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Original Research Article

Tonsillectomy and its effect on ASO titre

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ABSTRACT

Background: Acute tonsillitis is one of the most common manifestations of the upper respiratory tract infections. It is common in children and accounts for an incidence of about 32 per 1000 patients per year. The objective of this study was to determine the effect of tonsillectomy on ASO titre and to evaluate the sensitivity and specificity of throat swab culture.
Methods: Present study performed a prospective study, a total number of 50 children were screened, out which 25 patients under the age of 15 years (16 male and 9 female), were included in the study, who were having chronic tonsillitis with raised anti-streptolysin O titre (>200IU/ml). All the patient underwent tonsillectomy and serological estimation of ASO titre was done at the end of first, second and third month post-surgery. Throat swab culture was performed prior to tonsillectomy and at the third month of follow up.
Results: Twelve children (48%), twenty children (80%) and twenty-two children (88%) became serologically negative for ASO antibody at the end of first, second and third month respectively, with a statistically significant p value of 0.0001. The sensitivity and specificity of throat swab culture was 16% and 100% respectively.
Conclusions: Tonsillectomy has a significant role in reducing the serological levels of anti-streptolysin O antibody and its reactivation, thereby decreasing the rate of complications associated with Group A-beta haemolytic streptococci.

Keywords: ASO titre, Tonsillectomy, Throat swab culture

INTRODUCTION

Acute tonsillitis is one of the most common manifestations of the upper respiratory tract infections. It is common in children and accounts for an incidence of about 32 per 1000 patients per year. The highest incidence occurs between 3 months - 5 years; while the school going children between the age of 6 and 12 years are highly predisposed.[1] Group A beta - haemolytic streptococci (GABHS) are the most common causative organisms associated with bacterial pharyngitis. It accounts for 37% of cases of acute pharyngitis in children older than 5 years.[2] Other bacterial causes of pharyngitis include Group C *Streptococcus* (5% of total cases), *C. pneumoniae* (1%), *M. pneumoniae* (1%) and *anaerobic species* (1%). Among virus Rhinovirus, Coronavirus and Adenovirus account for about 30% of the total cases, Epstein Barr virus accounts for 1%, Influenza and Parainfluenza virus for about 4% of total cases.[3] Complications of the GABHS infection can be distinguished into suppurative and non-suppurative. Suppurative complications are due to the spread of GABHS to adjacent tissues, including cervical lymphadenitis, peritonsillar abscess, retropharyngeal

abscess, otitis media, mastoiditis and sinusitis. The use of antibiotics has reduced the incidence of this group of complications, however these still remain a reality when primary illness has gone unnoticed or untreated.[4]

Non- suppurative, immune-mediated sequalae are acute rheumatic fever (ARF), acute post-streptococcal glomerulonephritis, Sydenham chorea, reactive arthritis, psoriasis, Behcet's disease and paediatric autoimmune neuropsychiatric disorders associated with *Streptococcus pyogenes* (PANDAS). Group A streptococcal infections have recently been associated with Tourette syndrome, tics and movement and attention deficit disorders.

Anti-streptolysin O (ASO) is the antibody response most often examined in serological tests to confirm antecedent streptococcal infection. Todd developed the assay for ASO antibodies.[5] According to Read SE and Zabrinskie an increase in ASO titre warns of the possible development of rheumatic fever.[6] A single titre of more than 200 IU/ml is considered as a raised value.[7] Approximately 80% of the patients will have an elevated ASO titre (>200 Todd units) at two months after onset of disease.[8]

Tonsillectomy is the most frequently performed otolaryngological procedure, especially in young children; it is effective in reducing the number and duration of episodes of sore throat in children, the gain being more marked in those most severely affected.[9,10] However, pediatricians prefer to treat children having tonsillitis with long-acting penicillin. The recommended dose of benzathine penicillin G is 600,000U intramuscularly for patients weighing 27 kg (60lb) or less, and 1,200,000 U for patients weighing more than 27 kg.[11]

