Common Ear Problems in the Elderly

81

Hearing Loss in the Elderly

Contents

Abstract

This chapter provides an overview of some of the problems relating to the ear that are common to this population, namely, hearing impairment/loss, imbalance and vertigo and tinnitus. In the elderly, chronic hearing loss is the third prevalent condition. Presbycusis is the most common type of hearing impairment in the elderly and is age related affecting about 40% of individuals 75 years or older. The quality of life and functional ability are largely dependent on the preservation of hearing in elderly persons.

Keywords

Hearing impairment/loss · Imbalance · Vertigo · Tinnitus · Sensorineural hearing loss · Presbycusis

Introduction

It is often difficult to distinguish changes of normal ageing from those of other contributing factors [1]. Hearing depends on the integration of three processes – the peripheral comprising the external ear, middle ear and inner ear, auditory nerve and the central auditory processing (the brainstem and cortex). With ageing, there are a number of structural and pathophysiological processes associated with changes to functional components of the ear. Some of the common problems relating to the ear in the elderly are (1) hearing impairment/loss, (2) imbalance and vertigo and (3) tinnitus.

In the elderly, chronic hearing loss is the third prevalent condition [2]. Approximately 50% of

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Australians over the age of 65 years have hearing impairment [3]. It had been estimated that 24.2 million Americans had an auditory disorder in the year 2000 [4]. Some of the common causes of conductive deafness include cerumen, tympanosclerosis, otosclerosis and Paget's disease. Dysfunction in the sensory elements and neural structures in the inner ear, cochlear and auditory centres will give rise to sensorineural hearing loss and is the most common hearing impairment in adults [5]. Sensorineural hearing loss can be further subdivided into sensory (cochlear) or neural (retrocochlear) hearing loss. It is important to make the distinction because neural hearing loss is often caused by tumours which are potentially curable. Some of the more common causes of sensorineural hearing loss are shown in Boxes 1 and 2.

Box 1 Common Causes of Sensorineural Hearing Loss

Infection: viral infections, meningitis, syphilis

Neoplasms: acoustic neuroma, meningiomas, metastatic lesions

Ototoxicity: see Box 2.

Trauma: head injury, noise-induced cranial/ear surgery

Idiopathic: presbycusis, Meniere's disease, idiopathic

Box 2 Ototoxic medications

Antibiotics: aminoglycosides, erythromycin

Antimalarials: quinine

Antineoplastics: cisplatin, nitrogen mustard

Anti-inflammatory agents: aspirin, NSAIDs; Diuretics: loop diuretics

Presbycusis

Presbycusis is a slowly progressive bilateral and symmetrical sensorineural hearing loss that is most predominant at high frequencies. Presbycusis is the most common type of hearing impairment in the elderly and is age related affecting about 40% of individuals 75 years or older [6]. It may arise from loss of internal ear hair cells and to degeneration of the central auditory pathways. Besides the decline in the high frequencies (due to sensory cell loss), there is reduction in speech discrimination (due to loss of cochlear neurons) particularly in the presence of background noise resulting in significant communication difficulties [7].

Diagnosis

A detailed history is important and should include past or present ear infections, ear surgery, trauma and the use of ototoxic medications. This is followed by an otoscopic examination to remove occluding cerumen and for evidence of otitis media. The traditional 'whispered voice test' or 'watch tick test' in primary care have been shown to be inadequate [8]. The Hearing Handicap Inventory for the Elderly – Screening Version (HHIE-S) and the audioscope are effective screening instruments in the clinical setting [9]. The HHIE-S is a ten-item self-administered questionnaire [10]. Its sensitivity increases when combined with the pure-tone audioscope.

Noise-Induced Sensorineural Hearing Loss (NIHL)

Noise-induced hearing loss is hearing loss due to exposure to loud and repeated sounds over an extended period resulting in damage to the inner ear. The incidence and prevalence are not known specifically. According to the World Health Organization, it is the most common occupational illness, and its incidence is on the increase [11]. The prevalence is varied ranging from 7% in the Western nations to 21% in the developing countries [12]. NIHL generally affects both ears. Other causes of hearing loss like Meniere's disease and acoustic neuroma are described in ▶ Chap. 82, "Vertigo/Dizziness in the Elderly."

Evaluating Hearing Loss

The evaluation of hearing loss involves (1) medical history, (2) physical examination, (3) laboratory evaluation, (4) tests of clinical measurement of hearing and (5) other diagnostic tests as needed.

