

Clinical Bacteriological Evaluation of Tonsillar Surface and Core Microflora in Recurrent Tonsillitis Undergoing Tonsillectomy

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Abstract

Background: Clinically, chronic/recurrent Tonsillitis the most common disease is indistinguishable whether viral or bacterial etiology. Effective treatment of the tonsillitis depends on knowledge of the infecting organism, but there is always a dilemma whether the antibiotics prescribed for the tonsillitis are sufficient for the different organisms in the surface and core of the tonsils. **Aim of study:** To determine the bacterial flora in the tonsillar core and compare it with tonsillar surface organisms, whether there is any difference between tonsillar surface and deep tissue cultures, and to correlate the clinical profile of the patients with various microorganisms. **Methods:** This prospective study was performed on (57) patients clinically diagnosed with recurrent tonsillitis/ Adeno-tonsillar hypertrophy, who underwent tonsillectomy, aged from (4) years to (37) years, admitted in the Otorhinolaryngology department, Surgical Specialty Center, University of Benghazi from 1st January to 31st December 2022. Tonsillar surface and core tonsillar cultures were taken and isolated. **Result:** The bacterial flora of the tonsil surface and core was compared. Pathogens were isolated by core culture but not by the surface culture in 14 cases (25%). In 34 cases (59.64%), pathogenic microflora were identified from the core of tonsils, differing from the surface. Discrepancy between surface and core culture as to the presence or absence of core pathogens was in (46) cases (81%), while it was identical in (11) cases (19%). Staphylococcus aureus was the most common isolated organism in the surface and core of the tonsil. **Conclusion:** Most bacteria are embedded in the core of the tonsil rather than the surface of the tonsil. Staphylococcus aureus was the most common isolated organism in the surface and core of the tonsil.

Keywords: Tonsil surface, tonsil core culture, chronic/recurrent tonsillitis, tonsillectomy

Introduction

There are different variations of tonsillitis: acute, sub-acute, chronic, and recurrent [1]. Chronic/Recurrent tonsillitis is the diseases of childhood but also frequently seen in adults. These children are prescribed various antimicrobial treatments, but these treatments are usually insufficient, and surgery is required. In recurrent tonsillitis, the tonsil core harbors numerous bacteria, some of which are pathogenic. A high tissue concentration of these bacteria correlates with clinical parameters of infection and hyperplasia of the tonsils [2]. The tonsil surface swab is commonly used as a diagnostic test for culture specimens to determine the organism responsible for the tonsil infection, commonly used in recurrent tonsillitis do not reflect the real pathogens, still in practice despite controversy [3]. The antibiotics chosen according to the surface swabs are not appropriate [4-8]. In many cases, pathogenic organisms

were found in the tonsil core, despite the fact that surface cultures revealed only normal respiratory flora [9]. Differences between the tonsil surface and core bacterial flora may explain the increasing failure rate in the eradication of the infection from the tonsil, leading to the chronic stage. Therefore, the rationale of treating chronic tonsillitis medically should be based on the knowledge of the common core pathogen [10]. Although antibiotic therapy may be sufficient in the treatment of acute tonsillitis, tonsillectomy remains the treatment of choice in the management of recurrent and chronic tonsillitis [11, 12]. In recurrent tonsillitis, the goal of the treatment is to eradicate the bacteria that cause infection. Inappropriate antibiotic therapy against the pathogen in deep tissue or inadequate antibiotic levels in the tonsillar tissue leads to the continuation of the infection and re-inoculation of the surface [13]. Consequently, the

antibiotic treatment may sometimes be unsuccessful, although it is chosen according to the results of the cultures taken from the tonsillar surfaces. The tonsils are located in the oropharynx, the areas where microorganisms are most abundantly found; the tonsillar surface is contaminated with oropharyngeal secretions, and it generally shows normal flora of the oropharynx. Which contains Common causative organisms isolated, such as Alpha-hemolytic Streptococci, Staphylococcus

Materials and Methods

Study Participants

Selected cases with a history of recurrent tonsillitis who were admitted to the otolaryngology department in AL-Hawari specialized center for tonsillectomy during the period from 1/1/2022 to 31/12/2022 were enrolled in this prospective study. The patients were selected based on a history of recurrent attacks of tonsillitis (more than 5 attacks per year). Inclusion criteria included both children and adult patients, both male and female, who presented with recurrent tonsillitis attacks for 1 year or more. Exclusion criteria include recent attacks of acute tonsillitis, upper respiratory tract infection, bleeding disorders, co-morbidity conditions (e.g., diabetes or hypertension, neurological diseases, *etc.*).

