Horizontal canal benign paroxysmal positional vertigo

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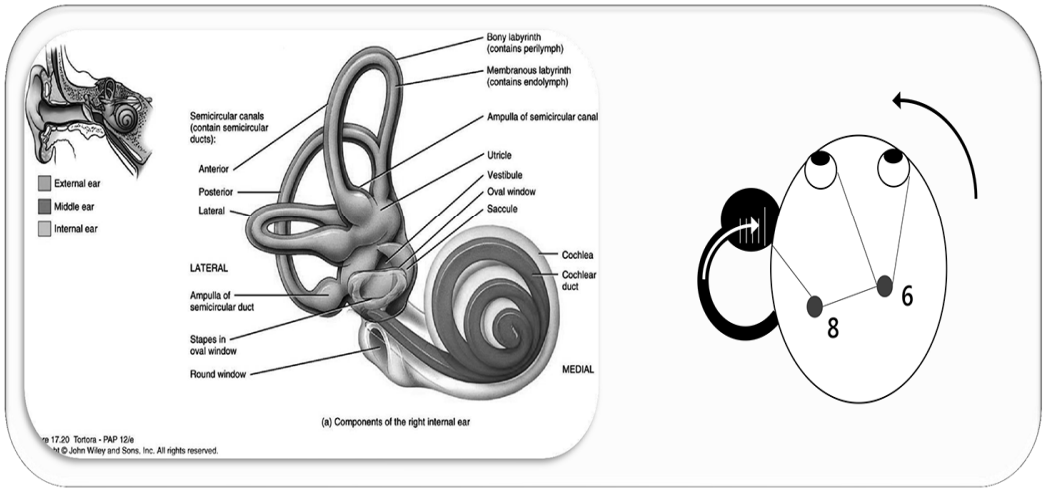
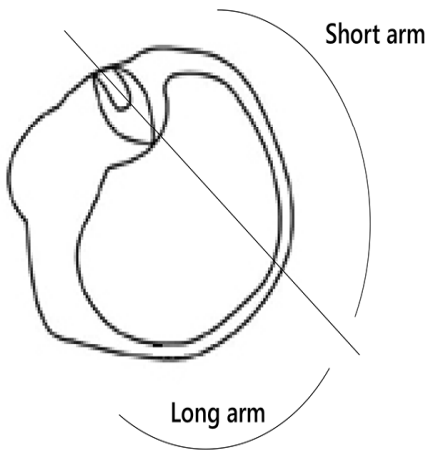