1. A clear patient history with respect to its mode of onset, whether gradual or sudden and unilateral or bilateral, and manner of progression, fluctuating or continuous. Associated symptoms such as dizziness, vertigo, unsteadiness, pain in the ear, ear discharge and tinnitus must be recorded. In the elderly, tinnitus is most commonly associated with hearing loss [13]. The medication list is vital. A history of ear infection, ear and intracranial surgery and injury to head or ear should be obtained. A history to exclude noise exposure at workplace, amplified music and impact noise such as explosion or gunshot. A family history of deafness or ear-related tumours must be known. General medical conditions such as diabetes, autoimmune or demyelinating disorders cardiovascular or cerebrovascular disease such as a stroke could cause impaired hearing.
2. Physical examination should include examination of the ear (the auricles, external auditory canals, tympanic membrane) as well as the head and neck. A thorough neurological examination is a requisite for hearing loss that may be the only presenting symptom of an acoustic tumour or could be a signal of other pathological processes such as Meniere's disease, demyelinating disease or an autoimmune disorder.
3. Routine laboratory tests would include a full blood count, sedimentation rate, thyroid function tests, blood sugar level for diabetes, fluorescent treponemal antibody test for syphilis and an autoimmune profile (RA factor, ANA) among others.
4. Clinical measurement of hearing can be carried out by the 'whispering test' and the 'watch tick test,' but they are thought to be inadequate. The Rinne and Weber tuning fork tests have practical application as hearing tests. Rinne's test complements Weber's test. They may be used to ascertain whether there is a conductive element to the hearing loss and may be used prior to obtaining audiometric data. A 512-Hz tuning fork is used. With Weber's test in conductive deafness, there is lateralisation to the affected side, and in sensorineural deafness, there is lateralisation to the unaffected side. Rinne's test measures air versus bone conduction. Normally air conduction is longer than bone conduction, and in conductive deafness, this is reduced. In sensorineural deafness, air conduction remains greater than bone conduction in both ears.

Diagnosis of presbycusis can be assisted by the Hearing Handicap Inventory for the Elderly – Screening Version (HHIE-S), which is a reliable robust method to identify hearing impairment in the elderly [9, 14] (Fig. 1). HHIE-S together with the audioscope has been found to be effective screening tools in the clinical setting [8]. The sensitivity and specificity determined in two locations, hearing centre and physician's office, revealed that with the audioscope the sensitivity was 94% and specificity 98% in hearing centre and was 72% for both at the physician's office [9]. The audioscope is a hand-held otoscope combined with an audiometer. Forty decibels (dB) are tested in both ears at the following frequencies: 500 Hz, 1,000 Hz, 2,000 Hz and 4,000 Hz, and the sensitivity of the audioscope has been found to be 94% [8]. Following the screening tests, audiograms are recommended. Pure-tone audiograms provide pure-tone test signals in the range from 125 to 8,000 Hz relayed through ear headphones. The thresholds for a series of frequencies are recorded. Normal decibel level is 0–20. A bone conduction vibrator could be placed behind the outer ear to determine any possible conductive loss. The audiogram helps to ascertain whether the hearing loss is unilateral or bilateral; the kind of hearing loss present, conductive, sensorineural or mixed; and at the what frequencies the loss occurs (Fig. 2). The audiometer may also contain an input for an external sound source, for example, for speech (speech audiometry), and includes speech discrimination and speech reception threshold.

	Yes (4)	Sometimes (2)	No (0)
1. Does a hearing problem cause you to feel embarrassed when meeting new people?			
2.Does a hearing problem cause you to feel frustrated when talking to members of your family?			
3.Do you have difficulty hearing when someone speaks in a whisper?			
4.Do you feel handicapped by a hearing problem?			
5.Does a hearing problem cause you difficulty when visiting friends ,relatives, or neighbours			
6.Does a hearing problem cause you to attend religious services less often than you would like?			
7.Does a hearing problem cause you to have arguments with family members?			
8.Does a hearing problem cause you difficulty when listening to TV or radio?			
9.Did you feel that any difficulty with your hearing limits or hampers your personal or social life?			
10.Does a hearing problem cause you difficulty when in a restaurant with relatives or friends?			

Range of points, 0-40; 0-8-no self-perceived handicap; 10-22, mild to moderate handicap; 24-40-significant handicap
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Fig. 1 Hearing Handicap Inventory for the Elderly – Screening Version (HHIE-S)

Persons with sensorineural and speech discrimination hearing loss who do not meet the criteria of presbycusis, noise-induced or ototoxic medications could be evaluated by auditory brainstem response and acoustic immittance, the latter includes tympanometry and acoustic reflex testing. They help to differentiate whether the lesions are central, retrocochlear or cochlear. Tympanometry, although is not a hearing test, is used to assess the function of the middle ear. The auditory brain response is used to determine the intactness of the auditory pathway from the cochlea to the brainstem.

