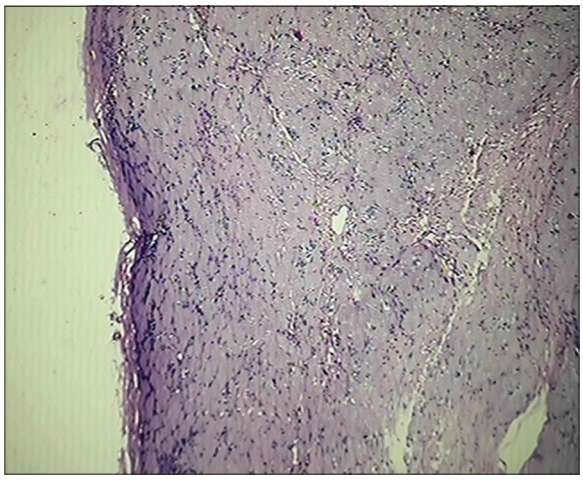

**Figure 2: High power view of capsule (Palisading pattern and verocay bodies).**

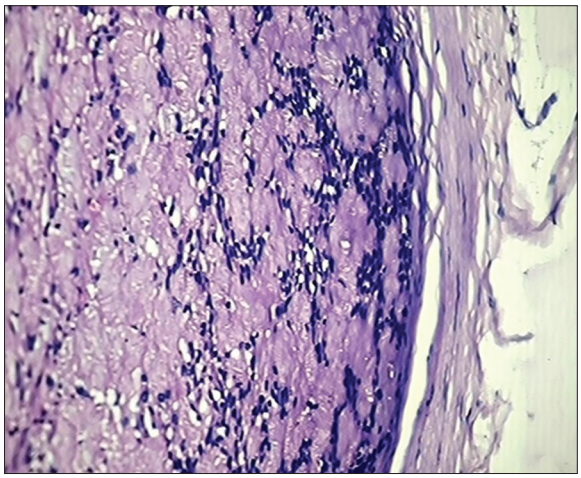

**Figure 3: Encapsulated Tumor**

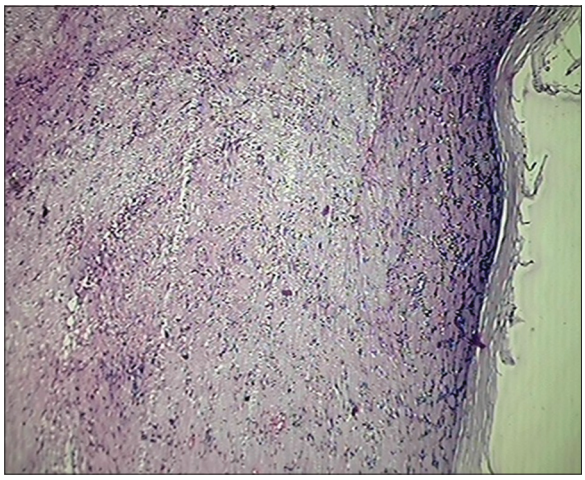

**Figure 4: View of Antoni A (more cellular) and Antoni B (more myxoid) components**

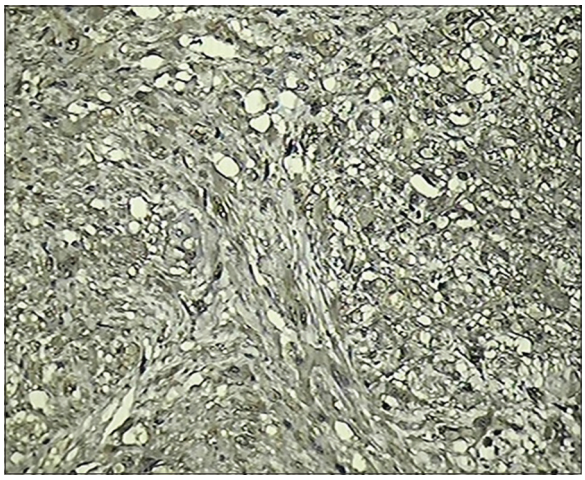

**Figure 5: Immunohistochemical staining of tumor cells revealed diffuse, strongly positive staining for S-100 protein**

areas. Immunohistochemistry shows diffuse positivity for S-100 protein. On the basis of routine hematoxylin and eosin staining along with immunohistochemical evaluation, the diagnosis of schwannoma is confirmed. Lack of necrosis, hyperchromatism, and atypical features helps in differentiating from other spindle cell tumors.

