ORIGINAL ARTICLE

Clinico-Bacteriological Evaluation of Surface and Core Tonsillar Tissue in Chronic Tonsillitis

Shrestha K[1], Paudel DR[1], Mahaseth SC[1], Pokhrel S[2]

ABSTRACT

Introduction: Chronic tonsillitis is the most common disease for Otolaryngologists. Effective treatment of tonsillitis depends on knowledge of the infecting organisms. Controversy regarding the treatment of tonsillitis based on throat culture report still persists. There is always a dilemma whether the antibiotics prescribed for tonsillitis are sufficient for the different organisms on the surface and core of the tonsils. If surface culture is a determinant of bacteriology of the core, then rational therapy could be aimed at organisms cultured by surface swabs. **Aims:** To study the correlation of bacteria isolated from the surface and core of the tonsil in chronic tonsillitis and antibiotic sensitivity of the bacterial isolates. **Methods:** This was a prospective study carried out on fifty patients, who underwent tonsillectomy for chronic tonsillitis. The swabs obtained from the surface of the tonsil before tonsillectomy and the core of the tonsil post tonsillectomy were sent for isolation of micro-organisms. Antibiotic sensitivity test was performed by Kirby-Bauer Disk Diffusion method on the bacterial isolates. **Results:** Bacterial growth was detected in 74% of the total sample, in cultures from the surface or the core tissue or both. 78% of surface samples versus 70% of tonsillar core samples revealed bacterial growth. No pathogens were isolated in 26% of samples. Staphylococcus Aureus and Group A β hemolytic streptococcus were the most commonly isolated organisms. Antibiotics sensitive against these pathogens include Amoxycillin-Clavulanic acid, Cefpodoxime, Amikacin, Levofloxacin, Doxycycline, and Nitrofurantoin. **Conclusion:** Our study shows that surface culture does not reliably predict core pathogens in cases of chronic infection. Staphylococcus Aureus and Group A β hemolytic streptococcus were the most commonly isolated organisms from the surface and core of the tonsil. So the antibiotics effective against these organisms should be chosen.

Keywords: Antibiotics, Chronic Tonsillitis, Core, Surface

Authors:

1. Dr. Kumar Shrestha
2. Prof. Dhundi Raj Paudel
3. Dr. Subhash Chandra Mahaseth
4. Mr. Sandeep Pokhrel

[1] Department of Otorhinolaryngology, Nepalgunj Medical College & Teaching Hospital, Kohalpur, Banke, Nepal

[2] Department of Microbiology, Nepalgunj Medical College & Teaching Hospital, Kohalpur, Banke, Nepal

Address for Correspondence:

Dr. Kumar Shrestha
Lecturer
Department of Otorhinolaryngology
Nepalgunj Medical College and Teaching Hospital
Kohalpur, Banke, Nepal
Email: kumar.stha11@gmail.com

INTRODUCTION

Tonsils are important components of the immune system and their infections are one of the most frequently encountered diseases in humans. Chronic tonsillitis results from recurrent acute tonsillitis which is thought to result from insufficient penetration of antibiotics into the core of the tonsil or inappropriate antibiotic therapy.[1]

Tonsil infection may occur primarily or secondarily as a result of upper respiratory tract infections commonly preceded by viral infections.[2] Causative agents of tonsillitis include viruses: Adenovirus, Epstein Barr Virus (EBV), Influenza virus and Echovirus, and bacteria: beta-hemolytic streptococcus. In rare instances, tonsillitis can be caused by fungi or parasites.[3,4]Effective treatment of patients with tonsillitis depends on knowledge of the infecting organisms. The practice of swabbing the surface of the tonsil as a culture specimen for the determination of the bacteria responsible for the tonsillar pathology may be misleading. The tonsillar disease may stem from the bacteria within the substance of the tonsil rather than the bacteria identified on the surface.[5] If the surface culture was representative of the bacteriology of the core, then rational treatment of tonsillitis could be directed at organisms cultured by surface swabs. Previous studies have shown that surface culture does not reliably predict core pathogens.[6,7] Thus, comparing the surface and core microflora can help the otorhinolaryngologist to determine the etiological agent and initiate effective treatment and also reduce the emerging impending antibiotic resistance. This study was aimed to determine the correlation of bacteria on surface and core tonsillar tissue and also to predict bacterial sensitivity to some antibiotics.

