

Novel Case of Bilateral Posterior Semicircular Canal Benign Paroxysmal Positional Vertigo with Asymmetric Mechanisms: Left Cupulolithiasis and Right Short-Arm Canalolithiasis

Shreya Vats¹, *Ajay Kumar Vats², Sudhir Kothari³

Abstract

Introduction:

Benign paroxysmal positional vertigo (BPPV) involving multiple semicircular canals (MC-BPPV) is an uncommon variant in which otoconia dislodged from the utricular macula migrate into two or more canals, provoking brief vertigo episodes with positional changes. The single-canal variant predominates, most often affecting the posterior canal, followed by the horizontal and anterior canals. MC-BPPV typically presents with ipsilateral or contralateral posterior-horizontal canal combinations, while atypical posterior canal variants are rarer and require careful nystagmus evaluation during positional testing.

Case Report:

A 62-year-old man presented with a one-day history of vertigo triggered by rising from the supine position, along with retropulsion and vertigo during transitions to lateral recumbent positions. Standard right Dix-Hallpike test (DHT) and right half DHT were unremarkable. Augmented right half-DHT elicited persistent upbeat right-torsional nystagmus; a negative inversion test indicated right short-arm posterior canalolithiasis. Left half-DHT evoked persistent left torsional upbeat nystagmus that reversed to downbeating nystagmus with a subtle right-torsional component on right lateral rolling nose-down, consistent with left posterior cupulolithiasis. The Bascule maneuver was used to treat the left ear, and the prone pitch-and-yaw maneuver was used to treat the right ear. Follow-up showed conversion of left posterior cupulolithiasis to typical canalolithiasis, which resolved with the Epley maneuver, resulting in complete symptom remission.

Conclusions:

This case highlights the importance of comprehensive positional testing and mechanism-specific therapeutic maneuvers for successful management of atypical bilateral MC-BPPV.

Keywords: Benign paroxysmal positional vertigo; Multi-canal BPPV; Cupulolithiasis; Canalolithiasis; Posterior semicircular canal; Positional nystagmus

Received date: 5 Nov 2025

Accepted date: 19 May 2026


**Please cite this article;* Vats S, Vats AK, Kothari S. Novel Case of Bilateral Posterior Semicircular Canal Benign Paroxysmal Positional Vertigo with Asymmetric Mechanisms: Left Cupulolithiasis and Right Short-Arm Canalolithiasis. *Iran J Otorhinolaryngol.* 2026;38(3): 197-201. Doi: 10.22038/ijorl.2026.92534.4081

¹Clinical Vestibulology Observer, Otoneurology Centre, 6-A, Block-B, Shikarbadi, Udaipur-313001, Rajasthan, India.

²Consultant Neurophysician, ShantiRaj Hospital Kesar Kunj, New Bhupal Pura, Udaipur, India.

³Department of Neurology, Poona Hospital and Research Centre, Pune, Maharashtra, India.

*Corresponding author: E-mail: vatsneuro@gmail.com

 Copyright©2026 Mashhad University of Medical Sciences. This work is licensed under a Creative Commons Attribution-Noncommercial 4.0 International License <https://creativecommons.org/licenses/by-nc/4.0/deed.en>

Introduction

Benign paroxysmal positional vertigo (BPPV) affecting multiple semicircular canals (MC-BPPV) is characterized by detachment of otoconia from the utricular macula and their migration into two or more semicircular canals of the inner ear, resulting in brief episodes of vertigo provoked by specific head movements (1). The single-canal variant of BPPV is more prevalent than the multicanalicular form, with the posterior canal most commonly involved, followed by the horizontal and anterior canals. MC-BPPV is rarer and primarily features combinations of posterior and horizontal canals, either ipsilaterally or contralaterally (2). Recent insights into atypical posterior canal variants underscore the need for detailed assessment of nystagmus patterns during standard and adjunctive positional maneuvers to identify concurrent occurrences in MC-BPPV (3). This report details a rare manifestation of MC-BPPV involving left posterior semicircular cupulolithiasis along with co-occurring right short-arm posterior semicircular canalolithiasis.

Case Report

A 62-year-old man presented with a one-day history of vertigo that occurred when he rose from the supine position. Symptoms included retropulsion on sitting and vertigo when he moved to either lateral recumbent position. He reported no significant past medical or surgical history. Physical examination showed no abnormalities. Vital signs remained stable, with blood pressure of 130/80 mmHg in both supine and standing positions. Neurological and musculoskeletal evaluations were unremarkable.

