



이 형
계명대

Contents

1. 전정계 질환(vestibular disorder)에 의한 현훈(vertigo), 어지럼(dizziness)과 감별 해야 할 비전정계 질환들
 - Autonomic dysfunction (OH, POTS)
 - Panic attack, persistent postural-perceptual dizziness (PPPV)
 - Fit (seizure)
2. Pitfall in the differential diagnosis of peripheral and central vertigo
 - Central vertigo mimicking peripheral vertigo
 - Dangerous peripheral vertigo

Classification of vestibular symptoms: Towards an international classification of vestibular disorders. 2009

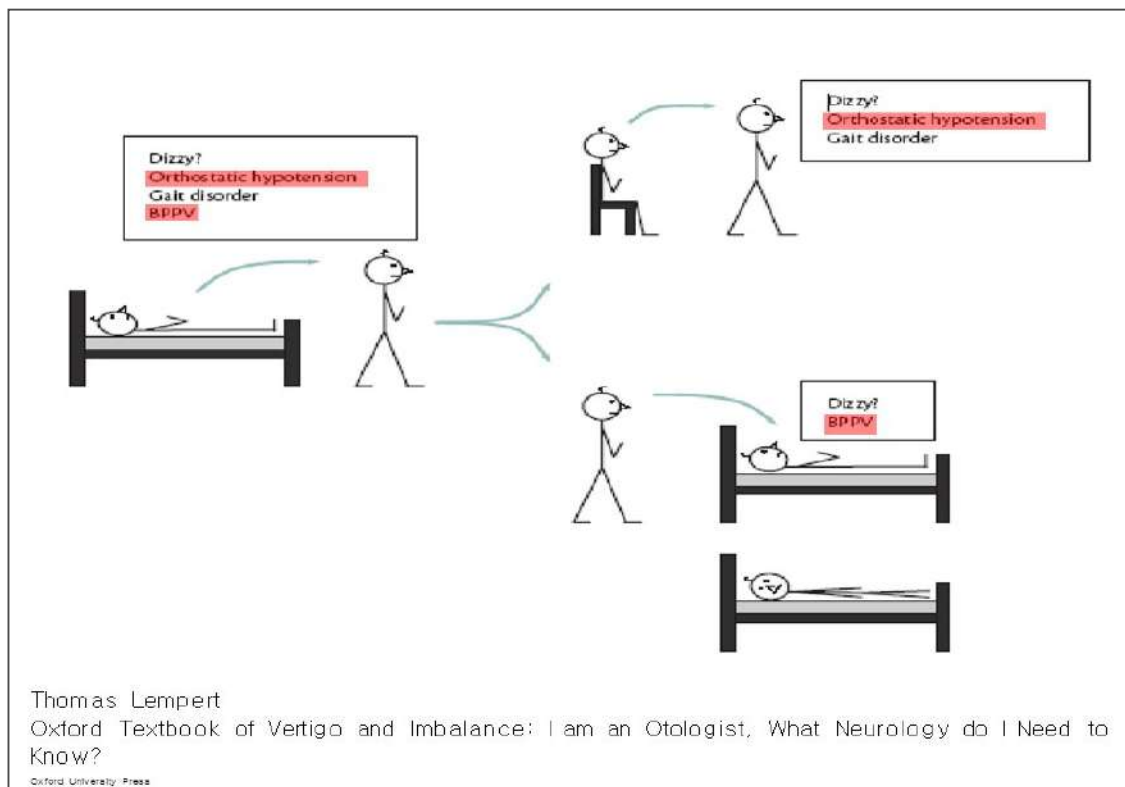
- ✓ Vertigo, 현훈 (internal vertigo)
 - false sensation of movement (motion) of the self
 - 자신이 움직이는 듯한 착각, 운동 감각 (코끼리 손, 러닝머신 ?)
- ✓ External vertigo
 - false sensation of motion in the visual surround
 - 주위 사물이 움직이는 느낌 (놀이 기구 탄 느낌?)
 - Vestibulo-visual symptoms
- ✓ Dizziness. 어지럼
 - sensation of disturbed or altered sensation of spatial orientation WITHOUT a false sense of motion
 - 운동감각의 장애는 없으나 공간감의 이상

Definitions of vestibular symptoms according to the Bárány Society

Symptom	Definition	Subtypes
Vertigo	Sensation of motion of self when no motion is present or altered sensation of motion when motion occurs. The motion sensation may be rotary, translational, or tilt. A similar sensation of motion of the environment is a vestibulovisual symptom (external vertigo)	Spontaneous vertigo Triggered vertigo <ul style="list-style-type: none"> • Positional vertigo • Head-motion vertigo • Visually induced vertigo • Sound-induced vertigo • Valsalva-induced vertigo • Orthostatic vertigo • Other triggered vertigo
Dizziness	A disturbed or altered sensation of spatial orientation without false or altered movement	Spontaneous dizziness Triggered dizziness <ul style="list-style-type: none"> • Positional dizziness • Head-motion dizziness • Visually induced dizziness • Sound-induced dizziness • Valsalva-induced dizziness • Orthostatic dizziness • Other triggered dizziness
Vestibulovisual symptoms	Visual symptoms that result from vestibular pathology or visual-vestibular interactions. Symptoms arising from ocular pathology are not included	External vertigo Oscillopsia Visual lag Visual tilt Movement-induced blur
Postural symptoms	Balance-related symptoms that occur while in an upright posture. For example, unsteadiness is a sensation of swaying or rocking when sitting, standing, or walking. Symptoms that occur only when changing positions (e.g., standing up from sitting) are classified as orthostatic, not postural	Unsteadiness Directional pulsion Balance-related near fall Balance-related fall

환자에 의한 표현 방식

- 어지럽다 – dizziness
- 주변이 빙빙 도는 느낌 – spinning (environment moves)
- 내 머리 안이 돌아가는 느낌 – something spinning inside the head (environment stationary), internal spinning vertigo
- 머리 속이 텅 빈 것 같은 느낌 – lightheaded
- 어찔어찔하다, 아찔하다, 현기증 난다 – giddy, swimming
- 머리가 휘황하고 뺨 하며 맑지 않는 느낌 – headache ?
- 서 있든지, 걸을 때 몸이 흔들린다 - swaying, rocking, bobbing, internal non-spinning vertigo
- 물체들이 앞뒤, 좌우로 스쳐 지나간다
- 몸이 붕 떠 있는 것 같다 – floating sensation
- 땅바닥이 파도 (지진) 치는 것 같이 울렁거린다 – arising sensation
- 차멀미 하는 느낌 – motion sickness
- 정신이 없을 질 것 같은, 기절 할 것 같은 느낌 – loss of consciousness, faint



Vestibular and non-vestibular cause?

- ✓ Patients with orthostatic hypotension (OH) may present with true spinning vertigo, NOT dizziness
- ✓ Patients with BPPV may present with postural lightheadedness, near faint, imbalance (rather than vertigo) that could be mistaken for OH
- ✓ Residual dizziness after a successful treatment in BPPV mimic orthostatic dizziness

ORIGINAL ARTICLE

Vertigo and nystagmus in orthostatic hypotension

J.-H. Choi^a, J.-D. Seo^{b,c}, M.-J. Kim^b, B.-Y. Choi^b, Y. R. Choi^b, B. M. Choi^d, J. S. Kim^e and K.-D. Choi^b

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Keywords:

cerebral ischaemia, nystagmus, orthostatic hypotension, orthostatic vertigo, vertebrobasilar insufficiency

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Background and purpose: Generalized cerebral ischaemia from cardiovascular dysfunction usually leads to presyncopal dizziness, but several studies reported a higher frequency of rotatory vertigo in cardiovascular patients. Whether generalized cerebral ischaemia due to cardiovascular disorders may produce objective vestibular dysfunction was investigated.

Methods: Thirty-three patients with orthostatic dizziness/vertigo due to profound orthostatic hypotension and 30 controls were recruited. All participants underwent recording of eye movements during two orthostatic challenging tests: the Schellong and the squatting–standing tests. Most patients had neuroimaging, and patients with abnormal eye movements were subjected to follow-up evaluations.

Results: Symptoms associated with orthostatic dizziness/vertigo included blurred vision, fainting and tinnitus. Ten (30%) of 33 patients developed rotatory vertigo and nystagmus during the Schellong ($n = 5$) or squatting–standing test ($n = 5$). Four of them showed pure downbeat nystagmus whilst five had downbeat and horizontal nystagmus with or without torsional component. Patients with orthostatic nystagmus had shorter duration of orthostatic intolerance than those without nystagmus (1.0 ± 1.6 vs. 11.0 ± 9.7 months, $P < 0.001$). In two patients, orthostatic nystagmus disappeared during follow-up despite the persistence of profound orthostatic hypotension.

Conclusions: Generalized cerebral ischaemia caused by orthostatic hypotension induces rotatory vertigo due to objective vestibular dysfunction. The presence of orthostatic vertigo and nystagmus has an association with the duration of orthostatic intolerance.

Neurol Sci
DOI 10.1007/s10072-015-2363-2

REVIEW ARTICLE

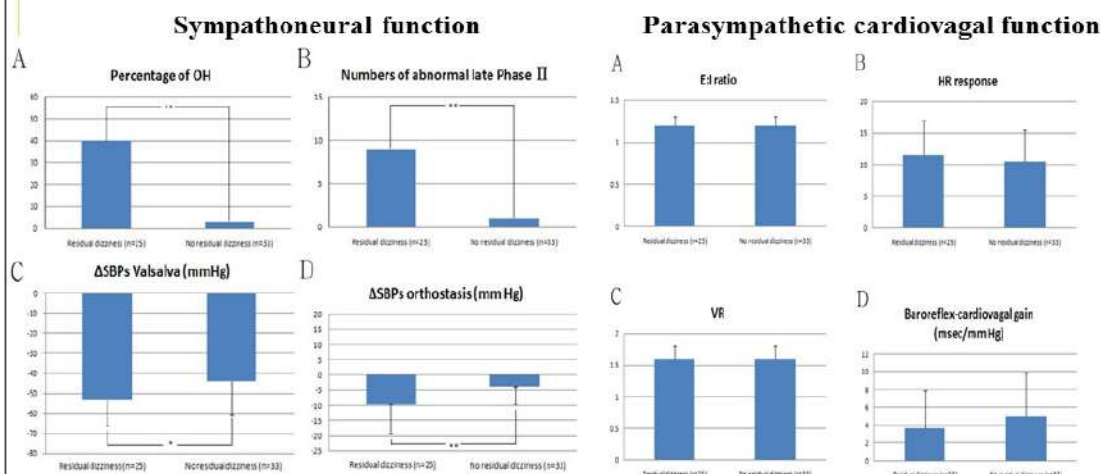
Recent advances in orthostatic hypotension presenting orthostatic dizziness or vertigo

Hyun-Ah Kim^{1,2} · Hyun-Ah Yi^{1,2} · Hyung Lee^{1,2}

Abstract Orthostatic hypotension (OH), a proxy for sympathetic adrenergic failure, is the most incapacitating sign of autonomic failure. Orthostatic dizziness (OD) is known to be the most common symptom of OH. However, recent studies have demonstrated that 30–39 % of patients with OH experienced rotatory vertigo during upright posture (i.e., orthostatic vertigo, OV), which challenges the dogma that OH induces dizziness and not vertigo. A recent population-based study on spontaneously occurring OD across a wide age range showed that the one-year and lifetime prevalence of OD was 10.9 and 12.5 %, respectively. Approximately 83 % of patients with OD had at least one abnormal autonomic function test result. So far, 11 subtypes of OD have been proposed according to the pattern of autonomic dysfunction, and generalized autonomic failure of sympathetic adrenergic and parasympathetic cardiovagal functions was the most common type. Four different patterns of OH, such as classic, delayed, early, and transient type have been found in patients with OD. The head-up tilt test and Valsalva maneuver should be performed for a comprehensive evaluation of sympathetic adrenergic failure in patients with OD/OV. This review summarizes current advances in OH presenting OD/OV.



