

Vector Electronystagmography Analysis in Elderly Individuals with Dizziness Complaint

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Int Arch Otorhinolaryngol 2013;17:380–382.

Abstract

Introduction Vector electronystagmography is widely used to evaluate vestibular function; however, elderly patients may show changes not due to vestibular disorders.

Aim This study aims to characterize vector electronystagmography tests in the elderly participants in a service station of the Brazilian public health system, the Unified Health System (SUS) in the city of Natal, who presented with dizziness.

Methods A cross-sectional and clinical study to characterize the vector electronystagmography in 10 members of an elderly SUS referral center located in the city of Natal with dizziness.

Results Of 10 patients interviewed, 9 were women, and just 1 was a man. All complained of dizziness in the last year, and most of them had more than one type of dizziness. The main differential diagnosis was benign paroxysmal positional vertigo. Regarding vector electronystagmography, we found 20% of patients with semispontaneous nystagmus in at least one direction and changes in saccades latency in 100% of patients, with 20% in relation to the accuracy of pendular tracking changes at the frequency of 0.2 Hz, 10% at 0.4 Hz, and 80% at 0.8 Hz, and 10% change in optokinetic gain. No patient had altered caloric test.

Conclusion Vector electronystagmography alterations in the elderly do not always indicate disease.

Keywords

- ▶ aged
- ▶ dizziness
- ▶ medical examination

Introduction

Vestibular dysfunction, or vestibulopathy, comprises disorders of the vestibular system in the peripheral (labyrinth or cochlear nerve) and/or central (nuclei, pathways, and central nervous system interrelationships). When the condition is determined by impairment of the inner ear (labyrinth), it is called *labyrinthopathy*.¹

Among the elderly with chronic vestibular disease, 53.3% fall every year,² and vertigo is the most common cause, occurring in 25% of episodes.³ It is important to remember that polypharmacotherapy, for various pathologies, also can cause falls among the elderly, either by side effects of drugs (hypotension, sedation, confusion, altered motor reflexes) or by its associations.⁴

received
January 10, 2013
accepted
June 25, 2013

Copyright © 2013 by Thieme Publicações Ltda, Rio de Janeiro, Brazil
DOI <http://dx.doi.org/10.1055/s-0033-1353139>.
ISSN 1809-9777.

Being multifactorial and closely related to systemic changes and to the patient's habits (drinking, smoking, stimulant use, or hyperkalemic diet), vestibulopathy is difficult to diagnose; it is often diagnosed by exclusion, and therefore treatment is difficult. Accurate diagnosis is not always achieved, and only the syndromic diagnosis will guide clinical practice.

Clinically, there are several ways to detect the imbalance and seek its causes to prevent complications such as falls. Vertigo is evaluated by anamnesis and otoneurologic clinical exam (with evaluation of the cranial nerves, cerebellum, and static and dynamic balance), laboratory tests (such as biochemical tests), audiological tests (audiometry, immittance, otoacoustic emissions, and brainstem evoked potentials), vestibular auxiliary exam (vector electronystagmography), and, if necessary, imaging studies (computed tomography and magnetic resonance image). It should be remembered that, depending on the patient's comorbidities, other laboratory tests are needed for diagnosis and/or monitoring of base pathologies.

The vector electronystagmography is a widely used exam in clinical practice; however, it has limitations related to the health condition of the patient (patients too debilitated may not undergo the test), especially the elderly, with their fragility and comorbidities. Moreover, the geriatric patient often presents degeneration of the vestibular, oculomotor, or proprioceptive systems, which generate abnormal results in vector electronystagmography but which in reality do not reflect the pathologic condition but physiology. The objective of this study is to characterize vector electronystagmography exams in elderly participants from a service station of the Brazilian public health system, the Unified Health System (SUS) in the city of Natal, who complain of dizziness.

Methods

A sectional study was conducted to characterize the vector electronystagmography of 10 elderly patients with dizziness. These patients are participants at a SUS referral center located in the city of Natal.

The subjects were chosen at random when questioned for the occurrence of dizziness in the last year. Subjects 60 years or older, with good cognitive level, able to walk without walking aids, and with dizziness complaint in the last year were included. Subjects with decompensated diseases and those who did not have exams by the scheduled date were excluded.

Patients underwent a clinical history and otoneurologic physical examination and then had the vector electronystagmography test.

Equipment used for vector electronystagmography included the computed electronystagmography system and an otoneurologic stimulator e-96 (Contronc, Brazil). The steps of the exam were performed according to criteria proposed by Mangabeira-Albernaz et al⁵: calibration of ocular movements, spontaneous and semispontaneous nystagmus registration, analysis of saccadic movements, analysis of pendular tracking, optokinetic gain, and analysis of pre- and post-caloric test (with water) nystagmus.

