Aerobic and Anaerobic Bacterial Isolates on the Surface and Core of Tonsils from Patients with Chronic Tonsillitis

Meera Niranjan Khadilkar,[1] Nitin Ankle,[1] Sheetal Harakuni[2]

ABSTRACT

Introduction

Controversy regarding treatment of tonsillitis based on throat culture report still persists. If surface culture is a determinant of bacteriology of the core, then rational therapy could be aimed at organisms cultured by surface swab.

Materials and Methods

A Cross-sectional study was conducted on 100 patients of chronic tonsillitis who underwent tonsillectomy. Tonsil surface and core swabs were studied for aerobic and anaerobic growth.

Results

Seventy-three percent patients had aerobic growth on tonsil surface and 74.2% in tonsil core. Staphylococcus aureus was the commonest aerobic bacteria isolated. Anaerobic growth was present in 44.4% patients on tonsil surface, and 48.4% in core. Porphyromonas sp. was the commonest anaerobic bacterium isolated.

Discussion

There was no statistically significant difference between aerobic and anaerobic bacteria found in tonsil surface and core.

Conclusion

Throat swabs adequately represent core pathogen, and are dependable in detecting bacteriology of chronic tonsillitis.

Keywords

Tonsillitis; Bacteria, Aerobic; Bacteria, Anaerobic.

Tonsillitis remains a frequently occurring clinical problem, affecting children and adults. Although treated everyday, the controversy regarding treatment based on throat culture report still persists. Chronic tonsillitis is not only clinically suspected, but has to be supported by bacteriological and patho-anatomical considerations. Empirical treatment of chronic tonsillitis patients cannot be based on bacteriological profile of surface. The bacterial profile obtained by swabbing the surface, may be colonizers only. If surface culture is a determinant of bacteriology of the core, then rational therapy could be aimed at organisms cultured by surface swab. This study was planned to assess the relationship of aerobic and anaerobic bacterial isolates on the surface and in the core cultures from recurrently infected and inflamed tonsils.

Materials and Methods

A cross-sectional study was conducted on hundred patients of chronic tonsillitis, who attended the Out Patient Department of ENT, from January to December 2014, who underwent tonsillectomy, were taken for the study after obtaining written informed consent. Patients with history of more than 3 episodes of tonsillitis for a minimum of 6 months, with no relief of symptoms, where selected for tonsillectomy. Patients were treated with broad-spectrum antibiotics before surgery. Patients

1 - Department of ENT, Jawaharlal Nehru Medical College, KLE University, Belgaum
2 - Department ofMicrobiology, Jawaharlal Nehru Medical College, KLE University, Belgaum

Corresponding author:
Dr Meera Niranjan Khadilkar
email: musicnmee@gmail.com

with tonsillar malignancy and those who failed to give consent were excluded. The study was approved by Institutional Ethics Committee.

Two swabs were procured from the tonsillar surface intraoperatively by rotating sterile cotton wool swabs over the surface of the tonsil, avoiding any other part of the oropharynx, before tonsillectomy. The tonsillar specimen obtained after surgery was immediately dipped into povidone iodine solution for half a minute and then rinsed in sterile saline solution. It was sectioned into two parts following thorough asepsis. Two sterile swabs were applied to the inner surface of the sectioned tonsil, without coming in contact with the outer surface. One swab from each pairs was transported in thioglycollate medium for anaerobic culture. The four samples were transported to the Microbiology laboratory for culture. The samples were processed for isolation of aerobic bacteria and anaerobic bacteria as per the standard protocol.[1,2] Statistical analysis was done to determine percentage and the significance between the aerobic and anaerobic isolates from surface and core of the infected tonsil by application of Chi-square test and Fischer Exact test.

