

Vertical canal BPPV: Diagnosis & treatment



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Diagnostic criteria of BPPV

1. Canalolithiasis of the posterior canal (pc-BPPV)

- A. Recurrent attacks of positional vertigo or positional dizziness provoked by lying down or turning over in the supine position
- B. Duration of attacks < 1 min
- C. Positional nystagmus elicited after a latency of one or few seconds by the Dix-Hallpike maneuver or side-lying maneuver (Semont diagnostic maneuver). The nystagmus is a combination of torsional nystagmus with the upper pole of the eyes beating toward the lower ear combined with vertical nystagmus beating upward (toward the forehead) typically lasting < 1 minute
- D. Not attributable to another disorder

Diagnostic criteria of BPPV

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Symptoms

- A. Recurrent attacks of positional vertigo or positional dizziness provoked by lying down or turning over in the supine position
- 1) Patients may have prolonged mild unsteadiness, even after successful treatment of benign paroxysmal positional vertigo.
 - 2) BPPV typically leads to positional vertigo but occasionally patients may complain of positional dizziness.
 - 3) Other complaints during the attacks include external vertigo, unsteadiness, and vegetative symptoms such as nausea, sweating, and tachycardia.
 - 4) Positional vertigo or dizziness must be distinguished from orthostatic symptoms present only on arising but not with other positional triggers.
 - 5) Attacks may not only be provoked in bed but also by other head movements (e.g., tilting the head backward [i.e., chin upward] or forward).

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Duration

- B. Duration of attacks < 1 min
- Patients may overestimate the duration of single attacks and mild, residual symptoms after an attack occasionally last minutes or hours. Furthermore, attacks may be triggered repetitively, causing more extended symptoms.
 - The duration of vertigo should not, however, generally exceed 1 minute; single attacks lasting consistently longer should be considered atypical and spark consideration of alternate or additional diagnoses.

Diagnostic criteria of BPPV

1. Canalolithiasis of the posterior canal (pc-BPPV)

Nystagmus

- C. PN elicited after a latency of 1 or few sec by the D-H man or side-lying man. The nystagmus is a combination of torsional nystagmus with the upper pole of the eyes beating toward the lower ear combined with vertical nystagmus beating upward typically lasting < 1 minute
- If positional nystagmus disappears immediately after positional therapy, this further supports the diagnosis.
 - The latency between the the diagnostic positional maneuver and the onset of positional nystagmus may be as long as 40 sec in rare cases.
 - The torsional component of PN is more prominent in the lower eye, whereas the vertical component is more prominent in the upper eye.
 - The direction of the patient's gaze may influence the appearance of positional nystagmus; If gaze is directed to the lower ear, nystagmus may appear predominately torsional; if directed to the upper ear, it may appear predominantly vertical.

Diagnostic criteria of BPPV

1. Canalolithiasis of the posterior canal (pc-BPPV)

Nystagmus

- C. PN elicited after a latency of 1 or few sec by the D-H man or side-lying man. The nystagmus is a combination of torsional nystagmus with the upper pole of the eyes beating toward the lower ear combined with vertical nystagmus beating upward typically lasting < 1 minute
- Usually, the duration of positional nystagmus does not exceed 40 seconds before it damps spontaneously.
 - Typically, positional nystagmus increases rapidly in intensity and then declines more slowly (crescendo-decrescendo).
 - Nystagmus of lower intensity with reversed direction may appear after the initial positional nystagmus has ceased.
 - After the patient returns to the upright position, PN with reversed direction of lesser intensity and shorter duration often occurs.
 - Furthermore, fatigability of nystagmus and vertigo with repetitive positional testing is a common finding.

Diagnostic criteria of BPPV

Emerging and controversial syndromes

Diagnostic criteria of BPPV

5. Canalolithiasis of the anterior canal (ac-BPPV)

- A. Recurrent attacks of positional vertigo or dizziness provoked by lying down or turning over in the supine position
 - B. Duration of attacks < 1 min
 - C. Positional nystagmus elicited immediately or after a latency of one or few seconds by the Dix-Hallpike maneuver (on one or both sides) or in the SHH position, beating predominantly vertically downward and lasting < 1 min
 - D. Not attributable to another disorder
- *Definite AC-BPPV*: immediate resolution after therapeutic maneuvers.
 - *Probable AC-BPPV*: only after exclusion of CNS disease when positional nystagmus is refractory to CRM.
 - Positional DBN also occurs as a sign of central vestibular dysfunction, it is mandatory to exclude CNS disease if positional nystagmus does not cease promptly after CRM.