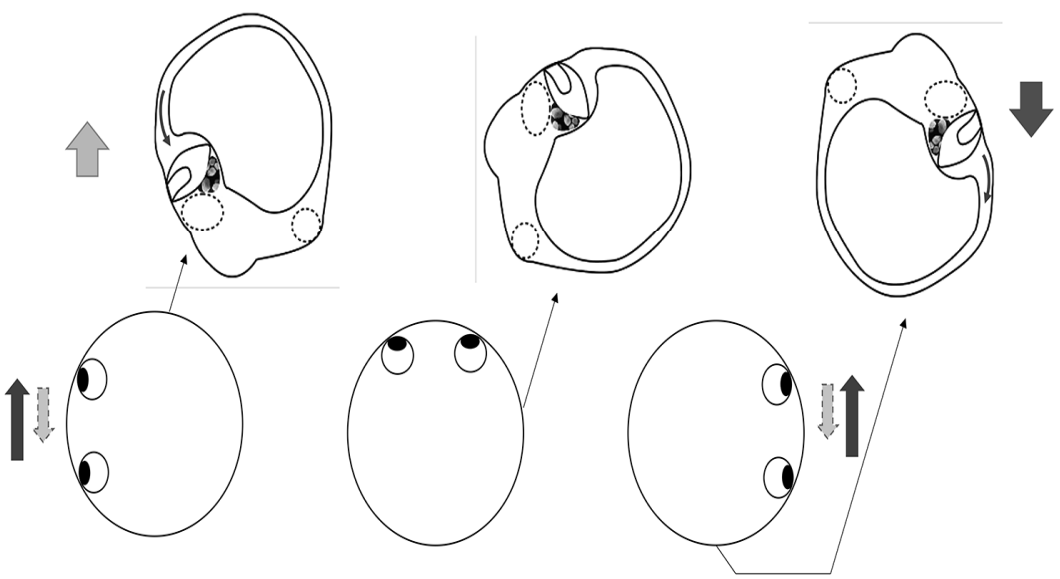
I. Anatomy & Physiology - HC



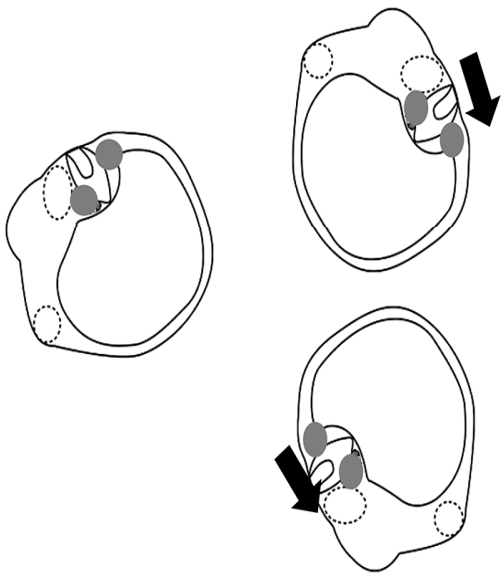
II. Subtypes of HC BPPV

HC BPPV	Cupulolithiasis
	Canalolithiasis
	Mixed
	Jam

Cupulolithiasis (heavy cupula): Apogeotropic nystagmus



Cupulolithiasis (heavy cupula): Position of otoconia

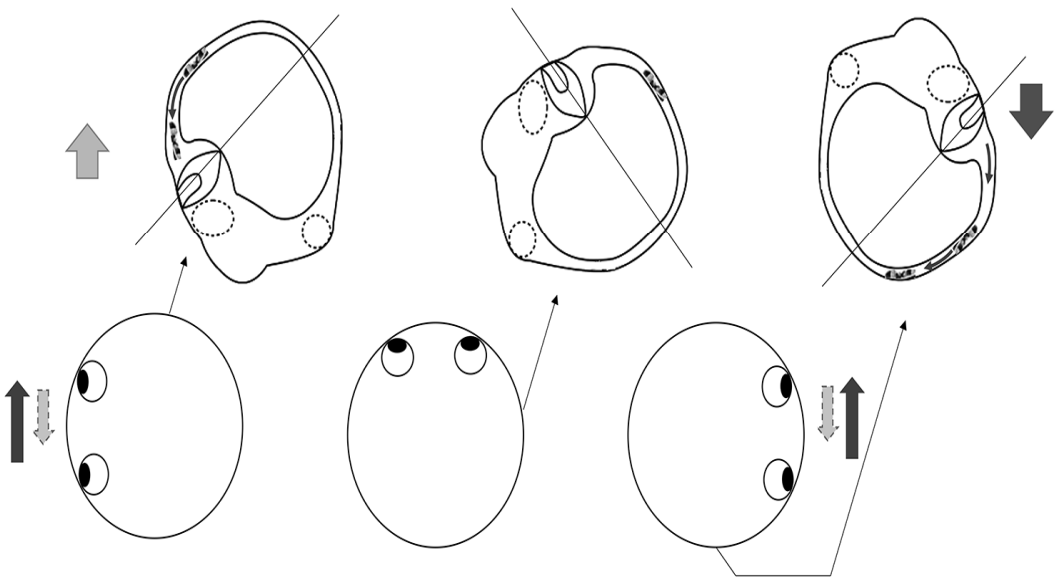


Cupulolithiasis

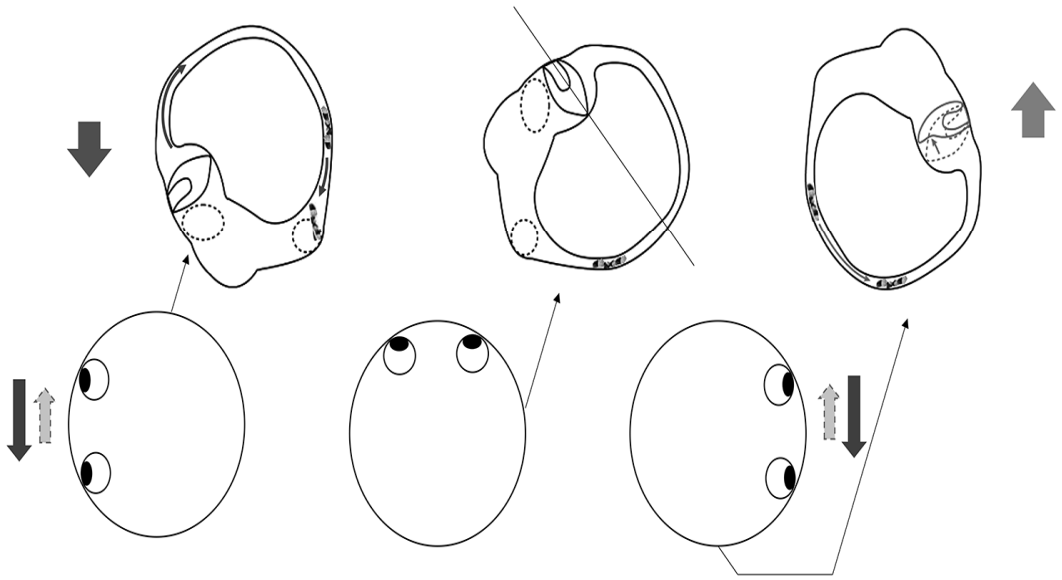
Otoconia on utricular side of cupula
Otoconia on canal side of cupula

