Central Vertigo

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Definition

- Central vertigo is vertigo caused by a disturbance of brain
- Central vertigo is NOT vertigo where examiner doesn't recognize the ENG pattern. (This is undiagnosed vertigo)

Central dizziness/vertigo is rare

- About 5% of all vertigo
- About 25% of vertigo seen by neurologists

There are many localizations and causes for Central Dizziness

- Brainstem
- Cerebellum
- Basal ganglia
- Cortex
- Neck
- Unknown

- Migraine
- Vascular
- Degenerative
- Seizure
- Developmental
- Toxic
- Paraneoplastic
- Unclear

Migraine causes most central vertigo !

Case (patient DA)

- 43 y.o. F, episodes of dizziness for 5 years
- Attacks begin with headache, nausea, dizziness, and severe ear pain.
- About 3/month, lasting 2-3 days.
- Severe motion intolerance

Case Study (patient DA)

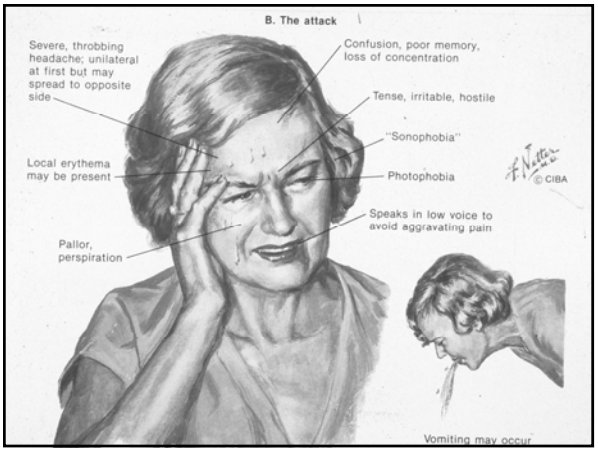
- Tinnitus in both ears
- Denies hearing loss
- Physical exam normal
- Audiogram, 3 caloric tests, MRI of brain normal

Headaches are common

- 90% lifetime prevalence
- 25% annually report recurrent episodes of severe headache
- 4% daily or near-daily headache
- Medications used by 9% of US adults each week to treat headaches

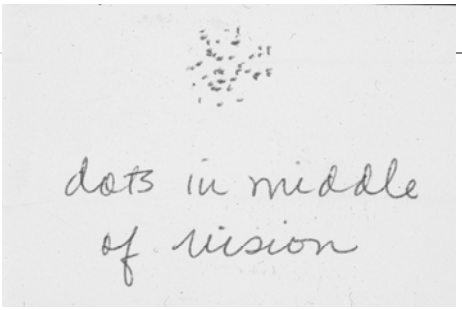
Migraine

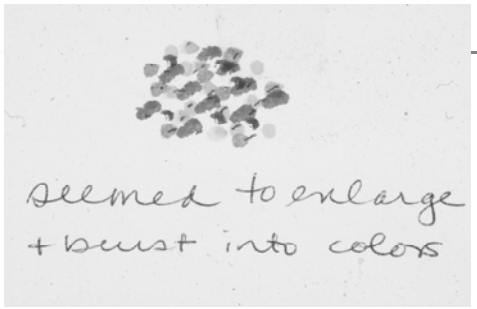
- Most common headache, about 10% of entire population (Stewart, 1992)
- 20-30% of women of childbearing age have migraine
- 90% of "sinus" headaches meet criteria for migraine diagnosis.

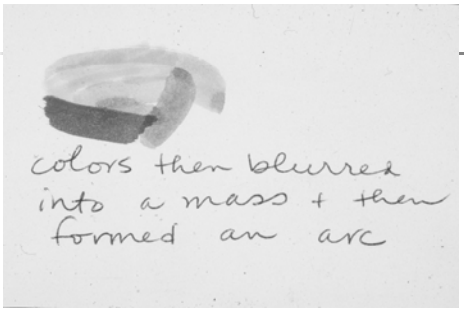


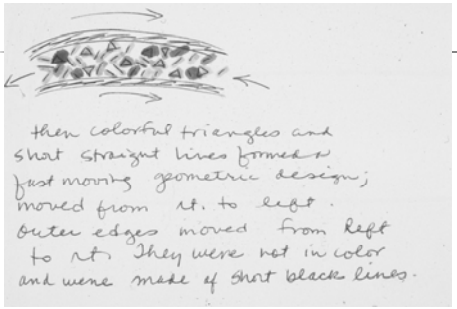
Migraine Variants

- Common migraine (just headache)
- Classic migraine (with aura)