Diagnostic criteria of BPPV

6. Cupulolithiasis of the posterior canal (pc-BPPV-cu)

- A. Recurrent attacks of positional vertigo or positional dizziness provoked by lying down or turning over in the supine position
- B. Positional nystagmus elicited after a brief or no latency by a “half Dix-Hallpike maneuver”, beating torsionally with the upper pole of the eye to the lower ear and vertically upward (to the forehead) and lasting > 1 min
- C. Not attributable to another disorder
 - A “half Dix-Hallpike maneuver” is performed with the head turned 45° toward the side to be tested and resting slightly raised from supine (about 30° in flexion). This position is best suited to bring the affected cupula to an earth-horizontal position to be maximally deflected by the gravitational force.

The NEW ENGLAND JOURNAL of MEDICINE

CLINICAL PRACTICE

Caren G. Solomon, M.D., M.P.H., *Editor*

Benign Paroxysmal Positional Vertigo

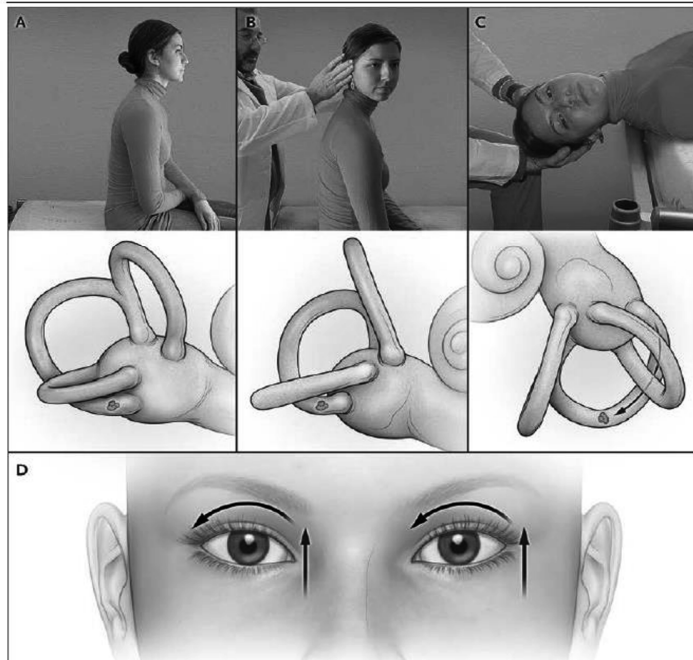
Ji-Soo Kim, M.D., Ph.D., and David S. Zee, M.D.

Diagnosis of PC-BPPV

Diagnosis			Treatment	
Maneuver	Method	Induced Nystagmus	Repositioning Maneuver	Method
Dix–Hallpike	With head turned to one side at angle of 45 degrees, patient is moved from sitting position to supine position, with head hanging below examination table	Upbeat and ipsiversive torsional*	Epley's maneuver	After performance of Dix–Hallpike maneuver, head is turned 90 degrees toward unaffected side; head is then turned another 90 degrees, and trunk is turned 90 degrees in same direction, so that patient lies on unaffected side with head pointing toward the floor; patient is then moved to sitting position
Side-lying	Patient is quickly placed on the side with affected ear with head turned 45 degrees in opposite direction	Upbeat and ipsiversive torsional*	Semont's maneuver	Patient is swung rapidly, through 180-degree cartwheel-like motion, from lying on the side with affected ear to lying on the side with unaffected ear