= Apogeotropic nystagmus

Canalolithiasis - short arm: Apogeotropic nystagmus



Canalolithiasis - long arm: Geotropic nystagmus



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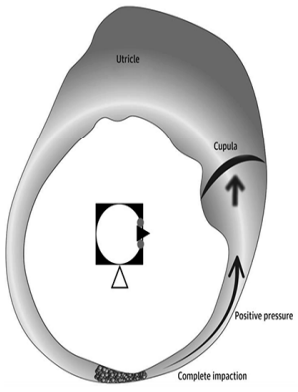


Persistent activation of cupula in affect ear

= Ipsilesional nonfatiguing spontaneous nystagmus

III. Diagnosis

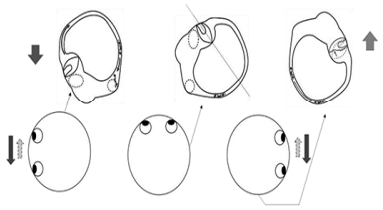
HC BPPV

- Supine Head Roll Test
- Observing SN
- Head-Bending / Lying-Down Test
- Treatment Response

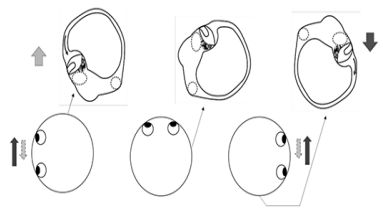
Supine Roll Test

Supine Roll Test

- Ewald Second's Law
- Excitation is better stimulus than inhibition.



- Geotropic N:
  - Lesion side is excited
  - Head turn to lesion side: larger amplitude N.



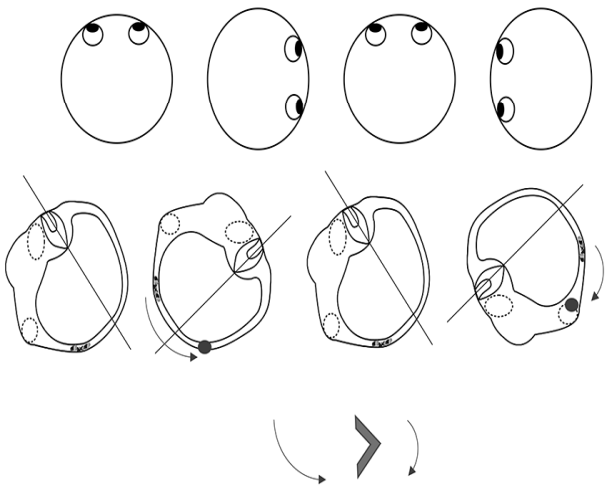
- Apogeotropic N:
  - Lesion side is inhibited
  - Head turn to lesion side: smaller amplitude N.

Supine Roll Test

- Gold standard test determining lesion side in HC BPPV
- Limitations
  - Unequal stimulation between ear-down position
  - Inaccuracy of visual inspection
  - Patient and physician driven inappropriate examination

Supine Roll Test: limitations

- Unequal stimulation between ear-down positions (Canalolithiasis)

