



CODEN [USA]: IAJPBB

ISSN: 2349-7750

**INDO AMERICAN JOURNAL OF  
PHARMACEUTICAL SCIENCES**<http://doi.org/10.5281/zenodo.2604424>Available online at: <http://www.iajps.com>

Research Article

**DIFFERENTIAL DIAGNOSIS OF HEARING LOSS, REVIEW OF  
CONDUCTIVE TYPE OF HEARING LOSS**<sup>1</sup>Halimah Abdullah Alessa, <sup>2</sup>ABDULHAMEED AHMED OMAR BASUDAN, <sup>3</sup>Hatem Saeed Alessa, <sup>4</sup>Saud Ali Alnashri, <sup>5</sup>Atheer Ali Altalhi<sup>1</sup>Dr.halima94@gmail.com - 053 120 7570 - P.O.X: 45142 -Jazan - Al Rawda<sup>2</sup>hmd.b@hotmail.com - 056 718 0801 - P.O.X: 45142 - Jazan – Al Rawda<sup>3</sup>AlessaHatim@gmail.com - 059 282 1128 - P.O.X: 45142 -Jazan - Al Rawda<sup>4</sup>saud.ali.5252@gmail.com - 059 050 7778 - P.O.X: 45142 -Jazan - Al Rawda<sup>5</sup>DraTheer19@gmail.com - 0599179558 - P.O.X: 45142 - Jazan -Al Rawda**Article Received:** January 2019**Accepted:** February 2019**Published:** March 2019**Abstract:**

*In this review we discuss about conductive type of hearing loss, it's anatomy, causes and symptoms. As well we mention regarding types of hearing loss and diagnosis of it. Searches were performed via MEDLINE for full-text articles published in English up to May 2018 containing data on the types of conductive type of hearing loss. Inning accordance with the World Health Organization, hearing loss is among the 6 leading contributors to the global concern of disease. It is coming to be an ever more crucial issue in community at large, not even if the populace is getting old, but likewise due to the fact that young individuals increasingly spend their leisure time in ventures that expose them to high noise. The term "hearing impairment" means a decrease of hearing ability in the widest possible sense, ranging from subjectively barely considerable disruptions to total deafness. Hence, hearing impairment is a symptom of many various conditions that affect the organs of hearing. If hearing problems is presumed a proper history and assessment need to be done.*

**Corresponding author:****Halimah Abdullah Alessa,****Dr.halima94@gmail.com - 053 120 7570 –****P.O.X: 45142 -Jazan - Al Rawda**

OR code



Please cite this article in press *Halimah Abdullah Alessa et al., Differential Diagnosis Of Hearing Loss, Review Of Conductive Type Of Hearing Loss., Indo Am. J. P. Sci, 2019; 06(03)*

**INTRODUCTION:**

Even mild hearing loss can be a significant drawback in a world of ever-faster information exchange. Individuals that can not hear talked language well sufficient to refine it quickly might find themselves remove from others at work, at home, or in social situations. Brand-new types of rehabilitative therapy are now available for this issue. Inning accordance with the World Health Organization (WHO), hearing loss is one of the six leading contributors to the concern of condition in industrialized countries: Along with heart disease, depression, and Alzheimer's condition, it is just one of the problems that the majority of badly impair the high quality of life of those that struggle with them [1]. Worldwide, approximates from the World Health Organization are that hearing loss affects 538 million people [2].

Hearing loss is an usual problem that can take place at any type of age and makes spoken interaction difficult. The ear is separated anatomically into 3 sections (external, middle, and inner), and pathology adding to hearing loss might strike several areas. Categories of hearing loss are as conductive, sensorineural, or both. Leading reasons for conductive hearing loss include otitis media, cerumen impaction, and otosclerosis. Leading causes of sensorineural hearing loss consist of inherited disorders, sound exposure, and presbycusis. An understanding of the indications for clinical management, surgical therapy, and boosting can help the family doctor supply more efficient care for these patients.

In this review we discuss about conductive type of hearing loss, it's anatomy, causes and symptoms. As well we mention regarding types of hearing loss and diagnosis of it.

