

Correlation of Bacteriological and Pathological Profile of Chronic Tonsillitis in Children

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ABSTRACT

Background: Much has been written about the bacteriology of recurrent tonsillitis but it remains a controversial topic. Bacteriological profile of chronic tonsillitis changes because of multiple factors such as: maluse of antibiotics and pathological changes that occur in chronic tonsillitis. **Aim of the study:** To correlate the bacteriological profile of tonsils taken after tonsillectomy, and the pathological changes; grossly and microscopically. **Methods:** Eighty eight patients with chronic tonsillitis underwent tonsillectomy, in Zagazig University Hospital in the period from August 2017 To January 2018. All patients included in this study were subjected to: (1)Full history taking laying stress on age, sex and number of attacks per year.(2)Symptoms of each attack (sore throat, fever vomiting)).3) Treatment of each attack. (4) culture From the surface of the tonsil.(5)Core culture after tonsillectomy. (5) pathological examination including gross examination, microscopic examination after tissue processing. **Results:** Staph aureus was the most common isolated organism in 86, 4% of the patients followed by H influenza and pseudomonas. As regard Staph sensitivity; (39, 5%) was sensitive to erythromycin. the histopathological examination of studied tonsils among our patients showed that; (62.5%) of studied tonsils were with thick fibrotic stroma and (45.5%) of them showed thick blood vessels. tonsillar cryptitis was an outstanding feature in 80% of patients denoting that the infecting organisms are embedded in the tonsillar crypts surrounded by fibrotic stroma and fibrotic blood vessels away from any trial of antibiotic therapy. **Conclusion:** In chronic tonsillitis, most of bacteria are embedded in the core of the tonsil rather than the surface of the tonsils. With chronic tonsillitis, pathological changes like fibrosis of stroma and blood vessels may be responsible for antibiotic resistance due to poor penetration of antibiotic to the tonsillar core.

Keywords: Tonsil, Chronic Tonsillitis.

INTRODUCTION

Tonsils are important structures of the immune system. There are different variation of tonsillitis acute, chronic and recurrent. Acute tonsillitis is the most common disease for pediatricians and general practitioner encountered in their daily practice,^[1] (Shishegar and Ashraf 2014). As regard acute tonsillitis, the most common bacterial cause is Group A β -Hemolytic Streptococcus (GABHS) which causes strep throat. Less common bacterial causes include: Staphylococcus aureus, Streptococcus, pneumoniae, Mycoplasma-pneumoniae, chlamydia, pneumonia, pertussis, Fusobacterium, diphtheria, syphilis, and gonorrhoea (Levinson, 2014).^[2] Much has been written about the bacteriology of recurrent tonsillitis but it remains a controversial topic.

Bacteriological profile of chronic tonsillitis changes because of multiple factors such as : maluse of antibiotics and pathological changes that occur in chronic tonsillitis. The organisms grown from superficial swabs may not be the same as those obtained from the tonsillar core thus throat swabs have little value in the diagnosis of the causative organism compared to deep tissue culture in recurrent tonsillitis as well as the antibiotics sensitivity of these organisms changes to be more drug resistant (Cowan and Hibbert, 1997).^[3]

Aim of the study:

To evaluate the micro organisms and pathological changes on the surface and in the depth of the tonsil in children with chronic tonsillitis after tonsillectomy. Evaluation of the antibiotic sensitivity patterns of isolated bacteria from the surface and core of the tonsil and their correlation with pathological changes.

MATERIALS AND METHODS

This cross sectional study was conducted on 88 Patients in Zagazig University Hospital in the period

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from August 2017 To January 2018.