Diagnosis of PC-BPPV

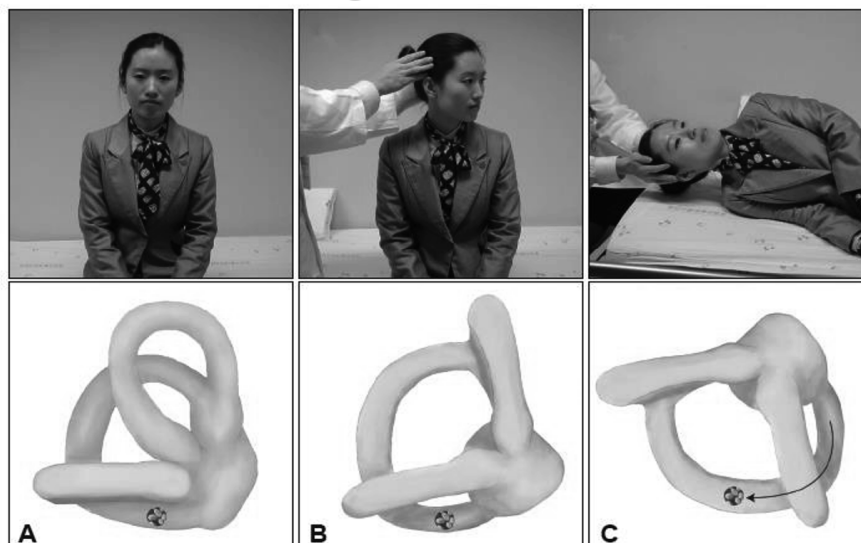
Dix-Hallpike maneuver



- With the patient sitting upright (Panel A), the head is turned 45 degrees to the patient's right (Panel B). The patient is then moved from the sitting position to the supine position with the head hanging below the top end of the examination table at an angle of 20 degrees (Panel C).
- The resulting nystagmus would be upbeat and torsional, with the top poles of the eyes beating toward the lower (right) ear (Panel D).

Diagnosis of PC-BPPV

Side-lying test for the diagnosis of right PC-BPPV



- 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).

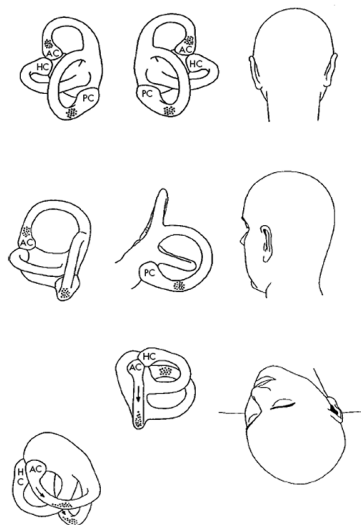
Diagnosis of AC-BPPV

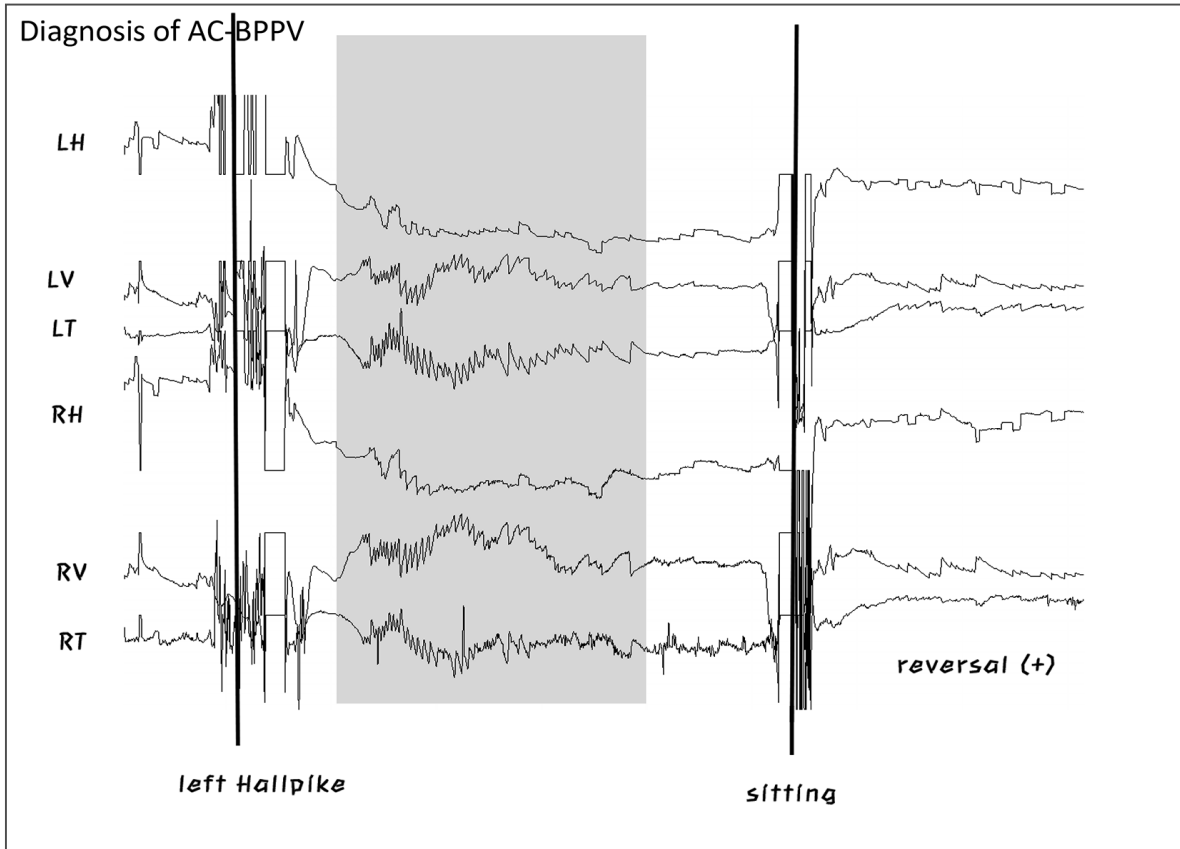
Type	Diagnosis		Treatment
	Maneuver	Induced nystagmus	
PC	Dix-Hallpike Side-lying	Upbeat & ipsiversive* torsional	Modified Epley's maneuver Semont's maneuver
HC- Geotropic	Supine roll	Geotropic	Barbecue maneuver Gufoni's maneuver Forced prolonged position Vannucchi-Asprella maneuver ²³
HC- Apogeotropic	Supine roll	Apogeotropic	Gufoni's maneuver Head-shaking maneuver modified Semont's maneuver
AC	Dix-Hallpike Straight head hanging	Downbeat & ipsiversive torsional	Reversed Epley's maneuver Forced prolonged position (Crevits's technique) Deep Dix-Hallpike maneuver Yacovino's maneuver