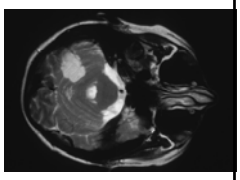
Migraine Variants

- Acephalgic migraine: Aura without headache (a tough call).
- Usual story is transformation of headache with aura into aura alone.
- About 1% of migraine population*

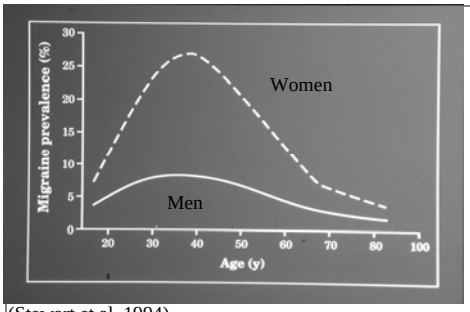
*Kayan/Hood, 1984; Selby/Lance, 1960
Kuritzky, et al, 1981

Migraine Variants

- Complicated migraine is accompanied by a neurological deficit.
  - About 1% of migraine patients
  - About 25% of patients with migraine have "small vessel disease" on MRI.
  - Prevention is important here



Prevalence of Migraine



(Stewart et al, 1994)

Migraine in Women

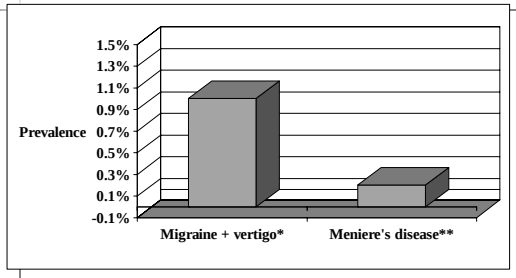
- 3:1 ratio of women:men.
- Peak age is 30-45.
- 10:1 increase in frequency of migraine around time of menses.
- Attributed to fluctuations in estrogen level. Can treat by eliminating fluctuations (often BC pills).
- Usually stops while pregnant
- Often flares for a few years near menopause

Migraine & Vertigo (MAV): Prevalence

- Migraine:
  - 10% of U.S. pop[1]
  - 20-30% of women childbearing age
- Vertigo: 35% of migraine population.[2]
- Migraine + vertigo:
  - ~ 3.5% of U.S. pop.
  - ~ 10% of women of childbearing age
- 1% of German population has MAV[3]

1. Lipton and Stewart 1993; Stewart et al, 1994
2. Kayan/Hood, 1984; Selby/Lance, 1960; Kuritzky, et al, 1981
3. Neuhauser, H. K., A. Radtke, M. von Brevern, et al. 2006.

There is 5 times more migrainous vertigo than there is Meniere's disease !



* Neuhauser, H. K., A. Radtke, M. von Brevern, et al. 2006. (1%)

**Waserman et al., 1984 (0.2% prevalence of Menieres)

Headache (HA) and dizziness not have to occur at same time in MAV.

- Cutrer/Baloh (1992)
  - 5% (5/91): vertigo time-locked to HA
  - 25%: vertigo always independent of HA
- Johnson (1998): 91% (81/89) vertigo independent of HA

Migraine is often accompanied by strong motion sensitivity

Percent of migraine patients with motion sickness

	Group	Authors
49%	Children	Bille (1962)
45%	Children (60)	Barabas et al (1983)
50.7%	Unselected	Kayan and Hood (1984)

10% normals have motion sensitivity

Even intermittent headache is not necessary to diagnose migraine

MAV without headache is very rare

- Migraine aura without headache:
  1% of migraine population*.
- Migraine associated vertigo (1% in general **, about 2% women child bearing age)
- Migraine aura without headache + vertigo: 0.01% of population, 0.02% women childbearing age.