The failure of penicillin to treat severe invasive streptococcal infections successfully is attributed to the phenomenon in which a large inoculum reaches stationary phase quickly and penicillin is not very effective against slow-growing bacteria.[12] Treatment failures are frequent and attributed mainly to poor compliance, antibiotic resistance, untreated close contacts, carrier state and antibiotic related or co-pathogenic suppression of host immunity and the necessary flora and therefore tonsillectomy has a significant role in preventing the recurrent streptococcal infections.[13]

The objective of this study was to determine the effect of tonsillectomy on the ASO titre and to evaluate the sensitivity and specificity of throat swab culture compared to the raised ASO titre.

METHODS

This study was a prospective randomised interventional study conducted in the department of ENT and HNS at Indira Gandhi medical college, Shimla, Himachal Pradesh, India. The study was done for a period of 1 year (duration from June 1, 2015 to May 31,2016), after the approval of Institutional Research and Ethics Committee. The study was aimed at assessing the effect of tonsillectomy on the serum ASO titre in patients of chronic tonsillitis.

A total number of fifty patients were screened, out of which 25 patients admitted indoors were subjected to anti-streptolysin O titration and throat swab culture, were included in this study after taking prior written informed consent.

Inclusion criteria

- Age of 4 - 15 years.
- Children suffering from recurrent tonsillitis with signs of chronic tonsillitis

a. Hypertrophy of the tonsils
b. Enlarged cervical lymph nodes
c. Pus in the tonsillar crypts
d. Flushed anterior pillar

- Severe attacks of tonsillitis: seven times in 1 year or five times each year for 2 years, or three times each year for 3 year
- According to the guidelines of the American Academy of Otolaryngology - Head and Neck Surgery, tonsillectomy is indicated if:

a. The patient contracts three or more attacks of sore throat per year, despite medical therapy
b. The attack of tonsillitis is severe enough to cause an abscess, or an area of pus and swelling, behind the tonsils
c. The tonsillitis did not improve by antibiotics
d. The child’s swollen tonsils and adenoids impair normal breathing
e. An ASOT of greater than 200 IU/ml and an ESR of greater than 30 ml/l at ½ hour.

Exclusion criteria

- The child has bleeding diathesis, cardiac disease, anaemia, acute infection, poor anaesthetic risk or an uncontrolled medical illness that prevents tonsillectomy
- Presence of Jones criteria fulfilling the diagnosis of rheumatic heart disease and rheumatic fever.

Then under all aspetic condition blood and throat swab samples were taken for ASO titre, routine blood investigations and throat swab culture.

The procedure for the determination of ASO titre is based on the inhibitory effect of patient's serum on the hemolytic power of the pre-titrated and reduced streptolysin O. The antigen and the antibody reactions occurs independently of the hemolytic activity of the

streptolysin O. This property determines ASO titre qualitative and quantitative test by agglutination of latex particles on a slide.

All the patient underwent tonsillectomy under general anaesthesia and were followed up for next three consecutive months, estimation of ASO titre was done at first, second and third month post-surgery.

Statistical analysis

The statistical analysis was done using SPSS (Statistical Package for Social Sciences) for Windows 15.0 program. ASOT were analyzed as categorical variables using Chi-square test and Fisher's exact test. Z-score and t-test were used for analysis of population proportions and means. Level of significance (α) was set at 5%. Hence, a p-value < 0.05 was accepted as statistically significant.

RESULTS

A total number of 50 patients of tonsillitis were screened for this study out of which 25 patients, who were ASO (anti-streptolysin O) positive, were finally included in this study (Table 1, Figure 1). Overall 16 patients were male (64%) and 9 were females (36%). The incidence of tonsillitis was higher in males compared to females but it was not statistically significant (chi squared p-value = 0.05; level of significance = 5%). The overall mean age of patients under this study was 9.24 years (range was 4 to 15 years and standard deviation was 3.39 years). There was no statistically significant difference in the incidence of tonsillitis between the children aged 9 years or below and those aged above 9 years (two tailed p-value = 0.16).

