

Benign paroxysmal positional vertigo and its variants

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INTRODUCTION

- Common labyrinthine disorder
- Mechanic stimulation
- Older patients:
 - Greater incidence of falls
 - Depression
 - Impairment of their daily activities

INTRODUCTION

- First description
 - Robert Bárány in 1921
- Features of the syndrome & diagnostic maneuver
 - Dix and Hallpike in 1952
- More than 1200 papers published in the last 25 years

EPIDEMIOLOGY

- Most common cause of vertigo in adults
- Lifetime cumulative incidence about 10%
- 15% of all equilibrium disorders
- Mean age of onset close to 60 years
- Incidence increases in those over 60 years
- Decreases below 40
- Very rare in children

EPIDEMIOLOGY

- Women are more commonly affected ratio of about 2:1
- Often a self-limiting disease after days to weeks
- About 1 in every 2 patients is prone to recurrences

EPIDEMIOLOGY

- Posterior semicircular canal (PC)
- Most commonly responsible
- Most gravity-dependent
- 70% of BPPV patients receive a diagnosis of unilateral PC-BPPV

- Right PC is more frequently affected (ratio about 1.5:1)
- Sleeping on right side

EPIDEMIOLOGY

- 5–10% bilateral involvement of the PC
- Almost 90% of these are posttraumatic

- 15–20% of patients have the lateral canal (LC) variant

- No significant difference in gender or side involved

PATHOPHYSIOLOGY

- Otoconial debris
- Detached from the utricular macula
- Enters one or more semicircular canals

- Clusters of calcium carbonate crystals have been observed inside the semicircular canals during surgery performed in patients affected by BPPV

PATHOPHYSIOLOGY

- Otoconia should dissolve in the endolymph reasonably quickly
- But a high calcium concentration in the endolymph seems to slow or prevent this process
- Debris can fall toward or away from the ampulla, thereby provoking an ampullopetal or ampullofugal deflection of the cupula

PATHOPHYSIOLOGY

- Otoconial clusters may also adhere to the cupula
- Rendering it sensitive to gravitational forces
cupulolithiasis theory
- Adhesion can probably occur on the side of the short arm or on the side of the long arm of the canals, or both
- It is possible that canalolithiasis and cupulolithiasis may coexist in the same patient

PATHOPHYSIOLOGY

- Typical PN as a result of canalolithiasis should be abrupt in onset, paroxysmal (intense), and transient,
- Whereas that due to cupulolithiasis should be gradual in onset, less intense
- Persist as long as the provocative position is maintained, or gradually subsiding due to adaptation.

ETIOLOGY

- 15% close relationship with a head trauma.
- BPPV may follow cochlear implantation
- Stapes surgery
- After a fall, especially in older people
- Vestibular damage from a viral cause or labyrinthine ischemia
- Vestibular neuritis

ETIOLOGY

- After prolonged bed rest
- Orthopedic surgery of the legs
- Motionlessness may predispose to detachment of otoconia
- Certain positions have been held at the hairdresser or dentist
- After general surgery with prolonged positioning with the head back

ETIOLOGY

- In most patients, the disease is idiopathic
- Aging plays an important role
- Hormonal effects and migraine in females
- Vasospasm of the inner ear

ETIOLOGY

- Menière's disease also seems to predispose to BPPV
- Recurrence with the disorders of calcium metabolism and vitamin D deficiency
- End of winter, when serum vitamin D level is known to be low

SYMPTOMS

- First episode generally occurs in bed or when getting up.
- Triggered by lying down and/or turning in the bed, this is typical of BPPV
- Subsides after around 10 seconds
- If the provoking position is maintained

SYMPTOMS

- When the lateral canals are involved, the attacks of vertigo are longer, more intense, and provoked mainly by rolling to the side while lying
- The first episodes of vertigo are more intense,
- Often accompanied by nausea and vomiting, and frighten the patient so that the duration of the attack may be overestimated

SYMPTOMS

- Patients with LC-BPPV are sometimes forced to lie immobile in a supine position, so it can be difficult to know whether it is a positional vertigo or not
- Some of them complain of a feeling of floating and postural instability between attacks
- recurrence rate has been estimated to be 15% after 1 year and up to 50% in the long term