Autonomic dysfunction as a possible cause of residual dizziness after successful treatment in BPPV



- Kim HA, et al. *Clin Neurophysiol.* 2013 -

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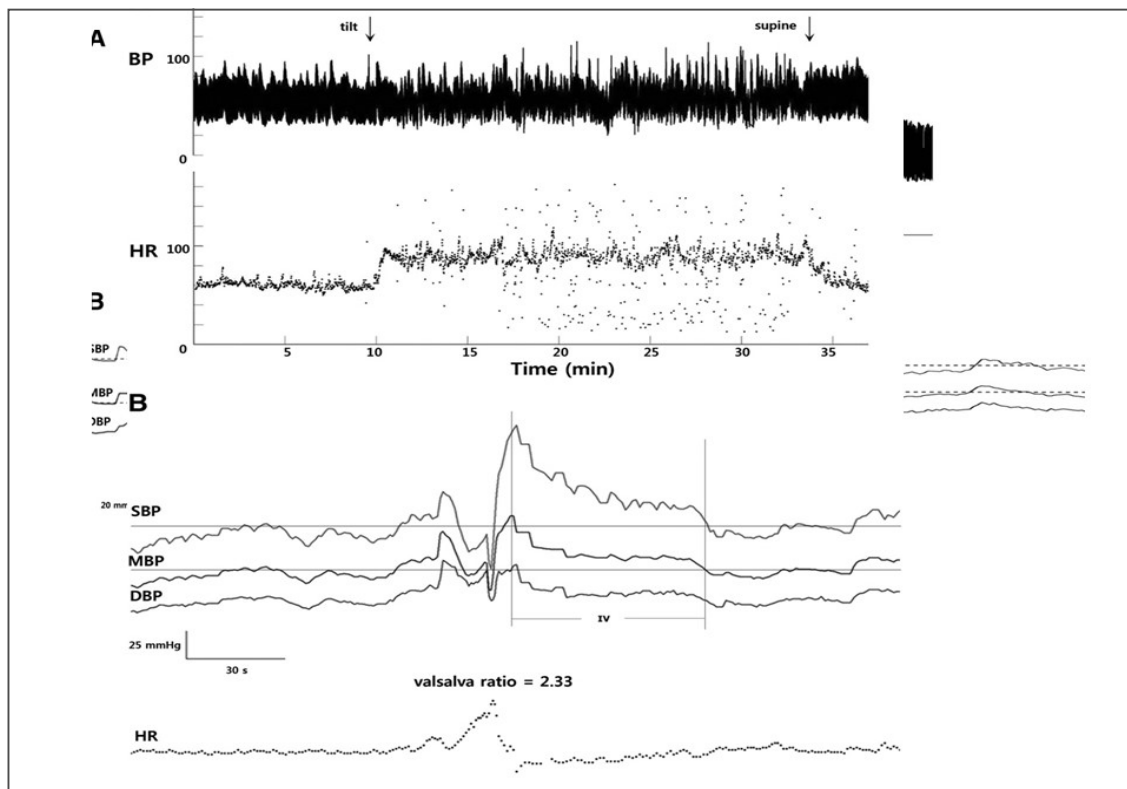


Orthostatic intolerance syndrome(OIS)

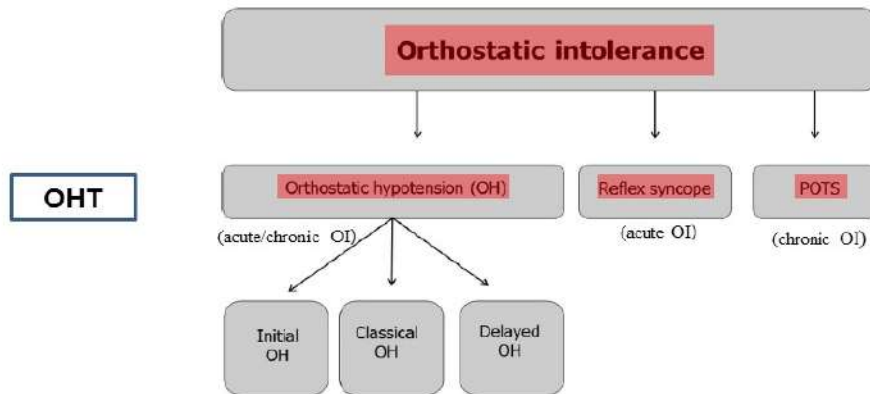
OIS : generic term, loosely used to describe symptoms occurring upon standing and relieved by recumbency.

Ranging from uneasiness, discomfort, dizziness, lightheadedness, vertigo, palpitations, head pressure, anxious feeling, a multitude of somatic complaints referable to sympathetic activation (i.e., shakiness, peripheral vasoconstriction, clammy feeling etc.) to frank symptoms suggesting cerebral hypoperfusion and even syncope.

Disturb QOL even by simple activities (eating, mild exercise...) or NON-orthostatic movement



Orthostatic intolerance syndrome causing dizziness/vertigo

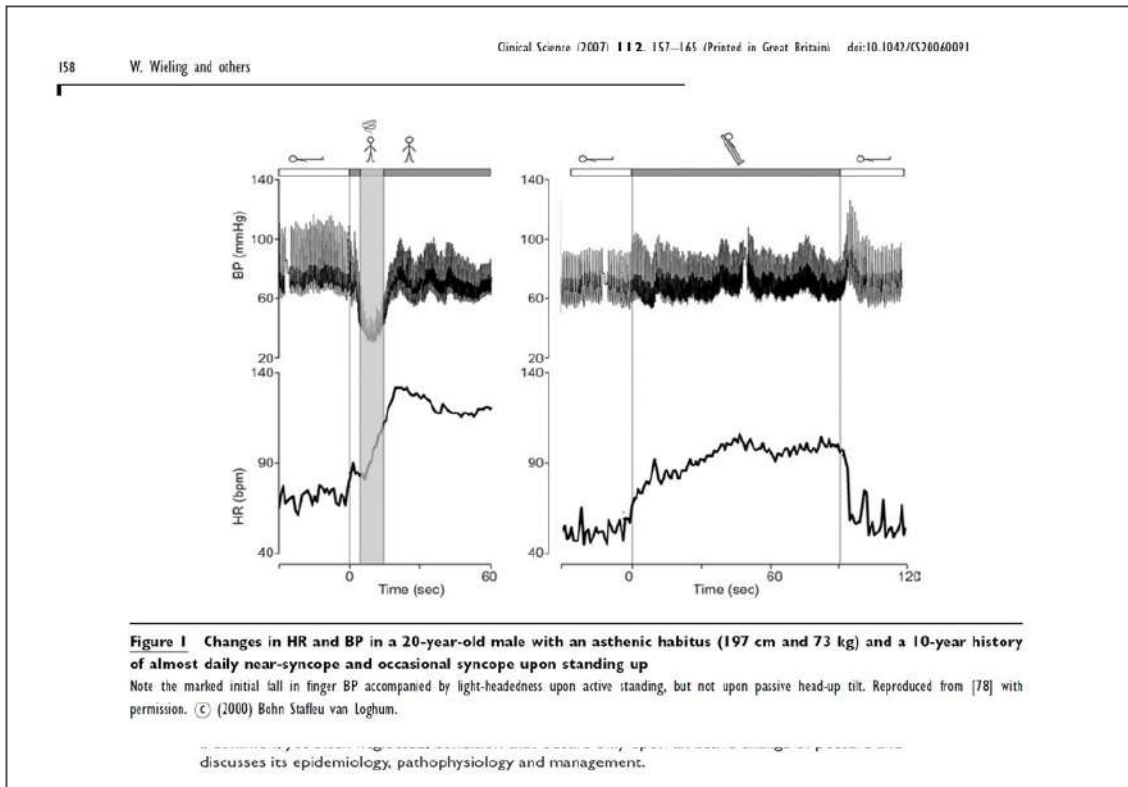


OH, orthostatic hypotension
 OHT, orthostatic hypertension
 POTS, postural tachycardia syndrome
 OI, orthostatic intolerance

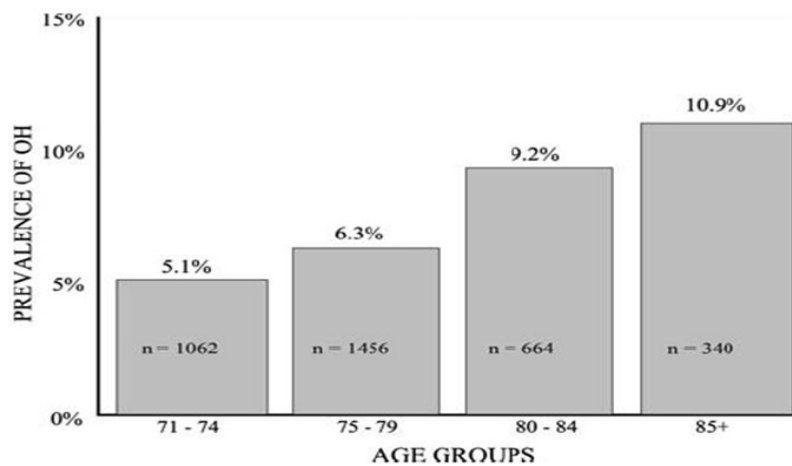
Neurogenic or non-neurogenic cause of OH

	Neurogenic	Non-neurogenic
Cause	Diabetic autonomic neuropathy, MSA, PD, PAF, amyloidosis	Dehydration/hypovolemia, anemia, drug, systemic infection, prolonged immobilization, CHF, deconditioning state
Age	Older (17% in > 65)	Any age
Pattern of OH	Classic	Classic or delayed or initial
SAF	A proxy for SAF	none
Plasma NE levels	No remarkable change after standing	Increase (at least 2-fold) after standing
HR response after tilting	OH associated with a heart rate increment <15 beats per minute	OH associated with a heart rate increment >15 beats per minute
VM-induced BP changes	Impaired PRT, blunted phase IV overshooting, reduced/absent phases II_L	Normal
Occurrence	Less common	Common
Duration	Chronic course	Acute course, often reversible

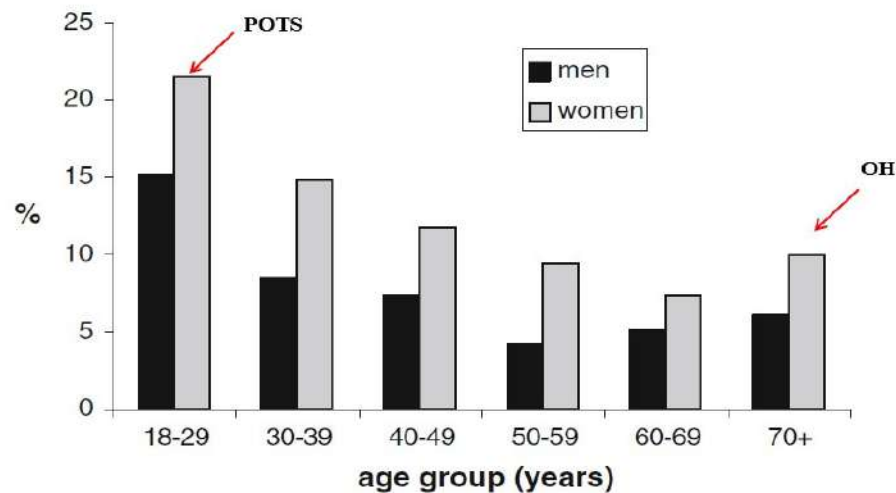
SAF, sympathetic autonomic failure, PRT, pressure recovery time, VM, valsalva maneuver
 PAF, pure autonomic failure



