

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

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 as 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.

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.

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⁾.

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 Zabriskie, 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 Jones 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.

Materials and methods:

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 acutetonsillitis with elevated ASO titer and positive throat culture for GABHS.

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.

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.

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⁾.

Tonsillectomy:

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

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.

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.

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).

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

Variables	Categories	No.	%
Age (years)	3-5	20	46.5

Gender	6-8	11	25.6
	9-11	5	11.6
	≥ 12	7	16.3
	Female	17	39.5
Residency	Male	26	60.5
	Rural	15	34.9
Total	Urban	28	65.1
		43	100.0

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 figure (1) and showed that after the 6 months, the titer had the lowest value.

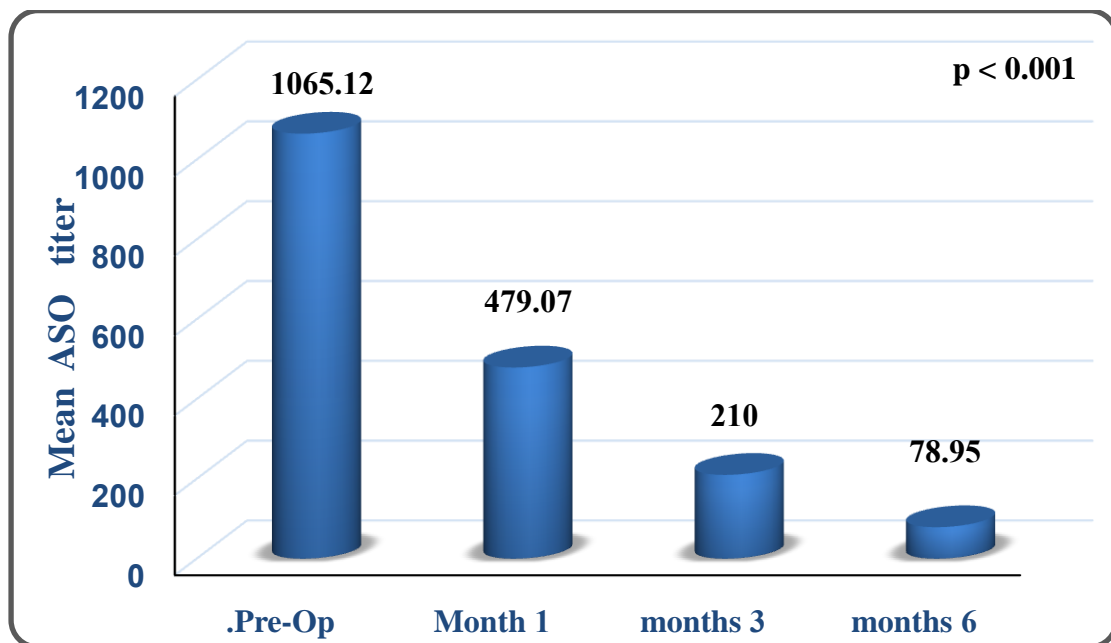


Figure (1):Mean ASO titer.

Mean number of episodes of sore throat before and after the operation was shown in figure (2) and illustrated that postoperatively, the mean number of the episode was significantly lower than preoperative mean number.

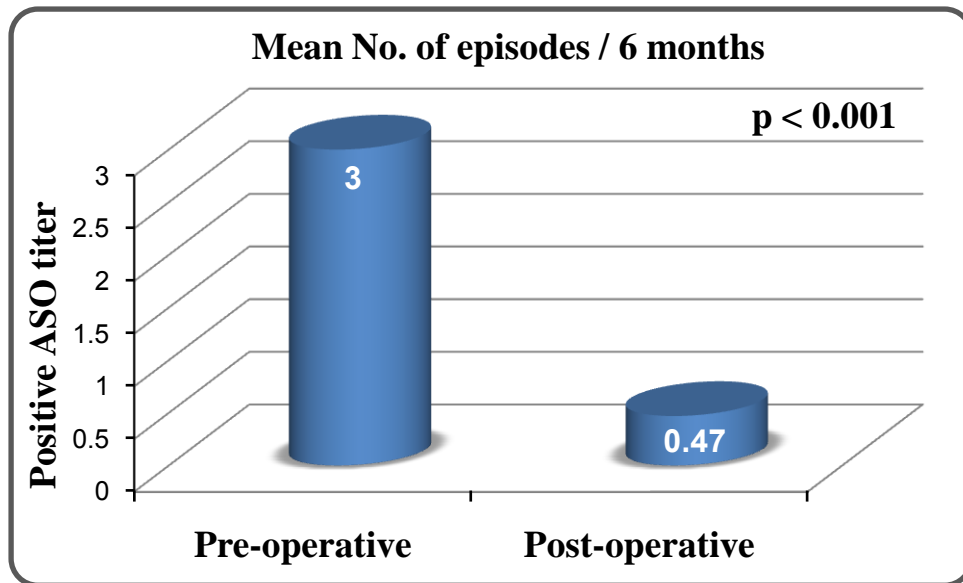


Figure (2): Mean number of episodes of sore throat before and after the operation.