Results

Chronic tonsillitis most commonly (44%) affected the adolescent age group (11-20 years). There was a slight female predilection in chronic tonsillitis with females comprising 53% and males 47%. Twenty (20%) patients had grade 2 tonsillar hypertrophy, 66 (66%) patients had grade 3 tonsillar hypertrophy, and 14 (14%) patients had grade 4 tonsillar hypertrophy; 37% patients had adenoids. Majority of patients (73%) with chronic tonsillitis manifested with bilateral jugulodigastric lymphadenopathy. Indication for tonsillectomy in 63 (63%) patients was chronic tonsillitis and in 36 (36%) patients was chronic adenotonsillitis. One (1%) patient had chronic adenotonsillitis with bilateral chronic otitis media (COM). Eighty-three (83%) patients had parenchymatous tonsillitis, while 17 (17%) patients had follicular tonsillitis.

Sixty-two (62%) and sixty-three patients (63%) patients had bacterial growth on tonsil surface and core respectively. Fifty-four out of 62 (87%) and 57 out of 63 (90%) patients had aerobic growth on tonsil surface and tonsil core respectively. Thirty-seven out of 54 (69%) patients had aerobic growth in tonsil surface as well as tonsil core; of which 29 (78%) patients had same aerobic growth on tonsil surface as well as in tonsil core. The remaining 18 patients had aerobic growth in either tonsil surface or in core. Eight out of 54 (15%) patients had polymicrobial aerobic growth on tonsil surface, 9 out of 57 (16%) patients had polymicrobial aerobic growth in tonsil core.

Staphylococcus aureus was the commonest aerobic isolate in surface culture (40.7%) followed by Streptococcus pyogenes (18.5%), Klebsiella pneumonia (9.3%), Streptococcus pneumoniae, Pseudomonas aeruginosa, Enterococcus sp. (7.4%), Citrobacter sp. (3.7%), and Klebsiella oxytoca, Escherichia coli, Acinetobacter (1.9% each). In core cultures too, Staphylococcus aureus and Streptococcus pyogenes were the commonest aerobes isolated (33.3% & 21.1% respectively), followed by Streptococcus pneumoniae (14.0%), Klebsiella pneumoniae (10.5%), Pseudomonas aeruginosa (7.0%), and Neisseria catarrhalis, Escherichia coli, Acinetobacter sp. (1.8% each). No statistical difference between surface and core cultures was seen. (Table I).

Twenty-nine out of 62 (47%) and 30 out of 63 (48%) patients had anaerobic growth on tonsil surface and core respectively. Twenty-two out of 29 (76%) patients had anaerobic growth on tonsil surface as well as in tonsil core, of which 13 patients had the same growth on tonsil surface as well as core. The remaining 7 patients had anaerobic growth in either tonsil surface or in core. One out of 29 (3%) patients had polymicrobial anaerobic growth on tonsil surface. No patients had polymicrobial anaerobic growth in tonsil core.

Porphyromonas sp. was the commonest anaerobe isolated in both surface and core cultures (41.4% and 33.3% respectively) in the present study. Bacteroides fragilis (17.2%), Prevotella intermedia, Prevotella loescheii (10.3% each), Prevotella melaninogenica (6.9%) were the other anaerobic isolates in surface cultures. Fusobacterium sp., Peptostreptococcus sp., Bilophila sp., Actinomycetes concomitans (3.4%) were the uncommon anaerobic bacteria isolated

exclusively in surface cultures. The core cultures also isolated Bacteroides fragilis (26.7%), Prevotella melaninogenica (20.0%), Prevotella intermedia (16.7%) and Fusobacterium sp. (3.3%). There was no statistical