## CONCLUSION

Schwannoma of the tongue is a relatively rare tumor of head and neck and is often not taken into account during clinical practice or even considered as a possible diagnosis. Given the rarity of the lesion, a careful consideration is warranted as it is indistinguishable from other benign neoplasms. The final diagnosis should be done after histopathological examination and in some cases after immunohistochemistry analysis. Schwannomas are managed by complete surgical excision and reoccurrence is rare. Malignant transformation of schwannoma is an exceptionally rare event and can be safely disregarded.

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Case Report

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# Prosthetic Rehabilitation of a Treated Cleft Palate Patient by Using an Overlay Denture with Twin Occlusion: A Case Report

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## Abstract

Rehabilitation of patients with congenital anomalies such as cleft lip and palate, anodontia, hypodontia is a daunting prosthetic challenge. A treatment plan, which would restore the functional and esthetic needs within the ambit of physiological and financial conditions of the patient, should be contemplated. Especially in the group of patients where old age in addition to multiple systemic diseases deters any invasive prosthetic treatment modality, a more conservative planning, which would resolve the chief complaint, is more fruitful. This article describes a case report of an elderly female where an overlay denture with twin occlusion is planned and fabricated in order to re-establish the masticatory efficiency and to achieve a pleasant esthetics.

**Keywords:** Cleft palate, Hypodontia, Malocclusion, Overlay denture

## INTRODUCTION

Patients afflicted with congenital/developmental anomalies address the prosthodontists with unique esthetic and functional challenges. Such anomalies are frequently associated with partial anodontia, which needs significant meticulous endeavors for an effective functional rehabilitation.[1]

One such commonly occurring anomaly is cleft lip and palate. The prevalence of cleft lip and palate among the general population depends on racial, ethnic, and geographic origin, as well as on socio-economic status. Its prevalence has been estimated to range from 1:500 to 1:2500 live births. It is mainly characterized by the presence of an oronasal communication, malformation or agenesis of the teeth close to the cleft and deficient sagittal and transverse growth of the maxilla.[2]

In healthy partially dentulous patients with normal tooth anatomy, excellent rehabilitations can be attained with fixed prosthetic modalities. However, achieving definitive prosthetic results in the cleft patients may not be feasible due to certain factors such as underdeveloped alveolar bone, severe malocclusion, hypodontia/"cone" shaped teeth, disproportionate lips, tooth agenesis, and poor periodontal conditions. In such group of patients, especially among the elderly, an overlay denture presents as a viable treatment option that can significantly improve the function and esthetics.[3]

According to GPT 8 an overlay denture is defined as "as any removable dental prosthesis that covers and rests on one or more of the remaining natural teeth, on the roots of the natural teeth, and/or on the dental implants." It is also called as over denture, overlay prosthesis, and superimposed prosthesis.[4] This article presents a case report of an elderly female patient with surgically repaired cleft palate, rehabilitated by an overlay denture with twin occlusion.

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## CASE REPORT

A 75-year-old female patient reported to the Department of Prosthodontics, Government Dental College, Thiruvananthapuram with a chief complaint of multiple missing upper teeth, depressed upper lip, and an inability to chew. Patient had undergone cleft repair surgeries at her young age following which the defect was completely closed. Furthermore, medical history disclosed that the patient is a known case of mitral stenosis for which she is under medication.

