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HIDDEN HEARING LOSS IN TINNITUS PATIENTS WITH NORMAL HEARING IN CONVENTIONAL PURE TONE AUDIOMETRY

Healthcare

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ABSTRACT

AIM: Among the many sufferers of tinnitus, a few have normal hearing sensitivity. The aim of the study is to find the relevance of high frequency audiometry in tinnitus patients with normal hearing in conventional pure tone audiometry.

SUBJECTS AND METHODS: A small group of 10 tinnitus patients were selected with normal pure tone audiogram and high frequency audiometry was performed and the results were analyzed.

RESULTS: The tinnitus patients showed higher thresholds in high frequency audiometry when compared to conventional pure tone audiometry. There was a correlation between tinnitus laterality and high frequency hearing loss.

CONCLUSION: High frequency audiometry provides essential information in tinnitus patients having normal pure tone thresholds. The association between tinnitus laterality and asymmetry of the high frequency audiometry suggests a potential causal role for the high frequency hearing loss in tinnitus etiopathogenesis.

KEYWORDS

Tinnitus, conventional pure tone audiometry, High frequency audiometry.

INTRODUCTION

Tinnitus is the perception of sound when there is no external noise present. Tinnitus can be of many forms and various factors can contribute to its etiology. However, it is well established that the hearing loss has been the most important risk factor for tinnitus [1]. The majority of tinnitus patients show hearing loss in pure tone audiometry particularly in the high frequency range [3, 11]. Moreover the frequency spectrum of individuals with tinnitus corresponds to the frequency range of the hearing impairment [4, 6], thus underscoring the relevance of hearing loss as an etiological factor for tinnitus. However some tinnitus patient does not show any detectable hearing loss in the frequency range of the conventional pure tone audiometry (125 Hz to 8 kHz) [13]. It has been argued that a normal pure tone audiogram (PTA) does not reliably preclude cochlear damage. Accordingly, tinnitus patient with normal audiogram had more frequently cochlear dead regions [15] and impaired hearing thresholds in the extended high frequency regions [16] as compared to control group. Patients with tinnitus and normal audiograms demonstrated significantly reduced amplitude of the wave I potential in the auditory brainstem response [13], suggesting damage of hair cells and/or auditory nerve fibers already at normal audiometric thresholds. Therefore all these studies support the theory of a "hidden hearing loss" in tinnitus patients.

The question; does high frequency audiometry provide additional or necessary information? Remain unanswered. Hence the study was conducted.

MATERIALS AND METHODS

A group of 10 patients with age range of 25 to 45 years presenting from chronic subjective tinnitus and normal hearing thresholds in conventional pure tone audiometry were selected for whom high frequency audiometry was done. The clinical, demographic and audiometry data were collected as a part of routine assessment in Institute of Speech and Hearing, Rajiv Gandhi Government General Hospital, Chennai.

The term normal PTA was defined as thresholds less than or equal to 15dB HL at all the frequencies from 250 Hz to 8000 Hz. The Tinnitus Sample Case History Questionnaire (TSCHQ) and Tinnitus Handicap Inventory (THI) were administered to gather detailed information about the tinnitus and its severity.

The audiological assessment included conventional pure tone audiometry (250Hz-8000Hz), High Frequency (HF) audiometry (10 kHz, 11.2 kHz, 12.5 kHz, 14 kHz and 16 kHz) and tinnitogram; matching of the tinnitus pitch and loudness. Audiometry and tinnitus matching were done in Piano inventis audiometer using TDH-39 supra aural headphones for PTA and Sennheiser HDA 200 for HF audiometry. The hearing threshold for all the frequencies were determined by standard Hughson-Westlake procedure (steps: 10dB down, 5dB up, 2 out of 3). The mean hearing level (dB HL) was calculated by averaging the 3frequencies (500 Hz, 1k Hz and 2k Hz). For mean HF-hearing level (dB HL) averaging was done for all frequencies from 10 kHz to 16 kHz. For tinnitus matching the most appropriate pitch and loudness as reported by the patient was taken into account.

The tinnitogram result (frequency & intensity matched by the patients) was compared with the high frequency audiogram. The relevance of the hidden hearing loss with tinnitus was noted.

RESULTS

Data from 10 patients (5 males and 5 females) with tinnitus were analyzed. All the patients had a severity of mild to moderate tinnitus according to the tinnitus handicap inventory score and had no history of any significant cause for tinnitus. All the patients reported the tinnitus frequency match to be present at high frequencies above 8 kHz where their thresholds were above the normal range (>15dB).

DISCUSSION

Many studies report the relationship between the laterality and pitch of tinnitus and hearing loss [2-4]. Hearing loss is considered to be the most important risk factor for tinnitus [5].

A comprehensive audiological assessment should comprise of high frequency audiometry because most of the patients report their tinnitus pitch to be in the high frequency range [6]. The purpose of this study is to evaluate the importance and effectiveness of high frequency audiometry in patients who have normal conventional pure tone audiometry results.

Primarily we found that most of the tinnitus patients with normal audiograms in conventional PTA had abnormal HF audiogram. This is in concordance with earlier findings of increased abnormality in HF audiograms [7].Our findings also confirm the notion that the HF audiometry is more sensitive for detecting hearing damage as compared to the standard audiometry [8, 9,10].

Lastly there is a relationship between tinnitus laterality and hearing asymmetry. The clients who had tinnitus in one ear also had higher thresholds in high frequency audiogram in the same ear. The demonstration of impaired hearing threshold in the high frequency range in combination with the perception of a high-pitched tinnitus might reflect a very useful element in the counseling of tinnitus patients [14].

CONCLUSION

In a gist tinnitus laterality and severity are related to the thresholds of high frequency audiometry in patients with normal pure tone

thresholds. Hence high frequency audiometry must be included in the comprehensive audiological test battery for patients having normal conventional pure tone audiogram.

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