Diagnosis of AC-BPPV

BPPV – Anterior Canal

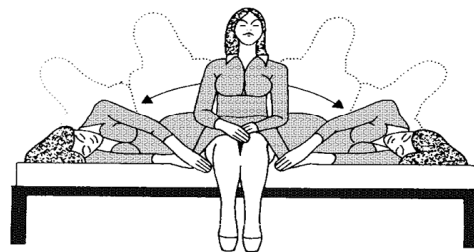
- Less frequent type (< 5%)
- Similar clinical feature to PC-BPPV
- Diagnosed by positional testing (Dix-Hallpike & Straight head-hanging)
- Downbeating & torsional nystagmus
- D/D with central positional vertigo





Treatment of BPPV

- Spontaneous remission (resolution)
 - HC-BPPV: 16 days (\pm 19 days)
 - PC-BPPV: 39 days (\pm 47 days)
- Vestibular suppressant
- Surgical treatment
 - Singular neurectomy
 - Canal plugging
- Habituation exercises
 - Brandt-Daroff exercise (1980)
- Physical therapy
 - Semont's liberatory maneuver based on the cupulolithiasis hypothesis (1988)
 - Epley's canalith repositioning procedure based on the canalolithiasis hypothesis (1992)



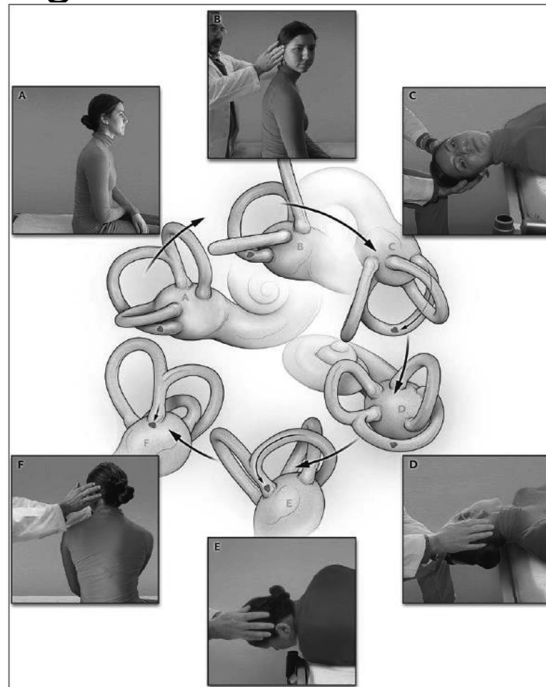
Before treatment

- A correct diagnosis of BPPV should be made.
- The clinician needs to know whether or not the patient has experienced extreme vertigo or nausea with changes in head position.
- Educate the patients before treatment
 - They may experience vertigo during treatment.
 - They should keep their eyes open and should not look around.
 - They need to remain in the test position until the vertigo has stopped.
- The patient needs to be reassured that they will not fall.
- The clinician needs to know whether or not the patient has neck pain, limited neck range of motion, or cervical dysfunction.