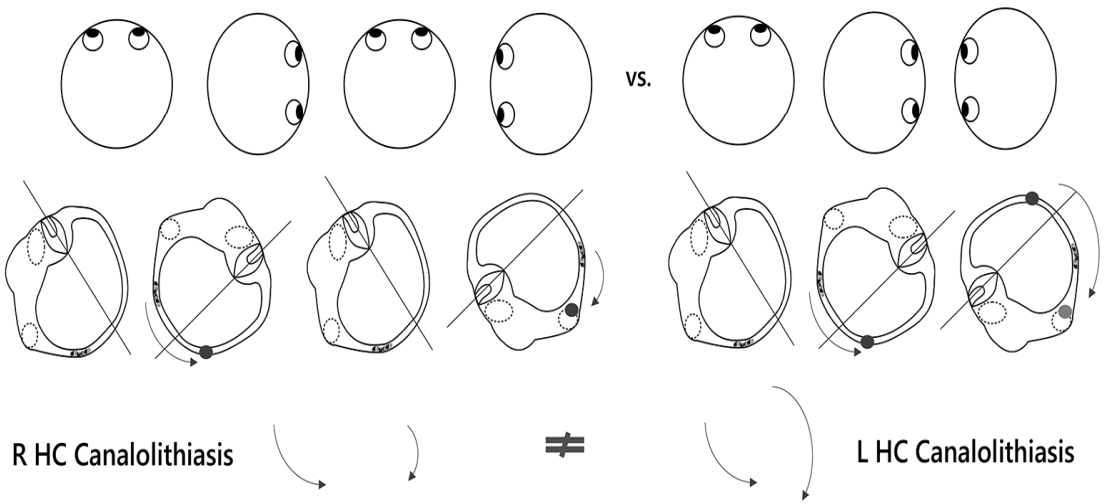


Supine Roll Test: limitations

- Inaccuracy of visual inspection (Cupulolithiasis and Canalolithiasis)

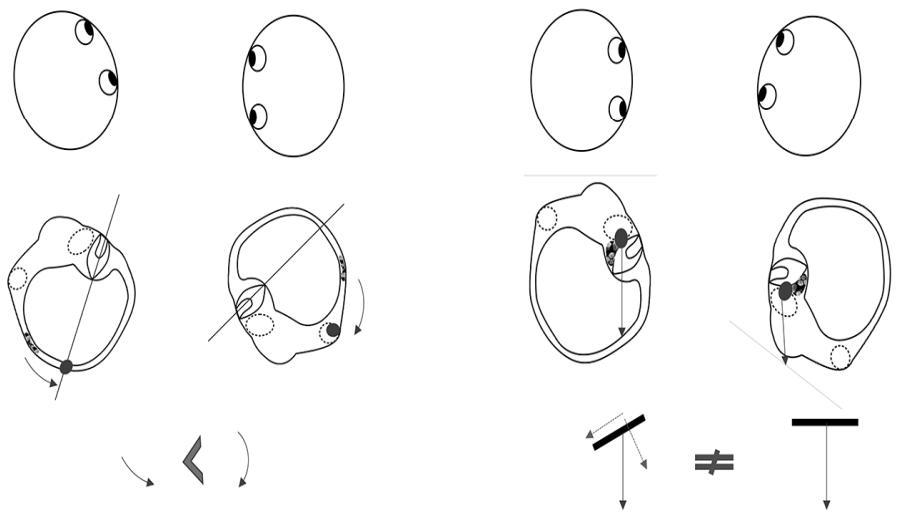
Supine Roll Test: limitations

- Inappropriate examination (Canalolithiasis)



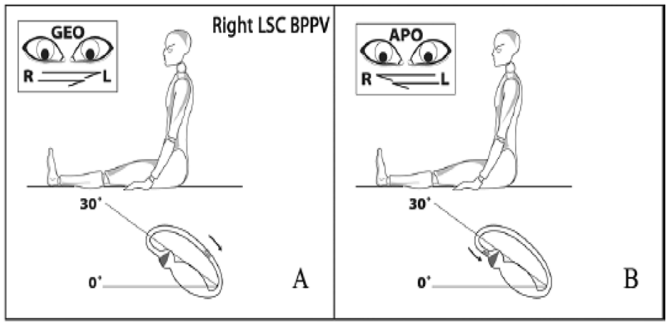
Supine Roll Test: limitations

- Inappropriate examination (Canalolithiasis/Cupulolithiasis)

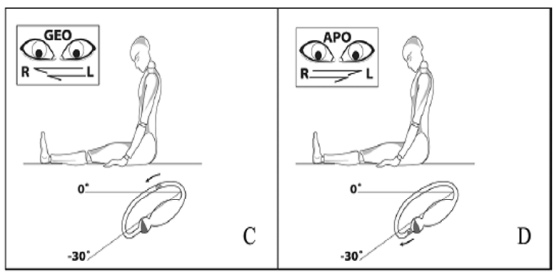


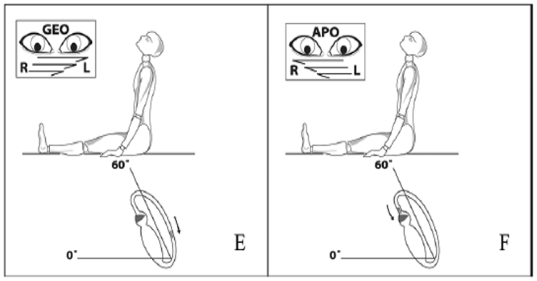
Pseudo-spontaneous nystagmus

- Geometry of HC in upright position - 30° upward deflected



Head Bending Nystagmus / Lying Down Nystagmus





Nystagmus during neck flexion in the pitch plane in benign paroxysmal positional vertigo involving the horizontal canal

