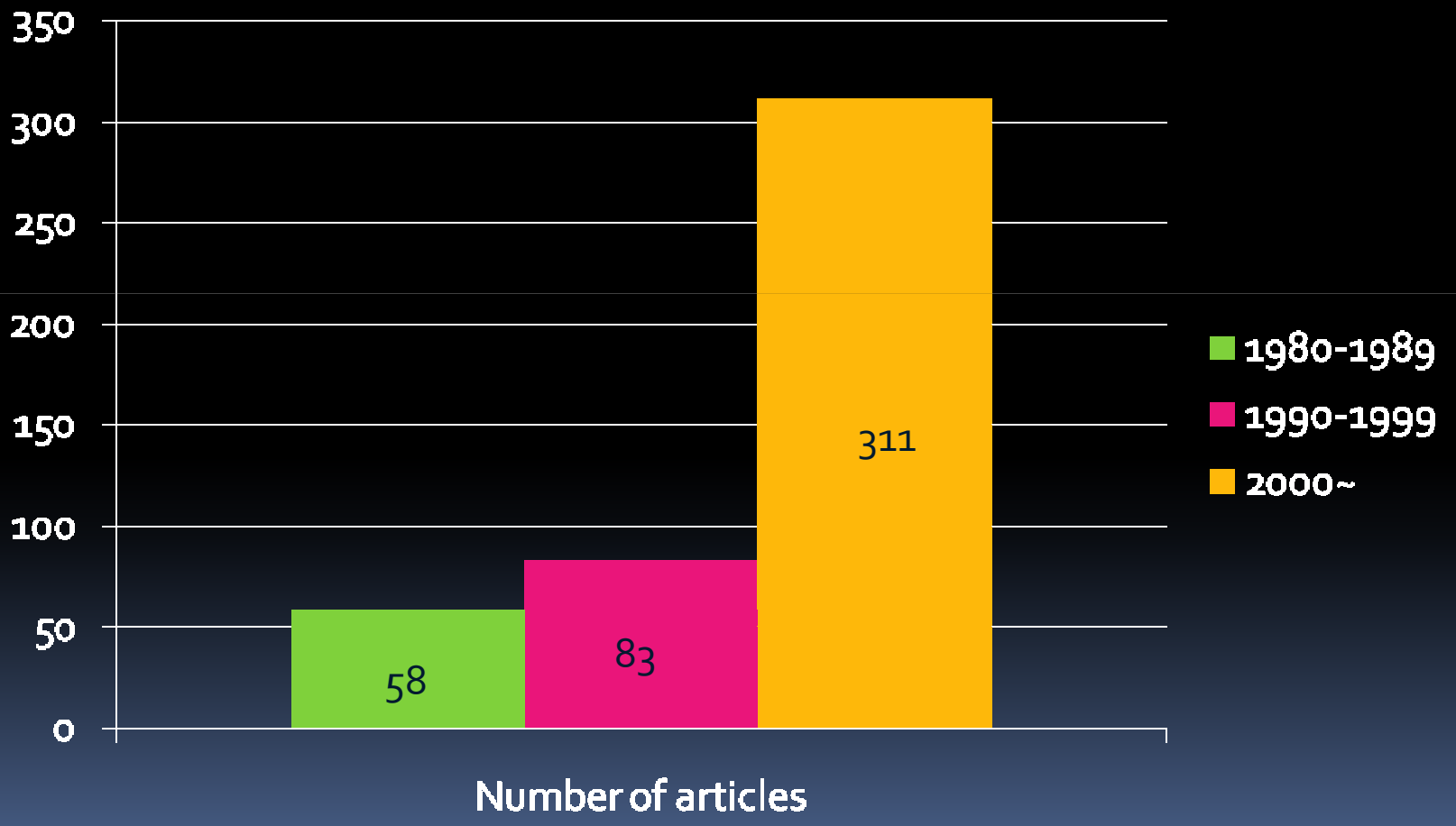
VERTIGO AND MIGRAINE

Tzu Chi General Hospital, Taichung Branch
Neurology
Tzu-Pu Chang

Revolution

- Physical therapy of BPPV
- Migraine

Keyword Search" Vertigo" And "Migraine" in *Pubmed.org*



Etiology of Vertigo

Benign paroxysmal positional vertigo	18.3%
Psychogenic dizziness	15.9%
Central vestibular vertigo	13.5%
Migraine	9.6%
Vestibular neuritis	7.9%
Meniere's disease	7.8%
Bilateral vestibulopathy	3.6%
Vestibular paroxysmia	2.9%
Perilymphatic fistula	0.4%
Various other disorders	12.3%
Unknown etiology	4.2%

Brandt T (n=4790 patients in 1989-2003)

- **Rotational vertigo:**
  - Migraine-associated vertigo might be NO. 2.
  - following BPPV
- **Chronic dizziness:**
  - Migraine-associated dizziness might be NO. 1.
  - much more than hypertension, orthostatic hypotension, anemia and other metabolic disorders

Migraine,

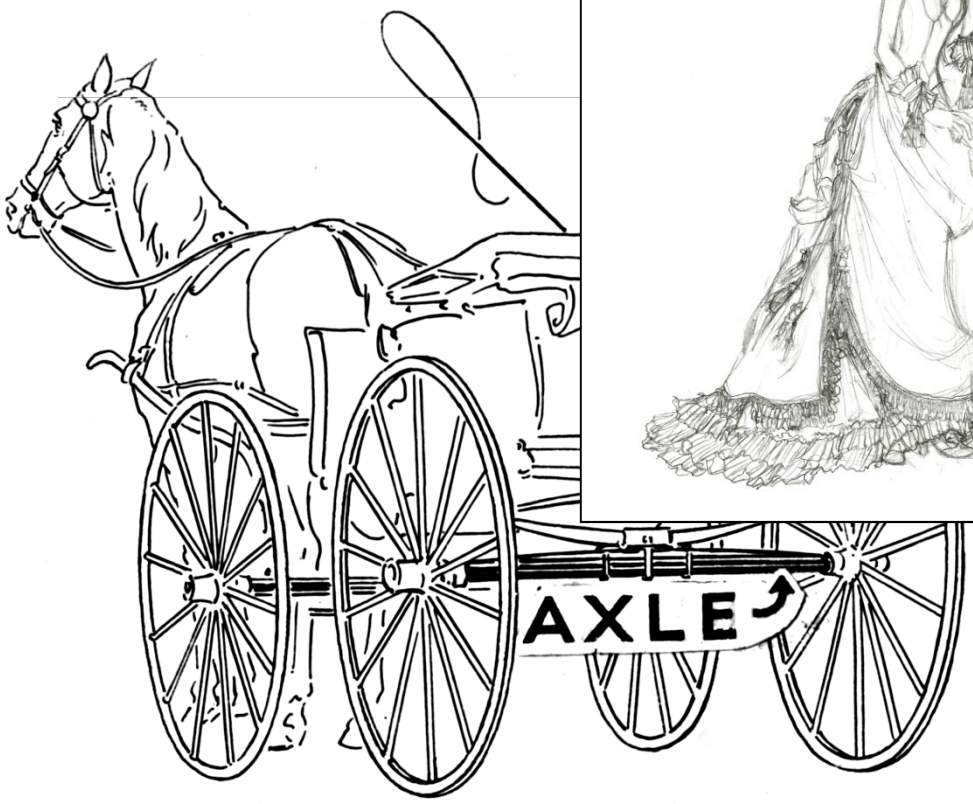
- Not only
- One of the most common headache disorder
- But Also
- One of the most common vestibular disorder