**METHODOLOGY:**

Searches were performed via MEDLINE for full-text articles published in English up to May 2018 containing data on the types of conductive type of hearing loss. The search term used was 'conductive type of hearing loss, diagnosis' as a major subject heading. Furthermore, references list of included studies were searched for more relevant articles to support our search.

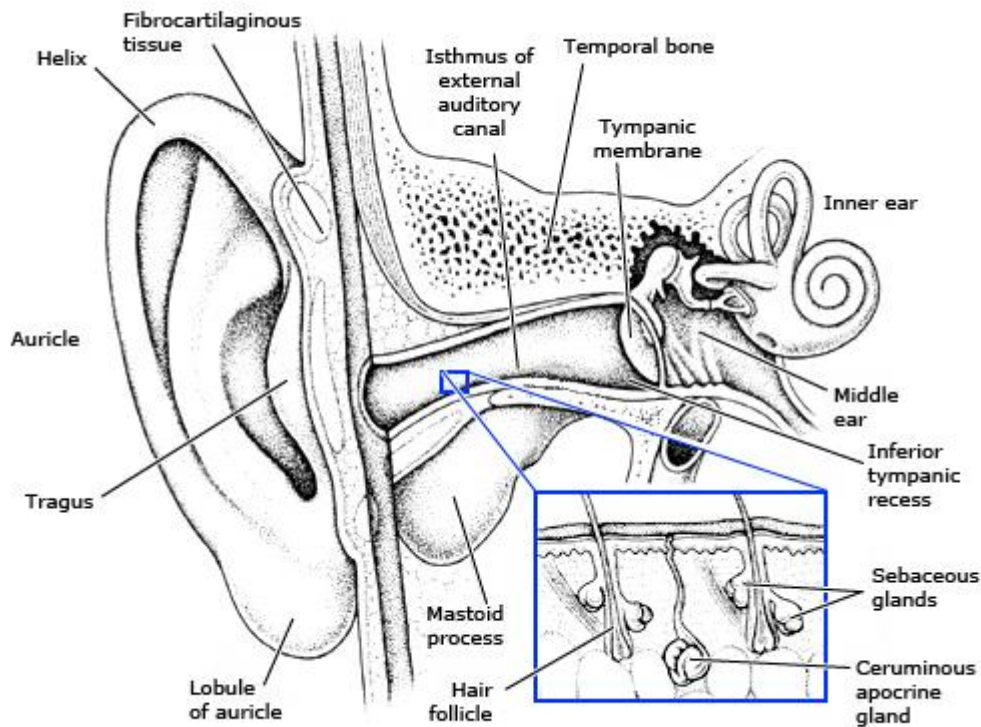
**DISCUSSION:**

- **ANATOMY AND PHYSIOLOGY**

The ear is divided into three segments (figure 1):

- The outer ear, comprising the auricle and ear canal
- The middle ear, comprising the tympanic membrane (TM), ossicles, and the middle ear space
- The inner ear, comprising the cochlea, semicircular canals, and internal auditory canals

Anatomically, the auricle, or outer ear, is a distinctively built organ. It is perfectly developed to "capture" inbound sound waves then funnel them down the external auditory canal (EAC). Acoustic waves vibrate the TM, triggering movement of the ossicles that causes the piston-like effect of the stapes. The piston activity of the stapes then presses the internal ear liquid around the two-and-one-half turns of the cochlea [4]. Frequency-specific activity establishes liquid waves within the cochlea, which subsequently establishes into movement the organ of Corti. The body organ of Corti activity bends the stereocilia, depolarizing the succeeding action of the auditory message traveling through the hair cells by means of the cochlear (auditory) nerve to the brain. The mind arranges the details into exactly what we regard as complex sounds



**Figure1.** Anatomy of ear.

• **CLASSIFICATION**

Hearing loss may be classified into three types:

- Sensorineural, involving the internal ear, cochlea, or the auditory nerve.
- Conductive, involving any reason that in some way restricts the quantity of exterior sound from obtaining access to the internal ear. For example middle ear fluid, cerumen impaction, or ossicular chain fixation (lack of activity of the small bones of the ear).
- Mixed loss, which is a mix of conductive and sensorineural hearing loss.