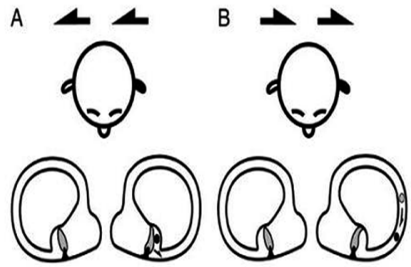
Seung-Han Lee [a], Kwang-Dong Choi [b], Seong-Hae Jeong [c], Young-Mi Oh [c], Ja-Won Koo [d], Ji Soo Kim [c,*]

The direction of head-bending and lying-down nystagmus in 45 patients with asymmetrical head-turning nystagmus

	The direction of nystagmus	
	Canalolithiasis (n=26)	Cupulolithiasis (n=19)
Head-bending nystagmus	Toward the affected ear 16/18 (88.9%)	Away from the affected ear 12/15 (80.0%)
Lying-down nystagmus	Away from the affected ear 14/19 (73.7%)	Toward the affected ear 15/16 (93.8 %)

Relationship of head-bending and lying-down nystagmus in each type of HC-BPPV

	Canalolithiasis (n=32)	Cupulolithiasis (n=22)	Total
LDN+HBN	18 (56.3%)	15 (68.2%)	33 (61.1%)
In opposite direction	*14 (77.8%)*	*12 (80.0%)*	*26 (78.8%)*
In same direction	*4 (22.2%)*	*3 (20.0%)*	*7 (21.2%)*
LDN only	5 (15.6%)	3 (13.6%)	8 (14.8%)
HBN only	4 (12.5%)	2 (9.1%)	6 (11.1%)
None	5 (15.6%)	2 (9.1%)	7 (13%)



Nystagmus while recumbent in horizontal canal benign paroxysmal positional vertigo

Byung In Han, MD; Hui Jong Oh, MD, PhD; and Ji Soo Kim, MD, PhD

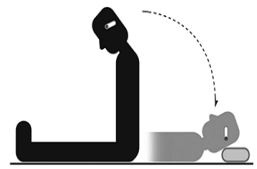
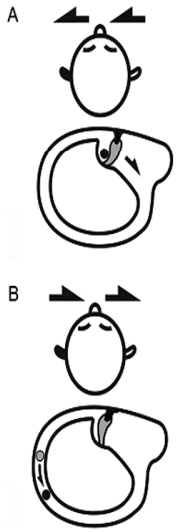


Figure 1. Lying-down positioning. After sitting with the head bent down (looking at knees) for 3 minutes, the patient lies quickly from a sitting to the supine position. The otolithic debris, depicted as a dot inside the canal, then moves away from the anterior portion of the canal. The horizontal semicircular canal is represented by a bar.



Abstract—*Background:* The identification of the affected ear is crucial for the successful treatment of benign paroxysmal positional vertigo involving the horizontal canal (HC-BPPV) by using particle-repositioning maneuvers. *Objective:* To determine the lateralizing value of lying-down nystagmus in HC-BPPV. *Methods:* The authors prospectively investigated lying-down nystagmus in 152 consecutive patients with confirmed HC-BPPV (99 geotropic and 53 apogeotropic types). Lying-down nystagmus was induced by placing patients in a supine position. For the geotropic type of HC-BPPV, the affected ear was identified by assuming that nystagmus is more intense when the head is rotated to the affected side while supine. The reverse assumption was adopted for the apogeotropic type. *Results:* Lying-down nystagmus was observed in 58 patients (38.2%), 36 (36.4%) of the geotropic and 22 (41.5%) of the apogeotropic type. The direction of lying-down nystagmus was mostly away from the affected ear in the geotropic type, but toward the affected ear in the apogeotropic type. Of the 16 geotropic patients in whom the affected ear was not identified initially, 7 with lying-down nystagmus showed resolution of vertigo after particle-repositioning maneuvers when the involved ear was identified by observing lying-down nystagmus. *Conclusion:* Lying-down nystagmus is a valuable sign for determining which ear is affected in benign paroxysmal positional vertigo involving the horizontal canal, especially when patients show symmetric nystagmus on turning the head to either side.

NEUROLOGY 2006;66:706–710

Head-Shaking Nystagmus.