The Present Study Included: Eighty eight patients with chronic tonsillitis underwent tonsillectomy. They were 45 Male (51, 1%) and 43 Females Their ages ranged from 2-12 Years. Inclusion criteria: Age: two to twelve Years. Criteria of chronic tonsillitis: 7 episodes per year in the past year, 5 episodes per year in the past 2 years, 3 episodes per year in the past 3 years, despite adequate medical treatment. Exclusion Criteria: (1) Contraindication of general anaesthesia. (2) Blood diseases (leukemia, lymphoma). (3) Patients outside the age group. All patients included in this study were subjected to: (1) Full history taking laying stress on age, sex and number of attacks per year. (2) Symptoms of each attack (sore throat, fever vomiting). (3) Treatment of each attack. (4) Culture From the surface of the tonsil. (5) Core culture after tonsillectomy. Tonsillar swab, were cultured on blood macconkey agar incubated at 37°C for 24 hour. Colonies were identified by (MALDI-ToF MS) Matrix Assisted Laser Desorption Ionization time of flight. •Antibiotic sensitivity for isolated organisms were done by Vitek, results were interpreted as MIC according to guidelines of CLSI (6) Pathological examination of the tonsillar tissue: Gross examination each sample is measured before processing, then underwent full description of the surface, whether smooth or mamillated, the color whether whitish, or brownish then the consistency is described, whether soft, firm or friable. The specimen is then bisected and the cut surface is described: whether homogenous, or heterogeneous. Then, the specimens underwent tissue processing according to Hegazy method⁴: (Hegazy and Hegazy 2015). Microscopic examination: Examination of Hematoxylin, eosin stained slides; by light microscopy using olympus binocular microscope (Cx31) with full description of the following items:

- Surface epithelium: whether continuous or ulcerated its thickness whether normal, atrophic or

hyperplastic. whether presence or absence of inflammatory cell exocytosis, presence or absence of Spongiosis (tissue edema).

- The stroma: whether, presence or absence tissue edema, granulation tissue stromal fibrosis.
- Blood vessels: whether thin or thick-walled.
- Crypts: whether presence or absence & cryptitis or crypt fibrosis.
- The lymphoid follicles: whether hyperplastic necrotic or atrophied.

Statistical Analysis

All data were collected, tabulated and statistical analyzed Using spss 15-0.

RESULTS

Table 1: Clinical presentation of the studied patients.

Variables	N (n=88)	%
Recurrent Fever	84	95.5
Sore throat	51	58
Snoring	14	15.9
Vomiting	8	9.1

This table shows that the fever was the most common presentation among studied patients.

Table 2: Surface and core culture of the tonsils among studied patients.

Variables	N (n=88)	%
Surface culture		
Sterile	54	61.4
Staph	34	38.6
Core culture		
Sterile	6	6.8
Staph. Aureus	76	86.4
Hemophilus-influenzae	3	3.4
Pseudomonas	3	3.4

This table shows that the most of surface cultures were sterile while the most of core cultures were staph aureus.

Table 3: Antibiotic sensitivity of core culture of our patients

Variables	Staph (n=76)		Others (n=6)			
	N	%	Pseudomonas (n=3)		H influenza (n=3)	
			N	%	N	%
Sensitive to						
Erythromycin	30	39.5	0	0	3	100
Vancomycin	25	32.9	2	66.6	0	0.0
Levofloxacin	15	19.7	0	0.0	0	0.0
Ciprofloxacin	3	3.9	0	0.0	0	0.0
ceftazidime	3	3.9	1	33.4	0	0.0
Resistant to						
Trimethprim + sulfamethazole +	73	96.1	3	100	3	100
Penicillins Sulbactam + ceftazidime	3	3.9	0	0.0	0	0.0

Table 4: Macroscopic examination of the tonsils among studied patients after tonsillectomy.

Variables	N (n=88)	%
Size		
(0.5-2) × (0.5-2) × (0.5-2)	62	70.5
> (0.5-2) × (0.5-2) × (0.5-2)	26	29.5
Surface		

Irregular	26	29.5
Mammillated	23	26.1
Papillae projection	30	34.1
Smooth	9	10.2
Color of surface		
Greenish	33	37.5
Whitish	40	45.5
Brownish	15	17
Cut section		
Homogenous	45	51.2
Nodular	28	31.8
Papillae	15	17

As regard to macroscopic examination of excised tonsils, the surface was irregular, mammillated with papillae projections in most of cases the tonsils were greenish and whitish in most of patients.

