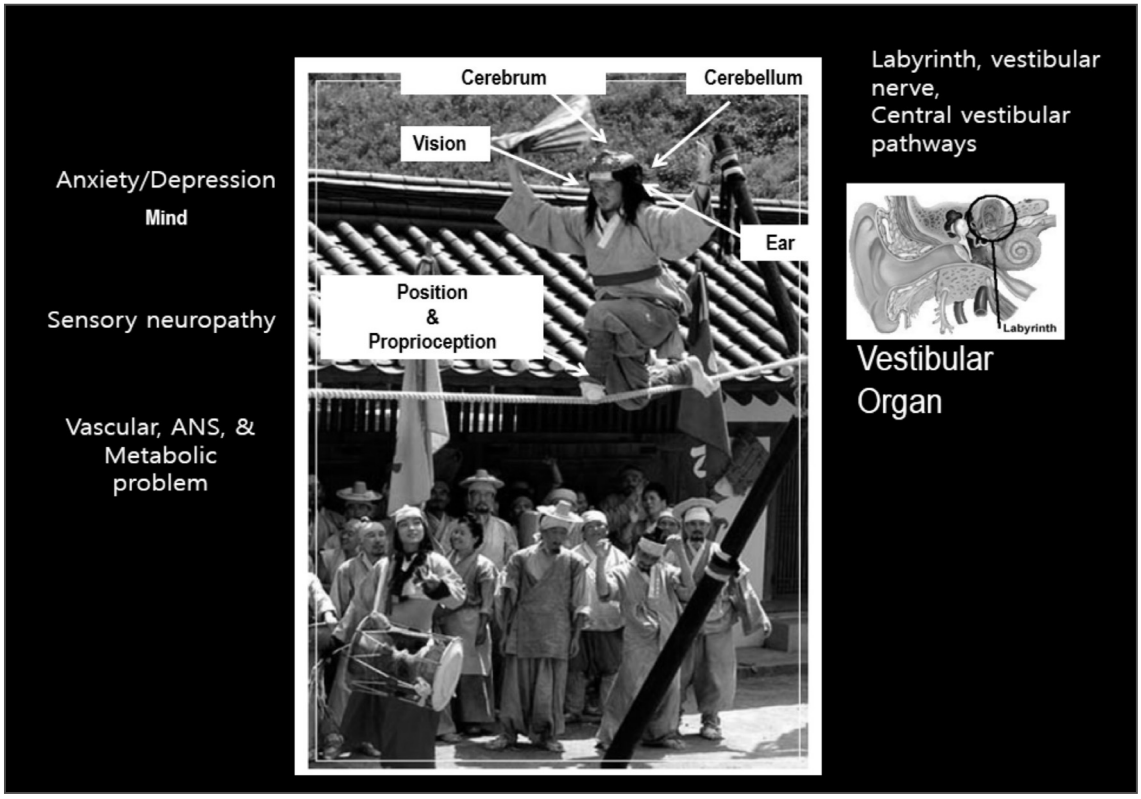
Dizziness and vertigo

정 성 해
충남의대



어지럼 환자 진료

- 자세한 병력청취
- 신경이과적 검진
- 치료
- 어지럼을 이해, 공감

Classification of Dizziness/vertigo

- Acute spontaneous vertigo
  - Stroke vs. VN
- Recurrent spontaneous vertigo
  - VBI/ Meniere's disease/ Migraine/ Psychogenic
- Recurrent positional vertigo
  - BPPV/Orthostatic hypotension
- Chronic dizziness and imbalance
  - Multisensory/ Psychogenic/ Degenerative

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Case I (60/M)

- Dizziness – 6 개월 전, 2주전
  - Intermittent drop attack rightward (+)/LOC(-)
  - Duration 5-6 min
  - Other focal neurologic deficits (-)
  - Ear ds/Ear sx(-/-)
  - Headache/Motion sickness(-/-)
  - Anxiety/Depression(-/-)
  - Chest discomfort(+)

  - HT/DM(+/-)
  - 156/86-64

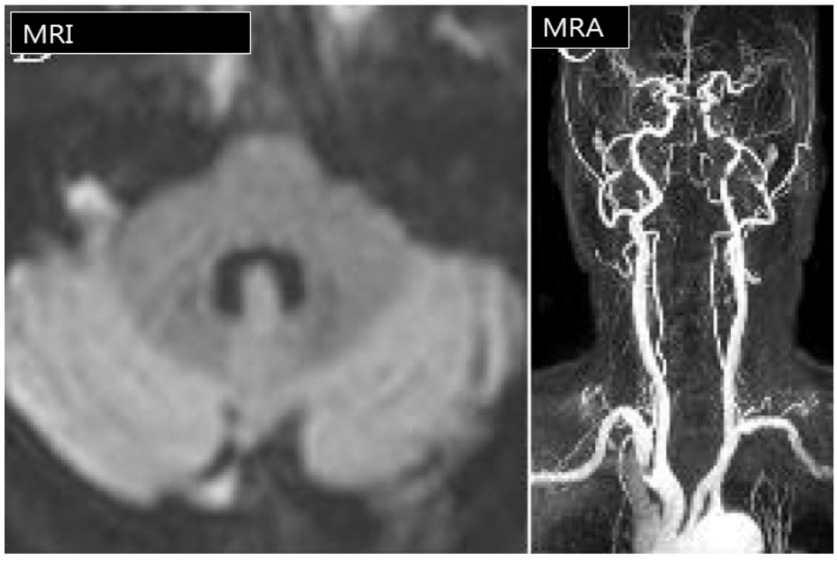
Neurological examination

- SN(-)
- GEN(-)
- HIT:OK
- Saccade/SP: OK
- HS:OK
- Positioning: OK
- Other neurologic examination

Summary

- 60-YO man with hypertension history
- Recurrent spontaneous dizziness +/- drop attack
- 5-6 min
- Chest discomfort(+)
- Interictal examination: normal

Brain image



Case II (68/F)

- Dizziness – 4 개월 전
- 전신쇠약감, 공중에 붕 떠 있는 느낌
- 움직이면 심하다.
  - Other focal neurologic deficits (-)
  - Ear ds/Ear sx(-/-)
  - Headache/Motion sickness(-/-)
  - Anxiety/Depression(-/-)
- 타병원 MRI/MRA:OK

- HT/DM(+/+)
- 170/90-101-20
- Cervical bruit(-/+)

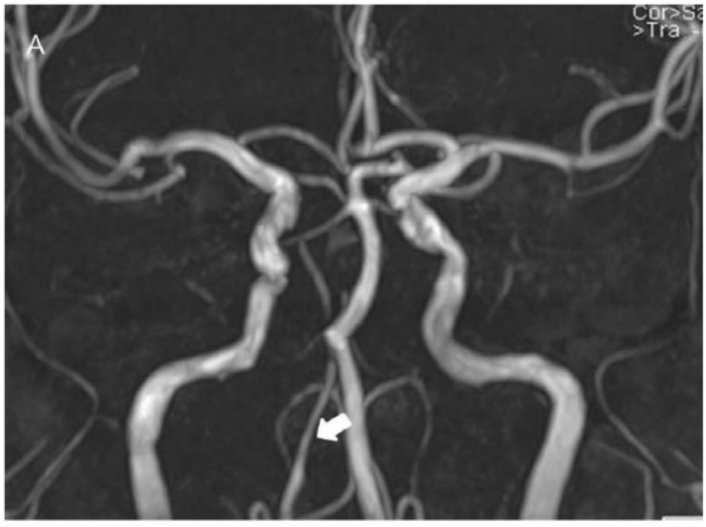
Neurological examination

- SN(-)
- GEN(-)
- HIT:OK
- Saccade/SP: Symmetric
- HS:OK
- Positioning: OK
- Other neurologic examination

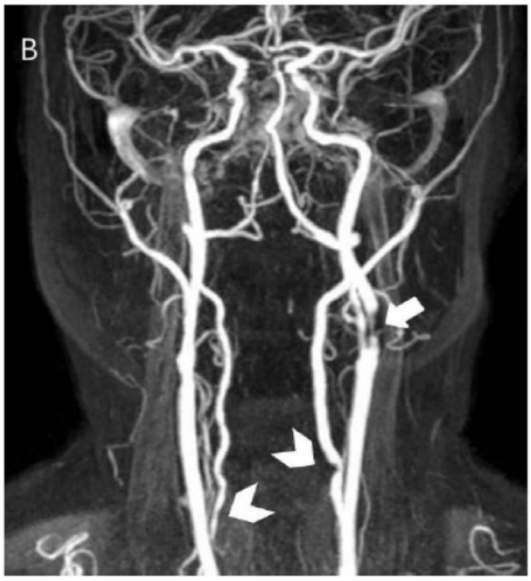
Summary

- 67-YO woman with HT&DM
- Recurrent dizziness
- Imbalance
- Cervical bruit(-/+)
- Interictal examination: normal

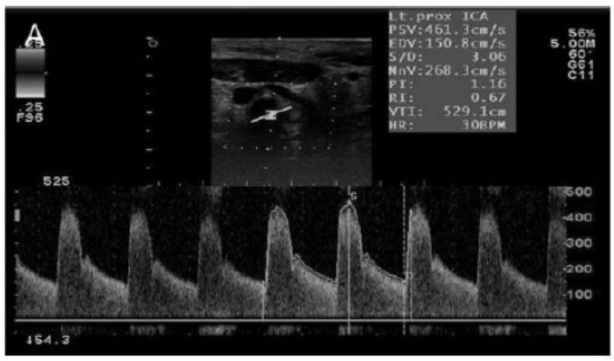
Outside MRA

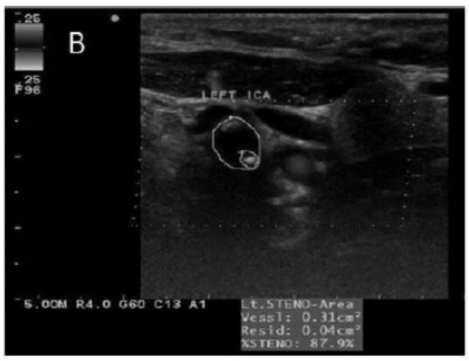


Follow up MRA



Transcranial doppler





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Case III (68/F)

P: 어지러워서 왔어요.
D: 언제부터 그러세요?
P: 한 일년 되었어요.
D: 본인이 어질어질하세요, 아니면 빙빙 도세요?
P: 빙빙 돌고, 토해요.
D: 귀에서 소리가 나나요?
P: 네, 우측 귀에서 소리가 나요. 무슨 소리가 나요?
D: 어지울 때 더 심하세요?
P: 어지러울 때 더 심해요
D: 몇 분이나 지속이 되나요
P: 한 15-20분

Neurotological examination

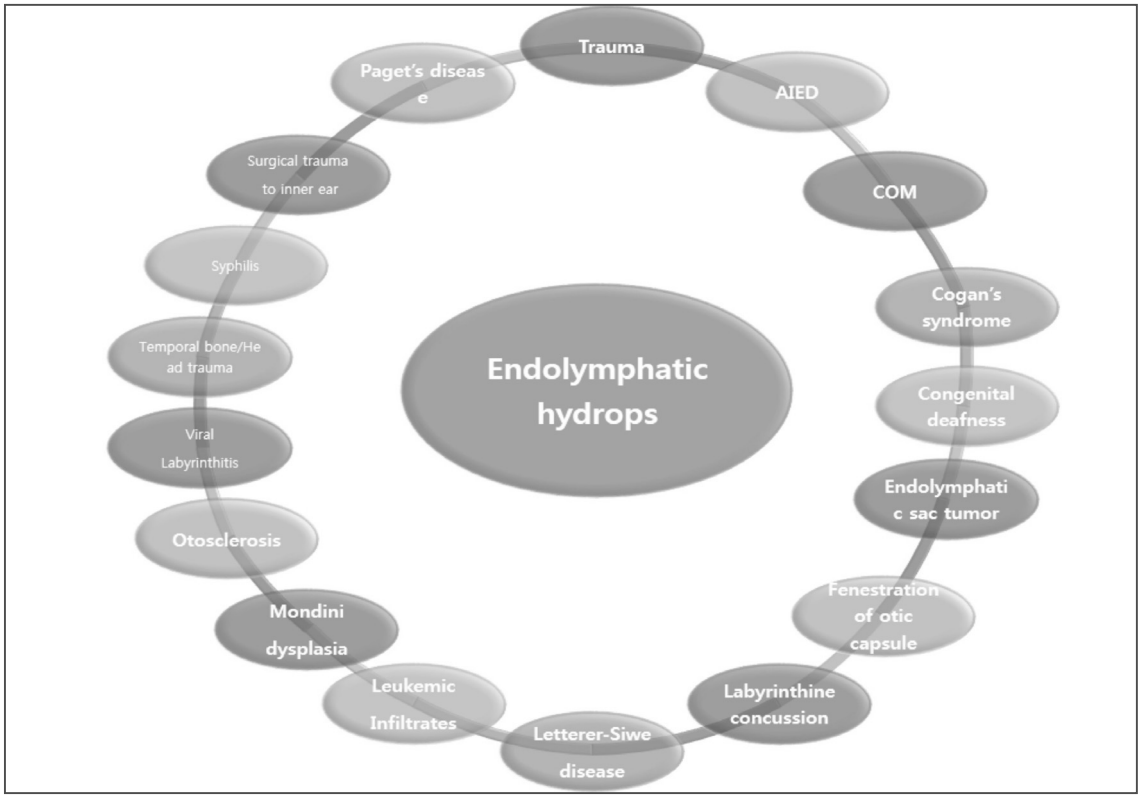
- SN(-)
- GEN(-)
- HC(+/-)
- HV:OK
- HS: Left
- PO:OK

