

Relation of Hyperacusis in Sensorineural Tinnitus Patients with Normal Audiological Assessment

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Abstract: Hyperacusis is mainly a consequence of the noise level in the twenty-first century, owing to dramatic changes in people's lifestyles. Of every 100 people with otological complaints (e.g., tinnitus and hyperacusis), 20 are affected by hyperacusis. Because of its high incidence, this symptom has long been the subject of investigation.

Nine patients (eight female, one male) with sensorineural tinnitus voluntarily participated in this study. Among the evaluated patients, three were between 25 and 40 years of age and six were between 41 and 60 years. The patients did not report a history of acoustic trauma, use of drugs, or otological diseases. The duration of complaints at the time the study began varied from 3 months to 8 years. The patients answered a questionnaire, submitted to an ear, nose, and throat examination, and were evaluated by pure-tone and speech audiometry and otoacoustic emissions and laboratory tests. In all patients, ear, nose, and throat assessments and audiological tests were within the normal ranges.

Of the nine subjects in our study, 100% had tinnitus, and 89% ($n = 8$) had hyperacusis as an associated symptom. Six subjects (67%) had severe tinnitus; among them, four had moderate hyperacusis, one had severe hyperacusis, and one was not affected by hyperacusis. In two subjects (22%) with moderate tinnitus, one had moderate hyperacusis and the other referred severe symptoms. Another patient (11%) reported mild tinnitus and mild hyperacusis. No patient classified his or her tinnitus as disabling.

The findings of the present study led us to conclude that the most affected age range of patients with tinnitus and hyperacusis was 41–60 years and that women are affected significantly more often than men. Tinnitus preceded hyperacusis as a complaint in 78% of the subjects. Hyperacusis was present in eight (89%) of the patients. There was no direct correlation between the severity of tinnitus and of hyperacusis, although we noticed that the discomfort of tinnitus was generally perceived as equal to or worse than that of hyperacusis.

Key Words: hyperacusis; tinnitus

If we were to enter an acoustic booth in which moderately loud, high-pitched sound were being produced, in only a short while we would be inclined

to leave such an unpleasant place. Now let us imagine that we cannot remove ourselves from the vicinity of the sound because it is not an external noise but rather a collapse of the normal tolerances of environmental sounds and hearing acuity within our bodies.

Hyperacusis is mainly a consequence of the noise level of the twentieth century, precipitated by dramatic

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changes in the lifestyle of patients. Of every 100 people who complain of otological problems such as tinnitus and hyperacusis, 20 experience hyperacusis, according to Johnson [1]. Owing to its high incidence, the symptom has been the subject of investigation for a long time.

Perlman [2] called *oxycoia* an increase in hearing acuity and painful hyperesthesia, cases characterized by abnormal discomfort caused by sounds excessively beyond thresholds. Malcore [3], a hyperacusis patient and member of the Hyperacusis Network,* explained that hyperacusic people experience a marked reduction of tolerance to sound. There is no detectable hearing loss, and all tests confirm that the hearing skills of the hyperacusic patient are perfectly normal. Sandim and Olsson [4] concluded that hyperacusis is reluctance to tolerate or irritability caused by everyday sounds that are perceived as incredibly loud or unpleasant.

More recently, the topic of tinnitus has been studied. *Tinnitus* is a word that derives from the Latin *tinnire*, which means "to make a buzzing sound." It is described as a hearing sensation that comes from the head and is not attributed to any external perceptible sign. The purpose of our study was to investigate the presence of hyperacusis in subjects with sensorineural tinnitus and normal audiological assessment.

MATERIALS AND METHODS

Nine patients with sensorineural tinnitus volunteered to join the study once they learned about its purpose. During the first semester of the current year, we evaluated eight female patients and one male patient. Among the evaluated patients, three were aged between 25 and 40 years, and six were aged between 41 and 60 years. The patients did not present with a history of acoustic trauma, use of drugs, or otological diseases. The duration of complaints varied from 3 months to 8 years.

