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ORIGINAL ARTICLE

Clinical characteristics of tinnitus in Ménière's disease

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KEYWORDS
Ménière's disease;
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Abstract
Introduction: Ménière's disease is characterised by vertigo, hearing loss and tinnitus. Various studies assess the problem of vertigo and audition deficit in Ménière's disease, but only a few of these relate to the clinical characteristics of tinnitus, the aim of this study.
Material and methods: A transversal descriptive study of the behaviour of tinnitus in 88 patients in different stages of Ménière's disease treated in a tertiary hospital was carried out. The different characteristics of disease were analysed: intensity was evaluated with an analogue-visual scale, subjective tonality through tonal shade references, the impact on the patient's quality of life was tested by a self-appraisal questionnaire, and competence level was evaluated with the Tinnitus Handicap Inventory. Epidemiologic factors, personal records, hearing thresholds and evolution in the number of vertiginous crises in the previous six months were also taken into account.
Results: The average time of evolution of the disease was 15.4 years. The results evidence the development of tinnitus of moderate intensity (5/10) and low frequency (46%), with a slight impact on quality of life. Worsening in the quality of life related to hearing affectation and/or advanced stages of the disease was also observed. We identified high frequency tonality, a medical record of depression and youth as unfavourable prognostic factors. There was no relationship found with the years of evolution of the disease or with the number of vertigo crises.
Conclusion: In large samples of long evolution Ménière's disease, patients do not perceive tinnitus as a problem that produces serious impairment in their quality of life.

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PALABRAS CLAVE
Enfermedad de Ménière;
Acúfeno;
Tinnitus Handicap Inventory;
Calidad de vida

Comportamiento del acúfeno en la enfermedad de Ménière

Resumen
Introducción: La enfermedad de Ménière se caracteriza por vértigo, hipoacusia y acúfeno. Existen diversos estudios sobre la evolución del vértigo y la audición pero son escasos los referidos al comportamiento del acúfeno, siendo éste el objetivo de nuestro estudio.
Métodos: Se realiza, en un hospital terciario, un estudio descriptivo transversal sobre el comportamiento del acúfeno en 88 pacientes con enfermedad de Ménière que se encontraban en distinta fase de la enfermedad. Analizamos las características del mismo: la intensidad con una escala analógico-visual, la tonalidad subjetiva con referencias tonales, la repercusión sobre su calidad de vida con un cuestionario de autoevaluación, y el nivel de incapacitación con el test Tinnitus Handicap Inventory. Se valoran también factores epidemiológicos, antecedentes personales, umbral de audición y evolución de las crisis vertiginosas en los últimos 6 meses.
Resultados: El promedio de años de evolución de la enfermedad fue 15,4 años. Se evidenció un acúfeno de intensidad moderada (5/10), con una leve repercusión en la calidad de vida y de frecuencia predominantemente grave (46%). Se observó un empeoramiento en la calidad de vida en relación con la afectación auditiva y/o estadio de la enfermedad. Factores de mal pronóstico fueron la tonalidad aguda, antecedentes de depresión y la corta edad. No encontramos relación con los años de evolución de la enfermedad ni con las crisis de vértigo.
Conclusión: En muestras grandes, y con largo tiempo de evolución, el acúfeno no es considerado por los pacientes con enfermedad de Ménière como un problema que repercuta de forma importante en su calidad de vida.

