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Original Article

Swab and aspiration specimen collection methods and antibiogram in chronic suppurative otitis media at Jos University Teaching Hospital: Which is superior?

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Abstract

Background: Chronic suppurative otitis media is a very common otologic problem in our environment. Appropriate methods for obtaining sample specimens for specific bacteria isolation has generated a lot of controversy. The simplest method available in our environment is the traditional swab method which, however, has been condemned on the basis of introducing contaminants. The objectives of this study were to compare the bacterial yield and the antibiogram of two specimen collection methods: the traditional swab method and aspiration method.
Method: This was a 3-month prospective study involving outpatients seen at both the emergency and outpatients' clinics of the Jos University Teaching Hospital in the period between May 2008 and July 2008. The biodata, duration of discharge and sites of samples were recorded in the study data form after obtaining consent from the patients or the parents of child.
Results: Eighty patients were studied comprising 40 each for aspiration and swab technique. This consists of 30 males (37.5%) and 50 females (62.5%) with a male to female ratio of 1:1.7. There were 24 (30%) children (14 males, 10 females). Six (4 males, 2 females) and 74 (26 males, 48 females) patients had bilateral and unilateral ear discharges, respectively. A total of 86 specimens were obtained in all, consisting of 42 left and 44 right ears. There were 68 bacteria isolates comprising *Pseudomonas* (30), *Staphylococcus* (18), *Proteus* (12), and (8) *Klebsiella* species. Two were incidental fungal isolates of (*Candida* species), (8) cultures grew contaminants and (10) specimens had no growth at all. Each of the swab and aspiration techniques had (44) specimens.
Conclusions: Despite the controversy surrounding the sampling technique in literature, swab technique has been found to be as good as the aspiration technique in our study. The organisms isolated are the same as those obtained in other places. Contaminants found were few and occurred in equal amount in the same patients in the two methods.

Keywords: Antibiogram, chronic suppurative otitis media, Jos, specimen collection methods

Résumé

Arrière-plan: Chronique suppurative otite moyenne est un problème très courant d'otologic dans notre environnement. Les méthodes appropriées pour l'obtention de spécimens d'échantillon de bactéries spécifiques d'isolement a généré beaucoup de controverse. La méthode la plus simple disponible dans notre environnement est la méthode traditionnelle écouvillons qui, cependant, a été condamnée sur la base de la présentation des contaminants. Les objectifs de cette étude étaient de comparer le rendement bactérien et l'antibiogram de deux méthodes de collecte de spécimens: les écouvillons traditionnelle méthode et aspiration méthode.
Méthode: C'était une étude prospective de 3 mois, impliquant des consultations externes, vus la situation d'urgence et cliniques des consultations externes de l'hôpital d'enseignement d'Université de Jos dans la période entre mai

2008 et juillet 2008. Le biodata, la durée de la décharge et sites d'échantillons ont été enregistrées sous la forme de données d'étude après avoir obtenu le consentement des patients ou des parents de l'enfant.
Résultats: Quatre-vingt patients ont été étudiés comprenant 40 chaque technique d'aspiration et de coton-tige. Il s'agit de 30 hommes (37,5%) et 50 femelles (62,5%) avec un mâle femelle ratio de 1:1.7. Il y avait des enfants (30%) 24 (14 hommes, 10 femmes). Six (4 mâles, 2 femelles) et 74 (26 hommes, 48 femmes) patients avaient des rejets de l'oreille bilatéraux et unilatérale, respectivement. Un total de 86 spécimens ont été obtenus en tout, consistant à 42 oreilles droite gauche et 44. Il y ont des 68 bactéries isolats comprenant *Pseudomonas* (30), *Staphylococcus* (18), *Protée* (12) et les espèces *Klebsiella* (8). Deux étaient d'accessoires isolats fongiques (espèces de *Candida*), cultures (8) ont augmenté de contaminants et spécimens (10) n'avaient aucune croissance du tout. Chacune des techniques écouvillons et aspiration avait spécimens (44).
Conclusions: Malgré la controverse entourant la technique d'échantillonnage dans la littérature, les écouvillons technique a été trouvé pour être aussi bon que la technique d'aspiration dans notre étude. Les organismes isolés sont les mêmes que ceux obtenus dans d'autres endroits. Contaminants trouvés étaient rares et se sont produits en quantité égale dans les patients mêmes dans les deux méthodes.