A number of problems could lead to hearing loss of each kind (table 1). Conductive hearing loss is typically connected to irregularities of the external or middle ear; sensorineural hearing loss is relevant to inner-ear pathology.

**Table1.** Causes of hearing loss[3].

<b>Conductive</b>	<b>Sensorineural</b>
<b>Outer-ear causes</b>	<b>Inner-ear causes</b>
Congenital microtia or atresia	Hereditary hearing loss
External otitis	Congenital viral infections
Trauma	Congenital malformations
Squamous cell carcinoma	Presbycusis
Exostosis	Meningitis
Osteoma	Thyrotoxicosis
Psoriasis	Viral cochleitis
Cerumen	Ototoxic drugs
<b>Middle-ear causes</b>	Otologic surgery
Congenital atresia or ossicular chain malformation	Meniere disease
Otitis media	Noise exposure
Cholesteatoma	Barotrauma
Otosclerosis	Penetrating trauma
Tympanic membrane perforation	Acoustic neuroma
Temporal bone trauma	Meningioma
Glomus tumors	Autoimmune disease
	Multiple sclerosis
	Cerebrovascular ischemia
	Arnold-Chiari malformation
	Otosyphilis

- **AUDITORY ASSESMENT**
- If hearing impairment is presumed a proper history and examination need to be performed. The clinician has to keep in mind if one or both ears are influenced, the rate of onset, previous employment, background of ingestion of any kind of potentially ototoxic drugs, [5] and the visibility of any one of the significant signs and symptoms of ear condition. These are pain (otalgia), a feeling of uncommon activity (vertigo), discharge (otorrhoea), and weird noise in the ear (tinnitus). It is essential to eliminate dementing and affective conditions because

complication and inattention might be misunderstood as evidence of hearing problems Examination procedure need to be done to make sure that the exterior canal is not obstructed and the tympanic membrane has a glowing translucent greyish look. Tuning fork examinations can differentiate conductive and sensorineural hearing disability (box 1). In Rinne's test a tuning fork (256 or 512 Hz) is struck and placed in front of the ear then while it is still vibrating placed behind the ear to mastoid process .With typical hearing the fork is heard loudest in front of the ear but if the patient has a

conductive hearing impairment it will be heard loudest when applied to bone. In Weber's examination the tuning fork is put on the centre of the forehead and the patient is asked where ear they listen to the fork best. With sensorineural hearing loss the fork will certainly be listened to

best in the much better hearing ear, and for a patient with conductive hearing loss it is perceived ideal in the affected or worst impacted ear [6].

**Box 1: Auditory assessment tools**

- Self assessment questionnaires
- Forced whisper test
- Tuning fork tests—Rinne, Weber
- Audiometry—pure tone, speech

For those over 60, if the hearing problems shows up to be progressive, bilateral and sensorineural in beginning, general practitioners (GPs) and healthcare facility medical professionals could make direct recommendation to medical facility audiology divisions. Nevertheless, if hearing loss is of unexpected start or independent, the tympanic membrane layer could not be seen plainly or looks unusual, assessment suggests conductive hearing loss, or there is a history of any of the distressing signs of ear illness then a first reference to an ear, nose, and throat surgeon is more suitable (box 2), so that possibly treatable sources of hearing loss can be left out and treated (although for GPs some problems may be within their scope).

