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Review Article

Vataja Bhadirya

Conceptual study on Vataja Bhadirya w.s.r. to Presbycusis

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Shalakya Tantra is also known as Jatrurdhva Tantra a branch of Ayurveda which deals with the diseases manifesting above clavicular region. Aacharya Susrutha is the only person who explained Ophthalmology and ENT in a systematic manner in Uttara Tantra portion of his Sushruta Samhita. According to Ayurveda, Shrotrendriya originates from Akasha Mahabhoota. Shabda (sound) travelling through Vata in the presence of Aakasha (space) comes in contact with Shrotrendriya Adhishthana (Karna) and transmitted through Shrotrendriya to the Shravana Buddhi which is responsible for perception of sound. So, Vata plays important role in normal hearing procedure. The detailed description about the disease Badhirya is available in Brihatrayees and Laghutrayees of Ayurvedic classics. Badhirya is caused due to the vitiated Vata Dosha or Vatakapha Doshas by deranging or obstructing the Shabdavahasrotas (pathway of hearing) or Shabdavaha Sira (auditory nerve) gives rise to diminished hearing or incapability of hearing. Vataja Bhadirya can be nearly corelated to the concept of Sensorineural Hearing loss of alternative science where the age group of 60 years plus will be named with the deafness condition called Presbycusis. As the Vardhyakya stage in Ayurveda will be dominated with Vatadosha the Vata Vikriti Lakshanas are more in that age group with this reference we can consider Vataja Bhadirya Lakshanas are similar to the sign and symptoms of Presbycusis.

Keywords: Bhadirya, Vata Dosha, Presbycusis

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Introduction

Acharya Charak has subdivided the Karna rogas into four groups based on the predominance of *Dosha* - *Vataja*, Pittaja, Kaphaja and sannipatajakarnarogas. On the basis of *Doshas*, *Badhirya* is one of the symptoms of *Vataja* Karna Rogas. This condition is mainly characterized by Srotorodha due to predominance of *Vata* or *Vata* Kapha *Dosha*.

इन्द्रियाणि समाश्रित्य प्रकुप्यन्ति यदा मलाः|
उपघातोपतापाभ्यां योजयन्तीन्द्रियाणि ते||२०||
उपघातेत्यादौ उपघातो विनाशः, उपतापस्तु किञ्चिद्वैकल्यम्||२०||

Badhirya refers to the Ayurvedic term for hearing impairment, characterized as an obstruction (*'Badha'*).

In Ayurveda, it is associated with the imbalance of *Doshas*, particularly *Vata* and *Kapha*. This term highlights the traditional understanding of hearing loss and its relevant treatment methods in the Ayurvedic framework.

Acharya Charaka has mentioned *Badhirya* under *Vatajananatmaja* Vyadhi. In Charaka Samhita where *Acharya Charaka*, *Vataroga* does not linger in *Kostha* that has been softened by *Snehana*.

Sabdavahasrotas (auditory canal) or *Sabdavahasira* (vessels) and nerves of the ear get obstructed or deranged by *Prakupita Vatadosa* or *Vata Kapha Dosas* and neglecting the disease *Karnanada* leads to difficulty in hearing or incapability of hearing, known as *Badhirya*.

Aim and Objectives

1. Conceptual study of *Vataja Bhadirya*
2. Conceptual study of Presbycusis
3. Conceptual study of both *Vataja Bhadirya*s.r. to Presbycusis

Understanding of *Vataja Bhadirya*

The detailed description about the disease *Badhirya* is available in *Brihatrayees* and *Laghutrayees* of Ayurvedic classics. *Badhirya* is caused due to the vitiated *Vata Dosha* or *Vatakapha Doshas* by deranging or obstructing the *Shabdavahasrotas* (pathway of hearing) or *Shabdavaha Sira* (auditory nerve) gives rise to diminished hearing or incapability of hearing.**[1,2]** Aacharya Sushruta has mentioned 28 types of *Karna-Roga* in *Uttar Tantra* and *Badhirya* is one among them.