METHODS

This was a prospective study done in the Department of Otolaryngology and Department of Microbiology, Nepalgunj Medical College, Kohalpur, Banke from May 2022 to April 2023, after obtaining ethical approval from Institutional Review Committee (IRC). A total of 50 patients with chronic tonsillitis who underwent tonsillectomy were included in the study. Patients with age between 5 to 50 years, diagnosed with Chronic tonsillitis (described as more than seven episodes of acute attacks in one year, more than five acute attacks for two years, more than three attacks for three consecutive years, or two weeks of school or work lost in one year due to tonsillitis), tonsils with obstructive symptoms like difficulty in swallowing, breathing and snoring and general ill health were included in the study. Patients with acute tonsillitis, active upper respiratory tract infection (URTI), patients on antibiotics within the past 2 weeks, clinical suspicion of malignancy of tonsils, patients undergoing tonsillectomy for reasons other than chronic tonsillitis, immunocompromised patients and patients with bleeding disorders and medically unfit for surgery were excluded from the study. Before enrolling subjects in the study, written informed consent was obtained either from patients or relatives after explaining in detail the purpose of the study. A proforma was filled out for each patient documenting age, sex, address, and clinical information, including chief complaints and duration of symptoms. Following this, a detailed Otorhinolaryngological and general physical examination was done. Investigations for pre-anesthesia fitness were done for all patients before surgery. After the patient was intubated, a tonsillar surface swab was taken trans-orally under direct vision by rotating a sterile cotton wool swab over the surface of the tonsil not touching other parts of the oropharynx, and was placed in a transport medium. Following this, a tonsillectomy was performed by dissection and snare technique. Immediately after excision, the tonsil was dipped in povidine iodine solution for 30 – 45 seconds. Then it was rinsed in sterile saline solution and sectioned into two pieces under strict aseptic conditions. The same procedure of rubbing a sterile swab was applied to the core of the excised tonsils, avoiding its outer surface, and placed into a transport medium. These two swabs were then transferred to the Microbiology laboratory within ½ hr where the swab sticks were inoculated in blood agar, chocolate agar, and McConkey media and were incubated at 37 °C with 5-10% CO2 for 18-24 hours. The isolated bacteria were gram stained and microscopically examined. Then they were identified by using standard biochemical tests. Antibiotic sensitivity test was performed by the Kirby-Bauer Disk Diffusion method by measuring the zone of inhibition around the antibiotic discs and reference tables were used to determine if the bacteria are sensitive (S), intermediate (I) or resistant (R) to the antimicrobial drugs. The data was entered in the MS EXCEL spreadsheet and data analysis was done using Statistical Package for the Social Sciences (SPSS) version 21 and necessary statistical tools.

RESULTS

A total of 50 patients with chronic tonsillitis scheduled for tonsillectomy were included in this study. Their ages ranged from 5 to 50 years. The mean age of the studied patients was 22.20 years. About 22 cases (44%) were males and 28 cases (56%) were females. (Figure 1)

