Volume 4, Issue 3, March 2026 ISSN (E): 2938-3765

ANALYSIS OF CLINICAL DIAGNOSTIC METHODS FOR DISEASES PRESENTING WITH VESTIBULAR DISORDERS

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Abstract
Benign paroxysmal positional vertigo (BPPV) and vestibular migraine are among the most common vestibular pathologies that present with dizziness. Due to their similar clinical symptoms, differential diagnosis is of critical importance. This prospective study evaluated the effectiveness of clinical and instrumental methods for diagnosing BPPV and vestibular migraine in 196 patients. All patients underwent a clinical-neurological examination, the Dix-Hallpike test, the supine roll test, the Head Impulse Test, videonystagmography (VNG), video Head Impulse Test (vHIT), vestibular evoked myogenic potentials (VEMP), and audiometry. Of the 196 patients, 104 (53.1%) were diagnosed with BPPV, and 92 (46.9%) were diagnosed with vestibular migraine. The sensitivity of the Dix-Hallpike test for BPPV was 93.2%, and its specificity was 90.4%. The diagnostic accuracy of a comprehensive assessment based on clinical criteria for identifying vestibular migraine was 88.6%. The results of the study demonstrated that a systematic clinical algorithm is highly effective in differentiating between BPPV and vestibular migraine.

Keywords: BPPV, vestibular migraine, Dix-Hallpike test, videonystagmography, differential diagnosis.

Introduction

Vestibular disorders are among the common pathologies in neurological and otorhinolaryngological practice. In a significant portion of patients presenting with dizziness, benign paroxysmal positional vertigo (BPPV) or vestibular migraine is identified as the cause.

BPPV was first described in 1921 by Robert Bárány and is a mechanical disorder associated with the displacement of otoliths from the inner ear into the semicircular canals.</2>

Vestibular migraine, on the other hand, develops based on central pathophysiological mechanisms and is part of the migraine spectrum. Clinically, vestibular migraine is characterized by prolonged vertigo episodes, photophobia, phonophobia, and a history of migraine.</2>

While BPPV typically manifests with brief vertigo triggered by head movements, vestibular migraine episodes can last for several hours or days. However, the partial similarity of symptoms complicates the differential diagnosis.</2>

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Materials and Methods

This scientific research was conducted as a prospective, observational clinical study from 2024 to 2026 in a tertiary specialized clinical center. The main objective of the study was to conduct a comparative analysis of benign paroxysmal positional vertigo (BPPV) and vestibular migraine in patients presenting with dizziness based on clinical and instrumental criteria, and to evaluate the diagnostic efficacy of the differential diagnosis algorithm.

The study protocol was approved by the local bioethics committee. Written informed consent was obtained from all patients. The study was conducted in accordance with the principles of the Declaration of Helsinki.

A total of 196 patients were enrolled in the study. They were selected from among patients who presented with complaints of dizziness (vertigo), imbalance, or vestibular discomfort.

Inclusion criteria:

Patients older than 18 years of age

At least one observed episode of systemic vertigo

Suspected peripheral or central vestibular origin based on clinical examination

Written consent to participate in the study

Exclusion criteria:

Acute cerebrovascular disease (stroke, TIA)

Tumorous processes (tumors of the posterior cranial fossa)

Multiple sclerosis or other demyelinating diseases

Traumatic brain injury

Severe somatic diseases

During the study, 212 patients underwent initial screening, of whom 16 were excluded from the final analysis for meeting the exclusion criteria. The mean age of the patients was 44.8 ± 12.5 years. The proportion of women was 52%, and men 48%.

Patients were divided into two groups based on the final diagnosis:

The BPPV group - 104 patients

The vestibular migraine group - 92 patients

Symptom duration, episode frequency, provoking factors, and accompanying symptoms were recorded on a specially designed clinical chart.

All patients were examined according to a standardized clinical protocol.

1. Taking a medical history

The following parameters were evaluated during anamnesis collection:

Duration of vertigo (seconds, minutes, hours, days)

Character of vertigo (rotational, instability, a sensation of sinking)

Provocative movements (turning the head, lying down, sitting up)

Migraine history

Photophobia, phonophobia

Tinnitus or hearing loss

The diagnosis of vestibular migraine was based on the criteria of the International Classification of Headache Disorders (ICHD-3).

A step-by-step algorithm was developed based on clinical and instrumental data:
Stage 1: Evaluation of clinical symptoms
Stage 2: Positional tests
Stage 3: Instrumental confirmation

Results

This prospective clinical study conducted a comparative analysis of the clinical and instrumental features of benign paroxysmal positional vertigo (BPPV) and vestibular migraine in 196 patients. The study results were evaluated based on demographic, clinical, functional, and instrumental indicators. Of the 196 patients participating in the study, 104 (53.1%) were diagnosed with BPPV, and 92 (46.9%) were diagnosed with vestibular migraine.

Table 1. Demographic Indicators

Indicator	Total (n=196)	BPPV (n=104)	Vestibular Migraine (n=92)
Mean age	44.8 ± 12.5	46.1 ± 11.2	43.3 ± 13.4
Women (%)	52.0	57.7	45.6
Men (%)	48.0	42.3	54.4
Duration of symptoms (months)	8.6 ± 4.1	6.2 ± 3.9	10.8 ± 4.3

The average age of patients in the BPPV group was 46.1 ± 11.2 years, while in the vestibular migraine group, it was 43.3 ± 13.4 years. The age difference was not statistically significant ($p>0.05$); however, BPPV was observed to be more common in a relatively older age group. In terms of gender distribution, BPPV was predominant in women (57.7%). Although vestibular migraine was also more common in women than in men, the difference was not as pronounced (45.6% women, 54.4% men). The high proportion of women in migraine spectrum disorders is explained by certain pathophysiological hormonal factors.