Table 5: Microscopic examination of surface epithelium and crypts of the tonsils among studied patients.

Variables	N (n=88)	%
Epithelium		
Normal	4	4.5
Thin	14	15.9
Thick	38	43.2
Ulcerated atrophic	4	4.5
Inflammatory cell exocytosis	44	50
Spongiosis	28	31.8
Crypts		
Normal	7	8
Fibrosed	10	11.4
Cryptitis	71	80.6

This table shows histopathology of the studied tonsils after tonsillectomy on microscopic

examination, epithelium of the tonsils was thickened in 43.2% of the cases ,inflammatory cells infiltrated the tonsillar tissue in 50% of the cases. Cryptitis was a very common finding (80%).

Table 6: Microscopic examination of lymphoid follicles, stroma and blood vs. of the tonsils among studied patients.

Variables	N (n=88)	%
Lymphoid follicle		
Hyperplasia	76	86.4
Necrosis	8	9.1
Atrophic	4	4.5
Stroma		
Normal	3	3.4
Thin fibrotic	30	34.1
Thick fibrotic	55	62.5
Blood vessels		
Normal	8	9.1
Few thin walled	30	34.1
Numerous thick walled	40	45.5
Numerous thin walled	10	11.3

Table 7: Difference between organisms isolated from core culture as regard microscopic examination of surface epithelium and crypts of the tonsils among studied patients.

Variables	Sterile (n=6)		Staph (n=76)		Others (n=6)		X2	P value
	N	%	N	%	N	%		
Epithelium								
Normal	0	0.0	3	6	1	20	10.02	0.249
Thin	1	20	10	20	3	50		
Thick	4	80	33	66	1	20		
Ulcerated atrophic	0	0.0	4	8	0	0.0		
Inflamm. cell exocytosis								
Yes	4	80	36	47.4	4	80	Fisher	0.67
No	2	20	40	52.6	2	20		
Spongiosis								
Yes	4	80	23	30.3	2	20	Fisher	0.07
No	2	20	53	69.7	4	80		
Crypts								
Normal	1	16.7	5	6.6	1	10	2.14	0.38
Fibrosed	1	16.7	8	10.5	1	10		
Cryptitis	4	66.6	63	82.9	4	80		

Microscopic examination of lymphoid follicles revealed hyperplasia in 86.4% of the cases. The stroma was fibrotic in 62.5% of cases while the blood vessels was numerous and thick walled in 45.5%. [Table 6]

[Table 7] shows no statistical significant difference regarding histopathological finding of tonsillar epithelium and crypts among different types of organisms isolated from core tonsils after tonsillectomy.

Results of Histopathological Examination of Studied Tonsils (X100):

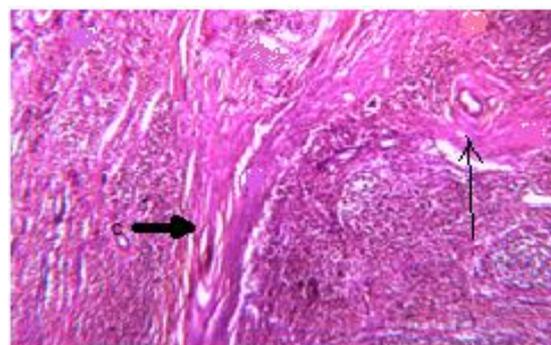


Figure 1: Showing Crypt Fibrosis(thick arrow) and Thick Walled Blood Vessels (thin arrow),x100

