Journal of Medical Sciences

ISSN 1682-4474

science alert

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Short Communication

JMS (ISSN 1682-4474) is an International, peer-reviewed scientific journal that publishes original article in experimental & clinical medicine and related disciplines such as molecular biology, biochemistry, genetics, biophysics, bio-and medical technology. JMS is issued eight times per year on paper and in electronic format.

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J. Med. Sci., 8 (3): 325-328
1st April, 2008

The Microbiologic Comparison of the Surface and Deep Tissue Tonsillar Cultures in Patients Underwent Tonsillectomy

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This study was performed to introduce whether there is any difference between tonsillar surface and deep tissue cultures in patients who underwent tonsillectomy for recurrent tonsillitis. The study was prospectively performed on 120 patients who had undergone tonsillectomy for recurrent tonsillitis. Tonsillar surface and deep tonsillar cultures were taken in all patients. All patients underwent tonsillectomy under general anesthesia and in operating room conditions. The tonsillar surface cultures were taken transorally under direct vision by using a sterile cotton-tipped applicator. The samples were inoculated into sheep blood and chocolate agar. All of the samples were taken to the microbiology laboratory within half an hour. Pathogenic bacteria were isolated in 78 patients of 120 patients included in the study. Of these, different types of bacteria were recovered from the surface and deep tissue cultures, whereas in 30 patients, the same types of bacteria were isolated from both the surface and deep tissue cultures. The organisms recovered from the tonsillar surface swabs and deep tissue specimens were: *Streptococcus pneumoniae* 35.9%; group A α-hemolytic streptococci 28.2%, *Haemophilus influenzae* 17.9%, *Staphylococcus aureus* (methicillin sensitive and resistant) 15.4% and *E. coli* 2.6%. Neither *E. coli* nor methicillin sensitive *S. aureus* (MSSA) were recovered from deep tissue cultures. Since swab cultures taken from the tonsillar surface may not always represent the actual bacteriology of the interior tonsil, thus, tonsillar deep tissue cultures may be helpful in clarifying tonsillar microbiology and guiding the treatment of patients with chronic tonsillitis.

Key words: Tonsillar cultures, tonsillectomy, microbiologic

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INTRODUCTION

Tonsils are important components of the immune system and their infections are one of the most frequently involved diseases in humans. Tonsils are immunologically more active in the first years of life. During aging, whereas lymphoid tissue regresses, subepithelial tissue changes into fibrotic tissue and crypts alter into cavities filled with keratin. In case of infection, bacteria that inhabit the crypts spread into the tonsil and leave their toxins and other products in it, eventually leading to polymorphonuclear leukocyte infiltration, swelling, necrosis and surface ulceration in tonsils. Consequently, after acute infection, bacteria may inoculate into the core (Gross and Harrison, 2000; Uppal and Bais, 1989). These infections are highly frequent especially in childhood. 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 (Discolo *et al*., 2003; Rosenfeld and Gren, 1990). Local infections and bacteremia may occur after tonsillectomy (Yildirim *et al*., 2003). In recurrent tonsillitis; the goal of the treatment is to eradicate the bacteria that cause the 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 the reinoculation of the surface (Mahakit *et al*., 2005). The results of antibiotic susceptibility tests for microorganisms isolated from tonsillar surface swab cultures are determinative both in the selection of antibiotics for the treatment of acute and recurrent tonsillitis and in prophylaxis. On the other hand, some studies have reported that bacteria causing tonsillitis inhabit not only the tonsillar surface but also the tonsillar deep tissue (Syrylo *et al*., 2007; Mahakit *et al*., 2005; van Staaij *et al*., 2003). In addition, it has been claimed that the results of the cultures taken from tonsillar surfaces may not always show the real pathogen (Brodsky *et al*., 1991; Loganathan *et al*., 2006). Consequently, the antibiotic treatment may sometimes be unsuccessful, although it is chosen according to the results of the cultures taken from tonsillar surfaces.

