



Available online at www.ajcr.sinaweb.net

Apadana Journal of Clinical Research

Original Article

Audiologic findings of tinnitus patients

Hassan Abshirini¹, Nader Saki^{1,*}, Soheila Nikakhlagh¹, Majid Karimi², Feridon Eslamijoo³, Sakineh Samadi²

1. Associated Professor of Otolaryngology, Hearing & Speech Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran
2. Audiologist, Apadana Clinical Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran
3. Resident of Otolaryngology, Hearing & Speech Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

Received 3 January 2013; received in revised form 12 February 2013; accepted 10 April 2013

Abstract

Background & objectives: The purpose of this study was evaluating the hearing status of tinnitus patients referred to our center.

Materials & Methods: A total of 144 Patients, referred to our center by the end of December 2008 to June 2009, who have tinnitus complaints after initial examination and cleaning the ear canal in the audiology clinic were introduced and completed the questionnaire. Audiometry with polls to assess the severity and tinnitus frequency is done.

Results: Based on the job criteria the patients divided in two groups of noisy job by 27.1 percent and 72.9 percent in a quiet job respectively. In the study based on precise frequency test (FT), 72 individuals (50%) with type Tone, 54 individuals (37.5%) with Narrow band noise condition and 18 (12.5%) had no resemblance. In comparison of the subjects based on severity of tinnitus only 126 individuals were correctly measured, 68 (47.2%) with intensity less than 5 dB SL, 41 (28.5%) were 5-10 dB SL and 17 (11.8%) showed more than 10 dB SL. In comparison of the audiogram as the highest values of inference are included 48 (31.5%) type of High Tone Loss, 38 patients (26.4%) type of sensory neural, 30 subjects (20.8%) or normal type and 22 subjects (15.3 percent) were of conductive type.

Conclusions: we could demonstrate that not only the amount of hearing losses, but also the shape of the audiogram might be an important factor for the occurrence of tinnitus. In our sample of patients, tinnitus was connected to audiograms with a steep slope.

Keywords: Hearing; Ahvaz; Tinnitus

1. Introduction

Tinnitus is one of the most common disorders of hearing system. Tinnitus prevalence range is 3% to 30% that depends on the population sample and type of the disorder. Severity of tinnitus varies from mild to severe and debilitating¹. It may affect the quality of life by the psychological effects directly on the patient and indirectly on his family².

One of the most controversial diagnostic issues is that tinnitus is not only diagnosed with internal ear and auditory nerve disorders such as Ménière disease, but could be present in people with normal hearing and without the presence of otological disorders³⁻⁴. Society, even among very high sound exposure may increase the risk of physiological damage in hearing system that in turn can cause tinnitus⁵.

The association between tinnitus and hearing loss has already been described. According to different

*Corresponding Author: Nader Saki, Department of ENT, Imam Khomeini Hospital, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran. Tel: +986132224673. E-mail: saki-n@ajums.ac.ir

reports, 85% to 96% of patients with tinnitus present some degree of hearing loss⁶⁻⁷. Some authors consider the theory that tinnitus is a result of a balanced mechanism to reduce dysfunction of peripheral hearing pathway, what means, tinnitus is a consequence of hearing loss existence⁸.

Hearing loss in patients with tinnitus is often present in the high frequencies usually 8000 HZ, which the routine hearing tests polls are not measuring those⁹. Interestingly, the hearing loss itself is a risk factor for causing tinnitus¹⁰. Only from 8 to 10% of the patients with tinnitus have normal hearing¹¹⁻¹², and they cannot be explained by the same theory.

In these individuals, the isolated tinnitus presence means that it can be the first symptom of diseases usually diagnosed with hearing loss. Therefore, although they are rare, these patients have an interesting sample because their information can be related only to tinnitus and not to hearing loss, which follows the majority of cases.

The purpose of this study was evaluating the hearing status of tinnitus patients referred to our center.

2. Materials and Methods

Study population

The study sample was selected from tinnitus patients who referred to Imam Khomeini Hospital, Ahwaz by the end of December 2008 to June 2009. A total of 144 patients referred to our center, which have tinnitus complaints after initial examination and cleaning the ear duct in the audiology clinic were introduced and completed the questionnaire.

Audiometry with polls is done to assess the severity and tinnitus frequency. The following clinical characteristics were noted: sex, age, laboratory findings. The audiology is done in hearing thresholds 500, 1000, 2000 and 4000Hz. SNHL of hearing threshold above 25 dB was considered.

All patients who participated in research projects signed written consent form. The study was approved by the university hospital and local Ethics Committees. All clinical records were analyzed.

Statistical analysis

After completing the questionnaire, collected data were analyzed by SPSS 13.0. Then descriptive data expressed using frequency tables, and men ± SD. Correlation analysis of the variables is done using Pearson correlation.