Introduction

Based on the criteria of the American Academy of Otolaryngology-Head and Neck Surgery (AAO-HNS'95),[1] Ménière's disease (MD) consists of recurrent episodes of spontaneous vertigo, fluctuating sensorineural hearing loss and tinnitus or sensation of aural fullness, all with specific characteristics. The time of onset of the symptoms is variable; it is frequent for the full triad not to be present in the early stages.[2]

Vertigo is the symptom that most often occurs first, both isolated and associated,[3] tending to decrease with evolution.[4] Hypoacusis increased over time, being fluctuating, sensorineural and predominantly at low frequencies.[5,6] Tinnitus becomes one of the greatest challenges in the management of MD, given the limited information available about it and its tendency to increase in intensity over time. When the vertigo of a patient with MD improves, tinnitus normally becomes worse as attention is focused on it.[7]

The relationship between tinnitus intensity and hearing loss level has been described previously, as has the bilateral nature of MD and its years of evolution.[6,7] In general, patients with MD present more severe tinnitus than those with other aetiologies.[8] They are found in a frequency range between 125 and 250 Hz,[9] unlike the rest of tinnitus, which are normally located above 3,000 Hz.

Tinnitus may sometimes be the most disabling symptom of MD,[10] becoming associated with anxiety and depression.[11] The Tinnitus Handicap Inventory (THI) adapted to Spanish has proven to be valid and reliable in evaluating the degree of disability caused by tinnitus.[12] This test assesses functional, emotional and catastrophic subscales produced by tinnitus in the lives of patients. The level of disability is classified into four grades according to the score obtained on the test.

The aim of our work was to study the behaviour of tinnitus in a sample of patients with MD at different stages of evolution and to consider whether tinnitus is influenced by various factors.

Material and methods

Type of study: transversal descriptive study.

Material: 88 patients, 53 men and 35 women, obtained randomly from a clinical MD management program in a tertiary hospital. To be included in the study, patients were required to meet the criteria published by the AAO-HNS'95 for definitive MD and to present tinnitus at the time of data collection.

Method: data were obtained through a questionnaire that patients completed in a room adjacent to the clinic; the patients were informed that they could ask an ENT doctor any questions desired. The following were collected: 1) demographic data and profession, including professional noise contamination; 2) relevant medical history: cardiovascular, neurological, psychiatric and otologic; 3) factors occurring in the last 15 days that might influence

the tinnitus: consumption of ototoxics, noisy or stressful events, dizzy spells and migraine; and d) MD data: years of evolution, number and type of vertigo crises, considering[4]: type I (<20 min), type II (between 20 min and 2 h), type III (between 2 and 6hours) and type IV (>6 hours) in the last 6 months, hearing thresholds being established by a tone audiometry performed at the time of the interview. According to AAO rules, the mean hearing threshold at frequencies 500 to 3,000 Hz were used to stage MD: stage 1 (=25 dB), stage 2 (26-40 dB), stage 3 (41-70 dB), stage 4 (>70 dB).

To assess the intensity of tinnitus, we used a visual analogue scale (VAS) graded from 0 (absent) to 10 (unbearable). Subjective tinnitus pitch was assessed with tonal references (reproduction of sounds with different frequencies) and was classified as acute, severe and complex (containing various tones). The disability caused in the patient was analysed using the validated Spanish THI, which ranks results into four grades: no disability, mild disability, moderate disability and severe disability. The impact of tinnitus on quality of life was measured with a self-assessment questionnaire (SAQ) with five options (1: *no impact,* 2: *little,* 3: *moderate,* 4: *strong,* and 5: *serious impact*).

Finally, patients were asked the closed question on which of the three MD symptoms they considered as the worst; vertigo, hearing loss or tinnitus.

Statistical analysis: data obtained were analysed using SPSS 16.0. Various statistical tests for each type of variable were utilised: Student t test, Mann-Whitney U test, ANOVA test, Kruskal-Wallis test.

Table 1 Relationship of personal history presented in the sample

History	No. (%)
LDL	15 (17)
TGC	5 (5.7)
DM	13 (14.8)
HT	31 (35.2)
Migraines	10 (11.4)
Depression	19 (21.6)
Anxiety	18 (20.5)

DM indicates diabetes mellitus; HT, hypertension; LDL, low density lipoprotein; No., number of patients; TGC, triglycerides.

