



Brazilian Journal of
OTORHINOLARYNGOLOGY

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ORIGINAL ARTICLE

The relationship between senile hearing loss and vestibular activity[☆]

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Received 18 September 2015; accepted 12 November 2015

KEYWORDS

Sensorineural hearing loss;
Vestibular dysfunction;
Pure tone audiometry;
Vestibular evoked myogenic potentials

Abstract

Introduction: A considerable high number of SNHL patients also suffer from dizziness and related vestibular symptoms.

Objective: To evaluate the association of vestibular dysfunction and sensorineural hearing loss (SNHL) in adult patients.

Methods: Prospective, double-blinded, controlled studies composed by 63 adult patients without any vestibular symptoms or diagnosed vestibular diseases. Audiological status was measured with pure tone audiometry and the vestibular system was tested with vestibular evoked myogenic potential (VEMP). Patients were divided into two groups: a study group (patients with SNHL) and a control group (patients without SNHL). VEMP results of the groups were calculated and compared.

Results: Mean P1 (23.54) and N1 (30.70) latencies were prolonged in the study group ($p < 0.001$) and the amplitudes of the study group were significantly reduced ($p < 0.001$). Both parameters of the VEMP test were abnormal in the study group when compared to the control group.

Conclusions: These findings suggest that age-related SNHL may be accompanied by vestibular weakness without any possible predisposing factors for vestibulopathy.

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[☆] Please cite this article as: Kurtaran H, Acar B, Ocak E, Mirici E. The relationship between senile hearing loss and vestibular activity. Braz J Otorhinolaryngol. 2016. <http://dx.doi.org/10.1016/j.bjorl.2015.11.016>

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PALAVRAS-CHAVE

Perda auditiva
neurosensorial;
Disfunção vestibular;
Audiometria tonal;
Potenciais evocados
miogênicos
vestibulares

Relação entre perda auditiva senil e atividade vestibular**Resumo**

Introdução: Um número considerável de pacientes com PANS também sofre de tonturas e sintomas vestibulares relacionados.

Objetivo: Avaliar a associação entre disfunção vestibular e perda auditiva neurosensorial (PANS) em pacientes adultos.

Método: Estudo prospectivo, duplo-cego e controlado com 63 pacientes adultos, sem quaisquer sintomas vestibulares ou doença vestibular diagnosticada. A audição foi avaliada por meio de audiometria tonal e o sistema vestibular, com potenciais evocados miogênicos vestibulares (PEMV). Os pacientes foram divididos em dois grupos: grupo de estudo (pacientes com PANS) e grupo de controle (pacientes sem PANS). Os resultados dos PEMV dos grupos foram calculados e comparados.

Resultados: As latências médias de P1 (23,54) e N1 (30,70) encontravam-se prolongadas no grupo de estudo ($p < 0,001$), e as amplitudes no grupo de estudo estavam significativamente reduzidas ($p < 0,001$). Ambos os parâmetros do teste de PEMV foram anormais no grupo de estudo quando comparados aos do grupo controle.

Conclusões: Nossas achados sugerem que a PANS relacionada à idade pode ser acompanhada por hipofunção vestibular, mesmo na ausência de possíveis fatores predisponentes para vestibulopatia.

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Introduction

Sensorineural hearing loss (SNHL) is the most common type of sensorial deficiency, affecting over 360 million people across the globe, and it is considered a public health problem regardless of the etiology.¹ A considerable high number of SNHL patients also suffer from dizziness and related vestibular symptoms. A relationship is therefore highly possible between SNHL and vestibular dysfunction, in the absence of evidences of any inner ear or systemic diseases that could cause vestibulopathy. Many patients present to otolaryngology clinics with dizziness and hearing loss problems with no obvious pathology and are diagnosed with presbycusis or age-related vestibulopathy.

This study aims to evaluate the relationship between the substructures of the vestibular system and the hearing organs with the same embryological origin. Pathologies affecting one subside of the inner ear may therefore cause a dysfunction in the parts with the same embryological origin. From this point forth we investigated the saccule as a part of the vestibular system using the Vestibular Evoked Myogenic Potentials (VEMP) as it is one of the most accurate and practical ways to assess the integrity and function of the saccule and inferior vestibular nerve. The principle of this diagnostic toolshed results from the selective activation of vestibular nerve afferents innervating the saccule. Cervical VEMP responses are recorded with Electromyography (EMG) of the Sternocleidomastoid (SCM) muscle after the onset of a click stimulus to the external ear canal.² It is a biphasic response that evaluates the sacculocollic reflex.

The number of relevant studies is limited as case reports constitute the vast majority of these papers. This lack of data motivated us to search and seek for more knowledge

about these indistinct patients. In this study, we investigated the relationship between SNHL and vestibular dysfunction in adults based on the hypothesis that the malfunction in one subside, may affect the parts of vestibular and hearing system with the same embryological origin.

Methods

A prospective, double-blinded, controlled study was conducted on adult patients. The study group consisted of patients admitted in our institute with a hearing loss complaint, diagnosed with bilateral moderate to severe SNHL. A control group with similar demographic features was formed by healthy individuals without hearing loss. Patients with mixed types of hearing loss, external ear canal pathologies, perforated tympanic membrane, abnormal middle ear functions, any kind of vascular or diagnosed neurological diseases, confirmed peripheral vestibular diseases, or a history of otologic or lateral skull base surgery were excluded.

Pure Tone Audiometry (PTA) was evaluated using an AD629 Interacoustics® (Denmark, 2012) device in a sound proof room to screen the hearing status of each participant for the frequencies 250–8000 Hz. A pure tone threshold in the range of 41–60 dB HL was considered as moderate and 61–80 dB HL as severe SNHL.³ Middle ear functions were evaluated by tympanometry and acoustic reflex testing.

Saccular function was tested by VEMP. Brief broadband clicks of 0.1 msn were used as stimulant and a surface EMG of the SCM muscle was recorded. The non-inverting electrode was placed on the upper third of the muscle and the inverting electrode was placed over the SCM tendon above the clavícula. The patients were positioned upright

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