

# DiZZcOVER

Systematic discussions on specific neurology topics

## INDEX

### 1. Issue In Focus

#### 1.1 Benign paroxysmal positional vertigo (BPPV)

*A brief write up on this topic*

### 2. Vertigo Grand Round

*An online presentation of a case and moderated discussion  
between the experts held on the last Friday of every month*

#### 2.1 Presentation of two cases of Posterior Canal BPPV

#### 2.2 Discussion Pearls

#### 2.4 Link to the online VGR Video

### 3. Journal Scan

*A brief review of current publications of relevance on the topic*

### 4. History

*An attempt to present events and people pictorially.*

### 5. Gallery

*Art of the Month*

# 1. Issue in Focus: POSTERIOR CANAL BPPV

## 1.1 Benign paroxysmal positional vertigo (BPPV)

Benign paroxysmal positional vertigo (BPPV) is a type of positional vertigo. BPPV occurs when free-floating otoconia (tiny crystals which are present in otolith organs) move in one of the semicircular canals (canalithiasis) or when the otoconia are adhered to the cupula (cupulolithiasis) which is located at one end of each semicircular canal.

BPPV most commonly occurs in the posterior canal (60-90% of cases). Diagnosis of posterior canal BPPV is done by history and examination for specific type of positioning nystagmus i.e. up-beating torsional nystagmus (typical) having one or few seconds latency and crescendo decrescendo pattern and fatiguability<sup>1</sup>.

### A. DIAGNOSTIC MANEUVERS:

The type of nystagmus elicited by the maneuver indicates which canal is involved.

#### i) Dix-Hallpike Maneuver

Adoption of the supine head extension position from a sitting position, with head turned 45 degrees towards testing ear, will cause the otoconia and the endolymph to move in an ampullofugal direction causing an excitatory nystagmus i.e. up-beating and a reversal of nystagmus can be seen after adopting a sitting up position from the head extension position, due to reversal of movement of otoconia in the endolymph towards the ampulla (Fig 1)

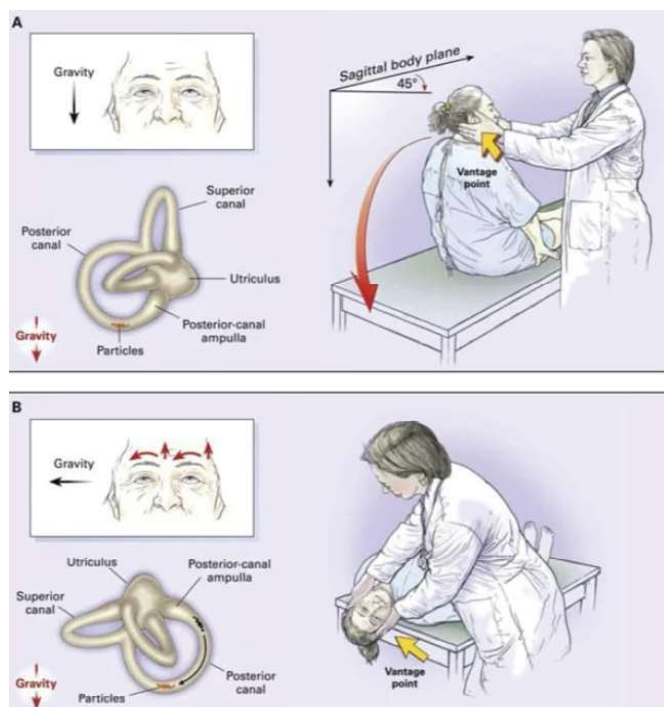


Fig. 1

#### ii) Side lying Maneuver

This maneuver is beneficial in patients with cervical spine issues who cannot extend their head. After seating the patient on the examination table (A), the head is turned 45° away from the involved ear (B). The patient then lies on the side of the involved ear (C) (Fig 2)