History

- *Almost as long as the history of vertigo*

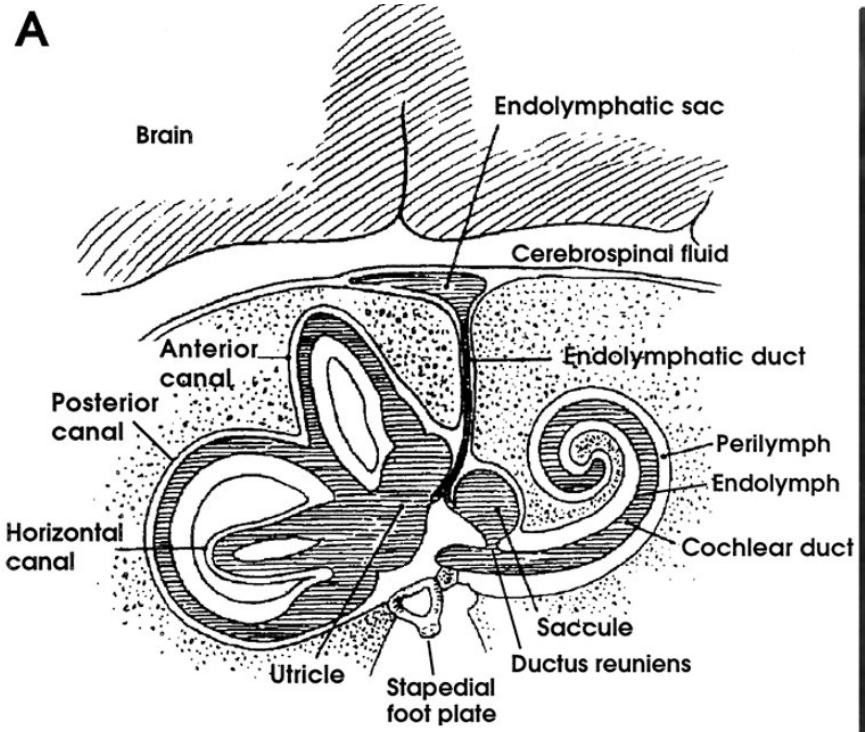
History – From Cerebral Congestion to Meniere's Disease

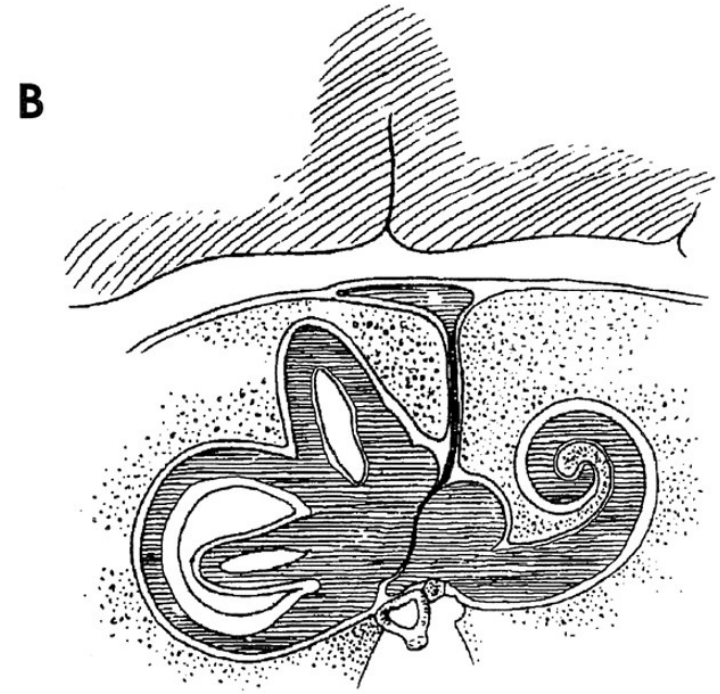
1861

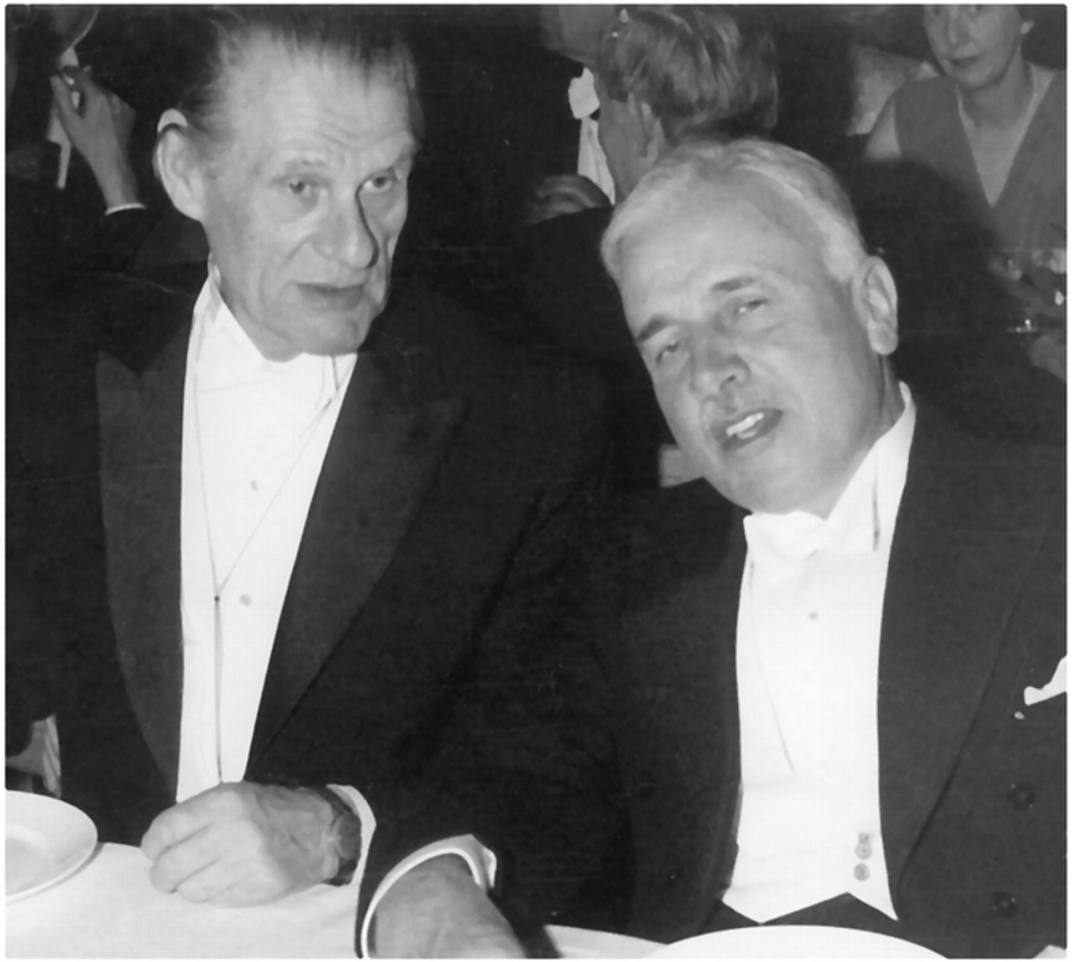


Prosper Ménière (1799-1862)

Ménière : Vertigo is related to migraine.







Charles Hallpike (1900-1979)

Yamakawa; Hallpike (1938):
endolymphatic hydrops

Meniere's Disease

TABLE I.
Diagnostic Scale of Ménière's Disease of American Academy of Otolaryngology–Head and Neck Surgery Committee on Hearing and Equilibrium.*

Certain Ménière's disease
Definitive Ménière's disease, plus histopathologic confirmation
Definitive Ménière's disease
Two or more episodes of vertigo of at least 20 minutes
Audiometrically documented hearing loss on at least one occasion
Tinnitus and aural fullness
Probable Ménière's disease
One definite episode of vertigo
Audiometrically documented hearing loss on at least one occasion
Tinnitus and aural fullness
Possible Ménière's disease
Episodic vertigo without documented hearing loss
Sensorineural hearing loss, fluctuating or fixed, with disequilibrium, but without definitive episodes

*In all cases, other causes must be excluded.

Recurrent Vertigo Without Hearing Loss:

Atypical Meniere's disease ?

