

Research Article

Impact of Tonsillectomy on Seropositive Antistreptolysin O (ASO) Titer in Pediatric Patients

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Abstract

Background: One of the common clinical issues in ENT practice is chronic tonsillitis. The major germ that causes tonsillitis to recur frequently is streptococcus. A tonsillectomy is the best option if medical therapy has failed. High antistreptolysin O (ASO) titer levels were observed in several patients who presented with recurrent tonsillitis attacks. Group A beta hemolytic streptococcal (GABHS) tonsillitis may be accompanied by severe consequences such as glomerulonephritis and rheumatic fever. **The aim of study:** To assess how tonsillectomy will affect an increased ASO titer in pediatric patients. **Patients and methods:** 65 patients who were eligible for tonsillectomy participated in a prospective, non-randomized clinical research. There were 35 females and 30 males, ranging in age from 3 to 16. All patients having a positive throat swab for group A beta hemolytic streptococcal (GABHS) and an elevated ASO titer level (equal or above 200 IU/ml). Following surgery, follow up is done after 1, 3, and 6 months. **Results:** First, third, and sixth month post-operative ASO titer means were all significantly lower than preoperative ASO titer means, $p < 0.001$. **Conclusion:** Tonsillectomy significantly lowers the level of ASO titer.

Keywords: GABHS, Recurrent attacks of tonsillitis, ASO titer, tonsillectomy.**Introduction**

Patients with tonsillar hypertrophy or recurrent tonsillitis are advised to have tonsillectomy because these conditions can result in speech impairment, obstructive sleep apnea (OSA), repeated use of antibiotics, chronic pain, airway obstruction.^[1]

One of the few surgical procedures that dates back to ancient times and is still performed today is the tonsillectomy. Tonsillectomy incidence in the United States reaches 2 million in the 1940s; it was frequently performed for recurrent tonsillitis as well as for many other conditions, including failure to gain weight due to subpar feeding, enuresis, and overbite. In the 1960s, tonsillectomy remained popular, with two million

tonsillectomies and adenoidectomies performed annually in the US. With about 400,000 surgeries performed annually, tonsillectomy is still one of the most commonly accomplished procedures today.^[2]

The two main causes of tonsillectomy are recurrent tonsillo-pharyngitis and obstructive sleep apnea brought on by tonsillar hyperplasia. peritonsillar abscess, suspicion of a malignant condition, speech impairment, and halitosis are additional indications.^[3]

ASO titer

The most frequent bacterial cause of tonsillitis is group (A) beta-hemolytic streptococci, with a peak incidence in

children between the ages of 5 and 15. Streptolysin O, the only antigenic cytolytic toxin, and streptolysin S are two hemolysins that are produced by it. Streptolysin O's biological properties include hemolysis of erythrocytes and other eukaryotic cells, as well as damage to leukocytes.^[4]

Antibodies against this toxin will be produced by the host, and the widely accepted, accessible, and standardized group Anti-streptolysin O (ASO) is a test for streptococcal antibodies. But regrettably, this antibody does not serve as a host protection mechanism.^[5]

The ASO is an antibody produced against the oxygen-labile hemolytic toxin streptolysin O, which is produced by the majority of group A, C, and G streptococci strains.^[6]

Streptolysin O is one of the toxins that the GABHS infection in humans produces; it has an antigenic nature. A normal immunological response, ASO is found in the serum after Group A Streptococcal infection. Infection with Group A Streptococcal in any part of the body is likely to cause an increase in ASO titer.^[7]

Causes of increased ASO titer:

- Infections by *S. pyogenes* or GABHS
- □pyoderma
- toxic shock syndrome
- scarlet fever
- rheumatic fever
- erysipelas
- Cellulitis
- necrotizing fasciitis
- puerperal fever
- bacteremia and sepsis^[6]
- multiple myeloma
- high rheumatoid factor and hypergammaglobulinemia^[5]
- Tuberculosis
- hepatic disorders may cause false positive titer of ASO^[5]

Causes of low ASO titer:

The absence of the streptococcal antigenic stimulus that stimulates antibody produ-

ction may be the cause of the low ASO values.

The most effective, widely used serological test to diagnose recent streptococcal infection is the ASO titre. A titre of 200 iu/ml or higher is regarded as a raised value. A rising ASO titre signals the potential emergence of rheumatic fever. It is well known that an elevated ASO titre is linked to each episode of rheumatic fever.