Ethical statement

The following considerations were taken carefully during the conduction of the study: informed consent regarding study aims and methods, ensuring confidentiality and privacy of the data, and acknowledging co-investigators and data collectors in the study.

Method of collection of culture specimens:

Preoperatively, tonsillar surface swabs were taken, and due care was taken for not touching the part of the

aureus, non-pathogenic Neisseria species, Haemophilus influenzae, S.Pneumococcus, Enterococcus, Bacteroides fragilis group, and Corynebacterium species [14]. In current research, we determine the correlation between the microorganism on the surface and in the core of the tonsil in patients of recurrent tonsillitis undergoing tonsillectomy, and correlate the clinical profile of the patients with various microorganisms isolated

pharynx. Tonsillectomy was performed by the dissection and snare method. After tonsillectomy, the excised tonsil was cut into two halves under strict aseptic conditions, and a sterile swab was rubbed on the cut surface of the tonsil, avoiding touching the margin and outer surface of the tonsil

Sampling technique and sample size

A purposive sampling technique was used to get the required sample. The study population is the number of cases attending the otolaryngology outpatient services in the AL-Hawari specialized center during the study period. The sample size was calculated considering an accepted margin of error of 5% and a confidence level of 95% using the above-mentioned data. The calculated sample size was 57 cases.

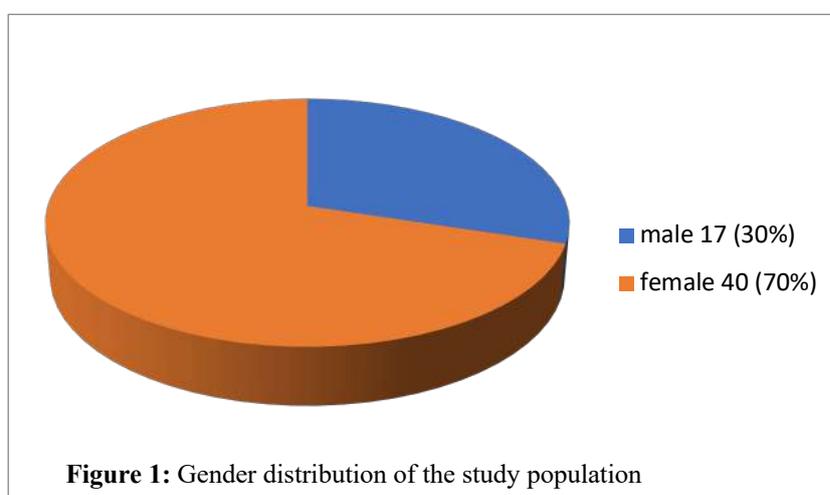
Statistical analysis

Statistical analysis of results carried out using SPSS version 8, the baseline demographic and clinical correlates were tabulated and expressed as numbers and percentages. The bacteriology of the tonsillar surface and core was also found to be expressed as frequencies. Relationship between the organism identified on the surface and that from the core was tested using sensitivity, specificity, and likelihood ratio calculated using chi-square test level of significance is considered < 0.05 .

age of 16 years mean age of $16.8 + 8.37$ S.D., including 17 patients (30%) male and 40 patients (70%) female.

Results

Demographic profile: There were 57 patients with ages ranging from 4 years to 37 years, with a median



Operative procedure: All patients were operated on by the cold and dissection method. 25 patients (44%) underwent tonsillectomy alone, while the other 32 patients (56%) had a simultaneous procedure of adenoidectomy.

Bacteriological analysis: Overall total number of positive isolates obtained from both surface and core culture was 72% (82 specimens). Core culture revealed pathogens in 42 patients (73.68%), while surface culture detected pathogens in 40 patients (70.18%). Figure 2