Journal of Neurology, Neurosurgery, and Psychiatry, 1979, **42**, 363–367

Benign recurrent vertigo

ROBERT SLATER

From the Division of Neurology, Delaware County Hospital, and Department of Neurology, School of Medicine, University of Pennsylvania, USA

Atypical Meniere's disease  typical Meniere's disease

Family History: Typical Meniere's diease: rare
Atypical Meniere's disease: common

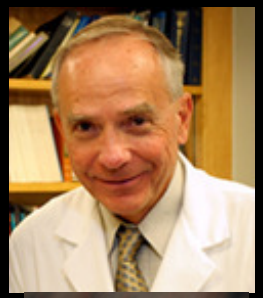
The disorder shows some features in common with migraine which include precipitation by alcohol, lack of sleep, emotional stress, female preponderance, and positive family histories. A similar vasospastic aetiology is thus suspected. Therapy with antimigrainous medication such as ergotamine or beta-adrenergic blockers may be worthy of clinical trials. Previous studies have also

Table *Summary of complaints and findings in seven patients*

Patient	*Age (yr)*	*Sex*	*Age at onset (yr)*	*Frequency*	*Duration*	*Tinnitus*	*Hearing loss*	*Clinical examination*		*Audiograms*	*Tone decay*	*Impedance audiometry*	*ENG*	*Calorics*	*Family history*	*Headaches*	*Precipitating factors*
								Spontaneous nystagmus	*Positional nystagmus*								
1	30	F	7	1/week	1/2–24 hr	Mild AU	—	—		Normal			SN Right	Normal	*Mother *Brother *Child	Frontal 1/2 months 1–2 hours unrelated to vertigo	Awakens from sleep with attacks
2	23	M	22	1/month	4 hr	Mild AU	—	—	—	Normal	—	Normal	PN DC	Normal	*Father	Unilateral severe paroxysmal unrelated to vertigo	
															(Father suffered attack of total blindness lasting 24 hr at age 49 yr)		
3	56	F	55	1/2 weeks	20 min	Mild AD	—	—		Normal		Normal	SN Right PN DC	Normal	—	Severe unilateral with scotoma when young	
4	33	M	23	3/year	24 hr	—	—	—	—	Normal			PN Left	Normal	—	Severe age 11–12 yr	Lack of sleep Alcohol Attacks always upon awakening
															ENG and audiograms performed at Temple University Hospital		
5	52	F	50	1/day for 3 wk followed by a 3 month remission and then a similar 3 week episode	1 min	Mild AD	—	—		Normal	—	Normal (EEG also normal)	SN Left PN DF Right	Normal	—	Loss of vision for a split second with attacks of vertigo	
6	39	F	35	1/2 years	2–3 days	Mild AU	—	—	—	Normal			SN Left	Normal	*Migraine only mother and two siblings	Pulsatile with nausea at times with vertigo	
															ENG and audiograms performed by Dr S. T. Westermun, Shrewsbury, New Jersey		
7	30	F	8	4/year	1–48 hr	—	—	—		Normal	—	Normal	SN Right	Normal	*Son age 10 *Migraine, mother, sister, brother	—	Emotional stress

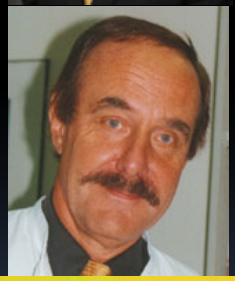
AU = both ears.
AD = right ear.
SN = spontaneous nystagmus.
PN = positional nystagmus.
DF = direction fixed nystagmus.
DC = direction changing nystagmus.
*Family history refers to attacks of recurrent vertigo unless otherwise indicated.

Robert Slater: benign recurrent vertigo (1979)



Robert Baloh: migraine-associated dizziness (1992)
familial benign recurrent vertigo (1994)

Joseph Furman: migraine-related vestibulopathy (1997)



Thomas Brandt: vestibular migraine (1999)

H. Neuhauser & T. Lampert: migrainous vertigo (2001)

- Migraine-associated vertigo (MAV)

= Migrainous vertigo

= Vestibular migraine

= Migraine-associated dizziness

= Migraine-related vertigo

= Migraine-related vestibulopathy

≈ Benign recurrent vertigo

Why

- *What is the link between recurrent vertigo/dizziness and migraine*

Existence of Vestibular Migraine

- Evidence
  - Epidemiology
  - Symptoms
  - Provoking factors
  - Response of treatment
  - Family history

Evidence 1: Epidemiology

- More Migraine in Dizziness Population
  - 38% of patients with dizziness have migraine.

- More Dizziness in Migraine Population
  - 56.5% of patients with migraine have dizziness.
  - 26.5% of patients with migraine have vertigo.

Neuhauser H 2001
Kayan A 1984

Evidence 2: Symptoms

- In some vertigo patients, vertigo is temporally associated with migrainous headache.
  - Before headache
  - During headache
  - After headache
- In many vertigo patients, vertigo is accompanied by migraine-associated symptoms
  - Photophobia
  - Phonophobia
  - Visual or other auras

Evidence 3: Provoking factors

- In many patients with vertigo, migraine precipitating factors induce vertigo attack.
  - Food
  - Sleep
  - Hormone change

Evidence 4: Response to drugs

- In many patients, their vertigo or dizziness are treated successfully by migraine prophylactic drugs.