Treatment of PC-BPPV

Epley's canalith repositioning maneuver for the treatment of right PC-BPPV

- After resolution of the induced nystagmus with the use of the right-sided Dix–Hallpike maneuver (A-C), the head is turned 90 d toward the unaffected left side (D), causing the otolithic debris to move closer to the common crus. The induced nystagmus, if present, would be in the same direction as that evoked during the Dix–Hallpike maneuver.
- The head is then turned another 90 d, to a face-down position, and the trunk is turned 90 d in the same direction, so that the patient is lying on the unaffected side (E); the otolithic debris migrates in the same direction. The patient is then moved to the sitting position (F), and the otolithic debris falls into the vestibule, through the common crus. Each position should be maintained until the induced nystagmus and vertigo resolve, but always for a minimum of 30 s.



Treatment of PC-BPPV

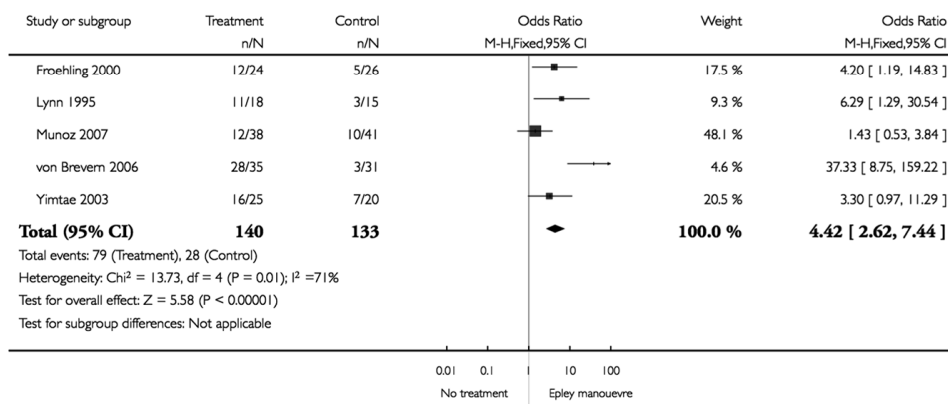
Comparison 1: Epley vs. control or placebo

Outcome 1: Complete resolution of vertigo (subjective report)

Review: The Epley (canalith repositioning) manoeuvre for benign paroxysmal positional vertigo

Comparison: 1 Epley versus control or placebo manoeuvre

Outcome: 1 Complete resolution of vertigo symptoms (subjective report)



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Treatment of PC-BPPV

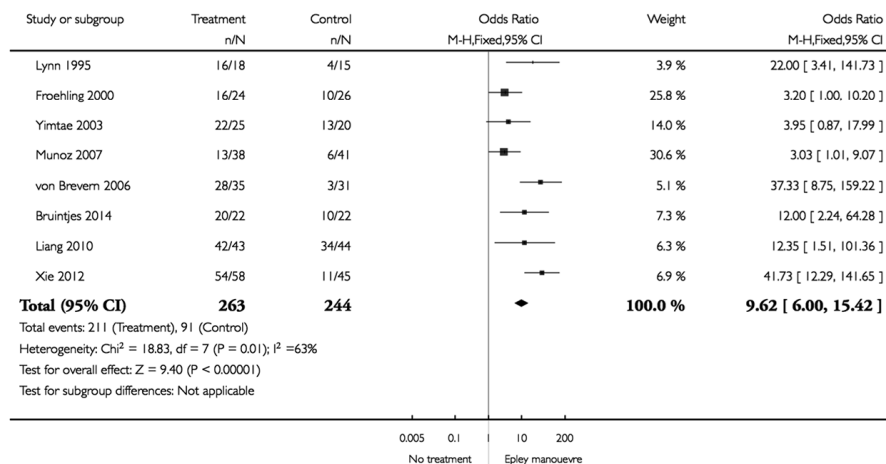
Comparison 1: Epley vs. control or placebo

Outcome 2: Conversion of a positive to a negative Dix-Hallpike test

Review: The Epley (canalith repositioning) manoeuvre for benign paroxysmal positional vertigo

