

Role of Tinnitus Retraining Therapies and Hearing Aids in Management of PresbytininitusRagini Raina¹, Swati Suneha², Sweta Soni³, Kranti Bhavana⁴¹Ex Senior Resident, Department of ENT, All India Institute of Medical Sciences, Patna, Bihar, India²Ex Senior Resident, Department of ENT, All India Institute of Medical Sciences, Patna, Bihar, India³Ex Senior Resident, Department of ENT, All India Institute of Medical Sciences, Patna, Bihar, India⁴Professor & Head, Department of ENT, All India Institute of Medical Sciences, Patna, Bihar, India

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Abstract**Objective:** To assess the role of tinnitus retraining therapy and hearing aid use in management of patients presenting with tinnitus and presbycusis.**Materials and Methods:** A retrospective observational study was done at Department of ENT, Aiiims Patna. A total of 75 patients aged 50 years or more who had attended OPD with complaints of hearing loss and tinnitus and were given TRT sessions with or without hearing aid were included in the study. Data was collected from hospital records and analysed using SPSS version 2.0.**Results:** Of the 75 patients, 54(72%) were males and 21 (28%) were females. The mean age of male patients was 60.74 years and female patients was 54.29 years. 56 patients (74.7%) had bilateral (B/L) and 19 patients (25.3%) had unilateral (U/I) tinnitus. A mean 18.03±3.09 TRT sessions were administered to patients. A total of 52 patients were prescribed and used digital hearing aids. All patients except for one experienced an improvement in tinnitus.**Conclusion:** Tinnitus retraining therapy is an effective tool in the management of symptoms related to this condition to a large extent. Hearing aid plays a significant role in alleviating hearing loss and tinnitus in such patients.**Keywords:** Presbytininitus, Presbycusis, Tinnitus Retraining Therapy (TRT), Hearing Aid.

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Introduction

The word Tinnitus is derived from the Latin verb *tinnire* meaning 'to ring', it is a conscious perception of sound in one or both ears in the absence of a corresponding external acoustic stimulation. [1] It may range from simple humming, whistling to complex music, single to multiple sounds causing minimal to severe discomfort to the patient. It is usually strongly associated with some degree of hearing loss in the elderly population. There are various factors reported to be associated with tinnitus like gender, hypertension, smoking, BMI, diabetes, alcohol intake etc. but a definite causal association has not been established. [2]

Presbycusis results from atrophy of hair cells in the organ of Corti, degeneration of nerve fibers in the cochlear ganglion and the cochlear nuclei, impaired blood supply of the spiral ligament and the vascular stripe, and atrophy of the spiral ligament and rupture of the cochlear duct [3]. Approx 11% of elderly patients with hearing loss complain of

annoying tinnitus [4–7]. Claussen [4,8], coined the term presbytininitus for symptoms specific in aged patients and reflecting cochleovestibular dysfunction [9].

Management of tinnitus aims to reduce its debilitating effect on quality of life with some evidence to rely on cognitive behavioral therapy. [10] Pharmacotherapy with agents like cortisone, vasodilators, benzodiazepines, lidocaine and spasmolytic drugs has been tried but a definite role has not been proven.

Tinnitus retraining therapy is based on the neurophysiological model of tinnitus, it comprises tinnitus specific counseling and low-level broadband sound therapy. It promotes habituation and reduces the disturbing awareness of tinnitus. [11] Hearing aids are beneficial in reducing the perception of presbytininitus. The exact mechanism is unknown but masking of tinnitus with amplified noise, less strain in hearing, and reversal of pathologic cortical mapping related to reduced

afferent activity are different hypotheses involved. [12]

A study assessing efficiency of hearing aids and TRT in presbycusis management was warranted to be able to provide better care to presbycusis patients. Hence to analyze these above-mentioned features, we conducted this retrospective study.

Materials and Methods

A retrospective study was conducted at the department of ENT, AIIMS patna, including patients aged 50 years and above who presented with varying degrees of hearing loss and tinnitus. A total of 75 patients were included in the study. Data was collected from their clinical records, demographic details, clinical history, otoscopic findings, audiological reports were noted and analyzed. All of these patients were diagnosed with presbycusis based on clinical findings and audiological reports.