Evidence 5:
Family History
Familial benign recurrent vertigo

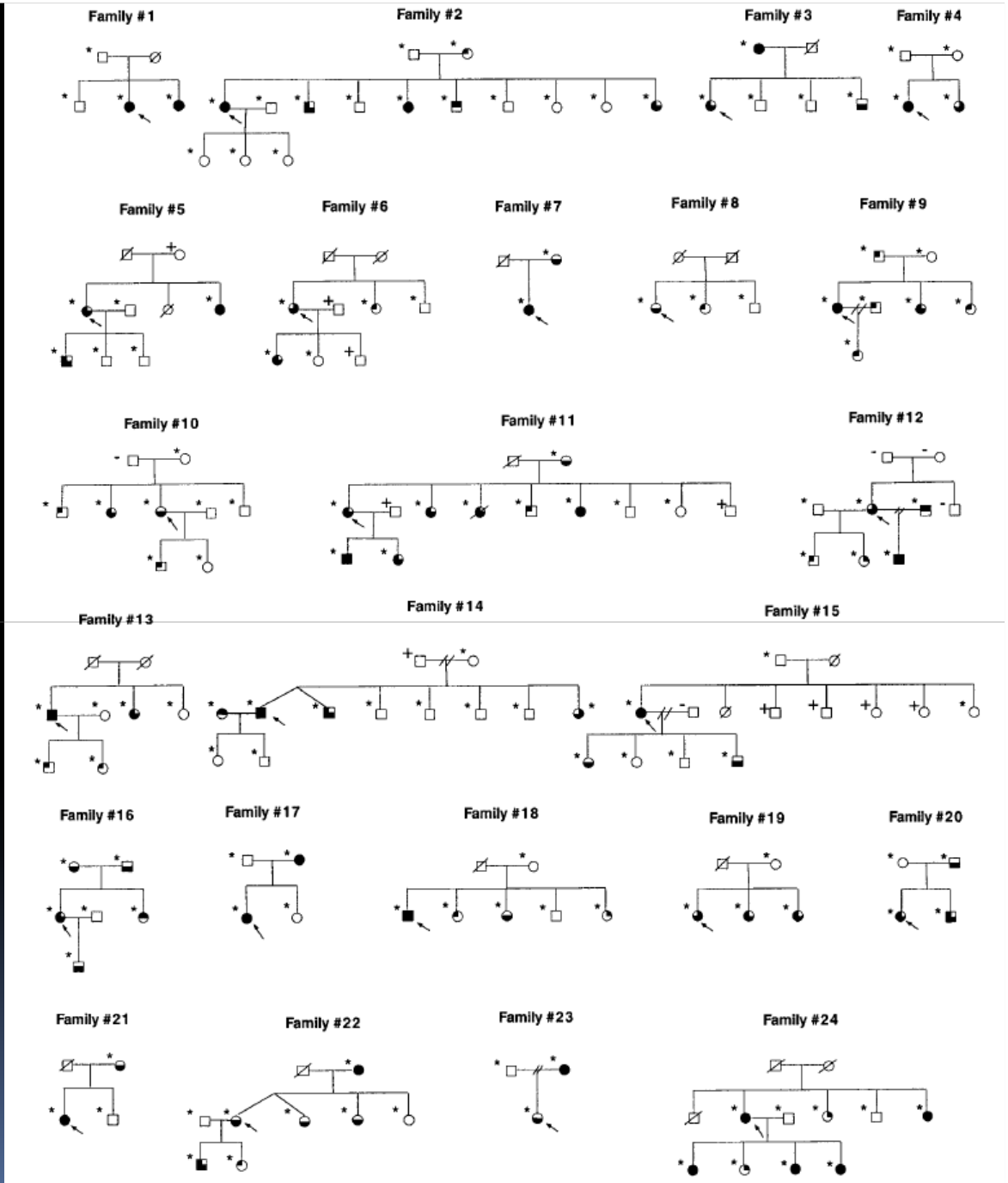


Fig. 1. Family pedigrees, first degree relatives only. □ ○, normal; ◧◔, migraine headaches; ◧◐, visual aura; ◒◒, episodic vertigo; ⧹, proband; *, questionnaire returned; +, questionnaire not returned; –, refused participation.

Oh AK 2001

Vertigo and Migraine

- 208 patients with recurrent spontaneous vertigo without auditory symptoms or neurological signs
  - 87% met IHS criteria of migraine
- Not co-incidence;
- Have causal relationship, or
- Share similar pathophysiology

Cha Y-H 2009

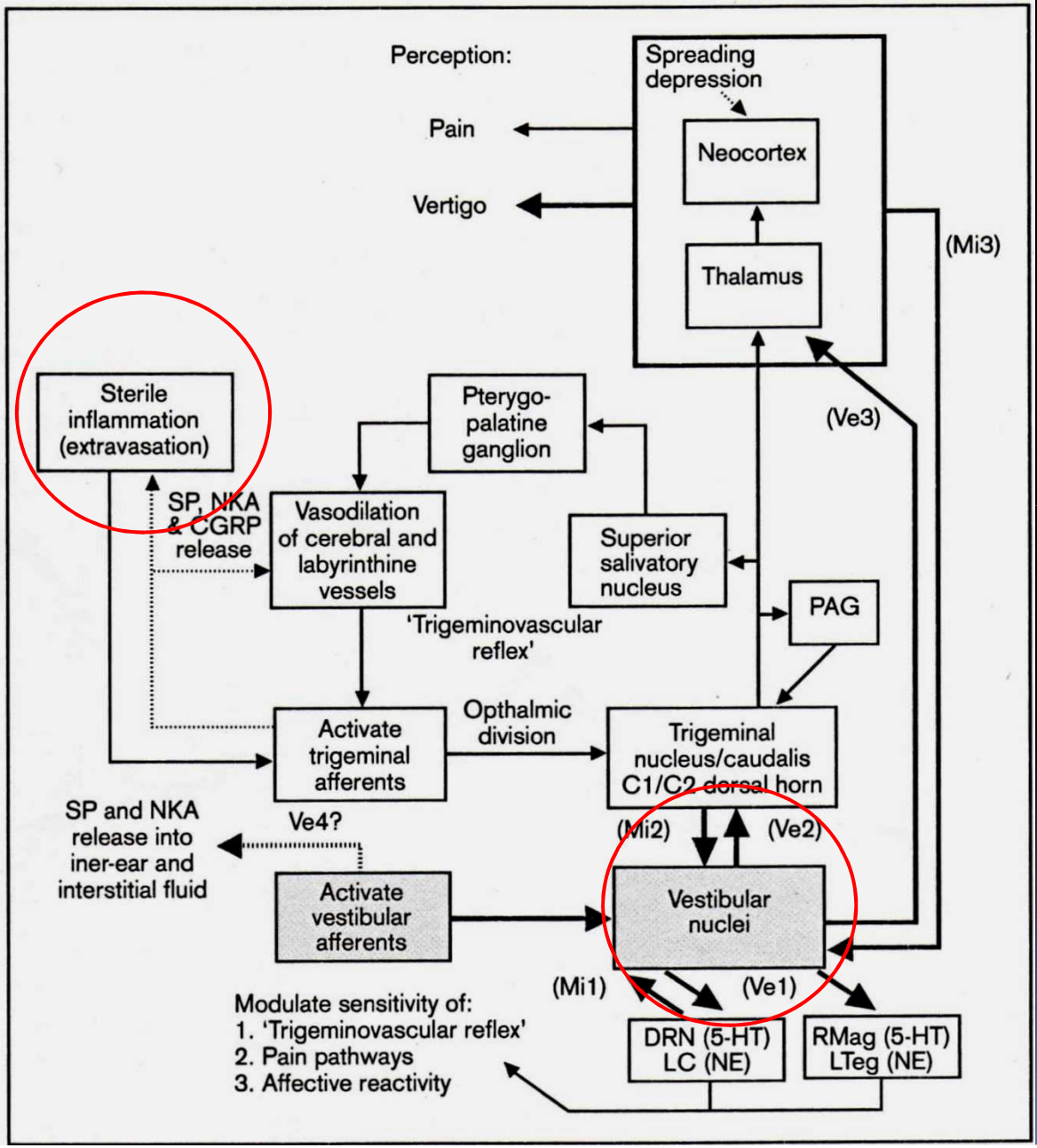
Pathophysiology of Vestibular Migraine

- Peripheral Theory
  - Vasospasm of labyrinthine artery
  - Release of neuropeptide in the inner ear
- Central Theory
  - Spreading depression to vestibular cortex, cerebellum or brainstem
  - Serotonin/Norepinephrine-related vestibular hyperexcitability
- Channelopathy

Cutrer FM 1992
Furman JM 2003

Figure 3. Schematic diagram of neurological linkages between migraine-related pathways (unshaded boxes, thin lines, and small arrowheads) and vestibular pathways (shaded boxes, thick lines, and bold arrowheads)

Solid lines indicate classical synaptic processing; dashed lines indicate local or distant effects via neuropeptide release. The vestibular nuclei may influence noradrenergic and serotonergic pathways (Ve1) that contribute to the triggering of migraine attacks and the modulation of pain pathways, information processing in the spinal trigeminal nucleus caudalis (Ve2) and thalamocortical mechanisms (Ve3). In addition, there is a hypothetical contribution (indicated by 'Ve4?') from peptide release from primary vestibulocochlear sensory terminals into inner-ear fluids during normal activation, which may act synergistically with trigeminal-associated peptide release at blood vessels. Conversely, migraine mechanisms may affect vestibular processing via monoaminergic pathways (Mi1), trigemino-vestibular connections (Mi2) and cortical mechanisms (Mi3). The likelihood that several of the hypothesized mechanisms are valid is supported by the various types of laboratory abnormalities (see Table 1) and various durations of symptoms (see Table 2) in patients with migraine-related dizziness. CGRP, calcitonin gene-related peptide; DRN, dorsal raphe nucleus; 5-HT, 5-hydroxytryptamine (serotonin); LC, locus coeruleus; LTeg, lateral tegmental noradrenergic neurons; NE, norepinephrine; NKA, neurokinin A; PAG, periaqueductal gray; RMag, nucleus raphe magnus; SP, substance P.