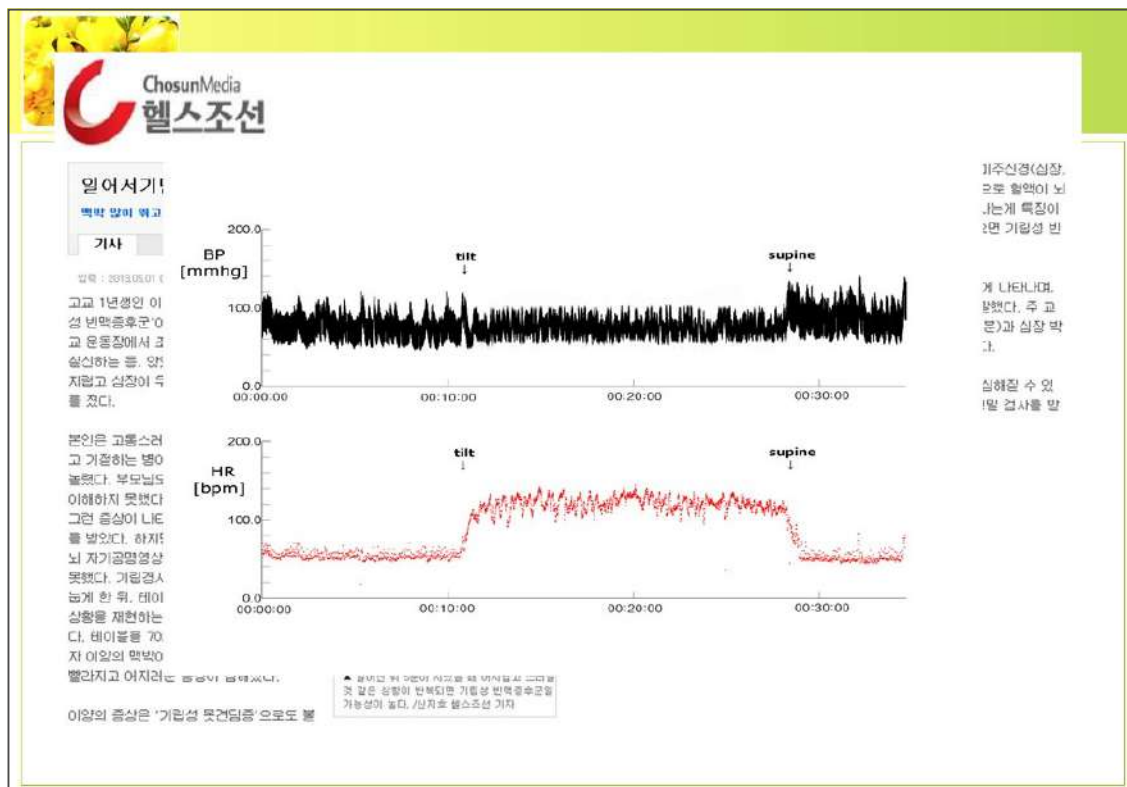
Prevalence of orthostatic hypotension

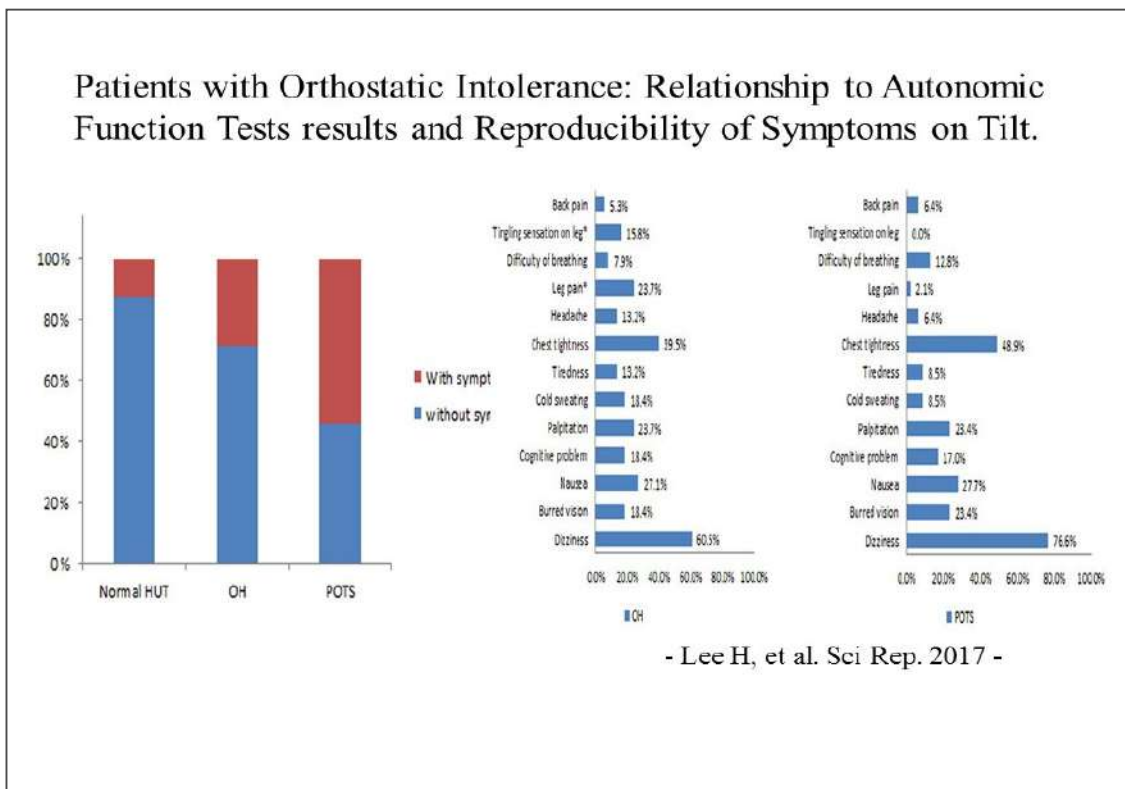
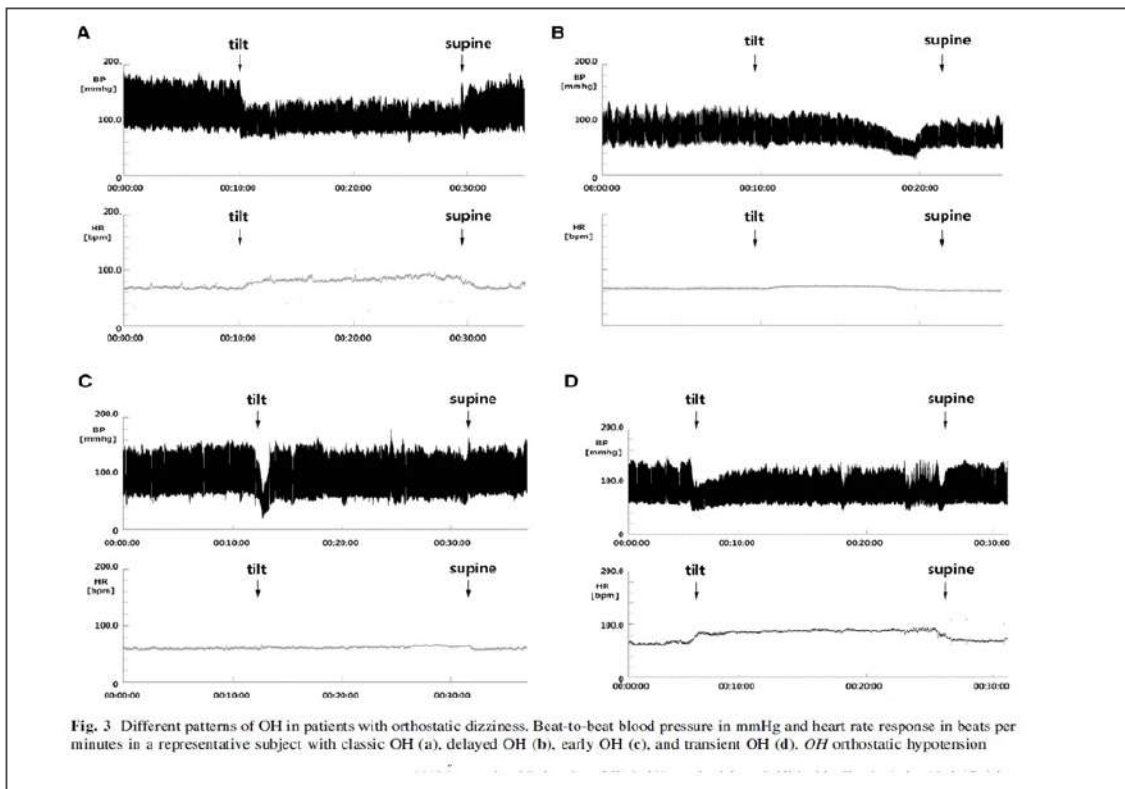


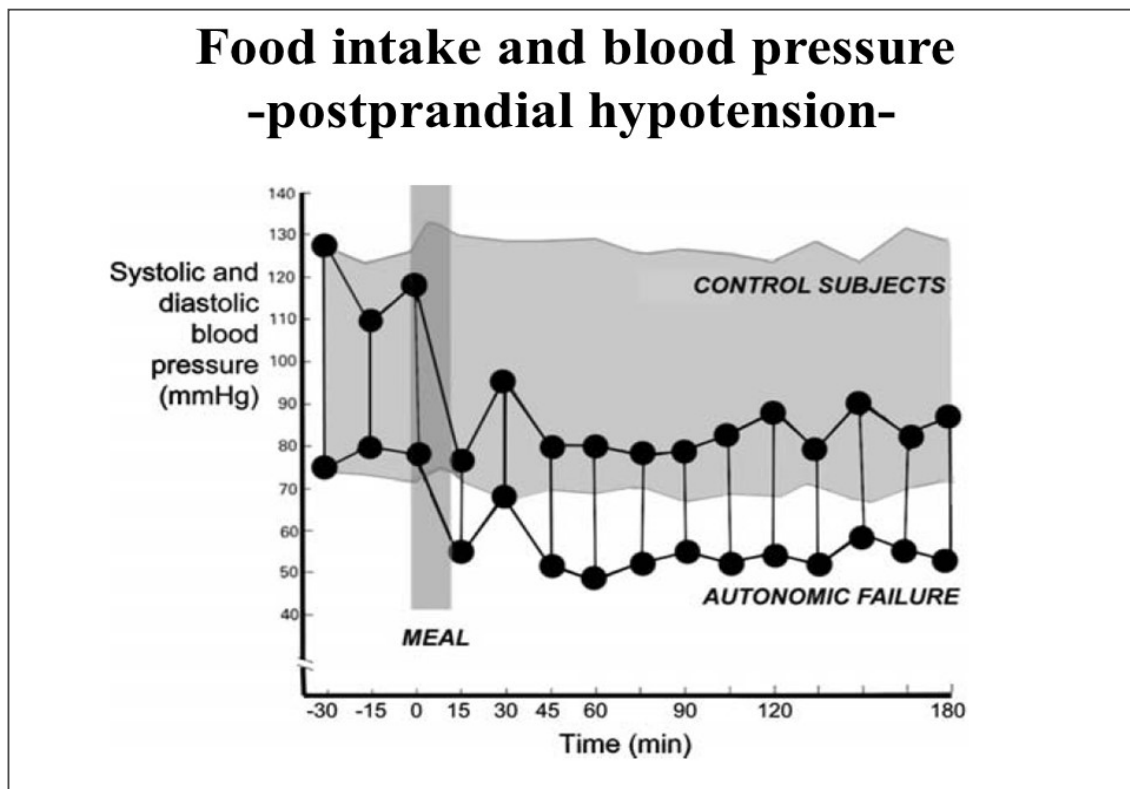
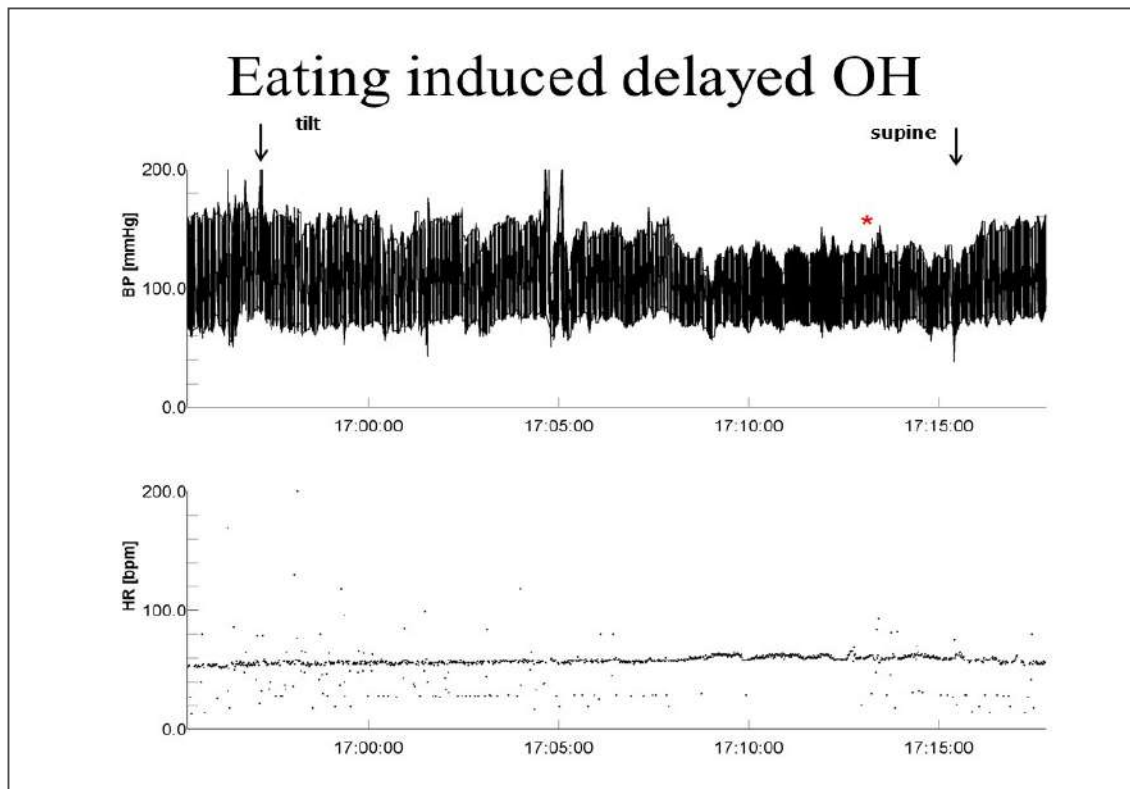
Prevalence of autonomic*dizziness/vertigo