Mots-clés: Antibiogramme, otite suppurative du chronique, Jos, les méthodes de collecte de spécimens

Introduction

Chronic suppurative otitis media is defined as inflammation of the middle ear cleft and the tympanum with otorrhoea lasting from 2 weeks to more than 3 months, with permanent perforation.[1]

The prevalence varies from place to place. In the developed world like America and Europe, it is declining because of awareness; but in developing countries like Nigeria, it is on the rise.[1-3] Appropriate sampling methods for obtaining specific bacteria have generated a lot of controversy and made some people adopt other techniques.[4] The simplest and cheapest method available in our environment is the cheaper traditional swab method which has proven usefulness in other developing nations,[5] but has largely been condemned on the basis that it introduces contaminant. This study aims to investigate the assertion.

Materials and Methods

This was a 3-month prospective clinical study of consecutive newly diagnosed patients with chronic suppurative otitis media, attending the inpatients and outpatients' clinic of the Jos University Teaching Hospital between May 2008 and July 2008. Ethical approval for this study was obtained from the Juth ethical committee. The purpose of the study was explained to the parent or patient and their consent was obtained for inclusion into the study. Information extracted included age, gender, duration of discharge and site of sampling. The exclusion criterion was duration of ear discharge lasting for less than 2 weeks. The swab sticks as usually prepared by the hospital were sterilized using autoclave while the pipettes were sterilized using ethylene gas encased in aluminum foil. The ears were inspected first; those with dry crust or discharge on the concha were cleaned with spirit to remove contaminant. Sterile pipette was used first before the swab in order not to stir the discharge, by gently introducing it into the external auditory canal; but where the discharge was scanty, it was introduced through a speculum placed in the external auditory canal and the discharge was aspirated.

The pinna was then pulled outward and backward, after which the sterile swab stick was gently introduced into the external auditory meatus and then gently rotated and taken out.

The ear swab and pipette aspirate specimens were immediately inoculated onto well-dried and labeled MacConkey agar, blood agar and chocolate agar. The inoculated MacConkey and blood agar were incubated aerobically at 37°C for 18–24 hours while inoculated chocolate plate agar was incubated in carbon (IV) oxide jar at 37°C at 18–24 hours. Gram staining was done after air drying and heat fixing the specimen, by using standard Gram staining technique. After 18–24 hours, visual examination was done for bacterial growth; where there was no growth, the plates were discarded but where there were growths, discrete colonies were selected for morphology for both ear swabs and pipette aspirates. There after, various biochemical tests were carried out to identify the different species. Data were collated, analyzed and presented in tables and simple descriptive statistics.

Results

A total of (80) patients were seen comprising 40 for aspiration and 40 for swab technique. There were 30 males (37.5%) and 50 females (62.5%), giving a male to female ratio of 1:1.7. The ages of the participants ranged from (7) weeks to 65 years. There were 24 (30%) children (14 males, 10 females), all below 10

years of age. Six (4 males, 2 females) patients and 74 (26 males, 48 females) patients had bilateral and unilateral ear discharges, respectively. A total of 88 specimens were obtained in all consisting of 42 left and 44 right ears.

There were 68 bacteria isolates comprising *Pseudomonas* 30 (44%), *Staphylococcus* 18 (27%), *Proteus* 12 (18%), *Klebsiella* species 8 (12%), and (2) were incidental fungal isolates (*Candida* species). Eight were contaminants while (10) did not have any growth at all. Each of the swab and aspiration techniques had (44) specimens.

The antibiotic disks used were ofloxacin (ofl), gentamycin (gen), amoxycilin (amx), clotrimazole (cot), erythromycin (ery), chloramphenicol (chl), cloxacilin (cxc), nalidixic acid (nal), tetracycline (tet), augmentin (aug) and ceftazidine (cef).

Nearly all the organisms were most sensitive to ofloxacin followed by gentamycin in both the sampling methods. *Staphylococcus aureus* sensitivity was not tested against ofloxacin in this particular study. *S. aureus* was sensitive to a number of antibiotics including augmentin, chloramphenicol, erythromycin and cloxacilin.