Furman JM 2003

Diagnosis

- *Clinical presentation is markedly variable.*
- *Associated symptoms/signs are important clues.*

Criteria – Definite Migrainous Vertigo

Neuhauser's criteria (2001)

- The diagnosis of **definite migrainous vertigo** was based on the following criteria:
  - 1. Episodic vestibular symptoms of at least moderate severity
    - Rotational vertigo,
    - Other illusory self or object motion,
    - Positional vertigo,
    - Head motion intolerance
  - 2. Migraine according to the IHS criteria
  - 3. At least one of the following migrainous symptoms during at least two vertiginous attacks:
    - Migrainous headache,
    - Photophobia,
    - Phonophobia,
    - Visual or other auras
  - 4. Other causes ruled out by appropriate investigations

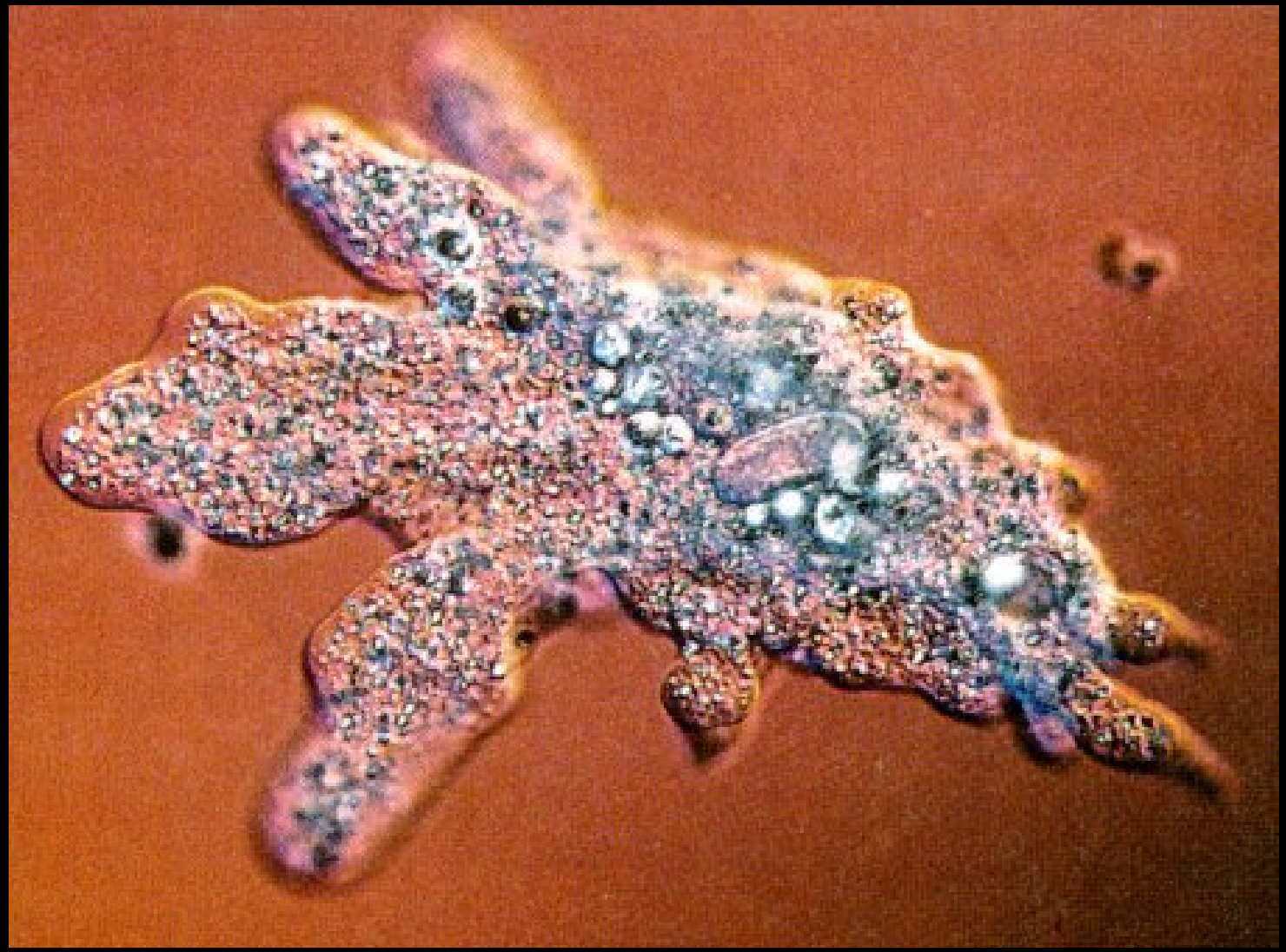
Neuhauser H 2001

Criteria – Probable Migrainous Vertigo

Neuhauser's criteria (2001)

- The diagnosis of **probable migrainous vertigo** was based on the following criteria:
  - 1. Episodic vestibular symptoms of at least moderate severity
  - 2. At least one of the following:
    - Migraine according to the criteria of the IHS;
    - Migrainous symptoms during vertigo;
    - Migraine-specific precipitants of vertigo,
      - specific foods,
      - sleep irregularities,
      - hormonal changes;
    - Response to antimigraine drugs
  - 3. Other causes ruled out by appropriate investigations

Neuhauser H 2001



Traditional Diagnosis of Vertigo

Nature of Dizziness
Vertigo?
Nonvertiginous dizziness?

Duration/frequency
of vertigo

Associated symptoms
Auditory?
Neurological?

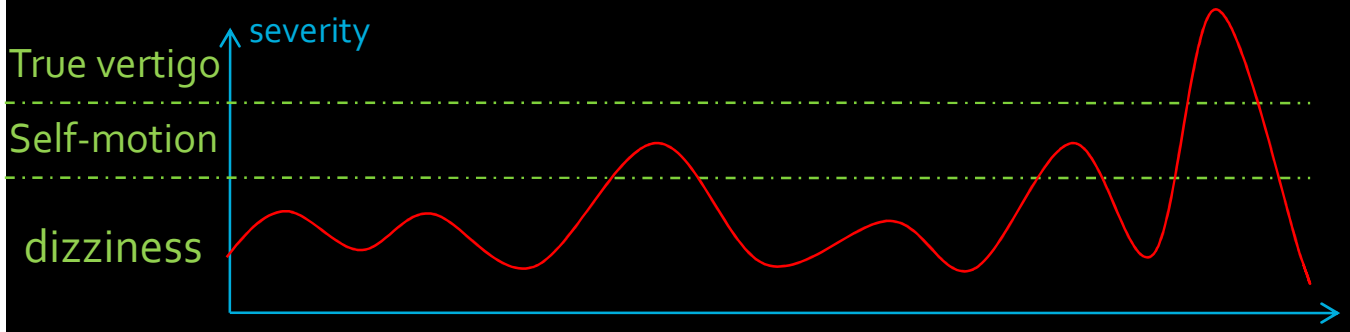
NE/oculography
Peripheral-type vertigo
Central-type vertigo

Dizziness or Vertigo

- Vertigo
  - Benign paroxysmal positional vertigo (BPPV)
  - Vestibular neuritis
  - Meniere's disease
- Dizziness
  - Orthostatic hypotension
  - Arrhythmia-induced dizziness
  - Psychogenic dizziness

Dizziness or Vertigo

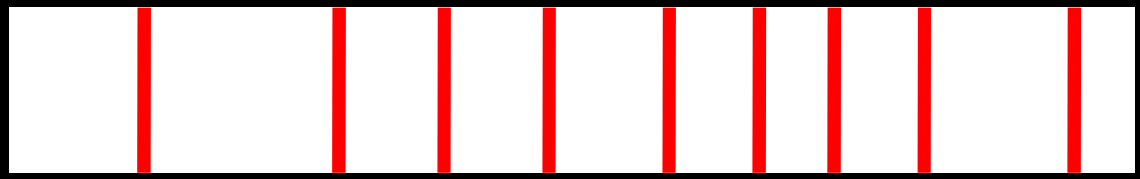
- The presentation of migrainous vertigo is markedly variable:
  - Episodic vertigo
  - Episodic lightheadedness
  - Motion sensitivity
  - Constant disequilibrium