The right half Dix-Hallpike test (DHT) involved turning the head 45 degrees to the right. The patient was then positioned supine on a four-inch-thick pillow, which created 30 degrees of head anteflexion. The full right DHT used a four-inch-thick pillow placed behind the buttocks while the patient sat with legs extended on the examination table. The head was turned 45 degrees to the right, and the patient was moved supine for one minute so the head hung 30 degrees below the table edge. Neither the right DHT nor the right half DHT provoked positional nystagmus. Augmented half DHT is used when the conventional half DHT does not elicit nystagmus (3). For the augmented right half DHT, the patient first assumed the right Dix-

Hallpike position and held it for one minute. The head was then flexed 60 degrees forward to position it 30 degrees above the horizontal plane. This maneuver provoked right torsional upbeating positional nystagmus that lasted more than one minute. The inversion test, which moved the patient from the augmented right half DHT position to the left lateral recumbent with the nose pointed downward, stopped the nystagmus (a negative inversion test). These findings suggested right short-arm posterior semicircular canalolithiasis (3,4). The left half DHT provoked left torsional upbeat positional nystagmus that lasted more than one minute. Moving from the left half DHT to the right lateral recumbent position with the nose pointed downward changed the nystagmus to downbeating with a subtle right torsional component. This indicated left posterior semicircular cupulolithiasis (4). For the left posterior semicircular cupulolithiasis, the Bascule maneuver was performed once (5). This involved a precise sequence of rapid positional changes to generate inertial forces in the planes of the right anterior and left posterior semicircular canals (abbreviated as RALP plane in standard nomenclature). The goal was to dislodge adherent otoconia from the posterior cupula using these forces and guide them into the utricular macula. The patient, starting in a seated position, first turned the head 45 degrees toward the unaffected right side. The body was then moved quickly to the right lateral recumbent nose-down position. Next, the head and torso rotated 180 degrees to the left affected side into a nose-up position, followed by a quick 180-degree reversal to the right uninvolved side in nose-down position (Figure 1).

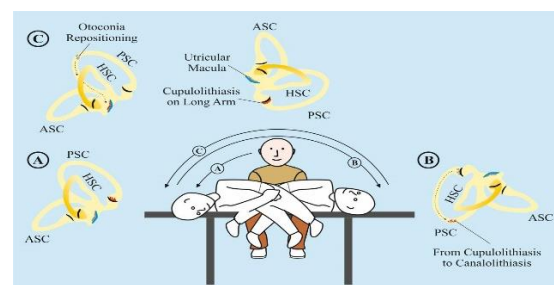


Fig 1. Otoconial debris adhering to the canal side of the left posterior semicircular canal cupula becomes dislodged during the initial nose-down positioning (1A), migrates to the most dependent part of the left posterior semicircular canal in the nose-up position (1B), and is repositioned to the utricular macula during the subsequent nose-down position (1C).

Ten sequences of alternating nose-down and nose-up positions were completed in the session. Each position lasted 15 seconds, with reassessment planned for the next day. For the right short-arm posterior semicircular canalolithiasis, the prone pitch-and-yaw maneuver was used once (6). The patient lay prone with the head and neck unsupported at the short edge of the table. He performed maximal head flexion with assisted lateral shaking at three cycles per second with 30-degree side-to-side excursions for one minute. This position was held statically for another minute, after which the patient sat upright (Figure 2).

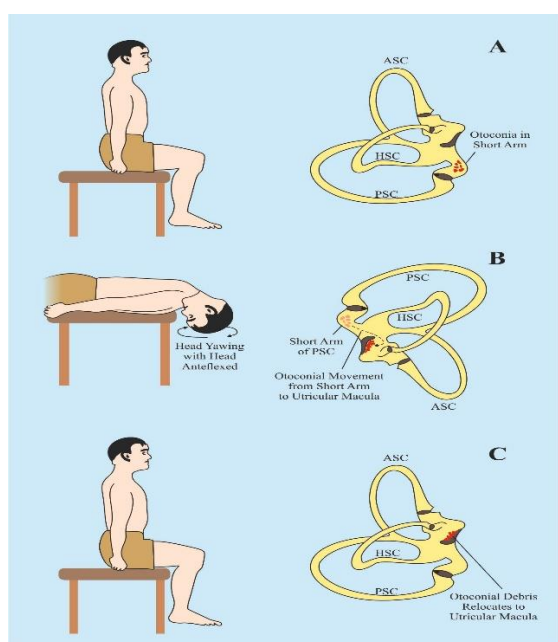


Fig 2. Otoconia in the short arm of the right posterior semicircular canal (PSC) (1A) move toward the utricle when the patient is in the prone position with the head maximally anteflexed (1B). Side-to-side yawing for one minute facilitates adherence of the otoconial debris to the utricle, and maintaining a static position for an additional minute allows it to firmly embed. In the subsequent upright position, no free-floating otoconia remain in the short arm (1C).