Comparison: 1 Epley versus control or placebo manoeuvre

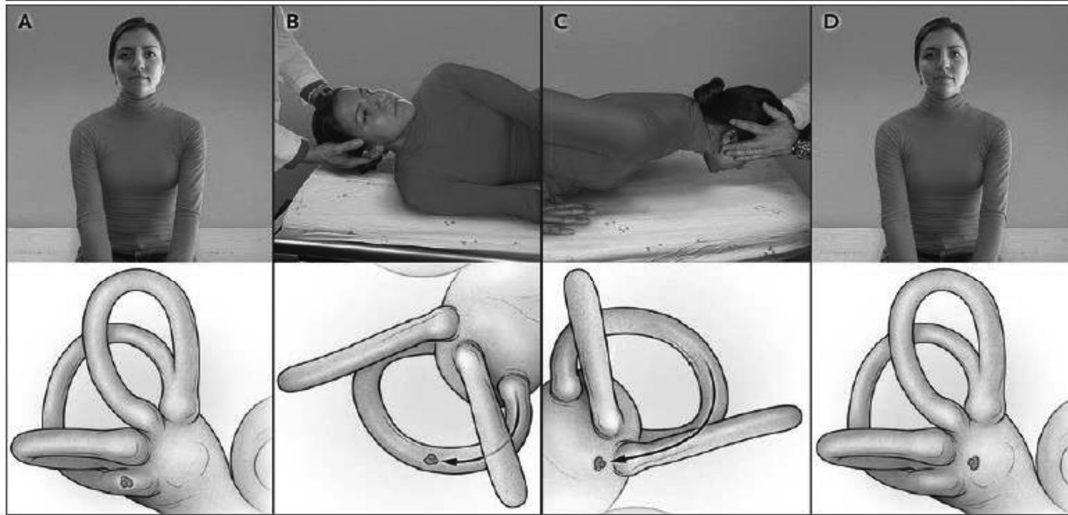
Outcome: 2 Conversion of a positive to a negative Dix-Hallpike test



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Treatment of PC-BPPV

Semont's repositioning maneuver



The patient is asked to sit upright (A) and then lies on the side of the unaffected ear (B). The patient is then rapidly guided in a cartwheel pattern through the upright position (without a pause) so that he or she is lying down on the opposite side (C). The head should remain turned toward the left (unaffected) side throughout the maneuver. Finally, the patient is seated and the head is returned to the neutral position (D). Each position should be maintained until the induced nystagmus and vertigo resolve, but always for a minimum of 2 minutes.

Treatment of PC-BPPV

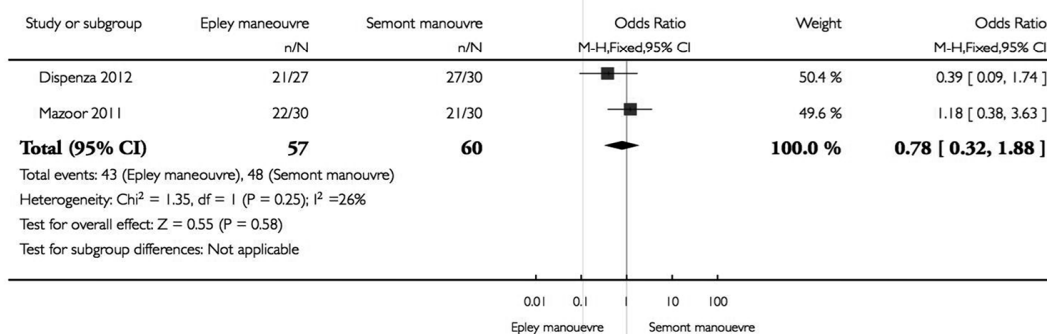
Comparison 3 Epley vs. Semont maneuver

Outcome 1 Resolution of nystagmus on provocation test

Review: The Epley (canalith repositioning) manoeuvre for benign paroxysmal positional vertigo

Comparison: 3 Epley versus Semont manoeuvre

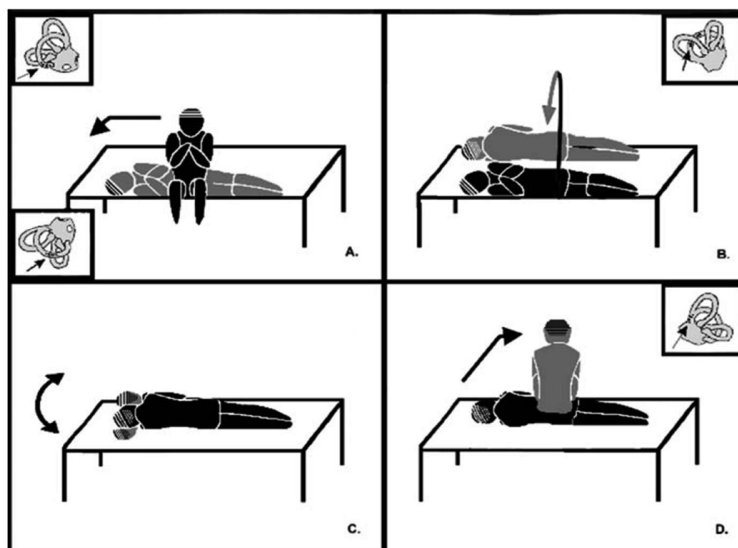
Outcome: 1 Resolution of nystagmus on provocation testing, at 7 days