* Dizziness/vertigo evoked or aggravated by exertional or orthostatic challenge







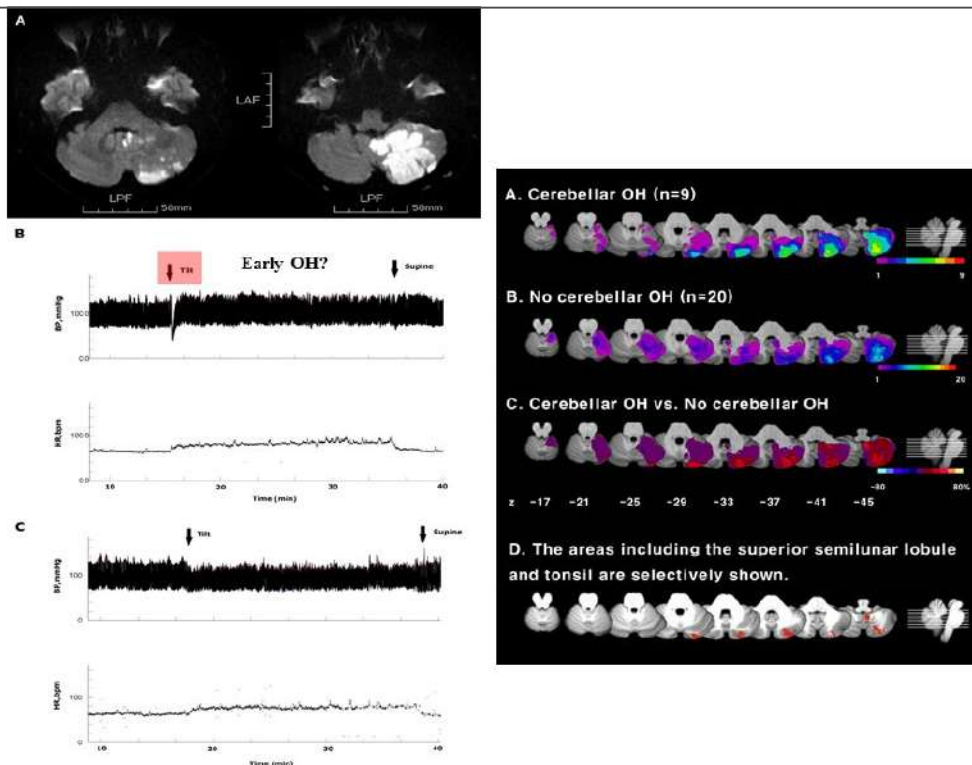
Orthostatic hypotension in acute cerebellar infarction

Hyun-Ah Kim^{1,2} · Hyung Lee^{1,2}

Abstract To investigate the frequency and pattern of orthostatic hypotension (OH) associated with acute isolated cerebellar infarction, and to identify the cerebellar structure(s) potentially responsible for OH, 29 patients (mean age 60.0) with acute isolated cerebellar infarction performed a standard battery of autonomic function tests including the head up tilt test using Finapres for recording of the beat-to-beat BP response during the acute period. Cerebellar infarction related OH was defined as fall in BP (>20 mmHg systolic BP) on tilting in patients without any disease(s) that could potentially cause autonomic dysfunction, or in patients who had a potential cause of autonomic dysfunction, but showed the absence of OH during a follow-up test. The severity and distribution of autonomic dysfunction were measured by the composite autonomic severity score (CASS). Nine patients (31 %) had OH (range 24–53 mmHg) on tilting during the acute period. Most patients (7/9) had a remarkable decrement in systolic BP immediately upon tilting, but OH rapidly normalized. Mean of maximal decrease in systolic BP during head up tilt test was 37.0 mmHg. The OH group showed mild autonomic dysfunctions (CASS, 3.7) with adrenergic sympathetic dysfunction appearing as the most common abnormality. Lesion subtraction analyses revealed that damage to the medial part of the superior semilunar lobule (Crus I) and tonsil was more frequent in OH group

compared to non-OH group. Cerebellar infarction may cause a brief episode of OH. The medial part of the superior semilunar lobule and tonsil may participate in regulating the early BP response during orthostasis.

Keywords Orthostatic hypotension · Cerebellar infarction · Head-up tilt test



Orthostatic hypertension: An underestimated cause of orthostatic intolerance

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HIGHLIGHTS

- Approximately 4% of the patients with orthostatic intolerance showed orthostatic hypertension.
- An increased peripheral vascular resistance during orthostasis may be a possible mechanism of orthostatic hypertension.
- Orthostatic hypertension should be considered as one of the causes of orthostatic intolerance.

ABSTRACT

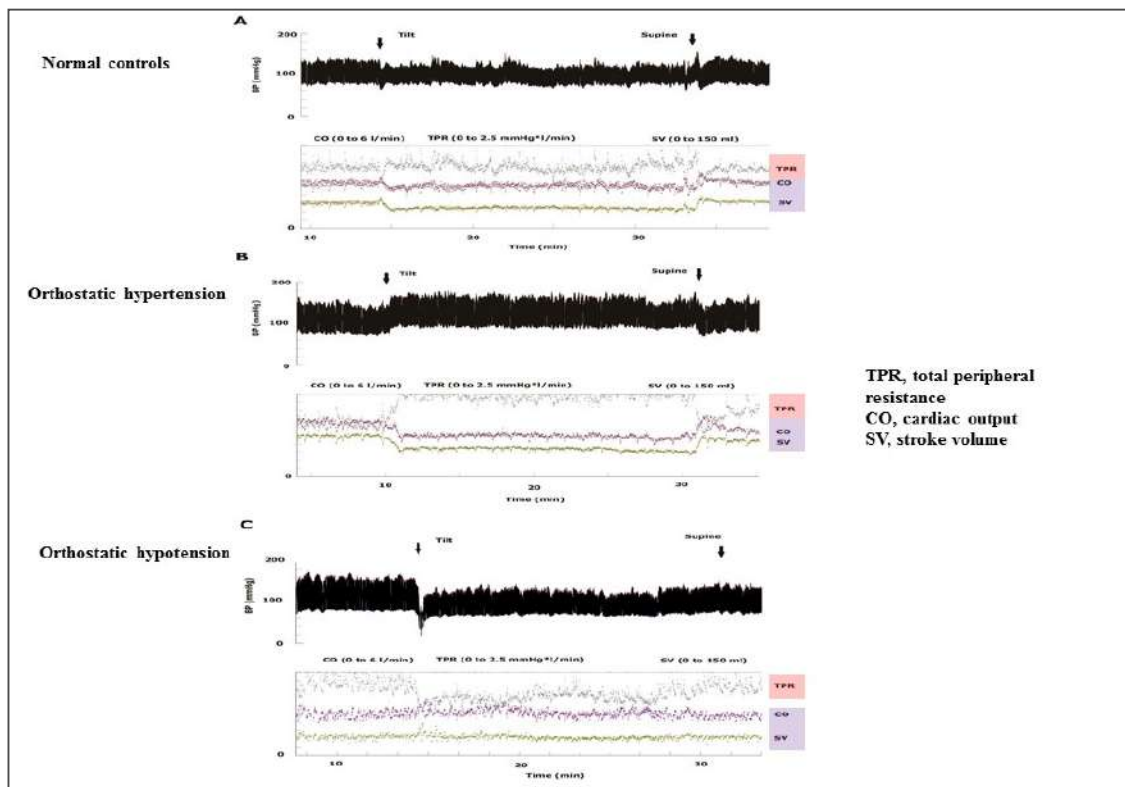
Objective: To investigate the frequency and mechanism of orthostatic hypertension (OHT) in patients with orthostatic intolerance.

Methods: We retrospectively reviewed 1033 consecutive case series of orthostatic intolerance that underwent autonomic function tests including a head-up tilt test. OHT was defined as a paradoxical orthostatic increase in systolic blood pressure (BP) of at least 20 mmHg during the tilt. We collected autonomic parameters during the standardized autonomic function tests, which included the beat-to-beat derived hemodynamic parameters during the tilt table test and compared them with age- and sex-matched normal controls and the orthostatic hypotension (OH) group with orthostatic symptoms.

Results: We identified 38 (3.7%) patients who showed OHT during the tilt. The increase in mean systolic BP during the tilt was 26.5 mmHg. Approximately 87% (33/38) of the OHT patients showed an increase in total peripheral resistance during the tilt. The mean increase in total peripheral resistance from a supine baseline was significantly higher in OHT patients compared to normal controls, but the OH group showed a decrease in mean total peripheral resistance during the tilt.

Conclusion: A select few patients with orthostatic dizziness can show OHT during the tilt and they have signs of increased peripheral resistance.

Significance: OHT may be considered in the differential diagnosis of orthostatic intolerance.



- 42세 여자
- 5-6년간의 만성 어지러움
- 머리가 땡하고 어질어질한 느낌이 거의 매일 나타남, 특히 막힌 공간 (좁은 엘리베이터, 사람 많은 백화점)에 가면 가슴이 답답하고 숨이 멈출 것 같고, 식은 땀이 나면서 힘이 쭉 빠짐. 쓰러질 것 같은 불안감, 심계항진, 죽음에 대한 공포 등 증상이 동반됨. 간혹 증상이 심해지면 주위가 도는 듯한 심한 어지러움이 나타나며 사람 많은 공간을 피하는 경향
- 이런 증상으로 인해 수년간 다니던 보험회사 영업직 그만 둠
- Normal VFT

Diagnostic criteria of Panic attack (DSM-IV)

A panic attack is a brief episode of intense fear or discomfort with at least 4 of the following symptoms developing abruptly and peaking within 10 minutes: 적어도 두 번의 공황 발작

- 1) 어지럽고 휘청거리거나 졸도 할 것 같은 느낌
- 2) 가슴이 두근거리거나 심장이 벌떡거리는 또는 심장박동이 빨라지는 느낌
- 3) 땀이 남
- 4) 손발이나 몸이 떨림
- 5) 호흡이 가빠지거나 숨이 막히는 듯한 느낌
- 6) 질식감
- 7) 가슴의 통증이나 불편감
- 8) 오심이나 복부의 불편감
- 9) 자신이 달라져 있거나(이인증) 딴 세상에 와 있는 느낌(비현실감)
- 10) 미쳐버리거나 자제력을 잃을 것 같은 느낌
- 11) 죽음에 대한 공포
- 12) 손발이 찌릿찌릿하거나 마비된 느낌
- 13) 오한이나 화끈거리는 느낌

1. 추가 발작에 대한 지속적인 걱정
2. 발작과 관련되는 뚜렷한 행동 변화 (직장을 그만 둠)

