


## Non-otologic Dizziness

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## Dizziness is an imprecise term

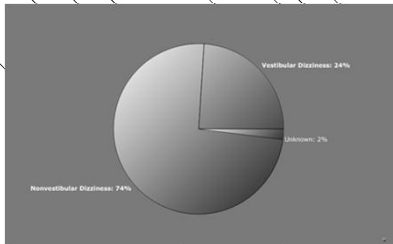
- Vertigo (sensation of motion)
- Lightheaded
- Ataxia
- Confusion



Because “Dizziness” is an imprecise term, a major role of the clinician is to sort patients

## Epidemiology of Dizziness

Most dizziness is non-vestibular

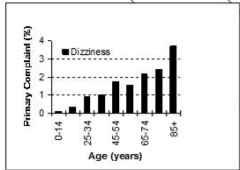


29.5% lifetime prevalence of dizziness or vertigo  
7% lifetime prevalence of vestibular vertigo, 1-year prevalence is 5.2%

Neuhauser et al, Neurology 65:898-904 2005

## More Dizziness #s

- Dizziness is the chief complaint in 2.5% of all primary care visits (Sloane et al, 1989).
- Older people have more dizziness



Estimated percentage of ambulatory care patients in whom dizziness was a primary complaint (Sloane, et. al., 1989).

## Diagnostic Categories

<u>Category</u>	<u>Example</u>
■ Otological	■ Meniere’s disease
■ Neurological	■ Migraine
■ Medical	■ Low BP
■ Psychological	■ Anxiety
■ Undiagnosed	■ Post-traumatic vertigo

## Question 1

- Which category is associated with the most dizziness ?

1. Inner ear disorders
2. CNS problems (e.g. Stroke)
3. Blood pressure
4. Psychological problems
5. Undiagnosed

### Answer 1

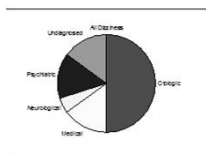
- It depends on your referral base
  1. Inner ear disorders (about 50% of ENT, 30% in general)
  2. CNS (about 25% of neurology, 5% everyone else)
  3. Blood pressure (30% of family practice, 5% everyone else)
  4. Psychological problems (15% to 50%)
  5. Undiagnosed (up to 50%)

### Diagnostic Categories

- Neurological (i.e. posterior fossa)
- Medical
- Psychological (anxiety, malingering)
- Undiagnosed

### Diagnostic Categories – non-otologic dizziness

1. Neurological (i.e. posterior fossa, Migraine)
2. Medical (i.e. low blood pressure)
3. Psychological (anxiety, malingering)
4. Undiagnosed

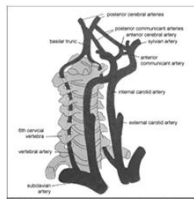


### Causes of neurological dizziness 15-30% subspecialty, 5% ER

- 35% Stroke and TIA (% varies with practice)
- 16% Migraine (% varies with practice)
- Various Ataxias
- Seizures (rare)
- Multiple Sclerosis (rare)
- Tumors (very rare)
- Head Trauma
- CSF pressure abnormalities - -CSF leak, NPH

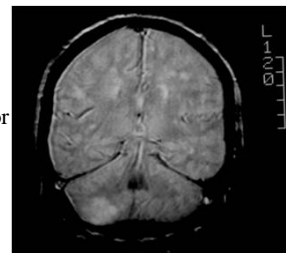
### Carotid disease does NOT cause dizziness

- Carotids supply anterior brain. No dizziness circuitry there. Carotid disease causes weakness/numbness/speech disturbance
- Carotid endarterectomy rarely helps dizziness



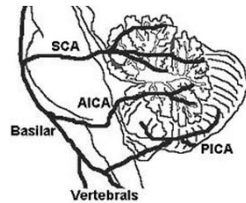
### Posterior Fossa stroke

- 50 year old doctor developed vertigo and unsteadiness
- Continued to operate for a week before seeking medical attention but wife wouldn't let him drive.
- PICA stroke seen on MRI



### Common Strokes with Dizziness

- PICA (lateral medulla and cerebellum) – palatal weakness, hemiataxia, anisocoria
- AICA (pons and cerebellum) – hearing loss
- SCA (cerebellar)



[http://en.wikipedia.org/wiki/Cerebellar\\_stroke\\_syndrome](http://en.wikipedia.org/wiki/Cerebellar_stroke_syndrome)

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

- Adolf Wallenberg

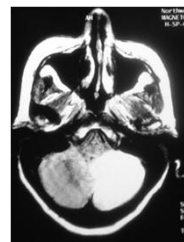
German internist, born November 10, 1862, Preuss.-Stargard. died 1949.



