

## Disclosure

Dr. Hain has no conflicts of interest relevant to the topic of this presentation.

Chicago Dizziness and Hearing

## Migraine Associated Vertigo (MAV)

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## 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

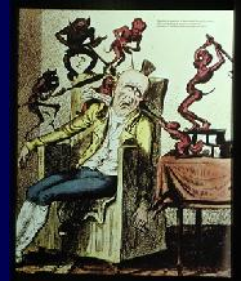
## Case Study (patient DA)

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

## MAV Migraine Associated Vertigo

## Headaches are common

- 90% lifetime prevalence
- 25% annually report recurrent episodes of severe headache
- 3-4% daily or near-daily headache
- Medications are used by 9% of US adults each week to treat headaches



## Migraine

- Most common headache, about 10-14% of entire population (Stewart, 1992)
- 20-30% of women of childbearing age have migraine
- Most self diagnosed “sinus” headaches are migraines (Eross et al, 2007)

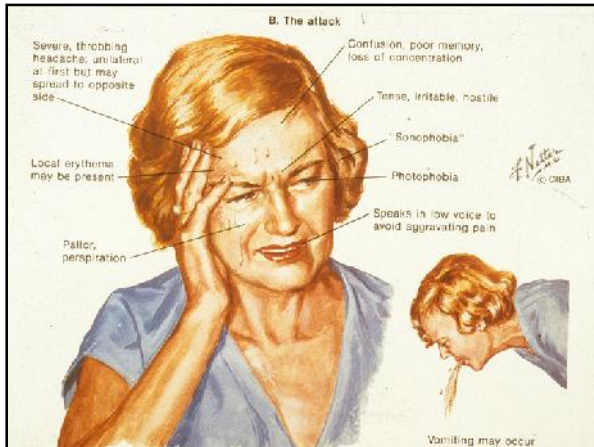
Eross, E., et al. (2007). "The Sinus, Allergy and Migraine Study (SAMS)." *Headache* 47(2): 213-224.

**EPIDEMIOLOGY**

### Epidemiological Observations of Migraine Prevalence in Industrialized Countries<sup>2</sup>

Study (Country)	Sample Source	Number of Respondents	Age of Respondents	Time period	% Males	% Female	% All
Dezube et al. USA	HMO	1,007	21-30	Lifetime One-year	7	16	13
D'Allesandro et al. Italy	General Population	1,144	>7	One year	9	10	10
Comrade et al. Canada	General Population	2,737	>15	Lifetime	9	23	16
Henry et al. France	General Population	633	>15	Five years	6	16	12
Liess et al. USA	General Population	10,189	12-29	One-month	3	7	NR*
Meisinger et al. Switzerland	Recruits from screening scales	457	27-28	One-year	6	20	13
Rasmussen et al. Denmark	General Population	740	25-64	Lifetime One-year	8	25	18
Stewart et al. USA	General Population	20,488	12-80	One-year	6	16	NR*

\*Histogram reported  
References: B. Rasmussen, B.K. et al.: Epidemiology of migraine, in *Twentieth Migraine 2000*, ed. Rose, F.C., Elsevier Science B.V., 1996, pp.3-11.



## Migraine is a “committee” diagnosis

- No specific tests –
  - i.e. MRI’s or blood tests
- Diagnostic criteria were set by a committee (the IHS).
- Other “committee diagnoses” include
  - Meniere’s disease (AAO)
  - Chronic subjective vertigo

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### Migraine (IHS) criteria:

recurrent headaches separated by symptom-free intervals and accompanied by any three of the following:

- abdominal pain
- complete relief after sleep
- nausea or vomiting
- aura (visual, sensory, motor)
- hemicrania
- throbbing, pulsatile quality

### Vestibular Migraine 2013 IHS criteria

- At least 5 episodes fulfilling C and D
- Past Migraine meeting IHS criteria
- Episodic vestibular symptoms of moderate or severe intensity, lasting between 5 min and 72 hours
- At 50% of episodes with at least one of following 3 migrainous features
  - Headache: Unilateral, pulsating, moderate or severe, aggravation by activity
  - Photophobia AND photophobia
  - Visual aura.