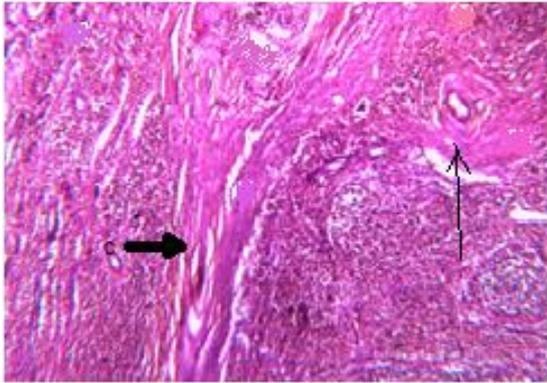


Figure 2: Showing thin walled blood vessels (arrows),x100

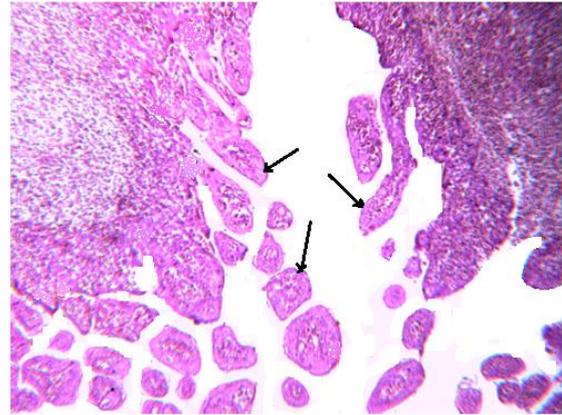


Figure 6: Showing Papillary Cryptitis (arrows),x100

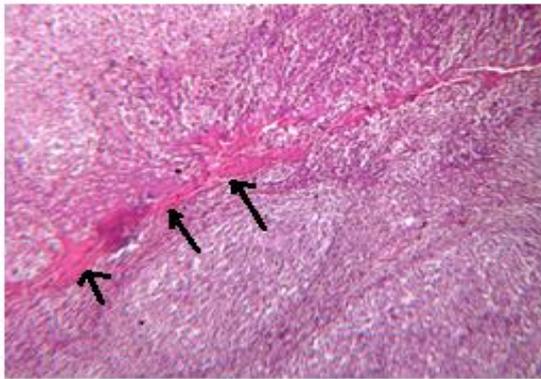


Figure 3: Showing cryptitis (arrows),x100

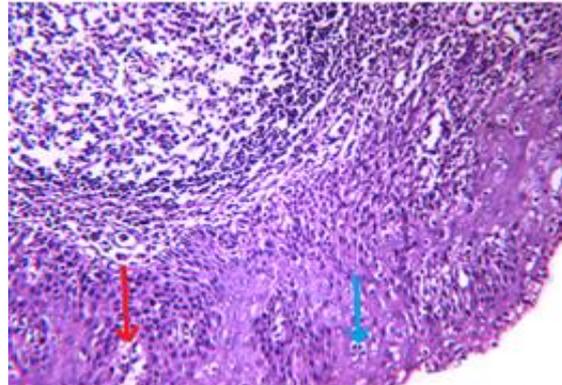


Figure 7: Showing surface Epithelium, Spongiosis (red arrow) and Exocytosis (blue arrow),x100