### Case (IC)

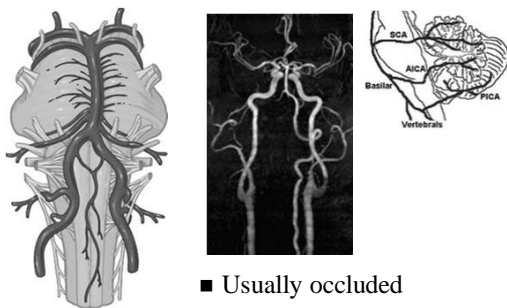
- Onset of dizziness 1 week ago
- Unable to walk
- Diabetes and new onset a-fib
- Exam:
  - Ataxic but intact VOR
  - No spontaneous nystagmus
  - Neuropathy

### Lateral Medullary Syndrome



- Most common “dizzy” stroke
- Generally lack clear localizing findings.
- MRI makes dx.

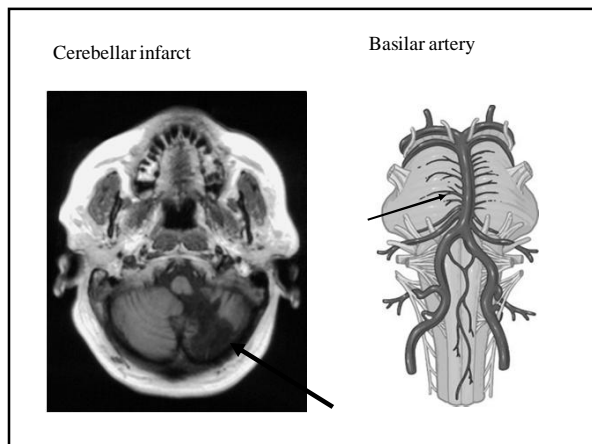
### Lateral Medullary Syndrome



- Usually occluded vertebral

### 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.



### Basilar artery case findings (1991 vs. 2001)

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

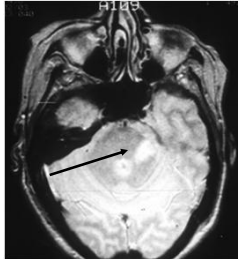
Basilar artery strokes are often fatal.

### Common features of cerebellar gait ataxia

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

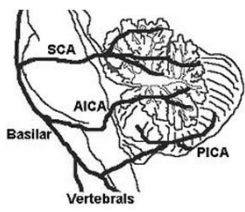
### Anterior inferior cerebellar artery Case

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




### Anterior inferior cerebellar artery AICA syndrome

- Rare stroke
- AICA supplies pons, cerebellum, 8<sup>th</sup> nerve
- Facial weakness
- Vertigo/hearing loss
- Incoordination



### Superior Cerebellar Artery SCA Syndrome

- Rare stroke
- SCA supplies superior cerebellum and midbrain
- Ataxia and diplopia

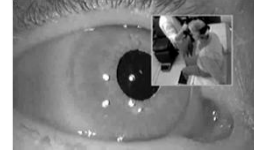


### Paraneoplastic syndromes -- case

- 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
  - Downbeating Nystagmus
  - Saccadic nystagmus
  - May be related to cellular immunity



Survivor from Colon Cancer

### DBN of floccular syndromes (paraneoplastic, Chiari) gets greater on lateral gaze

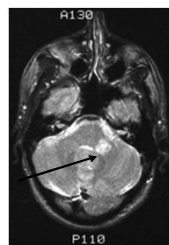


### The other pattern of paraneoplastic nystagmus is opsoclonus/saccadic flutter



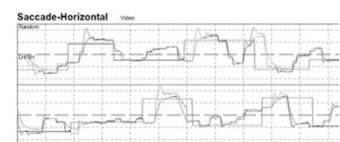
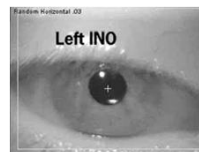
### Multiple Sclerosis (MS)

- No single pattern
- Multiple lesions distributed in time and space



### Multiple Sclerosis (MS)

- INO is common in MS

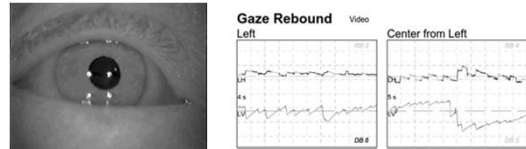


### Chiari Malformation: Case

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



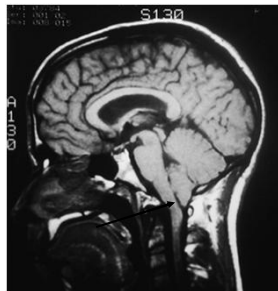
### Downbeating Nystagmus may be clue to underlying cerebellar degeneration or Chiari