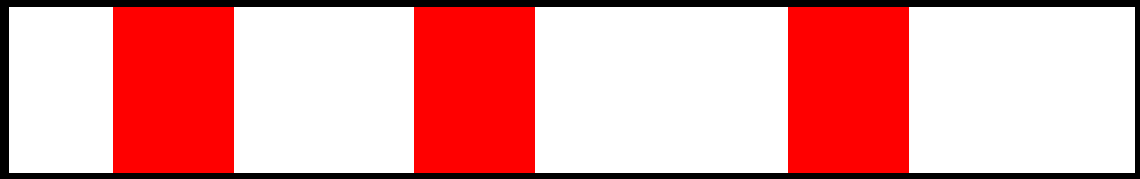
Reploeg MD 2002
Cass SP 1997

Duration of Attacks

Vestibular neuritis: days to weeks



BPPV: seconds



Meniere's disease: hours

Duration of Attacks

- The duration of migrainous vertigo is markedly variable:

Source	Number of Cases	% Lasting Seconds	% Lasting Minutes	% Lasting Hours	% Lasting Days
Cutrer, 1992	84	7.1	31	13.1	48.8
Cass, 1997	100	11	33	35	21
Johnson, 1998	89	25 (1 sec–5 min)	16 (5–60 min)	33	26
Dieterich, 1999	90	10	33	39	18
Neuhauser, 2001	33	18 (1 sec–5 min)	33 (5–60 min)	21	27
Reploeg, 2002	60	2	25	24	49
Neuhauser, 2006	33	25	44	28	3

Referenced from the presentation of YC Chen in 2009

Peripheral-type or Central-type

- Peripheral type
  - Unidirectional horizontal nystagmus (with some rotatory component)
    - Vestibular neuritis
    - Meniere's disease
- Central type
  - Multi-directional nystagmus
  - Vertical nystagmus
    - Cerebellar stroke

Peripheral-type or Central-type

- The oculographic findings of migrainous vertigo is markedly variable:
  - Central vestibular dysfunction: 50%
  - Peripheral vestibular dysfunction: 15%
  - Undetermined: 35% (combined or no nystagmus)

M von Brevern 2005

Associated Symptoms (1)

- Auditory symptoms
  - Most: none
  - If tinnitus exists, it is often bilateral
  - Mild fluctuating sensorineural hearing loss: acceptable, but is never progressive
- Neurological symptoms
  - Most: none
  - Rare: basilar-type migraine

Battista RA 2004

Associated Symptoms (2)

- Headache

?

- The Neuhauser's criteria should be incorporated in ICHD-III.
- The name, "vestibular migraine" is better than "migrainous vertigo".

Vertigo Specialist

Barany Society Conference, 2010

Not Necessary!

… if we regard vertiginous symptoms as just one more manifestation of migraine, then it follows logically that no specific subcategory of migraine is needed. ..

Headache Specialist

Olesen 2005 *(Letters to the editor)*

Is It a Problem ?

Vomiting is Seen in Migraine Attack

Migraine is a Cause of Vomiting

We Need a New Diagnosis: Migrainous Vomiting?

Why Don't We Divide Migraine as:
Migraine with Vomiting
Migraine without Vomiting
…… ?

Referenced from the presentation of YC Chen in 2009

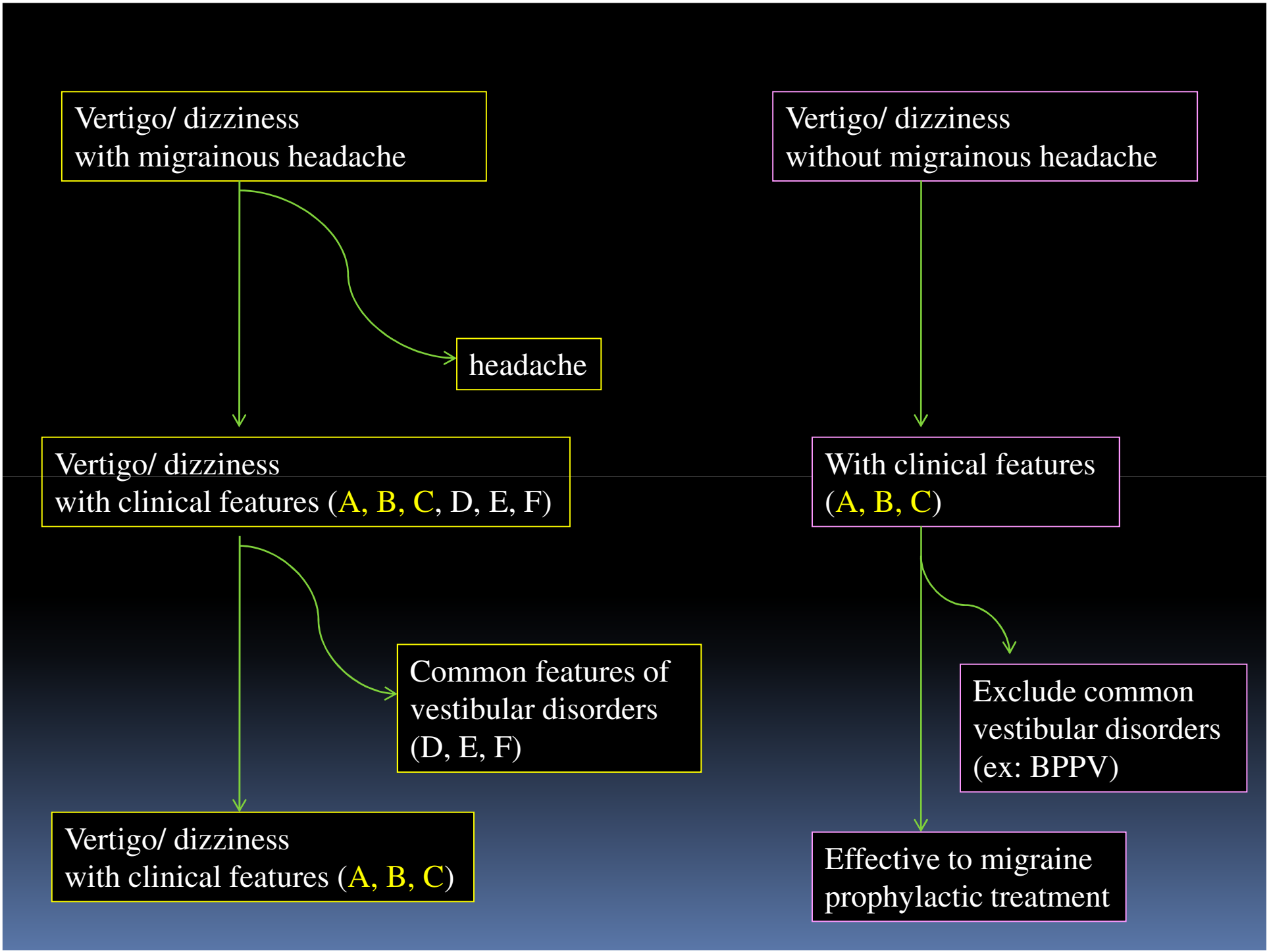
Probable migrainous vertigo: No value

Vertigo: No temporal association with migrainous headache = No logical links

Headache Specialist

Debates: Probable Migrainous Vertigo

- However, in the dizziness clinic, the value of probable migrainous vertigo is more important than definite migrainous vertigo.
- Numerous patients who were previously considered as nonspecific dizziness have been treated successfully by migraine prevention medication.