Assessment

Rt vestibulopathy with tinnitus of the Rt ear

r/o Meniere's disease

r/o Vestibular schwannoma



명확한 메니에르병 (Definite Ménierè's disease)	가능성이 높은 메니에르병 (Probable Ménierè's disease)

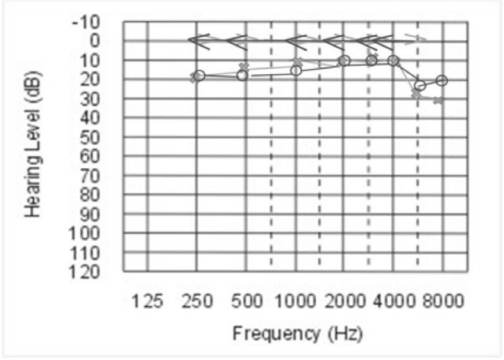
- 1) 자발성 회전성 어지럼이 2회 이상 발생하고, 발생시간이 20분에서 12시간까지 지속
- 2) 한쪽 귀에서 청력검사로 확인된 저주파에서 중주파수 대역의 감각신경성 난청, 이러한 감각신경 난청이 어지럼 발작 전, 발작 시 또는 발작 후에 이환된 귀에서 최소 1회 이상 보이는 경우
- 3) 이환된 귀의 변동성이 있는 청각 증상들(청력, 이명 또는 이충만감)
- 4)다른 전정질환의 진단으로 설명이 되지 않음

Journal of Vestibular Research 2015

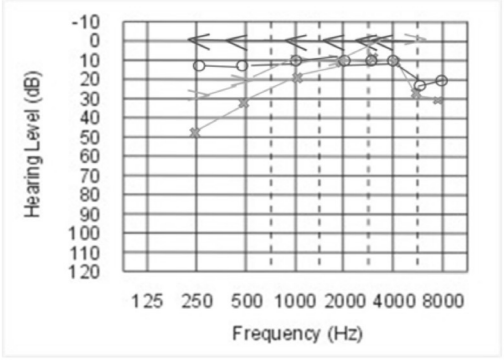
이 환자의 진단을 위해 어지러울 때 꼭 해야 할 검사는?

Pure tone audiometry

Attack(-)



Attack(+)



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Case IV (43/F)

recurrent spontaneous vertigo

D;환자 분 어디가 불편해서 오셨어요?

P;저는 머리가 맑지가 않아요

D;아 네..두통이 있거나, 어지러우세요? 언제부터 그러세요.

P; 둘 다요. 오래됐어요.

D;두통이 더 하세요, 어지럼이 더 하세요?

P; 이전에는 두통이 더 했는데, 요사이는 어지럼이 더 하네요.

D; 그럼, 어지럼에 대해서 먼저 여쭈어 볼게요.

본인이 어지러우세요, 아니면 주변이나 본인이 도세요?

뭐할 때 어지러우세요?

P; 제가 어지럽기도 하고, 빙빙 돌기도 하고 그래요.

D; 증상 있을 때 메슥거리거나 토하세요?

P; 네, 메슥거리고, 심하면 토하죠.

D; 귀에서 소리는 안 나세요? 귀는 잘 들리시고요?

P; 네, 귀는 괜찮아요.

D; 두통에 대해 여쭈어 볼게요. 두통은 언제 부터 있으세요?

P; 어려서부터, 중고등학교 다닐 때부터 그런 것 같아요.

D; 머리 아프면, 일상생활 하기가 힘드세요?

P; 네 참고는 하는데, 어렵죠.

D; 머리 아프면, 역시 속이 안 좋으세요?

P; 네, 메슥거리고, 토하고 그래요.

D; 머리 아프기 전에 눈이 잘 안보이거나, 감각이 이상하거나, 힘 빠지거나 그런 거 있나요?

P;그런 거는 없어요.

D;머리 아플 때, 밝은 빛이나, 시끄러운 소리가 부담스러운가요?

P;네

D;향수, 휘발유 냄새를 맡으면 두통이 심해지거나 유발되나요?

P;네, 아주 싫어합니다. 화장품도 무향으로 씁니다.

D:패턴 무늬 같은 거 보거나 3D 영화 보면 증상이 유발되나요?

P;네

Neurological examination

- WNL

Diagnostic criteria for VM

	1. Vestibular migraine
A.	At least 5 episodes with vestibular symptoms[a] of moderate or severe intensity,[b] lasting 5 min to 72 h[c]
B.	Current or previous history of migraine with or without aura according to the International Classification of Headache Disorders (ICHD)[d]
C.	One or more migraine features with at least 50% of the vestibular episodes[e]: • Headache with at least two of the following characteristics: one-sided location, pulsating quality, moderate or severe pain intensity, aggravation by routine physical activity • Photophobia and phonophobia[f] • Visual aura[g]
D.	Not better accounted for by another vestibular or ICHD diagnosis[h]
	2. Probable vestibular migraine
A.	At least 5 episodes with vestibular symptoms[a] of moderate or severe intensity[b], lasting 5 min to 72 h[c]
B.	Only one of the Criteria B and C for vestibular migraine is fulfilled (migraine history *or* migraine features during the episode)
C.	Not better accounted for by another vestibular or ICHD diagnosis[h]

Journal of Vestibular Research 22 (2012)

Diagnostic criteria for VM

	1. Vestibular migraine
A.	
B.	
C.	
D.	
A.	
B.	
C.	Not better accounted for by another vestibular or ICHD diagnosis[h]

- Vestibular symptoms
  - Spontaneous vertigo
    - Internal vertigo (a false sensation of self-motion)
    - External vertigo (a false sensation that the visual surround is spinning or flowing)
  - Positional vertigo, occurring after a change of head position
  - Visually induced vertigo, triggered by a complex or large moving visual stimulus
  - Head motion-induced vertigo, occurring during head motion
  - Head motion-induced dizziness with nausea (dizziness is characterized by a sensation of disturbed spatial orientation; other forms of dizziness are currently not included in the classification of vestibular migraine)

Journal of Vestibular Research 22 (2012)

Treatment

- Reduction of triggers
- Pharmacotherapy (Abortive & Preventive)
- Physical therapy
- Mitigation of comorbidities

Treatment options		Clinical trial [reference]
Acute medications		
Zolmitriptan	2.5 mg oral	Randomized controlled trial [37]
Rizatriptan	10 mg oral	Randomized controlled trial [38], motion sickness
Prophylactic medications		
Propranolol	160 mg, 40–160 mg	Retrospective cohort analysis [39–41]
Propranolol/venlafaxine	40~160 mg/37.5~150 mg	Prospective, randomized, controlled clinical trial [42]
Metoprolol	150 mg, 100–200 mg	Retrospective cohort analysis [39, 41]
Amitriptyline	100 mg, 10 mg	Retrospective cohort analysis [39, 41]
Nortriptyline	27–75 mg	Open-label, chart review [43]
Valproic acid	600 mg, 600 mg	Retrospective cohort analysis [44], cohort study, vestibule-ocular reflex [45]
Topiramate	50 mg, 50–100 mg	Retrospective cohort analysis [39], open-label chart review [43]
Lamotrigine	75 mg	Retrospective cohort analysis [39]
Flunarizine	5 mg, 5–10 mg, 5–10 mg	Retrospective cohort analysis [39], retrospective, open-label [41], open-label, postmarketing [46]
Cinnarizine	37.5–75 mg	Retrospective, open-label [47]
Cinnarizine + dimenhydrinate	20 mg and 40 mg	Observational trial [48]
Acetazolamide	500 mg	Retrospective cohort study [49]
Magnesium	400 mg	Retrospective cohort analysis [39]
Clonazepam	0.25–1 mg	Retrospective cohort analysis [41]
Nonmedical treatments		
Vestibular rehabilitation	5 therapy sessions over 9 weeks	Uncontrolled, observational trial [50]
Caffeine cessation	4–6 weeks	Retrospective, observational trial [43]

Behavioral neurology, 2016

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Case V (58/F)

- Vertigo – 이틀 전
  - 우측으로 돌아눕는데 증상 (+)/LOC(-)
  - Duration 1-2 min
  - Other focal neurologic deficits (-)
  - Ear ds/Ear sx(-/-)
  - Headache/Motion sickness(-/-)
  - Anxiety/Depression(-/-)
  - 수년 전에도 증상

- HT/DM(-/-)
- 113/71-81

Neurological examination

- SN(-)
- GEN(-)
- HIT:OK
- Saccade/SP: OK
- HS:OK
- Positioning: apogeotropic nystagmus in the head turn
- Other neurologic examination

Assessment

- Benign paroxysmal positional vertigo

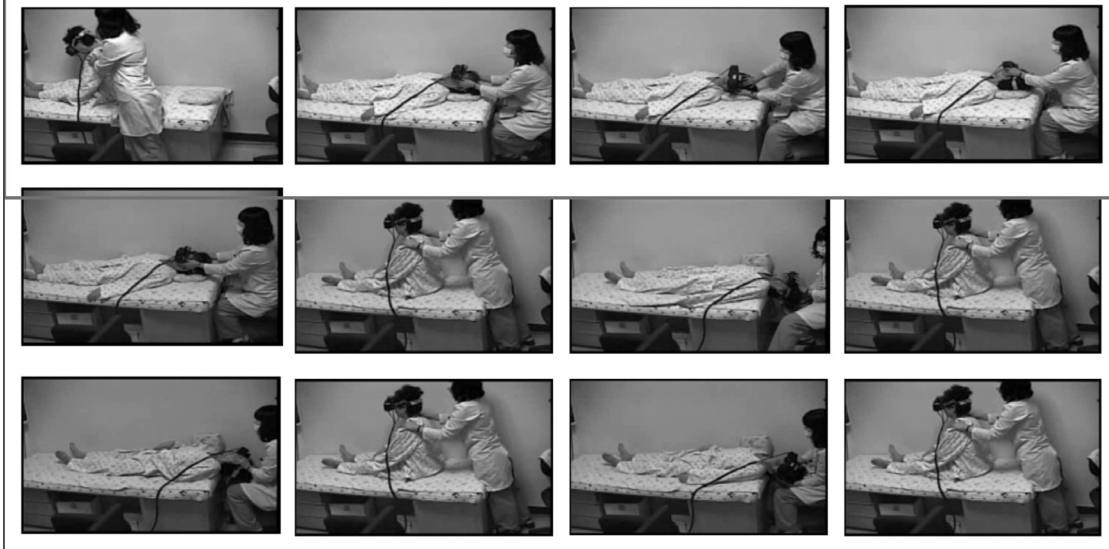


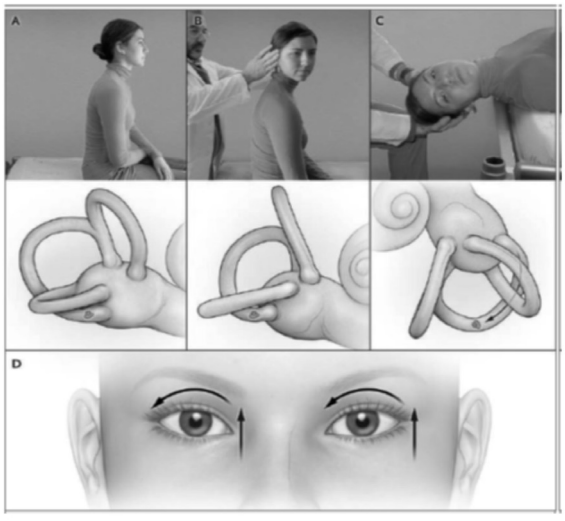
Table 2. **Diagnosis and Treatment of Benign Paroxysmal Positional Vertigo According to the Affected Canal.**