SYMPTOMS

- Patients with atypical BPPV and particularly those with positional downbeating nystagmus (pDBN) complain of less specific symptoms.
- Some of them complain of unsteadiness instead of vertigo, especially when getting up, and dizziness when walking, which is a rare feature in those with typical BPPV

SYMPTOMS

- Active phase
- Can drive a car, since turning the head from side to side in the sitting position does not provoke symptoms
- However, some of them complain of a feeling of floating and postural instability between attacks
- The recurrence rate has been estimated to be 15% after 1 year and up to 50% in the long term

SYMPTOMS

- The rare chronic forms with a persistent active phase that does not resolve with repeated physical treatment cause so-called “intractable BPPV.

DIAGNOSIS (THE CLINICAL PICTURE)

- Imaging of the brain or ear is not necessary in patients with typical BPPV

Posterior-canal BPPV

- Canalolithiasis is by far the most common mechanism.

DIAGNOSIS

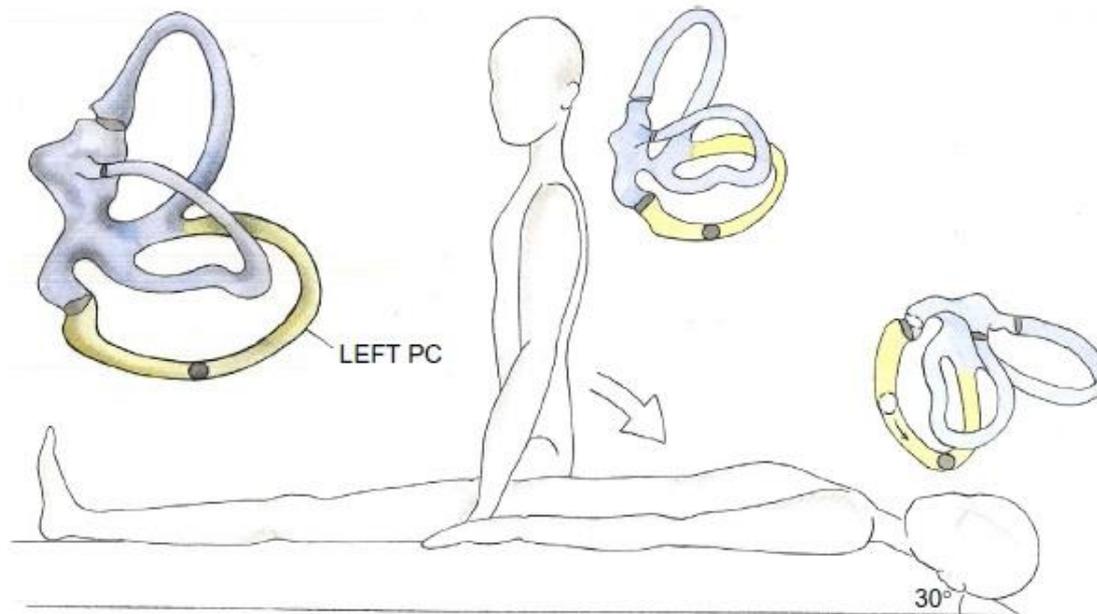


Fig. 18.1. Dix–Hallpike test for left posterior semicircular canal (PC) benign paroxysmal positional vertigo. The head is turned 45° to the left and then the patient is quickly brought into the left head-hanging position, about $30\text{--}40^\circ$ below the horizontal plane. This position is maintained for at least 30 seconds, since positional nystagmus may appear after a long latency. The patient is next returned to the sitting position with the head facing forward, again observing for nystagmus. The position and movement of particles inside the PC are shown (for details, see text).

DIAGNOSIS

- LATENCY:
 - 2–10 seconds

- DIRECTION AND PLANE :
 - Toward the ground and away from the ampulla
 - Excitatory stimulus
 - Mixed torsional-vertical paroxysmal nystagmus

DIAGNOSIS

- The fast phase of the vertical component beats towards the forehead (up)
- The fast phase of the torsional component is directed such that the upper pole of the eyes beats towards the affected lower ear
- The torsional component may appear more prominent when the patient looks toward the lowermost ear and the vertical component more prominent if the patient looks toward the uppermost ear.