**Box 2: When to refer to an ear, nose, and throat surgeon**

- Sudden onset
- Unilateral
- Tympanic membrane not seen/abnormal
- Basic examination suggests conductive hearing loss
- Symptoms of tinnitus and vertigo

Audiologists provide hearing tests utilizing electronic tools. In pure tone audiometry specific tones of different frequencies are offered at various strengths to each ear via bone and air conduction. The patient signals when they come to be conscious of the tone. An audiogram could be plotted to reveal the limit for each and every frequency. Pure tone audiometry could determine the seriousness of hearing loss and recognize conductive loss or a conductive component. In speech audiometry speech assumption is determined. In presbycusis, characteristically the pure tone audiogram slopes at high frequencies (fig 2) [7]. There is reduced sensitivity to pure tone over about 1000 Hz (best in guys) and a decrease in the radio frequency threshold (best in females) [8]. Older people with presbycusis, although commonly able to hear individuals chatting, have complication recognizing what is being said. Regular speech is accomplished in the range of frequencies 250-- 6000 Hz and 2-60 dB loudness. Certain consonants are high in pitch but reduced in volume- as an example, "sh", "t", and "k".

by recording exactly how several phonetically well balanced words are heard properly when offered at various intensities. Patients with conductive hearing loss could score 100% if the words are offered at high intensity. Its primary use remains in identifying sensory (issue in cochlea) hearing loss from neural hearing loss considering that each produce particular speech audiograms.

Vowels, like background sound, are lower in pitch and higher in volume. Audibility of the consonants is crucial to understanding speech. Given that, in presbycusis, the high frequency consonants will not be listened to, speech will be viewed in a distorted fashion, and this will be aggravated in a noisy room. In this circumstance listening devices function by bringing the high frequency, reduced intensity consonants into the hearable range without enhancing the already distinct vowels and background noise.

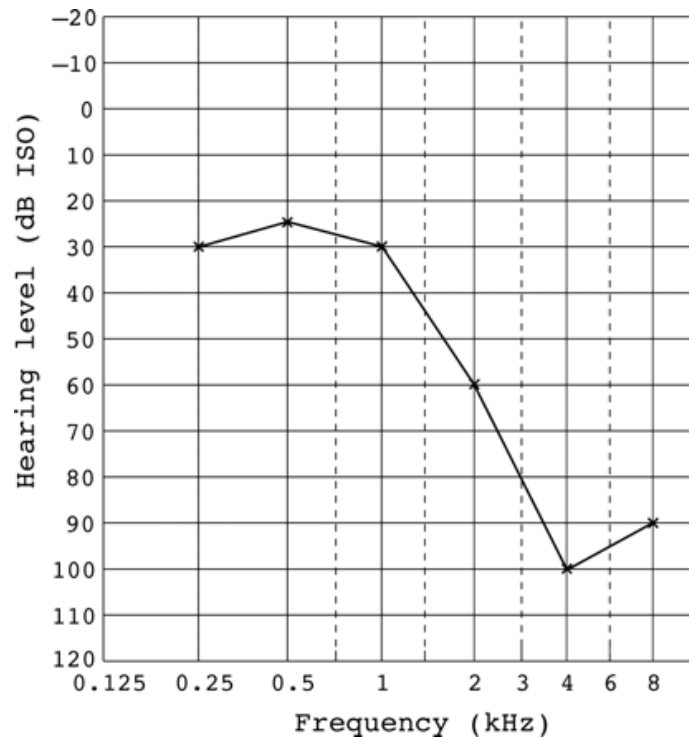


Figure 2. Pure tone audiogram

It is important to keep in mind that the audiometric examinations summarized give a quantitative procedure of hearing loss yet do not show how such a loss effect on a person's life. There can be an unexpected variant in the impacts on interaction, social, and emotional function for the very same degree of hearing loss.

#### • CONDUCTIVE HEAR LOSS

##### External ear

Conductive hearing loss can be often caused by full occlusion of the ear canal by cerumen. Cotton-tipped applicators are well-known for worsening cerumen impaction. A risk-free method of eliminating cerumen in patients who have no history of otitis media, perforation of the tympanic membrane layer, or otologic surgery is warm water (body temperature) irrigation. Usage of an otoscope and a curette allows cerumen to be eliminated under straight vision. The distance to the tympanic membrane need to be maintained in mind, because otoscopes do not permit deepness assumption. A variety of softening preparations are available if cerumen is too firm to get rid of. Docusate sodium, sodium bicarbonate, and hydrogen peroxide, aqueous-based preparations, are effective cerumenolytics [9], [10].