Table 1: Demographic profile of patients under study.

	ASOT positive (>200 iu/ml)
Total number (n)	25
Male (%)	16 (64)
Female (%)	9 (36)
P-value	0.05
Mean age (years)	9.24
SD (years)	3.39
Range (years)	4 - 15

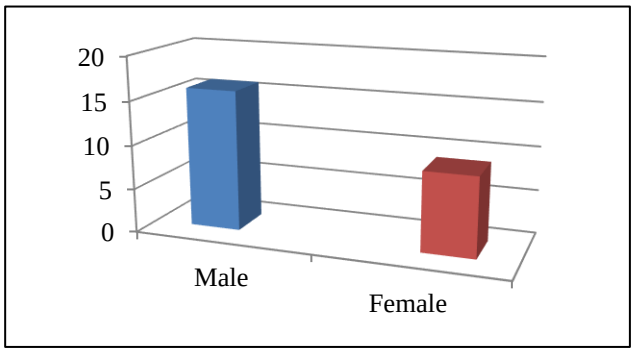

Figure 1: Gender distribution in tonsillitis.

It was observed that there was a reduction in ASO titres to levels <200 IU/ml at the end of first follow up (1 month after surgery) 12 (48%) out of 25 patients showed ASO titre < 200 IU/ml; two tailed p-value = 0.0001(statistically significant).

Table 2: Contingency table (Fisher exact test) at first follow up.

Groups	ASO titre > 200 IU/ml	ASO titre < 200 IU/ml
Before surgery	25	0
1 month after surgery	13	12

Two tailed p-value = 0.0001

At the end of second follow up (2 months after surgery); 20 (80%) out of 25 patients showed ASO titre < 200 IU/ml; two tailed p-value = 0.0001 (statistically significant).

Table 3: Contingency table at second follow up (2 months after surgery).

Groups	ASO titre > 200 IU/ml	ASO titre < 200 IU/ml
Before surgery	25	0
2 months after surgery	5	20

Two tailed p- value = 0.0001

At the end of third follow up (3 months after surgery) 22 (88%) out of 25 patients showed ASO titre < 200 IU/ml; p value = 0.0001 (statistically significant).

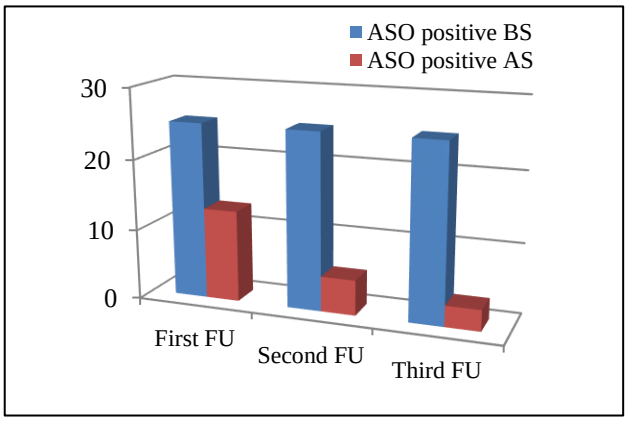

Figure 2: Reduction in ASO titres after tonsillectomy.

Table 4: Contingency table at third follow up (3 months after surgery).