Location in Semicircular Canal	Diagnosis			Treatment	
	Maneuver	Method	Induced Nystagmus	Repositioning Maneuver	Method
Posterior semicircular canal	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
Horizontal semicircular canal					
Geotropic	Supine head roll	Head is turned approximately 90 degrees to each side while patient is in supine position	Geotropic (beats toward the ground)	Barbecue rotation	Head is rotated in three 90-degree increments, for a total of 270 degrees, from affected ear down, to supine, to unaffected ear down, to prone
				Gufoni's maneuver	Patient lies on the side with unaffected ear for 1–2 minutes; head is then rotated 45 degrees in downward direction; patient then assumes sitting position
				Forced prolonged position	The patient lies with the unaffected ear down for approximately 12 hours
Apogeotropic	Supine head roll	Head is turned approximately 90 degrees to each side while patient is in supine position	Apogeotropic (beats toward the ceiling)	Gufoni's maneuver	Patient lies on the side with affected ear for 1–2 minutes; head is then rotated 45 degrees in upward position; patient then assumes sitting position
				Head-shaking	Head is shaken from side to side at approximately two cycles per second for 15 seconds

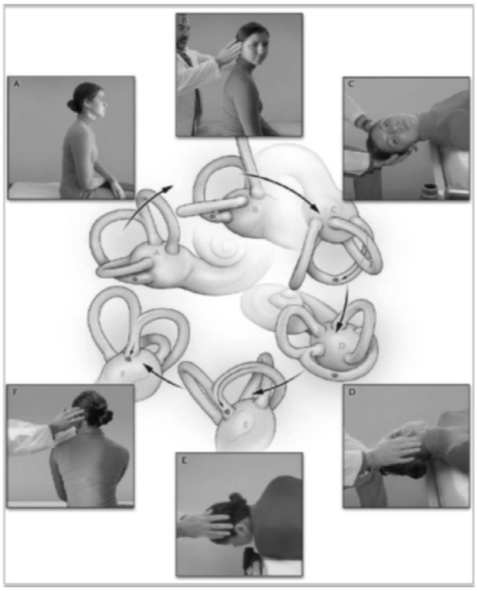
* In ipsiversive nystagmus, the upper pole of the eyes beats toward the side of the affected (lower) ear.
† If the apogeotropic type of benign paroxysmal positional vertigo is converted to the geotropic type, treatment for the geotropic type should be provided.

NEJM 2014

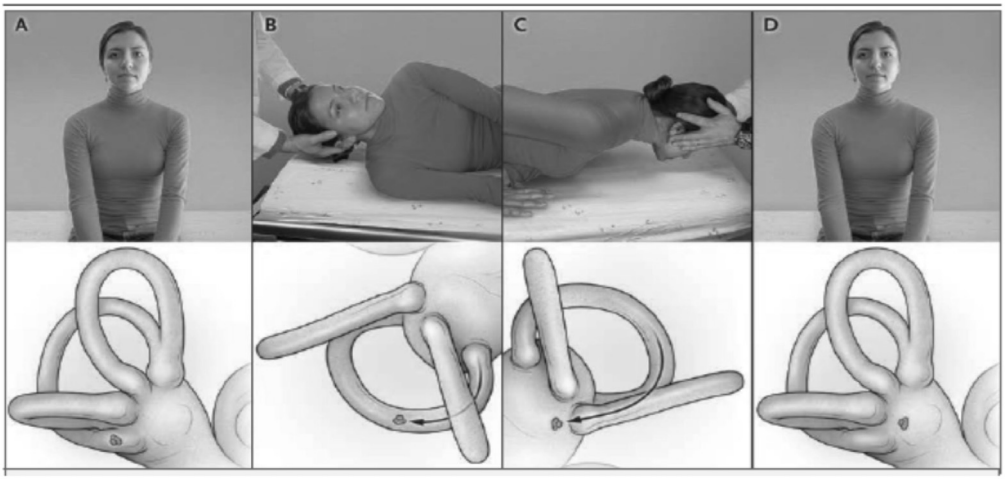
BPV-PC-RT



Epley's Canalith-Repositioning maneuver for BPV-PC-RT



Semont's Repositioning Maneuver for BPV-PC-RT



2017

AMERICAN ACADEMY OF OTOLARYNGOLOGY–HEAD AND NECK SURGERY FOUNDATION

Clinical Practice Guideline

Otolaryngology–Head and Neck Surgery
2017, Vol. 156(3S) S1–S47

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Clinical Practice Guideline: Benign Paroxysmal Positional Vertigo (Update)

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Sponsorships or competing interests that may be relevant to content are disclosed at the end of this article.

Abstract

Objective. This update of a 2008 guideline from the American Academy of Otolaryngology—Head and Neck Surgery Foundation provides evidence-based recommendations to benign

associated with undiagnosed or untreated BPPV. Other outcomes considered include minimizing costs in the diagnosis and treatment of BPPV, minimizing potentially unnecessary return physician visits, and maximizing the health-related quality of life of individuals afflicted with BPPV.

Action Statements. The update group made *strong recommendations* that clinicians should (1) diagnose posterior semicircular canal BPPV when vertigo associated with torsional, upbeating

Table 16. Patient Information: Frequently Asked Questions.

Question	Answer
What is BPPV?	Benign paroxysmal position vertigo (BPPV) is the most common inner ear problem and cause of vertigo, or false sense of spinning. BPPV is a specific diagnosis, and each word describes the condition:
Can BPPV be treated?	Yes. Although medications are not used other than for relief of immediate distress, such as nausea, most BPPV cases can be corrected with bedside repositioning exercises that take only a few minutes to complete. They have high success rates (around 80%) with only 1-3 treatments. These maneuvers are designed to guide the crystals back to their original location in your inner ear. They can be done at the same time that the bedside testing for diagnosis is being performed. You might be sent to a health professional (medical provider, audiologist, or therapist) who can perform these maneuvers, especially if any of the following apply: • You have severe disabling symptoms. • You are a senior with history of past falls or fear of falling. • You have difficulty moving around, such as joint stiffness especially in your neck and back and/or weakness. You can also be taught to perform these maneuvers by yourself with supervision, which is called "self-repositioning."
What are the common symptoms, and how can BPPV	Everyone will experience BPPV differently, but there are common symptoms. The most common symptoms are distinct *triggered* spells of vertigo or spinning sensations. You may experience nausea (sometimes vomiting) and/or a severe sense of disorientation in space. You may also feel unstable or like you are losing your balance. These symptoms will be intense for seconds to minutes. You can have lasting feelings of dizziness and instability, though
Can BPPV come back, and/or can I prevent it?	Unfortunately, BPPV is a condition that can sometimes return. Your risk for BPPV returning can shift from low risk (few experiences in your lifetime) to a higher risk, which is often caused by some other factor, such as trauma (physical injury), other inner ear or medical conditions, or aging. Medical research has not found any way to stop BPPV from coming back, but it can be treated with a high rate of success.
How common is BPPV?	BPPV is very common. It is more common in older people. Many of us will experience it at some time in our lives.
What caused my BPPV?	Most cases of BPPV happen for no reason. It can sometimes be associated with trauma, migraine, other inner ear problems, diabetes, osteoporosis, and lying in bed for long periods (preferred sleep side, surgical procedures, illness).
How is BPPV diagnosed?	Normal medical imaging, such as scans and x-rays, or medical laboratory testing cannot confirm BPPV. Your health care provider or examiner will complete simple bedside testing to help to confirm your diagnosis. The bedside testing requires the examiner to move your head into a position that makes the crystal move. The testing may include hanging your head a little off the edge of the bed or rolling your head left and right while lying in bed. The examiner will be watching you for a certain eye movement to confirm your diagnosis. The most common tests are called either the Dix-Hallpike test or supine roll test.

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J Neurol Phys Ther. 2019 Apr;43 Suppl 2 Supplement, Special Supplement: International Conference on Vestibular Rehabilitation:S37-S41. doi: 10.1097/NPT.0000000000000273.

Impaired Calcium Metabolism in Benign Paroxysmal Positional Vertigo: A Topical Review.

Jeong SH[1], Kim JS.

