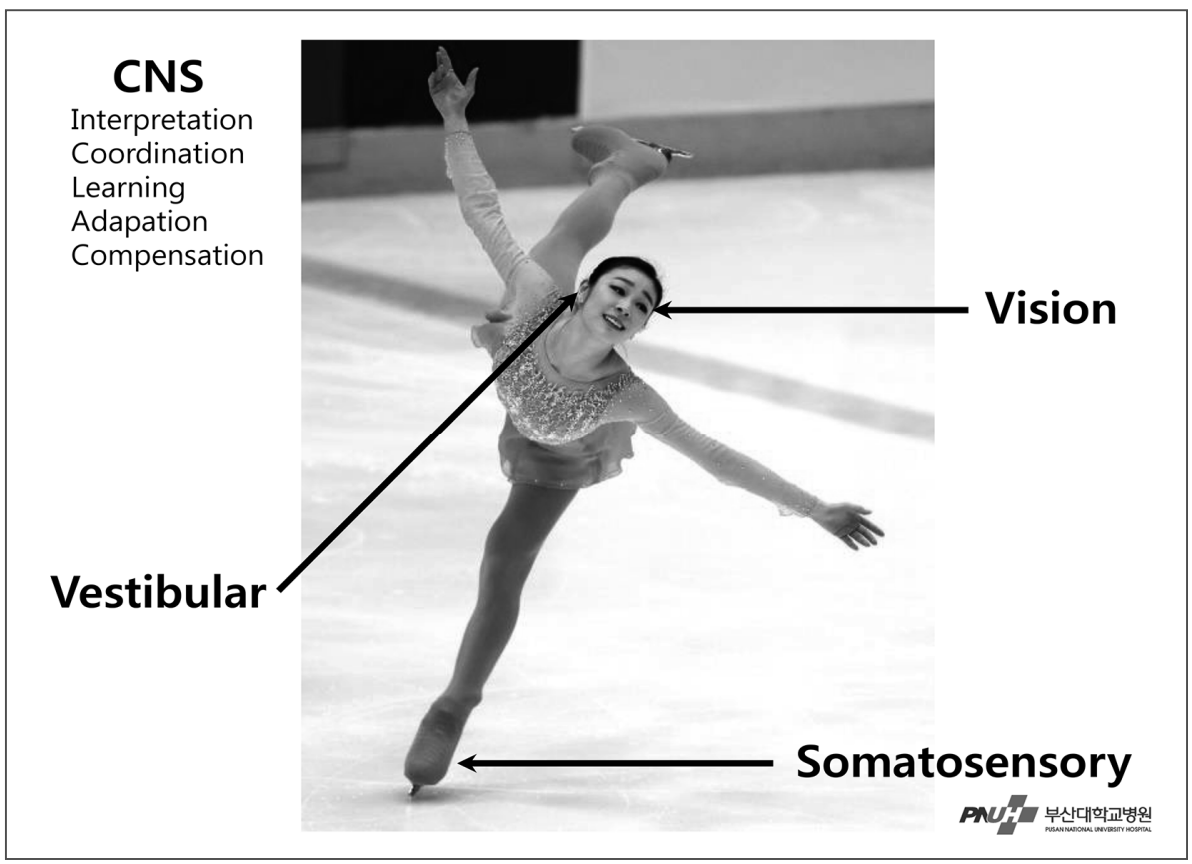
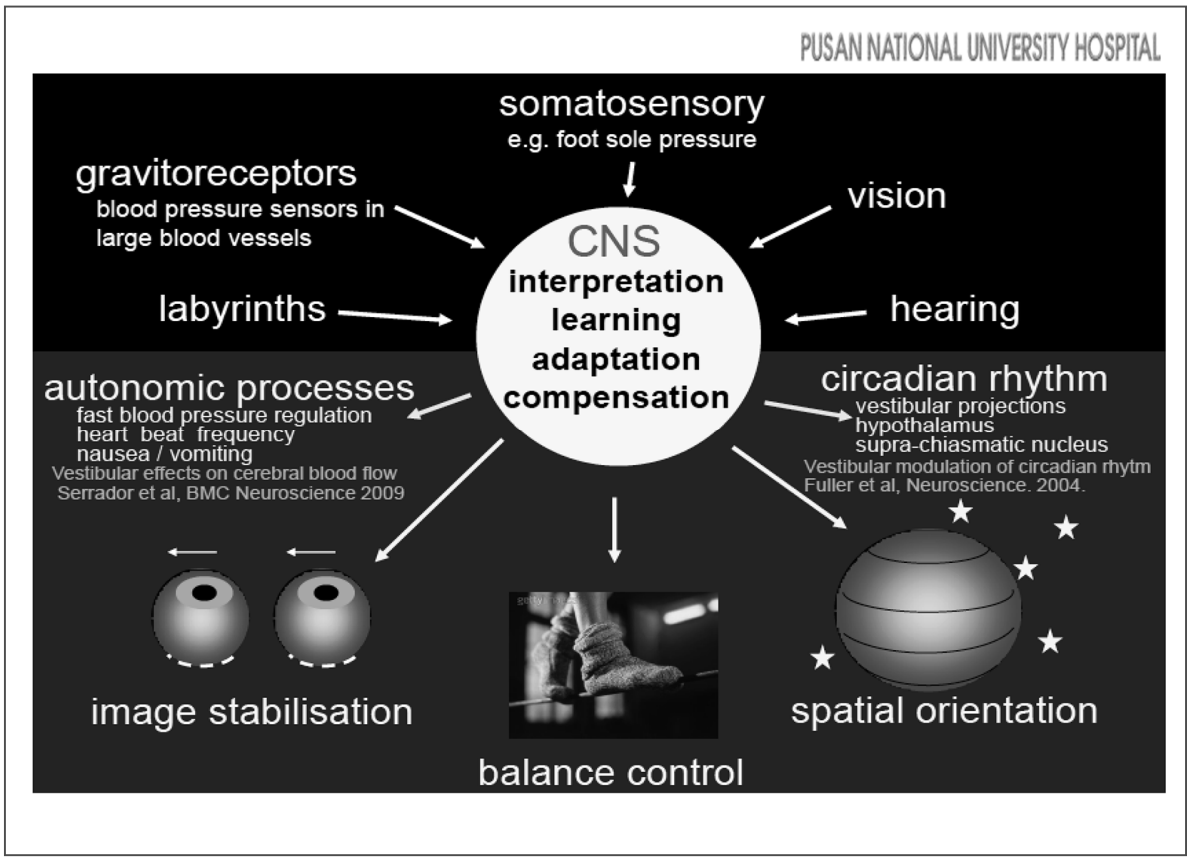
중추성현훈의 감별진단