The modified Johnes criteria require a raised ASO titre level in order to diagnose rheumatic fever. Tonsillitis was previously present in a large portion of cases of rheumatic fever and reactivation.^[8]

Aim of the study

Since a raised ASO titre is a sign of antecedent streptococcal infection, this study aims to assess the effect of tonsillectomy on ASO titre in patients with chronic tonsillitis.

Patients and methods

This Prospective non-randomized clinical study was conducted in the ENT Department of El-Minia university hospital for a period of about one year (January 2022 to December 2022), 65 children suffering from chronic tonsillitis below the age of 18 years were screened. There were 35 (53.8%) females and 30(46.2%) males.

Inclusion criteria

1. Age between 3-16 years old.
2. All patients were presented with a minimum of 7 attacks of recurrent tonsillitis annually for at least the last year that disabling normal life functioning. Clinical parameters used for the diagnosis of chronic tonsillitis were as follows:
 - Tonsils that are tender, atrophic, or hypertrophied and have a persistent sore throat.
 - Anterior pillar congestion is visible.
 - Palpable jugulodigastric lymph node.
 - When pressure is applied, cheesy material emerges from the crypts. on the tonsils.
3. ASO titer \geq 200 IU/ml.

4. Positive throat swab for GABHS.

Exclusion criteria

1. Patients not indicated for tonsillectomy.
2. Negative throat swab for GABHS.
3. ASO titer less than 200 IU/ml.
4. Apart from tonsillitis, any infection that can raise ASO titer.
5. Bleeding disorders.

After fully understanding the study's goals and methodology as explained (by the researchers), parents of the patients were asked for their consent in a conscious manner. The medical research ethics committee of the faculty of medicine, Minia University gave its approval for this study's ethical conduct (NO.876/10).

Assessment of patients

1. A thorough history, including the patient's name, age, gender, and the number of sore throats and fevers experienced. In the majority of cases, the parents were asked for their history.
2. Physical examination, including an ENT exam, the following are included in a clinical examination:
 - Assessment of the patient's overall health and vital signs (weight, paleness, jaundice, temperatures, pulse rate, respiratory rate, and cyanosis);
 - Using a tongue depressor to examine the oropharynx and oral cavity to check for submucous cleft palate and bifurcated uvulas, as well as to measure the size of the tonsils and the color of their mucosa.
 - Checking the neck for lymphadenopathy, particularly in the jugulodigastric group, and searching for rash distribution throughout the body.
3. Educating the patient's parents about the probable outcome.

4. Laboratory investigations:

Hematological investigations

- Routine blood and virology screening tests (HBV, HCV, HIV).
- Lab examination of blood in the form of total number of white cell and differential count, haemoglobin, Erythrocytes sedimentation rate (ESR).
- Bleeding time (BT), Clotting time (CT).

- Prothrombin time (PT), activated partial thromboplastin time (APTT).
- Blood group and rhesus group
- General urine examination (GUE)
- Covid19 test by polymerase chain reaction (PCR)
- Throat swab was taken from tonsil mucosal surface through a sticks of sterile swab and then sent for culture to identify the organism.

• ASO titration:

Serum sample was taken and sent for laboratory to be examined for ASO titer before surgery (using BioMed-ASOT, Germany) with catalogue number: ASO 300100

Procedure:

- 1- We brought all reagents and specimens to room temperature.
- 2- Shaked the ASO test reagent gently, expelled contents of dropper and refilled, then we placed one drop (50 μ l) onto glass slide. Using pipette, add one drop of the patient serum (50 μ l) onto the glass slide, and mixed both together with the flat end of straws.
- 3- we continued to mix for about 2 minutes with rotator or by hand and observed with macroscopic clumping using the indirect oblique light source.
- 4- Positive control and negative control should be run with each series to test sera.
- 5- The reaction of the test serum was compared to the ASO positive control serum and negative control serum. Agglutination indicates an ASO concentration of greater than or equal to 200 IU/ml in the serum sample. Sera that elicit a positive result should be retested and titered using the Semiquantitative Assay Protocol.

Interpretation of results- semiquantitative

The highest dilution in which visible agglutination occurs is considered the endpoint titer. The corresponding ASO concentration (in IU/ml) is calculated as the product of the endpoint dilution factor and the assay of cut-off value. For example, if the endpoint dilution is 1:4, the corresponding ASO serum concentration would be 4 x 200, or 800 IU/ml.