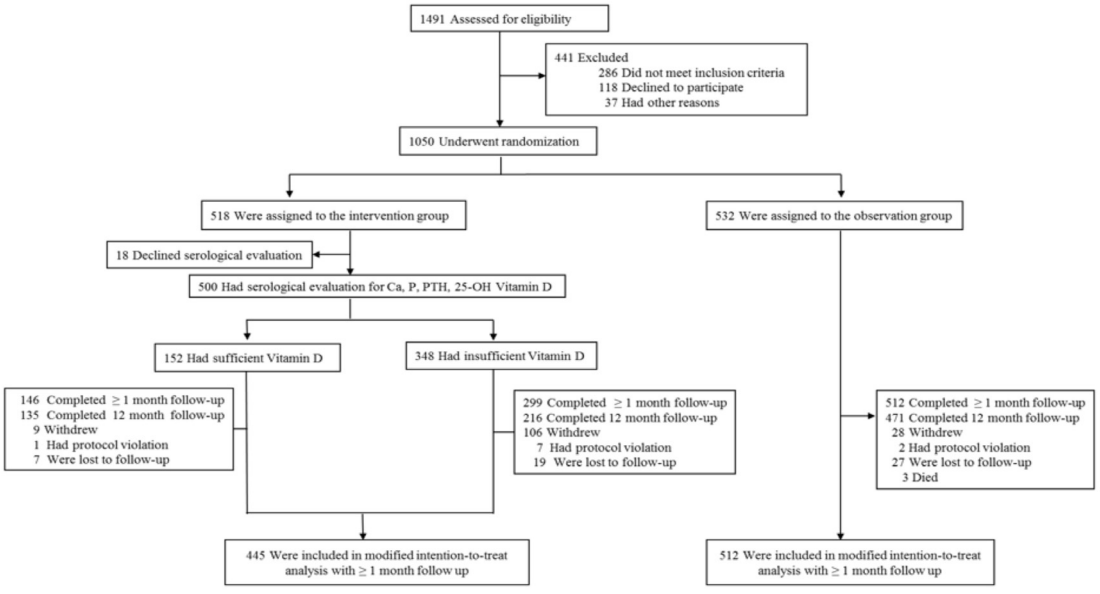
⊕ Author information

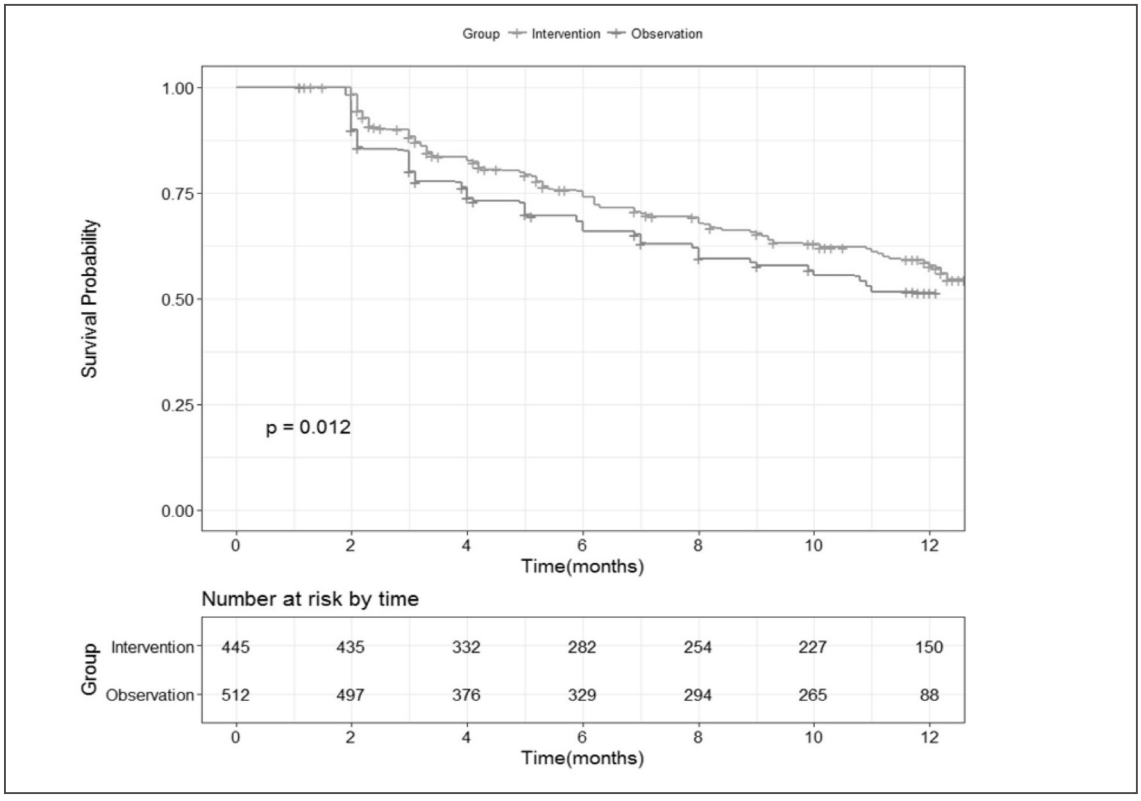
Abstract

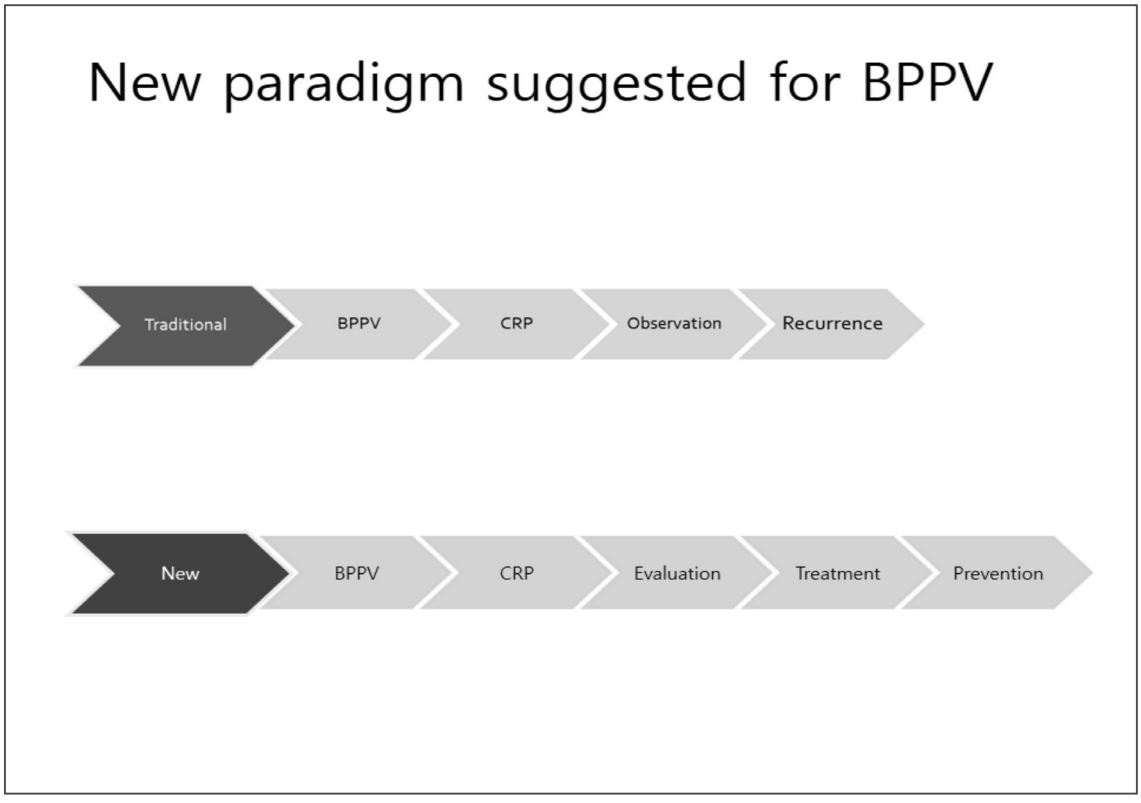
BACKGROUND AND PURPOSE: Although acute attacks of benign paroxysmal positional vertigo (BPPV) may be treated with canalith repositioning maneuvers, there have been no well-designed prospective trials to prevent this highly prevalent and recurrent disorder. This topical review explores the evidence related to the association between deficient calcium metabolism and BPPV. We also describe the development of therapeutic options to prevent recurrences of BPPV and introduce results from a recent randomized controlled trial on the effect of vitamin D and calcium supplementation in preventing BPPV recurrences.

SUMMARY OF KEY POINTS: The literature describes 3 lines of evidence on association of impaired calcium metabolism and development of BPPV: (1) decreased bone mineral density was more frequently observed in persons with BPPV than in healthy controls; (2) estrogen plays a vital role in maintenance of otoconia, and estrogen deficiency appears to precipitate degeneration of otoconia and development of BPPV; and (3) lower serum vitamin D level is associated with development of BPPV, and supplementation of vitamin D and calcium carbonate may reduce further attacks of BPPV in persons with BPPV and subnormal serum vitamin D level.

RECOMMENDATIONS FOR CLINICAL PRACTICE: Restoration of impaired calcium metabolism with supplementation of vitamin D or estrogen should be considered in the treatment of individuals with frequent recurrences of BPPV. Future randomized controlled trials are mandatory to validate these supplementation therapies in individuals with recurrent BPPV.




Group Intervention Observation
Survival Probability
1.00
0.75
0.50
0.25
0.00
p = 0.012
0
2
4
6
8
10
12
Time(months)
Number at risk by time
Group
Intervention 445 435 332 282 254 227 150
Observation 512 497 376 329 294 265 88
0
2
4
6
8
10
12
Time(months)


New paradigm suggested for BPPV
Traditional
BPPV
CRP
Observation
Recurrence
New
BPPV
CRP
Evaluation
Treatment
Prevention

Classification of Dizziness/vertigo

- Acute spontaneous vertigo
  - Stroke vs. VN
- Recurrent spontaneous vertigo
  - VBI/ Meniere's disease/ Migraine/ Psychogenic
- Recurrent positional vertigo
  - BPPV/Orthostatic intolerance
- Chronic dizziness and imbalance
  - Multisensory/ Psychogenic/ Degenerative

Case VI (77/M)

D: 어디가 불편해서 오셨어요?

P: 어지러워요.

D: 본인이 어지러우세요, 주변이 도세요?

P: 제가 어지러워요.

D: 뭐 할 때 어지러우세요?

P: 일어날 때, 움직일 때

D: 아, 앉았다가 일어날 때요. 일어날 때 잠시 어질하신 건가요?

울렁거리거나, 이명은 없으시구요?

P: 네, 없습니다.

D: 드시는 약은요. 혈압약, 전립선비대증약 같은 것은 안 드세요?

P: 네, 최근에 전립선약 먹어요.

- HT/DM(-/+)
- 전립선약

- Neurological examination:OK

진단?

- Orthostatic intolerance
- r/o Orthostatic hypotension

다음 해야 할 검사는?

- Orthostatic BP/HR

2018-09-10

Tilt manual BP

Supine 1min SBP(mmHg) : 147 DBP(mmHg) : 73 HR(bpm) : 78

4mins SBP(mmHg) : 141 DBP(mmHg) : 76 HR(bpm) : 79

Tilt 1min SBP(mmHg) : 102 DBP(mmHg) : 53 HR(bpm) : 87

3mins SBP(mmHg) : 109 DBP(mmHg) : 55 HR(bpm) : 87

5mins SBP(mmHg) : 115 DBP(mmHg) : 67 HR(bpm) : 88

7mins SBP(mmHg) : 112 DBP(mmHg) : 62 HR(bpm) : 89

9mins SBP(mmHg) : 120 DBP(mmHg) : 65 HR(bpm) : 94

11mins SBP(mmHg) : 133 DBP(mmHg) : 67 HR(bpm) : 94

13mins SBP(mmHg) : 135 DBP(mmHg) : 67 HR(bpm) : 94

15mins SBP(mmHg) : 131 DBP(mmHg) : 68 HR(bpm) : 96

17mins SBP(mmHg) : 136 DBP(mmHg) : 67 HR(bpm) : 96

19mins SBP(mmHg) : 146 DBP(mmHg) : 69 HR(bpm) : 97

Supine 1min SBP(mmHg) : 149 DBP(mmHg) : 69 HR(bpm) : 83

Orthostatic hypotension evaluation

Systolic Max change : 39 Duration of change : 1

Diastolic Max change : 23 Duration of change : 1

HR Max change : 18 Duration of change : 19

2018-12-05

Tilt manual BP

Supine 1min SBP(mmHg) : 152 DBP(mmHg) : 86 HR(bpm) : 68
4mins SBP(mmHg) : 152 DBP(mmHg) : 82 HR(bpm) : 67
Tilt 1min SBP(mmHg) : 148 DBP(mmHg) : 80 HR(bpm) : 70
3mins SBP(mmHg) : 145 DBP(mmHg) : 83 HR(bpm) : 77
5mins SBP(mmHg) : 146 DBP(mmHg) : 81 HR(bpm) : 73
7mins SBP(mmHg) : 159 DBP(mmHg) : 82 HR(bpm) : 75
9mins SBP(mmHg) : 146 DBP(mmHg) : 81 HR(bpm) : 74
11mins SBP(mmHg) : 150 DBP(mmHg) : 82 HR(bpm) : 75
13mins SBP(mmHg) : 147 DBP(mmHg) : 82 HR(bpm) : 76
15mins SBP(mmHg) : 145 DBP(mmHg) : 79 HR(bpm) : 76
17mins SBP(mmHg) : 150 DBP(mmHg) : 81 HR(bpm) : 78
19mins SBP(mmHg) : 147 DBP(mmHg) : 82 HR(bpm) : 78
Supine 1min SBP(mmHg) : 149 DBP(mmHg) : 77 HR(bpm) : 67

Orthostatic hypotension evaluation

Systolic Max change : 7 Duration of change : 3
Diastolic Max change : 3 Duration of change : 15
HR Max change : 11 Duration of change : 17

ARTICLE OPEN ACCESS CLASS OF EVIDENCE

The efficacy of nonpharmacologic intervention for orthostatic hypotension associated with aging

Julia L. Newton, PhD, and James Frith, PhD

Neurology® 2018;91:e652-e656. doi:10.1212/WNL.0000000000005994

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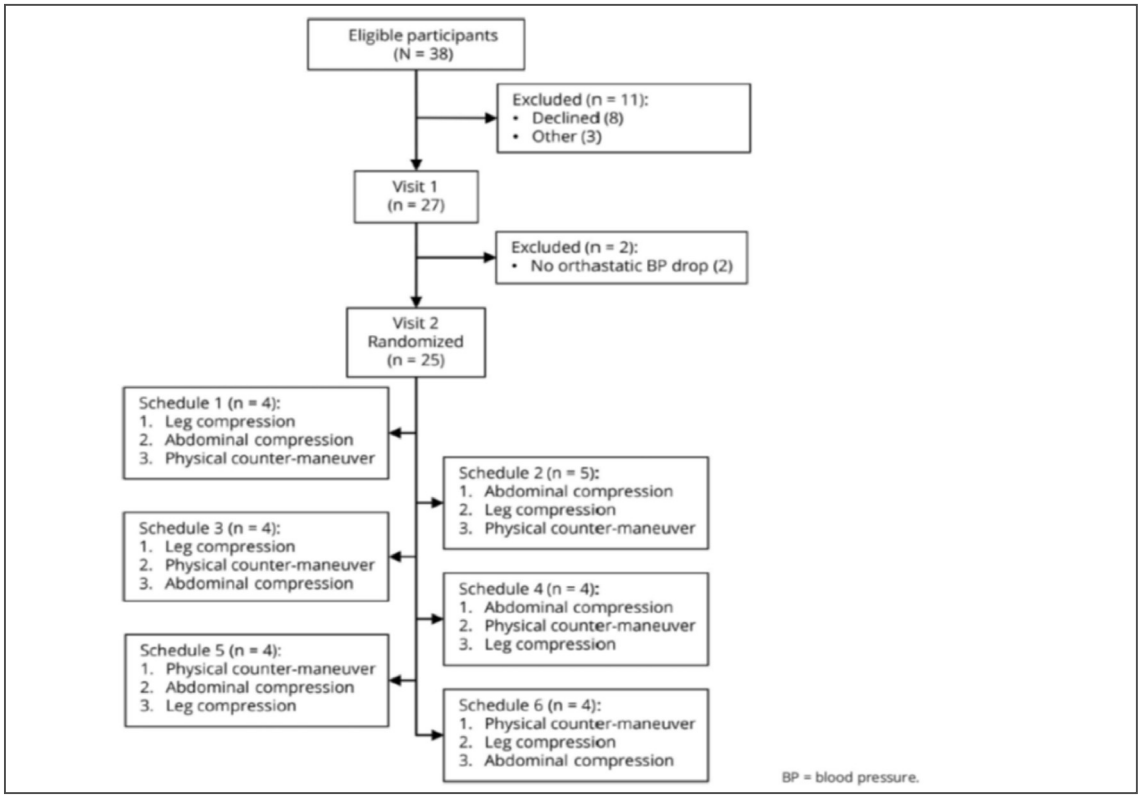


Abstract

Objective

To determine the efficacy and safety of nonpharmacologic interventions for orthostatic hypotension (OH) secondary to aging.

