Canadian Audiologist

The Official Publication of the Canadian Academy of Audiology

Striking the Right Balance – Benign Paroxysmal Positional Vertigo Involving Multiple Canals

Published May 7th, 2017

Alfarghal Mohamad, MBBS, MSc, AuD

STRIKING THE RIGHT BALANCE

Janine Verge, AuD, AuD(C) and Michael Vekasi, MClSc, RAud, Aud(C) will be coordinating the "Striking the Right Balance," feature which will cover the latest information on "all things vestibular."

In this edition of "Striking the Right Balance," Alfarghal Mohamad discusses benign paroxysmal vertigo involving multiple canals and includes a video demonstrating right mixed posterior and horizontal canal BPPV nystagmus on right Dix-Hallpike test.

If you are a health care professional and would like to be more involved in all things vestibular, please sign-up for the Vestibular Special Interest Group. Sign-up by emailing JanineAllison.Verge@nshealth.ca to let us know you want to be included. Also, check out our Facebook page for a free list of online vestibular resources at the CAA National Vestibular Special Interest Group page.

Benign Paroxysmal Positional Vertigo (BPPV) is the most common cause of peripheral vertigo, with one-year prevalence of 1.6%. It is a mechanical labyrinthine disorder, characterized by recurrent brief, intense vertiginous attacks provoked by head position changes with respect to gravity. Each attack usually lasts for 15 to 60 seconds. It usually has a favourable course which is why it is defined as "Benign"; however, it sometimes becomes a disabling condition which affects the patient's quality of life.

Considering the etiology of BPPV, it can be classified into: **primary BPPV** which occurs spontaneously. Some risk factors can increase its incidence such as old age, osteoporosis, vitamin D deficiency, and vertebrobasilar insufficiency. **Secondary BPPV** which occurs in addition to ear disorder such as Meniere's disease, vestibular neuritis, vascular and autoimmune labyrinthine

disorders, otosclerosis, chronic suppurative otitis media, or following ear surgery. **Post-traumatic BPPV**, occurs when the symptoms developed 24 to 72 hours following head trauma. Even minor head trauma, such as domestic injuries, sports injuries, school injuries, and dental care can trigger otoconial detachment leading to the development of the condition.

There are two main theories to explain BPPV: canalolithiasis where free floating debris are present in the endolymph filling the canal lumen and cupulolithiasis when the otoconial debris are attached to the cupula of the affected semicircular canal. Both canalolithiasis and cupulolithiasis cause the cupula of the affected canal to become gravity sensitive leading to the symptoms and characteristic nystagmus when the head moves in the plane of the affected canal with respect to the gravity.

BPPV can be classified according to the involved canal/s into: posterior canal BPPV which represent 75–80% of cases, lateral canal BPPV which represent 15-25 %, anterior canal BPPV which is rare and only represent 1–2% of cases and multiple canals BPPV which represent 6–20% of cases. The multi-canalar BPPV can occur due to involvement of different canals on the same ear or due to bilateral disease which involves same or different canals in both ears.

Diagnosis of BPPV can be easily obtained based on the characteristic history, eliciting the vertigo and characteristic nystagmus with a provoking manoeuvre such as Dix-Hallpike manoeuvre, side-lying manoeuvre, McClure-Pagnini manoeuvre (head yaw test), and bow - lean manoeuvre. Each semicircular canal has a characteristic excitatory and inhibitory pattern of nystagmus, this is due to the fact that each single semicircular canal is linked to a pair of extra-ocular muscles capable of generating a specific eye movement. It is the type of nystagmus rather than the provoking manoeuvre which determines the affected canal, as sometimes a specific canal gets stimulated with a manoeuvre meant to stimulate other canals such as the horizontal canal can be stimulated on Dix-Hallpike test. When the positional nystagmus is persistent, purely vertical, or not eliminated with repeated repositioning manoeuvres, brain magnetic resonance imaging should be performed to exclude structural lesions in the central vestibular pathway.

Clinicians should differentiate between bilaterally symptomatizing BPPV variants and true bilateral BPPV disease. Horizontal canal BPPV is a bilaterally symptomatizing condition with bipositional bidirectional nystagmus on head yaw test, whatever it is geotropic or apogeotropic type. Single anterior canal BPPV can present with downbeating nystagmus on both right and left Dix-Hallpike test. Single posterior canal BPPV can provoke symptoms and nystagmus on the Dix-Hallpike test on both sides in a condition called pseudo-bilateral BPPV or unilateral mimicking bilateral BPPV, which might happen due to inappropriate head positioning during testing of unaffected ear leading to ampullopetal movements of otoconia on affected posterior canal evoking inhibitory nystagmus. Inappropriate positioning can occur due to the fact that head is put on the required plane based only on the examiner’s eye judgment, moreover the limitation of the patient’s neck movement, skull form or hair style. In pseudo-bilateral posterior canal BPPV, usually the affected ear is more symptomatic and treatment of the affected side alleviate symptoms and nystagmus on both sides.

Bilateral Posterior canal BPPV

In cases of true bilateral posterior canal BPPV, the Dix-Hallpike manoeuvre provokes the symptoms and the characteristic nystagmus on both sides equally or unequally. As the fact that the canalith repositioning manoeuvre (modified Epley’s manoeuvre) for one ear could stimulate the other ear, it is better to use a modified Epley’s manouver to treat the more symptomizing side first followed by treatment of the less symptomatizing side with few days interval. Another option is using the Semont’s manoeuvre to treat both sides at the same session as it does not stimulate the non-treated side.