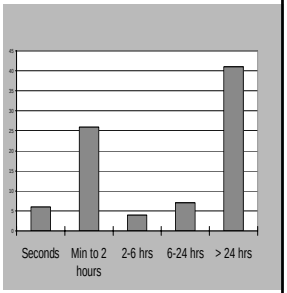
*Kayan/Hood, 1984; Selby/Lance, 1960, Kuritzky, et al, 1981, ** Neuhauser, 2006

Migraine variants with vertigo but without headache

- Benign Positional Vertigo of Childhood (BPV)
- Cyclic vomiting syndrome – periodic vomiting for several days.
- "Vestibular" Menieres ?

MAV symptoms may last for days (or even months)

- Cutrer and Baloh, 1992 : Bimodal distribution
- 31% min-2 hrs
- 49% longer than 24 hours



Diagnosis of MAV is Based on Clinical judgment

- Headaches and dizziness
- Lack of alternative explanation (normal otological exam, neurological exam, CT)
- High index of suspicion in women of childbearing age. Perimenstrual pattern.
- Family history in 50%
- Response to prophylactic medication or a triptan

ENG findings in Migraine

- Should be normal
- Migraine is not a disease of the inner ear
- When you have a normal ENG, in woman of childbearing-age with headache --

Brainstem disorders

- Brainstem contains cranial nerves and connects the cortex and spinal cord
- Typified by a mixture of lower motor cranial nerve problems (e.g. diplopia), and vertigo
- Strokes, tumors and denegerative disorders are main causes

Common Strokes with Dizziness

- PICA (lateral medullary and cerebellum)
- AICA (pons and cerebellum)
- Basilar artery

Cerebellar Strokes

- Basilar artery
- AICA
- PICA

Brainstem

Posterior Inferior Cerebellar Artery (PICA) Wallenberg's Syndrome Lateral Medullary Syndrome

- Adolf Wallenberg

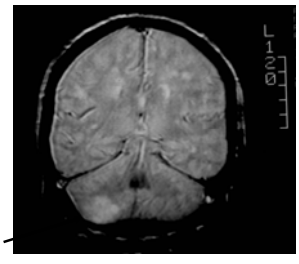
German internist, born November 10, 1862, Preuss.-Stargard. died 1949.

Posterior Inferior Cerebellar Artery (PICA) Wallenberg's Syndrome\ Lateral Medullary Syndrome

- PICA territory (often from vertebral artery)
- Supplies lateral 50% of medulla and inferior 1/3 cerebellum

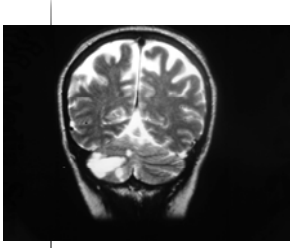
PICA syndrome Lateral Medullary Syndrome

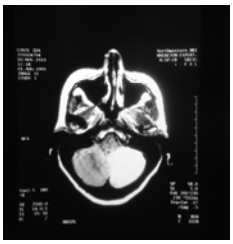
- Ipsilateral cerebellar signs
- Vertigo (vestibular nucleus)
- Contralateral pain and temp (STT)
- Dysphagia/Dysphonia (Nucleus ambig)
- Ptosis/Miosis



Case (IC)

- Onset of dizziness 1 week ago
- Unable to walk
- Diabetes and new onset a-fib
- Exam:
  - Ataxic but intact VOR
  - No spontaneous nystagmus
  - Neuropathy



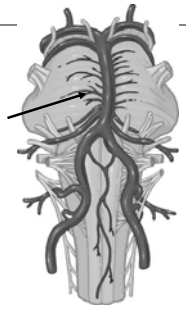


Basilar Artery syndrome (C.A.)

A 44 year old woman was involved in a rear end collision. She had a whiplash injury, and apparently the vertebral arteries in the neck were contused. Several days after the accident she became comatose, and studies suggested complete occlusion of the basilar artery.

Cerebellar infarct

Basilar artery



Basilar artery case findings (1991 vs. 2001)

- Unsteady Gait — Same
- Finger to nose ataxia — Same
- Nystagmus (eyes moving involuntarily) — Same

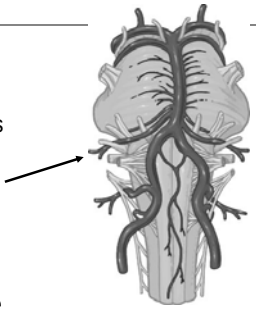
Basilar artery strokes are often fatal.