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

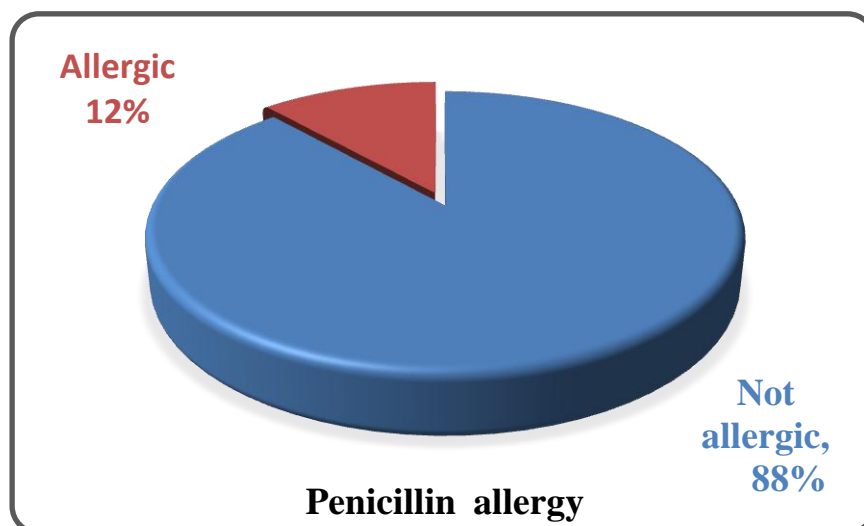


Figure (3): History of penicillin allergy.

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

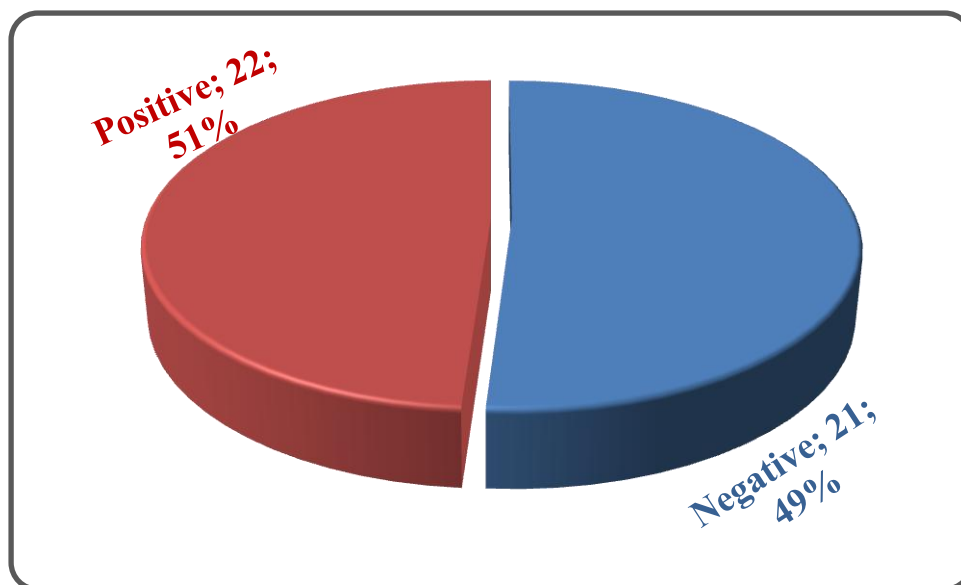


Figure (4): Family history of tonsillitis.

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.

	Positive family history		Negative family history		P value
	Mean	SD	Mean	SD	
Pre-op. ASO titer IU/ml	1218.18	440.39	904.76	398.09	0.019
ASO titer after 6 months IU/ml	95.24	149.92	58.82	137.20	0.445
Pre-op episodes 6 months	3.34	0.59	2.71	0.34	< 0.001
No. of post-op. attack of sore throat	0.82	0.85	0.10	0.30	0.001

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

Table (3): Means of ASO titer and number of episodes by residency.

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

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.* (2000) ⁽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 Buraq 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.*, (1968)⁽¹¹⁾. Additionally, Paradise *et al.* (1984)⁽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.*, (2005)⁽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.*, (1982)⁽¹⁶⁾ who were found that penicillin allergy is 14%.

Khasanov *et al.*, (2006)⁽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.*, (2005)⁽¹⁸⁾ and Schilder *et al.*, (1992)⁽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.*, (1992)⁽¹⁹⁾ and Renner *et al.*, (2012)⁽²⁰⁾.

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).

