



ORIGINAL ARTICLE

Evaluation of postural control in unilateral vestibular hypofunction^{☆,☆☆}



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Received 24 September 2013; accepted 15 February 2014

Available online 11 June 2014

KEYWORDS

Postural balance;
Vestibular function tests;
Physiological nystagmus;
Vestibular diseases

Abstract

Introduction: Patients with vestibular hypofunction, a typical finding in peripheral vestibular disorders, show body balance alterations.

Objective: To evaluate the postural control of patients with vertigo and unilateral vestibular hypofunction.

Method: This is a clinical cross-sectional study. Twenty-five patients with vertigo and unilateral vestibular hypofunction and a homogeneous control group consisting of 32 healthy individuals were submitted to a neurotological evaluation including the Tetrax Interactive Balance System posturography in eight different sensory conditions.

Results: For different positions, vertiginous patients with unilateral vestibular hypofunction showed significantly higher values of general stability index, weight distribution index, right/left and tool/heel synchronizations, Fourier transformation index and fall index than controls.

Conclusion: Increased values in the indices of weight distribution, right/left and tool/heel synchronizations, Fourier transformation and fall risk characterize the impairment of postural control in patients with vertigo and unilateral vestibular hypofunction.

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[☆] Please cite this article as: Quitschal RM, Fukunaga JY, Ganança MM, Caovilla HH. Evaluation of postural control in unilateral vestibular hypofunction. Braz J Otorhinolaryngol. 2014;80:339–45.

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PALAVRAS-CHAVE

Equilíbrio postural;
Testes de função
vestibular;
Nistagmo fisiológico;
Doenças vestibulares

Avaliação do controle postural na hipofunção vestibular unilateral**Resumo**

Introdução: Pacientes com hipofunção vestibular, achado típico em vestibulopatias periféricas, apresentam alterações de equilíbrio corporal.

Objetivo: Avaliar o controle postural de pacientes vertiginosos com hipofunção vestibular unilateral.

Método: Trata-se de um estudo clínico transversal. No total, 25 pacientes vertiginosos com hipofunção vestibular unilateral e um grupo controle homogêneo de 32 indivíduos hígidos foram submetidos à avaliação otoneurológica, incluindo a posturografia do *Tetrax Interactive Balance System* em oito diferentes condições sensoriais.

Resultados: O grupo experimental apresentou valores significativamente maiores do que o grupo controle quanto ao índice de estabilidade geral, índice de distribuição de peso, índice de sincronização da oscilação postural direita/esquerda e dedos/calcanhar, faixas de frequência de oscilação postural (F1, F2–F4, F5–F6, F7–F8) e índice de risco de queda, em diferentes condições sensoriais.

Conclusão: Alterações de distribuição de peso, sincronização da oscilação postural direita/esquerda e dedos/calcanhares, faixas de frequência de oscilação postural e do índice de risco de queda caracterizam o comprometimento do controle postural em pacientes vertiginosos com hipofunção vestibular unilateral.

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Introduction

One of the most important tasks of the human postural control system is the body balance on the small support base provided by the feet. The vestibular system, as a gravity sensor, is one of the main tools of the nervous system for the control of posture and balance when a person is standing and during locomotion. The difficulty to perceive movement, orient oneself vertically, control the position of the center of mass and stabilize the head result in gait and balance impairment.¹

Problems of vestibular origin account for approximately 50% of the cases of body balance disorders, with dizziness being one of the most frequent complaints in specialized clinical offices. Thus, there is a strong impetus to evaluate labyrinthine function and identify possible vestibular lesions responsible for body balance impairment.²

The diseases that compromise the vestibular system are called vestibulopathies; peripheral ones comprise disorders of the inner ear (labyrinth) and/or the vestibular branch of the eighth cranial nerve; the central ones involve central nervous system vestibular nuclei, pathways and interconnections. The vestibulopathies are considered primary when they are the result of vestibular system structure dysfunction; and secondary when they are associated with clinical manifestations originating from other parts of the human body.³

The instability and postural imbalances of individuals with vestibular dysfunction usually manifest as increased body sway in situations of visual and somatosensory conflict, reduced stability threshold and functional capacity, a shifted gait and falls.⁴

A fall, the main result of postural imbalance, is a result of multiple factors. It can be defined as an unintentional

displacement of the body to a level below the initial position due to an incapacity to promptly correct posture.⁵

Many neurotological evaluation methods have been developed to study body balance; the most commonly used procedures are the electronystagmography (ENG) and vecto-electronystagmography (VNG). Vestibular assessment performed with ENG or VNG is useful to substantiate or eliminate the diagnosis of vestibular involvement, locate the lesion at peripheral, central or a mixed level, establish the lesion prognosis, guide therapy and monitor evolution.⁶

The vestibular function tests can assess postural stability (vestibulospinal reflex or VSR) and vestibulo-ocular reflex (VOR); VOR is the primary control system for visual stabilization during locomotion and disturbances in this reflex result in dizziness and other symptoms of the loss of body balance.⁷

The evaluation of the VOR is insufficient to assess vestibular function as a whole. Although this reflex is essential for the body's angular displacement, the vestibulospinal reflex (VSR), visual and somatosensory information and sensory integration in the brain stem, actively participate in maintaining body balance, thus demonstrating the importance of a diagnostic method to assess this information.²

In clinical practice, postural stability is commonly assessed qualitatively by observing the static and dynamic balance. A quantitative evaluation can be performed using a posturography device consisting of a sensitive force platform that provides information about the patient's body sway.

Posturography measures the body sway and the variables associated with this sway. Posturography can be static, when it evaluates the subject's standing posture; and dynamic, when it measures the response to a disturbance applied to the subject.⁸

The posturography of the Tetrax Interactive Balance System (Tetrax™) is a diagnostic device developed by Reuven

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