This was a modified version of the bow-and-yaw maneuver, suitable for patients with mobility limitations (7). After 24 hours, the left DHT provoked transient left torsional upbeat positional nystagmus with reversal nystagmus upon sitting upright from the DHT position. This indicated conversion to typical periauricular left posterior semicircular canalolithiasis. A single session of the left Epley maneuver provided complete symptom relief (8). For the

left Epley maneuver, the patient was instructed to sit on the examination table with a four-inch-thick pillow placed behind the buttocks. The head was rotated 45 degrees to the left in the yaw plane, and the patient was then positioned supine with the head hanging 30 degrees below the horizon for one minute. After that, the patient's head was turned to the right through 180 degrees for one minute. He was subsequently positioned in the right lateral recumbent position with nose down for one minute. He was then brought upright, completing the left Epley maneuver. The patient remained asymptomatic the next day. Positional tests were negative, and he stayed symptom-free during one month of follow-up. The full video sequence of diagnostic positional tests and retests, performed after therapeutic maneuvers that provoked oculomotor responses, is accessible (9).

Discussion

The uncommon occurrence of BPPV in both ears (10-30% of cases) is frequently attributed to shared risk factors that have a bilateral influence on the inner ear. Key factors implicated in this condition are advanced chronological age (beyond 50 years), female gender, history of head injury (a factor in 7-17% of secondary instances), osteoporosis, inadequate vitamin D status, migraine headaches, dyslipidemia, and disorders of the inner ear, specifically vestibular neuritis or Meniere's disease (10). Given the lack of reported history in this individual, idiopathic bilateral involvement is inferred, with the caveat that subclinical contributors, including age-related otoconia degeneration, are not to be excluded. This case highlights an unprecedented manifestation of MC-BPPV, characterized by simultaneous left posterior semicircular cupulolithiasis and right short-arm posterior semicircular canalolithiasis. It has been observed in recent case series that bilateral atypical posterior canal variations, encompassing conditions like non-ampullary arm canalolithiasis and short-arm canalolithiasis, are remarkably rare, and their identification often relies on the implementation of both conventional and supplementary positional testing protocols (11). It is important to highlight that previous research reported cases of bilateral conditions where horizontal semicircular cupulolithiasis

appeared alongside short arm posterior semicircular canalolithiasis. As observed in these circumstances, the initial bow-and-lean assessments uncovered a fusion of vertical and horizontal nystagmus, serving as a crucial indicator of an unprecedented degree of multicanal participation extending to both sides (6) To facilitate diagnosis in the reported case, a systematic utilization of additional positional tests was imperative, supplementing the standard DHT with half-DHT, augmented half-DHT, and inversion testing (3,4). The characteristic nystagmus patterns observed with DHT variants precluded the necessity for further diagnostic examinations, aligning with established protocols for uncomplicated BPPV. Consequently, the authors elected not to perform neuroimaging, audiometry, vestibular evoked myogenic potentials, video head impulse testing, or biochemical assays for vitamin D and thyroid function. This approach is consistent with current prevailing standards that emphasize the precedence of bedside diagnostic methods over laboratory analyses, with the exception of circumstances where critical warning signs, such as auditory disturbances or central signs, imply the possibility of divergent diagnostic outcomes (1). A positive inversion test, along with left torsional upbeat nystagmus during the left half DHT persisting for more than one minute, served as the clinical indicator of left posterior semicircular canal cupulolithiasis, a hallmark presentation of this BPPV variant.

A persistent right torsional upbeat positional nystagmus elicited by the augmented right half-DHT, together with a negative inversion test, unequivocally indicated right short-arm posterior semicircular canalolithiasis. Clinical positional assessments, including standard and augmented half-DHT, inversion tests performed bilaterally, and conventional DHT, established the diagnosis.

These tests identified asymmetric pathologies in absence of spontaneous or gaze-evoked nystagmus.