Table I: Comparison of Aerobic Bacteria in Tonsil surface and core

AEROBIC BACTERIA	TONSIL SURFACE (NO.)	TONSIL SURFACE (%)	TONSIL CORE	TONSIL CORE (%)	P VALUE
Staphylococcus aureus	22	40.7%	19	33.3%	0.693
Streptococcus pyogenes	10	18.5%	12	21.1%	0.739
Streptococcus pneumoniae	4	7.4%	8	14.0%	0.413
Klebsiella pneumoniae	5	9.3%	6	10.5%	0.824
Klebsiella oxytoca	1	1.9%	0	0%	0.486
Neisseria catarrhalis	0	0%	1	1.8%	0.486
Escherichia coli	1	1.9%	1	1.8%	1
Pseudomonas aeruginosa	4	7.4%	4	7.0%	0.774
Citrobacter freundii	2	3.7%	3	5.3%	0.949
Acinetobacter sp.	1	1.9%	1	1.8%	1
Enterococcus sp.	4	7.4%	2	3.5%	0.327
TOTAL	54	100%	57	100%	

Table II: Comparison of Anaerobic Bacteria in Tonsil surface and core.

ANAEROBIC BACTERIA	TONSIL SURFACE	TONSIL SURFACE	TONSIL	TONSIL	P VALUE
Porphyromonas sp.	12	41.4%	10	33.3%	0.522
Bacteroides fragilis	5	17.2%	8	26.7%	0.382
Prevotella intermedia	3	10.3%	5	16.7%	0.742
Prevotella melaninogenica	2	6.9%	6	20.0%	0.276
Prevotella loescheii	3	10.3%	0	0.0%	0.112
Fusobacterium sp.	1	3.4%	1	3.3%	1.00
Peptostreptococcus sp.	1	3.4%	0	0.0%	0.491
Bilophila sp.	1	3.4%	0	0.0%	0.491
Actinomycetes concomitans	1	3.4%	0	0.0%	0.491
TOTAL	29	100%	30	100%	

significant difference between the anaerobic bacteria found in tonsil surface and core. (Table II).

Discussion

Tonsillitis is a common problem that affects children between the ages of 5-10 years, and is often treated inadequately or inappropriately with antibiotics. This often results in persistent infection with resistant aerobic and/or anaerobic bacteria leading to recurrent attacks of infection and eventually chronic tonsillitis. This condition also affects adults and rarely, the elderly. The resultant chronic inflammation and/or enlargement of the tonsils cause considerable morbidity requiring therapeutic surgical intervention.

Our study showed that adolescents were more affected (44%) and there were more females than males (sex ratio of 1:1.12). Similar age incidence was observed in many of the previous studies.[3,4,5,6,7,8] However the gender incidence was more in men in many of the previous studies.

Majority of the patients who sought surgical intervention had grade 3 tonsillar hypertrophy (66%).[9] In 37% of patients, adenoids were present along with enlarged tonsils, which was comparable to the study by Hadi and co-authors.[10] Majority of patients (73%) with chronic tonsillitis manifested with bilateral jugulodigastric lymphadenopathy. Chronic tonsillitis was the major indication for surgery in 63% of patients followed by chronic adenotonsillitis in 36%. Chronic adenotonsillitis with bilateral chronic otitis media was seen in only 1%. The study group of Hadi and co-authors had more number of cases with adenotonsillitis than tonsillitis alone.[10]

In the present study, bacterial growth on the surface and core of tonsils was nearly equal (62% and 63% respectively). An equal incidence of surface and core isolates was seen in three studies;[4,11,12] whereas in three other studies, core isolates were nearly double that of surface isolates.[13,14,15] The lack of any growth in tonsillar surface and core in the rest of the patients could be explained by a possible role of viruses 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. Staphylococcus aureus was the commonest isolate from both surface and core of tonsils. Streptococcus pyogenes was the next common isolate from the core. The aerobic isolates of the present study are comparable to findings of some of the previous studies.[4,12,16]

Anaerobic isolates in the surface and core cultures in the present study were almost equal (47% and 48% respectively). Another study revealed anaerobic growth in 20% surface isolates and 62.5% core isolates. In 61.1%, anaerobes were isolated in both surface and core cultures. Same isolates were seen in 59.1% in cultures from surface and core.[17] Porphyromonas sp. was the commonest anaerobic isolate from surface and core in the present study. These findings differ from those of Mitchelmore et al, which showed Fusobacterirum sp. as the commonest organism from the surface and Peptostreptococcus micros from the core.[18] Bacteroides melaninogenicus was the most common anaerobe isolated from tonsil cores in a study by Reilly and co-authors.[19] Taylan et al concluded that Peptostreptococcus sp. was the commonest organism in tonsil core (37%).[16] In our study, Peptostreptococcus sp. was isolated from surface only.