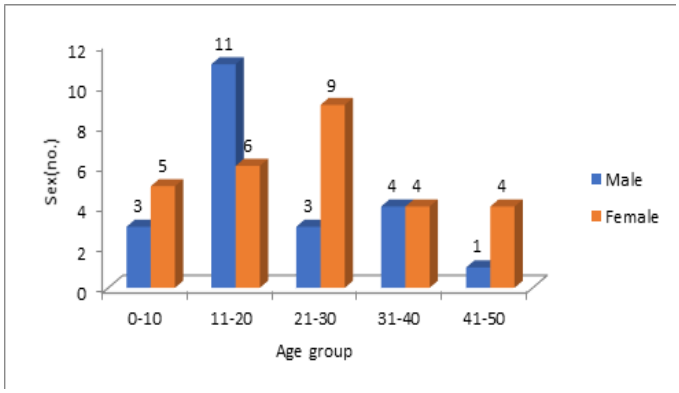

Figure 1: Age and sex-wise distribution of subjects (n=50)

The indication for tonsillectomy among patients was chronic or recurrent tonsillitis i.e. two or more episodes of tonsillitis for two or more consecutive years in 26(52%), followed by chronic adeno-tonsillitis 13(26%), tonsillar hypertrophy i.e. tonsillar size 3+/4+ denoting 50-70% and greater than 75% obstruction of the airway in 6 (12%) and general ill health in 5 (10%) respectively. (Figure 2)

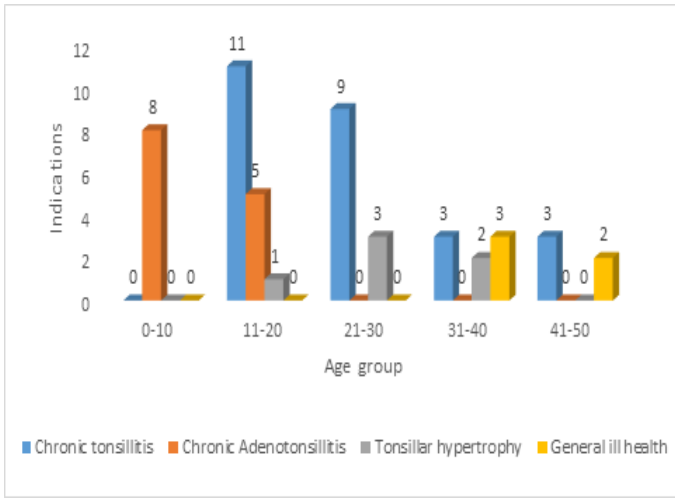

Figure 2: Indications of tonsillectomy/age group (years) (n=50)

The highest number of patients that is 23(46%) had grade III hypertrophy, followed by 19(38%) patients with grade II, 4 (8%) with grade IV and 4(8%) with grade I tonsillar hypertrophy. (Figure 3)

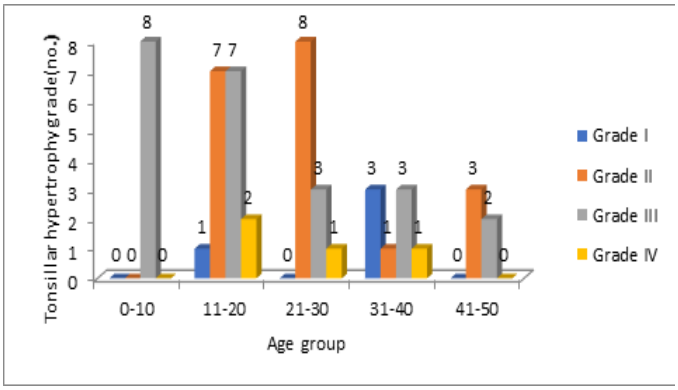

Figure 3: Grading of tonsillar hypertrophy/age group (years) (n=50)

Isolates	Number of samples			P value
	Surface samples	Core samples	Total	
Pathogens	39 (78%)	35 (70%)	74 (74%)	0.828
No Pathogens	11 (22%)	15 (30%)	26 (26%)	
Total	50	50	100	

Table I: Correlation of Organisms Isolated from Tonsillar Surface and Core

In the present study, pathogenic bacteria were isolated in 74(74%) and no pathogens in 26 (26%) from the total tonsillar samples, in cultures from the surface or the core tissue or both. In 39(78%) cases, pathogenic organisms were isolated in the tonsillar surface and 35 (70%) cases in the tonsillar core. Whereas no pathogens in 11(22%) cases in the tonsillar surface and 15(30%) cases in the tonsillar core. There was no statistical significant correlation between the type of bacteria isolated between the surface and core of tonsils. (P>0.05). (Table I).