Dilution	ASO IU/ml (in NEAT specimen)
NEAT *	200
1:2	400
1:4	800
1:8	1600
1:16	6400

*NEAT = undiluted

Tonsillectomy

All patients underwent tonsillectomy procedures while under general anesthesia, with either a cuffed or non-cuffed endotracheal tube used to maintain the airway. Plaster is used to carefully fix the tube in the pharynx's middle, taking care to prevent it from collapsing between the tongue and the gag. The patients were placed in the Rose position, which involves lying flat with the neck extended.

By opening the mouth with a Boyle Davis mouth gag supported by a mayo stand connection, the tonsils are effectively exposed. Wet gauze should be placed in the hypopharynx to stop blood from escaping into the stomach during surgery and to prevent oxygen and anaesthetic agents from escaping from the endotracheal tube.

All patients had a tonsillectomy using the cold steel dissection method. Palpation of the hard and soft palate was done prior to the procedure in order to rule out submucous cleft palate, which could increase the risk of velopharyngeal insufficiency afterward. The tongue was in the middle and the mouth gag blade was in place. As the mouth gag is opened, care must be taken to protect the tube, ensure that the upper lip is not trapped, and cover the tongue's base with the tongue blade.

The tonsillectomy procedure involves catching the tonsil with Dennis Browne tonsil holding forceps, pulling it medially and slightly inferiorly, and then making an incision at the anterior pillar just laterally to the mucosal reflection of the tonsil's surface. The tonsil descended inferiorly, and the tonsil's superior pole's capsule was

identified. Tonsils can usually be repositioned during this step using Lucs forceps. The tonsil was then removed with scissors, after which the tonsil's lower pole was tied off and hemostasis was accomplished. To ensure that bleeding was only stopped by mouth gag compression, the mouth gag closed and opened a few times. Next, the pharynx was irrigated with normal saline solution.

After the procedure, the patient was transferred to the ward after being brought to consciousness and ensuring there was no bleeding. A course of antibiotics (Ampicillin sulbactam 750 mg vial every 12 hours for 3 days or azithromycin syrup 10mg/kg once daily) was prescribed, and all patients received analgesia for one week following surgery. The patient was constantly monitored for the presence of any bleeding. Since the majority of the patients were day cases, we sent them home after 5 to 6 hours.

Follow up of the patients after tonsillectomy

Estimations of the ASO titre were made one month, three months, and six months after surgery.

Statistical analysis

Study data is processed and statistically analyzed using SPSS version 26 for Windows, the statistical package for social sciences. The frequencies were expressed as percentages, and the mean and standard deviation (SD) were used to describe the data statistically. For continuous variables, the tables test was used. The Pearson(R) correlation coefficient was used to measure correlation, and a P-value of 0.05 was used to determine the statistical significance of the data.

Results

For 65 patients who had an ASO titer above 200 IU/ml and a positive throat culture for GABHS, a tonsillectomy was performed. They range in age from three to sixteen years were the median (8.43 ± 3.64).

18.5% of the sample's participants were 3 to 5 years old. 49.2% of the sample's

participants were 5 to 10 years old. 32.3% of the sample's participants were 10 to 16 years old. There were 35 (53.8%) females and 30(46.2%) males (table 1), (fig 1,2).

First, third, and sixth month ASO titer measurements were significantly lower than those taken preoperatively (mean ASO titer: 581.5 ± 233.8), with a p value of 0.001 (table 2).

Table (1): Demographic characteristics of the studied group (n=65)

Variable	Mean ± SD or N (%)
Age (years)	
Range	3 - 16
Mean ± SD	8.43 ± 3.64
Age group	
< 5 years	12 (18.5%)
5 – 10 years	32 (49.2%)
> 10 years	21 (32.3%)
Sex	
Male	30 (46.2%)
Female	35 (53.8%)

*Quantitative data are presented by mean ± SD, while qualitative data are presented by N (%)