Methods

A total of 150 orthostatic challenges were performed in 25 older people (age 60–92 years) to determine cardiovascular responses to bolus water drinking, compression stockings, abdominal compression, and physical countermaneuvers. Primary outcome was response rate as assessed by proportion of participants whose systolic blood pressure (SBP) drop improved by ≥10 mm Hg.

Results

The response rate to bolus water drinking was 56% (95% confidence interval [CI] 36.7–74.2), with standing SBP increasing by 12 mm Hg (95% CI 4–20). Physical countermaneuvers were efficacious in 44% (95% CI 25.8–63.3) but had little effect on standing SBP (+7.5 mm Hg [95% CI −1 to 16]). Abdominal compression was efficacious in 52% (95% CI 32.9–70.7) and improved standing SBP (+10 mm Hg [95% CI 2–18]). Compression stockings were the least efficacious therapy (32% [95% CI 16.1–51.4]) and had little effect on standing SBP (+6 mm Hg [95% CI −1, 13]). No intervention improved symptoms during standing. There were no adverse events.

Conclusions

Bolus water drinking should become the standard first-line nonpharmacologic intervention, whereas compression stockings should be disregarded in this population.

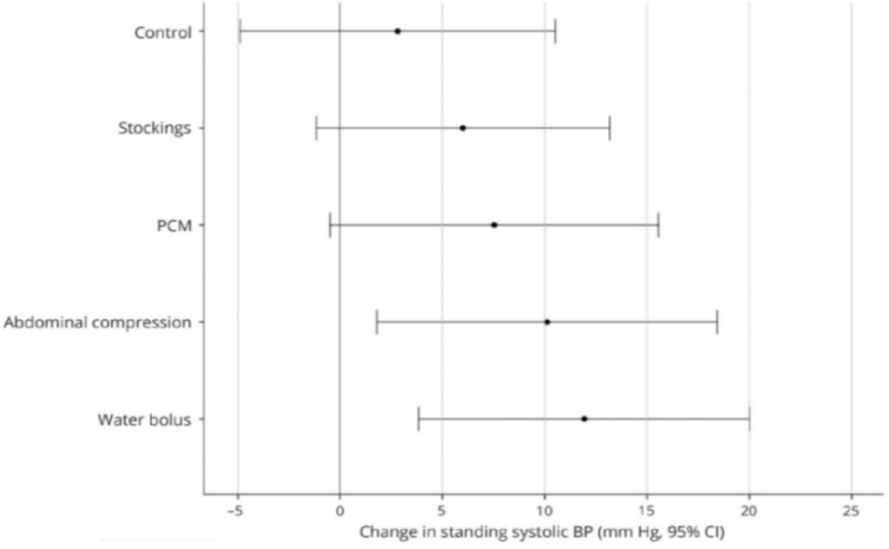
Table Baseline characteristics

Demographic	
Age, median (range), y	74 (60–92)
Male, n (%)	15 (60)
Charlson Comorbidity Index score, median (range)	4 (3–8)
Regular medications, median (range)	4 (0–13)
Fludrocortisone, n	5
Midodrine, n	3
Dominant hand grip strength, median (range), kg	25 (2–54)

Demographic	Visit 1	Visit 2
Control supine BP, mean (SD), mm Hg		
Systolic	128 (21)	126 (19)
Diastolic	75 (13)	77 (12)
Control standing BP nadir, mean (SD), mm Hg		
Systolic	87 (26)	84 (25)
Diastolic	57 (13)	59 (16)
Control orthostatic BP drop, mean (SD), mm Hg		
Systolic	41 (22)	41 (20)
Diastolic	19 (13)	18 (13)
Control orthostatic symptoms, OHSA score, median (range)		
Composite symptom score	1 (0–8.5)	1.2 (0–6)
Dizziness	2 (0–9)	4 (0–9)

Abbreviations: BP = blood pressure; OHSA = Orthostatic Hypotension Questionnaire Symptom Assessment subscale.
Control indicates values derived from baseline postural BP measurement before intervention. Maximum OHSA score is 10; maximum dizziness score is 10.

Figure 2 Change in standing systolic BP



Change in standing systolic blood pressure (BP) with each intervention compared to no intervention. Control refers to the difference between the baseline postural BP assessments on visits 1 and 2. CI = confidence interval; PCM = physical countermaneuver.

Case VII (22/F) recurrent dizziness and LOC

대학생

기립시 어지럼증
평소에는 붕 뜬 것 같고
순간순간 어지럽다.
심한 것은 3-4주 전부터

recurrent LOC, 2013년
수업시간 미용 수업 듣다가 어지럽고, 배가 아파 화장실 가려고 하다가 쓰러짐
Three episodes of medium voltage spike and waves complexes occur in all leads.

이후에는 본인이 어지러우면서 세상이 노랗게 되니까 눕는다.
식은땀(+)
그러고 나면 의식을 잃지는 않는다.
5-10 min 정도 안정을 취하면 덜하다.

최근에는 더 자주 어지럽다.
주로 기립시
가만히 있어도 붕붕 떠다니는 느낌
nausea(-)

headache:
냄새 맡으면 - 매연냄새, 진한향수, 담배냄새
어려서는 우측 두통, 최근에는 좌측두통
paresthesia - pinprick(+)
throbbing
eyeball pain(+)
congension of eyeball(-)
시험시간- 신경쓰면 심했다.
catamenial tendency(-)
차멀미는 안하는데 놀이기구타고 토했고, 무서워서 안탄다.
visual sx(-)
nausea(-), but 소화는 잘 안된다.
phono(+)
photo(+)
이전에는 자고 나면 좋아졌는데 요사이는 안 그렇다.
3-4개월에 한번 since 중학생
최근에 더 자주 온다.

visaul sx(-)
tinnitus: 삐소리 - either side,증상과 관계없이

family history(-)

뛰어도 어지럽다.
등산할 때 잘 주저 앉는다.

Neurotological examination

SN(-)
GEN(-)
HIT:OK
HS:OK
HV: subtle downbeat
PO:OK
DTR:OK
Tandem/Romberg: OK
Cbll fn test: OK

Assessment

- Recurrent spontaneous vertigo
- r/o POTS
- VM
- Known epilepsy

Tilt table test

Tilt test

Supine SBP(mmHg) : 122 DBP(mmHg) : 65 HR(bpm) : 73
Tilt 1min SBP(mmHg) : 119 DBP(mmHg) : 71 HR(bpm) : 85
2mins SBP(mmHg) : 111 DBP(mmHg) : 68 HR(bpm) : 85
3mins SBP(mmHg) : 117 DBP(mmHg) : 70 HR(bpm) : 94
4mins SBP(mmHg) : 105 DBP(mmHg) : 63 HR(bpm) : 98
5mins SBP(mmHg) : 104 DBP(mmHg) : 63 HR(bpm) : 87
6mins SBP(mmHg) : 100 DBP(mmHg) : 60 HR(bpm) : 95
7mins SBP(mmHg) : 104 DBP(mmHg) : 63 HR(bpm) : 95
8mins SBP(mmHg) : 105 DBP(mmHg) : 63 HR(bpm) : 99
9mins SBP(mmHg) : 103 DBP(mmHg) : 62 HR(bpm) : 93
10mins SBP(mmHg) : 110 DBP(mmHg) : 66 HR(bpm) : 101
11mins SBP(mmHg) : 109 DBP(mmHg) : 67 HR(bpm) : 94
12mins SBP(mmHg) : 100 DBP(mmHg) : 61 HR(bpm) : 91
13mins SBP(mmHg) : 122 DBP(mmHg) : 72 HR(bpm) : 93
14mins SBP(mmHg) : 108 DBP(mmHg) : 65 HR(bpm) : 93
15mins SBP(mmHg) : 107 DBP(mmHg) : 65 HR(bpm) : 92
16mins SBP(mmHg) : 114 DBP(mmHg) : 70 HR(bpm) : 94
17mins SBP(mmHg) : 109 DBP(mmHg) : 66 HR(bpm) : 100
18mins SBP(mmHg) : 110 DBP(mmHg) : 66 HR(bpm) : 101
19mins SBP(mmHg) : 112 DBP(mmHg) : 68 HR(bpm) : 104
20mins SBP(mmHg) : 107 DBP(mmHg) : 64 HR(bpm) : 95
Supine SBP(mmHg) : 110 DBP(mmHg) : 57 HR(bpm) : 85

Orthostatic hypotension evaluation

Systolic Max change : 22 Duration of change : 6
Diastolic Max change : 5 Duration of change : 6
HR Max change : 31 Duration of change : 19

Comment

tilt 시작하고 약간 어지럽고 띵했다. 곧 괜찮아지심.

2nd visit

S

Description

많이 어지럽다.
3일전에 나가려고 신발장 앞에 서 있는데 심하게 어지러워서
주저 앉아 있다가 나갔다.
지금도 어지러워

O

진료실
supine 110/74-81
erect 110/81-122
1min 112/85-110
3min 118/89-122
5min 116/86-116

검사실에서 검사할 때보다 더 안 좋다.

Vital sign

Systolic BP : 116 mmHg PR : 107
Diastolic BP : 60 mmHg

A

VM with POTS>

- 반복검사가 필요

Treatment

β-blocker

Case VIII (65/F) 라인댄스 할 때 어지럽다.

Known VM patient

S; 많이 좋아졌는데, 라인댄스 할 때 어지럽다.

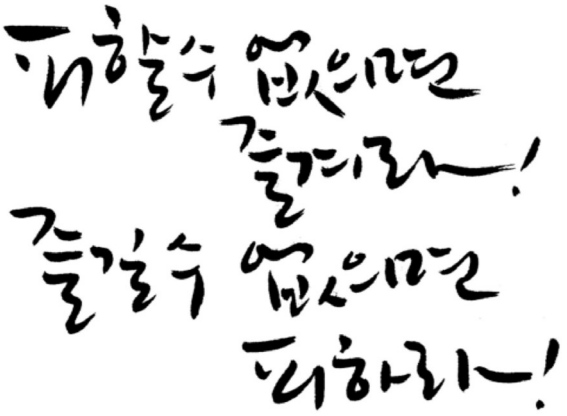
O; NEX:OK

A; VM

P: Habituation excercise

- Line Dance

Habituation excercise



Case IX (65/M) Imbalance for 3 years

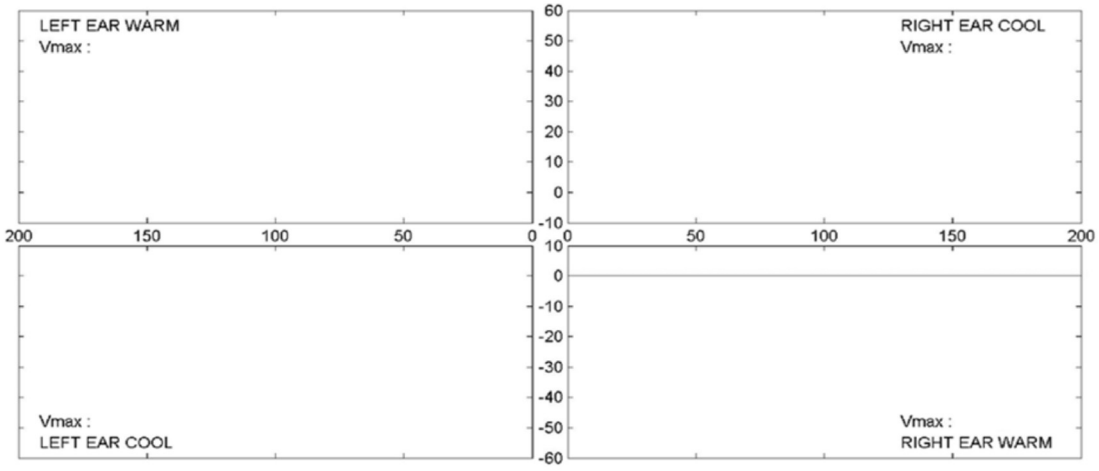
S: Pyogenic spondylitis, thoracolumbar region
bed rest
움직이면 어지럽다.