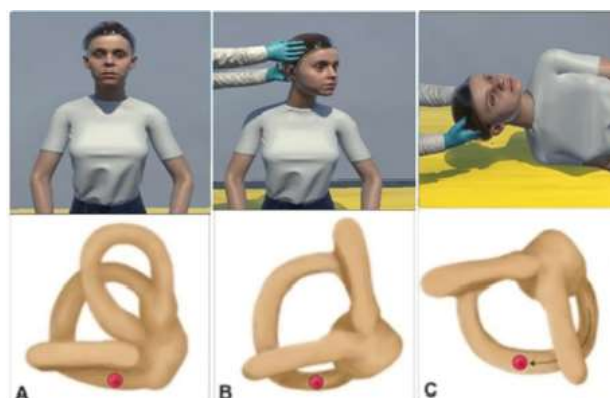


Fig. 2

### iii) Fully supported Hallpike Maneuver

This maneuver can be useful in more frail patients with issues that prevent neck extension. This will be performed just like Dix Hallpike maneuver but with head fully supported on the examination table and no head extension<sup>7</sup> (Fig. 3)



Fig. 3

## B. REPOSITIONING MANEUVERS:

The treatment of BPPV is undertaken by maneuvers that seek to reposition the otoconia back in to the utricle.

### i) Epley Canalolith Repositioning Maneuver for Posterior Canalithiasis:

It has a success rate upto 98%.<sup>3</sup>

*Diagram shows right sided posterior canal BPPV (45 seconds time gap between each step):*

- patient seated upright with head turned towards right 45 degrees.
- patient is made to lie back with head extended
- keep head of the patient towards right 45 degrees keeping head extended
- the patient is then asked to turn head towards left 45 degrees
- the patient is made to roll full body towards left side eyes looking down.
- In the end the patient is made to sit upright on left side (Fig 4).

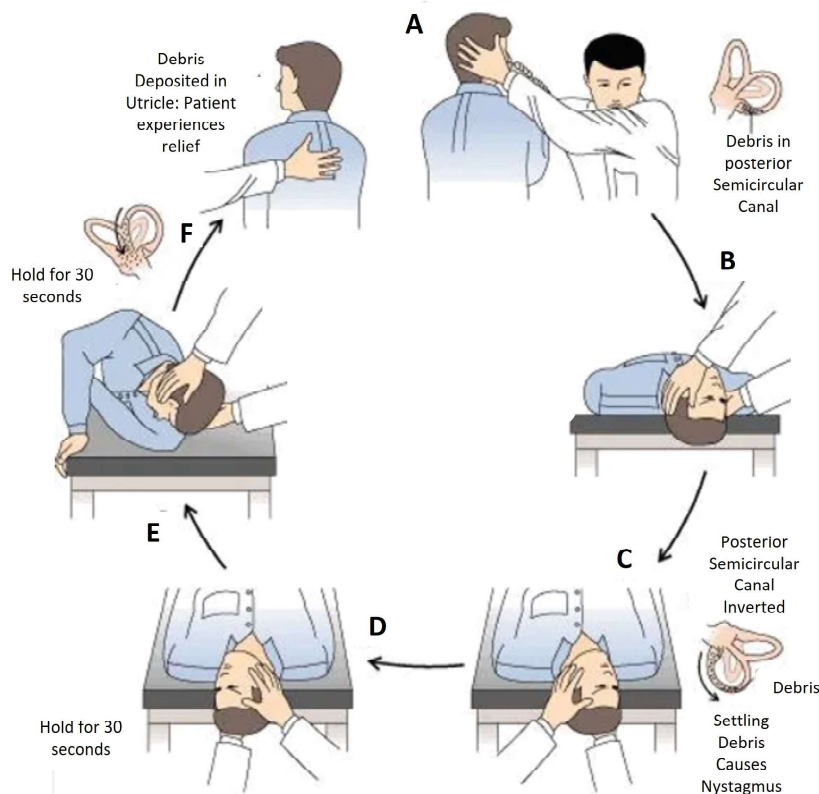


Fig. 4

## ii) Semont Liberatory Maneuver

This method is recommended for posterior cupulolithiasis<sup>4</sup>.