Vertigo/ dizziness
with migrainous headache
headache
Vertigo/ dizziness
with clinical features (A, B, C, D, E, F)
Common features of
vestibular disorders
(D, E, F)
Vertigo/ dizziness
with clinical features (A, B, C)
Vertigo/ dizziness
without migrainous headache
With clinical features
(A, B, C)
Exclude common
vestibular disorders
(ex: BPPV)
Effective to migraine
prophylactic treatment

Clinical Features of Vestibular Migraine

- Symptoms
  - Fluctuating dizziness and recurrent vertigo both exist.
    - Misdiagnosis: peripheral-type vertigo
  - Motion sensitivity (all direction)
  - Nausea in motion, even no vertigo
  - Bilateral tinnitus without progressive hearing loss
    - Misdiagnosis: Meniere's disease
  - Eye soreness/heaviness
    - Ophthalmology OPD: ?
  - Transient blurred vision/ Visual vertigo
  - Neck/shoulder soreness (fibromyalgia in some patients)
    - Misdiagnosis: cervical vertigo

Clinical Features of Vestibular Migraine

- Provoking factors
  - Sensation-induced dizziness
    - Sound/ light/ odor/ wind flow
  - Hunger-induced dizziness
    - Misdiagnosis: hypoglycemia
  - Insomnia/ many dreams/ sleep deprivation-induced dizziness
  - Anxiety/stress-induced dizziness
    - Misdiagnosis: psychogenic dizziness
  - Menstrual dizziness
    - Misdiagnosis: anemia
  - Postmenopausal dizziness
    - Postmenopausal syndrome

Clinical Features of Vestibular Migraine

- Other History
  - History of motion sickness (often since childhood) (70%)
  - History of recurrent dizziness/vertigo during childhood (benign paroxysmal vertigo of childhood)
  - Family history of migraine or recurrent vertigo

Migraine-Associated Vertigo Forums

www.mvertigo.org - a forum and information site for sufferers of migraine-associated vertigo (MAV)

Migraine-associated vertigo (MAV) is a syndrome consisting of dizziness and/or vertigo that is suspected to be related to migraine. Many patients diagnosed with MAV do not have headaches, or have chronic non-specific headaches that don't fit into the migraine classification developed by the International Headache Society.

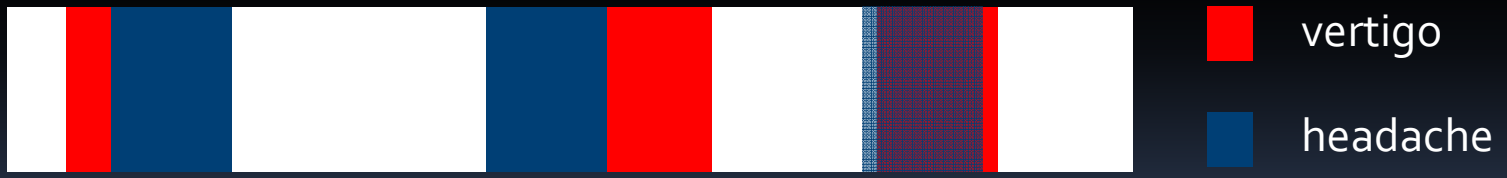
The cause of this condition is unknown but progress is being made through clinical experience and genetic research. This condition was previously rarely diagnosed, but is now proving to be one of the most common causes of chronic dizziness and/or recurrent vertigo.

……

MAV is often misdiagnosed as Meniere's Disease, Vestibular Neuritis or as a psychiatric disorder. A condition previously described, known as "atypical Meniere's" is no longer recognised and is believed to be a migrainous vertigo syndrome.
This site is being updated regularly with new articles, information and forum posts. Please check back regularly.

MAV Patient's Experience

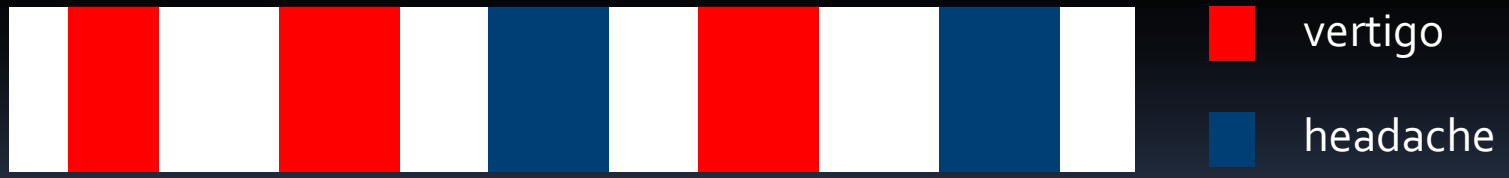
- MAV – Type 1
  - Distinct vertigo attacks (minutes to hours)
  - Sensory hypersensitivity (light, sound,…)
  - Maybe bilateral tinnitus
  - Accompanied by headache



MAV Survival Guide
MAV Forum. *www.mvertigo.org*

MAV Patient's Experience

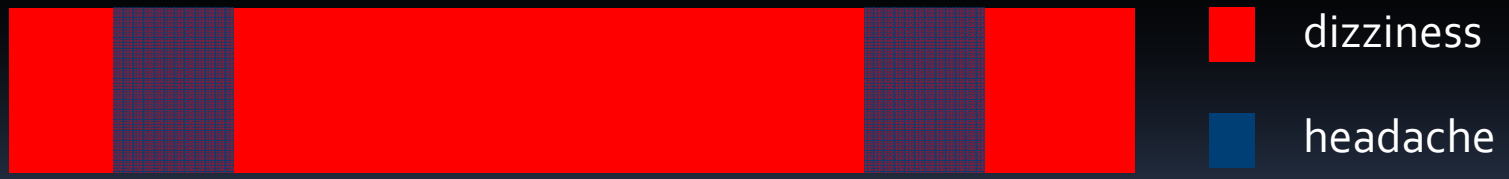
- MAV – Type 2
  - Distinct vertigo attacks (minutes to hours)
  - Sensory hypersensitivity (light, sound,…)
  - Maybe bilateral tinnitus
  - Vertigo attacks in headache-free period



MAV Survival Guide
MAV Forum. *www.mvertigo.org*

MAV Patient's Experience

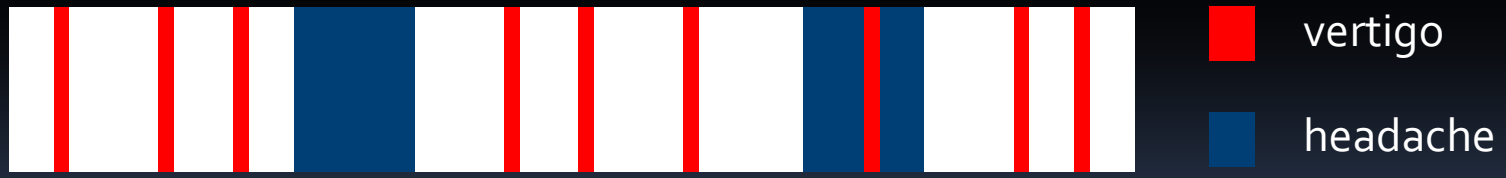
- MAV – Type 3
  - Chronic dizziness (brain fog, de-realization, tired)
  - Chronic disequilibrium (floating, swimming, drunken)



MAV Survival Guide
MAV Forum. *www.mvertigo.org*

MAV Patient's Experience

- MAV – Type 4
  - Brief vertigo or dizziness (seconds)
  - Posture change - induced
  - No BPPV nystagmus in positional test
  - Motion sensitivity



MAV Survival Guide
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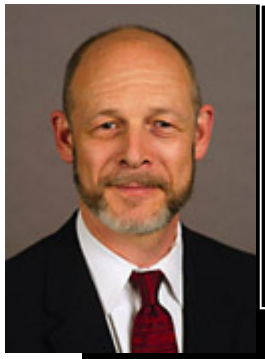


Steven D. Rauch, MD (Professor of Otology & Laryngology, Harvard Medical School) from Massachusetts Eye & Ear Infirmary, USA,

The Expert's Comments

- In the modern conception, migraine is not just a headache. Migraine is a global disturbance of sensory signal processing.
- By this I mean that sensory information –- sensations –- are distorted and/or intensified.
- It may be predominantly headache, with or without visual aura, at some time, but may become more of a vestibular disturbance or other part of the spectrum at other times.

