

Screening for Hearing Impairment in Hospitalised Elderly

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Abstract

Objectives: The objective of this study was to determine the prevalence of hearing impairment in hospitalised elderly patients using the Welch Allyn Audioscope 3. **Patients and Method:** Consecutive geriatric patients admitted to an acute 38-bedded geriatric ward over a 4-week period in 1998 were screened for hearing impairment. The examination was conducted in a quiet side-room adjacent to the ward. Ability to hear normal conversation at arm's length and the whispered voice were noted. A conventional auroscopy was done. Screening using Welch Allyn Audioscope 3 was then conducted at 40 dB using speech frequencies of 500, 1000 and 2000 Hz. Individuals who failed to respond at any 2 frequencies in the better ear were deemed to have significant hearing impairment. Patients with impacted earwax had repeat audioscopic examination after wax was cleared. **Results:** One hundred and twenty-four patients were enrolled. Fifty-four patients were excluded from the study: 37 patients had dementia, 11 were critically ill, 5 were dysphasic while 1 had acute confusion. The remaining 70 patients were included in the study. The median age of the study group was 81 years (range 72 to 96 years). There were equal number of males and females. Forty-seven (67.1%) patients had hearing impairment. Nineteen (40.4%) out of 47 hearing-impaired patients could not hear normal conversation at arm's length while 34 (72.3%) out of the same 47 patients failed the whispered voice test. Only 22 (46.8%) hearing-impaired patients complained of hearing difficulties. Four out of the 47 hearing-impaired patients possessed hearing aids. Majority (83.0%) of patients with hearing impairment did not want hearing aids and cited "no necessity" as the main reason for not wanting them. Five (7.1%) and 12 (17.1%) patients had bilateral and unilateral impacted ears respectively. Two out of 20 ears cleared of wax improved by one tone on repeat auroscopy. **Conclusion:** The prevalence of hearing impairment in hospitalised elderly patients was found to be very high during screening with an audioscope. However, identification of hearing impairment using the audioscope was not associated with keenness of wanting a hearing aid. The important factors associated with keenness for wanting a hearing aid were difficulty with hearing conversation at arm's and complaint about being handicapped socially by hearing difficulty. Screening for hearing impairment should be part of the routine in the examination of a hospitalised elderly as the prevalence of the disease is very high. Ability to hear normal conversation at arm's length alone was not a reliable method of screening for hearing impairment and it should be complemented by the whispered voice test. The audioscope is an expensive instrument and not widely available. Although the audioscope screening method was able to pick up more cases of hearing impairment, it did not result in more patients wanting hearing aid. Those detected to have hearing impairment will require further counselling regarding the usefulness of a hearing aid and detailed audiological assessment if they are keen for a hearing aid.

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Key words: Cerumen, Disability, Hearing aids, Hearing loss, Whispered voice test

Introduction

The prevalence of hearing impairment in the local elderly population is not known. Hearing loss prevalence estimates that 25% to 40% of individuals over 65 years of age are hearing impaired.^{1,2} However, there is no universal agreement on the definition of "normal hearing" and comparison between studies that report on the prevalence of hearing impairment is difficult.

Various criteria for hearing impairment have been proposed by Ventry and Weinstein³ in 1982, the World

Health Organization (WHO) in 1991⁴ and the European Union in 1996.⁵

The objective of the study was to investigate the prevalence of hearing impairment in hospitalised elderly using a pure tone screening device, the Welch Allyn Audioscope 3 (Welch Allyn, Inc, Skaneateles Falls, NY) (Fig. 1). The audioscope is a hand-held otoscope combined with an audiometer that delivers a fixed decibel tone (choices include 20 dB, 25 dB and 40 dB) at speech frequencies of 500, 1000, 2000 and 4000 Hz. It has been

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Fig. 1. Photo of Welch Allyn Audioscope 3.

shown by several studies to be a valid, reliable and sensitive screening instrument for detecting hearing impairment.⁶⁻⁸

According to the WHO classification, hearing is normal with a pure tone average (PTA) of 25 dB or better with the 500, 1000 and 2000 Hz tone. Hearing impairment is defined as mild with PTA of 26 to 40 dB, moderate with PTA of 41 to 60 dB, severe with PTA of 61 to 80 dB and profound with PTA of over 80 dB using the same three tones in the better ear. For this study, the WHO criteria were adapted due to the limitations of the screening instrument being used for this study. Failure to hear any 2 of the 500, 1000 or 2000 Hz tone at 40 dB in the better ear was considered as significant hearing impairment

Patients and Method

Patients

Consecutive geriatric patients admitted to an acute 38-bedded geriatric ward in Alexandra Hospital over a 4-week period in 1998 were screened. Patients who were critically ill, demented, confused or refused examination were excluded from the study. Repeat admissions were also not included.

Method

Patients were interviewed and examined in a quiet side-room adjacent to the ward. They were asked the following questions:

- Do they experience problems with their hearing?
- Does a hearing problem limit or hamper their social or personal life?
- Would they be keen for a hearing aid if they were hearing impaired?

