Evaluation of the Effect of Tonsillectomy on Antistreptolysin O (ASO) Titer

Saud Salim Bakir a*, Mohammed Zaki Salim Abdulridha b and Laith Mahmood Attallah a

a Al-Salam Teaching Hospital-Nineveh Health Directorate, Iraq.

b Al-Numan Teaching Hospital-Baghdad Rusafa Health Directorate, Iraq.

Authors’ contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: Acute recurrent tonsillitis is a common problem worldwide and tonsillectomy is the preferable treatment for patients not responding to medical treatment. Many patients with acute recurrent tonsillitis and increased antistreptolysin O (ASO) titers are caused by group A beta hemolytic streptococcal (GABHS) tonsillitis, which can lead to serious side effects such rheumatic fever and glomerulonephritis.

Aim: To assess the consequence of tonsillectomy on ASO titer.

Patients and Method: This prospective study was conducted to analyze the consequence of tonsillectomy on 43 patients with raised antistreptolysin O (ASO) titer out of 220 patients with acute recurrent tonsillitis, for the period from October 2015 to October 2016 at Otolaryngology department, Tertiary referring hospital at Erbil, Kurdistan/Iraq. Their Demographic characteristics, medical, drug and family history and disease extent were analyzed. Postoperative follow up were processed.

*Corresponding author: E-mail: saudalbek@gmail.com;
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Results: The study included 43 patients between 3 to 16 years suffering from acute recurrent tonsillitis, elevated ASO titer (≥200 IU/ml) and positive throat swab for GABHS were included in the study. Six months postoperatively had been shown that there is a significant reduction in ASO titer in comparison to preoperative measures (p < 0.001) and this is also applicable to the number of sore throat episodes.

Conclusion: The main conclusion from this study is significant effect of tonsillectomy on decreasing ASO titer which reveals the reduction in postoperative GABHS throat infection, this supported by reduction of postoperative sore throat episodes.

Keywords: Acute recurrent tonsillitis; ASO titer; sore throat; tonsillectomy.

1. INTRODUCTION

One of the frequent clinical issues in the field of otolaryngology is acute recurrent tonsillitis. The major agent in charge of this is Streptococcus. Due to the undervaluation of the significance of early detection of streptococcal throat infection and adequate response, rheumatic fever and glomerulonephritis are significant non-suppurative consequences of streptococcal tonsillitis. The most used test is the ASO titer test. Due to its accessibility in our nation, low cost, and suitable sensitivity, it is more well-liked. Even if penicillin is an excellent medical treatment, tonsillitis is only partially resolved when it recurs frequently. Surgery is therefore still the only effective treatment [1]. Since acute recurrent tonsillitis can result in chronic pain, repeated antibiotic use, tonsillar abscess, secondary otitis media, speech impairment, food take (per os) impairment, or airway obstruction, therefore, tonsillectomy or surgical removal of the palatine tonsils, is advised for patients [2].

Only the hemolysin O produced by group A streptococci is antigenic in the anti-streptolysin O test. Group A streptococci produce the cytolytic toxin known as streptolysin O. Its biological characteristics include hemolysis of erythrocytes and other eukaryotic cells; leukocytes may also be harmed. The most popular and standardized test for group A streptococcal antibody is the one made by the human host against this toxin, known as ASO [3].

1.1 Causes of elevated ASO titer

a. Infections by S. pyogenes or GABHS

The most prevalent infection caused by hemolytic S pyogenes is streptococcal sore throat. Other conditions caused by these bacteria include pharyngitis, toxic shock syndrome, scarlet fever, rheumatic fever, glomerulonephritis, erysipelas, necrotizing fasciitis, puerperal fever, bacteremia, and sepsis [4].

b. Other causes

Hypergammaglobulinemia, multiple myeloma, and people with elevated rheumatoid factor concentrations in their sera [3]. False positive ASO titres occasionally indicate the presence of liver illness or tuberculosis [5].

Streptolysin O, an immunogenic, oxygen-labile hemolytic toxin generated by the majority of group A streptococci and a large number of additional group C and G streptococci, is what is known as ASO [6]. In children and adults, respectively, Streptococcus pyogenes (group A streptococcus, GAS) causes 20 to 30% and 5 to 15% of acute tonsillitis/pharyngitis. Acute rheumatic fever (RF), peritonsillar abscess, and post-infectious syndromes such glomerulonephritis, acute rheumatic fever, and post-streptococcal reactive arthritis can all result from it in addition to causing acute sickness [6]. A single titer of 200 IU/ml or more is regarded as having an elevated value. In the opinion of Read SE and Zabrinskie, a rise in ASO titer, signals the potential emergence of rheumatic fever and every case of rheumatic fever is known to be accompanied by an increased ASO titer. The five cardinal manifestations of RF outlined by Dr. Jones and published in 1944 were carditis, arthritis, chorea, erythema marginatum, and subcutaneous nodules. These features have been memorized by health professionals for several decades with little amendment over time and according to Johnes criteria, the appearance of antibody to Streptolysin O (Antistreptolysin O or ASO) in serum of a patient or an increase in the ASO titer is usually indicative of recent streptococcal infection [1].