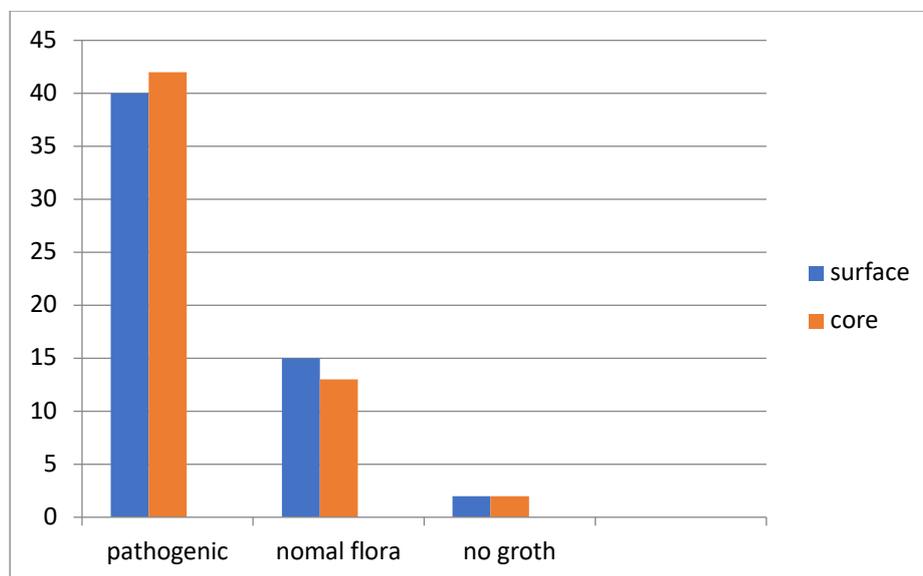


Figure 2: Overall Organism isolated from tonsillar from surface and core culture

3.4 Comparison of culture: The tonsillar surface culture is compared with the tonsillar core. A large percentage of the patients had no correlation between organisms cultured simultaneously from the two sites. On comparing the culture result between surface and tonsil core culture, 14 patients (25%) showed pathogen in

tonsil core culture with normal flora in corresponding surface swab culture and 12 patients (21%) had pathogenic organism in surface swab culture with normal flora in tonsillar core swab culture, while 3 patients (5%) had normal flora in both surface and core swab culture Table 1.

Table 1: Comparison of pathogen of surface and core cultures

Surface	Core	Total no. of patients	Percentage
Normal Flora	Pathogen	14	25%
Pathogen	Pathogen (same)	8	14%
Pathogen	Pathogen (different)	20	35%
Pathogen	Normal Flora	12	21%
Normal Flora	Normal Flora	3	5%
TOTAL		57	100%

However, similar pathogens in both surface and core culture were observed in (8+3) 11 patients (29.30%), and different pathogens in (14+20) 34 patients (60%). Discrepancy of Pathogen 14 + 20 + 12 = 46 patients (81%)

Statistical Analysis:

The results of the culture of tonsil surface and core swabs were further analyzed for statistical significance. The likelihood ratio for similar and general organism

pathogens was calculated using sensitivity and specificity. For a similar pathogen, the sensitivity and specificity was 19% and 80%, respectively, with a likelihood ratio of 0.95, and for a general pathogen, the sensitivity and specificity 66.67% and 20% specificity, respectively, with a likelihood ratio of 0.83. From this test result, it is evident that the tonsil surface swab is not a reliable diagnostic test for representing the growth of

the same bacterial microflora as the tonsil core (Table 2a and 2b)

Table (2a): Similar organism Pathogen

Tonsil surface Swab culture	Core swab culture		Total
	+	-	
Same pathogen +	8	3	11(40%)
Different pathogen -	34	12	46(60%)
Total	42	15	57

Sensitivity -19 % Specificity- 80 %

(+) ve predictive value - 72.73% (+)ve likelihood ratio - 0.95, (-) ve likelihood ratio- 1.01

Table 2b: General organism pathogen

Tonsil surface Swab culture	Core swab culture		Total
	+	-	
Any organism +	28	12	40(%)
Any organism/NF -	14	3	17(%)
Total	42	15	57

Sensitivity- 66.67 % Specificity 20 % Positive predictive value- 70%

(+)ve likelihood ratio -0.83, (-) ve likelihood ratio-1.67

Distribution of organisms isolated:

Among the distribution of organisms isolated from surface and core specimen staphylococcus aureus was the most common isolate found in 32 patients (56.41%), 15 patients (26.3%) in the core of the tonsil, and 17 patients (29.82%). According to prevalence in decreasing orders of frequency in 30 patients (52.62%)

were B. hemolytic streptococcus (B.H.S)- S.pyogen. 24 patients (42.108%), 9 patients (15.78%) in surface and 15 patients (26.31%) in core culture, followed by Alfa hemolytic streptococci (A.H.S) in 14 patients (24.46%), 9 patients in surface and 5 patients in core. H.Influenza was cultured in 4 patients (7%) only in the core Table 3

Table 3: distribution of organisms isolated

Organism isolated		Surface	Core	Total / %
S.Aureus		17(29.82%)	15(26.3%)	32(56.41%)
AHS		9	5	14(24.46%)
	S.Virians	8	3	11(19.29%)
	S.Pneumonia	1	2	3(5.26%)
BHS		13	17	30(52.62%)
	S.Pyogens	9(15.78%)	15(26.3%)	24(42.10%)
	S.Fecalis	3	2	5(8.77%)
	S.Aglec(((1	-	1(1.75%)
H.Influenza		-	4	4(7.01%)
Fungus		1	1	2(3.5%)