최 광 동

부산대학교 의과대학 신경과학교실

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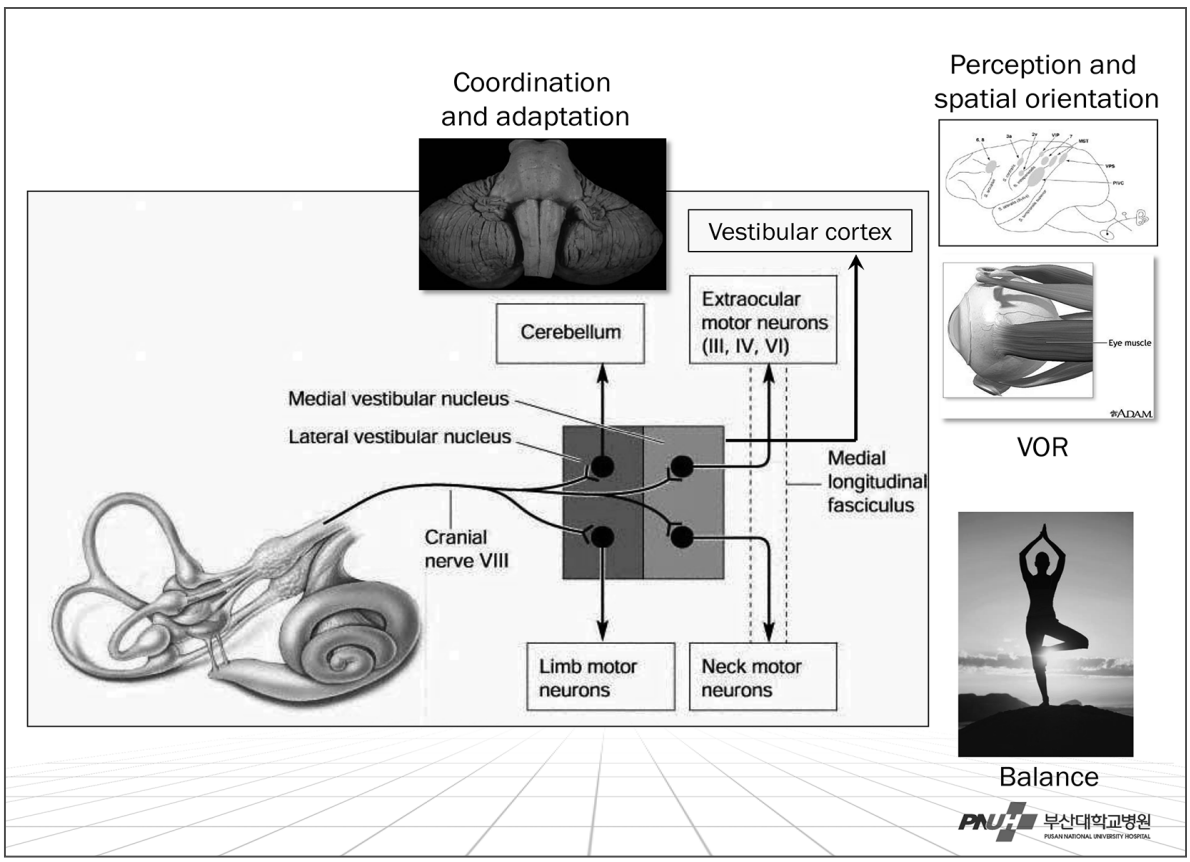
somatosensory
e.g. foot sole pressure
gravitoreceptors
blood pressure sensors in
large blood vessels
vision
CNS
interpretation
learning
adaptation
compensation
labyrinths
hearing
autonomic processes
fast blood pressure regulation
heart beat frequency
nausea / vomiting
Vestibular effects on cerebral blood flow
Serrador et al, BMC Neuroscience 2009
circadian rhythm
vestibular projections
hypothalamus
supra-chiasmatic nucleus
Vestibular modulation of circadian rhytm
Fuller et al, Neuroscience. 2004.
image stabilisation
balance control
spatial orientation


Coordination
and adaptation
Perception and
spatial orientation
Vestibular cortex
Cerebellum
Extraocular
motor neurons
(III, IV, VI)
Medial vestibular nucleus
Lateral vestibular nucleus
Medial
longitudinal
fasciculus
Cranial
nerve VIII
Limb motor
neurons
Neck motor
neurons
Eye muscle
VOR
Balance
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Approach to dizzy patients

- History taking
- ↓
- Bedside evaluation
- ↓
- Laboratory evaluation

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The 'Quality-of-Symptoms' Approach

Type of dizziness implies pathophysiologic mechanism

- Vertigo = vestibular = ear/ENT problem
- Presyncope = cardiovascular =Med/Cards problem
- Disequilibrium = neurologic = Neuro problem
- Non-specific dizziness = psychiatric = NP problem

→ Old approach
Quality approach doesn't work!

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The Old Approach

Quality Doesn't Work

- "vestibular" system
  - peripheral vestibular (benign inner ear)
  - central vestibular (bleed, stroke, TIA)
  - cortical projections (migraine, psych)
  - spinal cord projections (cord compression)

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The Old Approach

Quality Approach Doesn't Work

Cerebrovascular Dizziness is of All 4 Types

- 59% of cerebellar strokes present with vertigo (n=66) *(Kase, 1993)*
- 41% of cerebellar strokes have non-specific dizziness or disequilibrium, without vertigo (n=66) *(Kase, 1993)*
- 32% of vertebrobasilar insufficiency patients have pre-syncope/syncope (n=39) *(Toursarkissian, 1998)*

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EUROPEAN JOURNAL OF NEUROLOGY

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. Cho[d], J. S. Kim[e] and K.-D. Choi[b]

[a]*Department of Neurology, Pusan National University School of Medicine, Research Institute for Convergence of Biomedical Science and Technology, Pusan National University Yangsan Hospital, Yangsan;* [b]*Department of Neurology, Pusan National University Hospital, Pusan National University School of Medicine and Biomedical Research Institute, Busan;* [c]*Department of Neurology, Bonhospital, Busan;* [d]*Department of Preventive Medicine, Pusan National University School of Medicine, Research Institute for Convergence of Biomedical Science and Technology, Pusan National University Yangsan Hospital, Yangsan; and* [e]*Department of Neurology, Seoul National University Bundang Hospital, Seongnam, Korea*

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.

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A new approach!!

