

Bilaterally Positive Dix-Hallpike Test (DHT) with Unilateral Direction-Reversing Positional Nystagmus in Patient with Apogeotropic Posterior Canal BPPV

Sir,

Benign paroxysmal positional vertigo (BPPV) is a clinical dizziness syndrome exquisitely diagnosed, localized, and lateralized in pursuance to Ewald's laws by eliciting the characteristic patterns of oculomotor responses during the positional tests [Head-yaw test (HYT) for the lateral, and Dix-Hallpike test (DHT) for posterior and anterior semicircular canals]. Aberrantly located otoconial debris within the tract of semicircular canal and/or a partial canal jam can cause abnormal/unexpected eye movements during positional tests.^[1-3] We are presenting an interesting clinical case vignette here.

In early summers of 2023, a male aged 37-years visited our center complaining of short-lasting dizzy spells on lying supine and on positioning lateral recumbent to either side associated with constant non-positional disequilibrium, for about 2 weeks. The general physical examination and neurologic examination were unremarkable. Neuro-otologic examination revealed normal gaze holding, and vertical and horizontal smooth as well as saccadic eye movements. The positional tests were as under-

Left Dix-Hallpike Test (DHT): After a latency of 5s elicited a downbeating left torsional *non-crescendo-decrescendo* positional nystagmus which lasted more than 60s.

Right DHT: After a latency of 1s elicited upbeating right torsional *crescendo-decrescendo nystagmus* lasting 17s immediately followed by a downbeating left torsional *non-crescendo-decrescendo nystagmus* lasting 55s.

Based on the oculomotor patterns generated during DHT to either side,^[4] we diagnosed the patient having *apogeotropic right posterior semicircular canal BPPV (non-ampullated arm right posterior semicircular canalolithiasis) with a reversible partial canal jam* and physical therapy with 10 Quick Liberatory Rotation Maneuver (QLRM) was undertaken on the day-1.^[5] We reviewed the patient at short-term interval of 1 hour and after 24 hours. The patient was free of vertigo and did not elicit positional nystagmus during the DHT on either side, at short-term follow up. Clicking the link below will allow the reader to see the sequence of events in the case, which include the initial positional test and follow-up tests at 1 hour and after 24 hours. <https://youtu.be/IJnSLJp3QAA>.

A downbeating left torsional nystagmus elicited during left DHT can be either due to left anterior semicircular canal BPPV (ASC-BPPV) or an apogeotropic right posterior semicircular canal BPPV (*apo-PSC-BPPV*), and in both the

pattern of positional nystagmus elicited on head hanging to either side is usually identical. Oddly enough, in this case, a DHT to the left elicited a downbeating left torsional nystagmus, and to the right elicited a *biphasic direction-reversing positional nystagmus* (initially right torsional upbeating, and then left torsional downbeating). Canalolithiasis in the non-ampullated arm of the posterior semicircular canal causes inhibitory ampullopetal deflection of cupula, resulting in downbeating contratorsonal positional nystagmus during enhanced straight head-hanging position and in head hanging to both sides during DHT. Based on the biphasic positional nystagmus observed during right DHT, we hypothesize that otoconial debris initially located in the non-ampullated arm of the right posterior semicircular canal [in juxtaposition to crus commune, Figure 1a] was displaced ampullopetal, relocating to the periampullary region [Figure 1b and 1c]. During sequent right DHT, an initial ampullofugal displacement of periampullary otoconial debris resulted in stimulatory upbeating right torsional nystagmus. Perhaps because of a partial canal jam in the non-ampullated portion (near crus commune) of posterior canal, the otoconial debris ricocheted back in ampullopetal direction with the attendant second phase of inhibitory downbeat left torsional nystagmus [Figure 1d]. The present case is peculiar because so far only five cases of direction-reversing positional nystagmus in the posterior canal variant of BPPV during sustained head hanging have been reported.^[6,7] It is worth noting that Yetiser's model of biphasic positional nystagmus during DHT^[6] does not explain why the vertical component of BPPV continued to be upbeating while the torsional component reversed, and case series by Jeong *et al.*^[7] have just mentioned four patients of posterior canal BPPV with direction-reversing positional nystagmus during sustained Hallpike position without any further elaboration. By contrast, we have elucidated the mechanism of *biphasic direction-reversing positional nystagmus* during the right DHT by hypothesizing a partial reversible canal jam in the non-ampullated portion of the right posterior semicircular canal. Our hypothesis is based on the fact that a partial reversible canal jam in the non-ampullated portion of the posterior semicircular canal behaves like low-pass filter, clinically reflected by longer duration *non-crescendo-decrescendo* downbeating positional nystagmus in the Hallpike position, this has been reported in many studies.^[3,4,8,9]