Because the tonsillar surface is contaminated with oropharyngeal secretions, it generally shows normal flora of the oropharynx. Oropharyngeal flora contains aerobic and anaerobic bacteria, including α-hemolytic and nonhemolytic streptococci, coagulase negative *Staphylococci*, *Neisseriae*, *Corynebacteria*, *Actinomyces*, *Leptotrichiae* and *Fusobacterium* species. Bacterial agents such as Group A beta hemolytic streptococci (GABHS), *Staphylococcus aureus*, *Hemophilus influenzae*, *Streptococcus pneumoniae*, *Corynebacterium diphtheriae* and *Neisseria gonorrhoeae* are the main causes of tonsillitis (Forbes *et al*., 2002; Kielmovitch *et al*., 1989). This microorganism is different from other agents causing tonsillitis for the following reasons: it may lead to rheumatic fever and acute glomerulonephritis, its treatment is easy and it is still sensitive to penicillin. The treatment and prophylaxis of other agents are different. Today, medical therapy is the first step in the management of recurrent tonsillitis and surgical treatment is reserved for inevitably carried out in cases in which medical treatment fails.

In this study, we investigated both the differences in and correlation between the results of the tonsillar surface and deep tissue cultures.

MATERIALS AND METHODS

The study was prospectively performed on 120 patients who had undergone tonsillectomy for recurrent tonsillitis. The indication for tonsillectomy was recurrent acute tonsillitis for at least 2 years with 5 or more acute attacks per year (Bradsky, 1989; Paradise *et al*., 2002). The patients did not have any cardiovascular risk factors, nor did they receive any antibiotic therapy for at least 20 days before the operation. The study was approved by the Medical Ethics Committee, School of Medicine, Imam Khomeini Hospital, Ahwaz Jondishapour University of Medical Sciences and informed consent was obtained from all of children's parents or guardians. All patients underwent tonsillectomy under general anesthesia and in operating room conditions. The tonsillar surface cultures were taken trans-orally under direct vision by using a sterile cotton-tipped applicator. Each swab was placed in a transport medium. Then tonsillectomy was performed by using the dissection and routine technique. The tonsil was placed in a sterile container, rinsed out under sterile conditions with physiologic saline and held by forceps. One side was cauterized with a heated scalpel and an incision was made through that cauterized area with a sterile scalpel, cutting the tonsil in half. The core was swabbed with a sterile cotton-tipped applicator and placed into transport medium. All of the samples were taken to the microbiology laboratory within 1/2 h. The samples obtained by swabbing were inoculated into sheep blood agar, chocolate agar and McConky agar and incubated for 18 to 24 h at 37°C; the chocolate agar was incubated in a 5 to 10% carbon dioxide incubator. The isolated bacteria were Gram stained and microscopically examined. Then they were identified by using standard biochemical tests (Forbes *et al*., 2002).

RESULTS AND DISCUSSION

The age of the patients included in the study ranged from 3.5 to 35 years, (mean±SD:12.5±5.5). Sixty two (52.4%) were men and 58 (47.6%) were women. No pathogenic bacteria were recovered in 42 (35%) of 120 patient included in the study. Of these 42 patients, 19 (15.8%) showed normal respiratory flora in surface cultures with no growth of any organisms in the deep tissue cultures and 23 (19.2%) showed normal flora in both surface and deep tissue cultures. Pathogenic bacteria were isolated in 78 (65%) of 120 patients. The organisms isolated from the tonsillar surface swabs and deep tissue specimens are shown in Table 1. *Streptococci pneumoniae* was the most predominant organism isolated from tonsillar surface and deep tissue cultures, while *E. coli* was the least predominant. Neither *E. coli* nor methicillin resistant *S. aureus* (MRSA) were recovered from deep tissue cultures. Of these 78 patients in whom pathogenic bacteria were recovered, in 46 (38.3%) patients, different types of bacteria were recovered from the surface and deep tissue as mixed cultures, whereas in 30 (25%) patients, the single type of bacteria were isolated from both surface and deep tissue cultures (Table 2). In all 120 cases included in the study, the same bacteria were isolated from the surface and deep tissue in 52 (41.5%) patients and different bacteria were isolated from the surface and deep tissue in 68 (58.4%) patients. *H. influenzae* were less frequently predicted by surface culture than others.

Tonsillectomy is the most commonly performed surgical procedure, especially in children. Indications for tonsillectomy are recurrent infections and/or chronic obstructive hypertrophy of the tonsils (Hibbert, 1989; Kornblut, 1991). Data derived from the tonsillar surface and deep tissue cultures in patients with recurrent tonsillitis may be helpful in clarifying tonsillar microbiology and guiding the treatment of patients with tonsillitis.