In addressing the identified mechanisms, the study incorporated targeted interventions, including the Bascule maneuver for managing potentially refractory posterior semicircular cupulolithiasis and an adapted prone pitch-and-yaw maneuver for patients with short-arm posterior semicircular canalolithiasis who had

mobility limitations. The strategy that was implemented led to a swift and thorough resolution of the condition, successfully converting the left posterior semicircular cupulolithiasis into typical periampullary canalolithiasis, which was then effectively treated using the Epley maneuver. These results corroborate recent publications concerning bilateral and multicanal atypical BPPV (5-8).

Conclusion

This case represents a novel instance of MC-BPPV involving bilateral posterior semicircular canal pathology with left cupulolithiasis and right short-arm posterior canalolithiasis occurring simultaneously. Comprehensive positional testing and mechanism-specific therapeutic maneuvers resulted in complete symptom resolution.

Conflict of Interest

The authors declare no conflicts of interest.

Informed Consent

The patient provided written informed consent for the publication of de-identified clinical details regarding their illness and anonymized video footage in this manuscript. The patient was fully informed of the purpose, potential risks, and benefits of inclusion, and that their participation was voluntary and revocable at any time. All identifying information has been removed or obscured to protect anonymity and comply with the Helsinki Declaration. A copy of the consent form is available upon request from the corresponding author.

References

1. von Brevern M, Bertholon P, Brandt T, Fife T, Imai T, Nuti D, et al. Benign paroxysmal positional vertigo: Diagnostic criteria. *VES*. 2015 Oct 15;25 (3,4): 105-117.
2. Korres S, Balatsouras DG, Kaberos A, Economou C, Kandiloros D, Ferekidis E. Occurrence of Semicircular Canal Involvement in Benign Paroxysmal Positional Vertigo. *Otology & Neurotology*. 2002 Nov;23 (6): 926-32.
3. Kim H, Gil Y, Kim J. Subjective BPPV revisited: identification of positional nystagmus with a new maneuver. *J Neurol*. 2024 Jul;271(7): 4640-3.
4. Epley JM. Human Experience with Canalith Repositioning Maneuvers. *Annals of the New York Academy of Sciences*. 2001 Oct;942 (1): 179-191.
5. Castellucci A, Mohamad A, Vats AK, Kothari S, Vats S, Bijlani A. Physical therapy for posterior

semicircular cupulolithiasis: A case series of 15 patients from South Rajasthan. *Hearing Balance and Communication*. 2025 Apr;23 (2):92-8.

6. Bijllani A, Vats AK, Mohammad A, Kothari S, Vats S. Multicanalicular Benign Paroxysmal Positional Vertigo (MC-BPPV) Involving Atypical Short Arm Posterior Canal Variant with Contralateral Horizontal Semicircular Cupulolithiasis. *Indian J Otolaryngol Head Neck Surg*. 2025 Nov;77 (11): 5190-3.

7. Ping L, Yi-fei Z, Shu-zhi W, Yan-yan Z, Xiaokai Y. Diagnosis and treatment of the short-arm type posterior semicircular canal BPPV. *Brazilian Journal of Otorhinolaryngology*. 2022 Sep;88 (5): 733-9.

8. Bhattacharyya N, Gubbels SP, Schwartz SR, Edlow JA, El-Kashlan H, Fife T, et al. Clinical Practice Guideline: Benign Paroxysmal Positional

Vertigo (Update). *Otolaryngol Head Neck Surg*. 2017 Mar;156 (3_suppl): S1-S47.

9. Vats AK. Bilateral Posterior Semicircular Canal Benign Paroxysmal Positional Vertigo with Asymmetric Mechanisms: Left Cupulolithiasis and Right Short-Arm Canalolithiasis [Internet]. figshare; 2025. Available from: [https://doi.org/ 10.6084/m9.figshare.30480149.v1](https://doi.org/10.6084/m9.figshare.30480149.v1)

10. Alfarghal M, Singh NK, Algarni MA, Jagadish N, Raveendran RK. Treatment efficacy of repositioning maneuvers in multiple canal benign paroxysmal positional vertigo: a systematic review and meta-analysis. *Front Neurol* 2023;14. <https://doi.org/10.3389/fneur.2023.1288150>.

11. Vats AK, Vats S, Kothari S, Aswani N. Atypical Bilateral Posterior Semicircular Canalolithiasis – A Case Series. *Ann Indian Acad Neurol*. 2024;27(6): 720-3.