Aacharya Sushruta has mentioned *Badhirya* is one of the *Karna Roga* which is vitiated by *Vata Dosha* along with *Kapha* resides in *Shabdanuvaha Sira* and in the absence of appropriate treatment the person will suffer from *Badhirya* without any doubts.**[3,4]** Acharya Dalhana comment on this *Samprapti* that not only *Vata Dosha* but also *Rakta, Pitta* and *Kapha Doshas* also reside in *Shabdanuvaha Sira* causing *Badhirya.***[5-7]**

Sushrutha Samhita Uttara Tantra 20th chapter, 8th *Shloka* says**[8]**

स एव शब्दानुवहा यदा सिराः कफानुयातो व्यनुसृत्य तिष्ठति ।
तदा नरस्याप्रतिकारसेविनो भवेत्तु बाधिर्यमसंशयं खलु ||८||
बाधिर्यमाह - स एव शब्दानुवहा इत्यादि| स एव शुद्धो वायुः कफानुयातः कफानुगतः| स एवेत्यत्रापिशब्दो लुप्तो द्रष्टव्यः, तेन न केवलं शुद्धो वायुः श्लेष्मान्वितोऽपि वेत्यर्थः| व्यनुसृत्य विविधमार्गमावृत्य| अप्रतिकारसेविनः चिकित्सामकुर्वतः||८||

In *Nidanasthana*, of *Susruta Samhita* it has mentioned that vitiated *Kevala Vata* or *Kapha Anubandhavata* initiates the pathology of *Badhirya* by obstructing the *Sabdavaha Srotas*.**[9]** Whereas, in *Uttartantra*, *Ac*aryasusruta has mentioned that *Kapha* accompanies *Vata* throughout the *Samprapti* of *Badhirya*.**[4]** The *Suddha* or *Kevala Vata* accompanied by *Kapha* initiates the pathology of *Badhirya* which can be understood in the following way. Due to various etiological factors, vitiation of *Vata* and *Kapha* occur, *Vata* is being covered, hindered, or obstructed by *Kapha*. Because of the obstruction in the movement of *Vata*, its activities hamper or decreases, which results into improper conduction of sound (*Sabda Grahana*). According to Aacharya Vagbhatta, *Vata* associated with *Kapha* and getting increased or by neglect of *Karnanada*, gives rise to hearing of loud sounds only, hearing with difficulty and gradually leads to deafness.**[10]**

उच्चैर्वृच्छात् श्रुतिं कुर्यात् बधिरत्वं च ।।" (अ.हृ.उ.१७)

An individual who can't listen the loud sound eventually suffers from *Badhirya*.

Astanga Hrudaya Uttara sthana 17th chapter 10th *Shloka***[11]**

श्लेष्मणाऽनुगतो वायुर्नादो वा समुपेक्षितः|
उच्चैः कृच्छ्राच्छ्रुतिं कुर्याद्बधिरत्वं क्रमेण च||१०||
स०-वायुः श्लेष्मणाऽनुगतः कर्णनादो वा समुपेक्षितः-अचिकित्सितः, कर्णे-श्रोत्रे, उच्चैः कृच्छ्राच्छ्रुतिं-श्रवणं, कुI

Acarya Vagbhata also explains the same Samprapti for *Badhirya*.

He mentions that if *Karnanada* is left untreated it may leads to excess Dusti of *Sthanikavatadosa* and results in complete loss of its function i.e., *Sabda-Grahana*, which leads to *Badhirya*.

यति| क्रमेण बधिरत्वं-बाधिर्यं च, कुर्यात्|[12]

In the other reference of Puranas and Maha Kavyas like in Mahabharata the word meaning of Bhadirya is mentioned like this.