✓Timing

✓Triggers and duration

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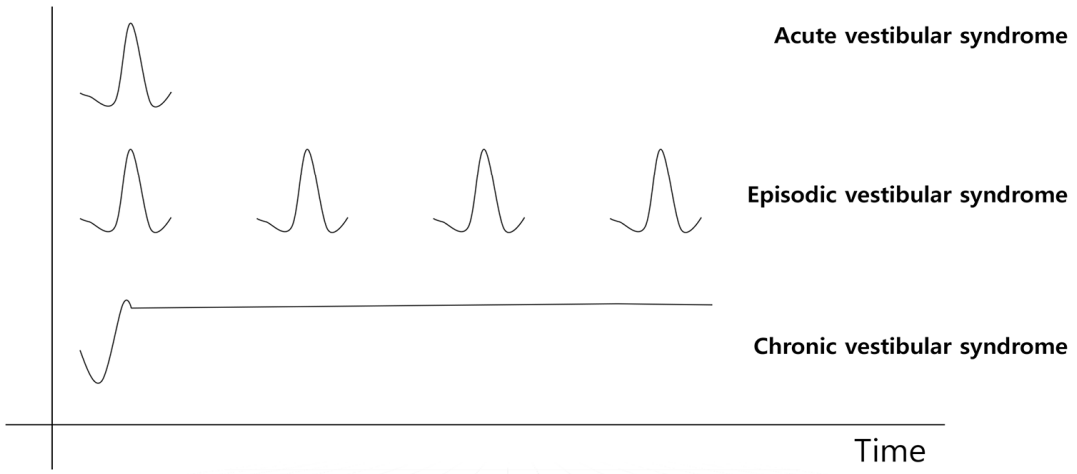
Vestibular Syndromes (Timing)



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Vestibular Syndromes (Timing)

Acute vestibular syndrome	Episodic vestibular syndrome	Chronic vestibular syndrome
➢ Vestibular neuritis/ labyrinthitis	➢ Vestibular migraine	➢ Chronic subjective dizziness
➢ Brainstem or cerebellar stroke	➢ Meniere's disease	➢ Cerebellar ataxia
	➢ TIA	➢ PSP
	➢ BPPV	➢ Post-concussion syndrome
	➢ Central positional vertigo	➢ Bilateral vestibulopathy
	➢ Rotational vertebral artery syndrome	➢ Drug-induced dizziness
	➢ Orthostatic hypotension	
	➢ Cardiogenic vertigo	

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Acute vestibular syndrome

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Vestibular Syndromes (Timing)

Acute vestibular syndrome

- Vestibular neuritis/ labyrinthitis
- Brainstem or cerebellar stroke

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Acute vestibular syndrome (AVS)

- ✓ Rapid onset (over seconds to hours)
- ✓ Vertigo, N/V, gait unsteadiness
- ✓ Head motion intolerance and **nystagmus**
- ✓ Lasting more than **24 hours**

Acute vestibular syndrome (AVS)

- ✓ Acute peripheral vestibulopathy vs central vestibulopathy
- ✓ Previous studies
  : 20-60% of AVS – posterior circulation stroke

Acute vestibular syndrome (AVS)

- ✓ CT scans : low sensitivity (16%) for acute infarction
- ✓ MRI : high cost,
  false-negative for acute infarction (12-20%)

- ✓ Long-tract or cerebellar signs
  : fewer than half of AVS
  : isolated vertigo without neurological signs??

- ✓ Careful eye movement assessment !!

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Acute vestibular syndrome ; HINTS examination

(Head impulse test, direction changing nystagmus, skew deviation)

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. Talkad, 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.**)

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Acute peripheral vestibulopathy

- Contralesional horizontal-torsional spontaneous nystagmus
  - unidirectional
  - suppression by visual fixation
- Positive head impulse test
- No skew deviation

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Acute vestibular syndrome
; dangerous HINTS examination

Direction changing nystagmus

Normal head impulse test

Skew deviation

Acute vestibular syndrome ; HINTS examination

(Head impulse test, direction changing nystagmus, skew deviation)

- HINTS examination is more sensitive than early DWI in excluding stroke maintaining a high specificity.

Table 4. Bedside Signs and Initial MRI With DWI Test Properties for Ischemic Stroke in AVS

	Sensitivity (n=69)	Specificity (n=25)	NLR Stroke (95% CI)
General neurological signs*	19%	100%	0.81 (0.72–0.91)
Obvious oculomotor signs	28%	100%	0.72 (0.63–0.84)
Severe truncal ataxia	33%	100%	0.67 (0.56–0.79)
Any obvious signs	64%†	100%	0.36 (0.27–0.50)
Initial MRI with DWI	88%‡	100%	0.12 (0.06–0.22)
Dangerous bedside HINTS	100%	96%	0.00 (0.00–0.12)

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Neurology® Clinical Practice

Isolated vestibular syndrome in posterior circulation stroke

Frequency and involved structures

Jae-Hwan Choi, MD*
Hyun-Woo Kim, MD*
Kwang-Dong Choi, MD
Min-Ji Kim, BSc
Yu Ri Choi, BSc
Han-Jin Cho, MD
Sang-Min Sung, MD
Hak-Jin Kim, MD
Ji-Soo Kim, MD
Dae-Soo Jung, MD

Summary
Dizziness/vertigo is a common symptom of posterior circulation stroke and usually accompanies other neurologic symptoms and signs. Although strokes involving the brainstem or cerebellum may produce isolated vestibular syndrome (isolated vertigo or imbalance), the overall frequency and involved structures of isolated vestibular syndrome in the posterior circulation stroke remain uncertain. Isolated vestibular syndrome occurs in approximately 25% of the patients with posterior circulation stroke, and mostly involves the cerebellum, inferior or superior cerebellar peduncles, and caudal lateral or rostral dorsolateral medulla. The occasional negative neuroimaging in patients with acute isolated vascular vertigo highlights the importance of appropriate bedside evaluation in acute vestibular syndrome.

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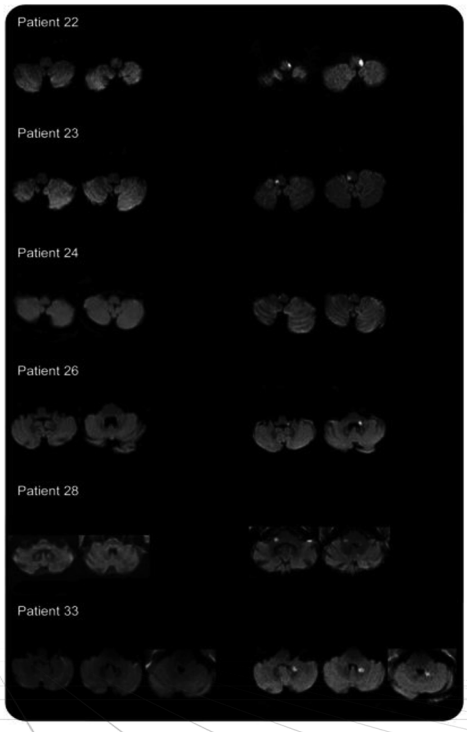
Initial neuroimaging including DWI was falsely negative in 17.6% of patients with isolated vestibular syndrome during the early phase.