An extraoral examination revealed facial asymmetry, sunken upper lip, deviation of the chin to the left, disproportionate lips, a concave profile (Figures 1 and 2). While a thorough intraoral examination showed depressed pre-maxilla, collapsed bite with total disocclusion, missing 15, 13, 12, 11, 21, 25, 26, 27, and root stumps with 14, 22, 23 (Figure 3). The findings were confirmed by a digital orthopantomogram. Patient did not want any extraction or invasive procedure to be done. All the treatment options were discussed with the patient and finally the option of an overlay denture over her remaining teeth in order to satiate her chief complaint of esthetics and function was decided.

Primary impressions were made using irreversible hydrocolloid (Zelgan, Dentsply, India) impression material. On the primary maxillary cast, a special tray was fabricated in autopolymerizing resin after blocking out the dentulous portion with modeling wax. Peripheral tracing was done with putty consistency polyvinyl siloxane impression material (Aquasil, Dentsply, India) in order to record the functional sulcus (Figure 4). Final impression was made in light body consistency (Figure 5). Casts were poured in Type IV dental stone (Elite Master, Zhermack). Record base and occlusal rims were fabricated on the maxillary cast after spacing out the tooth-bearing portions. Face bow transfer was done and the maxillary cast was mounted on a dentatus semi-adjustable articulator (ARL type). Horizontal and vertical maxillomandibular records were obtained and the mandibular cast was mounted using the centric relation record. Artificial teeth were selected and

**Figure 1: Pre-treatment extra oral frontal view**

**Figure 2: Pre-treatment extra oral profile view**

**Figure 3: Intraoral frontal view of maxillary and mandibular dentition**

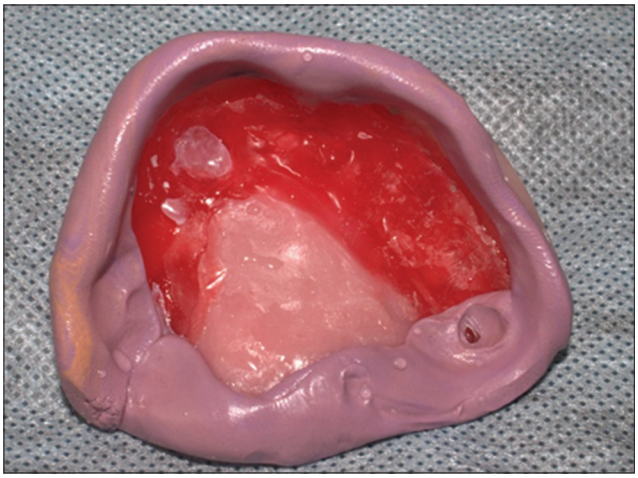

**Figure 4: Border moulding**

arranged; furthermore, an Adam's clasp was fabricated on right first maxillary molar in order to achieve additional retention. Trial denture was evaluated and checked for esthetics, vertical dimension of occlusion, phonetics, and occlusion. Patient's approval was also obtained. Finally, the trial denture was acrylized (Lucitone 199, Dentsply International, NY), finished, polished (Figures 6 and 7). The prosthesis was comfortable to the patient and enhanced the overall esthetics (Figures 8 and 9).

## DISCUSSION

The overlay/over denture is not a new concept, and its use dates back 100 years. Today with the stress on preventive measures the use of overlay dentures has increased to the point where it is now a feasible alternative to most complex treatment plans.[3-6] Special emphasis should always be placed on the preservation of tissues, which support artificial teeth. The use of teeth as a means of support for dentures is aimed at reducing the load on the osseous portions of the denture bearing area and minimizes the process of resorption.[7]

The mentioned case presented with the underdeveloped maxilla, complete buccal crossbite, deranged occlusion,