Based on the obtained results from present study, pathogenic bacteria were recovered from majority of patients, both in surface and deep tissue cultures. A comparison between the deep tissue and surface cultures showed that in 25% of patients the same organisms were recovered from both tonsillar surface and deep tissue, while in 38.3% we recovered different organisms from each site. Besides, *S. pneumoniae* was the most prevalent bacterium isolated from tonsillar culture. In a similar study, *S. aureus* was the most common isolated bacterium from tonsillar culture and GABHS was the most second which was not correspondent to present findings (Loganathan *et al*., 2006). In another study, in 52 patients of total 116, different type of bacteria were recovered from the surface and core cultures, while concordance in isolated bacteria from tonsillar surface and core was noted in 25 patients (Gul *et al*., 2007).

Table 1: Distribution of pathogenic bacteria isolated from tonsillar surface and deep tissue cultures

Microorganisms	Surface (n)	Deep tissue (n)	Surface and deep tissue (n) (%)
S. pneumoniae	20	8	28 (35.9)
GABHS	16	6	22 (28.2)
H. influenzae	3	11	14 (17.9)
MSSA	2	6	8 (10.3)
MRSA	0	4	4 (5.1)
E. coli	2	0	2 (2.6)
Total	43	35	78 (100)

MSSA: Methicillin Sensitive *S. aureus*, MRSA: Methicillin Resistant *S. aureus*, GABHS: Group A Beta Hemolytic *Streptococci*

Table 2: Distribution of organisms isolated from the tonsillar surface and deep tissue cultures

Tonsillar surface	Tonsillar deep tissue	No. (%)
Normal flora	Normal flora	23 (19.2)
Normal flora	No growth	19 (15.8)
Normal flora	Pathogen	2 (1.7)
Pathogen	Same pathogen	30 (25)
Pathogen	Different pathogen	46 (38.3)
Pathogen	Normal flora	0

In addition, Brodsky *et al*. (1991) reported that the tonsil core bacteria with the highest bacterial concentrations were more likely to be present on the tonsillar surface and the greater the bacterial concentration, the more likely the bacteria were to be found in most if not all areas of the tonsil core. In present study, the organisms isolated from the tonsillar surface did correlate well with those isolated from the deep tissue specimens. Whereas the surface cultures showed 36.7% normal flora, but the pathogens were more prevalent in this site as 43 (55.1%). The pathogenic bacteria recovered from core was 35 (44.9%). There was a significant difference between surface and deep tissue cultures, especially for *H. influenzae* and methicillin resistant *S. aureus* (MRSA). These organisms were more predominantly recovered from core cultures and ignoring a few instances, *H. influenzae* was rarely present on surface cultures. Lindroos (2000) demonstrated a correlation between surface and core cultures: that the surface bacteria in recurrently infected and hyperplastic tonsils differ significantly from those of the core, particularly with respect to *H. influenzae*. In view of present study and other studies investigating tonsillar bacteriology, it is obvious that there are differences between the results of the surface culture and those of deep tissue culture. Thus, if medical therapy is given only on the basis of the tonsil surface culture results and if this therapy fails in some cases, then the antibiotic therapy given should be revised. The number of isolated MRSA from core culture was quite low as 3.3% in present study.

This was in agreement with another study that reported 4.2% recovery of MRSA from core culture of children under investigation (Brook and Foote, 2006).

The results of this study indicate that rational therapy against tonsillar core pathogens includes antibiotics directed against *H. influenza*e as well as *S. aureus*, *Streptococcus pneumoniae* and GABHS. If the potential pathogen can be determined via needle aspiration of the tonsillar tissue in the early period of the acute attacks and if an appropriate antimicrobial therapy directed to this potential pathogen can be given, it may be possible to obviate chronicity and recurrence, eventually rendering tonsillectomy unnecessary. As a result, it can be said that the swab cultures taken from the tonsillar surface may not always represent the actual bacteriology of the interior tonsil and the estimated probability of tonsillar bacteriology via surface swabs varies with the type of the pathogen. Thus, tonsillar deep tissue cultures may be helpful in clarifying tonsillar microbiology and guiding the treatment of patients with chronic tonsillitis. It should be kept in mind that if medical therapy is planned according to the tonsil surface culture and its susceptibility testing results, it may be insufficient because of the difference between the tonsil surface and tissue interior culture.

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