Figure 2 Initial (left panels) and follow-up diffusion-weighted images (right panels) in 6 patients with negative neuroimaging

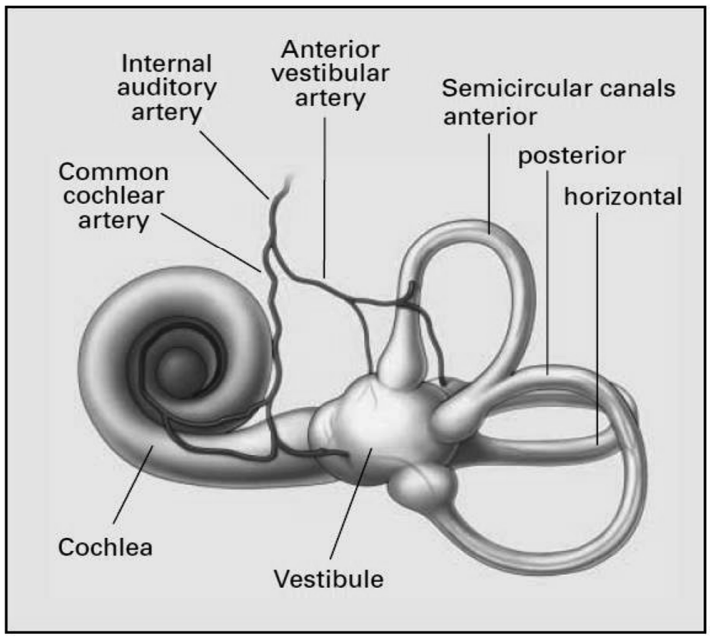


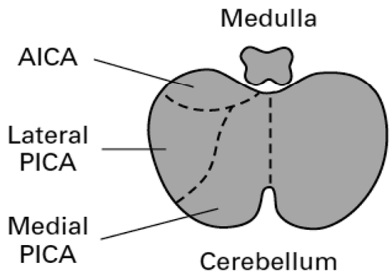
Follow-up MRIs show infarctions in the caudal lateral medulla (patients 22-24), rostral dorsolateral medulla and inferior cerebellar peduncle (patient 26), middle cerebellar peduncle (patient 28), and inferior and superior cerebellar peduncles (patient 33).

Limitation of HINTS

✓ AICA infarction : benign HINTS

Blood supply to labyrinth





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Limitation of HINTS

- ✓ AICA infarction : benign HINTS
- ✓ AVS without nystagmus
- ✓ Rapid resolution of AVS within 24 hours
- ✓ False negative stroke

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Acute transient vestibular syndrome (ATVS)

- ✓ Rapid onset (over seconds to hours)
- ✓ Vertigo, N/V, gait unsteadiness
- ✓ Head motion intolerance and nystagmus?
- ✓ Resolution within 24 hours
- ✓ Vertebrobasilar TIA????

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Acute transient vestibular syndrome (ATVS)

✓ During one year (2014)

713 pts. with first dizziness presentations

↓

86 pts. with ATVS

↓

HINTS, MRI, PWI

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	ATVS		
	Nystagmus (n=22, 26%)	No nystagmus (n=64, 74%)	Total (n=86)
APV, n (%)	15 (68)	0 (0)	15
Stroke, n (%)	2 (9)	21 (33)	23
cerebral infarction, n (%)	2 (9)	11 (17)	13
cerebellar hypoperfusion, n (%)	0 (0)	10 (16)	10
Undetermined, n (%)	5 (23)	43 (67)	48
HINTS plus			
sensitivity (%)	100	NC	NC
specificity (%)	75	NC	NC
MRI			
sensitivity (%)	100	52	57
specificity (%)	100	100	100

Data are n (%) unless otherwise indicated.

ATVS = acute transient vestibular syndrome; APV = acute peripheral vestibulopathy; NC=not calculated.

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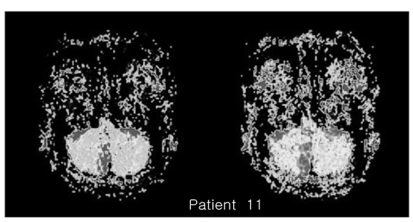
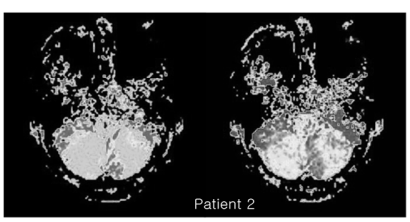
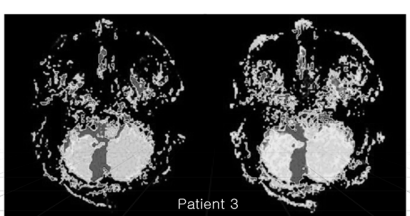
➢ Perfusion delay at medial cerebellum (n=3)







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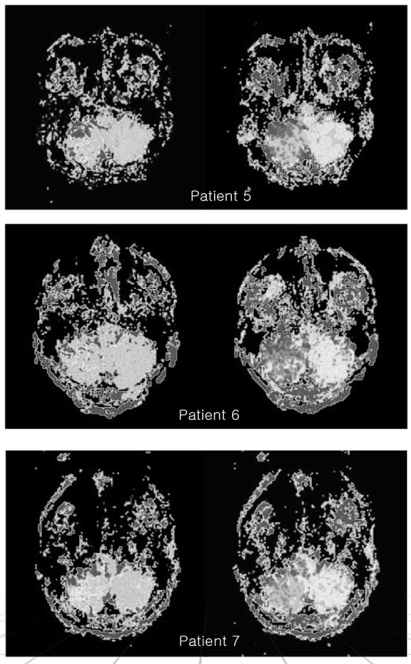
➢ Perfusion delay at whole cerebellum (n=7)



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Acute transient vestibular syndrome (ATVS)

Table 5. Results of multivariable logistic regression analysis with dependent variable of stroke in ATVS.

Primary variables	HR (95% CI)	*P* value
Male gender	4.0 (0.9~17.2)	0.066
Headache	9.6 (2.0~45.2)	0.004
Focal neurologic symptoms/signs	15.2 (2.5~93.8)	0.003
Symptom duration of minutes	2.9 (0.7~11.7)	0.142
VA stenosis or hypoplasia	7.0 (1.7~29.4)	0.008