*Diagram shows right sided posterior canal BPPV*

1. Patient seated upright with head turned 45 degrees left.
2. Patient was asked to lay on to right side keeping head same.
3. Patient was shifted to left side keeping head forward and 45 degrees to left. (Fig 5)

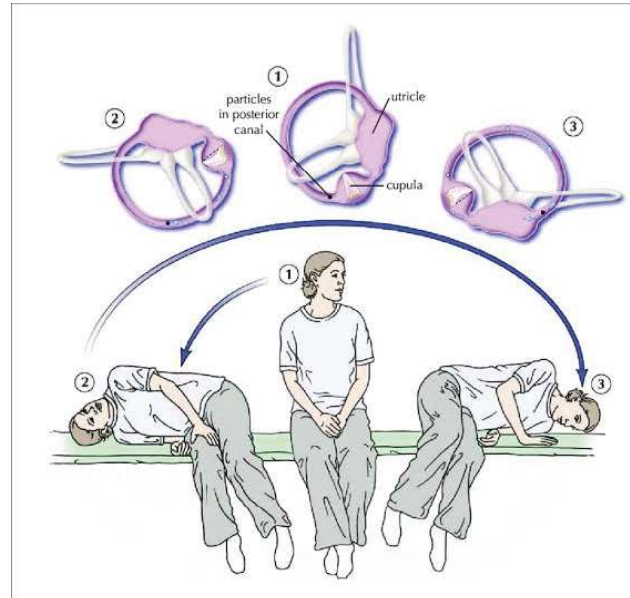


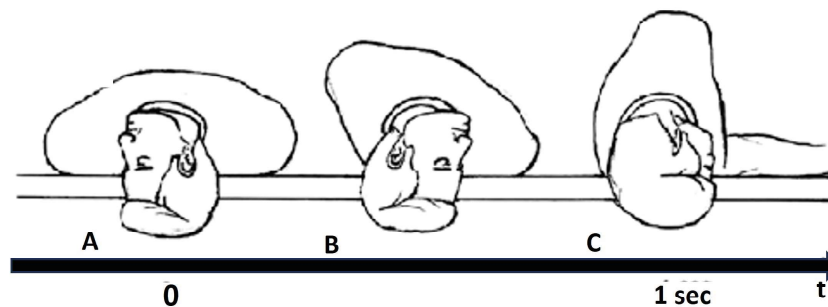
Fig. 5

## iii) Quick liberatory rotation maneuver:

This technique can be used in cupulolithiasis and atypical variants of posterior canal which need more inertial force to dislodge the partial canal jam.<sup>2</sup> (Fig 6)

*Diagram shows left sided post canal BPPV*

The steps are similar to Epley's maneuver but the only difference lies in speed of movement from most dependent affected side to opposite side shifting should be 180 degrees / sec.



**Quick Liberatory Repositioning QLR**

**A. Starting Position (-45 degrees);**

**B. Dynamic middle position (about +45 degrees);**

**C. Final lying position (about +135 degrees).**

**Velocity of head is about 180 degrees per second**

Fig. 6

#### iv) Gans/hybrid maneuver

This technique is preferred for individuals with cervical spine issues. This technique is a combination of Epley's and Semont's maneuvers.<sup>3</sup>

*Diagram shows right sided posterior canal BPPV*

- Patient is in primary position seated and facing forward. Head turned 45° to left and placed in a side-lying position on right side.
- Patient rolled from right side to left side with head maintained in position 45° to left.
- Patient is asked to do a liberatory head shake
- Patient is returned to primary position. Body brought to seated position with head turned forward to centre position. (Fig. 7)