Dizziness was classified according to the classification of Drachman and Hart.⁶ Physical examination consisted of otoscopy, evaluation tests of static balance (Romberg and Romberg-Barrè test), dynamic balance (proof of Fukuda and Babinski-Weil), evaluation tests of coordination (finger-nose and finger-nose-finger tests and diadochokinesis), evaluation of spontaneous and semispontaneous nystagmus, evaluation of vestibulo-ocular reflex, dynamic visual acuity, head shake, head impulse, vibration-induced nystagmus, roll test, and Dix-Hallpike maneuver. We also evaluated the cervical region through physiotherapy maneuvers to assess cervical causes for the dizziness. The etiologic diagnosis was made based on this physical examination and blood pressure control, along with the history of comorbidities and medications used.

The study was approved by the Ethics Committee under number 309/2012 of the institution, and all patients signed an informed consent form prior to data collection. It was made a descriptive statistics for data analysis.

Results

Of the 10 patients interviewed, 9 were women and only 1 was a man. All complained of dizziness in the last year, and most of them had more than one type of dizziness (► **Table 1**).

The most common etiologic diagnosis of dizziness was benign paroxysmal positional vertigo (BPPV; ► **Table 2**).

Regarding vector electronystagmography, we found that changes in saccades and pendular tracking were the most common findings, and no patient had abnormal caloric proof (► **Table 3**).

Discussion

The study group consisted of elderly patients with dizziness in the last year, not necessarily vertigo, so we can conclude that not all had labyrinthopathy. This became clear when considering the types of dizziness: several patients had presyncope, floating sensation, and imbalance, which refer, in most cases, to causes of dizziness not associated to the labyrinth. However, in general, vertigo was the most frequent type, alone or combined. This finding is confirmed by the literature,

Table 1 Classification of types of dizziness in elderly individuals

Type of dizziness	Number of patients
Vertigo	1
Disequilibrium	2
Presyncope	1
Floating sensation + presyncope	1
Vertigo + disequilibrium	2
Vertigo + floating sensation	1
Vertigo + floating sensation + presyncope	1
Vertigo + disequilibrium + presyncope	1

Table 2 Etiologic diagnosis of dizziness in elderly individuals

Diagnosis	Number of patients
BPPV	6
Cervical syndrome	2
Cardiovascular alterations	2

Abbreviation: BPPV, benign paroxysmal positional vertigo.

Table 3 Findings in the vector electronystagmography exams of elderly individuals

Semispontaneous nystagmus in at least one direction: 20% of the patients
Changes in saccadic movements: 100% of the patients regarding latency, 20% in relation to the precision
Changes in pendular tracking: 20% in the frequency of 0.2 Hz; 10% in the frequency of 0.4 Hz; 80% in the frequency of 0.8 Hz
Changes in optokinetic gain: 10% of the patients
Changes in caloric proof: 0

in which vertigo is identified as corresponding to 60.2% of cases.⁷

When evaluating the possible causes of dizziness, four patients had nonvestibular causes (two had cervical problems and two, cardiovascular) and most had BPPV, diagnosed by the Dix-Hallpike maneuver. This is a pathology of the labyrinth, with involvement of posterior semicircular canal in most cases.

The vector electronystagmography is a diagnostic test of vestibular disorders; its main stage is the caloric test, which diagnoses lesions of the two labyrinths separately. However, this test is sensitive to changes of the lateral semicircular canals only.

According to our findings, not all patients with BPPV will show changes in the vector electronystagmography, because the topography of the lesion is in different locations from the initial search.

In this study, no patient had abnormal caloric test because we obtained nonvestibular disorders as causes of dizziness, and the only vestibular cause chosen was BPPV, which shows no change in this examination. Felipe et al found normal caloric tests in 72.5% of their elderly patients.⁷

This is reflected in typical changes of electronystagmography in elderly patients, which occur due to degeneration of

the physiologic systems—in other words, caused by oculo-vestibular and neurologic age-related modifications and reduction of response time and reflexes. As such, the results of this study can be generalized to elderly without vestibular disorders.

Gushikem et al in 2003 found abnormal tests in 68% of an elderly group without vestibular disease.⁸ In the sample of this study, 100% had abnormal tests, but it is noteworthy that it was a reduced sample. The change in saccades latency in 100% of the elderly justifies these changes, and it is due to the slowness of oculomotor responses, not exactly to vestibular disorders.

The micrograph was not found in any examination, although this is described in the literature as a common finding in elderly.⁸

Conclusion

Most of the evaluated patients had BPPV as etiologic diagnosis for their dizziness, and the most prevalent alteration observed in the vector electronystagmography was the change in latency of saccades (in 100% of the tests). No patient had altered caloric proof.

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