Similar appearance as paraneoplastic DBN

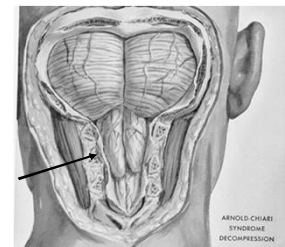
### Chiari Malformation

- Cerebellar tonsils herniate downward
- Adult onset
- Straining or coughing produces headache or fainting
- Unsteadiness
- Nystagmus



### Chiari Malformation Treatment: Suboccipital decompression (rarely indicated)

Arrow points to cerebellar tonsils. This surgical exposure is larger than would be used in real operation



Netter

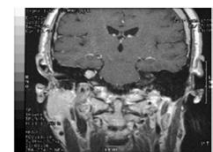
### Non-otologic ataxias – all of neurology ?

- |                              |                                 |
|------------------------------|---------------------------------|
| ■ Cerebellar                 | ■ Drugs (e.g. anticonvulsants)  |
| ■ Basal Ganglia              | ■ Degenerations (e.g. PSP, SCA) |
| ■ Hydrocephalus              | ■ Palatal myoclonus             |
| ■ Sensory loss (B12)         |                                 |
| ■ Periventricular WM lesions |                                 |
| ■ CSF leak                   |                                 |

### Brain Tumors Causing Dizziness

We worry a lot about these rare disorders

- Acoustic Neuroma (rare)
- Meningioma
- Cerebellar astrocytoma
- Cerebellar hemangioblastoma
- 4<sup>th</sup> ventricular ependymoma

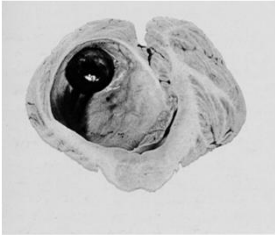


### Cerebellar Astrocytoma Case

- 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.

### Cerebellar Astrocytoma

- Largely in children
- Slowly growing tumor
- Cerebellar hemisphere syndromes
- Resection often cures

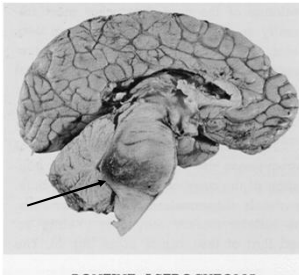


CYSTIC CEREBELLAR ASTROCYTOMA

Rubinstein L, Tumors of the Central Nervous System

### Pontine Astrocytoma


- Largely in children
- Slowly growing tumor
- Affects cerebellar connections
- No treatment – fatal disease



PONTINE ASTROCYTOMA

Rubinstein L, Tumors of the Central Nervous System

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




H.S. Cerebellar medulloblastoma

- Severe ataxia
- Strong positional nystagmus

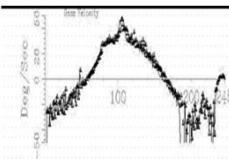
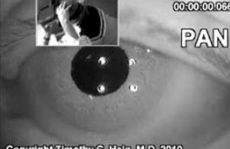
### Cerebellar Medulloblastoma

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



MEDULLARY CEREBELLAR MEDULLOBLASTOMA

### Periodic Alternating Nystagmus (PAN)

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Congenital and acquired forms. Acquired form usually from cerebellar nodulus lesion (such as medulloblastoma). Usual period is 200 sec. Responds to medication (baclofen), but not to PT.

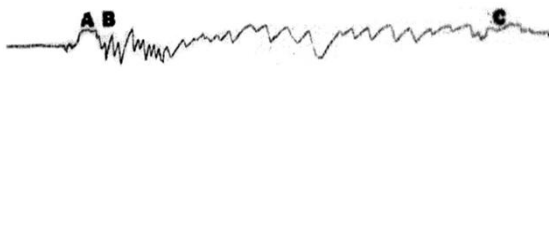
### Treatment of Central Dizziness

- Vestibular Suppressants
- Vestibular rehabilitation
- Environmental adaptations

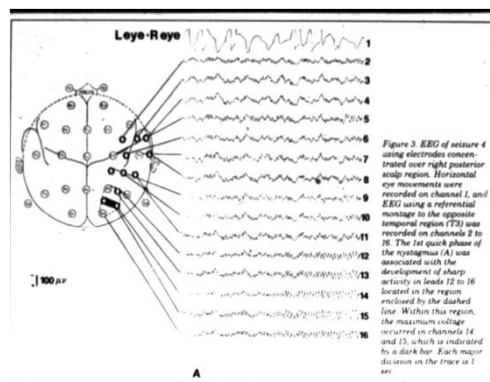
### Case

- 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 during nystagmus



### Seizures causing Dizziness

- Quick spins (1-2 seconds)
  - Also caused by vestibular nerve irritation
- Confusion and dizziness
- May be triggered by flashing lights
- Head injury is common
- Oxcarbamazine or other anticonvulsants may stop them

Tusa, R. J., et al. (1990). "Ipsiversive eye deviation and epileptic nystagmus." *Neurology* 40(4): 662-665.  
 Moon, I. S. and T. C. Hain (2005). "Delayed quick spins after vestibular nerve section respond to anticonvulsant therapy." *Otol Neurotol* 26(1): 82-85.