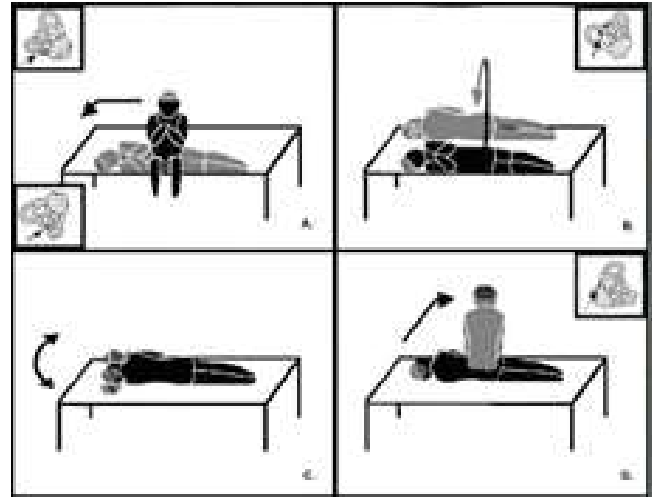


Fig. 7

#### v) Foster/half-somersault maneuver

This can be done at home with less or no side effects like aggravated vertigo and nausea during the maneuver. It is as effective as Epley's method.<sup>5</sup> (Fig. 8)

*Diagram shows right sided posterior canal BPPV*

- Patient is asked to sit as shown in above picture with head extended straight.
- He is then asked to bend down with head touching ground.
- He is then guided to turn chin towards right elbow.
- He is then raised back quickly so that head will be in level with back.
- Patient is the brought back in the head upright position.

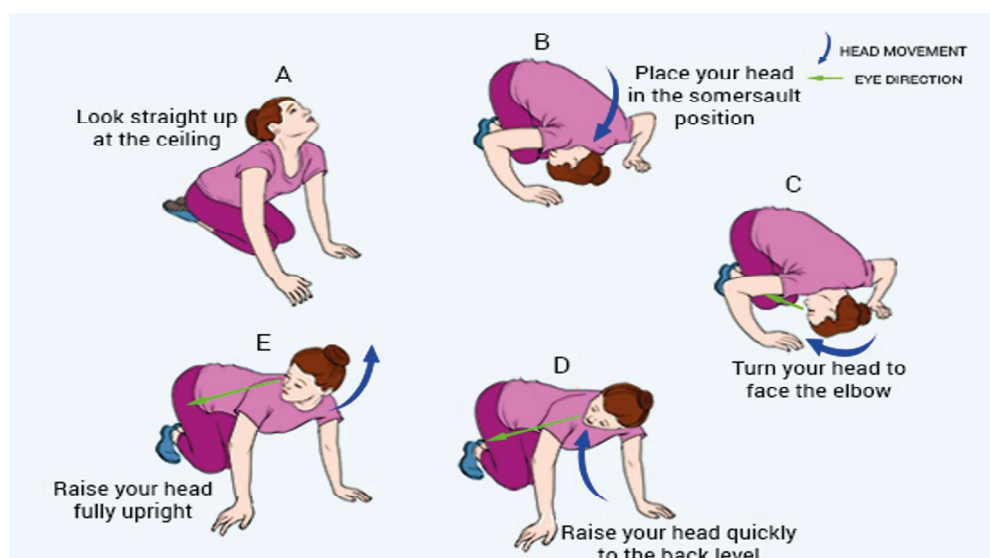


Fig. 8



## vi) Brandt Daroff Exercises

These exercises are suggested as a home-based therapeutic intervention with a non-specific approach (regardless of the affected side)<sup>4</sup> (Fig. 9)

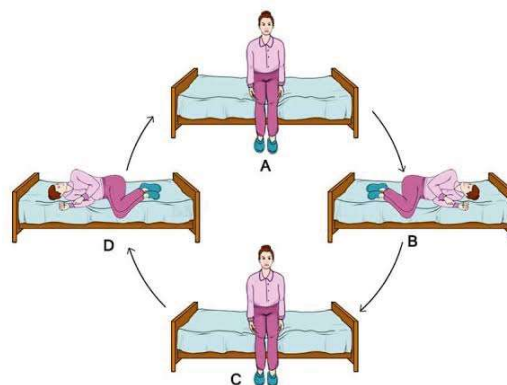


Fig. 9

## vii) Dias/Supine to Seated Approach

This method is being evaluated in obese, elderly, and those with neurological problems<sup>6</sup>.