STATIC REVERSAL

- In some patients, when PN is particularly intense, a spontaneous reversal of its direction may occur, without any change in head position.
- This “secondary” nystagmus begins a few seconds after the end of the previous PN, is of low amplitude, and probably reflects adaptation to a sustained vestibular stimulus.

DYNAMIC REVERSAL

- When the patient is returned to the sitting position
- particles fall back
- Smpullopetal flow
- Inhibitory response
- Less intense nystagmus in the opposite direction
- Typical feature of PC-canalolithiasis

DYNAMIC REVERSAL

- Cupulolithiasis
- Heavy cupula
- Same direction (vertical-upbeating and torsional),
- but gradual in onset
- Not paroxysmal
- Persisting as long as the provocative position is maintained
- A gradual decline can begin after more than 1 minute

DYNAMIC REVERSAL

- Half Dix–Hallpike maneuver
- Patient's head is turned 45° toward the side
- About 60° down to one side, instead of 120°
- Rolling the head 180° to the other side (release position) should reveal a less intense nystagmus beating in the opposite direction
- Due to ampullopetal deflection of the cupula

Lateral-canal BPPV

- Spontaneous nystagmus with the patient in the sitting position
- The patient is then rapidly brought to the supine position, with the head straight
- Bent about 30° forward to bring the lateral canal into the vertical plane.
- “supine roll test” (McClure–Pagnini test) is performed by rolling the patient’s head 90° to one side

Lateral-canal BPPV

- The head is then rotated 180° to the other side, looking for changes in the direction and intensity of nystagmus.
- Whole body can be rotated and also a step can be added: 90° to one side, back to neutral, and then 90° to the other side

GEOTROPIC VARIANT

- Intense horizontal nystagmus beating toward the lower ear.
- This is termed geotropic because it beats towards the ground
- Generally, it is more intense and longer lasting (sometimes for more than 1 minute) than that of PC-BPPV,
- Rotation of the head to the other side provokes a less intense nystagmus toward the opposite ear, again geotropic