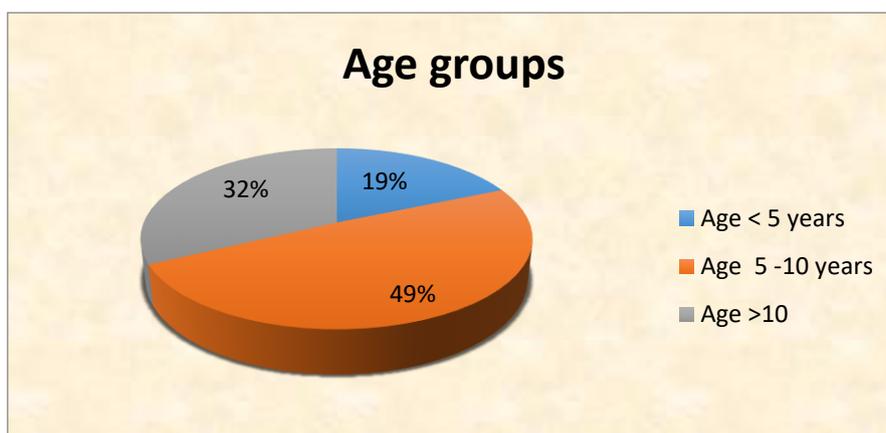


Fig. (1) Age groups of patients

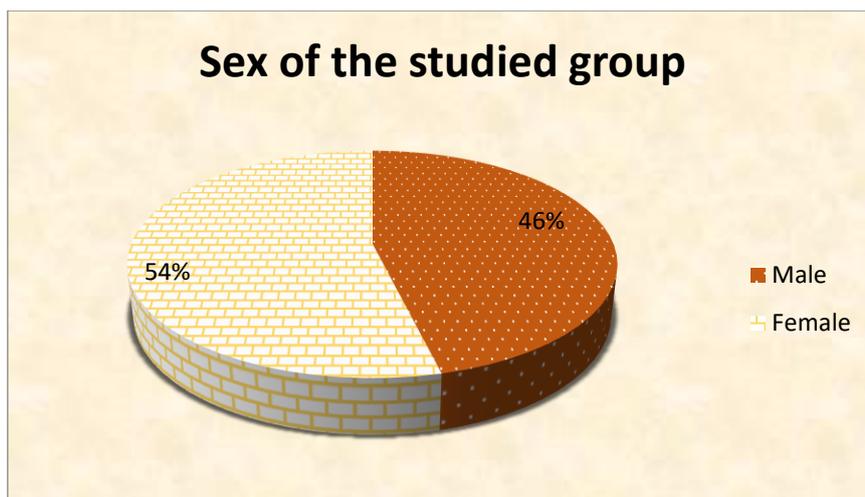


Fig. (2) Gender distribution of studied cases

Table (2): Preoperative and postoperative ASO titer of the studied group (n=65)

ASO titer	Mean \pm SD
Preoperative	
Range	200 - 1200
Mean \pm SD	581.5 \pm 233.8
1 month postoperative	
Range	0 - 800
Mean \pm SD	409.2 \pm 198.2
3 months postoperative	
Range	0 - 800
Mean \pm SD	258.5 \pm 192.7
6 months postoperative	
Range	0 - 600
Mean \pm SD	101.5 \pm 158.6
P value	< 0.001*

- Quantitative data are presented by mean \pm SD

Repeated measure of MANOVA was used to compare different reading of ASO titer

*: Significant difference (p value \leq 0.05)

All patients had positive ASO titers prior to tonsillectomy, but this positivity dropped to 70.3% one month after surgery 44.5% three months later, and then to 17.4% six months later (table 2), Fig. (3).

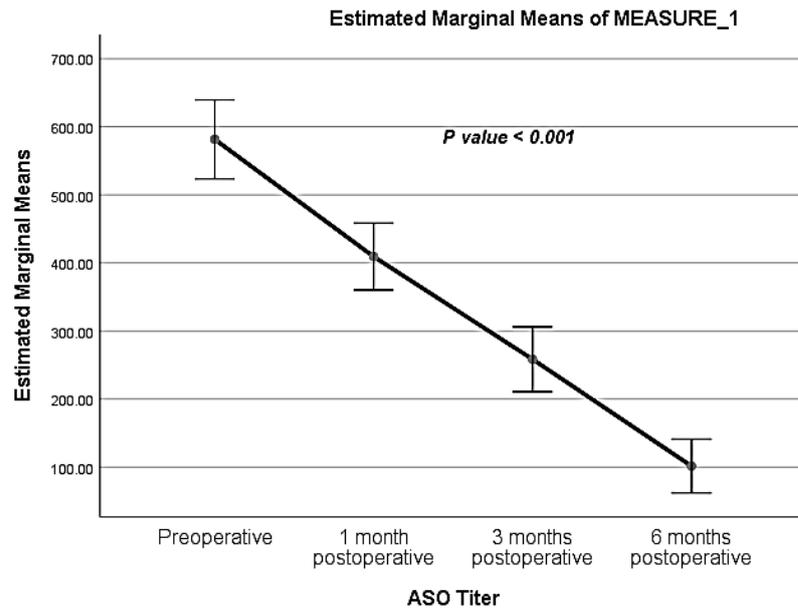


Fig. (3). Postoperative decreasing course of ASOT.