Table 2 List of exacerbating factors in the previous 15 days

History	No. (%)
Migraine	7 (8)
Stress	9 (10.2)
Aminoglycosides	0 (0)
ASA	8 (9.1)

ASA indicates acetyl salicylic acid, No., number of patients.

Results

Of the 88 patients included in the study, 53 (60.3%) were men and 35 (39.7%), women. The mean age of 61 years (Standard deviation [SD] 11.2 years; range, 26-82 years).

The ratio of personal history data in the sample studied is shown in Table 1, without any profession standing out.

In the 15 days prior to the visit, the mean number of vertigo spells suffered by patients was 0.08 (SD 0.31; range, 0-2). The events that may have influenced tinnitus are reflected in Table 2.

The mean duration of illness was 15.5 years (SD 9.6). The mean stage was 3.3 (SD 9.7), which places the sample studied at a hearing threshold between 41 and 70 dB. The mean hearing threshold at the frequencies of 250-1,000 Hz was 69.3 dB (SD 27.19), while at frequencies of 2,000-4,000 Hz, it was 68 dB (SD 27.3).

The mean number of vertigo spells in the previous 6 months was 0.81 (SD 2.23). The distribution between the different types is shown in Table 3.

Table 3 Value of the mean number of seizures by their type in the previous 6 months

Type of crises	No. (SD; range)
II	0.38 (1.44; 0-10)
III	0.33 (1.72; 0-15)
IV	0.10 (0.40; 0-3)
Total (II+III+IV)	0.81 (2.23; 0-15)

No., average number of crisis; SD, standard deviation. Type of crises: type I (<20 min), type II (between 20 min and 2 h), type III (between 2 and 6 h), type IV (>6 hours).

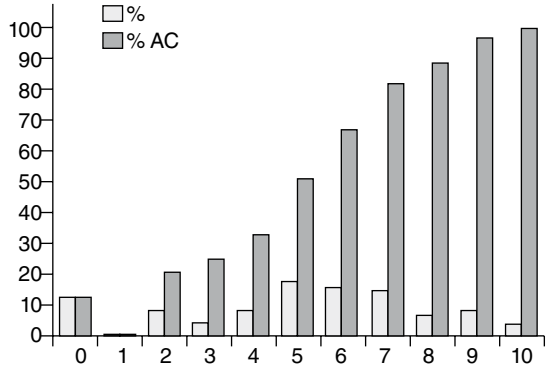

Figure 1 Relationship of proportion of patients according to their score on the VAS and cumulative percentage. %, proportion of patients at each level; % AC, percentage of patients accumulated; VAS, visual analogue scale.

The tinnitus pitch was severe in 39 cases, acute in 35 and complex in 8. In 6 cases, we could not clarify the pitch due to lack of patient cooperation.

The mean value of the VAS was 5.1 (SD: 2.8; range, 0-10). The distribution in the different degrees of intensity is presented in Figure 1. The mean THI value was 31.9 (SD 25.6; range, 0-100), distributed predominantly in the lower levels of disability (Figure 2). The mean impact on quality of life of patients considered in the SAQ (values from 1 to 5) was 2.38 (SD 1.5; range, 0-5), interpreted as low impact.

In all, 69.3% of patients felt that vertigo was the worst of the three symptoms, 18.2% felt it was the hearing loss and 5.7%, tinnitus. Six patients did not respond to this question.

Statistical analysis of all the variables revealed that the relationship between having acute tinnitus and the VAS was statistically significant ($P<.001$), as well as between acute tinnitus and the THI ($P<.001$) and SAQ ($P<.001$). The VAS was also related to the THI ($P<.001$) and the SAQ ($P=.001$) (Table 4).

Neither the VAS nor the pitch had any relationship with gender or age. They were not related to personal history, either. No relationship was found with events in the previous 15 days or with the MD data.

Disability, assessed with the THI, presented significant statistical relationships (Table 4). Although anxiety presented no significant relationships, it was close to having them ($P=.06$). It was not related to gender, occupation, personal history, events in the previous 15 days, number or type of crises, or years of disease progression.