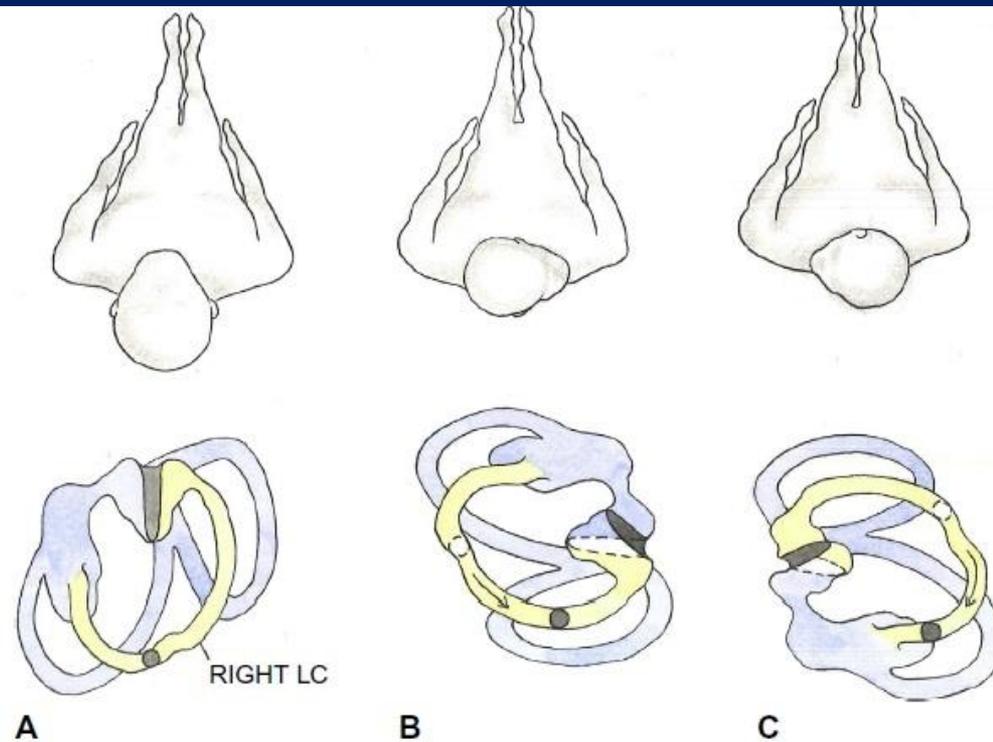


Fig. 18.2. Supine head roll test in right lateral canal (LC) benign paroxysmal positional vertigo (geotropic form). (A) Patient in the supine position and the head straight: particles are located in the most gravity-dependent part of the lateral canal. (B) Rotating the head 90° to the right side causes particles to fall toward the ampulla, producing an ampullopetal flow and intense horizontal nystagmus beating to the right, affected, ear. (C) Rotation of the head 180° to the left side causes particles to move in the opposite direction, producing ampullofugal flow and left-beating horizontal nystagmus (again geotropic), less intense than in (B).

Lateral-canal BPPV

- The phenomenon of static reversal nystagmus is much more frequent in LC-BPPV
- LC-PN seems less susceptible to habituation with repetition of the diagnostic maneuvers
- Even though this characteristic is often difficult to assess, due to nausea or vomiting.
- The latency of geotropic paroxysmal nystagmus is usually shorter than that of PC-BPPV

Lateral-canal BPPV

- Sometimes, however, it may be difficult to appreciate a difference between the intensity of the two sides
- Pseudospontaneous nystagmus
- more common when patients are observed in darkness with video recordings, since it is completely inhibited by fixation.
- It may be revealed by a gentle shake of the head

Lateral-canal BPPV

- Increasing its intensity with bending the head 30° backward
- Stopping with the head bent 30° forward
- reversing its direction if the head is further bent forward to 60
- Bow and Lean Test or Head Pitch Test

Bow and Lean Test

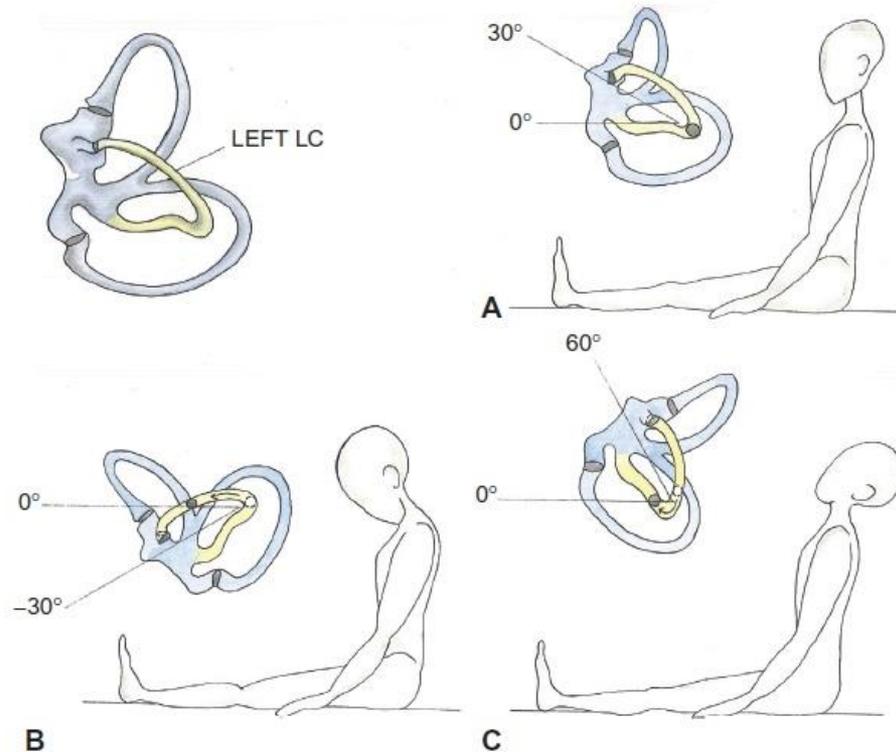


Fig. 18.3. Bow and Lean Test in left lateral canal benign paroxysmal positional vertigo (geotropic form). (A) With the patient in the sitting position, the angle between the horizontal plane and the plane of the lateral canal could cause particles to move away from the ampulla with "pseudo-spontaneous" beating to the right. (B) When bending the head about 60° forward, gravity causes debris to move towards the ampulla, producing left-beating nystagmus. (C) By bending the head backwards, the lateral canal is placed almost in the vertical plane, favoring the fall of particles away from the ampulla and producing right-beating nystagmus.