Headache classification committee of the International Headache Society. The international classification of headache disorders, 3rd edition (beta version). *Cephalgia* 33(9) 629-808, 2013

### IHS criteria for MAV are cumbersome

- We use simpler criteria:
  - Headaches or sensory amplification (photo or phonophobia or osmophobia)
  - Dizziness
  - Exclusion of alternative causes

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### Migraine Variants

- Common migraine (just headache – 90%)
- Classic migraine (with aura – 10%)

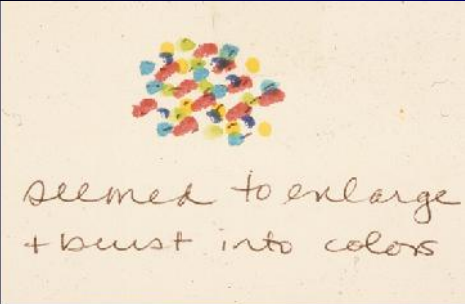
### “Kaleidoscopic vision”



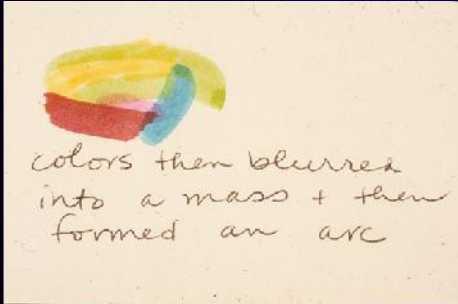
<http://www.rightmindpower.com/wp-content/uploads/2012/05/kaleidoscope4.jpg>



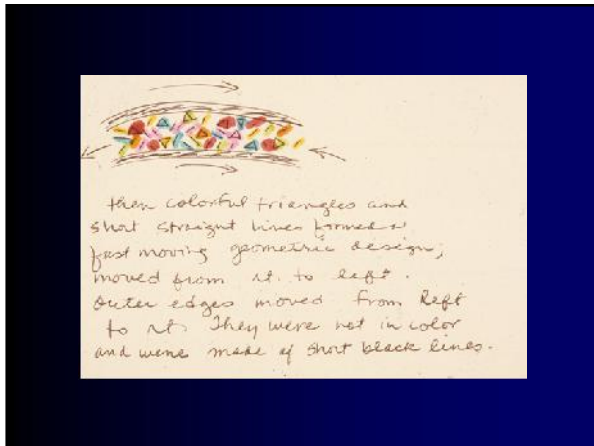
dots in middle of vision





seemed to enlarge + burst into colors



colors then blurred into a mass + then formed an arc




### Migraine Art

Ina Rubloff (migraine patient of Dr. Hains)

Even intermittent headache is not necessary to diagnose migraine

### Migraine Variants



Acephalgic migraine: Aura without headache (a tough call).

- Usual story is transformation of headache with aura into aura alone.
- In older people, called “benign migrainous accompaniments of the elderly
- About 1% of migraine population\*

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

### Migraine variants with vertigo but without headache (acephalgic migraines)

- Benign Positional Vertigo of Childhood (BPV)
- Cyclic vomiting syndrome – periodic vomiting for several days.
- Benign Recurrent vertigo (BRV).

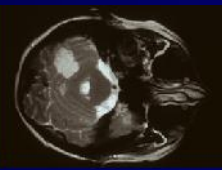
### Headache (HA) and dizziness don't have to occur at same time in MAV either.

- 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

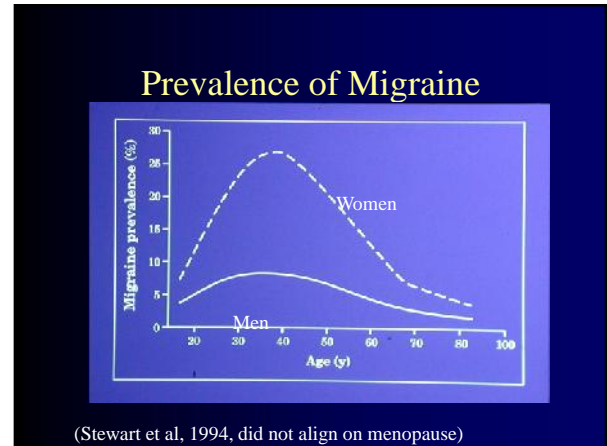
Cutrer, F. M. and R. W. Baloh (1992). "Migraine-associated dizziness." *Headache* 32(6): 300-304.  
Johnson, G. D. (1998). "Medical management of migraine-related dizziness and vertigo." *Laryngoscope* 108(1 Pt 2): 1-28.

### 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




(Evans and Olesen, 2003; De Benedittis and Lorenzetti, 1995).