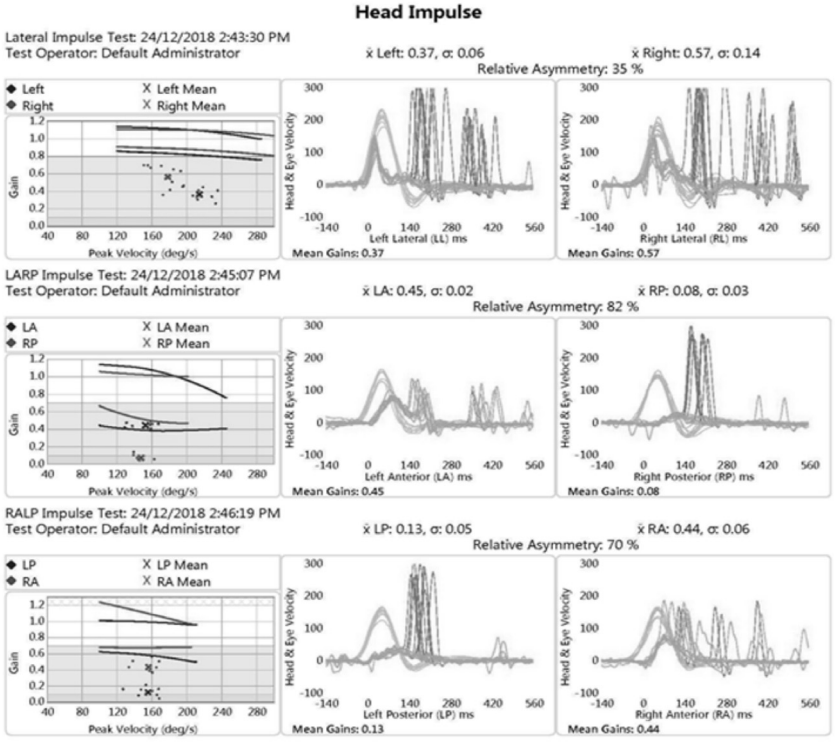
O: DM/HT (-/-)
No nytagmus
HC(+/+)
AC(+/+)
PC(+/+)

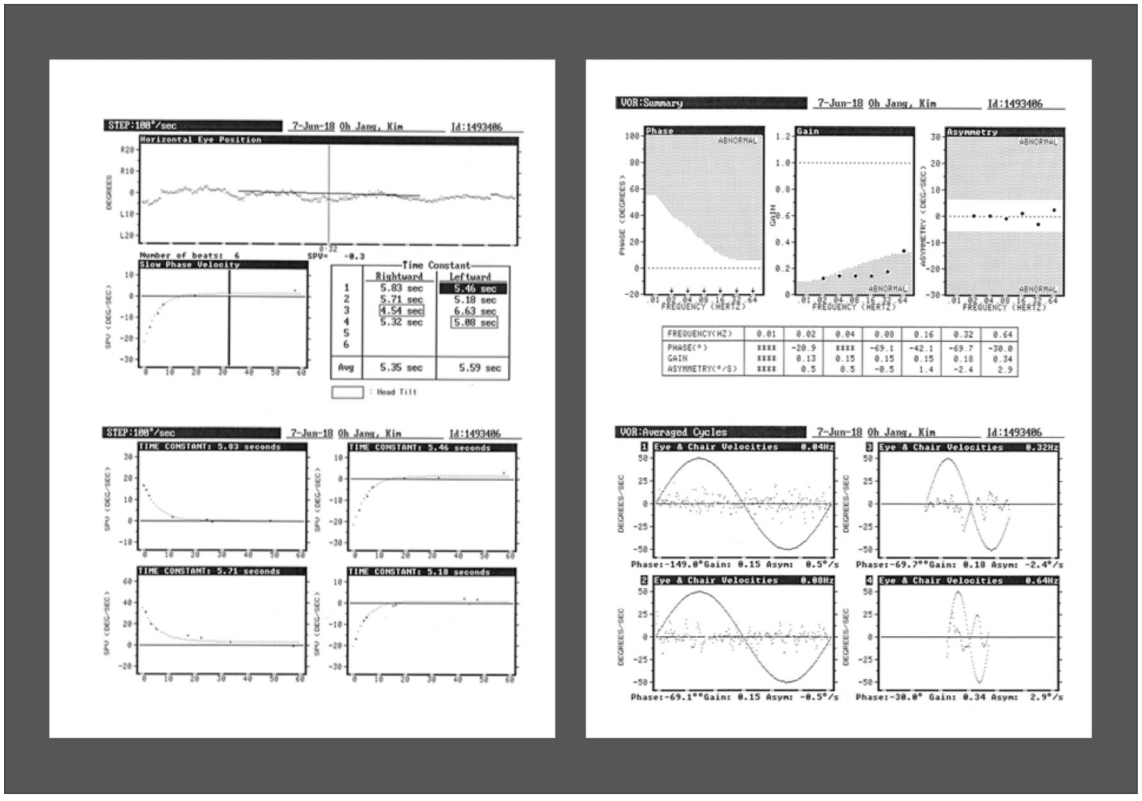
DVA: 0.6->0.1

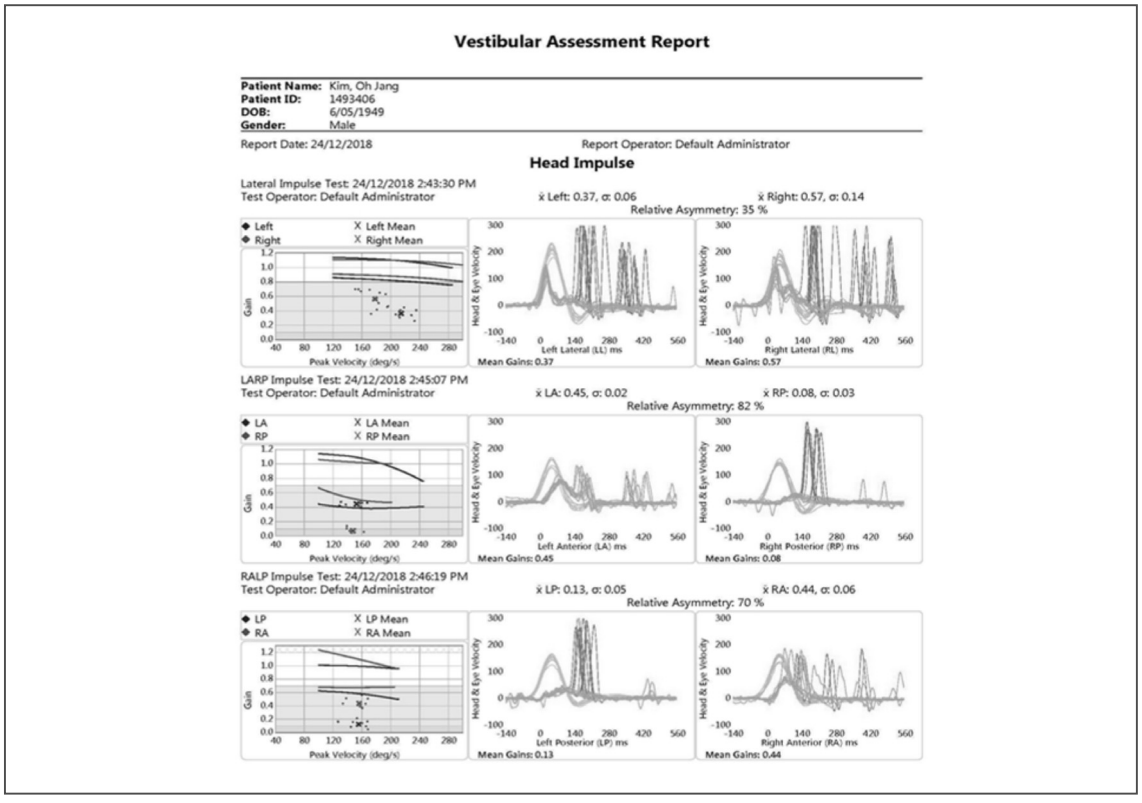
A: Bilateral vestibulopathy

Bithermal caloric test









Vestibular Assessment Report

Patient Name: Kim, Oh Jang
Patient ID: 1493406
DOB: 6/05/1949
Gender: Male

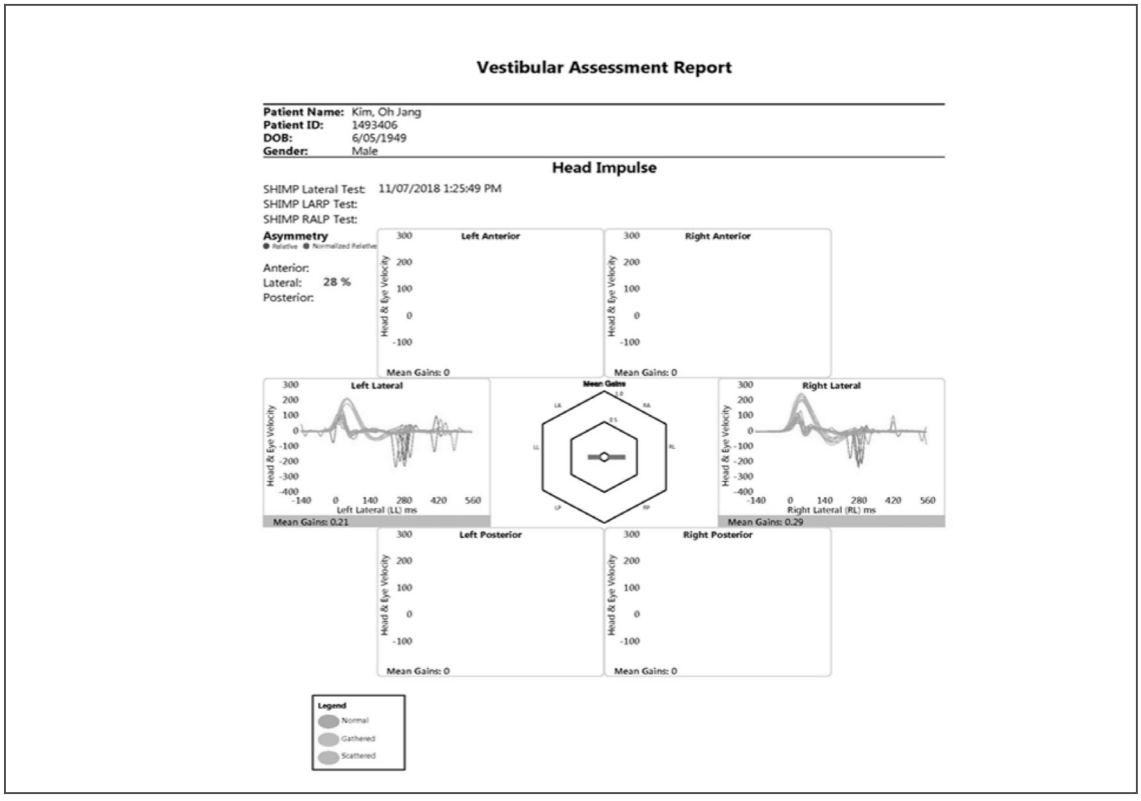
Report Date: 24/12/2018 Report Operator: Default Administrator