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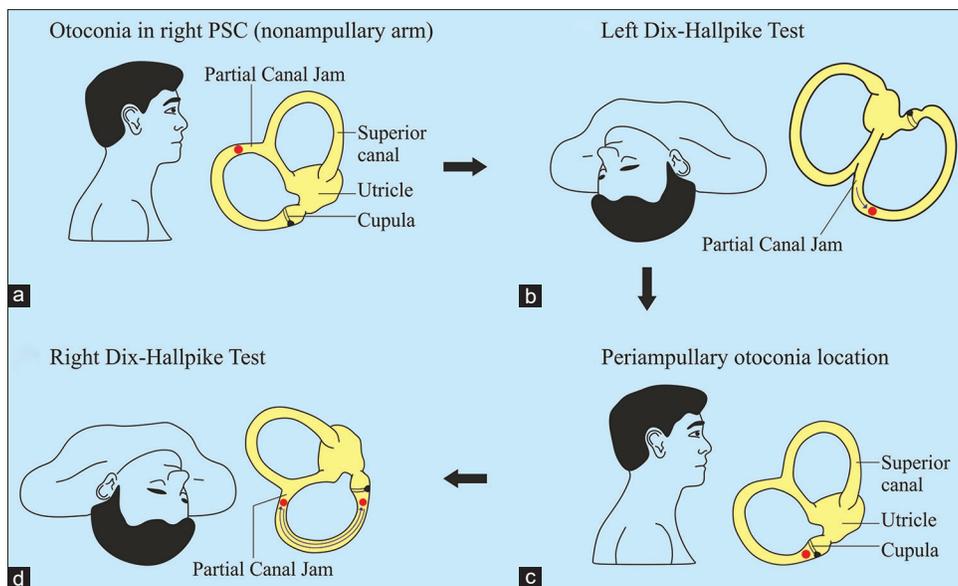


Figure 1: During left DHT there is ampullopetal displacement of otoconial debris in the partially jammed non-ampullary portion of the right posterior semicircular canal (PSC) generating downbeating left torsional nystagmus (a and b). On uprighting debris moves in the periaampullary location (c), and during right DHT debris 1st moves ampullofugal resulting in upbeating right torsional nystagmus, and on encountering the canal jam it ricochets ampullopetally resulting in downbeating left torsional nystagmus (d)

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

Ajay K. Vats, Shreya Vats¹, Sudhir Kothari²

Consultant Neurophysician, Department of Medicine and Neurology, Chaudhary Hospital and Medical Research Centre Private Limited, Udaipur, Rajasthan, ¹Clinical Vestibulology Observer, Otoneurology Centre, Shikarbadi, Udaipur, Rajasthan, ²Department of Neurology, Poona Hospital and Research Centre, Pune, Maharashtra, India

Address for correspondence: Dr. Ajay K. Vats, Consultant Neurophysician, Chaudhary Hospital and Medical Research Centre Private Limited, 472-473, Sector 4, Hiran Magri, Udaipur - 313 002, Rajasthan, India.

E-mail: vatsneuro@gmail.com

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