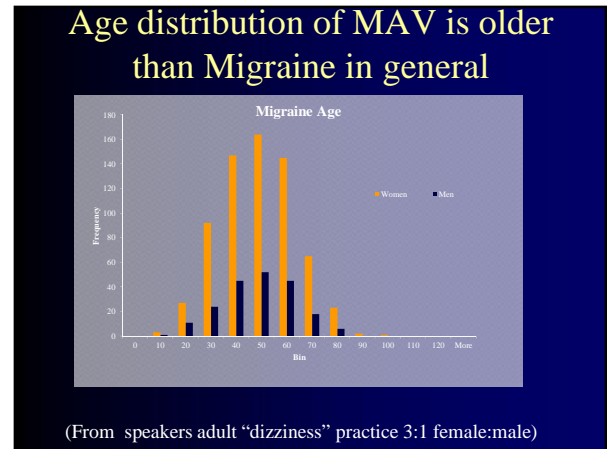


### Migraine & Vertigo: High Prevalence

- Migraine:
  - 14% of U.S. population has Migraine†
  - 20-30% of women childbearing age
- MAV – 1% with strict criteria\* 3% with loose criteria.




† Lipton and Stewart 1993; Stewart et al, 1994;  
\* Neuhauser, H. K., A. Radtke, et al. (2006) *Neurology* 67(6): 1028-1033.

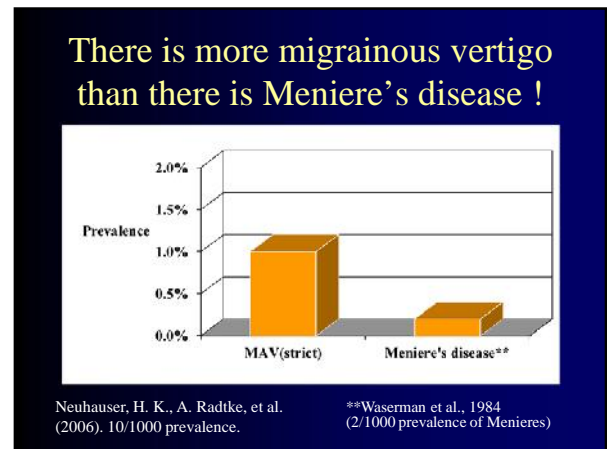


### Migraine in Women

- 3:1 ratio of women:men.
- Peak age for migraine is 40
- 10:1 increase in frequency of migraine around time of menses.
- Attributed to fluctuations in estrogen level. Can treat by eliminating fluctuations (BC pills – “seasonale”).
- 75% stop while pregnant
- Often flares for a few years near menopause

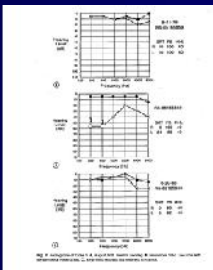


MacGregor, E. A. (2009). “Migraine headache in perimenopausal and menopausal women.” *Curr Pain Headache Rep* 13(5): 399-403.



### Hearing in MAV can look like Menieres

- Fluctuating low-tone SN hearing loss is common
- Both ears can fluctuate together



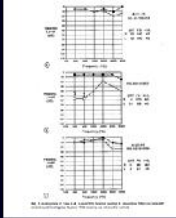
The image shows three audiograms labeled (a), (b), and (c). Each graph plots hearing level in dB HL against frequency in Hz (250, 500, 1000, 2000, 4000, 8000). The curves show significant fluctuations, particularly at the lower frequencies, which is characteristic of Meniere's disease or MAV.

### Migraine-Meniere's overlap

- 50% of Menieres have migraine too.

Harker, L. A. and C. Rassekh (1988). "Migraine equivalent as a cause of episodic vertigo." *Laryngoscope* **98**(2): 160-164.  
 Radtke, A., T. Lempert, et al. (2002). "Migraine and Meniere's disease: is there a link?" *Neurology* **59**(11): 1700-1704.

### Dr. Hain's opinion is that migraine prophylaxis should be used prior to any invasive treatment for Meniere's



Verapamil is usually a good pick (later coming in treatment).