Tinnitus presence and laterality was noted, its severity was graded based on psychoacoustic measurements by the audiologists like pitch

matching, loudness matching, minimum masking levels and residual inhibition. These patients had been offered TRT (Tinnitus retraining therapy) sessions with or without digital hearing aids. Number of TRT sessions needed by each patient to reach a satisfactory benefit was recorded, subjective improvement in tinnitus was graded.

Data was entered on a Microsoft Excel worksheet and analysis was done using IBM SPSS Statistics software Version 20. Mean values were calculated and unpaired t-tests were applied. We obtained the following results.

Results and Observations

A total of 75 presbycusis cases with tinnitus were evaluated. Of the 75 patients, 54 (72%) were males and 21 (28%) were females. The mean age of the patients was 59.04 years. The mean age of male patients was 60.74 years and that of females was 54.29 years.

The audiological analysis revealed the following pattern of hearing loss (Table 1) -

Table 1: Audiological data of presbycusis patients with tinnitus

Parameter	Male		Female		Total	
	Right ear	Left ear	Right ear	Left ear	Right ear	Left ear
Pure Tone Audiometry (PTA)	54.80 dB (±27.44)	53.07 dB (±26.33)	56.38 dB (±22.11)	46.19 dB (±22.14)	55.24 dB (±25.92)	51.15dB (±25.28)
Bone conduction threshold (BCT)	37.40 dB (±22.86)	36.47 dB (±21.12)	36.20 dB (±21.34)	29.99 dB (±22.33)	37.06 dB (±22.31)	34.66 dB (±21.52)

Out of these, 56 patients (74.7%) had bilateral (B/L) and 19 patients (25.3%) had unilateral (U/L) tinnitus. Among patients with bilateral tinnitus, 42(75%) had similar severity on both sides and 14(25%) had varying severity on each side.

All of these patients were given TRT sessions, male patients required an average of 17.96 sessions and female patients required 18.10 sessions. Patients with bilateral tinnitus required an average of 18.18 TRT sessions and those with unilateral tinnitus required 17.50 sessions.

Unpaired t test was applied on these data, two tailed p-value equals 0.9420 and thus there was no significant difference found between TRT sessions required by patients with bilateral tinnitus and patients with unilateral tinnitus.

A total of 52 patients had been prescribed digital hearing aids including one patient being given CROSS hearing aid. Below is a table illustrating the average number of TRT sessions given to hearing aid users according to severity of tinnitus.

Table 2:

Tinnitus severity	Mean TRT sessions	Hearing aid use (%of total 52 HA)
Mild	16.67±3.81	06 (11.54%)
Moderate	18.33±3.02	21 (40.38%)
Severe	18.75±2.21	24 (46.15%)
Very severe	20.00±0.00	01 (01.93%)

All patients recorded an improvement in tinnitus severity except one who was using CROSS hearing aid. A total of 44 patients were cured of their tinnitus related symptoms post TRT sessions, 16 patients were left with minimal tinnitus, 12 patients had mild tinnitus and 2 patients had moderate tinnitus left following completion of therapy.