Groups	ASO titre > 200 IU/ml	ASO titre < 200 IU/ml
Before surgery	25	0
3 month after surgery	3	22

Two tailed p- value = 0.0001

Sensitivity of Superficial throat swab culture = {true positive / (true positive + false negative)}×100 = {4/(4+21)}×100 = 16%

Specificity of Superficial throat swab culture = {true negative / (true negative + false positive)}×100 = {25/(25+0)}×100 = 100%

DISCUSSION

Recurrent tonsillitis is common in children and considered to be the third most frequently diagnosed disease in paediatric medicine. The highest incidence occurs between 4-5years. About 34 to 80% of all cases of tonsillo-pharyngitis have been attributed to bacterial etiology.[14-16] The commonest pathogenic bacteria being the Group A Beta Haemolytic Streptococcus, accounting for 24 to 65% of the cases.[17] About one in four children with acute sore throat has serologically confirmed GABHS pharyngitis. GABHS are associated with both suppurative and non suppurative complications. Non suppurative are based on molecular mimicary and cross antigen reactions and therefore difficult to treat.[18]

A positive throat culture for GABHS makes the diagnosis of streptococcal sore throat likely but a negative culture does not rule out the diagnosis. There are cases where streptococcus is isolated from sore throats but there is no serological evidence of infection.[19] The asymptomatic carrier rate for GABHS is up to 40%.[19,20] The flora of bacteria recovered from the surface of the tonsil correlates poorly with that of those deep in the tonsillar crypts which are most likely to be causing the infection.[21,22] Symptoms also correlate poorly with results of throat swab culture.[23]

ASO titre remains the most sensitive serological indices of antecedent Group A beta-haemolytic streptococcal infection.[24] In present study it was observed that there was a reduction in ASO titres to levels <200 IU/ml post tonsillectomy. At the end of first follow up (1 month after surgery) 12 (48%) out of 25 patients showed ASO titre < 200 IU/ml; two tailed p-value = 0.0001, which was statistically significant. At the end of second follow up (2 months after surgery); 20 (80%) out of 25 patients showed ASO titre < 200 IU/ml; two tailed p-value = 0.0001, which was statistically significant. At the end of third follow up (3 months after surgery) 22 (88%) out of 25 patients showed ASO titre < 200 IU/ml; p value = 0.0001, which was statistically significant. Our study was in concordance with Viswanathan N et al, who observed a marked reduction in the ASO titre level from third month onwards after tonsillectomy and ASO continued to remain negative at six months and one year in a statistically significant level, in 88% of patients.[25]

Azza Mohamed et al also conform our study results. The mean ASOT readings for the tonsillectomy group were 518.29, 253.28, and 117.13 IU/ml, respectively (P-value 0.004), whereas for the penicillin group, they were 526.70, 413.39, and 262.98 IU/ml, respectively (P-value of 0.072).[26] He concluded that that the first line of treatment of recurrent chronic tonsillitis is tonsillectomy, as it is both clinically effective and cost-effective for children and that the second line of treatment is long-acting penicillin which requires a long-term follow-up, it can be given in patients who are have contraindications for surgery such as bleeding diathesis.

A high ASO titre indicates the presence of a recent streptococcal infection. A rise of ASO antibody generally takes place from one to four weeks after streptococcal infection and after that the titre returns to the previous level within two or three months, by this time patient can develop suppurative and non-suppurative complications of GABHS. Throat swab culture is positive in 80% of streptococcal infections but may be negative in cases of chronic infection. Antigen detection test is very sensitive, but it is very costly and not available in all the centers. ASOT titre test is the most widely used test. It is more popular because of its availability in our country, less cost and reasonable sensitivity. Very few studies have been reported regarding the value of ASO tire as an indicator of tonsillectomy and in reducing the non suppurative complications of GABHS. Henceforth, comparative discussion is limited. Further prospective randomized multi-centric studies investigating the efficacy of tonsillectomy on ASO titre are required in this regard, in order to draw a final.

CONCLUSION

Tonsillectomy led to significant decrease in the levels of raised ASO titre in chronic tonsillitis patients. About 88% of the patients turned negative at the end of study. It also reduces the chances of recurrence of disease. The levels of ASO titre are reduced and therefore, humoral and cellular-mediated immune responses resulting in non-suppurative complications of GABHS is also reduced. As the streptococcal proteins exhibit molecular mimicry with heart valves, neurons and other tissues the risk of rheumatic fever and rheumatic reactivation can be reduced by preventing streptococcal infection.

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