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Treatment of PC-BPPV

Gans maneuver



Roberts RA, et al. J Am Acad Audiol 2006

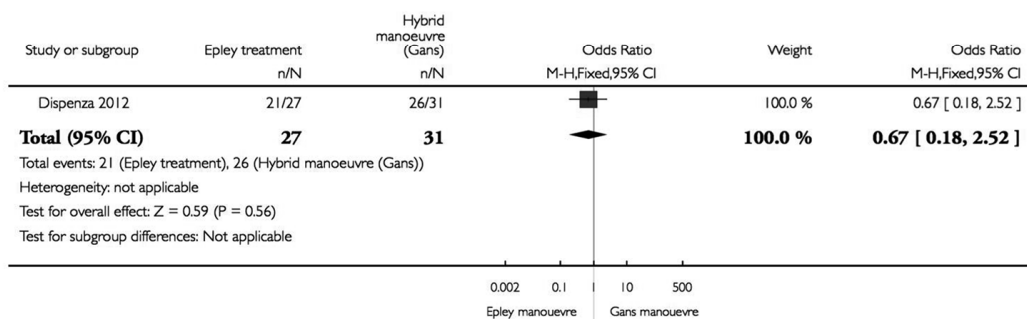
Treatment of PC-BPPV

Comparison 4 Epley vs. Hybrid (Gans) maneuver Outcome 1 Resolution of nystagmus on provocation test

Review: The Epley (canalith repositioning) manoeuvre for benign paroxysmal positional vertigo

Comparison: 4 Epley versus hybrid (Gans) manoeuvre

Outcome: 1 Resolution of nystagmus on provocation testing, at 7 days



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Brandt-Daroff exercise



- Patients are instructed to rapidly lie on their side, sit up, lie on the opposite side, and then again sit up.
- Each position should be maintained for at least 30 seconds.
- These exercises are repeated serially 5-10 times a day until resolution of the symptoms.

Treatment of AC-BPPV

JCN Open Access

ORIGINAL ARTICLE

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Diagnosis and Treatment of Anterior-Canal Benign Paroxysmal Positional Vertigo: A Systematic Review

- Electronic search retrieved 178 unique citations, 31 of which were considered eligible for further analysis.
- Analysis of the collected data revealed an estimated occurrence of AC-BPPV among BPPV patients of 3% (range 1–17.1%).
- No controlled therapeutic trials could be identified, and so the analysis was focused on un-controlled case series.
- Treatment was categorized into three groups: Epley maneuver, Yacovino maneuver, and specific, nonstandard maneuvers described in individual articles.
- All three categories demonstrated success rates of over 75%, and the overall sample-size-weighted mean was 85.6%.

Treatment of AC-BPPV

Epley maneuver

- Reverse Epley maneuver
- Modified Epley maneuver

Honrubia V, Baloh RW, et al. Am J Otol, 1999.

Jackson LE, et al. Otol Neurotol, 2007.

Yacovino's maneuver

Yacovino DA, Hain TC, Gualieri F. J Neurol, 2009.

Others

- Crevits' forced prolonged position
- Modified CRP
- Deep Dix-Hallpike maneuver

Crevits L. J Neurol Neurosurg Psychiatry, 2004.

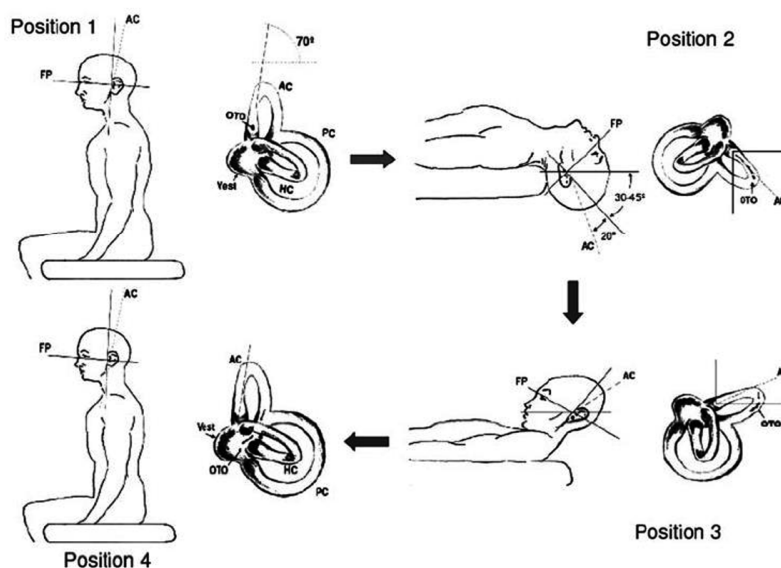
Kim YK, et al. ORL J Otorhinolaryngol Relat Spec, 2005.