Discussion

This study was conducted primarily to compare tonsil surface and core swab culture results in chronic or recurrent tonsillitis. The current study revealed that 70% of tonsil surface cultures grew a pathogenic bacterium, versus 74% in the tonsil core. These results are similar to those of Kurien et al.[15] and Abdulrahman et al.[16], which reported pathogens in 72.5% and 81.2%, respectively. Tonsil surface cultures are likely to grow organisms, but the true pathogenic organism within the tonsil core is not always reflected in the routine tonsil surface swab. Determining core bacteriology is important for several reasons. Failure to eradicate pathogens in the core, whether from inappropriate antibiotic choice or insufficient penetration into the core, will allow persistence of core infection or reinoculation of the initially sterilized surface. Failure to achieve a bactericidal level of the antibiotic inside the tonsil results in bacterial survival.[9] In the current study, organisms isolated from the tonsil surface did not always correspond to those isolated from the deep tissue specimen. The surface cultures showed normal flora, while tonsil core cultures yielded pathogenic microorganisms in 25% (14 patients). In addition, 59.69% (34 cases) showed a different pathogen on the surface and in the core, and a pathogen discrepancy was observed in 81% (46 patients). This finding is in agreement with Surrow et al.[9], who noted that a small group of patients showed a pathogen on the surface and a different pathogen in the core. In our study, the discrepancy between organisms obtained from surface and core cultures simultaneously was seen in the maximum number of cases. Similar results were observed by Abhay Kumar et al.[17], who reported 58% cases with overall variance in surface culture as to the presence or absence of a core pathogen. Mustafa Gul et al.[18] reported 59%, Abdul Aziz M et al. [19] showed variance in surface in 62.5% cases, and Aggarwal et al [20]. observed variation in surface and core organisms in 63%. Salman Mutiullah Shaikh et al [21] reported 57.5%, and Babaiwa U.F et al [22] reported 33.3%. Accordingly, the surface swab cultures do not reliably reflect the presence of pathogens in the tonsil core. This finding is in agreement with studies by Brook et al [23] and Rosen et al. [12], who recorded that the determination of surface flora was not useful in predicting core bacteria.

Statistical analysis

of tonsillar bacteriology in this study, the likelihood ratios for similar organisms being 0.95, and for general pathogens 0.83, indicate that the tonsil surface swab is

not a reliable diagnostic test for representing the growth of the same bacterial microflora as the tonsil core. Pathogenesis of chronic and recurrent tonsillitis remains largely unknown, and selecting the appropriate antibiotic therapy for affected patients can be difficult, which is attributable to the limitations of the traditional throat swab methods of predicting tonsillar microflora and the increasing incidence of beta-lactamase-producing bacteria in the tonsils. [24] In literature, the various bacteriological studies for both tonsil surface and core culture reported *Staphylococcus aureus* as a principle pathogenic isolate. The present study revealed *S. aureus* as the most common isolate seen in 32(56.41%), while GABHA was found in 30(52.56%). These findings are comparable to finding of AbdulAziz M E et al. [19], the most common organism was *Staph aureus* (77.7%), followed by GABHS 18.3 % and also in agreement with the findings of Surrow et al. [9], Endo et al. [25], Yildirim et al. [26], Abdulrahman et al. [16], Abbas et al. [27], and Loganathan et al. [28]. Even in recent studies reported by Kacatruk et al. (2003, Kumar et al. (17) *S.Aureus* is the main endogenous pathogen responsible for recurrent tonsillitis. In our study *H.Influenza* cultured in 7% (4 patients) in core only, is consistent with Kurien et al [15] who mention that the use of superficial swabs failed to recognize the presence of *Haemophilus* species in a significant number of patients.

Conclusion

In view of our study and other studies investigating tonsillar bacteriology, it is obvious that there are differences between the results of the surface culture and core culture. This study highlights that the culture on the surface of the tonsil reflects the organism in the core. In chronic tonsillitis, most of the bacteria are embedded in the core of the tonsil rather than on the surface of the tonsil. There is a discrepancy between the tonsillar surface and core culture. *Staphylococcus aureus* was the most common isolated organism in the surface and core of the tonsil. Our result was the same and confirmed and established by the other studies that give the same conclusion and the same outcomes regarding the aim, which was studied through this study.

Limitations

Tonsil surface swab cultures do not reliably reflect the presence of the actual pathogens in the tonsil core. The tonsil surface reflected mainly the normal flora of the oropharynx, whereas the tonsil core showed growth of organisms like *Haemophilus*, which were rarely reflected in the surface culture. The study indicates that, therefore, the role of throat swab in the management of chronic tonsillitis is doubtful.

Conflicts of interest: The authors declare that they have no Conflicts of interest related to this study

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