Conductive hearing loss independently could be triggered by foreign bodies in the exterior auditory canal. These foreign bodies can be removed by irrigation or with a curette. If the object is not impacted or hygrostatic, warm water irrigation most likely must be attempted initially. If this strategy is not reliable, the foreign body can be gotten rid of with an instrument if the patient is participating. If the patient is uncooperative, removal in an operating room may be essential.

Otitis externa is an infection of the skin of the external auditory canal. In people with otitis externa their ear canal is edematous and filled up with transmittable debris and experience pain on control of the pinna or tragus. Conductive hearing loss could happen if swelling and particles occlude the canal. The most usual microorganisms in otitis externa are *Pseudomonas aeruginosa* and *Staphylococcus aureus* [11]. Treatment entails debridement of the canal, followed by the application of ototopical drops. In patients with extreme otitis externa, a wick is placed in the ear for a couple of days to make certain distribution of the medicine. Oral antibiotics that are reliable versus *P. aeruginosa* and *S. aureus* are handy in patients with extreme infection. The conductive hearing loss settles after the inflammation subsides.



Exostoses and osteomas are benign bony growths of the external auditory canal that disrupt regular cerumen movement, resulting in occlusion and conductive hearing loss. Exostoses are multiple and bilateral, and are located beside the tympanic membrane. Patients with exostoses commonly report a

history of cold-water swimming. Osteomas are discovered at the bony-cartilaginous junction and are solitary and unilateral (Figure 3). If symptomatic, exostoses and osteomas are removed surgically, however this is rarely essential.



**Figure 3.** Otoscopic view of osteoma of the external auditory canal, showing tympanic membrane (short arrow) and an osteoma (long arrow).

Rare reason of external auditory canal obstruction are cysts and tumors. Sebaceous cysts, adenomas, sarcomas, fibromas, cancerspapillomas, and cancer malignancies could be additional reasons. Biopsy is needed if a malignancy is presumed.

#### Middle ear

Conductive hearing loss could be caused by middle ear pathology. Perforations of the tympanic membrane cause hearing loss by lowering the surface available for sound transmission to the ossicular chain. The main reasons for tympanic membrane perforations are chronic otitis media and injury. In patients who have had chronic otitis media with tympanic membrane layer perforation, otoscopic examination and debridement are vital. Otological antibiotics (ofloxacin [Floxin]) are required, and oral antibiotics may be beneficial. An accurate evaluation of the patient's tympanic membrane and hearing could be made only when the ear is dry.

Due to water incidents, barotrauma, explosions, penetrating injury, or temporal bone fractures traumatic perforations of the tympanic membrane may take a place. Small openings (much less compared to 2 mm) frequently recover spontaneously [12]. In the acute setting, blood may block the ear canal and avoid visualization of the membrane layer. It is recommended to keep the ear dry and take otological antibiotics. If

the perforation or hearing loss persists past two months, the patient must be referred for proposal of surgical adjustment.

Otitis media is the most usual reason for conductive hearing loss in kids [13]. Middle ear effusions lower the movement of the tympanic membrane and the ossicular chain. This loss of mobility causes an ordinary hearing loss of 20 to 30 dB. The diagnosis of otitis media could be validated by tympanometry and audiometry, and resolution of the effusion brings back hearing. Myringotomy tubes are advised for use in children with recurring acute otitis media (even more than 3 episodes in six months or four episodes in one year), chronic middle ear effusions (greater than three months in period), or significant hearing disability (greater compared to 30 dB together with an effusion) [14].

