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ORIGINAL ARTICLE

Cochleovestibular Dysfunction in Patients With Diabetes Mellitus, Hypertension, and Dyslipidemia☆

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Prevention;
Vertigo;
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Abstract
Introduction and objective: Polygenic or multifactorial inheritance of chronic disorders (MICDs) contributes to irreversible cochleovestibular impairment. Our aim was to determine the type and degree of cochleovestibular dysfunction (CVD) in patients with MICD.
Methods: Cross-sectional. We studied 385 patients with type 2 diabetes mellitus, systemic arterial hypertension and dyslipidemia who were referred to Otorhinolaryngology Unit with hearing and vestibular symptoms. The auditory function was evaluated using conventional tonal audiometry and the vestibular function by electronystagmography. Duration of the disease and number of comorbidities, hearing thresholds at 125–8000 Hz pure tones, speech audiometry, oculomotor evaluation, and thermal caloric tests were also analyzed.
Results: A total of 66.7% (95% CI, 61.8–73.4) of patients had 1 comorbidity; 27.7% (95% CI, 23.3–32.5) had 2 and 5.4% (95% CI, 3.4–8.2) had systemic arterial hypertension, diabetes mellitus, and dyslipidemia. The mean age was 62 years (SD 12.9) and 57.1% were women. The majority showed obesity, physical inactivity and smoking (77.4%; 95% CI, 72.8–81.4). Cochlear dysfunction was more common than CVD (98.9%; 95% CI, 97.3–99.7 versus 36.1%; 95% CI, 31.2–41.1; P=.001). However, the presence of CVD was significant in patients over 60 years (χ^2_{tend}, $P \leq .001$, odds ratio: 6.43) and with MICD ≥11 years old (χ^2_{tend}, $P \leq .001$, odds ratio: 4.57).

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Conclusions: Cochlear dysfunction occurs in patients with MICD and the impact is greater than that of vestibular dysfunction. However, the age factor, duration and number of MICDs contribute to CVD. It is necessary to act on the MICDs and lifestyles to improve CVD.

PALABRAS CLAVE
Prevención;
Vértigo;
Hipoacusia;
Enfermedades crónicas de herencia compleja o poligénicas

Disfuncion cócleo-vestibular en pacientes con diabetes mellitus, hipertensión arterial sistémica y dislipidemia

Resumen
Introducción y objetivo: Las enfermedades crónicas de herencia compleja o poligénicas (ECHC) contribuyen al deterioro irreversible cócleo-vestibular. Se determino el tipo y grado de disfunción cócleo-vestibular (DCV) en pacientes con ECHC.
Métodos: Estudio transversal. Se incluyeron 385 pacientes con diabetes mellitus tipo 2, hipertensión arterial sistémica y dislipidemia que acudieron a otorrinolaringología con síntomas auditivos y vestibulares. La función auditiva se evaluó mediante audiometría tonal convencional y la vestibular por electronistagmografía. Se registró antigüedad y número de comorbilidades, umbrales auditivos (125 Hz a 8.000 Hz), logoaudiometría, evaluación oculomotora y pruebas térmicas.
Resultados: El 66,7% (IC95%,61,8 a 71,4) de los pacientes tuvieron un comórbido; 27,7% (IC95% 23,3 a 32,5) dos y 5,4%(IC95% 3,4 a 8,2) hipertensión arterial sistémica, diabetes mellitus y dislipidemia. La edad promedio fue de 62 años (DE 12,9) y 56,1% fueron mujeres. La mayoría presentaron obesidad, sedentarismo y tabaquismo (77,4%, IC95%: 72,8 a 81,4). La disfunción coclear fue más frecuente que la DCV (98,9%, IC95%: 97,3 a 99,7 frente a 36,1%, IC95%: 31,2 a 41,1, p = 0,001). Sin embargo, la presencia de DCV fue significativa en pacientes mayores de 60 años (χ^2_{tend}, $p \leq 0{,}001$, *odds ratio*: 6,43) y con antigüedad de ECHC ≥ 11 años (χ^2_{tend} $p \leq 0{,}001$, *odds ratio*: 4,57).
Conclusiones: La disfunción coclear ocurre en pacientes con ECHC y el impacto es mayor que el de la disfunción vestibular. Sin embargo, el factor edad, la antigüedad y el número de ECHC contribuyen a la DCV. Es necesario actuar sobre las ECHC y estilos de vida para mejorar la DCV.

Introduction

The importance of polygenic or multifactorial inheritance chronic disorders (MICDs) is illustrated by the level of disability caused by micro- and macrovascular damage occurring at different levels of the organism and by increasing rates of mortality.[1] It has recently been established that systemic arterial hypertension (SAH), diabetes mellitus type 2 (DM-2) and dyslipidemia comprise a group of complex genetic disorders (MICDs) which develop through the interaction of environmental and epigenetic factors on the genome of individuals with susceptible allelic variants.[2–6] In Mexico, they represent a public health problem[7] and for the World Health Organization (WHO) addressing this MICD epidemic has been one of the main challenges of the 21st century.[8] MICD contribute to irreversible cochleovestibular and neurological damage; in most cases, functional alterations go unnoticed, are undervalued, underestimated and cause severe disability.[9–11] The most severe symptoms are caused by vestibular dysfunction, which generates disability for social and physical activities and an impairment of quality of life.[12]

Since 1857, an increasing number of experimental studies and clinical trials have offered morphological evidence of cochleovestibular dysfunction (CVD) in the presence of high blood pressure levels, glucose metabolism disorders and elevated lipid levels.[9,13,14] Using ultrastructural studies, Tachibana et al. showed that the site of primary lesion by SAH was the stria vascularis of the cochlea, followed by the Corti body.[14] In diabetic rats, Perez et al. found alterations in latency and amplitude of the first wave of the vestibular evoked potential, involved in vestibular function.[13] Likewise, other studies have shown several pathophysiological mechanisms to explain CVD in these diseases. Among the more significant are an increase in blood viscosity, which subsequently reduces cochleovestibular supply and leads to tissue hypoxia, cellular ionic alterations, which accelerate cochleovestibular degeneration, and abnormalities in the cerebral cortex, which are associated with diffuse microangiopathies affecting the neural sheath of peripheral nerves.[9,15] It has also been observed that MICD carriers present bilateral cochlear dysfunction (CD), with a progressive course and affecting high frequencies, similar to the auditory pattern of presbycusis, but with a more severe CD than expected due to age.[9,15] However, other studies have not found an association between CVD and MICD and offer conflicting and imprecise results.[16,17]

There are few studies evaluating CVD in MICD. Recently, an estimation of CD was conducted on the population of Guadalajara, Jalisco, Mexico. This study found that so-called mixed cochleopathy ranked second in frequency among hearing impairments, probably due to a vascular or metabolic factor. However, it also revealed limitations in vestibular symptoms and characteristics of MICD.[18] Taking