ATVS = acute transient vestibular syndrome; VA = vertebral artery

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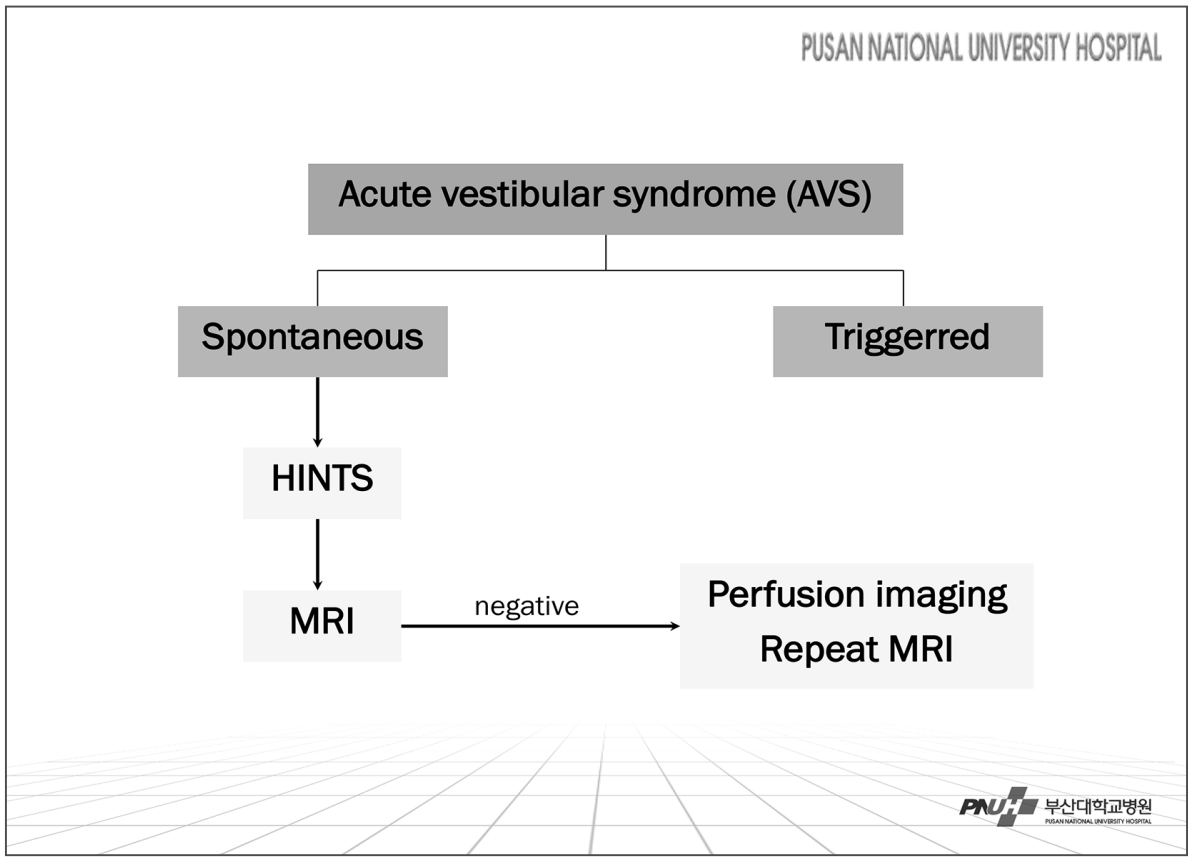
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Acute vestibular syndrome (AVS)
Spontaneous
Triggerred
HINTS
MRI
negative
Perfusion imaging
Repeat MRI
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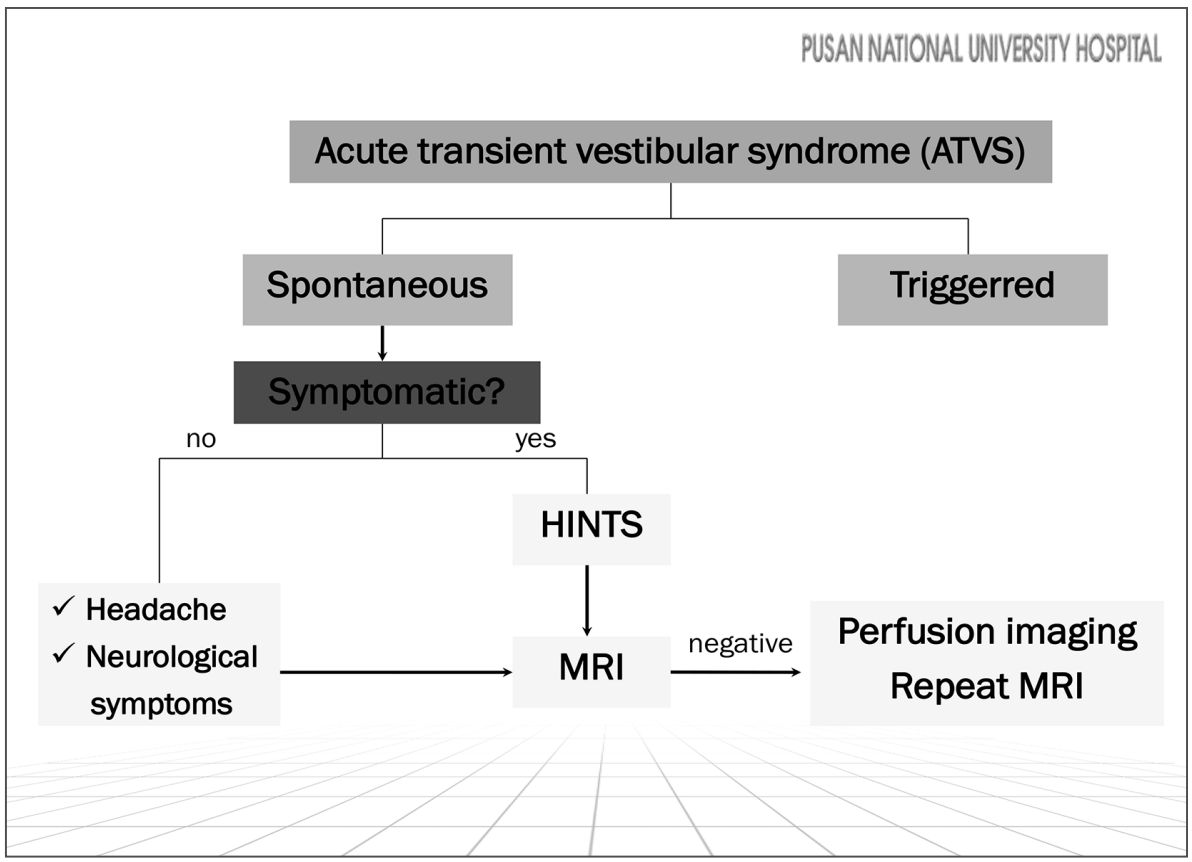
PUSAN NATIONAL UNIVERSITY HOSPITAL
Acute transient vestibular syndrome (ATVS)
Spontaneous
Triggerred
Symptomatic?
no
yes
HINTS
✓ Headache
✓ Neurological symptoms
MRI
negative
Perfusion imaging
Repeat MRI

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Episodic vestibular syndrome

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Vestibular Syndromes (Timing)

Episodic vestibular syndrome

- Vestibular migraine
- Meniere's disease
- TIA
- BPPV
- Central positional vertigo
- Rotational vertebral artery syndrome
- Orthostatic hypotension
- Cardiogenic vertigo

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Episodic vestibular syndrome (EVS)

✓ Mostly benign

✓ <u>Caution !!</u>

1. episodic vertigo lasting minutes	**VBI (TIA)**
2. episodic vertigo lasting seconds	**Cardiogenic vertigo**
3. epsiodic vertigo with unilateral hearing loss	**Acoustic neuroma**

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Episodic vestibular syndrome (EVS)

Common	Uncommon
• Meniere's disease • Vestibular migraine • Vertebrobasilar insufficiency (VBI) • BPPV • Orthostatic hypotension	• Acoustic neuroma • Episodic ataxia type 2 • Autoimmune inner ear disease • Otosyphilis • Multiple sclerosis • Vestibular epilepsy • Perilymph fistula/SCD • Cardiogenic vertigo

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Episodic vestibular syndrome (EVS)

- Triggers
- Duration
- Auditory symptoms
- Headache
- Neurological symptoms
- Family history

History taking

↓

- Normal or abnormal

Interictal exam.

↓

- The most important !!

Ictal exam.