The patients answered a questionnaire (see the appendix), followed by an ear, nose, and throat examination, pure-tone and speech audiometry, and otoacoustic emission and laboratory tests. In all patients, ear, nose, and throat and audiological test results (pure-tone and speech audiometry and tympanometry [immitanciometry]) were within normal ranges. Pure-tone audiometry was conducted at frequencies of 250, 2,000, 3,000, 4,000, 6,000, and 8,000 Hz. Bone conduction was tested at frequencies of 500, 1,000, 2,000, 3,000, and 4,000 Hz. The speech tests used were speech reception threshold and the speech recognition index. The same examiner performed all tests with a Maico MA 41 audiometer.

* The Hyperacusis Network offers support and information sharing to people having a modified tolerance to sound. It can be accessed at www.hyperacusis.net.

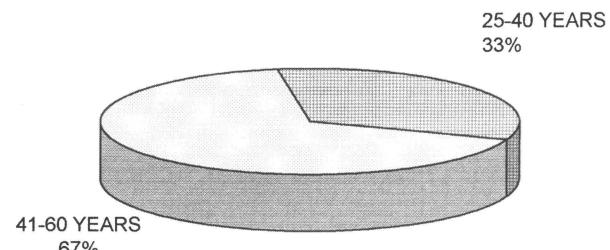


Figure 1. Age ranges of patients with normal audiological assessment and idiopathic sensorineural tinnitus.

Immitanciometry was carried out with an Interacoustics AZ7 middle ear analyzer, and we evaluated tympanometric curves and contralateral reflexes at frequencies of 500, 1,000, 2,000, and 4,000 Hz. Otoacoustic emissions were tested with the Grason-Standler device (model GS160). Laboratory test results (glycemia, total and fractionated cholesterol, triglycerides, thyroid-stimulating hormone, and thyroxine) were also within normal ranges in all patients. We classified hyperacusis as mild, moderate, or severe on the basis of patients' complaint about a noisy environment. Tinnitus was classified as mild, moderate, severe, or disabling.

RESULTS

Figure 1 shows the age ranges of patients with normal audiological assessment and idiopathic sensorineural tinnitus. Figure 2 shows the gender distribution of these patients, and Figure 3 the incidence of hyperacusis in these patients. Table 1 depicts the duration of tinnitus and hyperacusis in each patient at the time of entry into the study, and Table 2 shows the correlation between severity of tinnitus and that of hyperacusis.

DISCUSSION

In our study, we noticed that the age range affected most was that between 41 and 60 years, accounting for

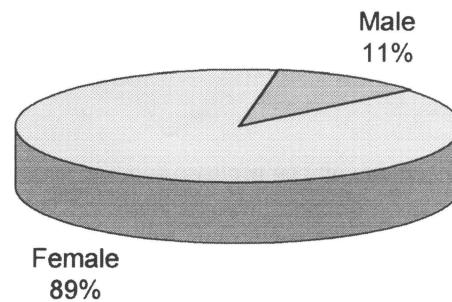


Figure 2. Gender distribution of patients (n = 9) with normal audiological assessment and idiopathic sensorineural tinnitus.

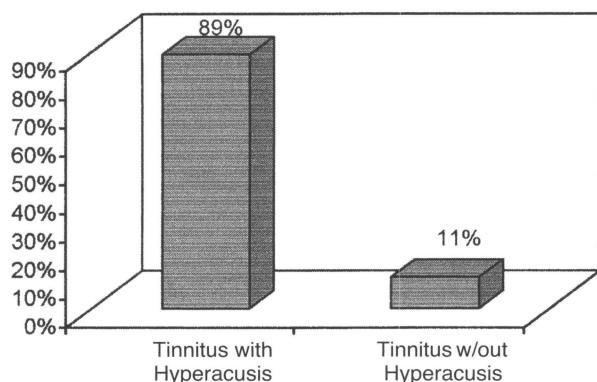


Figure 3. Incidence of hyperacusis in patients ($n = 9$) with normal audiological assessment and idiopathic sensorineural tinnitus.

six patients (67%), whereas three patients (33%) were between 25 and 40 years of age (see Fig. 1). Among the selected patients, there was a significant difference between genders: Female patients had a higher incidence ($n = 8$; 89%; see Fig. 2). In a study by Tyler and Baker [5], of 70 tinnitus patients who participated in a psychological follow-up study, 22 were men, and 48 were women. Among them, the mean age was 61 years, which correlates with the data obtained in our study.