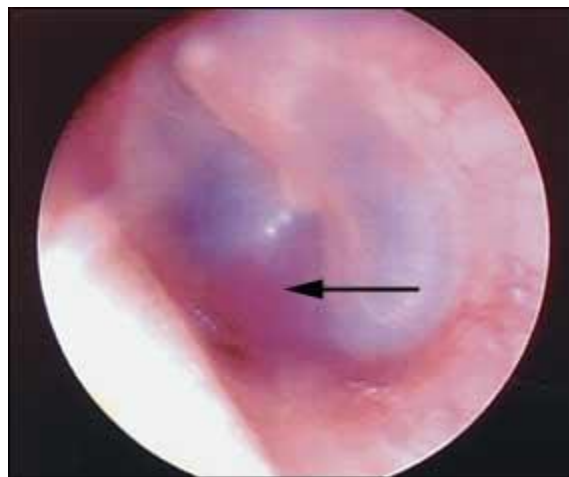
Cholesteatoma is a build-up of squamous epithelium within the middle ear. This mass could be seen in patients with otitis media. Cholesteatomas are separated into 2 types: congenital and obtained. Congenital cholesteatoma presents as a pearly white mass located behind an undamaged tympanic membrane in a patient with one-sided conductive hearing loss. Acquired cholesteatoma arise from a retracted or perforated tympanic membrane with an ingrowth of epithelium. Cholesteatomas are in your

area harmful and characterized by chronic drainage. In 90 percent of patients with cholesteatomas conductive hearing loss brought on by ossicular erosion is appear[15]. Long lasting cholesteatomas expand to include the inner ear, mastoid, and facial nerve. Surgical examination is needed if suspicion of cholesteatoma .

Myringosclerosis of the tympanic membrane establishes in feedback to infection or inflammation. Irregular white spots including calcium show up on the membrane layer [16]. Isolated myringosclerosis of the tympanic membrane seldom creates substantial conductive hearing loss. However tympanosclerosis identified as myringosclerosis, involves the tympanic

membrane and middle ear mucosa, ossicular chain, and creates stiffening the whole system ,which cause significant conductive hearing loss.

Otosclerosis is known by unusual footplate (base of stapes)bone deposition .This bone deposition avoide typical vibration,byleading to fixation of the stapes at the oblong window. Otosclerosis typically presents as progressing two-sided conductive hearing loss in middle-aged white females. It is the leading root cause of conductive hearing loss in grownups that do not have a middle ear effusion or a history of otitis media [17]. There is generally a positive family background. Treatment includes amplification with hearing help or surgical repair work by stapedectomy.



**Figure4.** Otoscopic view of glomus tumor (arrow).

Glomus tumors are an uncommon reason for conductive hearing loss (Figure 4). These neuroendocrine tumors arise from the neural plexus within the middle ear or area the adventitia of the jugular bulb. Generally, patients coming with glomus tumors are women 40 to 50 years old that report

hearing loss and pulsatile tinnitus. On assessment, a pulsating reddish-blue mass could be seen behind an undamaged tympanic membrane. However, diagnosis of these tumors is difficult, and computed tomography of the temporal bones is needed. Clues to the diagnosis of conductive hearing loss are provided in Table 2.

**Table 2.** Clues to the diagnosis of conductive hearing loss.

HISTORY	PHYSICAL FINDINGS	SUGGESTED CAUSE OF CONDUCTIVE HEARING LOSS
<b>Sudden painless loss of hearing</b>	Cerumen	Complete canal occlusion
<b>Sudden painful loss of hearing</b>	Narrow canal with debris	Otitis externa
	Normal canal with red, immobile tympanic membrane	Chronic otitis media
<b>Gradual painless loss of hearing</b>	Immobile tympanic membrane	Middle ear effusion
	Normal mobile tympanic membrane	Otosclerosis
	Reddish-blue pulsating mass behind intact tympanic membrane	Glomus tumor or vascular anomaly
	Retracted or perforated tympanic membrane, with chronic drainage	Cholesteatoma