Psychiatric and functional vestibular disorders

- Panic attack
- Generalized anxiety disorder (GAD)
- Phobic postural vertigo (PPV), 1986
- Visual vertigo (VV), 1995
- Space and motion discomfort (SMD), 1993
- Chronic subjective dizziness (CSD), 2007
- Persistent postural-perceptual dizziness (PPPD)

(Narrow) Definition of psychogenic dizziness

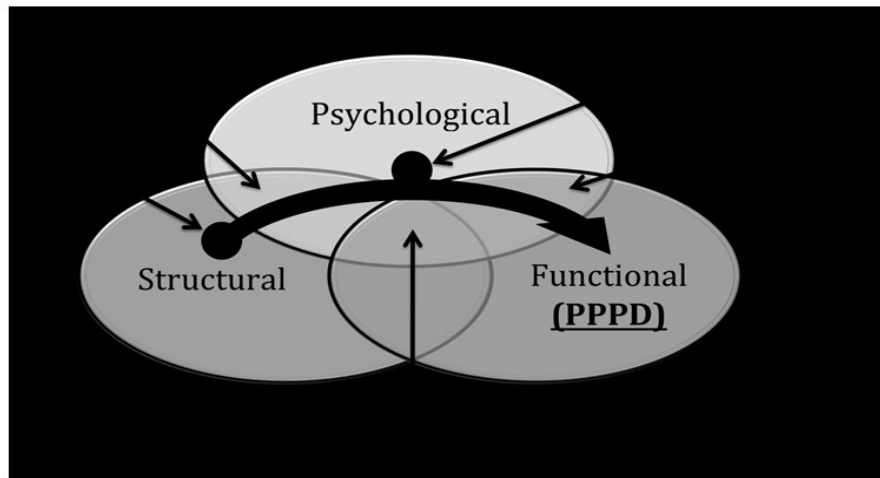
- No vertigo
- Definition of vertigo – a sensation of motion in the absence of motion (classification society of Barany Society, 2009)
- **어지러움이 정신과적 증후군의 다른 증상들과 같이 나타난다** – part of psychiatric symptom cluster
- **전정기능 검사에서 정상**
- Panic attack
- Isolated dizziness between panic attacks ?
monosymptomatic postural dizziness in phobic postural vertigo (PPV) ?

Persistent postural-perceptual dizziness (PPPD)

- ✓ persistent
 - most days for 3 months or more, wax and wane
- ✓ postural
 - exacerbated by postural challenges (standing or walking)
- ✓ Perceptual
 - perceptual sensitivity to space-motion stimuli, i.e., expose to moving visual stimuli or complex visual patterns or active or passive head motion
- ✓ dizziness, unsteadiness, or non-spinning internal vertigo
- ✓ significant distress or functional impairment

Persistent postural-perceptual dizziness (PPPD)

- ✓ 2nd most common cause of dizziness (after BPPV)
 - ✓ precipitating event (70%, structural vestibular syndrome or medical condition)
 - peripheral or central vestibular conditions, 25-30%
 - vestibular migraine
 - concussion or whiplash injuries
 - autonomic disorders
 - cardiac dysrhythmias, adverse drug
 - ✓ precipitating event (30%, acute psychological distress)
 - Panic or generalized anxiety disorder
 - ✓ Predisposing factor
 - anxiety-related personality traits or pre-existing anxiety disorders
 - ✓ SSRI
- vestibular and balance rehabilitation therapy



Persistent postural-perceptual dizziness (PPPD)

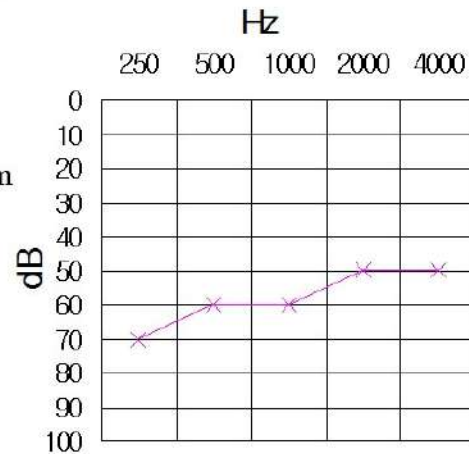
Isolated epileptic vertigo

- 'Tornado epilepsy' mimicking vestibular disorders
- less than 1% of all new cases of epilepsy
- lasting few seconds
 - vestibular paroxysmia or vestibular migraine
- activation of parieto-insular vestibular cortex (PIVC)
- usually have other clinical features of epilepsy
- nausea was frequent in recovery phase after seizure
- ictal nystagmus usually beating away from the side of the lesion

Tumarkin's otolithic crisis (TOC)

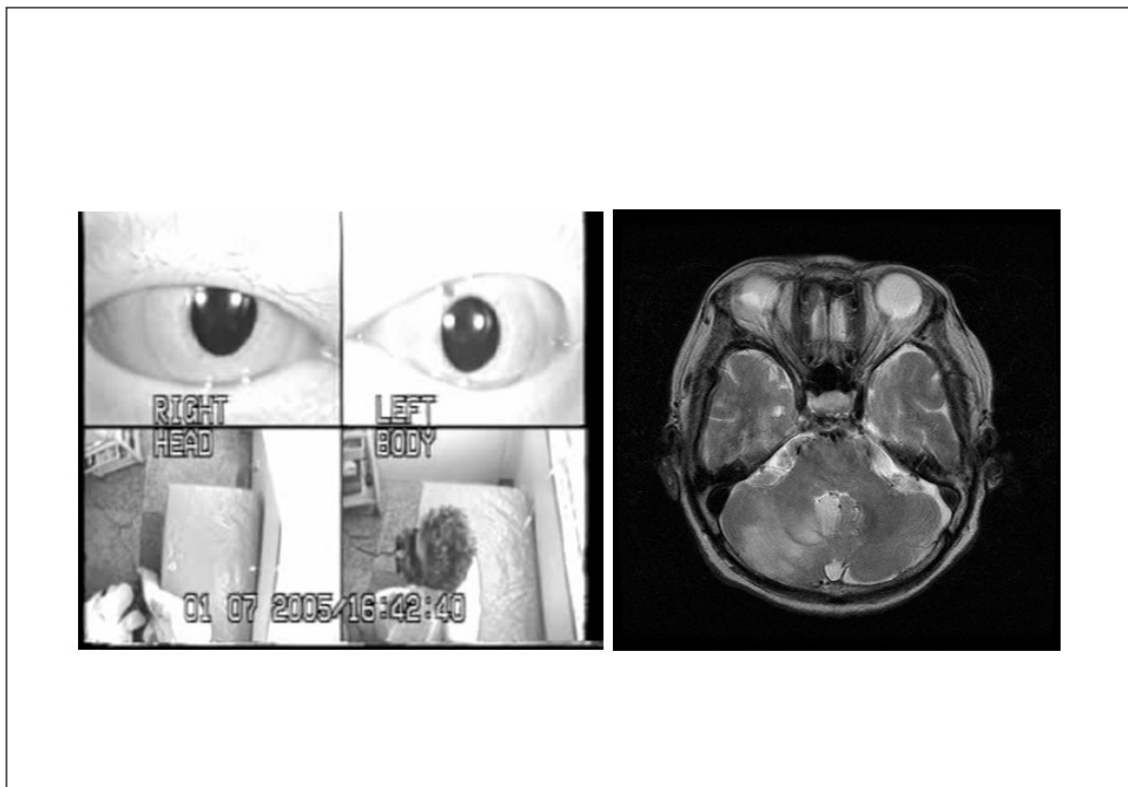
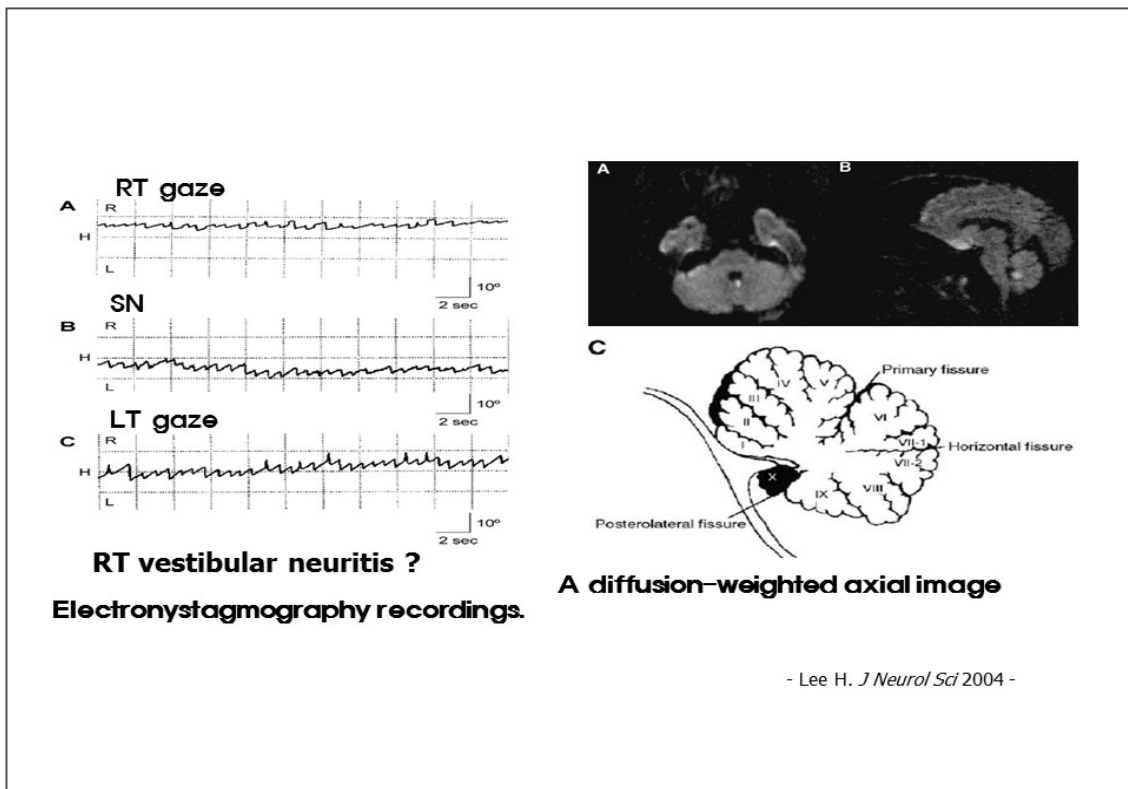
- sudden fall without LOC of vestibular origin
- drop attack of otologic cause
- sudden balance related fall

+ 67-year-old woman
 c/c; sudden falling to the ground (4 cluster attacks)
 she subjectively felt as if pushed from front.
 p/I: hearing loss, tinnitus on left
 and episodic vertigo
 Brain MRI and MRA: normal
 Dx: Meniere's disease with drop attack



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특성	중추성	말초성
양상	순수한 수직, 회선, 또는 수평 안진	회선성 및 수평 안진 (혼합형)
방향	방향 전환 ?	일측성
시선고정	영향 없음 ?	억제





Cerebellar infarction presenting isolated vertigo

Frequency and vascular topographical patterns

H. Lee, MD; S.-I. Sohn, MD; Y.-W. Cho, MD; S.-R. Lee, MD; B.-H. Ahn, MD; B.-R. Park, MD; and R.W. Baloh, MD

Abstract—Objective: To determine the frequency of cerebellar infarction mimicking vestibular neuritis (VN), the pattern of clinical presentation, and the territory of the cerebellar infarction when it simulates VN. **Methods:** We studied 240 consecutive cases of isolated cerebellar infarction in the territories of the cerebellar arteries diagnosed by brain MRI from the acute stroke registry at the Keimyung University Dongsan Medical Center. **Results:** We identified 25 patients (10.4%) with isolated cerebellar infarction who had clinical features suggesting VN. Two types of cerebellar infarction simulating VN were found: isolated spontaneous prolonged vertigo with imbalance as a sole manifestation of cerebellar infarction ($n = 24$) and isolated spontaneous prolonged vertigo with imbalance as an initial manifestation of cerebellar infarction ($n = 1$) followed by delayed neurologic deficits 2 days after the onset. The cerebellar infarction territory most commonly involved was the medial branch of the posterior inferior cerebellar artery territory (24/25: 96%), followed by the anterior inferior cerebellar artery territory (1/25: 4%). None of patients with infarcts in the territory of the superior cerebellar artery or multiple cerebellar arteries showed isolated spontaneous prolonged vertigo. **Conclusions:** Cerebellar infarction simulating vestibular neuritis is more common than previously thought. Early recognition of the pseudo-vestibular neuritis of vascular cause may allow specific management.