Helminski JO and Hain TC. Ann Long Term Care, 2007.

Treatment of AC-BPPV

Yacovino's maneuver for the Tx of AC-BPPV

- 4 steps
- 30 sec intervals
- 13 patients
- Single session cure rate: 84.6%
- Overall 1.23 session



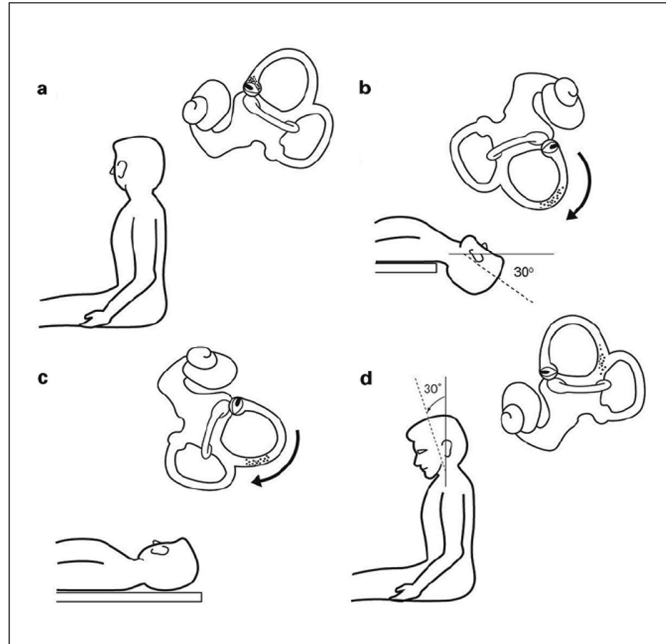
Yacovino & Hain. 2009 J Neurol

Treatment of AC-BPPV

Modified CRP (Kim's)

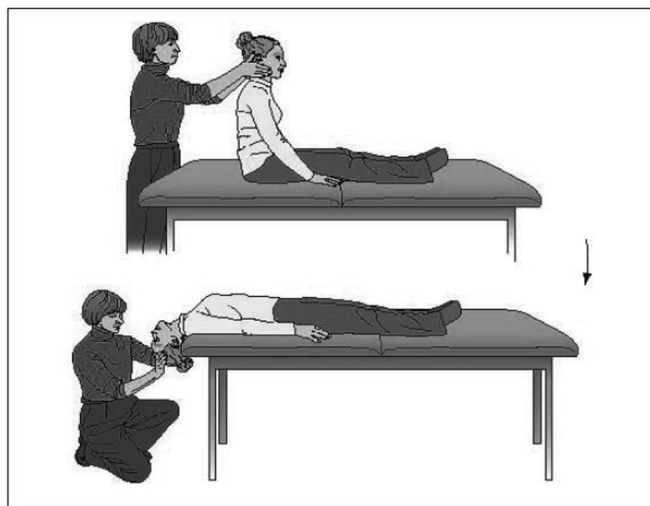
30 patients
18; both AC and PC-BPPV
Cured 96.7%
Single session: 47%
mean 1.97 session

g. 1. The CRP for the patient with left ASC BPPV. **a** The patient's head is turned 45° toward the right side (unaffected side). **b** The patient is lowered to a supine position with the head hanging off 30° at the end of the bed (2 min). **c** The patient's head is elevated in a supine position while the head remains turned 45° (1 min). **d** The patient is returned to a sitting position, and the chin is tilted 30° down. Insets show the position of the LSCs and the moving canaliths. Particles inside the canal are canaliths.



Treatment of AC-BPPV

Deep Dix-Hallpike maneuver



- The patient is moved from sitting to supine, with the head extended over the edge of the treatment table. The head is moved forward, and then the patient sits up. Both positions are held for 2 minutes. The procedure is repeated 3 times.

Helminski JO, Hain TC. 2007 Ann Long Term Care