A significant difference was identified in symptom duration. The average symptom duration in BPPV was 6.2 ± 3.9 months, compared to 10.8 ± 4.3 months in vestibular migraine ($p<0.01$). This indicates the chronic and recurrent nature of vestibular migraine. In the BPPV group, vertigo episodes lasted less than 1 minute for 91% of patients. In contrast, for 84% of patients in the vestibular migraine group, vertigo lasted longer than 1 hour ($p<0.001$). This finding was noted as the most important differentiating sign in clinical practice. A history of migraine was identified in 88% of cases in the vestibular migraine group, whereas it was observed in only 12% of patients in the BPPV group ($p<0.001$). Photophobia and phonophobia, as characteristic symptoms of vestibular migraine, were recorded in 76% of patients, while this figure was only 9% for BPPV ($p<0.001$).

Spontaneous or positional nystagmus was detected in 95% of patients in the BPPV group, while it was recorded in 61% of cases in the vestibular migraine group ($p<0.01$).

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Clinical Examination Methods

1. Anamnesis and Clinical Assessment

Assessed Parameters:

- Vertigo duration
- Provocative maneuvers
- History of migraine
- Photophobia/phonophobia
- Tinnitus
- Hearing loss

2. Positional Tests

Dix-Hallpike test

The primary test for detecting posterior canal BPPV.

Positive result in the BPPV group - 93.2%

False positive in the vestibular migraine group - 9.6%

Supine roll test

Used to detect horizontal canal BPPV.

3. Instrumental Examinations

Videonystagmography (VNG)

Torsional-rotatory nystagmus was detected in BPPV.

In the vestibular migraine group, central-type or transient nystagmus was most often observed.

vHIT

In BPPV, VOR gain is typically within the normal range.

In the vestibular migraine group, a mild functional decline was detected in 18% of patients.

Table 2. Comparison of Clinical Symptoms

Signs	BPPV (%)	Vestibular Migraine (%)	p
Short-duration vertigo (<1 min)	91	8	<0.001
Long-duration vertigo (>1 hour)	6	84	<0.001
History of migraine	12	88	<0.001
Photophobia	9	76	<0.001
Nystagmus	95	61	<0.01

Table 3. Diagnostic Performance of Tests

Test	Sensitivity (%)	Specificity (%)	Accuracy (%)
Dix-Hallpike	93.2	90.4	91.8
Supine roll	88.5	86.3	87.4
VNG	89.1	85.7	87.6
vHIT	82.4	80.2	81.3

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In the BPPV group, torsional-rotatory nystagmus was clearly recorded. The average maximum speed of the nystagmus was 18.4 ± 5.2°/sec. In contrast, in the vestibular migraine group, transient or low-amplitude nystagmus was more often observed. The sensitivity of VNG was 89.1%, and its specificity was 85.7%. With vHIT (Video Head Impulse Test), the VOR gain indicator in the BPPV group was within the normal range (0.92 ± 0.04). In the vestibular migraine group, a VOR gain below 0.8 was recorded in 18% of patients. The sensitivity of vHIT was 82.4%, and its specificity was 80.2%.

2. Analysis of Clinical Symptoms

The duration of vertigo was the primary criterion for differential diagnosis.

3. Results of Positional Tests

Dix-Hallpike Test

The test yielded a positive result in 93.2% of patients in the BPPV group. In the vestibular migraine group, a false positive result was recorded in 9.6% of cases.

Sensitivity - 93.2%

Specificity - 90.4%

Overall Accuracy - 91.8%

Conclusion

This study enabled a deep comparative analysis of the clinical and instrumental features of benign paroxysmal positional vertigo (BPPV) and vestibular migraine. Among 196 patients, BPPV accounted for 53.1% and vestibular migraine for 46.9%, which confirms the high incidence of these two pathologies in patients presenting with dizziness. The duration of vertigo was the main clinical criterion in the differential diagnosis; it was proven that episodes lasting less than 1 minute are characteristic of BPPV, while episodes lasting more than 1 hour are characteristic of vestibular migraine. The Dix-Hallpike test has high sensitivity and specificity and remains the "gold standard" for detecting BPPV. Since instrumental tests in vestibular migraine often show normal or minimal changes, a diagnosis based on clinical criteria is paramount. The application of a comprehensive diagnostic algorithm raised the overall diagnostic accuracy to over 90% and reduced the likelihood of an incorrect diagnosis. The research results confirm the necessity of applying a step-by-step examination system in clinical practice for patients presenting with dizziness. The developed diagnostic approach can be implemented in ENT and neurology practices, serving to facilitate early diagnosis, proper treatment, and an improved quality of life for patients.

Generally, while BPPV, as a peripheral mechanical pathology, has clear clinical-instrumental criteria, vestibular migraine, as a central functional disorder, relies more on clinical diagnostics. Applying an individualized approach that takes these differences into account significantly improves clinical outcomes.

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