During the interview, difficulty understanding normal conversation at an arm's length away (conversation test) was also noted. Subsequently, questions such as "What is

your name?" or "How old are you?" were whispered at most twice into each ear to assess difficulty with the whispered voice.⁹

A conventional auroscopy was done to look for wax, perforation, discharge or other abnormalities.

To use the audioscope, the physician selected the largest ear speculum needed to achieve a seal within the external auditory canal. The tympanic membrane was visualised. If the canal was obstructed by cerumen, the impaction had to be removed before re-testing. Screening using Welch Allyn Audioscope 3 was then conducted at 40 dB using speech frequencies of 500, 1000 and 2000 Hz with the patient indicating by raising or tapping a finger that he or she had heard the tone. Individuals who fail to respond to any 2 of the 500, 1000 or 2000 Hz tone in the better ear were deemed to be hearing impaired.

Results

Over the 4-week period, 124 patients were enrolled. Fifty-four patients were excluded from the study: 37 patients had dementia, 11 were critically ill, 5 were dysphasic while 1 was confused. The remaining 70 patients were included in the study.

The median age of the 70 patients included in the study was 81 years (range 72 to 96 years). There were equal number of males and females. Fifty-eight (82.9%) patients were Chinese, 8 (11.4%) were Malays and 4 (5.7%) were Indians.

On screening with the audioscope, 47 (67.1%) patients were hearing impaired. Thirty (42.9%) patients could not hear any of the 3 frequencies at 40 dB in both ears. Twelve (17.1%) could hear all 3 frequencies in the better ear, while only 2 (2.9%) could hear all 3 frequencies in both ears.

Five (7.1%) patients had bilateral earwax impaction while 12 (17.1%) had unilateral impaction. There was a total of 22 (15.7% of 140 ears) impacted ears. Twenty ears were cleared of wax while 2 ears were missed. On repeat audioscopy, 17 ears had no change in hearing, 2 ears could hear 1 tone more while 1 ear could hear 1 tone less.

Out of the 47 hearing-impaired patients, 22 (46.8%) patients reported problem with hearing, while 11 (23.4%) reported that their social life was hampered because of hearing difficulty. Two (8.6%) patients with normal hearing complained of hearing difficulties.

Out of 47 hearing-impaired patients, 39 (83.0%) did not want hearing aids. Thirty-two, 4 and 3 patients cited "no necessity", "too troublesome" and "financial difficulties" respectively as reasons for refusing hearing aids.

Nineteen (40.4%) out of 47 hearing-impaired patients could not hear normal conversation at arm's length while only 1 (4.4%) out of 23 patients without hearing impairment

was unable to hear at arm's length (statistically significant using chi-square).

Thirty-four (72.3%) of the 47 hearing-impaired patients failed the whispered voice test (i.e. could not hear whispers in both ears) while 7 (30.4%) out of the 23 normal patients failed the same test. These results were statistically significant using the chi-square test. The sensitivity, specificity and predictive values of the conversation test and whispered voice test are shown in Table I.

The presence of hearing impairment as determined by the audioscope, ability to hear normal conversation at arm's length, results of the whispered voice test, impairment of social life because of hearing difficulty were cross-tabulated against keenness for hearing aids to determine if there were any strong associations (Tables II to V). Only 2 cross-tabulations proved to be significant statistically. Those with difficulty in hearing conversation at arm's length and

who admitted to being socially handicapped were more likely to agree to a hearing aid. The presence of hearing impairment as determined by the audioscope was not associated with keenness in getting a hearing aid.

Discussion

Prevalence rate of hearing impairment is known to be high among the elderly and increases with age.¹⁰ We found a high prevalence rate of 67% during our study. Two possible explanations for this high rate could be that hospitalised elderly are a less healthy group of elderly and that we were screening a very elderly group of patients. The prevalence in the community could be lower. Nevertheless this high figure is a cause for concern.

As mentioned in the introduction to our study, it is difficult to compare the prevalence of hearing impairment with other studies because there is no universal agreement to the criteria for diagnosing hearing impairment. In one general practice study in the Netherlands, 660 people aged 60 years or over were screened by means of pure tone audiometry and a questionnaire to assess the prevalence of hearing impairment and hearing complaints.¹¹ Hearing impairment was defined as an average loss of 35 dB or more in 1, 2, and 4 KHz frequencies in one or both ears. In total, 37.4% of the participants were hearing impaired. The prevalence was higher in men (55.1%) than in women (44.9%) and clearly increased with age in both sexes. Of the subjects with hearing impairment, 64.4% reported hearing problems. In an Australian study comparing the prevalence of hearing impairment, disability and handicap in the elderly living in residential care with those living in

TABLE I: SENSITIVITY, SPECIFICITY AND PREDICTIVE VALUES FOR DIAGNOSTIC TESTS IN THE DIAGNOSIS OF HEARING IMPAIRMENT

Test	Sensitivity (%)	Specificity (%)	Predictive values (%)*	
			Positive	Negative
Conversation	40	96	91	62
Whispered voice	72	70	71	71