3. Results

This study included 144 patients aged 16 to 82 years and average age of 46.24% (± 1.03). A total of 144 patients included 76 males (52.8%) and 68 females (48.2%) that has been explained in table1. Based on the job criteria the patients were divided into two groups of noisy job by 27.1% and 72.9% in a quiet job, respectively (Table 1).

In the study based on precise frequency test (FT), 72 individuals (50 %) were with type Tone, 54 individuals (37.5%) were with Narrow band noise condition and 18 individuals (12.5%) had no resemblance (Fig 1). The subjects compared based on severity of tinnitus only 126 individuals were correctly measured, 68 (47.2 %) with intensity less than 5 dB SL, 41 (28.5 %) were 5-10 dB SL and 17 (11.8 %) showed more than 10 dB SL (Table 1).

In comparison of the audiogram in table 1 as the highest values of inference are included 48 (31.5 %) type of high tone loss, 38 patients (26.4 %) type of sensorineural, 30 subjects (20.8 %) or normal type and 22 subjects (15.3%) were of conductive type.

Table 1. Demographic data and the presented values among the 144 studied patients

| Variables | Values |
|---------------------------------------|--------------|
| Gender [No. (%)] | |
| Male | 76 (52.8%) |
| Female | 68 (48.2%) |
| Age (years) | |
| Mean ± SD | 46.24 ± 1.03 |
| Range | 16-82 |
| Job [No. (%)] | |
| Noisy | 39 (27.1%) |
| Quiet | 105 (79.9%) |
| Frequency Test [No. (%)] | |
| Not similar | 18 (12.5%) |
| Narrow band noise | 54 (37.5%) |
| Tone | 72 (50%) |
| Severity of tinnitus (dBsl) [No. (%)] | |
| Less than 5 | 68 (47.2%) |
| 5 to 10 | 41 (28.5%) |
| More than 10 | 17 (11.8%) |
| Audiogram [No. (%)] | |
| Normal | 30 (20.8%) |
| Conductive | 22 (15.3%) |
| Neuro-sensory | 38 (26.4%) |
| High tone loss | 45 (31.5%) |

Low tone loss 4 (2.8%)
 Mixed 5 (3.5%)

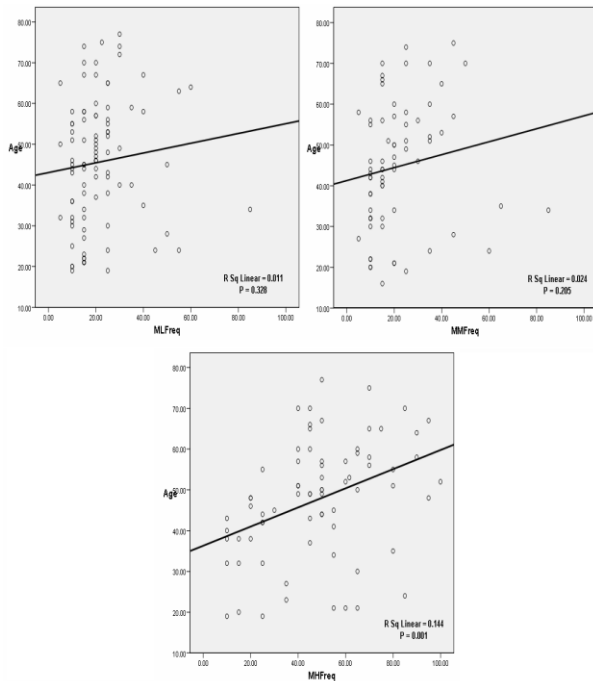


Figure 1: Correlation between age and different frequencies

4. Discussion

In this study, patients with tinnitus were significantly remarkable during their audiograms. Furthermore, the patients with tinnitus had fewer hearing losses, steeper maximum slopes of their audiograms, and the edges of their audiograms were located at higher frequencies. Tinnitus presents a large prevalence in the world (3% in the general population and 30% in the elderly) and causes considerable morbidity, which may interfere with sleep, concentration, emotional balance and social life of subjects¹³⁻¹⁵.

The complexity of pathophysiology and subjectivity reduces the interest of otolaryngologist in this symptom. It can cause annoyance and interference with everyday activities. Although tinnitus is experienced by a large part of the population, only a small number of people seek medical help¹⁶. The degree of annoyance, distress level, anxiety, sleep problems, emotional reactions, difficulties with concentration, and interference with work and everyday activities varies among patients. Tinnitus is more prevalent in elderly, although it may affect people of all ages, including children¹⁷⁻¹⁸. Audiological examination including pure tone air and bone levels, speech reception thresholds, speech discrimination scores, uncomfortable loudness levels, tympanometry, and in some cases acoustic reflexes should not be

performed in tinnitus patients with hyperacusis because of the potential of worsening tinnitus¹⁹⁻²⁰.