Lyingdown nystagmus

- PN can also be evoked by bringing the patient rapidly from the sitting to the supine position
- Mild horizontal nystagmus toward the unaffected ear
- Lyingdown nystagmus

APOGEOTROPIC VARIANT

- less common
- PN that beats toward the ceiling when the supine roll test is performed
- The affected side is again the one toward which the more intense nystagmus beats

APOGEOTROPIC VARIANT

- most popular theory: cupulolithiasis,
- The cupula is deflected toward the canal when the affected ear is down
- PN should be of low to medium intensity and persistent for all the time that the critical position is held, with a slow decline due to adaptation.
- Latency should be absent or minimal

APOGEOTROPIC VARIANT

- When the patient is lying with the head is turned about 20° towards the side of the affected ear, it is possible to find the so-called “null point” where nystagmus stops

APOGEOTROPIC VARIANT

- alternative theory
- Canalolithiasis
- If debris is located near the ampulla of the lateral canal, on its anterior part
- Moving in the opposite direction with respect to the geotropic variant

- pseudo-spontaneous nystagmus
- lying-down nystagmus
- opposite to that found in the geotropic form

Anterior-canal BPPV

Spontaneous nystagmus

- Persistent spontaneous nystagmus in LC-BPPV has been described
- Not influenced by gravity and does not change its direction with positional maneuvers
- Must be differentiated from “pseudo-spontaneous” nystagmus
- Jamming of the particles within a narrow segment of the LC
- Negative or positive endolymph pressure and persistent deflection of the cupula
- It often follows therapeutic procedures and more frequently affects the lateral canal, thereby provoking horizontal nystagmus

Direction-fixed positional nystagmus

- Rare form of LC-BPPV
- PN that does not reverse its direction when the supine roll test is performed
- Is usually more intense on one side
- Simultaneous presence of masses of different density, or dimensions in the same canal and entrapment of the largest ones in the narrower part of the canal.

Multiple-canal BPPV

- possible, especially after head trauma

Positional downbeating nystagmus

- ???

DIFFERENTIAL DIAGNOSIS

- Absence of neurologic signs and symptoms
- A re-evaluation is required when the patient is not cured despite many attempts with therapeutic maneuvers

DIFFERENTIAL DIAGNOSIS

- Horizontal apogeotropic PN can be “dangerous” when it is not paroxysmal, persistent, not accompanied by vertigo and, mainly, when it fails to reverse its direction or to resolve with appropriate maneuvers or positions

DIFFERENTIAL DIAGNOSIS

- A central lesion can cause pDBN when it is purely vertical, not associated with autonomic symptoms, and especially if there is no lessening of symptoms and nystagmus intensity by repeating the provoking maneuvers

DIFFERENTIAL DIAGNOSIS

- Since LC-BPPV may present with spontaneous or “pseudo-spontaneous” nystagmus, differentiation from acute unilateral vestibular loss is mandatory
- Every patient with horizontal unidirectional spontaneous nystagmus should therefore be tested with the Bow and Lean Test and with the supine roll test to look for direction changing PN

DIFFERENTIAL DIAGNOSIS

- Vestibular migraine (VM)
- Hours to days in VM patients, weeks to months in BPPV patients
- Intense and short-lasting (seconds) in typical BPPV, less intense and longer-lasting in VM patients
- Headache, photophobia, and phonophobia

DIFFERENTIAL DIAGNOSIS

- persistent and with low velocity of its slow phase,
- difficult to detect without removing visual fixation.

- PN in VM is more often horizontal, geotropic or apogeotropic, but direction-fixed, that is, it does not reverse its direction when the supine head roll test is performed.

- Persists as long as the precipitating head position is maintained and is not removed or modified by physical treatment.

- Atypical BPPV, namely those with pDBN.