Pseudo-Spontaneous and Head-Shaking Nystagmus in Horizontal Canal Benign Paroxysmal Positional Vertigo

*Sun-Uk Lee, †Hyo-Jung Kim, and ‡Ji-Soo Kim

*Department of Neurology, Ajou University College of Medicine, Ajou University Hospital, Suwon; †Kangwon National University College of Medicine, Medical Research Institute, Seoul National University Bundang Hospital, Seongnam; and ‡Department of Neurology, Seoul National University College of Medicine, Seoul National University Bundang Hospital, Seongnam, Republic of Korea

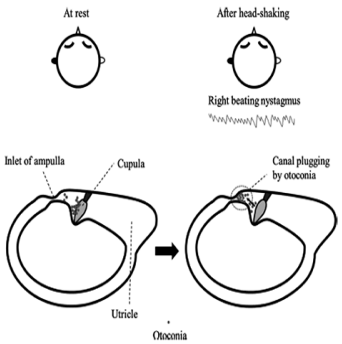
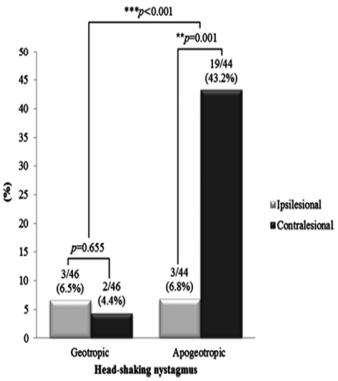


TABLE 1. *Comparison of clinical features according to the presence of HSN*

	HSN (+) (n = 27)	HSN (-) (n = 63)	*p*
Age, yr (SD)	64.4 (11.4)	65.8 (11.8)	0.589
Sex (%, women)	19/27 (65.1)	41/63 (70.4)	0.626
Lesion side (%, Right)	16/27 (59.3)	32/63(50.8)	0.461
Presence of SN (%)	20/27 (74.1)	45/63 (71.4)	0.797
Direction of SN (%, ipsilesional)	12/20 (60.0)	23/45 (51.1)	0.507
Mean SPV of SN (°/s, SD)	0.87 (0.78)	0.86 (0.93)	0.944
Subtype of HC-BPPV (%, apogeotropic)	22/27 (81.5%)	22/63 (34.9%)	<0.001

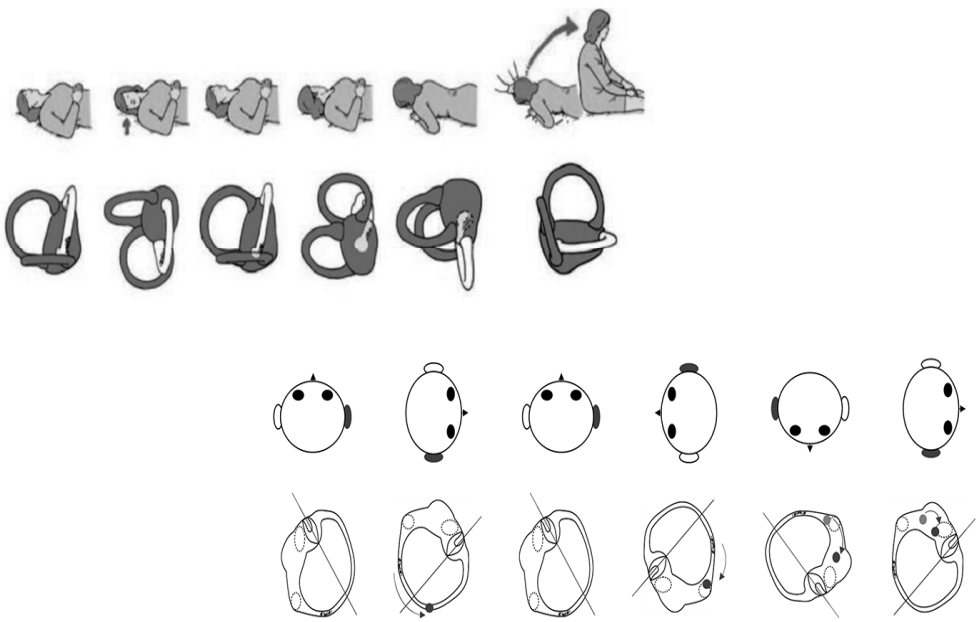
HC-BPPV indicates horizontal canal benign paroxysmal positional vertigo; HSN, head-shaking nystagmus; SN, pseudo-spontaneous nystagmus; SPV, slow-phase velocity.