Same isolates in both surface and core cultures were more common among aerobic group (78%) than among the anaerobic group of bacteria (45%). Patients with aerobic growth in tonsil surface as well as core (37) outnumbered patients with anaerobic growth in surface as well as core (29). Polymicrobial aerobic flora was more frequently encountered (15% on surface, 16% in core) when compared with polymicrobial anaerobic flora (3% in surface and 0% in core). Aerobic and anaerobic isolates together were slightly more in the tonsil core (90%) and 48% respectively) when compared to the same in tonsil surface (87% and 47% respectively).

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. Also, in view of the fact that tonsillitis is a common condition existing in widespread geographical areas, studies with a greater sample size and over larger geographical regions are recommended.

Conclusion

Throat swab adequately represents the core pathogen, and is dependable in detecting the bacteriology of chronic tonsillitis. Staphylococcus aureus and Porphyromonas sp. were the most common aerobic and anaerobic pathogens respectively, among both children and adults.

References

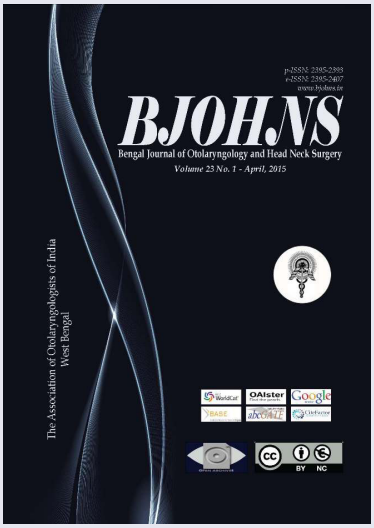
1. Collee JG, Fraser AG, Marmion BP, Simmons A. Mackie & McCartney Practical Medical Microbiology. 14th ed. Churchill Livingstone; New York; 1996
2. Sutter VL, Citron DM, Edelstein M, Finegold SM. Wadsworth Anaerobic Bacteriology Manual. 4th ed. Star Publishing Company; California; 1985.
3. Agrawal A, Kumar D, Goyal A, Gupta R, Bhooshan S. Bacteriological evaluation and their antibiotic sensitivity pattern in tonsillitis. IOSR J Dental Med Sc. 2014; 13(3):51-5
4. Bista M, Sinha BK, Amatya RCM, Tuladhar NR, Pokharel BM. Comparison of core and surface cultures in recurrent tonsillitis. J Institute Med. 2005; 27:60-5
5. Kumar A, Gupta V, Chandra K, Gupta P, Varshney S. Clinico bacteriological evaluation of surface and core microflora in chronic tonsillitis. Ind J Otolaryngol Head Neck Surg. 2005; 57(2):118-20
6. Mallya PS, Abraham B. Clinico Microbiological Evaluation of Surface and Core Microflora in Chronic Tonsillitis. Ind J Otolaryngol Head Neck Surg. 1998; 50(3)281-3
7. Gul M, Okur E, Ciragil P, Yildirim E, Aral M, Kilic MA. The comparison of tonsillar surface and core cultures in recurrent tonsillitis.Am J Otol. 2007; 28(3):173-6
8. Jayasimha VL, Vinodkumar CS, Raghukumar KG, Basavarajappa KG. Surface Tonsillar bacteria versus deep tonsillar bacteria in tonsillitis. J Pub Health Med Res. 2013;1(2):92-4
9. Brodsky L. Modern assessment of tonsils and adenoids. PedClin North Am. 1989 ; 36(6):1551-69
10. Hadi U, El-Hajj M, Uwaydah M, Fuleihan N, Matar GM. Characteristics of Pathogens Recovered from the Tonsils and Adenoids in a Group of Lebanese Children Undergoing Tonsillectomy and Adenoidectomy.J Applied Research. 2005; 5(3):473-80
11. Shishegar M, Ashraf MJ. Post-tonsillectomy Bacteremia and Comparison of Tonsillar Surface and Deep Culture. Adv in Prev Med. 2014;1-5
12. Babaiwa UF, Onyeagwara NC, Akerele JO. Bacterial tonsillar microbiota and antibiogram in recurrent tonsillitis. Biomedical Research 2013; 24:298-302.
13. Pereira LMP, Juman S, Bekele I, Seepersadsingh N, Adesiyun AA. Selected bacterial recovery in Trinidadian children with chronic tonsillar disease. Rev Bras Otorrinolaringol. 2008; 74(6):903-11
14. Al-Roosan M, Al-Khtoum N, Al-Said H. Correlation between surface swab culture and tonsillar core culture in patients with recurrent tonsillitis. Khartoum Medi J. 2008;1(3):129-32
15. Yousef RY, Faza'a SA, Yousef RY. Comparison of The Bacteriology of Tonsil Surface and Core in Bacterial Profile Isolated from Children with Chronic Tonsillitis. Med J Babylon. 2014; 7(1):52-7
16. Taylan I, Ozcan I, Mumcuoglu I, Baran I, Ozcan KM, Akdogan O, Selcuk A, Balaban N, Dere H. Comparison of the surface and core bacteria in tonsillar and adenoid tissue with beta-lactamase production. Ind J Otolaryngol Head Neck Surg. 2011;63(3):223-8
17. Klug TE, Henriksen JJ, Fuursted K, Ovesen T. Similar recovery rates of Fusobacteriumnecrophorum from recurrently infected and non-infected tonsils. Dan Med Bull. 2011; 58(7):1-5
18. Mitchelmore IJ, Reilly PG, Hay AJ, Tabaqchali S. Tonsil surface and core cultures in recurrent tonsillitis: Prevalence of anaerobes and beta-lactamase producing organisms. Eur J Clin Microbiol Infect Dis. 1994;13(7):542-8
19. Reilly S, Timmis P, Beeden AG, Willis AT. Possible role of the anaerobe in tonsillitis. J Clin Pathol. 1981;34:542-7.