Organisms isolate	Tonsil surface	Tonsil core	P value
S. Aureus	10 (20%)	13 (26%)	0.753
Group A β Haemolytic streptococci	15 (30%)	8 (16%)	0.029
S. Pneumoniae	5 (10%)	3 (6%)	0.561
Pseudomonas Aeruginosa	4 (8%)	3 (6%)	0.607
Klebsiella Pneumonia	2 (4%)	4 (8%)	0.678
S. Viridans	1 (2%)	1 (2%)	0.888
E. Coli	1 (2%)	1 (2%)	0.894
Candida	1 (2%)	2 (4%)	0.841
Total	**39**	**35**	

Table II: Comparison of organisms isolated from Tonsillar surface and core

Among these, the aerobic bacteria in surface and core isolates were 38(76%) and 33(66%) and fungus isolated in the surface and core was 1(2%) and 2(4%). Group A β hemolytic streptococci was the commonest isolated organism in surface culture 15(30%) followed by S. Aureus 10(20%), Streptococcus pneumonia 5(10%), Pseudomonas 4(8%), Klebsiella pneumonia 2(4%), S. Viridans 1(2%), E. coli 1(2%) and Candida 1(2%). In core cultures, Staphylococcus aureus 13(26%) followed by Group A β haemolytic streptococci 8(16%), Klebsiella pneumonia 4(8%), Streptococcus pneumonia 3(6%), Pseudomonas 3(6%), Candida 2(4%), S. Viridans 1(2%) and E. coli 1(2%) were the commonest isolated organisms respectively. Only Group A β hemolytic streptococci were statistically more in proportion in surface isolates as compared to core isolates (p<0.05) and other organisms were not statistically significant in proportion between surface and core isolates (p>0.05). (Table II).

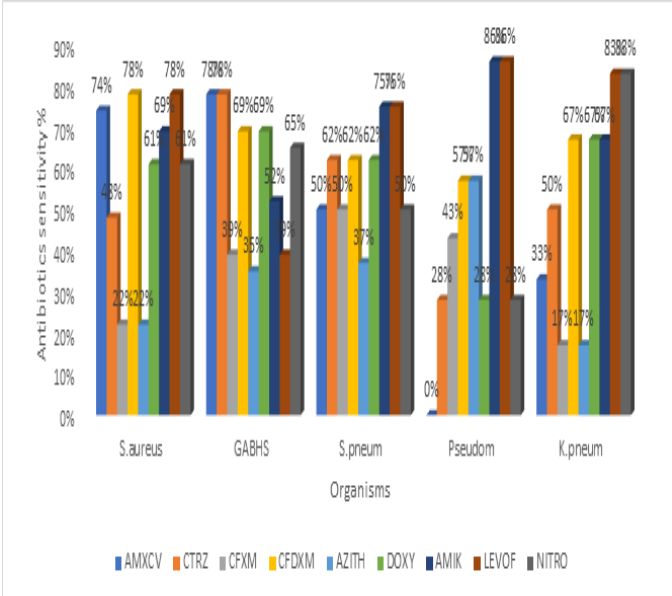

Figure 4: Antibiotic sensitivity results of the isolated strains

The antibiotic sensitivity of Staph. Aureus to Amoxycilline-clavulanic acid, Ceftriaxone, Cefixime, Cefpodoxime, Azithromycin, Doxycycline, Amikacin, Levofloxacin and Nitrofurantoin were 74%, 48%, 22%, 78%, 22%, 61%, 69%, 78% and 61% respectively. The antibiotic sensitivity of Group A β haemolytic streptococci to Amoxycilline-clavulanic acid, Ceftriaxone, Cefixime, Cefpodoxime, Azithromycin, Doxycycline, Amikacin, Levofloxacin and Nitrofurantoin were 78%, 78%, 39%, 69%, 35%, 69%, 52%, 39% and 65% respectively.

