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BACTERIOLOGY OF THE CHRONICALLY DISCHARGING EAR

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Summary: Aspiration of the exudate through open perforation was performed 183 patients with chronic otitis media. Pus was cultured aerobically and anaerobically. Aerobes only were isolated from 71 patients (39%), 20 patients (11%) had only anaerobes, and 91 patients (50%) had both aerobes and anaerobes. Only 7 specimen had no growth. There were 259 aerobic isolates. Pseudomonas aeruginosa was recovered in 47 patients (26%); other aerobes commonly recovered included Staphylococcus aereus and Klebsiella pneumoniae. There were 178 anaerobes isolated. Only anaerobic Gram-positive cocci were isolated in 20 instances. 63 Bacteroides species were recovered, including 12 B fragilis group and 21 B melaninogenicus.

Key words: Chronic otitis media

Chronic suppurative otitis media, a chronic inflammatory process, is slow and insidious in its course, tends to be persistent and very often destructive with sometimes irreversible sequellae.The bacterial flora found in chronic otitis media was studied on several occasions in the past. The bacteria isolated in those studies were mostly aerobic, predominantly gram negative bacilli and staphylacocci. Past studies did not employ strict anaerobic techniques and anaerobic bacteria were infrequently isolated (1). The improved anaerobic bacteriological techniques of recent years have led to a reevaluation of the bacteriological etiology and emphasized the role of the anaerobes in many bacterial infections (7). The foul smell of chronic ear discharge and the high frequency of anaerobic becteria in otogenic intracranial infections (8) suggest that anaerobes are a common occurence in chronic otitis media (12). Yet earlier methods have revealed only a few anaerobes (15) or none at all (3,4,18). We therefore, decided to study the bacteriology of chronic otitis media by using appropriate aerobic and anaerobic bacteriological methods.

Material and Methods

The study was carried out on 183 consecutive out-patients with active chronic otitis media between January 1987 and July 1988. The 79 of the patients were woman and 104 were men between 16 and 58 ages. No dry ears were included the study. Bacteriological specimens were taken under operation microscopic control. At the same

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time the apperance of middle ear discharge, and the status of the tympanic membrane were inspected. All presented to the outpatient Ear, Nose and Throat Clinic of State Hospital in Isparta with an exacerbation of their chronic otitis media and all had past medical history of repeated ear infections for the last 6 months to 8 years. The patients had not been recieving antimicrobial theraphy for at least one month prior to the sample collection.

Collection of specimens. The external ear canal was cleaned of cerumen and pus with a blunt curette when indicated. It then was swabbed with povidone-iodine (Betadine) and a 70% alcohol solution and allowed to dry for 2 to 3 minutes. A culture of the external auditory canal was obtained using a swab soaked in sterile saline. The swab was spread immediately onto media supportive for the growth of aerobic and anaerobic bacteria in order to document the sterility of the external canal. The only cultures considered in the study were obtained from patients whose external ear canal culture showed no growth following the above procedure. In this manner,18 aditional patients were excluded from the study. 9 more patients, in whom insufficient amount of middle ear fluid were obtained, also were excluded from the study. Collection of the exudate was done through a perforation in the tympanic membrane using an 18-gauge Medicut, which consisted of an 18-gauge needle covered by a plastic cannula and attached to a 2-mL syringe (2). The needle was bent to a 45^{o} angle, and the cannula was slipped forward to cover the tip. When the tympanic membrane was approached via an microscope, the canulla was retracted, the ear drum was entered through the perforation, and the exudate was collected. Thus, no contact by the needle tip was made with the speculum or the auditory canal, and pus was collected only from the middle ear.

Microbiology. Each middle ear aspirate was diluted 1:10 in prereduced thioglycolate broth. The suspension was shaken vigirously and used immediately for quantitative colony count by inoculation onto aerobic and anaerobic media. Sheep blood agar, chocolate agar, and MacConkey's agar plates were inoculated for aerobes. The plates were incubated at 37^{o}C aerobically (McConkey's) or under 5% CO_2 and examined at 24 and 48 hours. For anaerobes, the material was plated on prereduced vitamin K_1-enriched brucella blood agar and anaerobic blood agar plates containing kanamycin and vancomycin and then placed into enriched thioglycolate broth (containing hemin, sodium bicarbonate, and vitamin K_1) (17). The plates were incubated in anaerobic jars and examined at 48 and 96 hours. The thiyoglycolate broth was incubated for 14 days. Anaerobes were identified by techniques previously described (9,17). Aerobic bacteria were identified by conventional methods (13).

Results

The bacteriologic results are summarized in Table I.

