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EDITORIAL

THE EFFECT OF AREA AND SITE OF TYMPANIC MEMBRANE PERFORATIONS ON HEARING THRESHOLD AMONG SUDANESE PATIENTS

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تأثير مساحة وموقع ثقب طبلة الأذن على درجة السمع

مقدمة:- التهاب الأذن الوسطى المزمن من الأمراض ألأذنيه الأكثر شيوعاً وسط الأطفال والكبار في السودان من العلامات المرضية له ثقب طبلة الأذن ونجيج الأذن ودرجات متفاوتة من ضعف السمع.

أهداف البحث:- يهدف هذا البحث دراسة أثر مساحة و موقع ثقب طبلة الأذن على درجة السمع لدي مرضي سودانيين.

المرضي و طريقة البحث:- هذه دراسة مستقبلية أجريت بقسمي الأذن و الأنف والحنجرة بكل من مستشفى الخرطوم وابن سينا التعليمي في الفترة من 1 ابريل إلي 30 يوليو 2002.جمعت المعلومات من أشخاص شاهدين والمرضي بواسطة استبانه. حوت الدراسة على (25) شخص شاهد (50) إذن تم اختيارهم عشوائيا تم قياس سمعهم من اجل إيجاد مرجع لمعدل السمع الطبيعي. تم اختيار (71) من المرضي تباعا يعانون من التهاب الأذن الوسطى المزمن ، بإذن واحده أو الإذنين(100اذن) .

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النتائج: - متوسط معدل درجة سمع الأصحاء هو (17) ديسبل وهو في مدى المعدل الطبيعي العالمي لدي نورثين وداون 0 – 25 ديسبل.تم إيجاد ذلك بحساب متوسط درجة الكثافه السمعيه في الترددات (500-1000- 2000)هيرز. وجد أن درجة السمع في الترددات المنخفضة تتأثر أولا بغض النظر عن موقع ومساحة ثقب الطبل وبزيادة مساحة الثقب تتأثر الترددات المتوسطة و العالية . أكثر المرضى (79%) يعانون من ضعف السمع التوصيلي . الموقع الأكثر شيوعا لثقب طبلة الأذن هو الأوسط (90%) يليه، الثقب المتوسط الخلفي3% . المساحه الأكثر شيوعا لثقب الطبلة هو تَحْتَ التَّام (54%) يليه الثقب الكبير (25%).وجد ان نقص درجة السمع اكثر تاثيرا في الثقب الخَلْفِيٌّ السُفْلِيّ والامامي العلوي.

الخلاصة والتوصدات:-

- من هذه الدراسة نستخلص أنه بغض النظر عن مساحة ثقب طبلة الأذن نجد أن موقع ثقب طبلة الأذن هو الأكثر تأثيرا علي درجة السمع. الثقب الخَلْفِيٌّ السُـفْلِيّ والأمامي العلوي لهم التاثير الاكثر علي درجة السمع. من اجل هذا السبب نوصي بان المرضي الذين لديهم هذه الثقوب يجب أن تجري لهم عملية ترميم طبلة الأذن.

ABSTRACT

Background: Chronic otitis media is one of the commonest otological problems among Sudanese children and adults. The disease presents with perforations of the eardrum, discharging ears and varying degrees of hearing loss.

Objective: The objective of this work is to study the effect of the area and the site of the tympanic membrane perforation on hearing threshold among Sudanese patients.

Patients & Methods: This is a prospective hospital-based study conducted at Ibn Sina and Khartoum Teaching Hospitals-Otolaryngology Departments (E.N.T), in the period from 1 April – to the 30 of July 2002. Information from both the control and study subjects was taken, using protested questionnaire. Twenty-five normal subjects (50 ears) were taken as a control group selected randomly from the healthy population; their hearing thresholds were tested in order to find a reference level. Seventy-one consequtive patients with uni - or bilateral chronic suppurative otitis media (100 perforated ears) were taken as a study group.