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Triggers – position

Video 1

Video 2

Video 3

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EUROPEAN JOURNAL OF NEUROLOGY

ORIGINAL ARTICLE

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J.-H. Choi[a], J.-D. Seo[b,c], M.-J. Kim[b], B.-Y. Choi[b], Y. R. Choi[b], B. M. Cho[d], J. S. Kim[e] and K.-D. Choi[b]

[a]*Department of Neurology, Pusan National University School of Medicine, Research Institute for Convergence of Biomedical Science and Technology, Pusan National University Yangsan Hospital, Yangsan;* [b]*Department of Neurology, Pusan National University Hospital, Pusan National University School of Medicine and Biomedical Research Institute, Busan;* [c]*Department of Neurology, Bonhospital, Busan;* [d]*Department of Preventive Medicine, Pusan National University School of Medicine, Research Institute for Convergence of Biomedical Science and Technology, Pusan National University Yangsan Hospital, Yangsan; and* [e]*Department of Neurology, Seoul National University Bundang Hospital, Seongnam, Korea*

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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.

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Triggers – position

Video 1

Video 2

Video 3

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Rotational Vertebral Artery Occlusion

Mechanisms and Long-term Outcome

Kwang-Dong Choi, MD*; Jae-Hwan Choi, MD*; Ji-Soo Kim, MD; Hyo Jung Kim, MSc; Min-Ji Kim, BSc; Tae-Hong Lee, MD; Hyung Lee, MD; In Soo Moon, MD; Hui Jong Oh, MD; Jae-Il Kim, MD

Background and Purpose—To elucidate the mechanisms and prognosis of rotational vertebral artery occlusion (RVAO).

Methods—We analyzed clinical and radiological characteristics, patterns of induced nystagmus, and outcome in 21 patients (13 men, aged 29–77 years) with RVAO documented by dynamic cerebral angiography during an 8-year period at 3 University Hospitals in Korea. The follow-up periods ranged from 5 to 91 months (median, 37.5 months). Most patients (n=19; 90.5%) received conservative treatments.

Results—All the patients developed vertigo accompanied by tinnitus (38%), fainting (24%), or blurred vision (19%). Only 12 (57.1%) patients showed the typical pattern of RVAO during dynamic cerebral angiography, a compression of the dominant vertebral artery at the C1-2 level during contralateral head rotation. The induced nystagmus was mostly downbeat with horizontal and torsional components beating toward the compressed vertebral artery side. None of the patients with conservative treatments developed posterior circulation stroke, and 4 of them (21.1%) showed resolution of symptoms during the follow-ups.

Conclusions—RVAO has various patterns of vertebral artery compression, and favorable long-term outcome with conservative treatments. In most patients with RVAO, the symptoms may be ascribed to asymmetrical excitation of the bilateral labyrinth induced by transient ischemia or by disinhibition from inferior cerebellar hypoperfusion. Conservative management might be considered as the first-line treatment of RVAO. (***Stroke*. 2013;44:1817-1824.**)

Key Words: mechanism ■ prognosis ■ rotational vertebral artery occlusion ■ stroke

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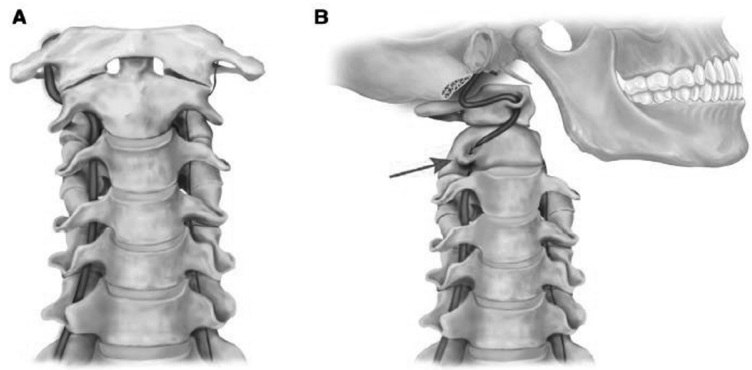

Figure 1. Typical rotational vertebral artery occlusion. A typical pattern of rotational vertebral artery occlusion shows a stenosis or anomaly of the vertebral artery on 1 side (**A**) and compression of the dominant vertebral artery at the C1-2 level during contraversive head rotation (**B**).

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Triggers

Sound

Mastication

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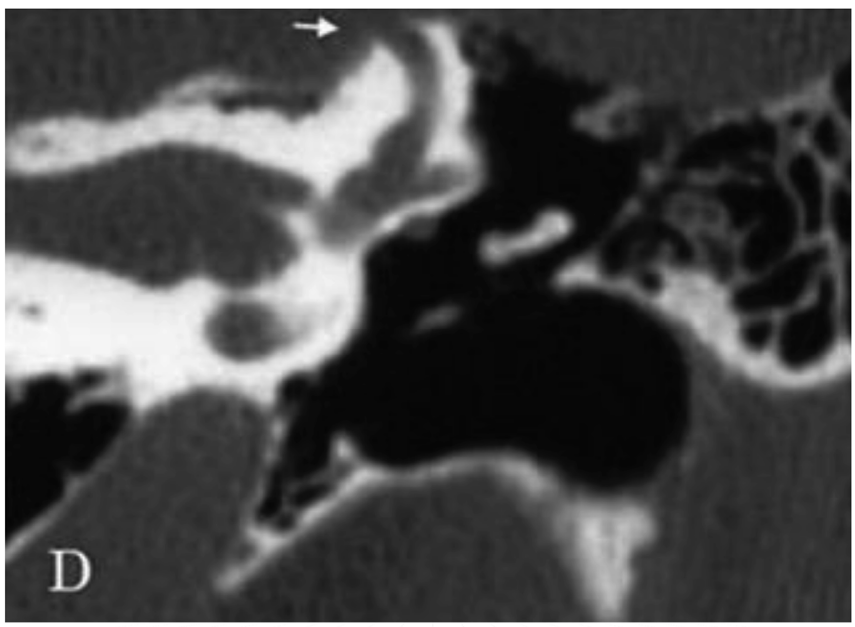

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Triggers

Sound

Mastication

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J Neurol (2014) 261:480–489
DOI 10.1007/s00415-013-7221-7

ORIGINAL COMMUNICATION

Mastication-induced vertigo and nystagmus

Seong-Ho Park · Hyo-Jung Kim · Ji-Soo Kim · Ja-Won Koo · Seo Won Oh · Dong-Uk Kim · Joon-Tae Kim · Miriam Welgampola · Franca Deriu

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Abstract Even though trigeminovestibular connections are well established in animals, mastication-induced dizziness has been described only as a vascular steal phenomenon in humans. We determined induction or modulation of nystagmus in two index patients with mastication-induced vertigo, 12 normal controls, and 52 additional patients with peripheral ($n = 38$, 26 with vestibular neuritis/labyrinthitis and 12 with Meniere's disease) or central ($n = 14$, 11 with Wallenberg syndrome, two with cerebellar infarction, and one with pontine infarction) vestibulopathy during their acute or compensated phase. Both index patients developed mastication-induced vertigo after near complete resolution of the spontaneous vertigo from presumed acute unilateral peripheral vestibulopathy. The nystagmus and vertigo gradually built up during mastication and dissipated slowly after cessation of mastication. Brain MRI and cerebral angiography were normal in these patients. Mastication did not induce nystagmus in normal controls. However, mastication induced nystagmus in five (24 %) of the 21 patients without spontaneous nystagmus (SN) but with a previous history of a vestibular syndrome, and either increased (21/31, 68 %) or decreased (7/31, 23 %) the SN in almost all the patients (28/31, 90 %) with SN. Mastication may induce significant vertigo and nystagmus in patients with a prior history of acute vestibulopathy. The induction or modulation of nystagmus by mastication in both peripheral and central vestibulopathies supports trigeminal modulation of the vestibular system in human. The gradual build-up and dissipation suggest a role of the velocity storage mechanism in the generation of mastication-induced vertigo and nystagmus.