5. Imaging. The MRI is used to exclude retrocochlear pathology and provides good assessment of the internal auditory canal and bony changes in the canal walls [15]. MR imaging is less expensive and is the modality of choice in most patients with sensorineural hearing loss [16]. It is more practical and with the addition of fast spin-echo imaging (FSE) demonstrates changes in the internal auditory canal, cerebellopontine angle, cranial nerves and membranous labyrinth [16, 17]. High-resolution FSE is less expensive than gadolinium-enhanced T1 MRI and is equally sensitive [17]. Limited MRI of the internal auditory canals may be useful to screen for retrocochlear pathological conditions in patients with unilateral auditory symptoms and no dizziness [18]. Auditory brainstem response is used as a screening procedure but is not reliable in detecting small acoustic neuromas [15, 19] and is not appropriate as a primary test to screen for acoustic neuromas [20]. High-resolution computed tomography of the temporal bone is used in certain middle ear and

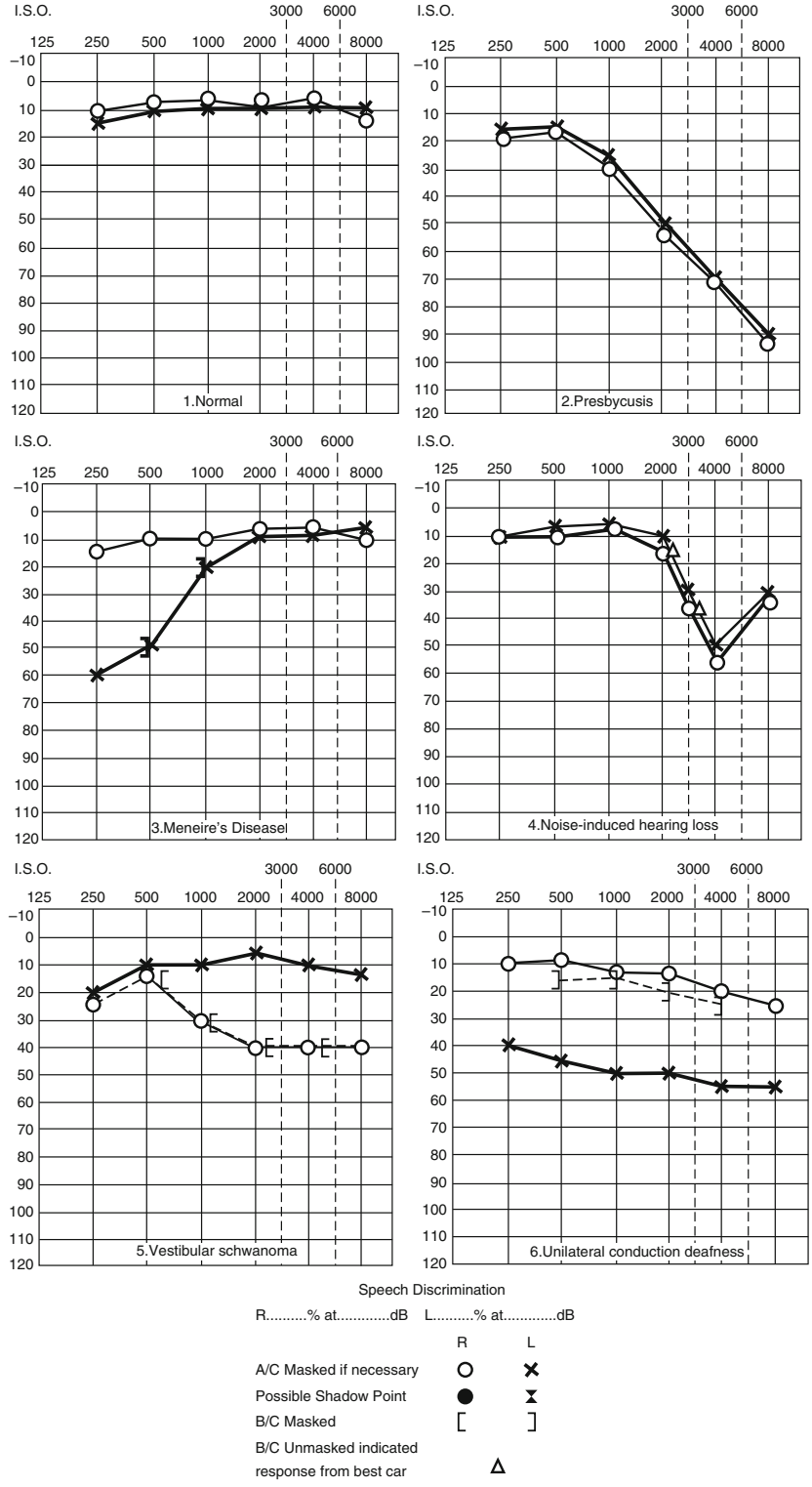

Fig. 2 (continued)

mastoid disorders, for example, glomus tumour and chronic infections.