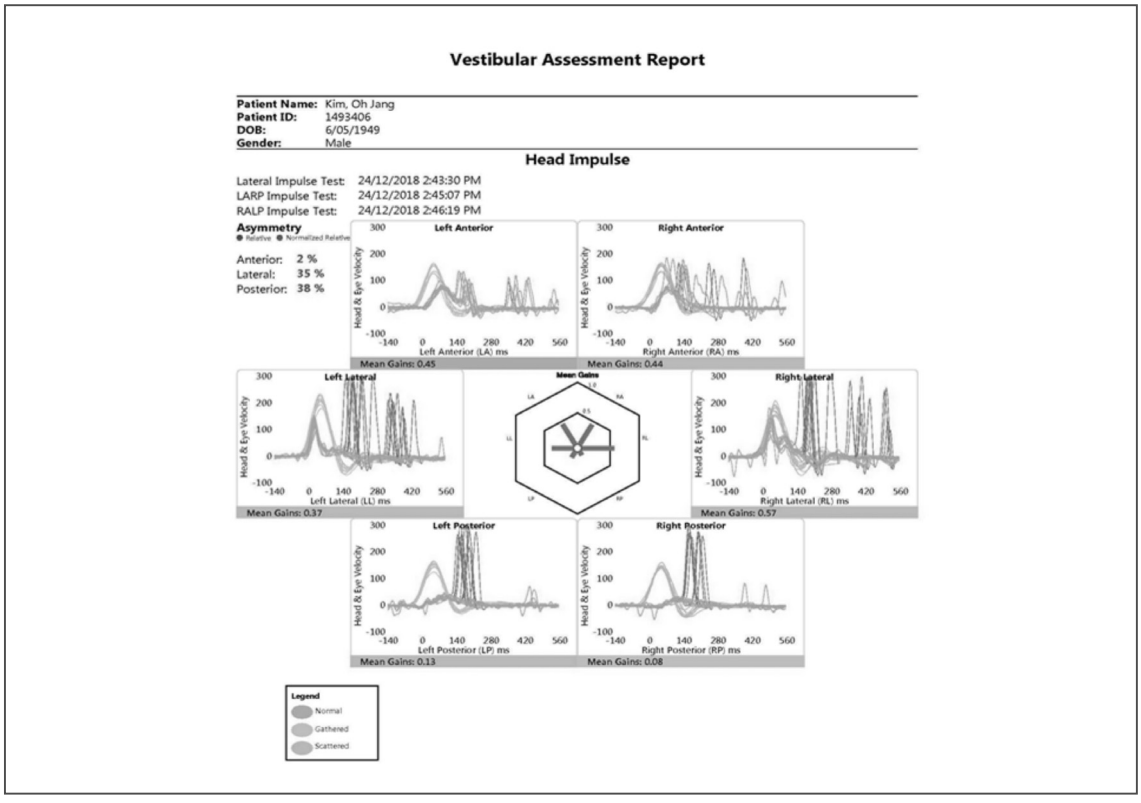
Head Impulse

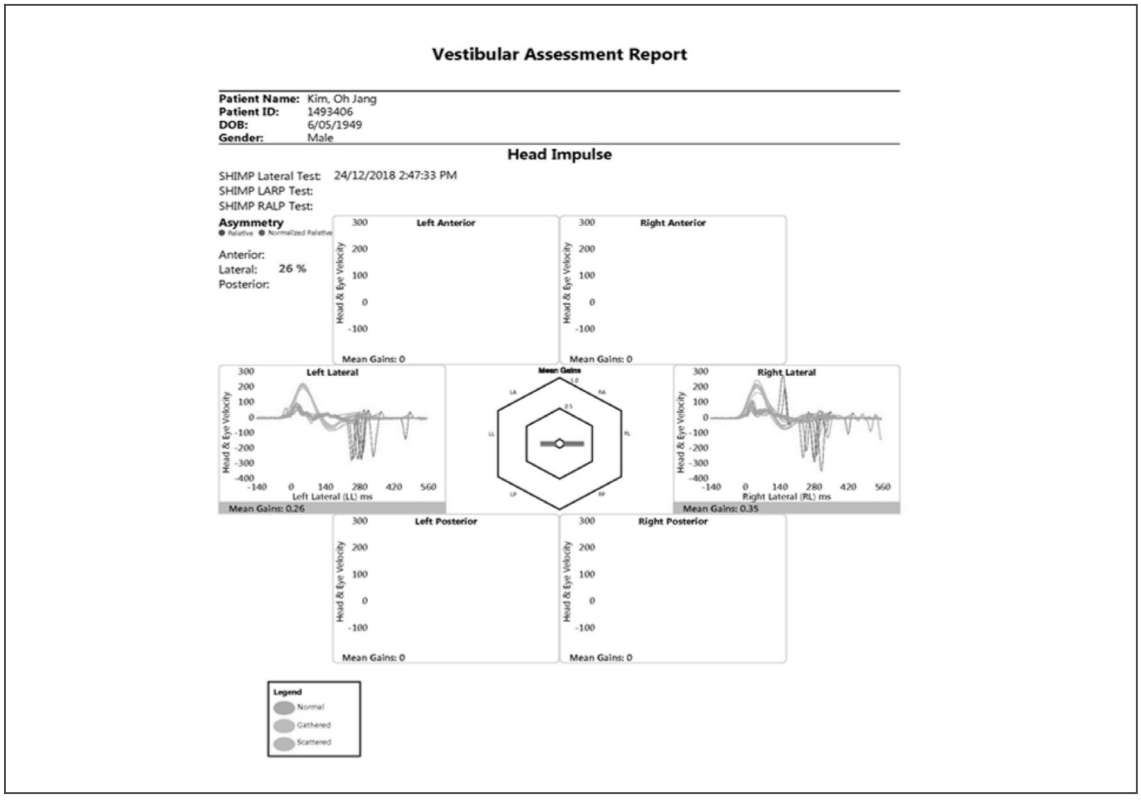
Lateral Impulse Test: 24/12/2018 2:43:30 PM
Test Operator: Default Administrator
x̄ Left: 0.37, σ: 0.06 x̄ Right: 0.57, σ: 0.14
Relative Asymmetry: 35 %
Left Right X Left Mean X Right Mean
Gain Peak Velocity (deg/s)
Head & Eye Velocity Left Lateral (LL) ms Mean Gains: 0.37
Head & Eye Velocity Right Lateral (RL) ms Mean Gains: 0.57

LARP Impulse Test: 24/12/2018 2:45:07 PM
Test Operator: Default Administrator
x̄ LA: 0.45, σ: 0.02 x̄ RP: 0.08, σ: 0.03
Relative Asymmetry: 82 %
LA RP X LA Mean X RP Mean
Gain Peak Velocity (deg/s)
Head & Eye Velocity Left Anterior (LA) ms Mean Gains: 0.45
Head & Eye Velocity Right Posterior (RP) ms Mean Gains: 0.08

RALP Impulse Test: 24/12/2018 2:46:19 PM
Test Operator: Default Administrator
x̄ LP: 0.13, σ: 0.05 x̄ RA: 0.44, σ: 0.06
Relative Asymmetry: 70 %
LP RA X LP Mean X RA Mean
Gain Peak Velocity (deg/s)
Head & Eye Velocity Left Posterior (LP) ms Mean Gains: 0.13
Head & Eye Velocity Right Anterior (RA) ms Mean Gains: 0.44


Vestibular Assessment Report
Patient Name: Kim, Oh Jang
Patient ID: 1493406
DOB: 6/05/1949
Gender: Male
Head Impulse
SHIMP Lateral Test: 11/07/2018 1:25:49 PM
SHIMP LARP Test:
SHIMP RALP Test:
Asymmetry
Anterior:
Lateral: 28 %
Posterior:
Left Anterior
Right Anterior
Left Lateral
Right Lateral
Left Posterior
Right Posterior
Mean Gains
Mean Gains: 0
Mean Gains: 0.21
Mean Gains: 0.29
Legend
Normal
Gathered
Scattered


Vestibular Assessment Report
Patient Name: Kim, Oh Jang
Patient ID: 1493406
DOB: 6/05/1949
Gender: Male
Head Impulse
Lateral Impulse Test: 24/12/2018 2:43:30 PM
LARP Impulse Test: 24/12/2018 2:45:07 PM
RALP Impulse Test: 24/12/2018 2:46:19 PM
Asymmetry
Anterior: 2 %
Lateral: 35 %
Posterior: 38 %
Left Anterior
Right Anterior
Left Lateral
Right Lateral
Left Posterior
Right Posterior
Mean Gains
Mean Gains: 0.45
Mean Gains: 0.44
Mean Gains: 0.37
Mean Gains: 0.57
Mean Gains: 0.13
Mean Gains: 0.08
Legend
Normal
Gathered
Scattered



Vestibular Assessment Report

Patient Name: Kim, Oh Jang
Patient ID: 1493406
DOB: 6/05/1949
Gender: Male

Head Impulse

SHIMP Lateral Test: 24/12/2018 2:47:33 PM
SHIMP LARP Test:
SHIMP RALP Test:

Asymmetry
● Relative ● Normalized Relative

Anterior:
Lateral: 26 %
Posterior:

Left Anterior — Mean Gains: 0
Right Anterior — Mean Gains: 0
Left Lateral — Left Lateral (LL) ms — Mean Gains: 0.26
Mean Gains
Right Lateral — Right Lateral (RL) ms — Mean Gains: 0.35
Left Posterior — Mean Gains: 0
Right Posterior — Mean Gains: 0

Head & Eye Velocity

Legend
Normal
Gathered
Scattered

편집

Bilateral vestibulopathy

PI
Pyogenic spondylitis, thoracolumbar region
bed rest

3년전부터
이후 imbalance(+)

ear ds: 면봉손상
tinnitus: left

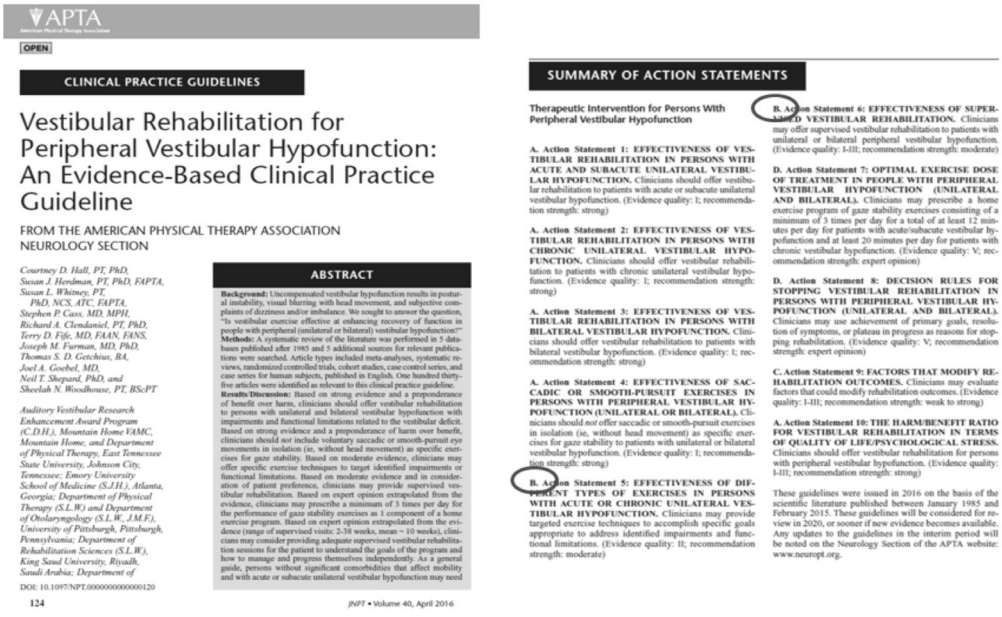
PH
DM : -
HT : -

PE
Vital sign
Systolic BP : 118 mmHg PR : 94
Diastolic BP : 73 mmHg
Neurologic examination
Mental status examination
Description
HC(+/+)
PC(+/+)
AC(+/+)

DVA: 0.5->0.3

Assessment
Impression
Bilateral vestibulopathy

Plan
진단계획
VFT



APTA

OPEN

CLINICAL PRACTICE GUIDELINES

Vestibular Rehabilitation for Peripheral Vestibular Hypofunction: An Evidence-Based Clinical Practice Guideline

FROM THE AMERICAN PHYSICAL THERAPY ASSOCIATION NEUROLOGY SECTION

Courtney D. Hall, PT, PhD, Susan J. Herdman, PT, PhD, FAPTA, Susan L. Whitney, PT, PhD, NCS, ATC, FAPTA, Stephen P. Cass, MD, MPH, Richard A. Clendaniel, PT, PhD, Terry D. Fife, MD, FAAN, FANS, Joseph M. Furman, MD, PhD, Thomas S. D. Getchius, BA, Joel A. Goebel, MD, Neil T. Shepard, PhD, and Sheelah N. Woodhouse, PT, BScPT

Auditory Vestibular Research Enhancement Award Program (C.D.H.), Mountain Home VAMC, Mountain Home, and Department of Physical Therapy, East Tennessee State University, Johnson City, Tennessee; Emory University School of Medicine (S.J.H.), Atlanta, Georgia; Department of Physical Therapy (S.L.W.) and Department of Otolaryngology (S.L.W., J.M.F.), University of Pittsburgh, Pittsburgh, Pennsylvania; Department of Rehabilitation Sciences (S.L.W.), King Saud University, Riyadh, Saudi Arabia; Department of

DOI: 10.1097/NPT.0000000000000120

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ABSTRACT

Background: Uncompensated vestibular hypofunction results in postural instability, visual blurring with head movement, and subjective complaints of dizziness and/or imbalance. We sought to answer the question, "Is vestibular exercise effective at enhancing recovery of function in people with peripheral (unilateral or bilateral) vestibular hypofunction?"