Keywords Nystagmus · Vertigo · Mastication · Velocity storage · Vestibular neuritis · Cerebral infarction

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Duration

✓Days

: **acute vestibular syndrome** (vestibular neuritis, stroke…)

✓Hours

: **meniere's disease**, vestibular migraine

✓Minutes

: **VBI**, vestibular migraine

✓Seconds

: **Cardiogenic vertigo, vestibular paroxysmia**, vestibular epilepsy, psychogenic dizziness

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Episodic vestibular syndrome (EVS)

- Triggers
- Duration
- Auditory symptoms
- Headache
- Neurological symptoms
- Family history

History taking

↓

- **Normal or abnormal**

Interictal exam.

↓

- **The most important !!**

Ictal exam.

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Neurol Sci (2015) 36:1393–1396
DOI 10.1007/s10072-015-2157-6

ORIGINAL ARTICLE

Exercise-induced downbeat nystagmus in a Korean family with a nonsense mutation in *CACNA1A*

Jae-Hwan Choi[1] · Jae-Deuk Seo[2] · Yu Ri Choi[3] · Min-Ji Kim[3] · Jin-Hong Shin[1] · Ji Soo Kim[4] · Kwang-Dong Choi[3]

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Abstract Episodic ataxia type 2 (EA2) is characterized by recurrent attacks of vertigo and ataxia lasting hours triggered by emotional stress or exercise. Although interictal horizontal gaze-evoked nystagmus and rebound nystagmus are commonly observed in patients with EA2, the nystagmus has been rarely reported during the vertigo attack. To better describe exercise-induced nystagmus in EA2, four affected members from three generations of a Korean family with EA2 received full neurological and neuro-otological evaluations. Vertigo was provoked in the proband with running for 10 min to record eye movements during the vertigo attack. We performed a polymerase chain reaction-based direct sequence analysis of all coding regions of *CACNA1A* in all participants. The four affected members had a history of exertional vertigo, imbalance, childhood epilepsy, headache, and paresthesia. The provocation induced severe vertigo and imbalance lasting several hours, and oculography documented pure downbeat nystagmus during the attack. Genetic analyses identified a nonsense mutation in exon 23 which has been registered in dbSNP as a pathogenic allele (c.3832C>T, p.R1278X) in all the affected members. Ictal downbeat nystagmus in the studied family indicates cerebellar dysfunction during the vertigo attack in EA2. In patients with episodic vertigo and ataxia, the observation of exercise-induced nystagmus would provide a clue for EA2.

Keywords Episodic ataxia · Exercise · Downbeat nystagmus · CACNA1A mutation · Calcium channel · Cerebellar dysfunction

Introduction

Episodic ataxia type 2 (EA2) is an autosomal-dominant inherited disorder caused by mutations in *CACNA1A*, which encodes Cav2.1, the main subunit of the P/Q-type

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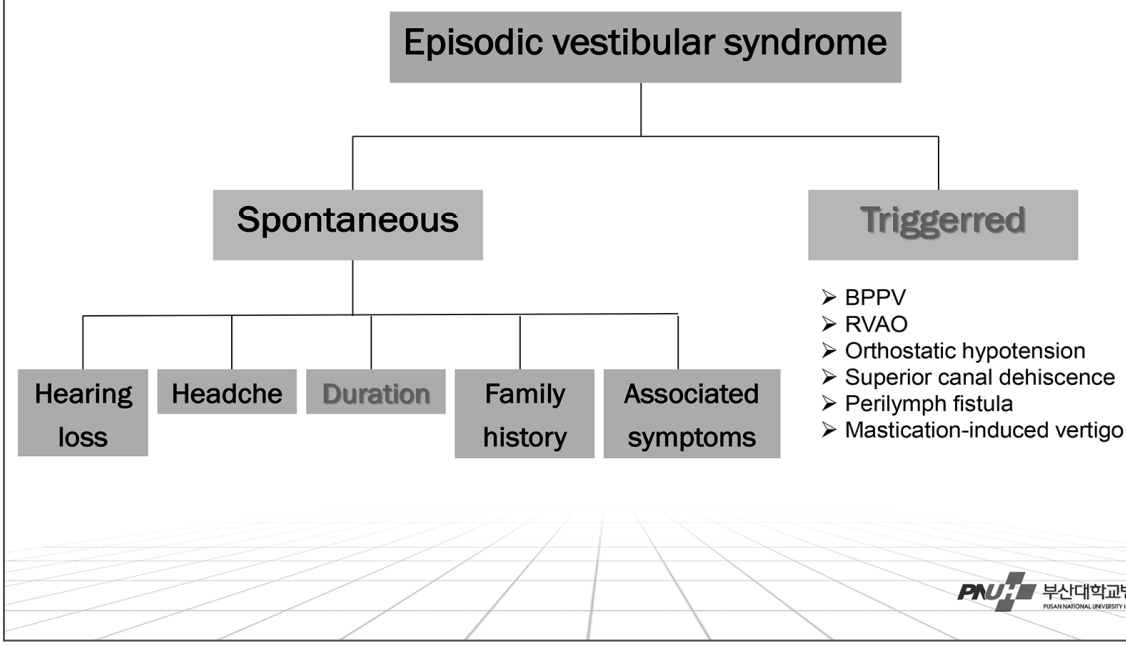
Episodic vestibular syndrome (EVS)



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Chronic vestibular syndrome (CVS)

Vestibular Syndromes (Timing)

Chronic vestibular syndrome

- Chronic subjective dizziness
- Cerebellar ataxia
- PSP
- Post-concussion syndrome
- Bilateral vestibulopathy
- Drug-induced dizziness