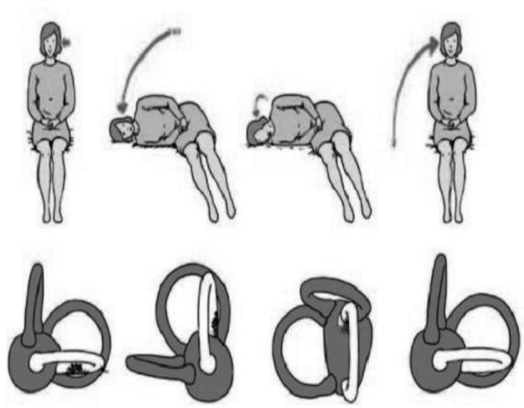
IV. Treatment

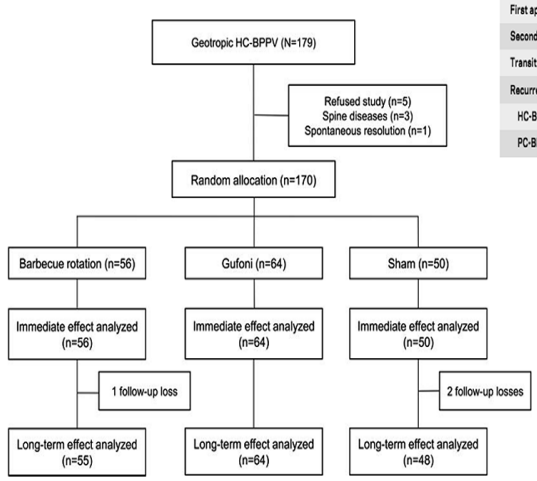
Canalolithiasis	Barbecue Maneuver
	Gufoni
Cupulolithiasis	Reversed Gufoni
	Head-Shaking

Barbecue Maneuver: Canalolithiasis

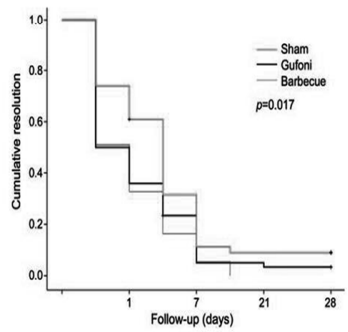


Gufoni Maneuver: Canalolithiasis

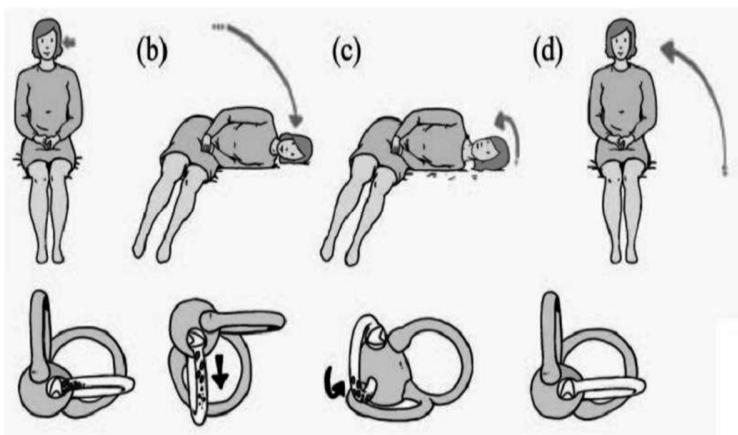


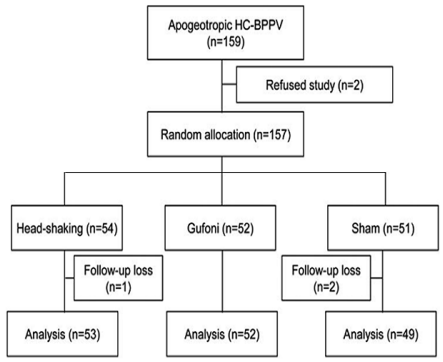


Treatment	Barbecue rotation (n = 55)	Gufoni (n = 64)	Sham (n = 48)	Total (n = 167)	p Value[a]
First application, n (%)	28 (50.9)	31 (48.4)	12 (25.0)	71 (42.5)	0.014
Second application, n (%)	38 (69.1)	39 (60.9)	17 (35.4)	94 (56.3)	0.002
Transitions to PC-BPPV, n (%)[b]	1 (1.8), resolved	2 (3.1), resolved	0	3 (1.8), resolved	
Recurred with HC-BPPV geo, n (%)[c]	2 (3.6), resolved	2 (3.1), resolved	1 (2.0), resolved	5 (4.1), resolved	
HC-BPPV apo, n (%)[d]			1 (2.0), resolved	1 (0.5), resolved	
PC-BPPV, n (%)[b]	1 (1.8), resolved			1 (0.5), resolved	