Sanchez et al. [6] reported that if sound is normally amplified by the auditory pathways, there may be an increased perception of external and internal sounds, resulting in tinnitus. This finding explains the correlation between tinnitus and hyperacusis. Of the nine subjects in our study, 100% had tinnitus, and 8 (89%) had hyperacusis as an associated symptom (see Fig. 3). Hazel [7] reported that low sounds may increase to loud and intruding sounds, resulting in a perception that is either constantly audible (tinnitus) or is perceived as an unpleasant sound (hyperacusis) or both. Johnson [8] reported that approximately 40% of the patients who went to Oregon Center for treatment of tinnitus and hyperacusis had both symptoms and that only 10% pre-

Table 1. Duration of Tinnitus and Hyperacusis in Each Patient at Time of Entry into Study

Patient	Tinnitus	Hyperacusis
1	8 years	10 months
2	5 years	2 years
3	2 years	3.3 years
4	2 years	1.5 years
5	6 months	3 months
6	2 years	1 year
7	1.5 years	2 years
8	3 years	2 years
9	1.25 years	Absent

Table 2. Correlation Between Severity of Tinnitus and of Hyperacusis

Tinnitus	Hyperacusis			
	Absent	Mild	Moderate	Severe
Mild	—	1	—	—
Moderate	—	—	1	1
Severe	1	—	4	1
Disabling	—	—	—	—

sented with only hyperacusis. Hazel and Sheldrake [3] stated that frequent and concomitant tinnitus was normally recognized with the onset of hyperacusis. In an Australian study of 628 chronic tinnitus patients, Gabriels [10] found that in 20.1% of the patients, hyperacusis was concomitant with tinnitus onset. Jastroboff and Hazel [11] reported that hyperacusis may be considered a pretinnitus stage, enabling prevention of tinnitus in cases of hyperacusis without tinnitus. However, in our study, we noticed that tinnitus was present before hyperacusis in most of the patients (79.8%), that hyperacusis was present before tinnitus was observed in 22% of the patients, and that there was no case of concomitant onset of both symptoms (see Table 1).

In the nine studied patients, six (67%) had severe tinnitus: four with moderate hyperacusis, one with severe hyperacusis, and one without this anomaly. In two patients with moderate tinnitus (22%), one had moderate hyperacusis and the other had a referred severe symptom. Another patient (11%) reported mild tinnitus and mild hyperacusis. In no patient was tinnitus classified as disabling.

CONCLUSION

The findings in our study led to several conclusions. The most affected age range of patients with tinnitus and hyperacusis was 41–60 years of age. The most affected gender was female ($n = 8$; 89%). Tinnitus was a complaint before hyperacusis in 78% of studied patients. Hyperacusis was present in eight (89%) of nine patients. There was no direct correlation between severity of tinnitus and of hyperacusis, although we noticed that the discomfort of tinnitus was generally perceived as equal to or worse than that of hyperacusis.

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APPENDIX. QUESTIONNAIRE GIVEN TO PATIENTS**Protocol of Hyperacusis in Patients with Tinnitus****TINNITUS**

Duration _____ (days/months/years)

Location _____ Right _____ Left _____ Head _____

Type

Whistle _____ Car engine _____ Buzzing _____ Flying insect _____

Waterfall _____ Pulsatile _____ Airplane _____ Locust _____ Wind _____

Sea waves _____ Rain _____

Continuous _____ Intermittent _____

Constant _____ Not constant _____

Tone

Monotonal _____ Polytonal _____

Severity

_____ Mild (noticed only in some situations)

_____ Moderate (present but not disturbing)

_____ Severe (disturbing and somewhat impairing)

_____ Disabling

Previous treatment _____

Aggravation factors

Day _____ Night _____ Silent environment _____

Tension _____ Smoking _____ Alcohol use _____ Drugs _____

Food _____ Fatigue/insomnia _____ Head position _____

Noise exposure

Do you use hearing protectors? _____ yes _____ no

Previous treatment _____

HYPERACUSIS

Duration _____ (days/months/years)

Location

Right _____ Left _____

Sound

Loud _____ Moderate _____ Specific _____

Time

Morning _____ Afternoon _____

Progressive evolution

Quick _____ Slow _____ Nonprogressive _____

	No	Mild	Moderate	Severe
Before tinnitus				
With tinnitus				
After tinnitus				

PURE-TONE AUDIOMETRY

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