Badhirya (बाधिर्य).> - Deafness; बाधिर्यंप्राणमन्दत्वंयःपश्यतिसमुच्यते Mahabharata in 12.288.4. **[13]**

Badhirya (बाधिर्य) in the Sanskrit language is related to the *Prakrit* word: *Bahijja*.**[14]**

Madhavakara while explaining the *Samprapti* of *Badhirya* says that *Badhirya* is caused when *Sabdavahisrotas* is vitiated by *Vata* or by both Vata and *Kapha*, hence it can be divided into two types - *Vataja* and *Vata-Kaphaja.***[15]** *Bhavamisra* also mentions that *Badhirya* is caused either solely by *Vata* or by the association of *Vata* and *Kapha*.**[16]** Whereas in view of *Yogratnakara* it occurs due to vitiated *Vata* which results in the destruction of *Shrotrendiyas* thereby producing their functional loss.**[17]**

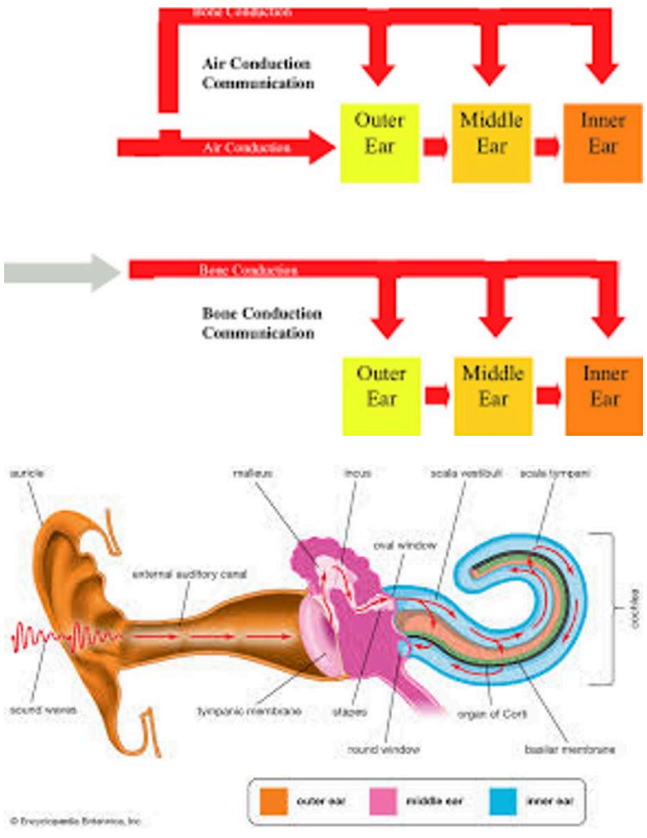

Figure 1

Presbycusis

Presbycusis refers to bilateral age-related hearing loss. In literal terms, presbycusis means 'old hearing' or 'elder hearing. It is the most common cause of hearing loss worldwide and is estimated to affect approximately two-thirds of Americans aged 70 or older. The hallmark of presbycusis is the impaired ability to understand high-frequency components of speech (voiceless consonants, such as p, k, f, s, and ch). This activity reviews the evaluation and management of presbycusis and highlights the role of the interprofessional team in improving care for patients with this condition.

Presbycusis refers to bilateral age-related hearing loss. In literal terms, presbycusis means "old hearing" or "elder hearing."**[18]** It becomes noticeable around age 60 and progresses slowly; however, there is evidence that certain stressors can speed the rate of deterioration. The diagnosis can be confirmed with audiometry.**[19]**

The hallmark of presbycusis is the impaired ability to understand high-frequency components of speech (voiceless consonants, such as p, k, f, s, and ch). **[19]** There is no cure; however, hearing aids that amplify sounds can be used to mitigate symptoms. Anatomically, presbycusis involves multiple components of the auditory system. It is primarily due to age-related changes in hair cells, the stria vascularis, and afferent spiral ganglion neurons. **[20]**