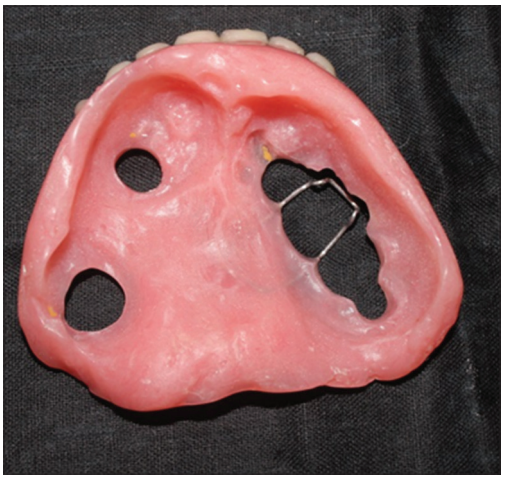

**Figure 7: Intaglio surface of the finished prosthesis**

**Figure 5: Secondary impression**

**Figure 8: Post treatment intraoral view**

**Figure 6: Overlay denture**

**Figure 9: Post treatment extra oral view**

poor esthetics, difficulty in mastication, and multiple roots stumps. Considering the constraints of old age, systemic diseases, and poor compliance, the most conservative option of a tooth-supported overlay denture with a twin occlusion was decided.[8] The prosthesis was comfortable, esthetically pleasant and functionally effective which resolved the chief complaint of the patient. Furthermore, satisfactory retention was obtained due to precise interdental engagement of the denture and furthermore by the addition of an Adam's clasp.[9]

## CONCLUSION

The goal of modern dentistry is to achieve prosthetic rehabilitation, which replaces missing teeth and lost supporting structures, as well as to restore proper esthetics and function. This article presents a case of preventive prosthodontics wherein a previously treated case of cleft, the rehabilitation was done by fabrication of an overlay denture to achieve adequate fullness and to correct the occlusal plane. Furthermore, a twin occlusion was planned to enhance masticatory efficiency as the patient had total buccal non-occlusion. Upon review after 1-week, 4 weeks, and 2 months the prosthesis was found to be effective, and the patient was satisfied with the outcome.

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Case Pictorial

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# Recurrent Giant Fibroadenoma: A Rare Case

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Fibroadenomas are common benign lesions of the breast that usually present as a single breast mass in young women.[1] They are assumed to be an aberration of normal breast development and the product of hyperplastic process rather than true neoplasm.[2] Histologically, they appear to be more cellular and have less lobular components than do simpler fibroadenoma, however, they are benign lesion that do not undergo transformation to malignancy.[3]

A 23-year-old lady presented with rapidly enlarging right breast lumb for the last 4 months. She was twice operated for fibroadenoma 3 years and 6 months back at some private hospital (Figure 1). There was no history of pain, trauma, nipple discharge, fever, anorexia or weight loss. On examination, there was a large mass measuring about 16 cm × 10 cm. Involving almost whole of the right breast. The lump was firm, mobile, with a regular surface with no superficial ulceration, overlying skin was shiny and was not fixed to the lump, however, previous surgery scar were visible. There was no axillary lymph node or any other lump in the other breast. Routine investigation was within normal limit. Fine-needle aspiration cytology report revealed the presence of few bare nuclei from the ductal cells with occasional clusters with mild anisonucleosis with no foci of atypia seen.

**Figure 1: Clinical picture of the right breast lump**

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Total excision of lump was done with preservation of normal breast issue, nipple, and areola (Figure 2). The specimen was sent for histopathological examination with

**Figure 2: Excised breast lump**

**Figure 3: Post-operative breast**

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revealed giant juvenile fibroadenoma of the right breast. The postop period was uneventful, and the patient is doing well at regular follow-up with no locoregional recurrence (Figure 3).

1. Fibroadenoma larger than 5 cm are commonly defined as a benign giant fibroadenoma, and they are usually encountered in pregnant or lactating women when found in an adolescent girl the term juvenile fibroadenoma is more appropriate.
2. These lesions contribute 0.5-2% of all fibroadenoma and are rapidly growing masses that caused asymmetry of the breast, distortion of overlying skin, and stretching of the nipple.

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