NEUROLOGY 2006;67:1178–1183

Table 2 Vestibular findings and imbalance in 24 patients with pseudo-vestibular neuritis associated with mPICA territory cerebellar infarction

Findings	Patients
Head thrust test	Normal
SN	15
GEN	
Typical*	13
Unidirectional†	4
Gaze to only lesion side	7
Asymmetric pursuit‡	6
Asymmetric OKN	4
Canal paresis	None
Imbalance grade	
1	7
2	1
3	16
Direction	
Lesion side	17
Healthy side	7

Canal paresis was defined as side differences more than 22% at bithermal caloric stimulation.

* Direction-changed bidirectional gaze-evoked nystagmus that the intensity was maximal when gaze to the lesion side.

† Direction-fixed unidirectional gaze-evoked nystagmus beating toward the side of lesion.

‡ Ipsilateral impairment of smooth pursuit with frequent corrective saccade.

mPICA = medial branch of posterior inferior cerebellar artery; SN = spontaneous nystagmus; GEN = gaze evoked nystagmus; OKN = optokinetic nystagmus.

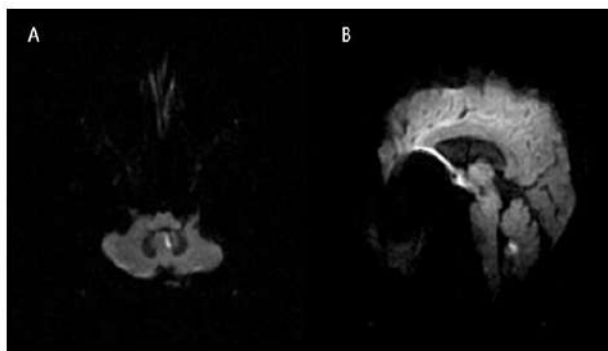
Cerebellar infarction presenting isolated vertigo: Frequency and vascular topographical patterns.

Lee, H; Sohn, S; Cho, Y; Lee, S; Ahn, B; Park, B; Baloh, R

Neurology 67(7):1178-1183, October 10, 2006.

DOI: 10.1212/01.wnl.0000238500.02302.b4

nodulus infarction



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2

Normal head impulse test differentiates acute cerebellar strokes from vestibular neuritis

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David Z. Wang, DO

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ABSTRACT

Objective: To test the diagnostic accuracy of the horizontal head impulse test (h-HIT) of vestibulo-ocular reflex (VOR) function in distinguishing acute peripheral vestibulopathy (APV) from stroke. Most patients with acute vertigo, nausea/vomiting, and unsteady gait have benign APV (vestibular neuritis or labyrinthitis) as a cause. However, some harbor life-threatening brainstem or cerebellar strokes that mimic APV. A positive h-HIT (abnormal VOR) is said to predict APV.

Methods: Cross-sectional study at an urban, academic hospital over 6 years. Consecutive acute vestibular syndrome patients at high risk for stroke underwent structured examination (including h-HIT), neuroimaging, and admission. Stroke was confirmed by neuroimaging (MRI or CT). APV was diagnosed by normal MRI and appropriate clinical evolution in follow-up.

Results: Forty-three subjects enrolled. One had an equivocal h-HIT. Patients with APV had a positive h-HIT ($n = 8/8$, 100%). Most patients with stroke had a negative h-HIT ($n = 31/34$, 91%). However, contrary to conventional wisdom, three patients with stroke (9%) demonstrated a positive h-HIT (1 vestibulocerebellar, 1 pontocerebellar, 1 pontocerebellar-labyrinthine stroke).

Conclusions: Patients with lateral pontine and cerebellar strokes can have a positive horizontal head impulse test (h-HIT), so the sign's presence cannot be solely relied upon to identify a benign pathology. Additional clinical features (e.g., directionality of nystagmus, severity of truncal instability, nature of hearing loss) must be considered in patients with acute vestibular syndrome with a positive h-HIT before a central localization can be confidently excluded. Nonetheless, the h-HIT remains a useful bedside test—in acute vestibular syndrome patients, a negative h-HIT (i.e., normal VOR) strongly suggests a central lesion with a pseudo-labyrinthine presentation. *Neurology*® 2008;70:2378-2385

HINTS to Diagnose Stroke in the Acute Vestibular Syndrome

Three-Step Bedside Oculomotor Examination More Sensitive Than Early MRI Diffusion-Weighted Imaging

Jorge C. Kattah, MD; Arun V. Takkad, MD; David Z. Wang, DO;
Yu-Hsiang Hsieh, PhD, MS; David E. Newman-Toker, MD, PhD

Background and Purpose—Acute vestibular syndrome (AVS) is often due to vestibular neuritis but can result from vertebrobasilar strokes. Misdiagnosis of posterior fossa infarcts in emergency care settings is frequent. Bedside oculomotor findings may reliably identify stroke in AVS, but prospective studies have been lacking.

Methods—The authors conducted a prospective, cross-sectional study at an academic hospital. Consecutive patients with AVS (vertigo, nystagmus, nausea/vomiting, head-motion intolerance, unsteady gait) with ≥ 1 stroke risk factor underwent structured examination, including horizontal head impulse test of vestibulo-ocular reflex function, observation of nystagmus in different gaze positions, and prism cross-cover test of ocular alignment. All underwent neuroimaging and admission (generally <72 hours after symptom onset). Strokes were diagnosed by MRI or CT. Peripheral lesions were diagnosed by normal MRI and clinical follow-up.

Results—One hundred one high-risk patients with AVS included 25 peripheral and 76 central lesions (69 ischemic strokes, 4 hemorrhages, 3 other). The presence of normal horizontal head impulse test, direction-changing nystagmus in eccentric gaze, or skew deviation (vertical ocular misalignment) was 100% sensitive and 96% specific for stroke. Skew was present in 17% and associated with brainstem lesions (4% peripheral, 4% pure cerebellar, 30% brainstem involvement; χ^2 , $P=0.003$). Skew correctly predicted lateral pontine stroke in 2 of 3 cases in which an abnormal horizontal head impulse test erroneously suggested peripheral localization. Initial MRI diffusion-weighted imaging was falsely negative in 12% (all <48 hours after symptom onset).

Conclusions—Skew predicts brainstem involvement in AVS and can identify stroke when an abnormal horizontal head impulse test falsely suggests a peripheral lesion. A 3-step bedside oculomotor examination (HINTS: Head-Impulse—Nystagmus—Test-of-Skew) appears more sensitive for stroke than early MRI in AVS. (*Stroke*. 2009;40:3504-3510.)

Positive HIT result in central lesion

★ Infarct selectively involving the root entry zone of the eighth nerve - Kim JS. J Neurol 2015 -

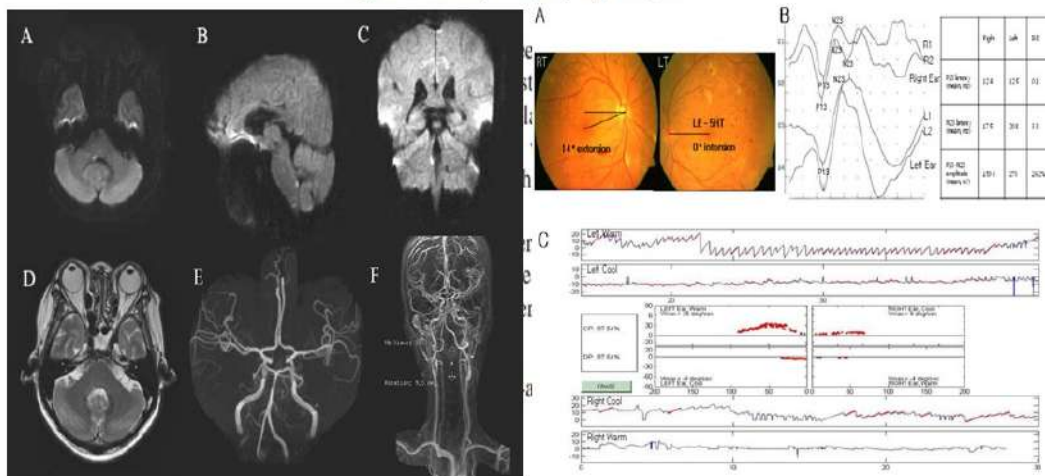
★ Isolated vestibular nucleus infarction

- Lee H. STROKE 2011, Kim JS. J Neurol 2014-

★ Isolated floccular infarction - Kim JS J Neurol 2014 -

Isolated Vestibular Nucleus Infarction Mimicking Acute Peripheral Vestibulopathy

Hyun-Ah Kim, MD; Hyung Lee, MD



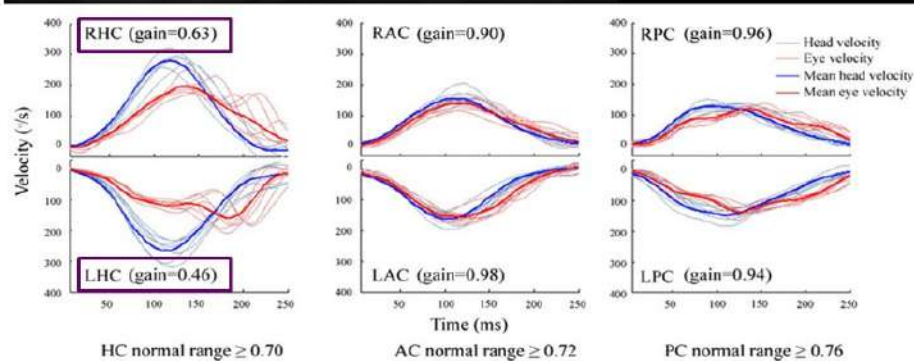
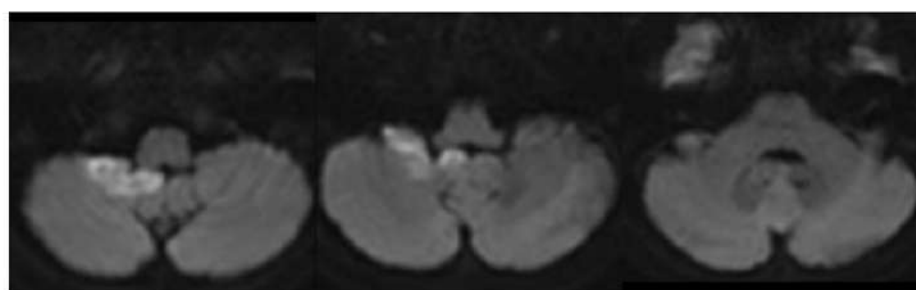


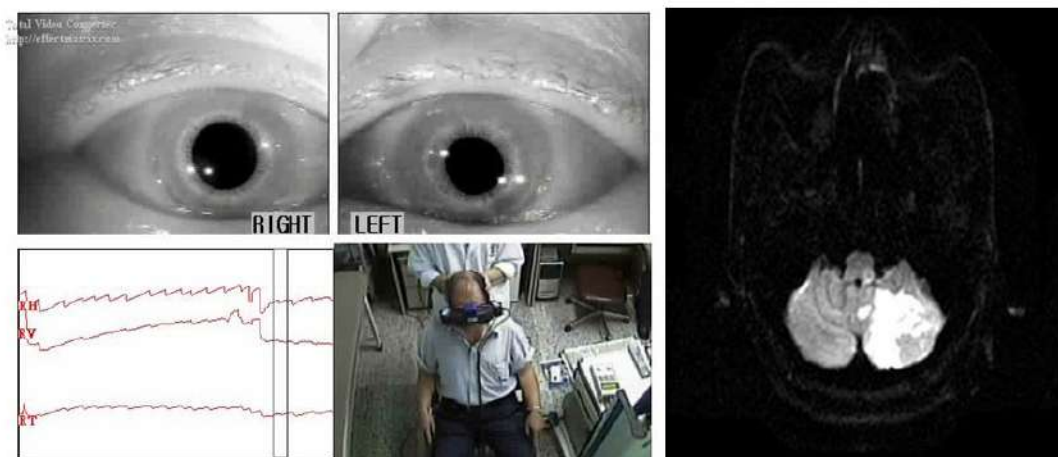
Table HINTS evaluation of isolated central vertigo syndromes