Multiple Canal BPPV

The most common form of multiple canal BPPV is the combination of posterior and horizontal canal BPPV on the same ear. The diagnosis is based on the features of the nystagmus on either manoeuvres Dix-Hallpike and McClure-Pagnini manoeuvre, and in most cases the horizontal nystagmus is geotropic due to canalolithiasis, although cupulolithiasis has been occasionally reported. During the Dix-Hallpike manoeuvre, horizontal canal is at least partially stimulated and a horizontal component of the nystagmus may be evident, in conjunction with the torsional up beating nystagmus of posterior canal origin. A vertical component of nystagmus may be evident with the horizontal nystagmus of lateral canal origin during the head yaw test. Clinicians should be careful in mixed horizontal and posterior canal BPPV cases as pseudo-spontaneous nystagmus, which is sometimes associated with HC-BPPV in the presence of the typical nystagmus of posterior canal BPPV on the Dix-Hallpike test, could be confused with acute superior vestibular neuritis associated with secondary posterior BPPV. Sometimes the torsional upbeating nystagmus originating from posterior canal BPPV spontaneously changes its direction to horizontal nystagmus . As the nystagmus of horizontal canal BPPV is usually of longer duration , thus might be confused with nystagmus of central origin.

(Watch the video of right mixed posterior and horizontal canal BPPV nystagmus on right Dix-Hallpike test. Courtesy of Alfarghal Mohamad)

Some clinicians prefer to treat the lateral canal BPPV first as it is usually more symptomatic, others prefer to treat posterior canal BPPV first as it is thought to be the reservoir of otoconia. There are many known manoeuvres for treatment of horizontal canal BPPV, the most commonly used are: the Lempert 270, the Lempret 360 (Barbicue manoeuvre), the Gufoni manoeuvre for geotropic type, the Gufoni manoeuvre for apogeotropic type, and the forced prolonged positioning manoeuvre which can be used alone or adjunct to any other manoeuvre.

Mixed horizontal and anterior canal BPPV is rare as anterior canal involvement is rare. The downbeating component of nystagmus differentiate anterior from posterior canal involvement and the torsional component of nystagmus will show if ipsilateral or contralateral anterior canal is involved. As the anterior canal has more chance of self-clearance of otoconia because of its anatomy in relation to gravity, treatment of horizontal canal, at first, sounds more reasonable. If treatment for the anterior canal BPPV is required, clinicians have to use their expertise as there is not enough research evdidence to support use of a specific manoeuvre. Different manoeuvres have been suggested to treat anterior canal BPPV including: deep head hanging manoeuvre (Yacovino manoeuvre) which can treat both sides, the deep Dix-Hallpike manoeuvre, the reversed Epley manoeuvre (starting from none-affected side) or the Vannucchi manoeuvre for anterior canal BPPV which is somewhat a reversed Semont’s manoeuvre .

Other forms of mixed canal BPPV are quite rare, very difficult to diagnose, or are still considered hypothetical entities. Each semicircular canal has a characterstic excitatory and a characteristic inhibitory nystagmus. Simultaneous stimulation of more than one canal generate nystagmus pattern which represents the net vector summation of each component of nystagmus. Correct identification of the affected canal/s, appropriate setting of treatment priorities in cases of multi-canalar BPPV, good counselling of the patient, repeating the manoeuvre more than once at the same session with 10 minutes interval for posterior canal BPPV and 3-5 minutes for other canals and use of alternative manoeuvre in case of repeated failures with a certain manoeuvre , are the tips to improve the outcome of the difficult cases of BPPV. Despite the fact that research showed no additional benefits regarding the use of a skull vibrator, head shaking, or tapping during repositioning manoeuvres, some expert clinicians still use them for cupulolithiasis or resistsent cases. The lastest guidlines on BPPV from the American Academy of Otolayrngology - Head &

Neck Surgery recommended against use of post-treatment postural restrictions, yet some expert clinicians still advice their patients to avoid lying on the affected side for few days after treatment, and encourge postural restrictions at least for the first night after repositioning, especially in recurrent cases. **Keep your eyes open** is the most commonly said phrase for patients in a vestibular clinic, and we would like to say it to every clinician examining dizzy patients. **Keep your eyes open!**

Bibliography

Asprella Libonati G. Benign paroxysmal positional vertigo and positional vertigo variants. Int J Otorhinolaryngol Clin 2012;4(1):25–40.

Balatsouras DB, Koukoutsis G, Ganelis P, et al. Review article diagnosis of single- or multiple-canal benign paroxysmal positional vertigo according to the type of nystagmus. Int J Otolaryngol 2011; Article ID 483965.

Gold DR, Morris L, Kheradmand A and Schubert MC. Repositioning maneuvers for benign paroxysmal positional vertigo. Curr Treat Options Neurol 2014;16:307.

Hornibrook J. review article benign paroxysmal positional vertigo (bppv): history, pathophysiology, office treatment and future directions. Int J Otolaryngol 2011; Article ID 835671.

Bhattacharyya N , Gubbels SP , Schwartz RS , et al. Clinical practice guideline: Benign paroxysmal positional vertigo (update). Otolaryngology–Head Neck Surg 2017;156(3_suppl):s1–s47.

Mohamad A and Saleh E. 2016. BPPV involving multiple canals. In: Understanding Benign Paroxysmal Positional Vertigo. London: Jaypee Brothers Medical Publishers; 2016.

Shim DB, Song CE, Jung EJ, et al. Benign paroxysmal positional vertigo with simultaneous involvement of multiple semicircular canals. Korean J Audiol 2014:18(3):126–30.

Welgampola M, Lechner C and Halmagyi M. Characteristics of benign positional vertigo tested on the epley omniax chair, Neurology 2016;86(16)Supplement P6.312.