BJOHNS

Bengal Journal of Otolaryngology and Head Neck Surgery

The Official Publication of The Association of Otolaryngologists of India, West Bengal

NOW ONLINE at www.bjohns.in



EASY ONLINE SUBMISSION OF ARTICLES

DOUBLE-BLIND PEER REVIEW PROCESS

ZERO SUBMISSION AND PUBLISHING CHARGES

PUBLISHED IN PRINT AND ONLINE VERSIONS

INDEXED IN POPULAR INDEXING SERVICES

OPEN ACCESS PROVIDED FOR ALL READERS

FOR AUTHORS

1. Visit **www.bjohns.in** on your internet browser (BJOHNS recommends Google Chrome or Mozilla Firefox)
2. Click '**Submit Article**' under *Publish with Us* from the right navigation bar
3. Registered users can log in to the system with their passwords
4. New users must complete a *one-time Registration Process* by selecting '**Not a user? Register with this site**'
5. Follow the instructions for the easy 5-step submission process
6. Track the status of your submission online as it is processed

FOR READERS

1. Visit **www.bjohns.in** on your internet browser (BJOHNS recommends Google Chrome or Mozilla Firefox)
2. Prior registration is *not mandatory* to browse articles but is preferred as all users are notified about new issues
3. Readers can access *all articles* published in the journal absolutely free of charge
4. Select '**Current**' for the current issue and '**Archives**' for previous issues from the top navigation bar
5. Use 'Article Tools' from the right navigation bar to cite the article, email the article hyperlink to a colleague or contact the corresponding author by email