*Diagram shows left posterior canal BPPV*

- Commencing one minute subsequent to the cessation of nystagmus in Position 1 (head extended 20 degrees and to the left at 45 degrees),
- This is followed by a two-minute duration in Position 2 (head turned to the right at 90 degrees),
- and concluding with a two-minute interval in Position 3 (sit upright with head inclined to the left at 45 degrees)

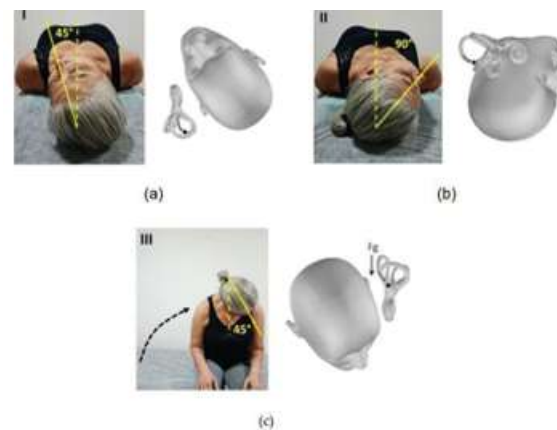


Fig. 10

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Contributed by



Dr. Anusha

## 2.1 Presentation of two cases of Posterior canal BPPV

### Case Presentation

#### CASE 1:

- 1) A 45-year-old male patient presented with typical history of positional vertigo on lying down and sitting up from bed, bending forward from 3 days.
- 2) On examination, all oculomotor tests were normal, no spontaneous/ gaze evoked nystagmus.
- 3) Videonystagmography (VNG) positioning tests: Right Dix-Hallpike test was positive with right and up-beating torsional nystagmus on supine head extension with head turned to 45 degrees right. Reversal of nystagmus to left and down beating was there on sitting from supine head extension position.
- 4) The diagnosis of right posterior canal BPPV was confirmed and treated successfully with Epley's maneuver.



**Chandrakantha Jain**

Director,  
Vestibular Rehabilitation Specialist,  
Dev ENT Hospital, INDIA

#### CASE 2:

- 1) A similar presentation of a 50-year-old female patient with VNG positioning tests: Left Dix-Hallpike was positive with left and up-beating torsional nystagmus on supine extension with head turned to 45 degrees left. Reversal of nystagmus was appreciated on sitting from supine head extension position.
- 2) Diagnosed as left posterior canal BPPV and repositioned by Epley's maneuver.

#### CASE DISCUSSION:

- 1) Approach to BPPV depends on careful observation of type of nystagmus during positional tests. Type of positional nystagmus denotes the canal involved and enables to select the appropriate repositioning maneuver (Table 1).

Approach to positional triggered vertigo (BPPV)			
Canal involved	Diagnostic testing	Nystagmus pattern	Repositioning maneuvers
Positional canal BPPV	Dix Hallpike Test	Torsional Up Beating	1. Epley Maneuver 2. Semont Maneuver 3. QLR
Geotropic lateral canal BPPV	Supine Head Roll test	Horizontal Nystagmus beating to away from ground	1. Gufoni maneuver 2. BBQ Roll 3. Modified Zuma maneuver
Apogeotropic Lateral Canal BPPV	Supine Head Roll test	Horizontal Nystagmus beating to away from ground	1. Modified Gufoni 2. Zuma maneuver
Anterior Canal BPPV	Supine straight head extension	Torsional down beating	Yacovino maneuver