Methods: A systematic review of the literature was performed in 5 databases published after 1985 and 5 additional sources for relevant publications were searched. Article types included meta-analyses, systematic reviews, randomized controlled trials, cohort studies, case control series, and case series for human subjects, published in English. One hundred thirty-five articles were identified as relevant to this clinical practice guideline.

Results/Discussion: Based on strong evidence and a preponderance of benefit over harm, clinicians should offer vestibular rehabilitation to persons with unilateral and bilateral vestibular hypofunction with impairments and functional limitations related to the vestibular deficit. Based on strong evidence and a preponderance of harm over benefit, clinicians should *not* include voluntary saccadic or smooth-pursuit eye movements in isolation (ie, without head movement) as specific exercises for gaze stability. Based on moderate evidence, clinicians may offer specific exercise techniques to target identified impairments or functional limitations. Based on moderate evidence and in consideration of patient preference, clinicians may provide supervised vestibular rehabilitation. Based on expert opinion extrapolated from the evidence, clinicians may prescribe a minimum of 3 times per day for the performance of gaze stability exercises as 1 component of a home exercise program. Based on expert opinion extrapolated from the evidence (range of supervised visits: 2-36 weeks, mean = 10 weeks), clinicians may consider providing adequate supervised vestibular rehabilitation sessions for the patient to understand the goals of the program and how to manage and progress themselves independently. As a general guide, persons without significant comorbidities that affect mobility and with acute or subacute unilateral vestibular hypofunction may need

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SUMMARY OF ACTION STATEMENTS

Therapeutic Intervention for Persons With Peripheral Vestibular Hypofunction

A. Action Statement 1: EFFECTIVENESS OF VESTIBULAR REHABILITATION IN PERSONS WITH ACUTE AND SUBACUTE UNILATERAL VESTIBULAR HYPOFUNCTION. Clinicians should offer vestibular rehabilitation to patients with acute or subacute unilateral vestibular hypofunction. (Evidence quality: I; recommendation strength: strong)

A. Action Statement 2: EFFECTIVENESS OF VESTIBULAR REHABILITATION IN PERSONS WITH CHRONIC UNILATERAL VESTIBULAR HYPOFUNCTION. Clinicians should offer vestibular rehabilitation to patients with chronic unilateral vestibular hypofunction. (Evidence quality: I; recommendation strength: strong)

A. Action Statement 3: EFFECTIVENESS OF VESTIBULAR REHABILITATION IN PERSONS WITH BILATERAL VESTIBULAR HYPOFUNCTION. Clinicians should offer vestibular rehabilitation to patients with bilateral vestibular hypofunction. (Evidence quality: I; recommendation strength: strong)

A. Action Statement 4: EFFECTIVENESS OF SACCADIC OR SMOOTH-PURSUIT EXERCISES IN PERSONS WITH PERIPHERAL VESTIBULAR HYPOFUNCTION (UNILATERAL OR BILATERAL). Clinicians should *not* offer saccadic or smooth-pursuit exercises in isolation (ie, without head movement) as specific exercises for gaze stability to patients with unilateral or bilateral vestibular hypofunction. (Evidence quality: I; recommendation strength: strong)

B. Action Statement 5: EFFECTIVENESS OF DIFFERENT TYPES OF EXERCISES IN PERSONS WITH ACUTE OR CHRONIC UNILATERAL VESTIBULAR HYPOFUNCTION. Clinicians may provide targeted exercise techniques to accomplish specific goals appropriate to address identified impairments and functional limitations. (Evidence quality: II; recommendation strength: moderate)

B. Action Statement 6: EFFECTIVENESS OF SUPERVISED VESTIBULAR REHABILITATION. Clinicians may offer supervised vestibular rehabilitation to patients with unilateral or bilateral peripheral vestibular hypofunction. (Evidence quality: I-III; recommendation strength: moderate)

D. Action Statement 7: OPTIMAL EXERCISE DOSE OF TREATMENT IN PEOPLE WITH PERIPHERAL VESTIBULAR HYPOFUNCTION (UNILATERAL AND BILATERAL). Clinicians may prescribe a home exercise program of gaze stability exercises consisting of a minimum of 3 times per day for a total of at least 12 minutes per day for patients with acute/subacute vestibular hypofunction and at least 20 minutes per day for patients with chronic vestibular hypofunction. (Evidence quality: V; recommendation strength: expert opinion)

D. Action Statement 8: DECISION RULES FOR STOPPING VESTIBULAR REHABILITATION IN PERSONS WITH PERIPHERAL VESTIBULAR HYPOFUNCTION (UNILATERAL AND BILATERAL). Clinicians may use achievement of primary goals, resolution of symptoms, or plateau in progress as reasons for stopping rehabilitation. (Evidence quality: V; recommendation strength: expert opinion)

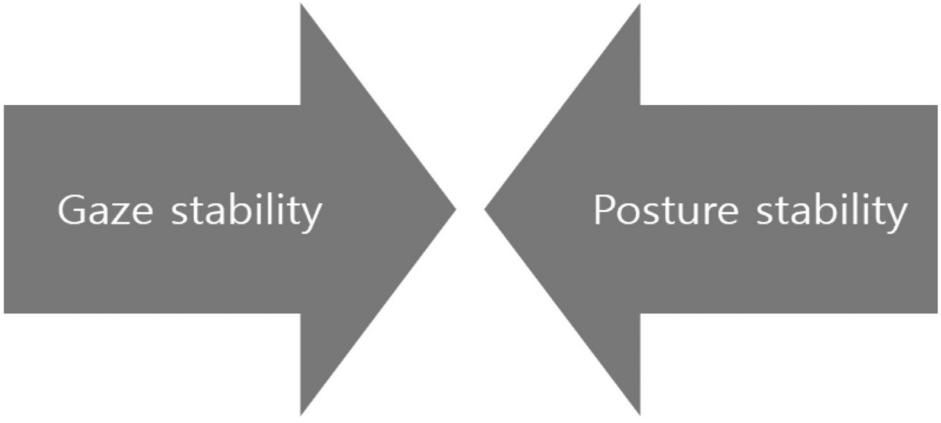
C. Action Statement 9: FACTORS THAT MODIFY REHABILITATION OUTCOMES. Clinicians may evaluate factors that could modify rehabilitation outcomes. (Evidence quality: I-III; recommendation strength: weak to strong)

A. Action Statement 10: THE HARM/BENEFIT RATIO FOR VESTIBULAR REHABILITATION IN TERMS OF QUALITY OF LIFE/PSYCHOLOGICAL STRESS. Clinicians should offer vestibular rehabilitation for persons with peripheral vestibular hypofunction. (Evidence quality: I-III; recommendation strength: strong)

These guidelines were issued in 2016 on the basis of the scientific literature published between January 1985 and February 2015. These guidelines will be considered for review in 2020, or sooner if new evidence becomes available. Any updates to the guidelines in the interim period will be noted on the Neurology Section of the APTA website: www.neuropt.org.

Supervised customized vestibular exercises

- The treatment approach for patients with complete loss of vestibular function involves the combined use of gaze stabilization exercises and exercises that foster the substitution of visual and somatosensory information to improve postural stability and the development of compensatory strategies that can be used in situations where balance is stressed maximally.



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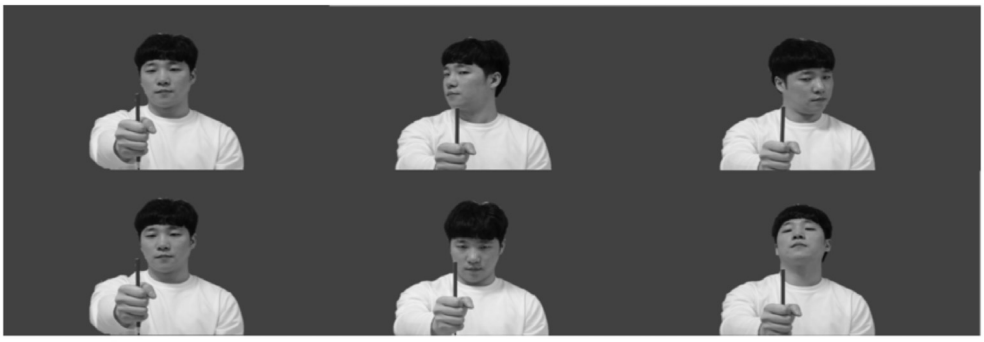

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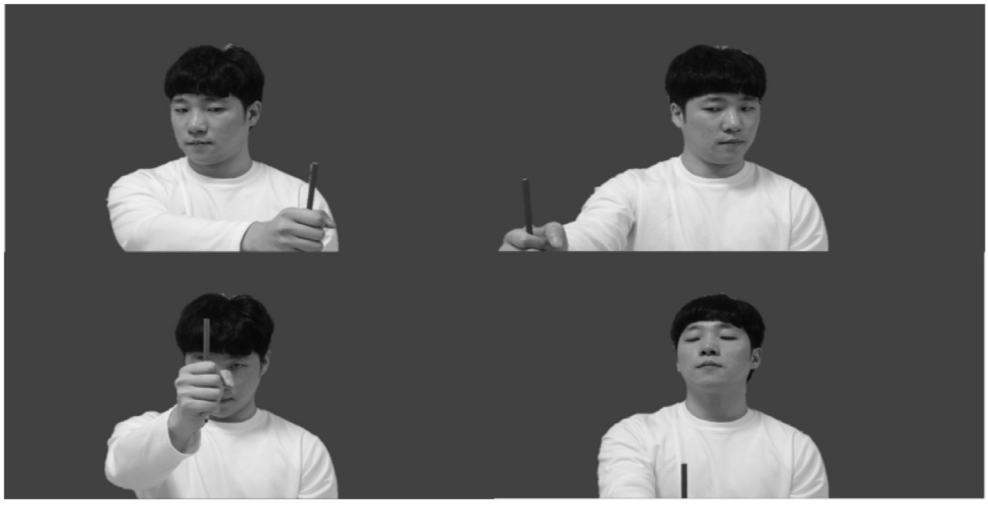
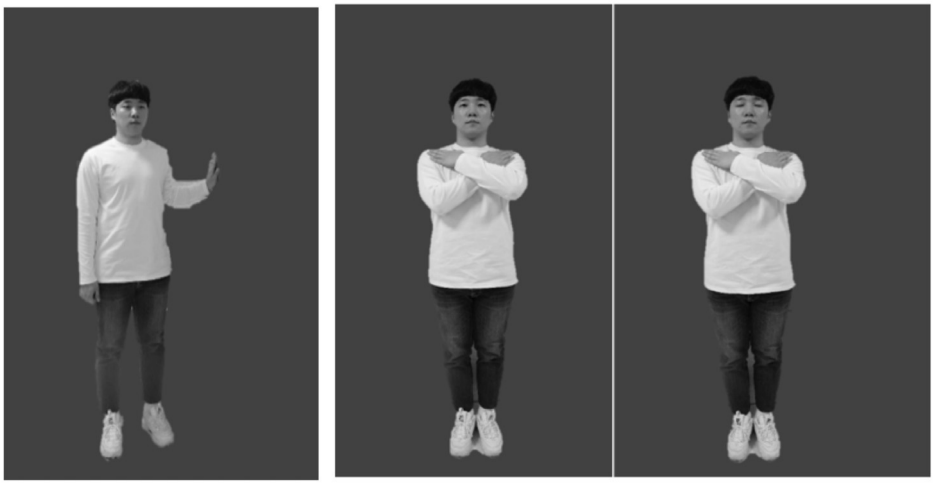


표적위치 상상하며 머리운동

눈으로 보고 머리 따라가기 운동

서기



벽을 따라 걷기

Mall Walking

Daily activities
Sports

Take home message

- No biomarker! – Hx. & Ex
- 고개 돌릴 때, 걸어 다닐 때
  -> 전정안반사, 두부충동검사, 전정재활운동
- 누웠다가 일어날 때
  ->양성돌발두위현훈(BPPV)
- 빙빙 도는 어지럼증이 청력감소, 이명, 이충만감과 동반
  ->메니에르병
- 어지러울 때 두통, 빛혐오, 소리혐오 동반-
  -> 전정편두통
- 불안, 우울
  ->심인성 어지럼증
- 노인, 수분, 자발반복성현훈
  ->뇌척추동맥허혈증
- 기립 시 어지럼증
  -> 기립성저혈압, 기립성빈맥증후군