Discussion

Chronic suppurative otitis media is defined as inflammation of the middle ear cleft and the tympanum, with otorrhoea lasting from 2 weeks or more with permanent perforation.[1]

The cycle of inflammation, infection, ulceration and development of granulation tissue is most times a continuum and the end result may be some fatal complications.[6] This disease may be difficult to treat medically for some known reasons like presence of cholesteatoma and granulation tissues.[7] Understanding the bacteriology guides the clinician toward effective treatment plan and maximum efficacy with less morbidity.[8] However, the technique for collecting specimen has been a subject of controversy.[4]

Total of (80) patients were seen within the study period comprising 30 males (37.5%) and 50 females (62.5%) with a male to female ratio of 1:1.7. Their age ranged from (7) weeks to 65 years. Children constituted a larger number with 24 (30%) cases. Out of this, (7) were males and (5) were females, all below 10 years of age, with a male to female ratio of 1.4:1. This study revealed that chronic suppurative otitis media was commoner in females than in males in the adult group, but the reverse was the case with children; this was in contrast to the findings of Gycoolea[1] but similar to that of Shamboul.[9] In children, similar male preponderance was noted by Olubanjo *et al.* at Ife.[10]

There were 6 (7.5%) bilateral cases, out of which (4) were males and (2) were females. Seventy-four (26 males and 48 females; (92.5%) had unilateral disease. More unilateral cases were important especially in the disease morbidity because bilateral disease with hearing loss carries greater morbidity.[11]

A total of 88 specimens were obtained in all consisting of 42 left and 44 right ears. There was no significant site predilection noted in this study.

Sixty-eight bacteria isolates were obtained, with *Pseudomonas* constituting 30 (44%) of the cases and being the most common, followed by *Staphylococcus* 18 (27%) and then *Proteus* 12 (18%) and *Klebsiella* species 8 (12%) as Gram negative organisms, while two were incidental fungal isolates (*Candida* species). Eight cases were contaminants (*Bacillus* species) while (10) did not grow any organism. These findings were noted in the same proportion in both the sampling techniques [Table 1]. These organisms were found in various studies by Altuntas,[12] Oni *et al.*,[13] with *Pseudomonas* being the highest in all these studies but were in contrast in the order of frequency of occurrence as observed by Coker[14] and Brobby *et al*.[15] The fungus, *Candida* species, was just an incidental finding and present in the same patient in both the sampling techniques in our study, but was also found by Oni.[13-16] Anaerobic culture was not performed and hence the non isolation of anaerobes in this study. This was due to non availability of the culture medium during the

Table 1: Microbial isolates (aspiration technique)

Microbes	No. of microbes isolated
Aspiration technique	
S. aureus	9
Pseudomonas spp.*	15
Klebsiella spp.	4
Proteus spp.	6
Candida	1
Contaminants	4
No growth	5
Swab technique	
microbes	No. of microbes isolated
S. aureus	9
Pseudomonas spp.	15
Klebsiella spp.	4
Proteus spp.	6
Candida	1
Contaminants	4
No growth	5

*spp., species

period of study. The cultures that did not show any growth may have yielded anaerobes if this had been undertaken. Furthermore, polymicrobial infections were not noted in this study and this may be because anaerobic study was not carried out. This is in contrast to the findings of Raju *et al.*[6]

Antibiotic use in chronic suppurative otitis media is very important for a number of reasons: firstly, the best antibiotic that will eradicate the infective micro-organisms; secondly, the one that has minimal or no toxicity; and lastly, the route that delivers the higher concentration in smaller quantity needed to eradicate the infective organisms. Two antibiotic disks containing eight different types of antibiotics were used for the sensitivity of these organisms. The first disk contained chloramphenicol, cloxacilin, erythromycin, gentamicin, amoxycilin, cotrimoxazole, tetracycline and augmentin, while the second disk contained ofloxacin, nalidixic acid, nitrofurantoin, gentamicin, amoxycilin, cotrimoxazole, tetracycline and augmentin. The difference between the two plates was that the first three antibiotics, namely chloramphenicol, cloxacilin, erythromycin, were present only in the first disk while their places were taken up by ofloxacin, nalidixic acid and nitrofurantoin in the second disk. The remaining five antibiotics, gentamicin, amoxycilin, cotrimoxazole, tetracycline and augmentin were common to both the disks. Disk one was used for *S. aureus* while disk two was used for the remaining isolates except *S. aureus*. This means *S. aureus* sensitivity was not tested against ofloxacin because it was not available in disk one.