Table 1

- 2) Mechanism underlying the positional nystagmus can be explained by Ewald's law (i.e. ampullo petal endolymph movement in horizontal canals produce excitatory response and in vertical canals produce inhibitory response, vice versa.) and VOR connections between semicircular canals and extra ocular muscles.
- 3) For posterior canal BPPV, commonly used repositioning maneuvers are:
  - a. Epley's maneuver
  - b. Semont maneuver
  - c. Quick Liberatory Maneuver
- 4) Repositioning with help of VNG enables to know whether the maneuver worked or not. By observing the type of nystagmus throughout the procedure can detect re-entry of otoconia into same canal or canal switch, so that we can make corrections at the same time.
- 5) Differential diagnosis (central positional vertigo, vestibular paroxysmia etc.) of BPPV should be considered in cases resistant to repositioning therapy.
- 6) In cases of multiple canal BPPV, customized protocol should be considered depends on symptomatic profile. For example, unilateral posterior and horizontal canal BPPV (commonest involvement of multiple canal type) can be treated first with Epley's to correct posterior canal first and making the patient to Forced prolonged sleeping on opposite side at home can correct horizontal canal BPPV as well.
- 7) Risk factors like disorders of calcium metabolism (hypoparathyroidism), medical or post operative restrictions for lying on single side or particular positions can give clue regarding the diagnosis of BPPV.
- 8) In cases of refractory cases of BPPV, change of repositioning maneuver and optimal usage of mastoid vibrators can be considered. The contraindications for usage of mastoid vibrators are: a. history of cataract surgery with intra ocular lens placement, presence of risk factors for retinal detachment.
- 9) Pediatric BPPV can be seen in post-traumatic cases, non-traumatic BPPV in children should be thoroughly investigated with brain imaging.



## 2.2 Discussion Pearls



**Alfarghal Mohamad, MD**  
**Chief of Audiovestibular Services**  
**King Abdulaziz Medical City-Jeddah**  
**Saudi Arabia**



**Dr Ravi Nayar**  
**Co-founder & Chief Scientific Officer**  
**Cyclops MedTech**  
**INDIA**

**Q.1 In recent years, there is increase in literature regarding BPPV, atypical variants and therapeutic maneuvers. Why do you think its increased recently? do you think that we might missed diagnosing the atypical variants before?**

A1. yes, there is a lot of development in literature regarding understanding the mechanism of BPPV, diagnostic and therapeutic maneuvers in recent days. This can be attributed to two points:

- We have mastered the basic laws of semicircular canal functioning by various laws like Ewald's law, Alexander's law etc. which are very helpful in analyzing the type of nystagmus arising from the particular location of otoconia in semicircular canals.
- Another important contribution is from development of tools like VNG which is extremely helpful in observing the nystagmus patterns and response from repositioning maneuvers.

**Q.2 Please elaborate the various differential diagnoses of BPPV.**

A2. The differential diagnoses for BPPV will be the various causes of positional vertigo like vestibular paroxysmia, uncompensated unilateral vestibular hypofunction, cervical vertebral artery compression syndrome, perilymph fistula and central causes of positional vertigo.

We have to keep in mind the differences in nystagmus patterns in peripheral as well as central vertigo regarding latency, duration, fatiguability in making a diagnosis. The most important finding in support of BPPV is the response to repositioning maneuver.

**Q.3 Do you have any preference for repositioning maneuvers in case of posterior canal BPPV?**

A3. We do all maneuvers at our center, I personally prefer semont maneuver as I feel it is more efficient. It is powerful to dislodge otoconial blocks because of which it is efficient in atypical variants as well. There are two modifications in semont maneuver. We have to choose maneuver depending on the individual restrictions and requirements from patient side. Proper training in conducting maneuvers enable to get better outcome.

## **Q.4 Do you use vibratory devices in treating BPPV?**

A4. yes, we use them. The protocol we follow in treatment for BPPV is at first sitting minimum 2 repetitions of repositioning maneuver. In review sitting after 5 days, if the nystagmus persisting, we change the repositioning maneuver. In some cases, we use skull vibratory devices. We have to be very cautious in using these devices because inappropriate usage can lead to otoconial displacement into multiple canals. The absolute contraindications for skull vibratory device usage are presence of Intraocular lens with cataract surgery, patients at risk of retinal detachment like high myopia etc.

## **Q5. How often do you see secondary BPPV i.e. BPPV due to systemic issues?**

A5. We have a greater number of thyroidectomies for cancer cases at our center. We see regularly BPPV after thyroidectomy with parathyroidectomy (accidental removal or intentional removal of parathyroids). This can be explained in terms of altered calcium metabolism. So, any systemic problem altering calcium metabolism can be expected with high incidence of BPPV.

