



Diagnosis and management of benign paroxysmal positional vertigo

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Abstract

Benign Paroxysmal Positional Vertigo (BPPV) is the most common peripheral vestibular disorder, especially among older adults. It is characterized by sudden, transient episodes of vertigo triggered by specific changes in head position. The underlying mechanism involves dislodged otoconia entering one of the semicircular canals, causing abnormal stimulation of the vestibular system. This review provides a comprehensive overview of the vestibular anatomy, pathophysiology of BPPV, diagnostic methods including the Dix-Hallpike and Supine Roll Tests, differential diagnoses, and current therapeutic approaches. Effective diagnosis relies heavily on clinical history and positional testing, while treatment primarily involves canalith repositioning maneuvers. Surgical options are reserved for persistent, treatment-resistant cases. This manuscript aims to provide a complete clinical guide to the diagnosis and management of BPPV.

Keywords: Benign Paroxysmal Positional Vertigo; Otoconia; Dix-Hallpike Test; Repositioning Maneuvers; Vestibular System; Vertigo

1. Introduction

Benign Paroxysmal Positional Vertigo (BPPV) is a mechanical disorder of the inner ear and represents the most common cause of vertigo arising from a peripheral vestibular pathology. It is defined by episodes of vertigo associated with changes in head position relative to gravity. The term "benign" reflects the non-life-threatening nature of the disorder, while "paroxysmal" refers to its sudden onset, and "positional vertigo" to its characteristic symptom triggered by specific head movements.

2. Anatomy and Physiology of the Vestibular System

The vestibular system, located within the inner ear, comprises three semicircular canals (anterior, posterior, and horizontal) and two otolithic organs (utricle and saccule). These structures are responsible for detecting angular and linear acceleration, respectively. The semicircular canals are oriented perpendicularly and filled with endolymph fluid. Movement of the head causes endolymph displacement, stimulating hair cells within the ampulla. The otoliths—calcium carbonate crystals—are embedded in a gelatinous matrix within the utricle and saccule, contributing to the detection of gravity and linear movement.

3. Pathophysiology of BPPV

BPPV is primarily caused by canalithiasis or cupulolithiasis. Canalithiasis refers to free-floating otoconia that enter one of the semicircular canals, typically the posterior canal, leading to abnormal endolymph movement during head motion. Cupulolithiasis involves otoconia adhering to the cupula, making it abnormally sensitive to gravity. These mechanisms result in inappropriate stimulation of the vestibular system, producing vertigo and characteristic nystagmus.

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4. Clinical Presentation

Patients with BPPV typically present with sudden episodes of vertigo that last for less than one minute and are triggered by movements such as turning over in bed, looking up, or bending forward. Associated symptoms may include nausea, imbalance, and, less commonly, vomiting. The hallmark sign is positional nystagmus observed during diagnostic maneuvers.

5. Diagnostic Approach

5.1. History Taking

An accurate diagnosis of BPPV begins with a detailed patient history. Clinicians should inquire about the nature, duration, and triggers of vertigo episodes, as well as associated symptoms. Important differential diagnoses to consider include vestibular neuritis, Meniere's disease, and central causes such as stroke.

5.2. Positional Tests

Dix-Hallpike Maneuver: The primary test for diagnosing posterior canal BPPV. A positive result includes the onset of vertigo and a characteristic upbeating-torsional nystagmus.

Supine Roll Test (Pagnini-McClure): Used to diagnose horizontal canal BPPV. Geotropic nystagmus suggests canalithiasis, whereas apogeotropic nystagmus indicates cupulolithiasis.

6. Management

6.1. Canalith Repositioning Maneuvers

Epley Maneuver: Most effective for posterior canal BPPV. It involves a series of head and body movements to guide the otoconia back to the utricle.

- **Semont Maneuver:** An alternative for posterior canal BPPV, particularly in cases of cupulolithiasis.
- **Lempert (Barbecue Roll) Maneuver:** Designed for horizontal canal BPPV.
- **Gufoni and Vannucchi Maneuvers:** Target specific horizontal BPPV subtypes.
- **Brandt-Daroff Exercises:** Used for habituation therapy, particularly in recurrent or residual BPPV.

6.2. Pharmacological Treatment

While not curative, vestibular suppressants such as meclizine, diazepam, and dimenhydrinate can be used for short-term symptom relief.

6.3. Surgical Options

Surgical treatment is considered in rare, intractable cases. Options include:

- **Posterior Canal Occlusion:** Occludes the affected canal to prevent endolymph movement.
 - **Singular Neurectomy:** Involves sectioning the singular nerve, though it carries a higher risk and is technically demanding.
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7. Discussion

BPPV is often underrecognized despite its prevalence. Timely diagnosis and intervention can significantly improve patient quality of life. Clinical assessment remains the cornerstone of diagnosis. The efficacy of canalith repositioning maneuvers underscores the importance of proper technique and patient education. Recurrence is not uncommon and may be influenced by factors such as age, head trauma, or comorbid osteoporosis.

8. Conclusion

BPPV is a prevalent and treatable vestibular disorder. Diagnosis is clinical, relying on positional testing. Non-invasive treatment via repositioning maneuvers is highly effective. Surgical options are reserved for refractory cases. Ongoing

research into pathophysiological mechanisms and recurrence prevention continues to refine the management of this condition.

Compliance with ethical standards

Disclosure of conflict of interest

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Statement of informed consent

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