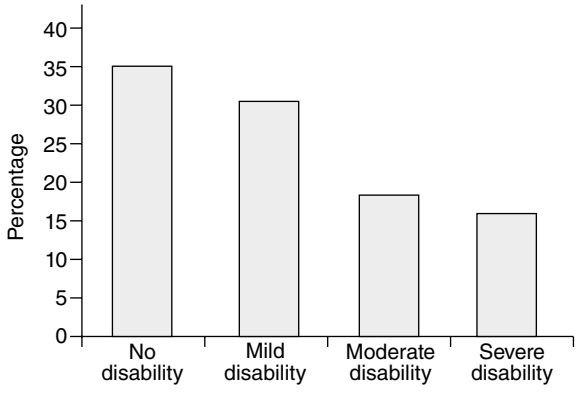

Figure 2 List of patients at each level of THI according to their score.

The SAQ was associated, in addition to the above variables, with a history of depression ($P=.05$) and with MD stage ($P=.003$).

Discussion

Tinnitus is a common symptom in the population. Fortunately, most patients get used to it but, in some cases, it can influence their quality of life significantly. In the case of MD, diagnosing it requires the presence of tinnitus/ear pressure, based on the widely accepted AAO standards. However, most published studies focus on hearing loss or vertigo, with those relating to tinnitus being much less frequent.[6,10,13]

Our study, conducted in a large group of patients, evaluates MS-specific factors that may influence the severity of tinnitus (MS stage, evolution, level of hearing loss, frequency and type of vertigo crises), and factors dependent on the patient's environment or even on the influence of the patient himself (occupation, age, gender, cardiovascular or psychological risk factors, recent administration of ototoxic drugs, stress,[14] etc.). Like other authors, we have used questionnaires and visual analogue scales that provide enough guidance about the tinnitus pitch and the subjective intensity of the tinnitus, (which may be more representative than the feeling it causes in the patient).[10] To assess the disability caused by tinnitus in emotional, functional, and catastrophic areas of the subject, the THI, a widely used test for this purpose was administered.[15] Unlike other studies, a SAQ on the impact of tinnitus on quality of life was introduced.

Neither gender nor age affected the VAS or the SAQ. There was an inverse relationship between patient age and THI, probably because the patient adjusted to tinnitus over the course of time. Out of all personal histories studied, depression was the only factor with a statistical relationship to THI, a fact also observed by other authors.[6] In considering whether recent stressful events in the patient's life affected the results, no relationship was observed. However, we believe that this factor does not have enough statistical weight because only 10% of cases indicated having recent stress.

Unlike other authors, we observed no relationship between the evolution of MD and the VAS.[10] However, a relation of the stage of the disease with the THI was found. By relying on the stage level of hearing loss, it is logical to assume that a higher level of cochlear involvement may

Table 4 Relationship between statistically-significant variables

	VAS	THI	SAQ	Age	Depression	Stage
Acute	<0.001	<0.001	<0.001	—	—	—
VAS	—	<0.001	<0.001	—	—	—
THI	<0.001	—	<0.001	0.01(Rho-0.26)	0.02	0.002
SAQ	<0.001	<0.001	—	—	0.05	0.003

SAQ indicates self-assessment questionnaire; THI, Tinnitus Handicap Inventory; VAS, visual analogue scale.

cause worse tinnitus. In addition, the masking effect of ambient noise on the tinnitus will be less if the patient has worse hearing. Coinciding with other studies,[6,10] we have not observed a relationship between the frequency of vertigo spells in the previous months and evaluating the patient and the severity of tinnitus. In contrast to other studies, we have also assessed the influence of crises types according to their duration and have not obtained a significant relationship. It is possible that cochlear involvement may evolve independently of vestibular.[16]

It should be noted that a significant relationship was observed between VAS and THI and SAQ. This could mean that the more intensely patients perceive tinnitus, the more it limits their activities and the more impact it has on their quality of life.