Although, the majority of tinnitus patients has an associated hearing loss, approximately 20% to 30% of patients have a normal hearing loss. Patients with tinnitus and normal hearing showed similar characteristics compared to those with hearing loss. However, the age of the patients and the interference over concentration and emotional states were significantly lower in this group in the present study, the pre-dominance of the patients with tinnitus with normal audiometry is 20.8% of all patients. The relation in our patient samples between tinnitus pitch and type of hearing loss is consistent with results in earlier studies. Tinnitus pitch is predominantly matched to frequencies above the audiogram edge.

In conclusion, we could demonstrate that not only the amount of hearing losses, but also the shape of the audiogram might be an important factor for the occurrence of tinnitus. In our sample of patients, tinnitus was connected to audiograms with a steep slope.

References

1. Shiley S, Folmer R, McMenomey S. Tinnitus and hyperacusis. Otolaryngology head & neck surgery. 4th ed. Philadelphia: Elsevier Mosby; 2005. 2832-47.
2. Crummer RW, Hassan GA. Diagnostic approach to tinnitus. Am family Physi 2004; 69(1): 120-6.
3. Satar B, Kapkin O, Ozkaptan Y. Evaluation of cochlear function in patients with normal hearing and tinnitus: a distortion product otoacoustic emission study. Kulak Burun Bogaz Ihtis Derg 2003; 10(5): 177-82.
4. McKee G, Stephens S. An investigation of normally hearing subjects with tinnitus. Int J Audiol 1992; 31(6): 313-7.
5. Schilter B, Jager B, Heermann R, Lamprecht F. [Drug and psychological therapies in chronic subjective tinnitus. Meta-analysis of therapeutic effectiveness]. HNO 2000; 48(8): 589-97.
6. Elgoyhen AB, Langguth B. Pharmacological approaches to the treatment of tinnitus. Drug Discov Today Biosilico 2010; 15(7): 300-5.
7. Antonelli AR, Bellotto R, Grandori F. Audiologic Diagnosis of central versus eighth nerve and cochlear auditory impairment. Int J Audiol 1987; 26(4): 209-26.
8. Most T, Rothem H, Luntz M. Auditory, visual, and auditory-visual speech perception by individuals with cochlear implants versus individuals with hearing aids. Am Ann Deaf 2009; 154(3): 284-92.

9. Bauer CA. Mechanisms of tinnitus generation. *Curr Opin Otolaryngol Head Neck Surg* 2004; 12:413-7.
10. Roberts LE, Moffat G, Bosnyak DJ. Residual inhibition functions in relation to tinnitus spectra and auditory threshold shift. *Acta Otolaryngologica* 2006; 126(56): 27-33.
11. Sindhusake D, Golding M, Wigney D, Newall P, Jakobsen K, Mitchell P. Factors predicting severity of tinnitus: a population-based assessment. *J Am Acad Audiol* 2004; 15(4): 269-80.
12. Sindhusake D, Golding M, Newall P, Rubin G, Jakobsen K, Mitchell P. Risk factors for tinnitus in a population of older adults: The Blue Mountains hearing study. *Ear Hear* 2003; 24(6): 501-7.
13. Kehrle HM, Granjeiro RC, Sampaio AL, Bezerra R, Almeida VF, Oliveira CA. Comparison of auditory brainstem response results in normal-hearing patients with and without tinnitus. *Arch Otolaryngol Head Neck Surg* 2008; 134(6): 647-51.
14. Cai Y, Tang J, Li X. [Relationship between high frequency hearing threshold and tinnitus]. *Lin Chuang Er Bi Yan Hou Ke Za Zhi* 2004; 18(1): 8-11.
15. Ahmad N, Seidman M. Tinnitus in the older adult: epidemiology, pathophysiology and treatment options. *Drugs Aging* 2004;21(5):297-305.
16. Heller AJ. Classification and epidemiology of tinnitus. *Otolaryngol Clin North Am* 2003; 36(2): 239-48.
17. Nondahl DM, Cruickshanks KJ, Wiley TL, Klein R, Klein BE, Tweed TS. Prevalence and 5-year incidence of tinnitus among older adults: the epidemiology of hearing loss study. *J Am Acad Audiol* 2002; 13(6): 323-31.
18. Series E. Tinnitus. Diagnosis and treatment of this elusive symptom. *Geriatrics* 2003; 58(2): 28-34.
19. Savastano M. Tinnitus with or without hearing loss: are its characteristics different? *Eur Arch Otorhinolaryngol* 2008; 265(11): 1295-300.
20. Konig O, Schaette R, Kempter R, Gross M. Course of hearing loss and occurrence of tinnitus. *Hear Res* 2006; 221(1): 59-64.