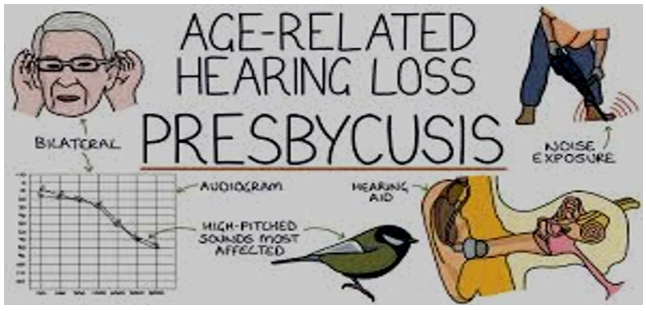

Figure 2

During the normal hearing, sound, in the form of air vibration, is captured by the funnel-shaped external ear and is directed to the tympanic membrane. This causes the tympanic membrane to vibrate at a specific frequency and amplitude. This movement is amplified by three small bones in the middle ear: the malleus, incus, and stapes. From there, the signal proceeds as vibrations that are transmitted through the fluid within the inner ear to the cochlea.

In the cochlea, receptors known as hair cells transform the information encoded in the vibrations into a neurologic signal which travels to the auditory cortex via the cochlear nerve.**[20]**

Age-related hearing impairment (ARHI), also referred to as presbycusis, is the most common sensory impairment seen in the elderly. As our cochlea, the peripheral organ of hearing, ages, we tend to experience a decline in hearing and are at greater risk of cochlear sensory-neural cell degeneration and exacerbated age-related hearing impairments, e.g., gradual hearing loss, deterioration in speech comprehension (especially in noisy environments), difficulty in the localization sound sources, and ringing sensations in the ears. However, the aging process does not affect people uniformly; nor, in fact, does the aging process appear to be uniform even within an individual. Here, we outline recent research into chronological cochlear age in healthy people, and exacerbated hearing impairments during aging due to both extrinsic factors including noise and ototoxic medication, and intrinsic factors such as genetic predisposition, epigenetic factors, and aging. We review our current understanding of molecular pathways mediating ARHL and discuss recent discoveries in experimental hearing restoration and future prospects.

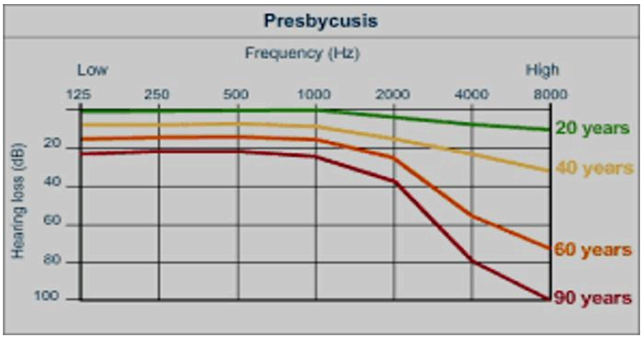

Figure 3

Aging is a progressive decline or loss of tissue and organ function over time due to the gradual accumulation of deleterious biological changes. The aging process has three distinct components: biological degeneration, extrinsic damage, and intrinsic damage. These factors are superimposed on a genetic substrate and can be overshadowed by the general age-related susceptibility to diseases. Age-related diseases are those that are observed with increasing frequency with increasing age, such as atherosclerosis, cardiovascular disease, cancer, Arthritis, cataracts, Alzheimer's disease, presbyopia, and presbycusis. Whereas all adult humans or animals become old, not all suffer from age-related diseases. Age-related diseases can be conceptualized as accelerated aging resulting from the genetic background interacting throughout life with environmental and lifestyle factors.