We noted, as Herraiz et al did, that tinnitus of a severe pitch was more frequent, but that patients were less tolerant of the acute pitch tinnitus.

In the sample studied, the impact on quality of life (SAQ) caused by tinnitus on the average patient was low. When patients were asked which the 3 symptoms of the disease they tolerated the least, they considered it to be the vertigo crises. However, the study of Herrera et al noted that it was tinnitus. This was possibly because, as the authors indicate, their work was carried out at a clinic specialising in the study of tinnitus and received the most severe cases.

Conclusions

In large samples and with a long evolution, tinnitus is not considered by patients as a problem with a major impact on their quality of life. Low-tone tinnitus was predominant but acute tinnitus was tolerated worse.

The perception of discomfort due to tinnitus or the disability referred by patients was related to the stage of MD and was not related to years of disease progression or to the frequency of vertigo crises.

The majority of patients considered vertigo crises to be worse than tinnitus.

References

1. Committee on Hearing and Equilibrium guidelines for the diagnosis and evaluation of therapy in Ménière's disease. American Academy of Otolaryngology-Head and Neck Foundation Inc. Otolaryngol Head Neck Surg. 1995;113:181-5.
2. Sajjadi H, Paparella M. Ménière'disease. Lancet. 2008;372: 406-14.
3. Friberg U, Stahle J, Svedberg A. The natural course of Ménière's disease. Acta Otolaryngol Suppl. 1984;406:72-7.
4. Pérez Garríguez H, López J, Pérez P, Sanz R. Time course of episodes of definitive vertigo in Ménière's disease. Arch Otolaryngol Head Neck Surg. 2008;134:1149-54.
5. Söderman AC, Bagger-Sjoback D, Bergenius J, Langius A. Factors influencing quality of live in patients with Meniere's disease, identified by a multidimensional appoach. Otol Neurotol. 2002;23:941-8.
6. Havia M, Kentala E. Hearing loss and tinnitus in Ménière's disease. Auris Nasus Larynx. 2002;29:115-9.
7. Vernon J, Johnson R, Scheuning A. The characteristics and natural history of tinnitus in Meniere's disease. Otolaryngol Clin North Am. 1980;13:611-9.
8. Stouffer JL, Tyler RS. Characterisation of tinnitus by tinnitus patients. J Speech Hear Disord. 1990;55:439-53.
9. Douek E, Reid J. The diagnostic value of tinnitus pitch. J Laryngol Otol. 1968;82:1029-42.
10. Herráiz C, Tapia C, Plaza G. Tinnitus and Ménière's disease: characteristics and prognosis in a tinnitus clinic simple. Eur Arch Otorhinolaryngol. 2006;263:504-9.
11. Erlandsson SI, Eriksson-Mangold M, Wiberg A. Meniere's disease: trauma, distress and adaptation studied through focus interview analyses. Scand Audiol Suppl. 1996;43:45-56.
12. Herráiz C, Hernández J, Plaza G. Evaluación de la incapacidad en pacientes con acúfenos. Acta Otorrinolaringol Esp. 2001;52: 534-8.
13. Kentala E. Characteristics of six otologic diseases involving vertigo. Am J Otol. 1996;17:883-92.
14. Söderman AC, Möller J, Bagger-Sjöbäck D, Bergenius J, Hallqvist J. Stress as a trigger of attacks in Menière's disease. A case-crossover study. Laryngoscope. 2004;114:1843-8.
15. Baguley DM, Humphriss RL, Hodgson CA. Convergent validity of the tinnitus handicap inventory and the tinnitus questionnaire. J Laryngol Otol. 2000;114:840-3.
16. Belinchon A. Evolución natural de la enfermedad de Meniere. Tesis doctoral. Universidad de Valencia: 2009.