Table I BACTERİAL İSOLATES IN 183 PATİENTS WITH CHRONIC OTITIS MEDIA

Isolates	Number of Isolates
Aerobic and Facultative	
Gram -positive cocci	
Streptococcus pneumoniae	8
-hemolytic streptococci	11

Group A -hemolytic streptococci	15
Strep viridans	9
Strep pyogenes	7
Staphylococcus aereus	43
Staph epidermidis	19
Gram -negative bacilli	
Pseudomonas aeroginosa	68
Klebsiella pneumoniae	39
Escherichia coli	13
Proteus miribalis	18
Proteus rettgeri	4
Serratia marcescens	3
Providencia sp	2
TOTAL	259
Anaerobic	
Gram-positive cocci	
Peptostreptococcus sp	34
Peptococcus sp	39
Gram -positive bacilli	
Bifidobacterium sp	9
Propionibacterium acnes	12
Clostridium sp	11
Gram -negative bacilli	
Bacteroides melaninogenicus	21
B fragilis	12
Bacteroides oralis	6
Bacteroides sp	18
Bacteroides corrodens	4
Fusobacterium nucleatum	16
Bacteroides distasonis	2
TOTAL	178

Aerobic bacteria only were isolated in 71 patients (39%), and anaerobic organisms were only isolated in 20 patients (11%). Mixed aerobic and anaerobic isolates were recovered from 91 patients (50%), and 7 cultures were negative. Table II. Thus, anaerobes were recowered from 61% of the patients studied, and aerobes were recovered from 89% of the patients studied. Each ear contained 3.2 species on average, 1.6 aerobic and 1.6 anaerobic.

Table II DISTRUBUTION OF PATIENTS IN AEROP AND ANAEROP GROUPS

Only	No. of patients	%	Isolate/Ear
Aerop	71	39	1.6
Anaerop	20	11	1.6

There were 259 aerobic isolates. Pseudomonas aeroginosa were recovered in 47 patients (26%). In 28 patients Pseudomonas were the only isolate recovered, and in 12 instances recovered mixed culture with other aerobic bacteria. In 7 patients P. aeroginosa were isolated in mixed culture with anaerobic bacteria, sometimes other aerobes were also present. Proteus sp (18Pr mirabilis, 4 Pr rettgeri, were isolated from 14 patients. They were all isolated in mixed culture with anaerobic bacteria. Escherichia coli were isolated in 13 instances, 9 mixed with Pseudomonas and the 4 with anaerobic bacteria. Klebsiella pneumoniae were recovered in 39 instances which were mixed culture with other aerobic bacteria.

Staphylococcus aureus were recovered from 43 patients: in 8 instance it was the only isolate recovered, and in 14 instance it was mixed with Pseudomonas. The rest of the isolates were mixed with anaerobic bacteria. Streptococcus pneumoniae was recovered in 8 instances; in three cases it was recovered in pure culture and in the other mixed with

Pseudomonas and Klebsiella. α- Hemolytic streptococci were obtained from 11 patients- in three case mixed with aerobic bacteria and in the others mixed with anaerobic bacteria. Group A β-hemolytic streptococci were isolated from ten patients, together with anaerobic bacteria. Of the 178 anaerobes isolated, 73 were Gram positive cocci (39 peptococcus sp and 34 peptostreptococcus sp). 63 Bacteroides sp were recovered, 12 of which were B fragilis group, 21 B melaninogenicus, 6 B oralis, and 4 B corrodens. Clostridium sp were isolated in 11 instance.

In 9 instances anaerobic gram positive cocci were the only isolates recovered. Three were peptostreptococcus sp, and six were peptococcus sp. In the rest of the cases where anaerobes were isolated, they were mixed with other anaerobes or aerobic bacteria. 52 cases where mixed anaerobic and aerobic bacteria were present, the number of isolates ranged from two to five per specimen. The combinations of anaerobes and aerobes showed no consistent pattern.

Comment

The present study confirms that anaerobic bacteria are an important component of the bacterial flora in chronic otitis media. The aerobic organisms recovered in this study are similar to those found in previous studies of chronic otitis media (5). Staphylococcus aureus, Pseudomonas aeroginosa, Klebsiella pneumoniae and anaerobic Gram-positive coccus were the major pathogens. Failure to employ anaerobic techniques may account for the relatively high rate of negative cultures of middle-ear effusions reported (11,16). A recent study showed that 80% of such effusions demonstrated bacteria on direct smears of the effusion, while only 49% yielded positive cultures (14).

Two other recent studies confirm the role of anaerobes in chronic otitis media. Fulghum et al (6) recovered Pepto intermedius and Propionibacterium acnes in mixed culture from four of ten cases of chronic secretory otitis media. In 70 consecutive cases of active chronic otitis media, Jokipii et al (10) recovered anaerobes from one third of the cases, always in mixed culture.

The anaerobes always grew in mixed cultures. Facultative bacteria are believed to act synergistically in mixed infections: They remove oxygen, produce substances that lower the redox-potential of the tissues, or provide nutrients that are necessary for the proliferation of the anaerobic pathogens. This kind of bacterial synergy is probably common in anaerobic infections, particularly in superficial infections such as otitis media.

Since methods for identifications of anaerobes have been refined in recent years and classifications have changed, the use of newer techniques gives a clearer picture of the bacterial flora in chronic otitis media in the antimicrobial era. The anaerobic bacteria isolated in our study, all known pathogens of the upper and lower respiratory tracts, suggest a role for anaerobic bacteria in chronic otitis media. Attempts to eradicate such infections should include antimicrobial agents aimed at the anaerobes as well as other organisms.

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