The goal of this study is to determine how tonsillectomy affects ASO titer in patients between the ages of 3 and 16 who have acute
recurrent tonsillitis with at least five episodes in
the previous year that have interfered with their
ability to carry out their normal daily activities, an
ASO titer of less than 200 IU/ml, and a positive
throat culture for GABHS.

2. MATERIALS AND METHODS

2.1 Study Setting and Design

This prospective non-randomized study was
carried out during the period from 1st January
2016 till 1st January 2017 at otolaryngology
department, tertiary referral hospital in Erbil,
Kurdistan-Iraq. This study included 43 (19.54%)
out of 220 patients in whom tonsillectomy was
done, those patients suffered from recurrent
attacks of acute tonsillitis with elevated ASO titer
and positive throat culture for GABHS.

2.2 Inclusion Criteria

Patients between the ages of 3 and 16 presented
with acute recurrent tonsillitis, at least five bouts
of which had interfered with their ability to carry
out their normal daily activities, an ASO titer of
less than 200 IU/ml, and a positive throat culture for GABHS.

2.3 Exclusion Criteria

Patients who do not meet the criteria for
tonsillectomy include those with a throat swab
test for GABHS that is negative, an ASO titer of
less than 200 IU/ml, and any infection other than
tonsillitis that can raise the ASO titer.

2.4 Preoperative Evaluation

A thorough ENT examination, an in-depth history
and physical examination, and counseling of
patients (or their relatives) with the anticipated
outcome. In order to find the criteria of tonsillitis
as an indication of a tonsillectomy, the history
included the patient's name, age, gender, and
date of examination.

Specifically, the total white cell count, differential
counts, hemoglobin, bleeding and clotting times,
blood group, and rhesus group were all
examined as part of the normal blood and
virology screening procedures. Using sterile
swab sticks, a throat sample was collected from
the tonsil surface and sent for culture to identify
the pyogenic organisms. The swab was then
promptly infected, and the bacteria were
identified. The latex agglutination test was used
to determine the ASO titer because serum-bound
ASO antibodies react with latex particles coated
in streptolysin O. Agglutination took place when
the serum's antibody concentration reached 200
IU/ml. The rapid testing period is a benefit of this
test, however the qualitative and semi-
quantitative tests are a drawback [3].

2.5 Tonsillectomy

Under general anesthesia all the patients
underwent tonsillectomy by cold steel method.

2.6 Postoperative Follow up

1. Counting the number of sore throat
   episodes, if any, should be recorded.
2. Estimations of the ASO titer were made
   one month, three months, and six months
   after surgery.

2.7 Statistical Analysis

The Statistical Package for Social Sciences
(SPSS, version 19) was used to analyze the
data. In order to compare proportions, the Chi
Square Test of Association was utilized. Fisher's
exact test was performed when the predicted
count of more than 20% of the table's cells was
less than 5. The means of the two study groups
were compared using a Student's t test on two
independent samples. The means (of the same
sample) before and after the procedure were
compared using the paired t test. Statistical
significance was defined as a p value 0.05.

3. RESULTS

Tonsillectomy was done for 43 patients with
positive ASO titer and positive throat culture for
GABHS out of 220 tonsillectomized patients who
were approximately equal to 19.54%.

The mean age of the patients was 6.86±3.6
years, ranging from 5 to 9 years. The median
was 6 years. The mean duration of the disease
was 2.02±0.988, ranging from 1 to 5 years, with
a median of 2 years as shown in Table (1).

The comparison between mean of pre-operative
ASO titer with the ASO titer means measured
one, three, and six months post-operatively was
demonstrated in Fig. (1). and showed that after
the 6 months, the titer had the lowest
value.
Mean number of episodes of sore throat before and after the operation was shown in Fig. (2) and illustrated that postoperatively, the mean number of the episode was significantly lower than preoperative mean number.

Positive history of penicillin allergy was prevailed in 12.0% of the patients as demonstrated in Fig. (3).

Positive family history of Tonsillitis was found in 51.0% of the patients as shown in Fig. (4).

Table 1. Distribution of sample by age, gender, and residency

<table>
<thead>
<tr>
<th>Variables</th>
<th>Categories</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-5</td>
<td>20</td>
<td>46.5</td>
<td></td>
</tr>
<tr>
<td>6-8</td>
<td>11</td>
<td>25.6</td>
<td></td>
</tr>
<tr>
<td>9-11</td>
<td>5</td>
<td>11.6</td>
<td></td>
</tr>
<tr>
<td>≥ 12</td>
<td>7</td>
<td>16.3</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>17</td>
<td>39.5</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>26</td>
<td>60.5</td>
<td></td>
</tr>
<tr>
<td>Residency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>15</td>
<td>34.9</td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>28</td>
<td>65.1</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>43</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Means of ASO titer and number of episodes by family history was demonstrated in Table (2) and revealed significant statistical differences in preoperative, pre-op episodes 6 months, and no. of post-op. attack of sore throat.