Presbycusis, or age-related hearing loss (ARHL), is the loss of hearing that gradually occurs in most people as they grow older. According to the World Health Organization,**[20]** approximately one third of people over 65 years of age are affected by disabling hearing loss. In 2025, there will be 1.2 billion people over 60 years of age worldwide, with more than 500 million individuals who will suffer significant impairment from presbycusis.**[20]** ARHL is a progressive, irreversible, and symmetrical bilateral neuro-sensory hearing loss resulting either from degeneration of the cochlea, where sound-induced vibrations are encoded by sensory hair cells into electrical signals in cochlear neurons that relay the information to the brain (Figure 1), or loss of auditory nerve fibers during cochlear aging. Hearing loss begins in the high-frequency region of the auditory spectrum and spreads towards the low-frequency regions with age (Figure 2). The age-dependent deterioration in threshold sensitivity is generally associated with difficulty in speech discrimination, as well as in sound detection and localization, particularly in noise. Males are generally more severely affected than females (Figure 2). Untreated presbycusis can contribute to social isolation, depression, and dementia.**[20]**

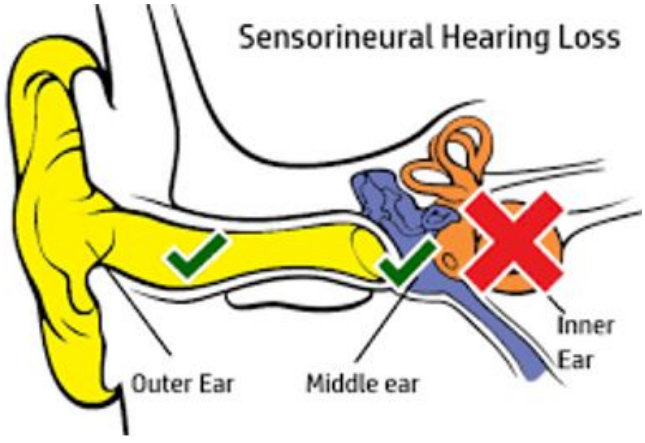

Figure 4

Epidemiologic studies in large populations of unscreened elderly adults show that the decline in hearing sensitivity accelerates above the age of 20 to 30 in men, and above age 50 in women.**[21]**

The average hearing thresholds of men exhibited a sharply rise of hearing loss in the high frequency range, whereas women's audiograms display a more gradual sloping.**[22]** Interestingly, a high proportion of participants reported exposure to noise, otologic disease, and ototoxicity,**[23]** suggesting that the source of the hearing impairment among unscreened populations is not exclusively associated with aging.

Based on temporal bone analyses correlating the patterns of hearing loss with defect location, Schuknecht**[24]** proposed three major forms of ARHL: (i) sensory presbycusis characterized by an abrupt pure-tone threshold elevation in the high frequencies and hair-cell loss at the basal end of the cochlea; (ii) strial presbycusis found in patients with a flat- or slightly descending pure-tone audiogram, correlated with atrophy of the stria vascularis; and (iii) neural presbycusis, characterized by a loss of cochlear neurons throughout the entire cochlea. The precise mechanisms underlying the age-related degeneration of the different cochlear structures remain unclear.**[25]** This is in part due to the complexity of each causal factor, but more importantly to the interaction of the different mechanistic pathways that can cause age-related hearing loss. Sensory hair cells are susceptible to an accumulation of injuries inflicted over time from a number of different sources, including direct mechanical, mitochondrial oxidative injury from noise, ototoxic drugs such as aminoglycosides, cisplatin, or other unknown factors.**[26]** The degeneration of spiral ganglion neurons (sgns) may be triggered by the accumulation of multitudinous noise-induced loss of afferent dendrites.**[28,27]** Interestingly, most vulnerable cochlear neurons, to both noise and aging, are those with high thresholds and low spontaneous rates. Although these low-spontaneous rate (SR) fibers do not contribute to threshold detection in quiet situations, they contribute to coding of transient stimuli in presence of continuous background noise,**[29]** leading to new concept called hidden hearing loss. Therefore, tone in noise detection may be a useful measure in detecting age-related hearing deficits for those patients who express difficulty, but have relatively normal thresholds in quiet.**[30]** This review recapitulates our current understanding of biological cochlear aging on hearing, extrinsic and intrinsic risk factors that exacerbate age-related hearing function decline in animal models and in humans,

The molecular pathways mediating cochlear cell senescence and degeneration as a consequence of aging, injury (noise, ototoxic drugs), and genetic predisposition. We discuss also the recent discoveries in experimental hearing restoration.