53.7% of patients had a positive family history of tonsillectomy, fig (4).

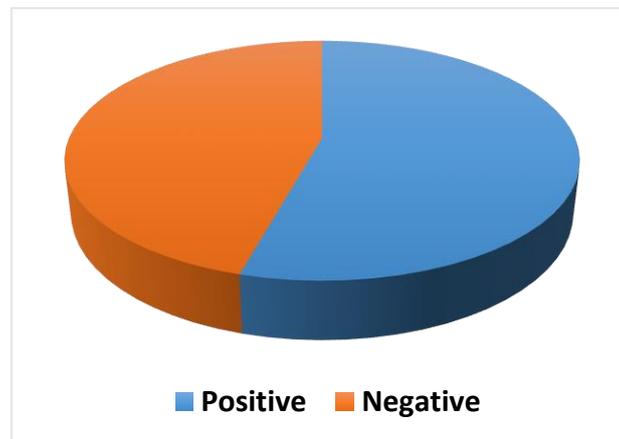


Fig. (4): family history of tonsillectomy

Discussion

One of the common clinical issues in ENT practice is chronic tonsillitis. The main germ that causes tonsillitis to recur frequently is streptococcus. Streptococcal tonsillitis can cause serious non-suppurative complications like rheumatic fever and glomerulonephritis. In third world nations, rheumatic fever accounts for 25 to 40% of cardiovascular diseases. This emphasizes the significance of early detection and efficient intervention in

streptococcal throat infection. 80% of streptococcal cases have positive throat swab cultures, but chronic tonsillitis cases typically have negative ones. Although the antigen detection test is very accurate, it is also very expensive and not offered in all centers. As a result, the ASO titer test is the most widely used test and is becoming more popular due to its accessibility in our nation, low cost, and adequate sensitivity [8].

Although medical treatment with penicillin plays a part in eliminating GABHS infection and is effective in many cases, repeated tonsillitis attacks result in incomplete resolution and end in chronic tonsillitis, for which surgery is still the preferred treatment.

The study involved 65 patients aged 3 to 16 who had tonsillitis recurrently, high ASO titer levels (equal or above 200 IU/ml), and positive throat swabs for GABHS. All of the patients underwent tonsillectomy surgery.

The majority of our patients (53.8%) were females; this gender distribution was similar to that reported in a study by Essam A. Abo El-magd et al., in 2016^[10], in which the proportion of female patients was 57%, and it also agreed with Saleem A. and Buraa M. F.'s study from 2023^[9], in which the proportion of female patients was 64%.

This study demonstrated that the means of the ASO titer level and the percentage of the sample study with a ASO titer level measured at the 1st, 3rd, and 6th months following tonsillectomy were, respectively, significantly lower than the mean of the ASO titer level (581.5) measured pre-operatively.

In their study, Viswanathan N. 2000^[8] found that tonsillectomy significantly reduced ASO titre. (22%) of the cases tested negative for ASO titre one month after tonsillectomy. 3 months following surgery, 62% of patients lost their ASO titre. After six months, (78%) people lost their ASO titre. ASO titer levels post-tonsillectomy significantly decreased, according to Bakir S.S.at 2017^[11]. About 23.3% of patients were ASO titer level negative at the first month after a tonsillectomy. In the third month following a tonsillectomy, 52.5% of patients tested negative for ASO titer levels. After a tonsillectomy, 73.7% of patients developed negative ASO titer levels. All of the aforementioned results are very close to or identical to our findings.

Our study found that 53.7% of participants had a positive family history of tonsillectomy, which is consistent with research by Khasanov SA et al., (2006)^[12], which found that about 53.3% of those with a family history of tonsillectomy had a history of recurrent infections. Bakir S.S.at 2017^[11] discovered that 51% of patients had a positive family history of tonsillitis, which is consistent with our research.

Conclusion:

The most significant finding from the findings of our study is that tonsillectomy significantly reduced the level of ASO titer. Additionally, our research provides strong evidence that tonsillectomy can significantly lower or prevent recurrent streptococcal throat infections.

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