Results: The hearing threshold of the control Sudanese subjects was **17**dB. This was obtained by computing the mean for the human speech frequencies (500, 1000, 2000Hz). The lower frequencies were affected regardless of side, site and area of the perforation. **Conductive** hearing loss was the commonest type (**79%**). The commonest site of the perforations was the **central** site (**90%**) followed by posteroinferior 3%. The

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commonest area of tympanic membrane perforations was the subtotal area (**54%**), followed by large central perforations (25%). The greatest hearing loss was found to be in the posteroinferior and anterio-superior perforation of the drum compartment.

Conclusion and recommendations From this study, we can conclude that regardless of the area, the site of tympanic membrane perforation is the most important factor affecting hearing threshold. The posterior central perforation having the greater effect for this reason, any patients with the posteroinferior and anterio-superior perforations should have repair of tympanic membrane (myringoplaty).

INTRODUCTION

Tympanic membrane perforation represents a hole in the eardrum, establishing a communication between the middle and external ear. One-third of perforations occur in acute otitis media, and 85% will occur in the anterior inferior quadrant, while the remaining 15% in the posterior superior quadrant. Tympanic membrane perforation usually occurs, due to acute or chronic otitis media, trauma, and neoplasm of the middle ear. [1, 2] Chronic otitis media is usually classified into; tubotympanic disease (perforation of the pars tensa) which presents with central or anterior perforation; and the atticoantral disease which most commonly involves the pars flaccid a .[3] The effect of the tympanic membrane perforation on hearing threshold depends on the area and site of the perforation. The area given as the percentage of the ear- drum surface, and the site or location describes the quadrant of the drum affected. [1]For the smallest perforation, the reduction in hearing level was restricted to the lower frequencies. However, as the size of perforation increases a decrease in the high frequency is noticed by Uedo, Nokata and Hoshino.[4] Usually the larger tympanic membrane perforation, the greater the loss of hearing. The site of the perforation, also affects the degree of hearing loss.[5] If the perforation is small but located directly over the round window, the loss may even be greater than that due to a large perforation located elsewhere .[6] Chronic otitis media is one of the commonest otological problems among Sudanese, both adults and children (43%) of ear diseases. They present with perforation of the eardrum, discharging ears and variable degrees of hearing loss as observed by Yagi .[7] This work is intended to study the effect of the area and site of tympanic membrane perforation on hearing threshold in Sudanese patients.

PATIENTS AND METHODS

This study was carried out at Ibn Sina and Khartoum Teaching Hospitals-Otolaryngology Departments (E.N.T), during the period from first of April to the 30th of July 2002.Data from both the control and study subjects was obtained by a questionnaire and analyzed in master sheets, one for each group.

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Twenty-five normal subjects (50 ears) were taken as a control group. They were selected randomly from normal healthy subjects with no medical problems or history of otological diseases. Their hearing thresholds were tested in order to find a reference level. This was obtained by computing the mean of the speech frequencies (500, 1000, 2000Hz). Seventy-one consequative subjects with uni - or bilateral chronic suppurative otitis media (showed 100 perforated tympanic membranes) were taken as the study group. They were the first patients to report to the E.N.T departments at Ibn Sina and Khartoum Teaching Hospitals. Only Sudanese patients without any concomitant medical problems were included. Patient with other ear diseases were excluded e.g past ear surgery, hypertension, diabetes and patients in whom pure tone audiometry was not obtained

Tympanic membrane perforations were classificed arbitrary according to site of perforation into six types : antero-superior, antero-inferior ,postero-superior , Postero-inferior ,central ,and attic perforations. Perforations area was classificed into four types according to the area of perforation; small (< ¼ of tympanic membrane area), medium(up to ½),large (up to ¾)and subtotal (> ¾ of the). All subjects, both the control and the study groups, were subjected to detailed history to confirm or refute the inclusion or exclusion criteriaand general E.N.T examination.The degree of hearing loss classification was based on the Northern and Downs, classification as: -Normal hearing (0 – 25 dB), mild hearing loss (26 – 40) ,moderate loss (41 – 55), moderate to severe loss (56 – 70), severe loss (71 – 90 dB) and(>91 dB H.L)as profound loss .[8]

RESULTS

Control group: Includes 12 males and 13 females with a mean age of 33.5 years. The average pure tone threshold of both was 17 dB for air conduction, and 10 dB for bone conduction.