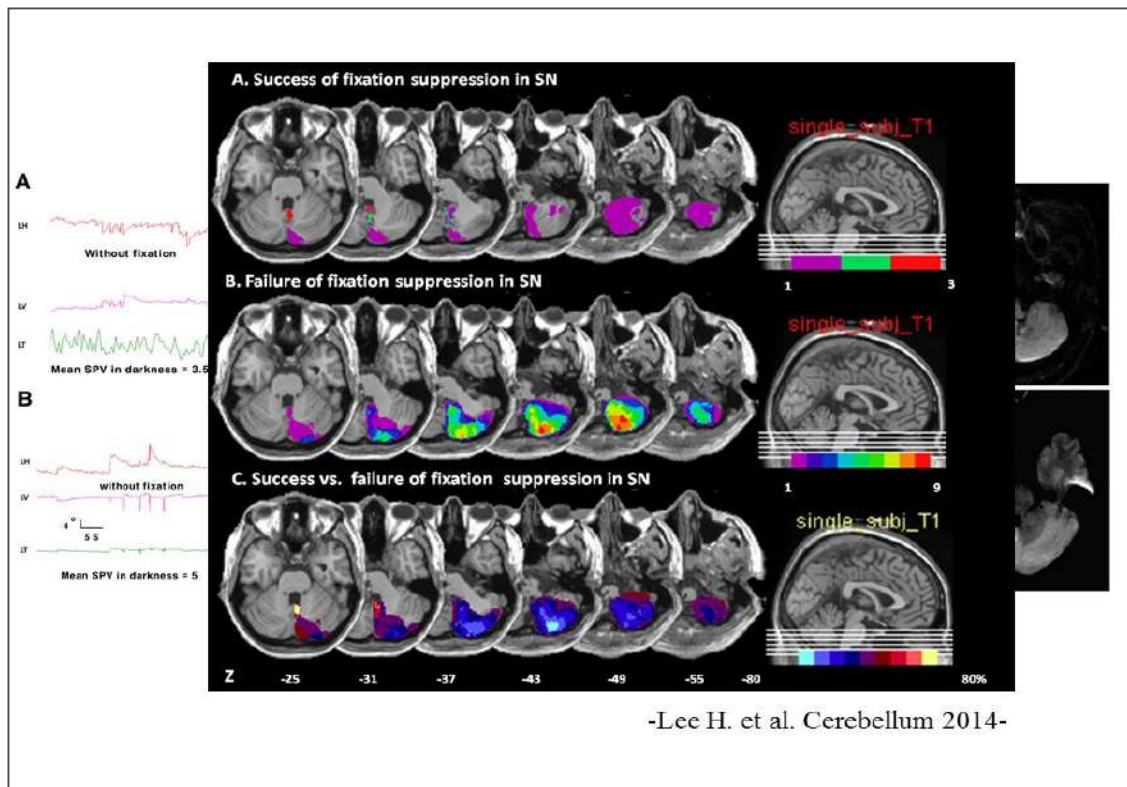
Central vertigo syndrome	Head impulse test	Spontaneous nystagmus	Gaze-evoked nystagmus	Ocular tilt reaction (including skew)	Characteristic feature(s)
Vestibular Nucleus	+Ipsilesional	Contralesional	+	\pm Ipsiversive	Overlapping central and peripheral
Flocculus	+Small contra > ipsilesional possible	Ipsilesional	+	+Contraversive	Bithermal calorics may be normal
Tonsil	—	Ipsilesional	+	+Contraversive	Poor pursuit
Nodulus	—	Ipsilesional	—	+Contraversive	Central patterns of HSN; PAN; positional nystagmus
Inferior cerebellar peduncle	—	Ipsilesional	—	+Contraversive	Impaired ipsilesional pursuit

HSN head-shaking nystagmus, PAN periodic alternating nystagmus

특성	중추성	말초성
양상	순수한 수직, 회선, 또는 수평 안진	회선성 및 수평 안 진 (혼합형)
방향	방향 전환 ?	일측성
시선고정	영향 없음 ?	억제

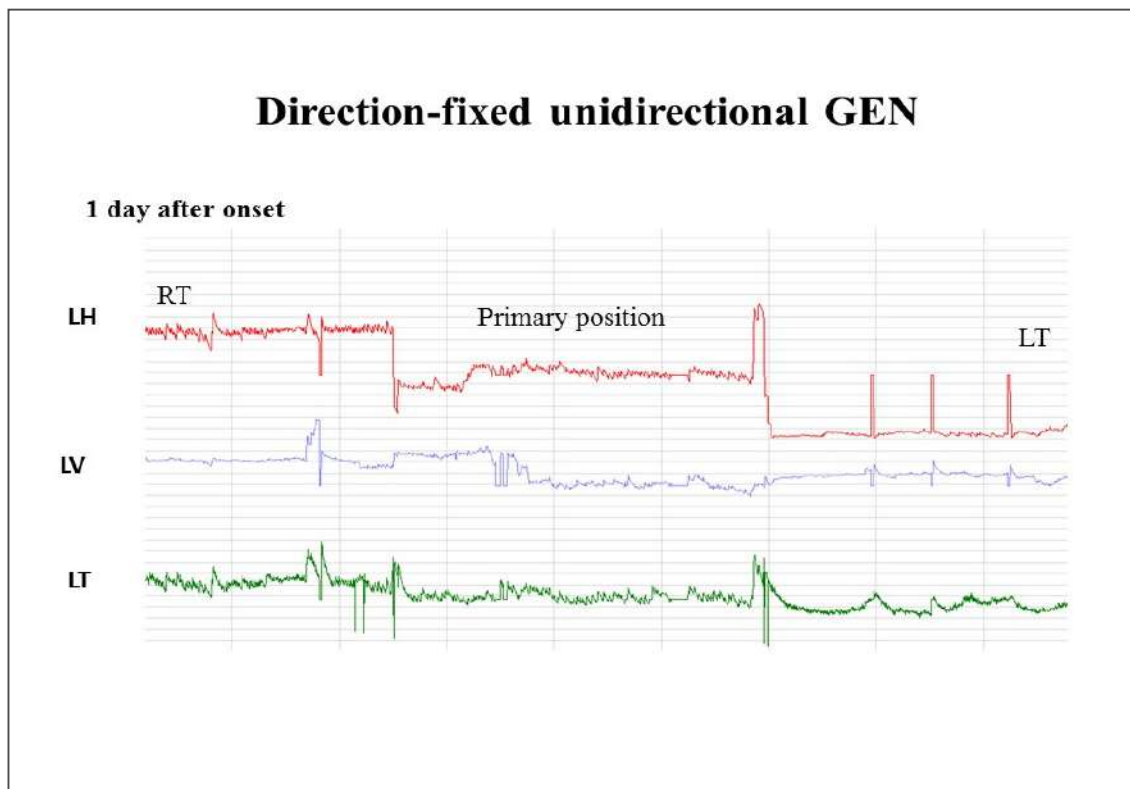
84번



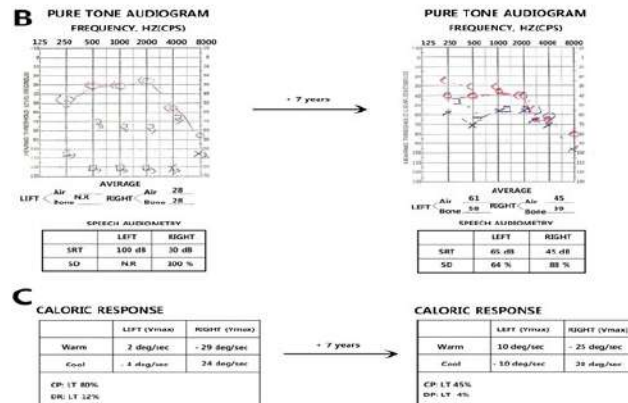


Dangerous peripheral vertigo

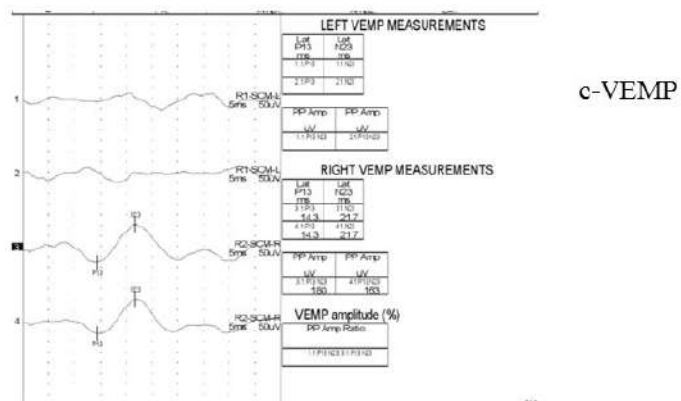
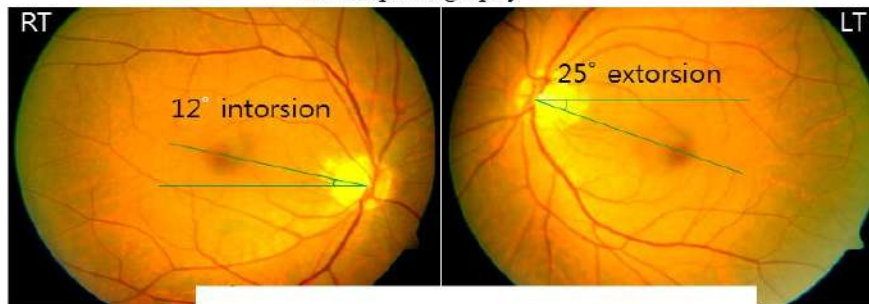
- ★ 67세, 여자
HTN/NIDDM for 20 years
- ★ Acute prolonged vertigo, spinning nature
- ★ Unidirectional spontaneous and gaze evoked nystagmus to right side
Positive HIT on left side
Veering to left side during walking