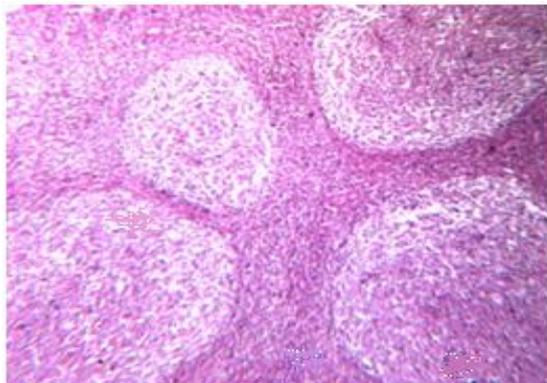


Figure 4: showing lymphoid follicle hyperplasia,x100

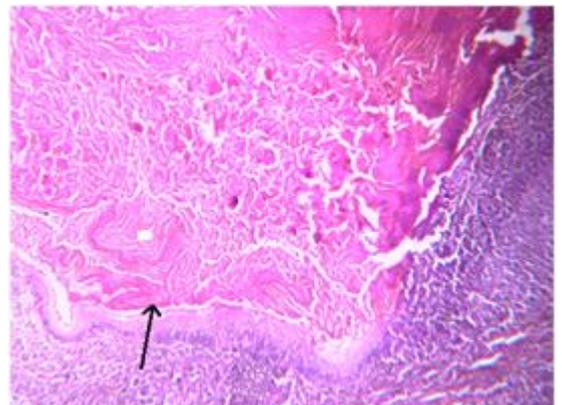


Figure 8: Showing Surface Keratinization(arrow),x100

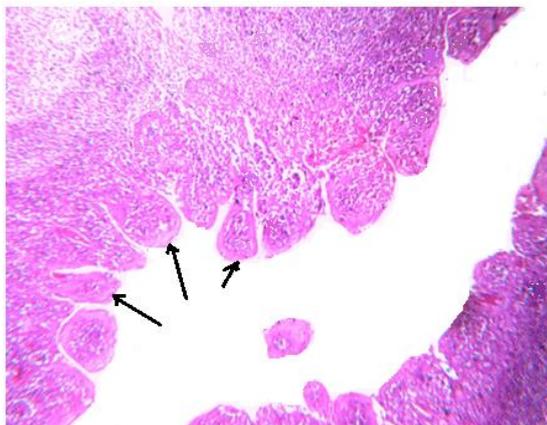


Figure 5: Showing Papillary Cryptitis (arrows),x100

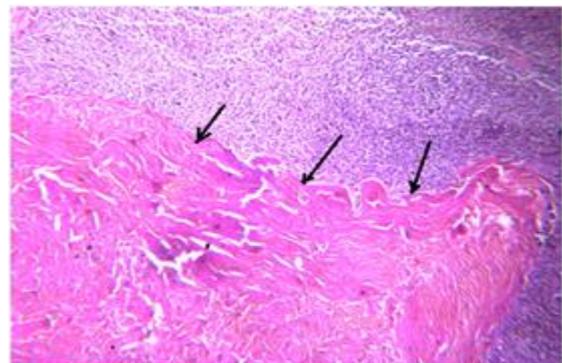


Figure 9: showing Surface Keratinization (arrows),x100

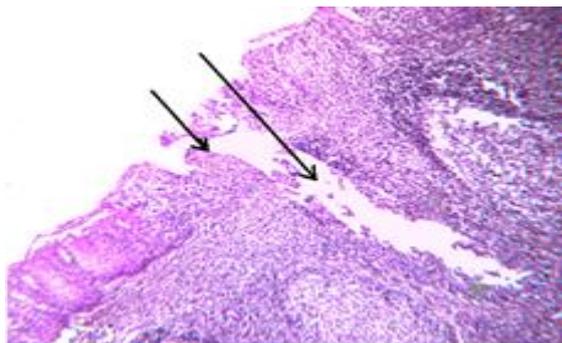


Figure 10: Showing Ulceration of surface epithelium (arrows),x100

DISCUSSION

Our study included 88 children with chronic tonsillitis who underwent tonsillectomy. As regard the clinical presentation of our patients before tonsillectomy, recurrent fever was the most common presentation followed by sore throat, snoring and vomiting, on the other hand Capper and Carter, (2008),^[5] during their study about the diagnostic features of tonsillitis, they reported that; sore throat was the most common presentation followed by fever and enlarged cervical lymph nodes. The most common organism isolated in cases of acute tonsillitis is GABHS (Simon, 2006).^[2] Due to frequent mal use of antibiotics in cases of chronic tonsillitis, the causative organisms is expected to be changed.