Common features of cerebellar gait ataxia

- Severe impairment of balance (worse than sensory balance disorders)
- Wide based gait
- Often refractory to treatment and time

Anterior inferior cerebellar artery Case

- Woman with diabetes, obesity, hypertension suddenly becomes dizzy, and develops facial weakness in swimming pool.
- Brought into hospital and CT scan shows stroke in mid-pons.



Anterior inferior cerebellar artery AICA syndrome

- AICA supplies pons, cerebellum, 8th nerve
- Facial weakness
- Vertigo/hearing loss
- Incoordination

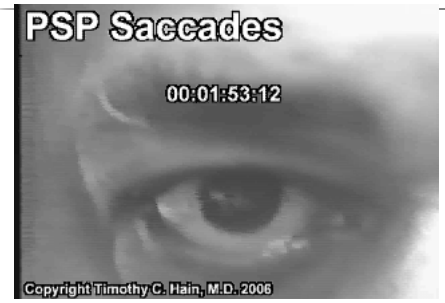
Degenerative brainstem disorders

- Tau-opathies
  - PSP – progressive supranuclear palsy
  - MSA – multisystem atrophy
- About 4/100K prevalence
- Present with falls
- Diagnosed with bedside exam or ENG

PSP – case example

- 55 year old AA man begins to fall
- Over several years frequency increases to daily
- On exam, he is ataxic and has slow saccades

Slow saccades of PSP



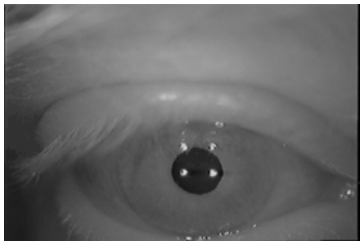
Cerebellar disorders

- Cerebellum is coordination center
- Typified by profound unsteadiness, uncoordinated limb movements, normal power.

Bedside findings

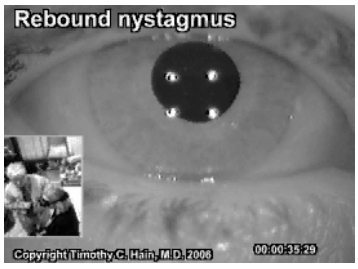
- Ataxia (Romberg)
- Dysmetria (limbs)
- Eye movement findings
  - Poor pursuit and fixation suppression
  - Spontaneous nystagmus, sometimes bizzare
  - Rebound nystagmus
  - Dysmetric saccades, Opsoclonus in some
  - Positional nystagmus (does not fatigue)

Pendular nystagmus



Something else was moving too

Rebound Nystagmus



Saccadic Dysmetria

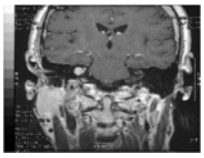
Opsoclonus

Many kinds of cerebellar disorders

- Tumors
- Paraneoplastic (don't miss this one)
- Congenital (Chiari)
- Degenerations
- Stroke
- Post-infectious

Brain Tumors Causing Dizziness

- Acoustic Neuroma
- Meningioma
- Cerebellar astrocytoma
- Cerebellar hemangioblastoma
- Metastatic

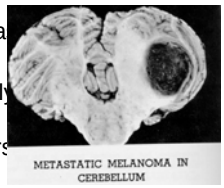


Brain tumors causing dizziness

- Very rare
- Occasionally dangerous

Cerebellar Tumors of Adults

- Adults
  - Metastatic from brea skin, lung or bowel
  - Prognosis is generally poor except for radiosensitive tumors (e.g. Lymphoma)

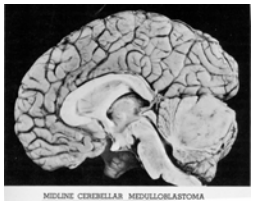


Rubinstein L, Tumors of the Central Nervous System

Cerebellar Astrocytoma Case

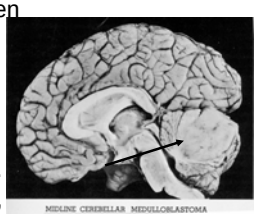
- Young woman in residency training
- Developed a headache and went to ER. In ER a CT scan was done.
- A large tumor was found occupying most of right side of cerebellum.
- Tumor was removed – after operation patient developed incoordination R side. Over 6 months, has improved so much can return to training program.