TREATMENT OF BPPV

- Drugs are not indicated in BPPV, except to relieve symptoms at the beginning of the disease or during the treatment maneuvers
- Surgical section of the nerve to the posterior semicircular canal and occlusion of the posterior semicircular canal have been performed, though rarely

TREATMENT OF BPPV

- Prevention with antimigrainous drugs could be useful in patients with migraine and recurrent BPPV
- Supplementation with vitamin D has been proposed, especially in women in menopause with recurrent BPPV, given the prevalence of vitamin D deficiency

Physical treatment of PC-BPPV

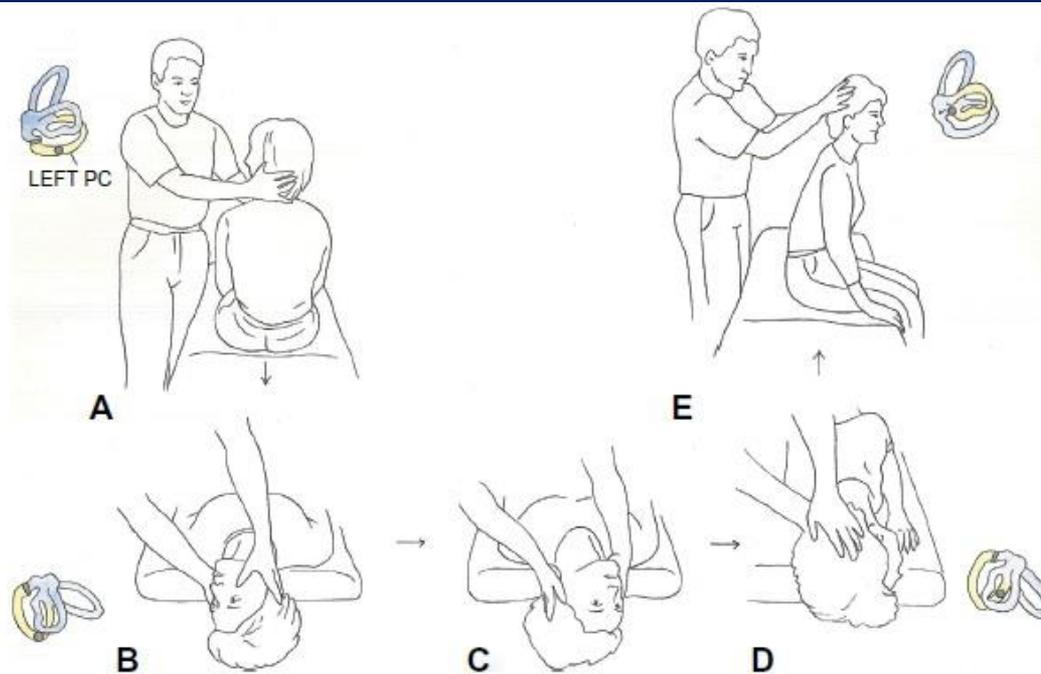
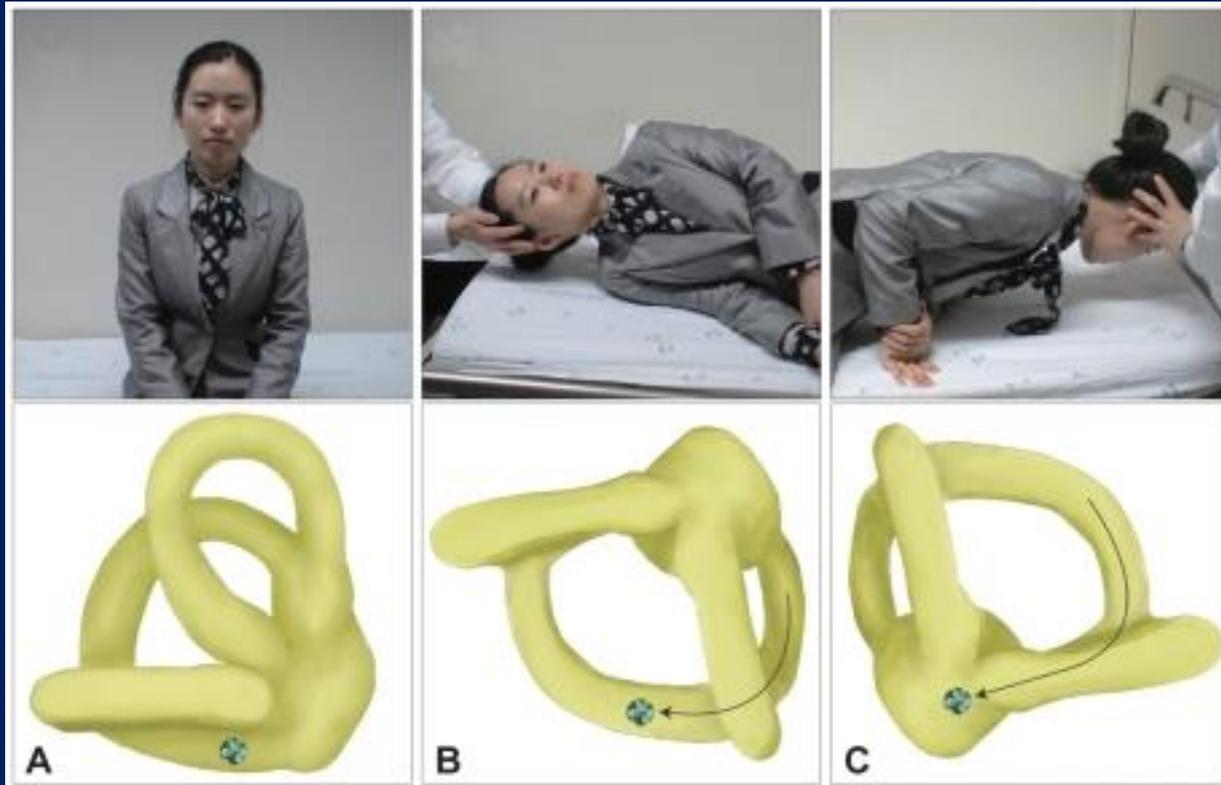