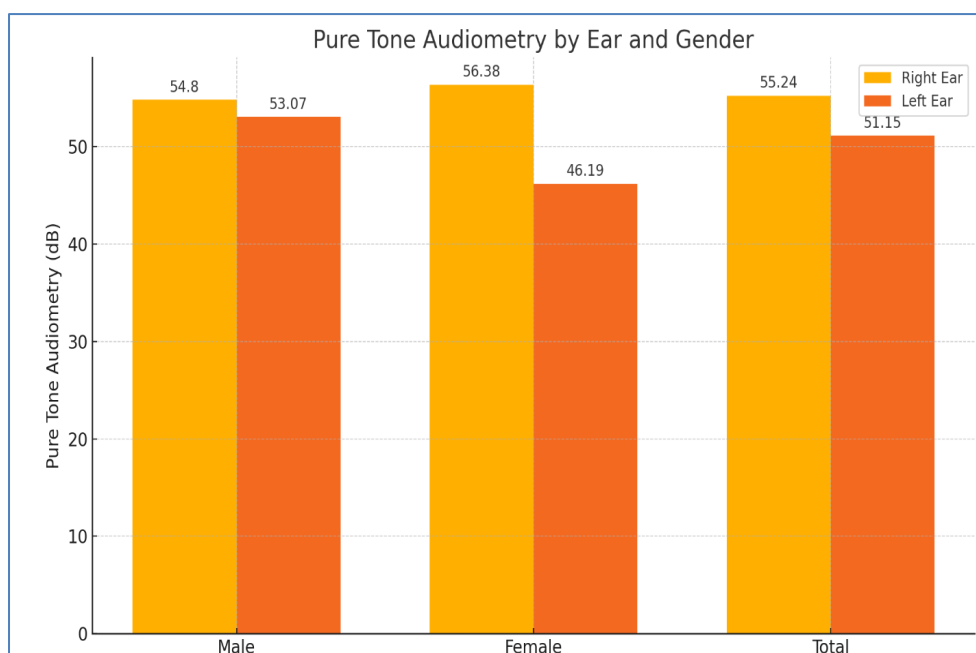


Figure 1: Pure Tone Audiometry by Ear and Gender

Discussion

Jastreboff proposed that tinnitus is perceived due to abnormal processing of a signal originating in the auditory system before it is perceived centrally. This abnormal processing results in 'feedback', which leads to the annoyance of tinnitus and makes the person concentrate increasingly on the noise, which exacerbates the annoyance and hence a 'vicious cycle' develops [11]. Tinnitus is commonly associated with otitis media, presbycusis and otosclerosis [9]. There are few studies to understand the demographic pattern of tinnitus in India.

Shulman states Presbytinnitus to begin at age 45–55 years, reaching a peak at mid-60 [9]. In our study the mean age of patients was 59.04 years. Tinnitus was seen to be more common in elderly males as compared to females. This is in correlation with studies by Manche et al and heller et al, [13,14]. Females being more ignorant in reporting their symptoms might be the reason for this gender preference.

The association of presbycusis to tinnitus severity is attributed to the common degenerative changes occurring in outer hair cells, organ of corti and spiral ganglion in both disorders. Zagolski found the main defect causing sensory component of both presbycusis and presbytinnitus was cochlear damage. [15]

Tinnitus treatment can be broadly divided into two modalities, first those catering tinnitus perception and second targeting response to tinnitus. [16] The AAO-HNF clinical guidelines recommend hearing aid evaluation and CBT as options for management of chronic bothersome tinnitus and sound therapy

as another option. They discourage the use of pharmacotherapy, dietary supplements, or repetitive transcranial magnetic stimulation (rTMS), as there was lack of enough supporting data at the time of its publication in 2014. [17]

Ueda et al. [18] noted high-pitched tinnitus (above 4,000 Hz) in presbycusis patients. Hence, when the main defect causing tinnitus is dysfunction of the organ of Corti, hearing aids could be beneficial in presbytinnitus patients. We advised hearing aids to patients wherever indicated. Amplification alone as treatment has been studied in the past and has not been found to be significantly reducing symptoms.

TRT was introduced in 1993 by Jastreboff and Hazell and was derived from neurophysiological principles of habituation and learning. It consists of counseling/teaching sessions and sound therapy which create habituation to perception and habituation of reaction. [11] Habituation is achieved by reducing the strength of the tinnitus signal and showing its benign character, education, demystification, and use of examples and analogies that illustrate the theoretical mechanisms whereby tinnitus becomes bothersome, intrusive, and disruptive [10]. Our study recorded an improvement in tinnitus symptoms following TRT sessions combined with hearing aid usage in all of the patients. The study by Bauer et al compares TRT with standard-of-care treatment for tinnitus and found TRT to be more efficient in reducing tinnitus severity. [10] Folmer and carroll have reported similar results about improvement in tinnitus symptoms following TRT combined with hearing aid usage in their study [19].

Conclusion

Tinnitus is almost always associated with presbycusis. Tinnitus Retraining Therapy is effective in managing presbycusis with results varying from complete cure to significant reduction in its severity. Digital hearing aids should be prescribed wherever indicated as per hearing loss pattern alongside TRT to manage associated hearing loss thereby assisting in tinnitus suppression.

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