This child is holding onto the bed rail due to ataxia from a medulloblastoma



Cerebellar Medulloblastoma

- Mainly affects children
- Begins in cerebellar nodulus -- vestibulocerebellum
- Hydrocephalus (projectile vomiting) and cerebellar signs.
- Treat with resection, chemotherapy and radiation.
- 5 year survival – 80%

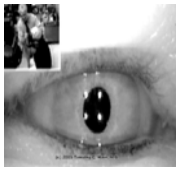


Paraneoplastic syndromes -- case

- 35 year old woman admitted to hospital because very unsteady – poor coordination
- Many tests were done without a diagnosis. Nobody did a breast exam.
- 1 year later noticed a large breast lump
- Breast cancer removed – but patient left with severe cerebellar syndrome

Paraneoplastic syndromes

- Remote effect of cancer
- Associated with lung and breast cancer
- Vestibulo-cerebellar syndrome – dominated by
  - Ataxia
  - Nystagmus (particularly downbeating)
- May be related to autoantibodies



Chiari Malformation: Case

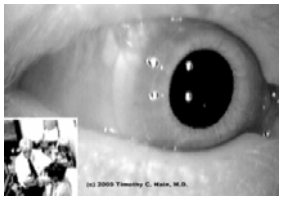
- Dock worker in Baltimore came in because gets dizzy when lifts heavy boxes
- Examination: unsteady, downbeating nystagmus.
- MRI showed cerebellar tonsils lower than normal.

Chiari Malformation

- Cerebellar tonsils herniate downward
- Adult onset
- Straining or coughing produces headache or fainting
- Unsteadiness
- Nystagmus
- Syrinx (hole in spinal cord) often associated

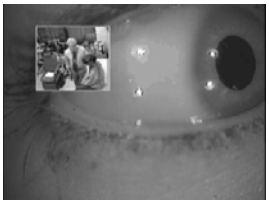
PAN – periodic alternating nystagmus

- Congenital form
- Acquired form (usually nodulus lesion)
- Often missed on ENG because 200 seconds to cycle



Post-infections cerebellar disease

- Rapidly developing gait ataxia
- Marked nystagmus/opsoclonus /nystagmus
- Recovery may take months, sometimes there is permanent residual



Cortex

- Little dizziness comes from cortex
- Seizures are often accompanied by dizziness

Seizures causing Dizziness

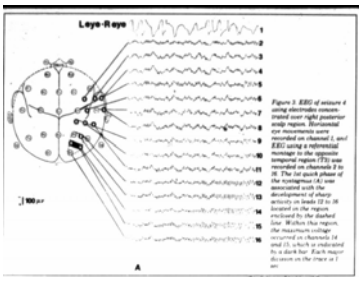
- Quick spins (1-10 seconds)
- Confusion and dizziness
- May be triggered by flashing lights
- Head injury is common

Case

- 8 Year old became dizzy playing video games
- Mother noted the eyes jumped
- Transient confusion

In the clinic he had a spell of dizziness with clear nystagmus

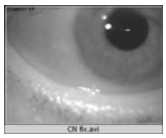
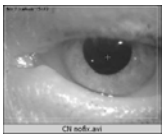
EEG shows seizure



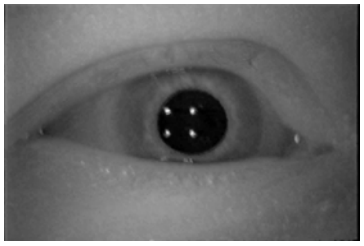
Congenital Nystagmus

- Strong nystagmus
- Worse in light
- Usually is strongly modulated by gaze
- May be “reverse exponential” on ENG

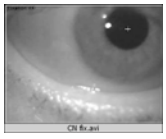
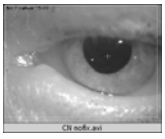
CN – worse with fixation

CN – Latent nystagmus



CN – worse with fixation

Summary – this is a hard part to dizzy evals

- Central vertigo is uncommon but very complex, and often a dangerous problem.
- Nearly any neurological condition may cause central vertigo
- Proper examination can require a lot of neurology.