Another group of patients are post-surgical pacemaker placement cases, with high incidence of BPPV on right side because of restricted lying to right side post operatively.

## **Q.6. what is the age of youngest patient with BPPV you have encountered?**

A6. I have seen a 10 years child with post traumatic BPPV. He had one sided temporal bone fracture with vestibular hypofunction and contralateral BPPV. He had significant betterment of symptoms after repositioning the BPPV as brain cannot tolerated BPPV unlike unilateral vestibular hypofunction. In non-traumatic cases of BPPV in children we have to investigate thoroughly with brain imaging.

## **Q.7. In case of multiple canal involvement in BPPV, which canal you prefer to reposition first? is there any protocol for that?**

A7. I prefer posterior canal to reposition first if its involvement is there because the repositioning of posterior canal is highly effective and guaranteed than rest of canal repositioning.

We have to customize the treatment protocol depending on canal involvement, for example in case of unilateral posterior and horizontal canal involvement which is the most common type, we can do Semont or Epley maneuver for posterior canal and ask the patient to go home and sleep on opposite side as the forced prolonged positioning is effective for horizontal canal BPPV.

## **Q.8. What do you see as the future of vestibular medicine?**

A8. There is a lot of growth in studies in the field of vestibular medicine and their global increase in interest among health care personnel in understanding and treating vestibular disorders. There is increase in number of emerging vestibular specialists from the fields of ENT, Neurology and Audiology etc.

# VERTiG Grand Rounds

**Q.9. which topic do you suggest in field of vestibular medicine as a project for PhD if you been asked for?**

- It will be very helpful to conduct research work regarding product or device development in diagnostic, therapeutic or rehabilitative usage in vestibular disorders.
- Research work which can validate protocols.
- Which helps in better understanding of mechanism underlying disease.
- Development of diagnostic screening tool for public regarding vestibular diseases.

## 2.3 Online VGR Video

Scan the below QR Code



to watch the complete Vertigo Grand Round Session



Static Posturography /  
Stabilometry

Postura - DR comes with dozens of calibrated exercise protocols as well as interactive games to rehabilitate every aspect of balance. Patient's progress can be measured from one visit to another.



### 3. Journal Scan

- i) Bhandari, A., et al. Editorial: Benign paroxysmal positional vertigo. Front Neurol 15, (2024).

#### *Editorial Comment:*

*This editorial provides insights into recent advancements in the comprehension of BPPV, encompassing its mechanisms, diagnostic approaches, and therapeutic methodologies. A noteworthy enhancement in BPPV diagnostics involves the proposal of supplementary positional tests like upright positional tests, bow and lean test. In addition, a 45° tilt of the head has been proposed to explore the presence of BPPV affecting posterior and anterior canals to increase the sensitivity of the bow and lean test in the diagnosis of vertical canal BPPV. The 60° roll test and prone roll test are supplementary tests that have also been proposed to aid in determining the position of otoliths within the affected canals and in distinguishing between canalolithiasis and cupulolithiasis.*

*This article underscores the efficiency and safety of the mechanical rotatory chair (MRC) in treating posterior BPPV and considers the MRC as a valuable addition to BPPV treatments, ensuring both efficacy and safety in clinical application.*

*Furthermore, the article emphasizes the importance of vestibular function tests in recurrent BPPV cases as recurrence is more common when associated with other vestibular disorders such as vestibular migraine, Meniere's disease, labyrinthitis, and labyrinthine concussion, etc.*

- ii) Song, M. H., Kong, et al. Optimal reassessment time for treatment response in posterior canal benign paroxysmal positional vertigo. Laryngoscope 130, 496–499 (2020).

#### *Editorial Comment:*

*This article is offering valuable insights for clinicians in determining the appropriate post-treatment evaluation duration. This study was conducted to assess the optimal timeframe for reassessment of treatment response in posterior canal benign paroxysmal positional vertigo subsequent to the initial Epley maneuver. The findings conclude that a 24-hour reassessment period following the initial Epley maneuver proves more advantageous than a 1-hour follow-up for patients with PC-BPPV.*

- iii) Corvera Behar, G. & García de la Cruz, M. Surgical Treatment for Recurrent Benign Paroxysmal Positional Vertigo. Int Arch Otorhinolaryngol 21, 191–194 (2017).