The antibiotic sensitivity of S. pneumoniae to Amoxycilline-clavulanic acid, Ceftriaxone, Cefixime, Cefpodoxime, Azithromycin, Doxycycline, Amikacin, Levofloxacin and Nitrofurantoin were 50%, 62%, 50%, 62%, 37%, 62%, 75%, 75% and 50% respectively.

The antibiotic sensitivity of Pseudomonas to Amoxycilline-clavulanic acid, Ceftriaxone, Cefixime, Cefpodoxime, Azithromycin, Doxycycline, Amikacin, Levofloxacin and Nitrofurantoin were 0%, 28%, 43%, 57%, 57%, 28%, 85%, 85% and

28% respectively.

The antibiotic sensitivity of Klebsiella pneumoniae to Amoxycilline-clavulanic acid, Ceftriaxone, Cefixime, Cefpodoxime, Azithromycin, Doxycycline, Amikacin, Levofloxacin and Nitrofurantoin were 33%, 50%, 17%, 67%, 17%, 67%, 67%, 83% and 83% respectively.

DISCUSSION

Tonsillitis is a common ENT problem occurring in the younger age group and is often due to chronic inflammation within the tonsils because of insufficient penetration of antibiotics into the core or inappropriate antibiotic therapy. This often results in persistent infection with resistant aerobic and/or anaerobic bacteria leading to recurrent attacks of infection and eventually chronic tonsillitis. The resultant chronic inflammation and/or enlargement of the tonsils cause considerable morbidity requiring therapeutic surgical intervention. Superficial tonsillar swabs are often used as a guide in identifying the offending organism and the proper selection of therapy in acute and recurrent tonsillitis. Normal bacterial flora present in the oral cavity and oropharynx may be cultured in most cases and antibiotic therapy is instituted based on the results obtained from the cultures grown by the throat swab.

Our study showed that adolescents were more affected 17(34%) and there were more females than males (sex ratio of 1.27:1). Similar age incidence was observed in many of the previous studies.[2,8] However, the gender incidence was more in men in many of the previous studies. The majority of the patients who sought surgical intervention had grade 3 tonsillar hypertrophy (46%).[9] In 26% of patients, adenoids were present along with enlarged tonsils, which was comparable to the study by Hadi and co-authors.[10] Chronic tonsillitis was the major indication for surgery in 26(52%) of patients followed by chronic adeno-tonsillitis in 13(26%).

In 26% of our study group, no bacteria were isolated. The lack of any growth in the tonsillar surface and core in the rest of the patients could be explained by a possible role of viruses[11] and other anaerobes in precipitating chronic tonsillitis, which has not been investigated in our study. It could also be attributed to the fewer number of attacks of tonsillitis in those patients.

In the present study, pathogenic bacterial growth on the surface and core of tonsils was nearly equal (78% and 70% respectively). An equal incidence of surface and core isolates were seen in three studies[8,12,13] whereas, in three other studies, core isolates were nearly double that of surface isolates.[14-16] Among the 74% total pathogens isolated, a significant 52.7% were found only in tonsil surface whereas 47.29% were found in tonsil core. Salman Mutiullah Shaikh et al[17] showed that among the 80.59% pathogens, a significant 46.29% were found only in the tonsil core. In a similar study by Kurien et al, the variance was 48% between core & surface cultures.[1,18] Abhay Kumar et al[19] showed an overall variance in surface culture as to the presence or absence of core pathogens in 58% of cases. Mustafa Gul et al[20] found the difference to be 59.4%. In contrary Babaiwa U.F et al[12] showed identical organism in both surface and core in maximum number of patients. Abdelaziz M.E et al[21] showed variation in 62.5% cases and similarity in 37.5% and Agarwal. A et al[2] showed variation in surface and core organisms in 63.63% and similarity in 36.3%.