Pure tone audiogram and caloric response



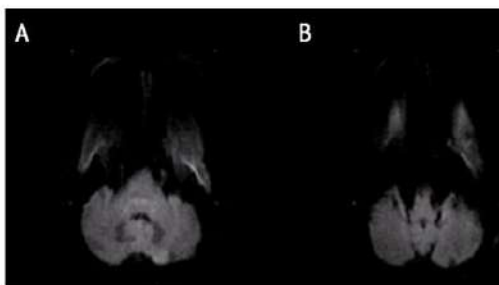
fundus photography



Possible lesion sites

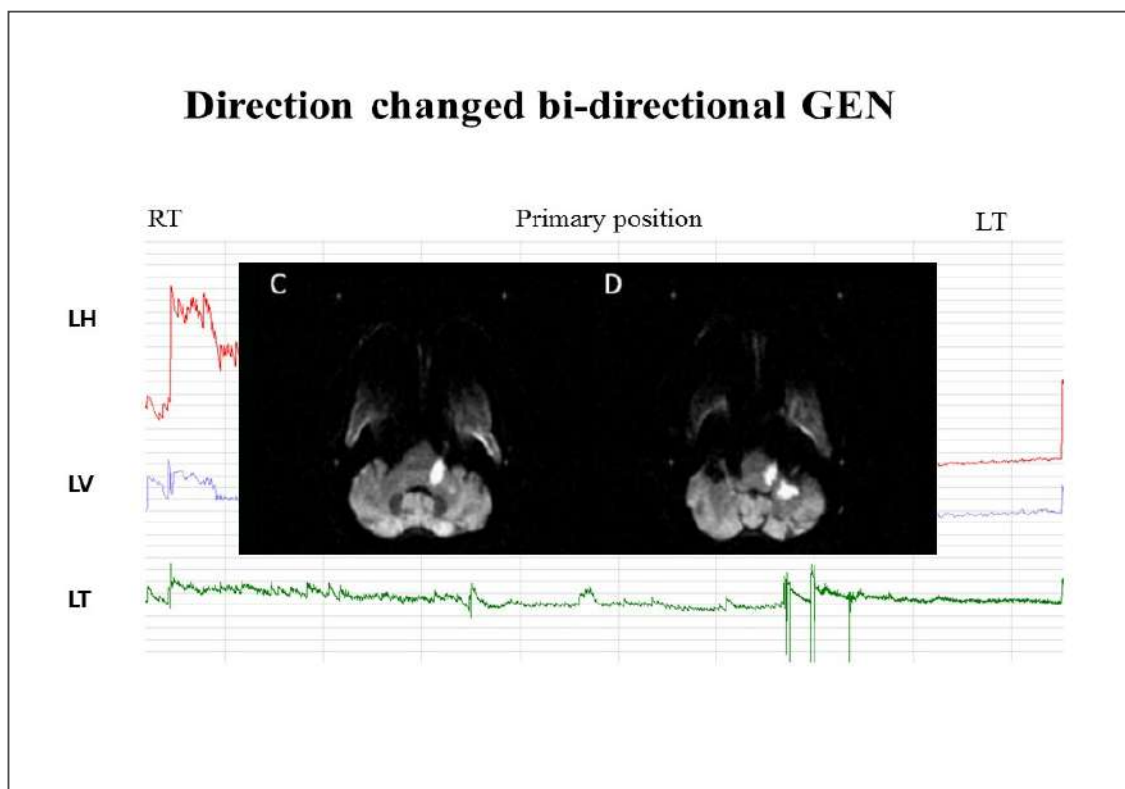
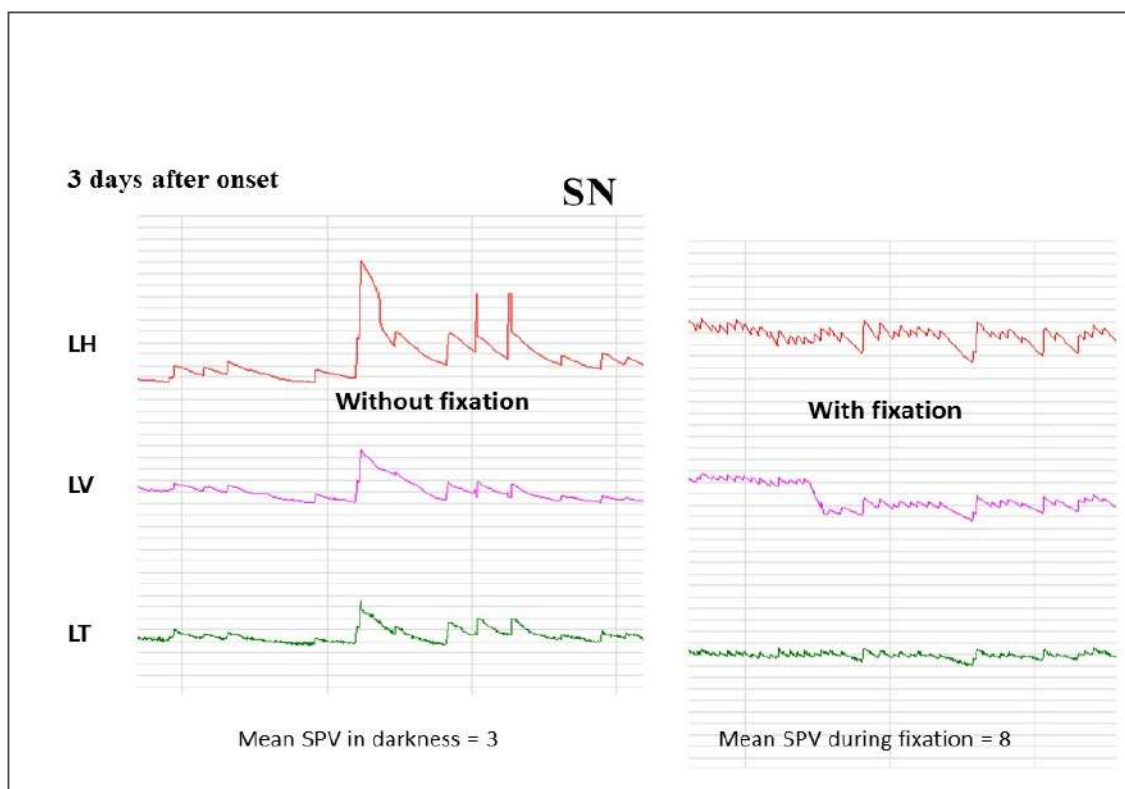
- ★ Inner ear
- ★ Eighth Nerve
- ★ Root entry zone of Eighth nerve
- ★ Vestibular and cochlear nuclei in brainstem

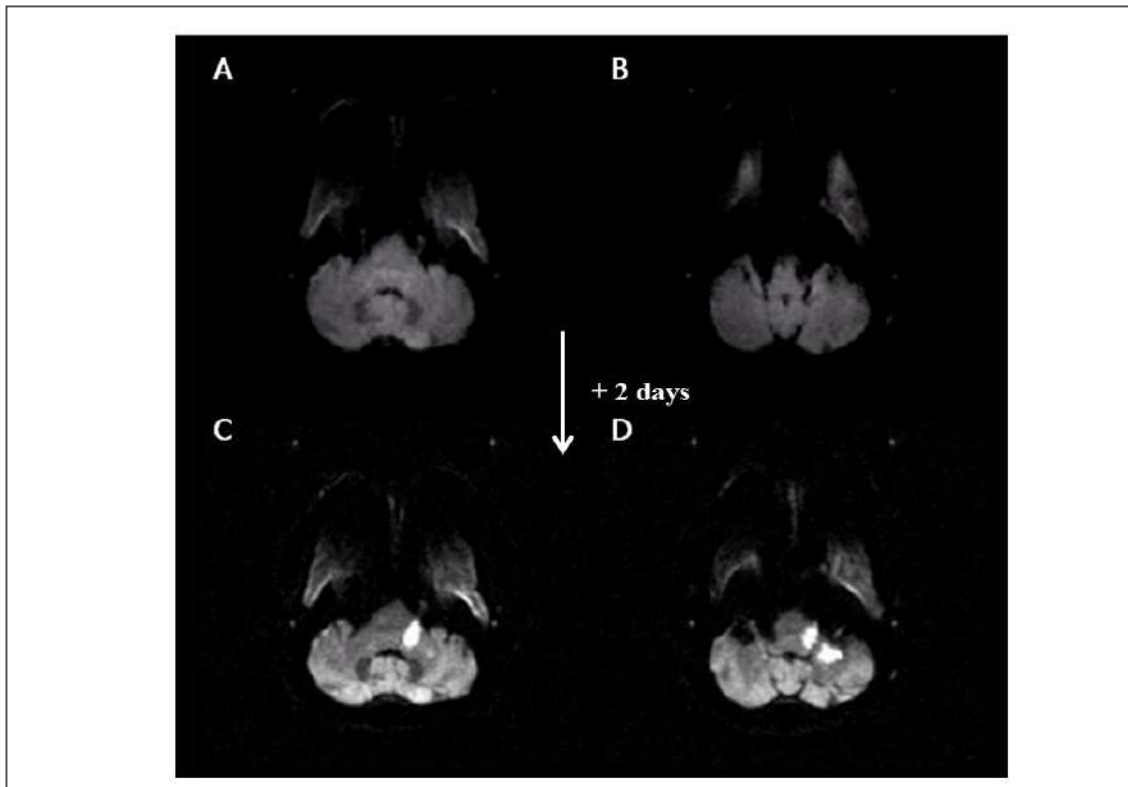
Initial MRI



★ Initial false negative MRI?

★ Otologic or Neurologic disease?





* 미래에셋증권 홈페이지
<http://fundro.com/stock.jsp>
 “보이는 것만 믿으세요”

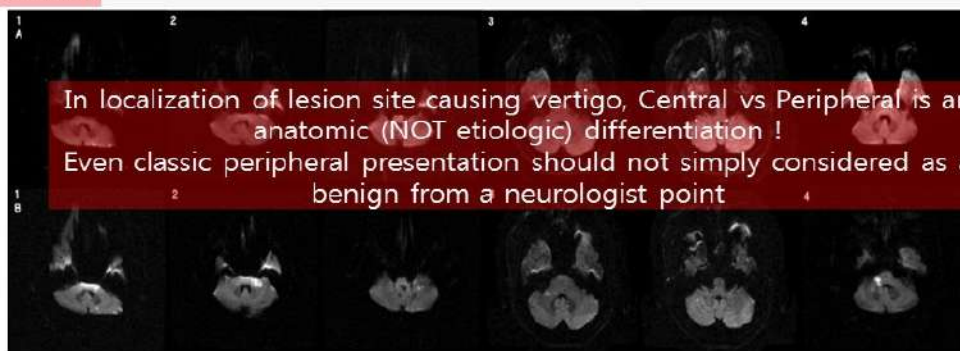
Isolated labyrinthine infarction as a harbinger of anterior inferior cerebellar artery territory infarction with normal diffusion-weighted brain MRI

Ji Soo Kim^a, Kyung-Hee Cho^b, Hyung Lee^{b,*}

Methods: We studied 54 consecutive patients with AICA infarction diagnosed by brain MRI from the acute stroke registry.

Results: We identified 4 patients (7.4%) with AICA territory infarction who initially presented with vertigo and hearing loss mimicking acute labyrinthitis and subsequently suffered from delayed neurological deficits. All patients had normal brain MRIs including diffusion-weighted images at the time of isolated audiovestibular loss, but all subsequently exhibited acute infarct(s) in the AICA territory on follow-up brain MRIs when they developed additional neurological deficits.

Conclusion: Labyrinthine infarction may be a warning sign of impending pontocerebellar infarction in the AICA territory. Our results indicate that even a classical peripheral presentation, e.g., acute hearing loss, and acute vertigo with unidirectional nystagmus, may be a manifestation of ischemic stroke in the posterior circulation.



8–30% of patients with posterior circulation stroke (mainly AICA territory) had acute audiovestibular prodromal symptoms before more widespread infarction and this symptom may come to be viewed as an opportunity to prevent an impending posterior circulation stroke. – Lee H et al (2005), Kim JS et al (2009), Lee H et al (2009) -

Audiovestibular loss in anterior inferior cerebellar artery territory infarction: A window to early detection?

Labyrinthine infarction, 내이경색, 귀중풍?

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ABSTRACT

Acute audiovestibular loss is a common neurological condition that is characterized by prolonged (lasting days) vertigo and hearing loss and is diagnosed by audiogram stimulation and sensorineural hearing loss on pure tone audiogram. Anterior inferior cerebellar artery (AICA) territory infarction focused mostly on associated neurological findings, without a detailed description of neurotological findings. Since 2000, several studies have reported that acute audiovestibular loss is an important sign for the diagnosis of AICA territory infarction. At least eight subgroups of AICA infarction have been identified according to the pattern of neurological presentations, among which the most common pattern of audiovestibular dysfunction is the combined loss of auditory and vestibular functions. Because audiovestibular loss may occur in isolation before ponto-cerebellar infarction involving AICA distribution, audiovestibular loss may serve as a window to prevent the progression of acute audiovestibular loss into more widespread areas of infarction in posterior circulation (mainly in the AICA territory). Clinician should keep in mind that acute audiovestibular loss may herald impending AICA territory infarction, especially when patients had basilar artery occlusive disease presumably close to the origin of the AICA on brain MRA, even if other central signs are absent and MRI does not demonstrate acute infarction.

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What a high risk factor(s) suggesting (predicting) impending stroke at the stage of isolated audiovestibular disturbance?

Table 3. MRA Findings in Patients With (Group 2) and Without (Others) Prodromal Audiovestibular Loss

	Group 2 (n=13)	Others (n=69)	P Value*
Basilar artery stenosis or occlusion†	62% (8/13)	13% (9/69)	0.000
Vertebral artery stenosis or occlusion‡	46% (6/13)	35% (24/69)	0.534
Normal vertebrobasilar system	23% (3/13)	55% (38/69)	0.067

*Based on χ^2 test. Significance was assumed at a value of $P < 0.05$.

†Focal (lower or middle portion close to the origin of the anterior inferior cerebellar artery) or diffuse narrowing of the basilar artery.

‡Focal or diffuse narrowing of the vertebral artery.

- Lee H et al. Stroke. 2009;40:3745-3751-