**CONCLUSION:**

Inning accordance with the World Health Organization, hearing loss is among the 6 leading contributors to the global concern of disease. It is coming to be an ever more crucial issue in community at large, not even if the populace is getting old, but likewise due to the fact that young individuals increasingly spend their leisure time in ventures that expose them to high noise. The term "hearing impairment" means a decrease of hearing ability in the widest possible sense, ranging from subjectively barely considerable disruptions to total deafness. Hence, hearing impairment is a symptom of many various conditions that affect the organs of hearing. If hearing problems is presumed a proper history and assessment need to be done. The clinician should keep in mind if one or both ears are impacted, the rate of onset, previous employment, background of consumption of any kind of potentially ototoxic medications, and the existence of any of the major symptoms of ear illness. These are pain (otalgia), discharge (otorrhoea), a feeling of abnormal motion (vertigo), and improper noise in the ear (tinnitus). It is very important to eliminate dementing and affective conditions since confusion and inattention may be misinterpreted as proof of hearing disability. If hearing loss is of sudden start or one-sided, the tympanic membrane can not be seen clearly or looks irregular, examination recommends conductive hearing loss.

**REFERENCE:**

- Mathers C, Smith A, Concha M. Global Burden of Disease. Geneva: World Health Organization; 2000. Global burden of hearing loss in the year 2000; 130 pp.
- Stevens G, Flaxman S, Brunskill E, Mascarenhas M, Mathers CD, Finucane M, Global Burden of Disease Hearing Loss Expert Group. Global and regional hearing impairment prevalence: an analysis of 42 studies in 29 countries. *Eur J Public Health*. 2013;23(1):146. Epub 2011 Dec 24.
- Schuknecht H, IgarSKI K (1964) Pathology of slowly progressive sensori-neural deafness. *Transactions of the American Academy of Ophthalmology and Otolaryngology* 62:222-242.
- Schuknecht HF, Gacek MR (1993) Cochlear pathology in presbycusis. *Ann OtolRhinolLaryngol* 102 (suppl 158) 1-16.
- Chermak G, Jinks M (1981) Counselling the hearing impaired older adult. *Drug Intelligence and Clinical Pharmacy* 15:377-382.
- Blakley BW, Siddique S (1999) A qualitative explanation of the Weber test. *Otolaryngol Head Neck Surg* 120:1-4.
- Wiley TL, Cruickshanks KJ, Nondahl DM, et al.(1998) Aging and high frequency hearing sensitivity. *Journal of Speech and Language and Hearing Research* 41:1061-1072.
- MoscickeE, Elkins E, Baum H, et al.(1985) Hearing loss in the elderly: an epidemiologic study of the Framingham Heart Study Cohort. *Ear Hear* 6:184-190.
- Jabor MA, Amedee RG. Cerumen impaction. *J La State Med Soc*. 1997;149:358-62.
- Mehta AK. An in-vitro comparison of the disintegration of human ear wax by five cerumenolytics commonly used in general practice. *Br J Clin Pract*. 1985;39:200-3.
- Clark WB, Brook I, Bianki D, Thompson DH. Microbiology of otitis externa. *Otolaryngol Head Neck Surg*. 1997;116:23-5.
- Canalis RF, Abemayor E, Shulman J. Blunt and penetrating injuries to the ear and temporal bone. In: Canalis RF, Lambert PR, ed. *The ear: comprehensive otology*. Philadelphia: Lippincott Williams & Wilkins, 2000:785-800.
- Bluestone CD, Klein JO. Otitis media, atelectasis, and eustachian tube dysfunction. In: Bluestone CD, Stool SE, Scheetz MD, eds. *Pediatric otolaryngology*. 2d ed. Philadelphia: Saunders, 1990:320-486.
- American Academy of Otolaryngology-Head and Neck Surgery.. *Bulletin (American Academy of Otolaryngology-Head and Neck Surgery)*. 2000;19:2-50.
- Edelstein DR, Parisier SC, Han JC. Acquired cholesteatoma in the pediatric age group. *Otolaryngol Clin North Am*. 1989;22:955-66.
- Forseni M, Eriksson A, Bagger-Sjoberg D, Nilsson J, Hultcrantz M. Development of tympanosclerosis: can predicting factors be identified?. *Am J Otol*. 1997;18:298-303.
- Emmett JR. Physical examination and clinical evaluation of the patient with otosclerosis. *Otolaryngol Clin North Am*. 1993;26:353-7.