In the present study, Staphylococcus (46%) and GABHS (46%) were the most prevalent bacterium isolated from the tonsillar culture. The most common organism isolated from the surface was GABHS (30%) followed by S. Aureus (20%) and the core was Staphylococcus Aureus (26%) followed by GABHS (16%). In Mustafa Gul et al[20] most common organism was GABHS followed by Staphylococcus Aureus. Similarly, in the study by Ozturkcan et al[22] streptococci and staphylococci were the predominant isolates, while anaerobic organisms were the least common ones. Loganathan et al[23] suggested that Staphylococcus aureus and Group A β hemolytic streptococci were the most common isolated bacteria from the tonsillar culture. Besides, Surow et al showed that Staphylococcus aureus was rarely reflected on the surface culture.[7] These findings were consistent with the results of our study.

The susceptibility of the gram-positive microorganisms isolated in this study showed that Staphylococcus Aureus was most susceptible to Amoxycillin-Clavulanic acid, Cefpodoxime and Amikacin. GABHS was susceptible to Amoxycillin-Clavulanic acid, Cefpodoxime and Doxycycline. Streptococcus pneumoniae was susceptible to Levofloxacin and Amikacin. Babaiwa U.F et al[12] showed that Staphylococcus Aureus was most susceptible to gentamycin and ciprofloxacin, and GABHS was susceptible to Amoxycillin. Agarwal. A et al[2] showed that Staphylococcus Aureus was most susceptible to ciprofloxacin and GABHS was susceptible to Netilmycin. Amongst the gram-negative organisms cultured in our study, Pseudomonas aeruginosa was sensitive to Levofloxacin, Amikacin and Cefpodoxime. Klebsiella pneumonia was more susceptible to Levofloxacin and Nitrofurantoin. This is in correlation with BabaiwaU.F et al[12] in which Pseudomonas aeruginosa showed the highest susceptibility to ciprofloxacin and gentamycin. In Agarwal. A et al[2] Pseudomonas aeruginosa was sensitive to ciprofloxacin and netilmycin. This study showed that Amoxycillin-Clavulanic acid, Amikacin and Cefpodoxime should be the treatment of choice for gram-positive organisms while Levofloxacin, Amikacin and Nitrofurantoin for the gram-negative organisms.

LIMITATIONS

The lack of any growth in the tonsillar surface and core could be explained by a possible role of viruses and other anaerobes in precipitating chronic tonsillitis, which has not been investigated in our study due to the unavailability of the anaerobic culture medium in our center. Further studies are recommended to analyze the possible role of viral etiology and host factors like malnutrition, socio-economic status and poor oral hygiene in the causation of chronic tonsillitis. Since tonsillitis is a common condition existing in widespread geographical areas, studies with a greater sample size and over larger geographical regions are recommended.

CONCLUSION

In conclusion, the role of throat swabs in the management of chronic tonsillitis is doubtful. In view of our study and other studies investigating tonsillar bacteriology, it is obvious that surface culture does not reliably predict core pathogens in cases of chronic infection. Staphylococcus Aureus and Group A β hemolytic streptococcus were the most common isolated organisms from core and surface of the tonsil followed by S. pneumonia, Klebsiella Pneumonia and Pseudomonas. So for effective treatment, the antibiotics sensitive against these pathogens like Amoxycillin-Clavulanic acid, Cefpodoxime, Amikacin, Levofloxacin, Doxycycline and Nitrofurantoin should be chosen. Thus, tonsillar deep tissue cultures may help clarify tonsillar microbiology and guide the treatment of patients with chronic tonsillitis.

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