#### *Editorial Comment:*

*This is a review article elaborating the outcomes of the surgical treatment for intractable BPPV. This study compares the two techniques i.e. Singular neurectomy and semicircular canal occlusion. Authors concluded that both techniques are safe and effective but as semi-circular occlusion is easier to learn and perform adequately thus may be considered as a best alternative.*

iv) Lin, S.-Z. et al. Efficacy of laser occlusion of posterior semicircular canal for benign paroxysmal positional vertigo: case report. J Laryngol Otol 124, e5 (2010).

*Editorial Comment:*

*This is a case report of a patient with refractory benign paroxysmal positional vertigo treated with laser occlusion of the posterior semicircular canal. This method had long-term effectiveness, and has been reported in this article as one of the most effective methods of treating patients with refractory benign paroxysmal positional vertigo. This is the first published case study of its kind in literature as claimed by the authors.*

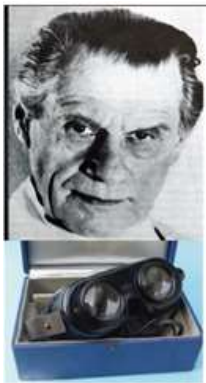


## 4. History



**Georg von Békésy** (a Nobel prize winner in 1961) Hungarian biophysicist is renowned for his work in auditory physiology. His work published in "Experiments in Hearing" (1947) and "A New Type of Electrometer and its Application to Sound Measurement" (1955), provides crucial insights into the mechanical and neural aspects of cochlear function and sound perception. His innovations cochlear model and traveling wave theory, fundamentally shaped the scientific discourse on hearing, leaving a lasting legacy in the study of sensory perception.

**Leonard Barend Willem Jongkees**, a renowned Otorhinolaryngologist from Amsterdam, in his publication "Quantitative Evaluation of Electronystagmography in Inner Ear Disorders (1964)," unveiled Jongkees formula for quantifying the asymmetry in responses during inner ear function test (electronystagmography). This still aids the diagnosis of inner ear issues like BPPV. He was awarded the American Otological Society's Gold Medal in 1977 for his research.



**Hermann Frenzel** a German physician/ World War I soldier was the first post-war secretary and chairman of the German Society of Otorhinolaryngology. His research spanned creating tools [Frenzel glasses (1822)], improving medical techniques (tracheobronchoscopy and the early stages of laryngeal carcinoma), and establishing diagnostic systems for clinical examination of vestibular disorders.

**Ernst Julius Richard Ewald** was a German physiologist, a polymath with degrees in math, physics, and medicine, researched inner ear of pigeons. His experiments on their semicircular canals led to "Ewald's laws," explaining how fluid movement in the ear affects 'balance & eye movements' and how the inner ear balance's its signals. His book "Physiologische Untersuchungen über das Endorgan des Nervus octavus" earned him recognition from the prestigious Paris Academy of Sciences in 1892.



**Dr. Gustav Alexander** an Austrian Otolaryngologist, the greatest exponent of scientific otology of late 80's, till date is remembered for "Alexander's Deafness". Alexander, a surgeon and prolific researcher (386 publications!), revolutionized surgical otology in Vienna. Notably, his 1904 work on the Echidna's ear earned him the Lenval Prize. Alongside Professor Marburg, he co-authored "The Manual of Oto-Neurology," further solidifying his legacy. Tragically, he was killed by a former patient in 1932.

## 5. Gallery - Art of the month



Photo credit:  
Dr. K. Govind Babu. MD

*Within the mind, these motes of might reside,  
No earthy seeds, but thoughts with wings that glide.  
They wait on gales of contemplation's art,  
A fertile tongue to play a knowing part.  
From tome to ear, from sage to youthful mind,  
These seeds of wisdom fertile growth shall find.  
And as they spread, the very earth shall see,  
A richer harvest, born of memory.*

- By Dr. Kanika Mahajan