Fig. 18.4. Canalith-repositioning procedure (Epley maneuver) for left posterior semicircular canal (PC) benign paroxysmal positional vertigo. (A) The patient is in the sitting position and the head is turned 45° to the left. (B) The patient is moved into the left Dix–Hallpike position (head hyperextended). In this position, particles gravitate toward the center of the PC. (C) After about 30 seconds, the head is rotated 90° rightward, maintaining the hyperextension. This movement should provoke progression of debris toward the common crus. (D) The head and shoulders are rotated rightward another 90° until the head is face down. With this movement, particles should cross the common crus. (E) The patient is returned to the sitting position and then the head is turned forward and slightly tilted about 20° down. In this way, debris should enter the utricle.

SEMONT'S LIBERATORY MANEUVER



SEMONT'S LIBERATORY MANEUVER

- If too slow, the debris might fall back in the wrong direction
- The expected response to the liberatory maneuver is another episode of intense vertigo and paroxysmal nystagmus with the same direction of rotation as in the provoking right Dix–Hallpike position, which is due to the movement of debris in the ampullofugal direction, toward the utricule. This is called the liberatory nystagmus and is therefore a good prognostic sign

Physical treatment of LC-BPPV

- GUFONI'S MANEUVER
- FORCED PROLONGED POSITION

GUFONI'S MANEUVER

BENIGN PAROXYSMAL POSITIONAL VERTIGO AND ITS VARIANTS

253

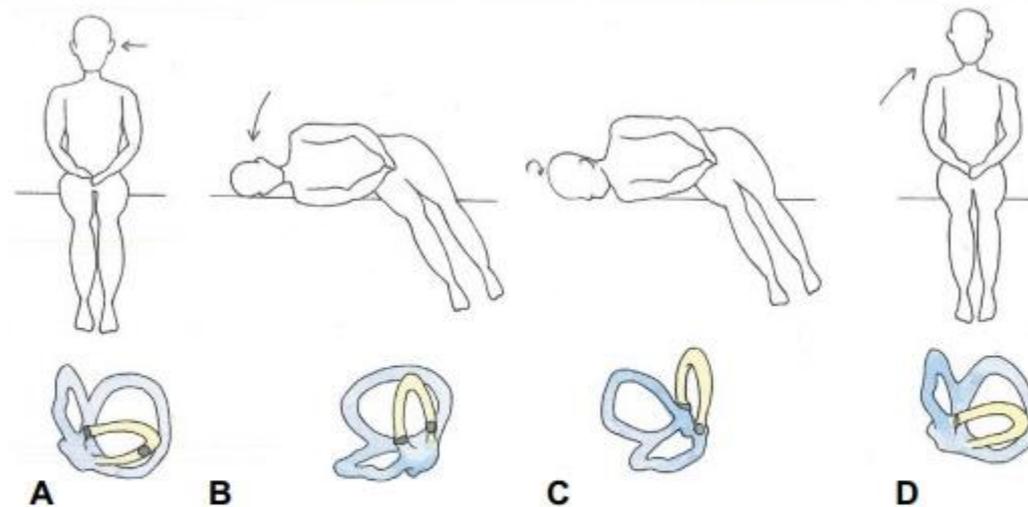