References

1. Viswanathan N, Nair S, Thulseedharan S. Effect of Tonsillectomy on ASO-titre. *Indian Journal of Otolaryngology and Head and Neck Surgery*. 2000; 52 (4):329–331. <https://doi.org/10.1007/BF02991470>
2. Pidelaserra MG, Isdahl MKG, Cox RJ, Brokstad KA. The Influence of Tonsillectomy on Total Serum Antibody Levels. *Scand J Immunol*. 2014 Nov;80 (5): 377-379.
3. Shet A and Kaplan EL. Clinical use and interpretation of group A streptococcal antibody tests: a practical approach for the pediatrician or primary care physician. *Pediatric Infectious Dis J*. 2002 May;21(5):420-426.
4. Brooks G, Carroll KC, Butel J, Morse S. JawetzMelnick and Adelberg's Medical Microbiology, Twenty-Sixth Edition. New York: McGraw-Hill. 2010; 14: 213-216.
5. Hembrom R, Roychaudhuri BK, Saha AK, Roychowdhury A, Ghosh S, Gon S, *et al*. Evaluation of the Validity of High Serum Antistreptolysin O Titre Only,

- as an Indication for Tonsillectomy. *Indian journal of otolaryngology and head and neck surgery: official publication of the Association of Otolaryngologists of India*.2014; 66(3):232–236.
6. Mazur E, Czerwińska E, Grochowalska A, Koziół-Montewka M. Concurrent peritonsillar abscess and poststreptococcal reactive arthritis complicating acute streptococcal tonsillitis in a young healthy adult: a case report. *BMC infectious diseases*. 2015; 15: 50. <https://doi.org/10.1186/s12879-015-0780-8>
 7. Khaled AA and Hassan AA. Anti Streptolysin O; Normal Values for Healthy Children Aged from 5 to 15 Years Old in Sana'a City-Yemen.*Clinical and Laboratory Research*. 2015; 3(1): 1.
 8. Saleem A, Buraa MF. Effect of Tonsillectomy on Antistreptolysin O (ASO) Titer. *Tikrit J. Pharm. Sci*. 2023 Jun. 25;17(1):22-9. Available from: <https://tjphs.tu.edu.iq/index.php/j/article/view/370>
 9. Motta G, Esposito E, Motta S, Mansi N, Cappello V, Cassiano B, Motta G Jr. The treatment of acute recurrent pharyngotonsillitis. *Acta Otorhinolaryngol Ital*. 2006; 26 (Suppl 84): 5–29.
 10. Mohamed A, El Tabbakh M, Zeitoun A and El Hennawib D. Acute-phase reactants in children with recurrent tonsillitis treated by tonsillectomy versus long-acting penicillin. *The Egyptian Journal of Otolaryngology*. 2013; 29: 99–103.
 11. Matanoski GM, Price WH, Ferencz C. Epidemiology of streptococcal infections in rheumatic and non-rheumatic families. IV. The effect of tonsillectomy on streptococcal infections. *American journal of epidemiology*. 1968; 87(1): 226–236. <https://doi.org/10.1093/oxfordjournals.aje.a120803>
 12. Paradise JL, Bluestone CD, Bachman RZ, Colborn DK, Bernard BS, Taylor FH, *et al*. Efficacy of tonsillectomy for recurrent throat infection in severely affected children. Results of parallel randomized and nonrandomized clinical

- trials. *The New England journal of medicine*. 1984; 310(11): 674–683.
<https://doi.org/10.1056/NEJM198403153101102>
13. Burton MJ, Glasziou PP, Chong LY, Venekamp RP. Tonsillectomy or adenotonsillectomy versus non-surgical treatment for chronic/recurrent acute tonsillitis. *Cochrane Database Syst Rev*. 2014;11(11):CD001802.
 14. Georgalas CC, Tolley NS, Narula PA. Tonsillitis. *BMJ ClinEvid*. 2014;2014:0503.
 15. Pichichero ME. A review of evidence supporting the American Academy of Pediatrics recommendation for prescribing cephalosporin antibiotics for penicillin-allergic patients. *Pediatrics*. 2005;115:1048–1057.
 16. Solley GO, Gleich GJ, Van Dellen RG. Penicillin allergy: clinical experience with a battery of skin-test reagents. *J. Allergy Clin. Immunol*. 1982;69: 238–244.
 17. Khasanov SA, Asrorov AA, Vokhidov UN. Prevalence of chronic family tonsillitis and its prevention. *Vestn Otorinolaringol*. 2006;(4):38-40.
 18. Kvestad E, Kværner KJ, Røysamb E, Tambs K, Harris JR, Magnus P. Article Heritability of Recurrent Tonsillitis. *Information Arch Otolaryngol Head Neck Surg*. 2005;131(5):383-387. doi:10.1001/archotol.131.5.383.
 19. Schilder AG, Zielhuis GA, Straatman HS, Van Den BP. An epidemiological approach to the etiology of middle ear disease in the Netherlands. *Eur Arch Otorhinolaryngol*. 1992;249:370-373.
 20. Renner B, Mueller CA, Shephard A. Environmental and non-infectious factors in the aetiology of pharyngitis (sore throat). *Inflamm. Res*. 2012; 61:1041–1052.