The cultures from the surface of the tonsils of our patients revealed that; most of surface cultures 64, 4% were sterile due to antibiotic use prior to tonsillectomy and only 38, 6% of the patients showed staph aureus while the cultures from the core of the tonsils revealed that; staph aureus was the most common isolated organism in 86, 4% of the patients followed by H influenza and pseudomonas. As regard Staph sensitivity; (39, 5%) was sensitive to erythromycin which may be due to unavailability of erythromycin in Egyptian market for long time while (32, 9 %) was sensitive to vancomycin and (19, 7 %) was sensitive to levofloxacin. Ninety six percent of staph was resistant to trimethoprim sulfamethazole and (3, 9 %) was resistant to penicillin sulbactam which are usually used for treatment of tonsillitis.

Isolated pseudomonas was sensitive to vancomycin and ceftazidime and was resistant to trimethoprim sulfamethazole; on the other hand H. influenza was sensitive to erythromycin and resistant to trimethoprim sulfamethazole.

Our results go in agreement with Loganathan et al. (2006),^[6] who employed the same methodology as he studied 101 patients aged between 2 and 12 years this study revealed that staph aureus was the most common isolated organism from the core cultures followed by H influenza and pseudomonas.

Going hand in hand with our results, Jin et al. (2017),^[7] concluded that; in recurrent tonsillitis, staphylococcus aureus was the most common pathogen followed by haemophilus influenzae and group A β hemolytic streptococcus. The study showed also that these bacterial strains were resistant to penicillin and showed a high sensitivity to third generation cephalosporin.

On the other hand Agrawal, et al. (2014),^[8] found that streptococcal viridans and branhamella catarrhalis were the most common isolated organisms from chronic tonsillitis patients (71, 43 %). Those organisms are considered as normal flora of the tonsil. Staphylococcus aureus was isolated only in (11, 85%) of the patients.

In a study about Chinese children Qian-wang et al. (2017),^[9] reported that the cultures from the surface of the tonsils revealed that; staphylococcus aureus (32 %), Haemophilus influenzae (30 %) and Streptococcus pneumoniae were the most common isolated organisms in recurrent tonsillitis group. Meanwhile the cultures from the core of tonsil revealed haemophilus influenzae, staph aureus and β hemolytic streptococcus.

In this Chinese study, staph aureus was resistant to penicillin and sensitive to macrolides, quinolones and gentamycin while haemophilus influenzae was resistant to penicillin and sensitive to third generation cephalosporin.

In Turkey, Yildizoglu et al. (2015),^[10] studied the core organisms and concluded that; staph aureus was the most frequently isolated pathogenic bacteria in patient with recurrent tonsillitis and group A β hemolytic streptococcus was most prevalent in children. Haemophilus influenzae was a common tonsil pathogen and pseudomonas aeruginosa was seldom seen.

Yildizoglu postulated many theories to explain the antibiotic resistance among his patients.^[10]

One of these theories is that β lactamase producing bacteria such as group A β hemolytic Streptococcus protect themselves from Penicillin. The second theory was that unusual bacteria were out of penicillin activity spectrum such as pseudomonas. Another theory postulated that fibrosis which developed as a result of recurrent tonsillitis can prevent penetration of antibiotic into the tonsillar tissue.

Our Results go in agreement with these theories as the histopathological examination of studied tonsils among our patients showed that; (62.5%) of studied tonsils were with thick fibrotic stroma and (45.5%) of them showed thick blood vessels. According to our result, staph aureus in particular cause thick walled blood vessels in 50% of cases, this percentage may be explained by the fact that staph is apyogenic organism with more tissue destruction and more fibrosis.

As regard to macroscopic examination of excised tonsils. The surface was irregular, mammillated with

papillae projections in most of cases which can be considered as a good clinical sign for chronic tonsillitis. Meanwhile the excised tonsils were greenish and whitish in most of patients which could be considered a further clue for diagnosis.