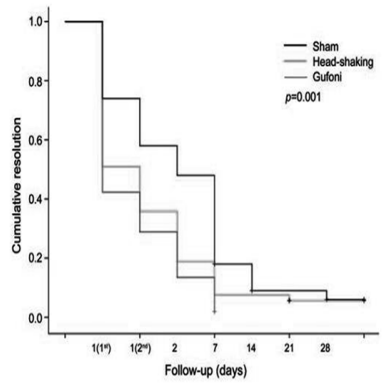


Reverse Gufoni Maneuver: Cupulolithiasis





Follow-up	Gufoni maneuver (n = 52)	Head-shaking (n = 53)	Sham (n = 49)	p Value[a]
1st day, n (%)				
1st application[b]	31 (59.6)	25 (47.2)	11 (22.4)	0.001
2nd application[b,c]	38 (73.1)	33 (62.3)	17 (34.7)	<0.001
2nd day, n (%)	45 (86.5)	41 (77.4)	22 (44.9)	<0.001
1st week, n (%)	51 (98.1)	48 (90.6)	41 (83.7)	0.042
4th week, n (%)	51 (98.1)	51 (96.2)	48 (98.0)	0.801
Transitions, n (%)[d]	40 (76.9)	28 (52.8)	10 (20.4)	
Geotropic	39 (75.0)	26 (49.1)	9 (16.5)	<0.001
PC-BPPV	1	2	1	
Recurrences, n (%)[d]	2 (3.8)	0 (0)	1 (2.0)	0.36
Geotropic HC-BPPV	1		1	
PC-BPPV	1			



Head-Shaking: Conversion of Apo to Geo

Modified Semont (Casani): Cupulolithiasis

Brandt-Daroff Maneuver

Forced Prolonged Position: Canalolithiasis

V. Update (2014 - 2015)

Double-Blind Randomized Trial on the Efficacy of the Gufoni Maneuver for Treatment of Lateral Canal BPPV

Objectives/Hypothesis: The need for class I and II studies on the efficacy of liberatory maneuvers in the treatment of lateral canal benign paroxysmal positional vertigo (LC-BPPV) motivated the present double-blind randomized trial on the short-term efficacy of the Gufoni liberatory maneuver (GLM).

Study Design: Double-blind randomized controlled trial.

Methods: Seventy-two patients with unilateral LC-BPPV were recruited for a multicentric study. Patients were randomly assigned to treatment by GLM (n = 37) or sham treatment (n = 35). Subjects were followed up twice (at 1 hour and 24 hours) with the supine roll test by blinded examiners.

Results: At 1- and 24-hour follow-up, 75.7% and 83.8% of patients, respectively, undergoing GLM had recovered from vertigo, compared to around 10% of patients undergoing the sham maneuver ($P < 0.0001$).

Conclusion: To the best of our knowledge, this is the first class I study on the efficacy of the GLM in the treatment of LC-BPPV in both geotropic and apogeotropic forms. GLM proved highly effective compared to the sham maneuver ($P < 0.0001$). The present class I study of the efficacy of the GLM changes the level of recommendation of the method for treating LC-BPPV from level U to level B for the geotropic variant and from level B to level A for the apogeotropic variant of LC-BPPV.

Key Words: Benign paroxysmal positional vertigo, Gufoni liberatory maneuver, evidence-based, double-blind randomized trial, vestibular, semicircular canals.

Level of Evidence: 1b.

Laryngoscope, 123:1782–1786, 2013

V. Update (2014 - 2015)

J Neurol (2015) 262:74–80
DOI 10.1007/s00415-014-7519-0

ORIGINAL COMMUNICATION

Natural history of horizontal canal benign paroxysmal positional vertigo is truly short

Dae Bo Shim · Kyung Min Ko · Joon Hee Lee · Hong Ju Park · Mee Hyun Song

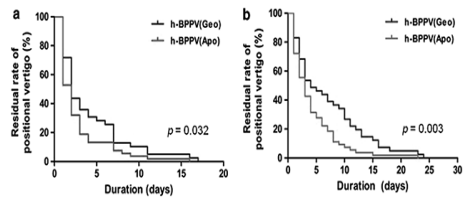


Fig. 3 Comparison between the subtypes of horizontal canal benign paroxysmal positional vertigo in the remission from the initial diagnosis to the remission of positional vertigo. A significant difference was observed between the two subtypes in the time courses of vertigo remission **a** after the initial diagnosis ($p = 0.032$) and **b** after the onset of symptoms ($p = 0.003$) using Kaplan–Meier curve with a log-rank test