Table 2. Means of ASO titer and number of episodes by family history

<table>
<thead>
<tr>
<th></th>
<th>Positive family history</th>
<th>Negative family history</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-op. ASO titer IU/ml</td>
<td>Mean 1218.18</td>
<td>Mean 904.76</td>
<td>0.019</td>
</tr>
<tr>
<td>ASO titer after 6 months IU/ml</td>
<td>Mean 95.24</td>
<td>Mean 58.82</td>
<td>0.445</td>
</tr>
<tr>
<td>Pre-op episodes 6 months</td>
<td>Mean 3.34</td>
<td>Mean 2.71</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>No. of post-op. attack of sore throat</td>
<td>Mean 0.82</td>
<td>Mean 0.10</td>
<td>0.001</td>
</tr>
</tbody>
</table>

![Fig. 1. Mean ASO titer](image-url)
**Fig. 2.** Mean number of episodes of sore throat before and after the operation

![Bar chart showing mean number of episodes before and after operation](chart1.png)

**Fig. 3.** History of penicillin allergy

![Pie chart showing penicillin allergy rates](chart2.png)

**Fig. 4.** Family history of tonsillitis

![Pie chart showing family history of tonsillitis](chart3.png)
Table 3. Means of ASO titer and number of episodes by residency

<table>
<thead>
<tr>
<th></th>
<th>Urban Mean</th>
<th>SD</th>
<th>Rural Mean</th>
<th>SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-op. ASO titer IU/ml</td>
<td>1092.86</td>
<td>437.10</td>
<td>1013.33</td>
<td>468.84</td>
<td>0.582</td>
</tr>
<tr>
<td>ASO titer after 6 months IU/ml</td>
<td>96.00</td>
<td>164.52</td>
<td>46.15</td>
<td>87.71</td>
<td>0.317</td>
</tr>
<tr>
<td>Pre-op episodes 6 months</td>
<td>3.04</td>
<td>0.58</td>
<td>3.03</td>
<td>0.58</td>
<td>0.990</td>
</tr>
<tr>
<td>No. of post-op. attack of sore throat</td>
<td>0.54</td>
<td>0.74</td>
<td>0.33</td>
<td>0.72</td>
<td>0.396</td>
</tr>
</tbody>
</table>

Means of ASO titer and number of episodes by residency was demonstrated in Table (3). This table elicited no statistically significant differences.

4. DISCUSSION

Tonsillectomy is the most frequently performed otolaryngological procedure, especially in young children. The most common indication for tonsillectomy is recurrent bacterial tonsillitis. The effectiveness of tonsillectomy has been questioned in a 2009 systematic review of 7765 papers that were published in the journal of Otolaryngology – Head and Neck Surgery. The study showed that it was most likely not effective all the time, but rather was modestly effective, and not a single paper reported that tonsillectomy is invariably effective in eliminating sore throats. After tonsillectomy, Viswanathan et al. [7] discovered a substantial decrease in ASO titer. After a tonsillectomy, 22% of patients tested negative for ASO titer after one month, 62% after three months, and 78% after six months (p <0.001). Moreover, Saleem and Buraa study [8] conducted in Tikrit province in Iraq reported that after six months following tonsillectomy there is a significant decrease in ASO titer level in comparison to preoperative level measures (p <0.001). In addition, Motta et al. [9] and Mohamed et al. [10] found that the ASOT levels after 6 months of treatment were found to be lower in patients treated by tonsillectomy than in those who were treated with long-acting penicillin; the difference between both the groups was found to be statistically significant (P-value = 0.023). The majority of the results mentioned above are very close to ours.

Patients who had undergone surgery had a decreased rate of sore throat, according to Matanoski et al. [11]. Additionally, Paradise et al. [12] discovered that throat infections significantly decreased following tonsillectomy. Furthermore, previous systematic reviews of tonsillectomy for recurrent throat infections have combined studies of children and adults and reported moderate reductions in sore throats in the first postoperative year with greater benefit associated with more severe baseline infections [13,14]. In this study there were 12% allergic to penicillin, this result is nearly comparable to the result obtained by Pichichero et al. [15] who found that the true incidence of penicillin-allergy among patients with that history is likely to be less than 10%. The present result is also comparable to Solley et al. [16] who were found that penicillin allergy is 14%.

Khasanov et al. [17] found that 53.3% of children having positive family history of tonsillitis which is nearly approximate to ours (51.2%). These results are comparable to Kvestad et al., [18] and Schilder et al. [19] those showing that there is positive correlation between family history and tonsillitis, this can be explained by the presence of genetic, environmental and anatomical predisposition for tonsillitis.

This can be explained by the effect of environmental factors (smoking, air pollution….etc.) as found in the studies done by Schilder et al. [19] and Renner et al. [20].

5. CONCLUSIONS

The main conclusion from this study is significant effect of tonsillectomy on decreasing ASO titer which reveals the reduction in postoperative GABHS throat infection, this supported by reduction of postoperative sore throat episodes. There is strong evidence that there is a clear relation between family history of recurrent tonsillitis and ASO titer as well as number of sore throat episodes. Tonsillectomy is the definitive treatment for group A beta hemolytic streptococcus tonsillitis.

CONSENT

Informed consent was taken from each patient after explaining the purpose of the study (by the researcher).
ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES


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