[Table 7] showed that the type of isolated organism has no impact on lymphoid follicle hyperplasia which consequently affect the tonsillar size. But as mentioned before 50% of staph produce numerous thick walled blood vessels, which is not caused by either pseudomonas or haemophilus influenzae.

On the contrary of our result Linda Brodsky et al. 1998,^[11] reported that haemophilus influenza had significant positive correlation to tonsil weight. Ninety four percent of chronically inflamed tonsil with haemophilus influenzae had tonsillar hypertrophy.

To our mind, we think that those inflammatory changes are sequential starting with hyperplasia of lymphoid follicles followed by fibrosis and atrophy of the tonsils. On microscopic examination, tonsillar cryptitis was an outstanding feature in 80% of patients denoting that the infecting organisms are embedded in the tonsillar crypts surrounded by fibrotic stroma and fibrotic blood vessels away from any trial of antibiotic therapy.

CONCLUSION

- (1) In chronic tonsillitis, most of bacteria are embeded in the core of the tonsil rather than the surface of the tonsils.
- (2) In pediatric chronic tonsillitis, isolated organisms and antibiotic sensitivity change to abnormal organisms which are multidrug resistant.
- (3) With chronic tonsillitis, pathological changes like fibrosis of stroma and blood vessesles may be responsible for antibiotic resistance due to poor penetration of antibiotic to the tonsillar core.

REFERENCES

1. Shishegar M and Ashraf M.J.(2014): Posttonsillectomy Bacteremia and Comparison of Tonsillar Surface and Deep Culture; *Advances in Preventive Medicine* Volume(2014), Article ID 161878, 5pages.
2. Levinson W.(2014): *Clinical microbiology in: Review of medical microbiology and immunology*, 11th ed., copyright(2014), Lang press. Pp:116-117.
3. Cowan DL and Hibbert J (1997): *Scott-Brown's Otolaryngology*. Vol 5. 6th ed. London: Butterworth Heinemann; p:2
4. Hegazy R and Hegazy A: (2015): Hegazy simplified method of tissue processing (consuming less time and chemicals): *Annals of international Medical and Dental Research*, Vol. (1), Issue (2).
5. Capper R and Canter RG. (2008): Is there agreement among general practitioners, paediatricians and otolaryngo-logists about the management of children with recurrent tonsillitis? <https://doi.org/10.1046/j.1365-2273.2001.00485>
6. Loganathan A, Arumainathan U. D. and Raman, R. (2006): "Comparative study of bacteriology in recurrent tonsillitis among children and adults," *Singapore Medical Journal*, vol. 47, no. 4, pp. 271– 275.
7. Jin H.J, Dong W.L, Young S. et al., (2017): Bacteriology and antibiotic sensitivity of tonsillar diseases in Chinese children. Author information *Laryngoscope* 2146-2151. *Eur Arch Otorhinolaryngol.* ; 274(8):3153-3159.
8. Agrawal A, Kumar D, Goyal IA, et al., (2014): Suneel Bhooshan Bacteriological Evaluation and Their Antibiotic Sensitivity Pattern in Tonsillitis; *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)* Volume 13, Issue 3 Ver. V. PP 51-55.
9. Qian Wang, Jingdong Du, Chen Jie et al., (2017): Bacteriology and antibiotic sensitivity of tonsillar diseases in Chinese children. Volume 274, Issue 8, pp 3153–3159.
10. Yildizoglu U, Polat B, Gumral R et al., (2015): Effect of antibiotic use on bacterial flora of tonsil core in patients with recurrent tonsillitis. *Eur Arch Otorhinolaryngol.* 272 (6): 1525-8.
11. Linda B, Linda M and Stanievich J (1988): The role of haemophilus influenzae in the pathogenesis of tonsillar hypertrophy in children. *Eastern Section Triological Paper*. Pages 1055-1060.

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