* Predictive value applies at hearing impairment prevalence of 50% (conservative estimate)

TABLE II: CROSS-TABULATION OF HEARING IMPAIRMENT DETERMINED BY AUDIOSCOPE AGAINST KEENNESS FOR HEARING AID

	No hearing impairment (determined by audioscope)	Hearing impairment (determined by audioscope)	Total
Keen for hearing aid	0	6	6
Not keen	21	37	58
Total	21	43	64*

* 6 patients had not applicable responses ($P = 0.179$)

TABLE III: CROSS-TABULATION OF ABILITY TO HEAR NORMAL CONVERSATION AT ARM'S LENGTH AGAINST KEENNESS FOR HEARING AID

	Difficulty hearing at arm's length	No difficulty hearing at arm's length	Total
Keen for hearing aid	4	2	6
Not keen	12	46	58
Total	16	48	64*

* 6 patients had not applicable responses ($P = 0.048$)

TABLE IV: CROSS-TABULATION OF WHISPERED VOICE TEST AGAINST KEENNESS FOR HEARING AID

	Whispered voice test impaired	Whispered voice test not impaired	Total
Keen for hearing aid	6	0	6
Not keen	31	27	58
Total	37	27	64*

* 6 patients had not applicable responses ($P = 0.078$)

TABLE V: CROSS-TABULATION OF IMPAIRMENT OF SOCIAL LIFE AGAINST KEENNESS FOR HEARING AID

	Social life impaired	Social life not impaired	Total
Keen for hearing aid	3	3	6
Not keen	5	53	58
Total	8	56	64*

* 6 patients had not applicable responses ($P = 0.023$)

the community, 95% of residential subjects and 70% of community-based subjects were hearing impaired using pure tone audiometry as a measure of impairment.¹²

Although the Audioscope 3 is only a screening instrument, comparison with standard pure tone audiometry has yielded reproducible results in the physicians' offices and a hearing centre. The sensitivity of the audioscope was 94% in both locations, while its specificity was 90% in the hearing centre and 72% in the physicians' offices.⁸ The Audioscope 3 is a validated reliable instrument for screening for hearing impairment.^{13,14}

In our study, only 47% of hearing-impaired patients reported hearing difficulties and 23% reported disruption of social life as a result of hearing loss. Only 1 out of 5 hearing-impaired patients wanted hearing aids. The reason for this could be related to culture.¹⁵ These elderly may have low expectations of themselves. Some of the patients interviewed said that since they were already old, not working and home-bound, they did not find hearing impairment a big problem.

It is interesting to note that the presence of hearing impairment as determined by the audioscope was not a good predictor for keenness in wanting a hearing aid. Only those who had difficulty hearing conversation at arm's length and who admitted to being socially hampered by hearing difficulty were likely to be associated with keenness for a hearing aid.

The prevalence of cerumen impaction has been reported to be 25% in a nursing home.¹⁶ The prevalence in our study was 24.3%. Clearing impacted earwax has been reported to improve hearing.¹⁷ In our study, clearing earwax did not improve hearing. The reason for lack of improvement could be due to the lack of sensitivity of Audioscope 3 to detect any changes or the small number of patients studied.

Ability to hear normal conversation at arm's length was not a sensitive method of screening for hearing impairment when compared with the audioscope. Although all patients with normal hearing were correctly diagnosed to be normal, it could only pick out 19 (40.4%) out of 47 patients with hearing impairment. The whispered voice test was more sensitive and was able to pick out 34 (72.3%) out of 47 patients with hearing impairment. The whispered voice test would be the preferred bedside method of screening for hearing impairment when the audioscope is not available. In fact, it has been found in another study that when paying attention to the loudness of the whispering, the whispered voice test can be a valuable test for assessment of hearing loss in general practice.¹⁸

Conclusion

The prevalence of hearing impairment in hospitalised elderly patients was found to be very high during screening

with an audioscope. However, identification of hearing impairment using the audioscope was not associated with keenness of wanting a hearing aid. The important factors associated with keenness for wanting a hearing aid were difficulty with hearing conversation at arm's length and complaint about being handicapped socially by hearing difficulty. Screening for hearing impairment should be part of the routine in the examination of a hospitalised elderly as the prevalence of the disease is very high. Ability to hear normal conversation at arm's length was not a reliable method of screening for hearing impairment alone and it should be complemented by the whispered voice test. However, if the subject being screened does have difficulty hearing conversation at arm's length, the positive predictive value of the test is high (91%).

The audioscope is an expensive instrument and not widely available. Although the audioscope screening method was able to pick up more cases of hearing impairment, it did not result in more patients wanting hearing aid. Those detected to have hearing impairment will require further counselling regarding the usefulness of a hearing aid and further detailed audiological assessment if they want a hearing aid.

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