Most of the bacteria *Pseudomonas*, *Klebsiella* and *Proteus* species were most sensitive to ofloxacin, with *Pseudomonas* being the most sensitive to ofloxacilin compared to *Klebsiella* and *Proteus* species. *Klebsiella* and *Proteus* species have equal sensitivity but only next to *Pseudomonas* [Table 2]. In this study, otic ofloxacin 2 mg/ml was used either as drop for those with scanty discharge, those staying far away, or soaked in gauge and the ear dressed daily in those with copious ear discharge, for all our patients. This is in agreement with the findings of Buck.[17] The second most sensitive drug from this study was gentamycin. *Pseudomonas* was found to be most sensitive to gentamycin, followed by *Klebsiella* and *Proteus* species with equal sensitivity. This was similar to the findings of Loy *et al.* in Singapore.[8] *S. aureus* was sensitive to a number of antibiotics including augmentin, chloramphenicol, erythromycin and cloxacilin. It was most sensitive to three antibiotics, namely gentamycin, augmentin and chloramphenicol, in equal proportion, followed by erythromycin and was less sensitive to cloxacilin and amoxycilin. Syed *et al*.[18] in Karachi obtained similar results. *Pseudomonas*, *Klebsiella* and *Proteus* species showed resistance to varieties of antibiotics such as amoxycilin, cotrimoxazole, tetracycline, augmentin, chloramphenicol, cloxacilin and erythromycin. This is similar to the findings of Atluntas *et al.,*[12] even though the antibiotics were not exactly the same. It is important to note that one species of *Pseudomonas* was completely resistant to every antibiotic except ceftazidine that was later introduced; however, the species was not identified. These findings were similar to that of Iaconis *et al*.[19] It is clear from this study that ofloxacin stands as the first choice of drug especially against *Pseudomonas*; this is in tandem to findings of Ettehab *et al* in Ardebil[20] and gram positive organisms, even though it was not tested. But from previous hospital antibiogram, it was found to be the most sensitive drug, followed by gentamycin, augmentin, chloramphenicol as the second choice, erythromycin as the third choice and lastly cloxacilin. Gentamycin is the first choice against gram negative organism as found from this study. These antibiogram findings were the same for both swab and aspiration techniques.

Finally, it is advised that where gentamycin and chloramphenicol are sensitive as other antibiotics, it is better to use the antibiotics that are less ototoxic,[21] as these two have been reported to be ototoxic in perforated tympanic membranes.[22] If there is no other choice, then the benefits should outweigh the risks.

Conclusions

Despite the controversy surrounding the sampling technique in literature, swab technique has been found to be as good as the aspiration technique

Table 2: Microorganisms and antibiotic sensitivity

Organisms	Ofl	Gen	Amx	Cot	Tet	Aug	Chl	Cxc	Ery	Nal
S. aureus	–	6	4	0	2	6	6	4	5	0
Pseudomonas spp.*	14	9	1	0	1	1	0	0	0	0
Klebsiella spp.	4	3	0	0	0	0	0	0	0	0
Proteus spp.	4	3	2	0	0	2	0	0	0	0
Total	22	21	7	0	3	9	6	4	5	0

*spp., species, ofl, ofloxacin; gen, gentamicin; amx, amoxycilin; cot, cotrimoxazole; ery, erythromycin; chl, chloramphenicol; cxc, cloxacilin; nal, nalidixic acid; tet, tetracycline; aug, augmentin

in our study. The organisms isolated and the antibiogram were the same as those obtained in other places. Contaminants found were few and occurred in equal amount in the same patients in the two methods. The best antibiotics are otic preparation of quinolone, in particular, ciprofloxacin because it is safer than the otic aminoglycosides.

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