Management

It is important to determine the hearing status prior to any diagnostic tool because of the existence of comorbidity of hearing loss and cognitive disorders [21]. Many adults ignore their hearing loss for years or decades because of the insidious nature of presbycusis [21]. The average age of first-time hearing aid wearer is around 70 years of age [22], and an average hearing age user waits over 10 years after the diagnosis to be fitted with the first hearing aid [23]. For effective communication, optimised hearing is crucial [22]. Early evaluation and treatment will allay the effects of hearing on quality of life and long-term health [21].

Impact

Hearing impairment adversely affects the quality of life of the elderly. It is the commonest cause of sensorineural deafness [24]. It had been reported that more than 30 million Americans are exposed to hazardous sound levels on a regular basis [25]. It is a costly occupational illness, and one-third of the total cost of hearing loss of about $ 11.6 billion is due to NIHL in Australia [26].The impact of hearing impairment can have serious consequences for social, functional and psychological well-being [6] and can create a psychological solitary confinement [27]. Hearing loss has been associated with whole range of reactions and can have a direct impact on mental health [27] such as embarrassment, fatigue, irritability, tension, stress, anger, depression, negativism and paranoia among others [22]. The quality of life and functional ability are largely dependent on the preservation of hearing in elderly persons. It causes serious communication difficulties limiting, for instance, occupational opportunities. This may have considerable physical, psychological and social consequences for the person, family and friends. Many older persons who are hard of hearing feel isolated or lonely within their own families [27]. Hearing impairment has been associated with decreased cognitive functioning in the elderly particularly Alzheimer's disease [8], and there is a strong correlation between the degree of hearing loss and risk of developing dementia [28]. There are a number of factors which may influence the ability of the individual to cope with hearing loss and will depend on factors such as mode of onset, severity, personality and communication demands [29]. Those with early-onset hearing loss report that they have incorporated the negative aspects of hearing loss into their personalities [27] (Box 3).

Box 3 Key Points: Hearing Loss

Presbycusis is the most common type of hearing impairment in the elderly and is age related affecting about 40% of individuals 75 years or older [6].

Sensorineural hearing loss that is most predominant at high frequencies.

According to the World Health Organization, NIHL is the most common occupational illness, and its incidence is on the increase [11].

A sudden hearing loss calls for an urgent referral to an otolaryngologist.

(*continued*)

Fig. 2 Audiometric configurations: (i) Normal – shows an almost straight line. (ii) Presbycusis – normal sensitivity at lower frequencies but poorer sensitivity for higher frequencies, 'sloping'. (iii) Meniere's disease – severe loss in the lower frequencies. (iv) Noise-induced hearing loss – loss in higher frequencies especially at 4 kHz. (v) Vestibular schwannoma – there is an asymmetric high-frequency sensorineural hearing loss. (vi) Unilateral conduction deafness – loss across a range of frequencies most commonly in one ear only

Box 3 Key Points: Hearing Loss (continued)

Sensorineural hearing loss which is asymmetrical and is gradually progressive on serial audiometry necessitates referral to an otolaryngologist.

Hearing Handicap Inventory for the Elderly – Screening Version (HHIE-S) is a reliable robust method to identify hearing impairment in the elderly [9, 14].

The MRI is used to exclude retrocochlear pathology [18].

Multiple Choice Questions

1. The following are true about hearing loss except:
   A. In presbycusis, the hearing loss is predominant at high frequencies.
   B. A sudden hearing loss requires urgent referral to otolaryngologist.
   C. In presbycusis, there is no reduction in speech discrimination.
   D. The total cost of noise-induced hearing loss is $11.6 billion in Australia.
2. The following are true of audiometric configurations except:
   A. In presbycusis, the configuration is a greatly sloping audiogram.
   B. In Meniere's disease, loss is in higher frequencies.
   C. In unilateral conduction deafness, there is loss across a range of frequencies.
   D. In vestibular schwannoma, there is an asymmetric high-frequency sensorineural hearing loss.
3. The following hearing tests are true except:
   A. 'Watch test' and the 'whisper test' are thought to be inadequate.
   B. In Weber's test in conduction deafness, there is lateralisation to the affected side and in sensorineural deafness to the unaffected side.
   C. In conductive deafness air conduction is longer than bone conduction.
   D. The audiogram helps to ascertain whether the hearing loss is unilateral or bilateral, kind of hearing loss and at what frequencies the loss occurs.

MCQ Answers

1 = C; 2 = B; 3 = C

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