Study group: There were (71) patients, (29 male and 42 females with a mean age of 26 years .These patients had (100) perforated ears, (29) patients showed bilateral perforations, (22) showed right-sided perforations and (20) patients showed left sided perforations. Table1and Table2 show the different sites and areas of perforations and the mean air conduction and bone conduction losses.

Most of the patients (79%) presented with conductive hearing loss (15%) with a mixed type of hearing loss and (6%) showed normal hearing thresholds. [8]

The most affected area was central (90%) followed by Postero-inferior perforations 3%. (Table1) most of the patients presented with subtotal perforations (54%) followed by the large tympanic membranes perforations (25%). (Table2)

The most severe effect of site on hearing thresholds was encountered with Postero-inferior perforations and anterio-superior perforations.

DISCUSSION

The control group, both males and females showed an average air conduction threshold of **17**dB (HTL) which is within the international reference range .[8] In this study group, the age and sex of the patients were found to have no effect on hearing threshold, irrespective to the site and size of perforation. This in agreement with those of **Yung** .[9] The low frequencies were noted to be affected first, and with a higher threshold shift than the mid and high frequencies. This is in accord with **Bamanie** who did a similar study in Saudi patients and American Academy of Otolaryngology .[10, 11] As the area of the perforation increases the hearing threshold increases, with marked affection at the mid and higher frequencies, and a bigger air-bone gap becomes apparent. Also this finding agrees with **Ueda**, **Nokata** and **Hoshino**.[4] In this study, it was found that the effect of the site of tympaic membrane perforation on hearing threshold was more marked when the perforation was in the postero-inferior quadrent compared to other sites which is simillar to **Austin**.[12,13]It is to be recalled that ninety percent (90%) of the perforations in this study were central with minimum effects on hearing thresholds. The postero-inferior small perforations have greater effect on hearing thresholds due to the loss of the baffle effect. This is similar to **Madigan Army Medical Centre** .[1]

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CONCLUSIONS AND RECOMMENDATIONS

The hearing threshold for both males and females in the control Sudanese subjects was 17dB (HTL). The age and sex of the patients have no effect on the site and area of the tympanic membrane perforation. The commonest site was the central perforation. The commonest area was subtotal perforation. Conductive hearing loss was the commonest type of hearing loss(79%,).

The site of tympanic membrane perforations was found to be more important than the area affected. Small postero-inferior and anterio-superior perforations have the highest mean air conduction loss of50- 54 dB.

We recommen that patients with posterior-inferior and anterio-superior perforations should have repair of tympanic membrane (myringoplasty) to restore hearing.

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Site of perforation	*No. of patients*	*Percent*	*Mean air conduction(dB)*	*Mean bone conduction(dB)*
Antero-superior	***2***	***2%***	***50***	***16***
Antero -inferior	***2***	***2%***	***45***	***12***
Postero- superior	***2***	***2%***	***48***	***13***
Postero- inferior	***3***	***3%***	***54***	***14***
Central	***90***	***90%***	***37***	***11***
Attic	***1***	***1%***	***24***	***15***
Total	*100*	*100%*	_	_

*Table1**:** Distribution of site of perforation among the study group*

Table 2: Distribution of area of perforation among the study group

Size of perforation	*No. of patients*	*Percent*	*Mean air conduction (dB)*	*Mean bone conduction (dB)*
Small	*9*	*9%*	*23.7*	*0*
Medium	*12*	*12%*	*30.0*	*-2*
Large	*25*	*25%*	*41.0*	*1*
Subtotal	*54*	*54%*	*39.7*	*2*
Total	*100*	*100%*	_	_