### Migraine & Vertigo: Prevalence

- Migraine:
  - 14% of U.S. population has Migraine†
  - 20-30% of women childbearing age
- Vertigo: 35% of migraine population.\*
- Migraine + vertigo (MAV):
  - 1% of entire population (Neuhauser, 2006)

† Lipton and Stewart 1993; Stewart et al. 1994  
 \*Kayan-Hood, 1984; Selby/Lance, 1980; Kuritzky, et al. 1981  
 Neuhauser, H.K., et al. (2006). "Migrainous vertigo: prevalence and impact on quality of life." *Neurology* 67(6): 1028-1033.



### Diagnosis of MAV

Nystagmus

- Often low amplitude downbeating or upbeating nystagmus, commonly present during positional testing.
- Bitorsional is common too (looks like bilateral BPPV)
- ? Due to cerebellar disturbance

Polensek, S. H. and R. J. Tusa (2010). "Nystagmus during attacks of vestibular migraine: an aid in diagnosis." *Audiol Neurootol* 15(4): 241-246.

### Diagnosis of MAV

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 (e.g. venlafaxine) or a triptan

### CSF pressure problems

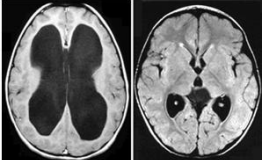
#### Orthostatic symptoms

- CSF leak
  - Post-LP dizziness/nausea/headache
  - Post-epidural dizziness/hearing loss/tinnitus
  - Idiopathic
- No nystagmus

### CSF-pressure problems

#### Normal pressure hydrocephalus

- Ataxic/Apraxic gait
- No vertigo, hearing problems or cerebellar signs
- Respond to spinal tap followed by shunt




### Diagnostic Categories

- Neurological (i.e. posterior fossa)
- Medical
- Psychological (anxiety, malingering)
- Undiagnosed

### “Medical Dizziness”

Much more prevalent than vestibular

- Cardiovascular (23-43%)
  - Orthostatic hypotension
  - Arrhythmia
- Infection (4-40%)
- Medication (7-12%)
- Hypoglycemia (4-5%)



Rapid improvement with sitting, squatting, or recumbency strongly suggests near-syncope. Once symptoms begin to improve, patients usually regain normal alertness over several seconds to a few minutes.


Source: Madlon Kay (85), Herr et al (89)

### Psychogenic Vertigo Substantial

- Anxiety, hyperventilation, panic, Agoraphobia
- Somatization
- Malingering

### Anxiety

- Long-duration dizziness
- Situational
- Responds to benzodiazepines
- Some have vestibular disorders too (Chicken-Egg problem)

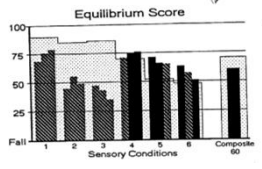



### Somatization

- Chronic dizziness
- Numerous bodily ailments
- One goes away to be replaced by another
- We don't have a treatment for SD.
- Do not tell these people there is "nothing wrong". Rather, try to minimize the health-care cost.

### We have several good tests for Malingering

- Moving Platform Posturography -- An algorithm for detecting inconsistency (Cevette score)

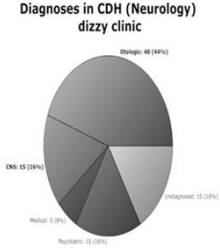
Cevette, M J et al. (1995). "Aphysiologic performance on dynamic posturography." Otolaryngology - Head & Neck Surgery 112(6): 676-88.

### Undiagnosed Dizziness

- About 15% of all dizzy patients
- Our tests are not 100% sensitive
- We are not perfect either

### Summary – non otologic dizziness

- Neurological (i.e. Migraine, posterior fossa)
- Medical (i.e. low blood pressure)
- Psychological (anxiety, malingering)
- Undiagnosed



### More Details

Hain, T.C. Approach to the patient with Dizziness and Vertigo. Practical Neurology (Ed. Biller), 2002, 2007. Lippincott-Raven

### More movies

[www.dizziness-and-hearing.com](http://www.dizziness-and-hearing.com)