Fig. 18.5. Gufoni's maneuver for left lateral canal (LC) benign paroxysmal positional vertigo in the geotropic form. (A) Patient in the sitting position and debris located in the middle of the LC. (B) The patient is moved to the right healthy side, without changing head position relative to the shoulders. The maneuver is rapid and with deceleration as the head makes contact with the bed. With this movement, debris should move away from the ampulla. (C) After a few seconds, the head is rotated about 45° down to favor the exit of debris from the canal, by gravitation. (D) After about 2 minutes, the patient is returned to the sitting position. The maneuver can be repeated three times.

FORCED PROLONGED POSITION

- patient is simply instructed to lie in a supine position, then to turn on to the side of the healthy ear and to stay in this position for as long as possible, all night if possible
- useful in patients with severe autonomic symptoms, in older people, and in obese patients or those with significant mobility limitations

TREATMENT OF APOGEOTROPIC LC-BPPV

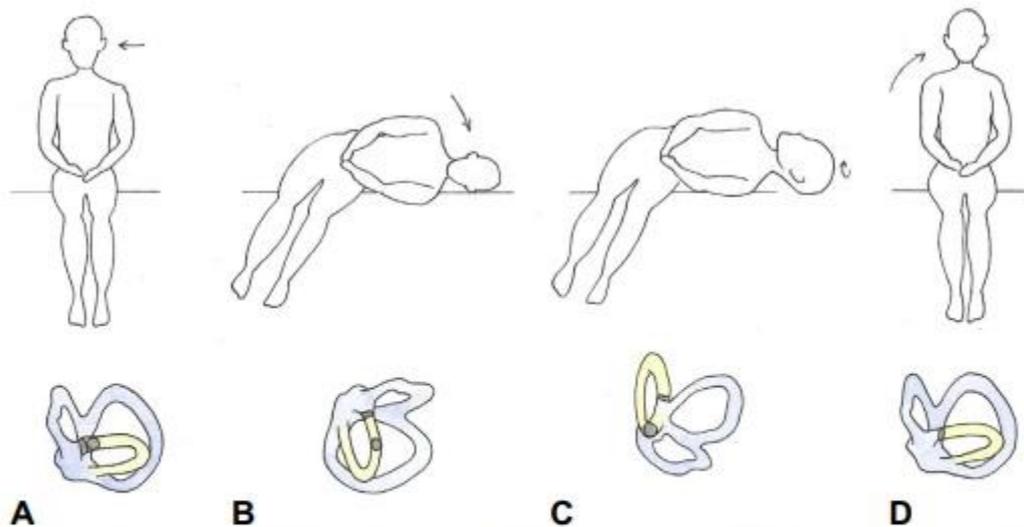


Fig. 18.6. Modified Gufoni's maneuver for left lateral canal benign paroxysmal positional vertigo in the apogeotropic form. (A) Patient in the sitting position and debris located close to ampulla or on the cupula. (B) The patient is rapidly moved to the left affected side, without changing the head position relative to shoulders. With this movement debris should move away from the ampulla. (C) After a few seconds the head is rotated about 45° up to favor the exit of debris from the canal. (D) After about 2 minutes the patient is returned to the sitting position.

Physical treatment of AC-BPPV

- reverse” Epley’s maneuver, starting from the healthy side, seems to be logical
- Excellent results are also reported with Epley’s maneuver starting from the affected side
- Crevits
- Home treatment with maneuvers similar to the well-known Brandt–Daroff exercises