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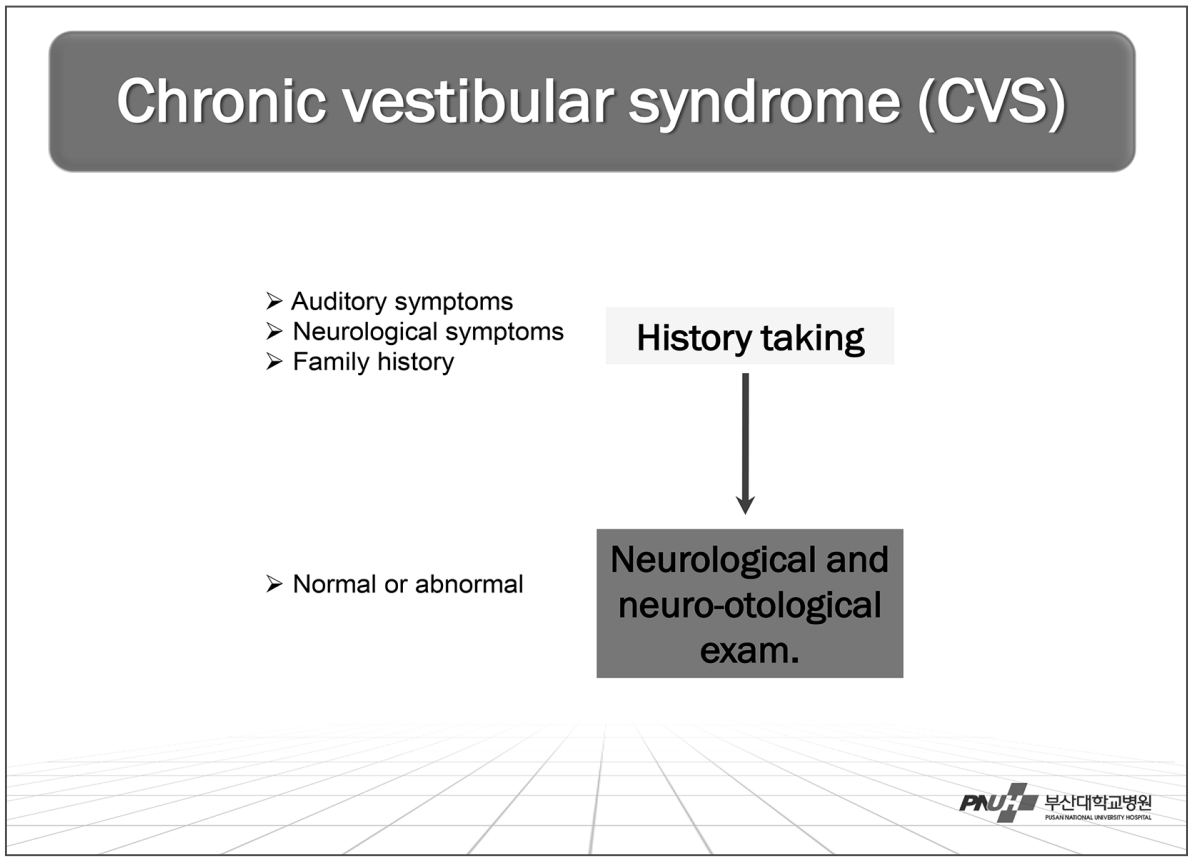
Chronic vestibular syndrome (CVS)
Auditory symptoms
Neurological symptoms
Family history
History taking
Normal or abnormal
Neurological and neuro-otological exam.
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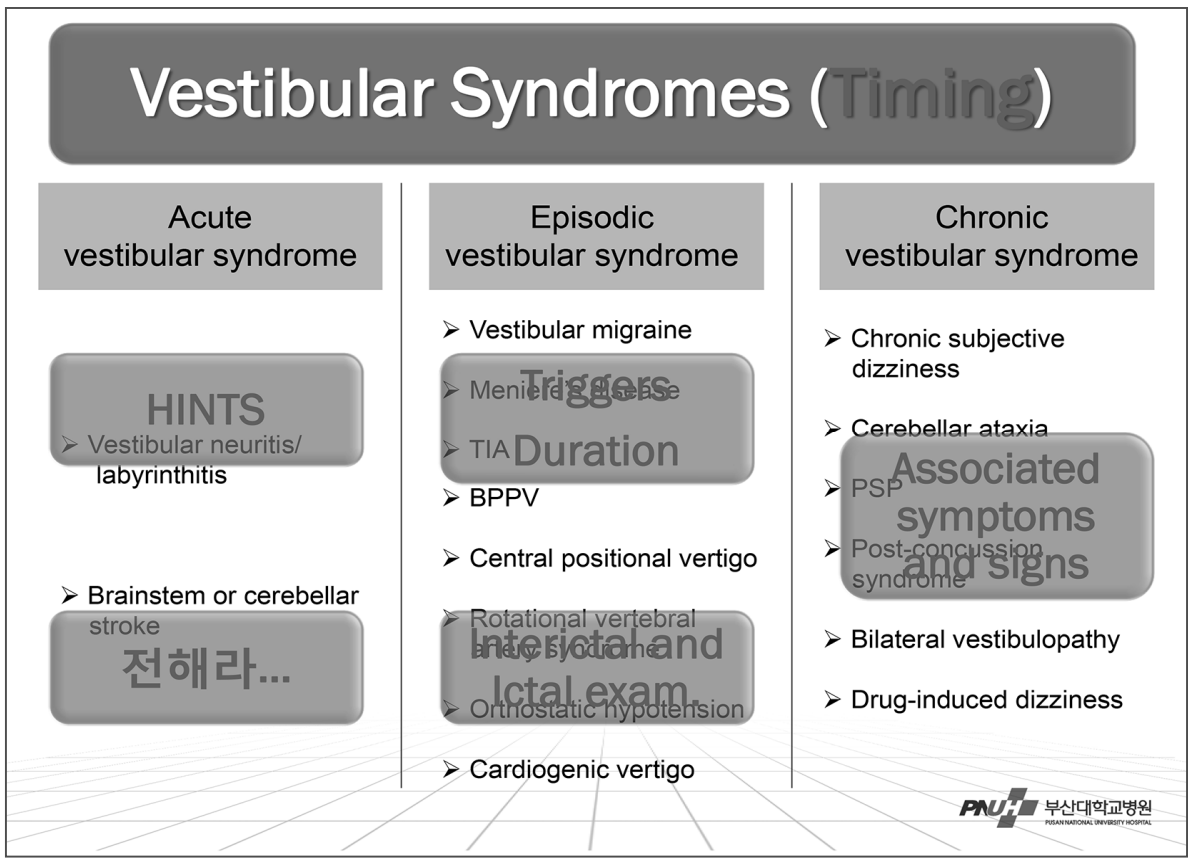
Vestibular Syndromes (Timing)
Acute vestibular syndrome
Episodic vestibular syndrome
Chronic vestibular syndrome
HINTS
Vestibular neuritis/ labyrinthitis
Brainstem or cerebellar stroke
전해라...
Vestibular migraine
Meniere's disease
TIA
BPPV
Central positional vertigo
Rotational vertebral artery syndrome
Orthostatic hypotension
Cardiogenic vertigo
Triggers
Duration
Interictal and Ictal exam.
Chronic subjective dizziness
Cerebellar ataxia
PSP
Post-concussion syndrome
Bilateral vestibulopathy
Drug-induced dizziness
Associated symptoms and signs
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