1. Major Causal Factors of Age-Related Hearing Loss

The clinical presentation of presbycusis, the rate of the progression, age at onset, and ultimate severity of hearing loss varies from patient to patient. Whereas the majority of elderly patients present clear hearing losses, a significant fraction of the geriatric population has almost normal hearing. This is due to intrinsic (genetic predisposition, epigenetic factors, and aging), and extrinsic factors (e.g., noise- or ototoxic drug-exposure, head trauma, cigarette smoking) that are either the sole etiology for hearing loss, or several work in synergy with the physiopathology of presbycusis.**[31]**

1.1. Biological Aging on Hearing

1.1.1. Aging and Hearing in Healthy People

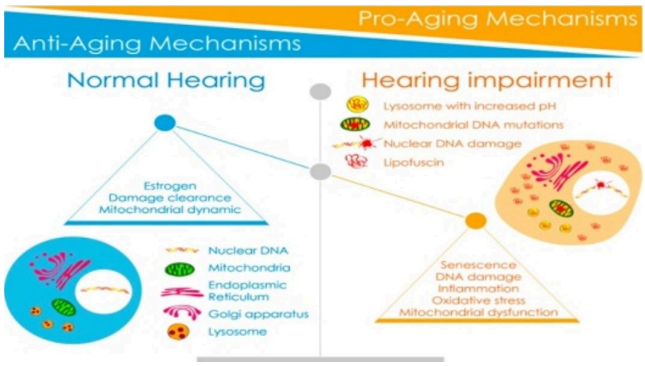

Figure 5

The clinical diagnosis of presbycusis is based on bilateral progressive loss of hearing starting from a high-frequency region of the hearing spectrum. Loss of hearing can begin in young adulthood, but is initially evident at 60 years for most people (Figure 2). Over time, the threshold elevation progresses to lower and lower frequency areas. However, presbycusis studies in humans are limited by the genetic heterogeneity and the difficulty in controlling deleterious auditory exposures over time. Despite these limitations, it has been reported that in a cohort unscreened for noise exposure, ototoxic drug exposure, and otologic disease history, presbycusis develops earlier and to a greater extent than in a highly screened cohort (without history of significant noise exposure or diseases that affect the ear).**[32]**

It has been suggested that the onset of hearing loss induced by biological aging is very late. Indeed, the Mabaan tribe living in the Sudanese desert retains their hearing into old age.**[33]**. Because the hearing of the young Mabaans was the same as those of young people from other countries, the good preservation of hearing in the tribe has been attributed to their quiet living environment and generally healthy condition.**[34]**

However, it can be argued that this difference might be caused by genetic differences between the populations. To answer this question, Goycoolea et al.**[35]** compared the hearing of natives of Easter Island, people living in a pre-industrial society, with those who had emigrated to Chile and spent varying amounts of time in modern society. Results showed that hearing in males that had lived or were living in Chile was significantly worse than that of males who had lived their entire lives on Easter Island, and that the poorer hearing was related to the number of years lived in modern society. Contrary to these early investigations, more recent studies showed that hearing thresholds decline with age and the rate of decline accelerates with age in presbycusis patients without noise-exposure or diseases that may affect the ear.**[36]**

In addition, the differences of hearing thresholds between presbycusis patients with or without noise exposure are limited.**[37]** These results thus supported the belief that age is one of the major causal factors of ARHL.

Conclusion

Based on the above conceptual study the *Lakshanas* of *Vataja Bhadirya* and signs and symptoms of Presbycusis are similar with the interpretation. As the *Vata* predominant *Vyadhis* are more common in old age the hearing capacity disorders will be developed commonly in such age groups the proper understanding is required with these type of conceptual studies.

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