Steven D. Rauch, MD (Professor of Otology & Laryngology, Harvard Medical School) from Massachusetts Eye & Ear Infirmary, USA,

The Expert's Treatment

- Regular schedule – Every day should look like every other day.
- General medical "tune-up"
- Migraine diet
- Drug:
  - Nortriptyline (30-50 mg/day)

Dr Timothy Hain
(Professor of Neurology, Otolaryngology and Physical Therapy, Northwestern University Medical School

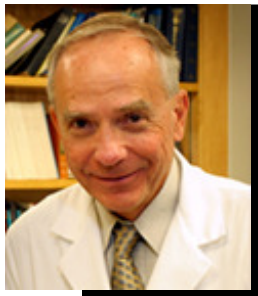
The Expert's Comments

- Migraine simply causes far more vertigo than any other condition.
- Prevalence of MAV in general population:
  - 13% x 50% = 6.5% (- 13% x 17% = 4.4%)
  - Prevalence of Meniere's disease = 0.2%
- In our practice in Chicago, we encounter many persons who are extremely motion sensitive, have visual sensitivity, and sound sensitivity, lasting months ! Even with few headache, these persons usually respond to migraine prevention medication.

Dr Timothy Hain
(Professor of Neurology, Otolaryngology and Physical Therapy, Northwestern University Medical School

The Expert's Treatment

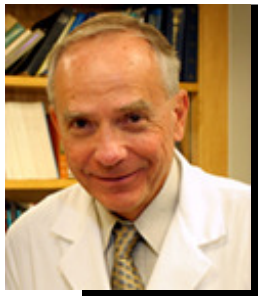
- Verapamil
  - Very effective – 75%
  - 120-240mg
  - Two weeks to work
- Venlafaxine (Efexor)
  - Very effective – 80%
  - Start with 12.5mg, increase slowly to maximum of 75mg
  - One month to work
- Topiramate (Topamax)
  - Very effective – 75%
  - Start with 25mg, increase weekly (<150mg)
  - One month to work



Robert W. Baloh
(Professor of
Neurology, UCLA)

The Expert's Comments

- Migraine is not just a headache. Headache is the most common symptom but only one of many symptoms. Vertigo is the second most common symptom.
- It is one of the mysteries of migraine that headache and dizziness do not occur together.
- Most patients who have been told they have Meniere's in fact have MAV. ENTs tend to think that recurrent vertigo is Meniere's because that's all they tend to know about in this case. MAV is by far much more common than MD.



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The Expert's Treatment

- Citalopram
- Acetazolamide

2011 嘉基 眩暈及內耳生理檢查研討會

台灣耳鼻喉科醫學會
台灣聽語學會
教育學分申請中

時間：2011 年 6 月 11 日 (星期六)

主辦單位：戴德森醫療財團法人嘉義基督教醫院
協辦單位：台灣耳鼻喉科醫學會、台灣聽語學會、嘉義市聽力師公會

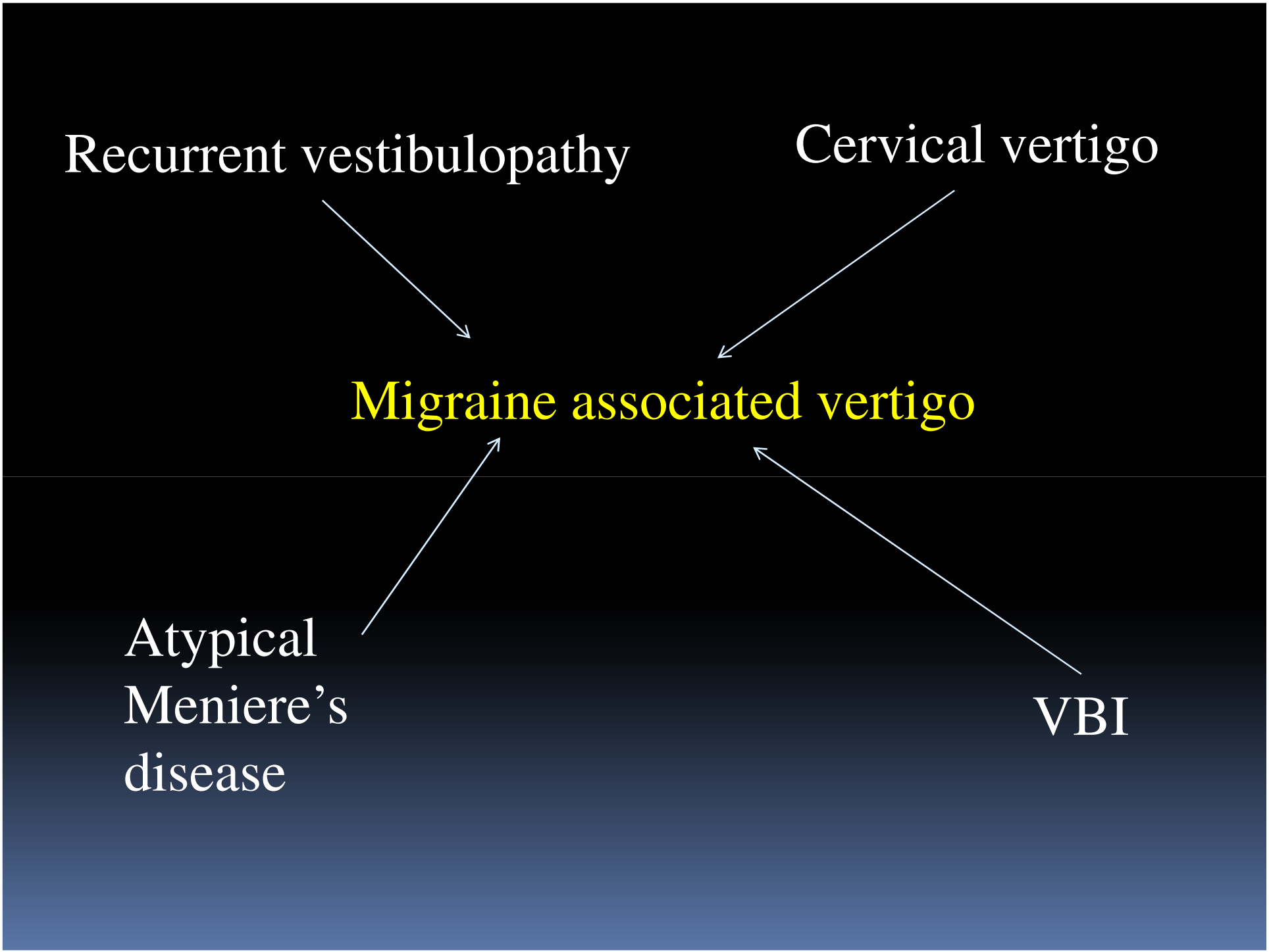
ENT's Debates in Vestibular Conference

- Dr. Lai: What is the most common vertigo in ENT OPD?
- 長庚：Atypical Meniere's disease
- 北榮：Recurrent vestibulopathy (viral infection)
- 三總：VBI
- 中國：cervical vertigo (spondylosis-related)

ENT's Debates in Vestibular Conference

- Dr. Yang: Vertebro-basilar insufficiency (80%)

節錄~
基底動脈循環不全症：佔眩暈症百分之八十……年輕人多因椎基底動脈痙攣引起眩暈，常伴有頭痛


Recurrent vestibulopathy
Cervical vertigo
Migraine associated vertigo
Atypical Meniere's disease
VBI

ENT's Debates in Vestibular Conference

- 持續吃藥三個月 vs 改善就停藥 (debates for many years)

- Central compensation: a process of CNS that involves rebalancing the peripheral vestibular loss

TEXTBOOK:

- Drugs may impair central compensation
- Stop the drugs and perform vestibular rehabilitation as early as possible

Furman JM 2003

ENT's Debates in Vestibular Conference

- Yang's Theory: 要持續服藥三個月，因爲中樞代償須三個月
- Many ENT doctors disagree because it is not standard treatment in textbook.
- However, numerous patients get better under this treatment strategy.

???

ENT's Debates in Vestibular Conference

- Neurologist's view:
  - Flunarizine (sibelium) x 3 months
  - Not to treat peripheral vestibulopathy
  - This is migraine prophylactic treatment !