### Nystagmus in Migraine

- Polensek, S. H. and R. J. Tusa (2010). "Nystagmus during attacks of vestibular migraine: an aid in diagnosis." *Audiol Neurootol* **15**(4): 241-246.
- Spontaneous nystagmus was seen in 19% of 26 patients and nystagmus provoked by horizontal headshaking was seen in 35%.
- Nystagmus could be provoked with positional testing in 100% of symptomatic patients with fixation blocked. The positional nystagmus most commonly was sustained, of low velocity, and could be horizontal, vertical or torsional.
- Bithermal water caloric or rotary chair tests obtained during symptom-free intervals were normal in all patients

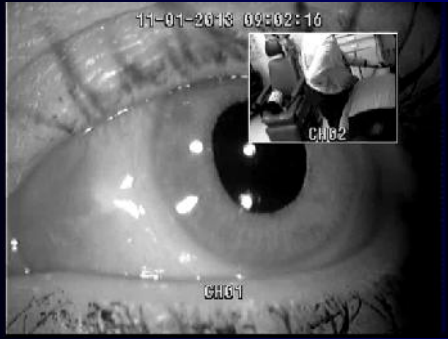
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### Dr. Hain's opinions about nystagmus in MAV

- Weak UBN or DBN is frequent
- DCPN
- Bitorsional -- specific

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### Bitorsion in Migraine



The image shows a close-up of a human eye with a contact lens. A small inset video frame in the upper right shows a person sitting in a chair, likely during a clinical examination. The date and time '11-01-2013 09:02:16' are visible at the top of the eye image. Labels 'CH02' and 'CH01' are present near the eye.

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### MAV symptoms may last for days (or even months)

- Cutrer and Baloh, 1992 : Bimodal distribution
- 31% min-2 hrs
- 49% longer than 24 hours
- Chronic migraine – about 0.2%.

Straube, A., V. Pfaffenrath, et al. (2009). "Prevalence of chronic migraine and medication overuse headache in Germany-the German DMKG headache study." *Cephalalga*.

### Migraine is often accompanied by strong motion sensitivity

10% normals have "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)

### Migraines are "hard-wired"

- Sensitive brains, with thicker sensory cortex (Aurora, 2007)
- Structural changes in brain (Palm-Meinders, 2012)
- Strong genetic association (about 50%)

Aurora, S. K. and F. Wilkinson (2007). "The brain is hyperexcitable in migraine." *Cephalalga* 27(12): 1442-1453.  
Palm-Meinders, I. H., et al. (2012). "Structural brain changes in migraine." *Lancet* 380(18): 1839-1897.  
Montagna, P. (2008). "Migraine: a genetic disease?" *Neural Sci* 29(Suppl 1): S47-51.

### 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

### Differential Diagnosis

- Independent headache/dizziness
  - HA responds to treatment, dizziness persists – might have BPPV...
- Dizziness -> headache
- Structural lesion (very rare)
  - No response to treatment
- Sleep apnea (AM headache)
- Psychogenic headache and dizziness
- Anti-phospholipid antibody syndrome
  - Refractory headaches
  - May need anticoagulation because of stroke risk

### Missing brain tumors happens

- Risk of missing brain tumors in patients with headaches is small (because brain tumors are rare)
- Cost of missing them to providers is gigantic (because of litigation).
- Thus, when patients "ask for an MRI", the answer is usually Yes.

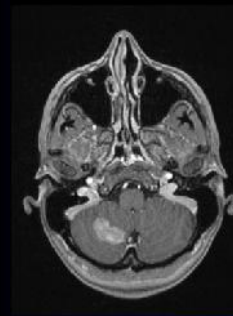
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## A Missed Tumor

- 45 year old woman with dizziness, imbalance and headaches.
- Worse with bright light, loud noise, smell (i.e. she really has migraine)
- MRI showed a tumor.

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## Serendipitous brain tumor



- Cerebellar neurocytoma (bx)
- No change over 4 years
- Patient responded nicely to migraine medication.

MB

## I usually treat first – but if severe headaches do not respond ...

- MRI or CT scan of brain/sinuses, possibly neck also. Makes most sense for non-triptan responders.
- Sed-Rate (for temporal arteritis)
- Sleep study if AM

## Migraine Treatments

- Life style change (diet, sleep, BC pills)
- Analgesics and antiemetics
- Abortive agents (triptan family)
- Prophylactic agents
- Alternative agents (e.g. Butterbur, magnesium supplements)
- Last resorts (MAO inhibitors)

## Two reviews

- Silberstein, S. D., S. Holland, et al. (2012). "Evidence-based guideline update: Pharmacologic treatment for episodic migraine prevention in adults: *Neurology* **78**(17): 1337-1345.
- Holland, S., S. D. Silberstein, et al. (2012). "Evidence-based guideline update: NSAIDs and other complementary treatments for episodic migraine prevention in adults: *Neurology* **78**(17): 1346-1353.


## Most useful non-drug treatments

- Migraine diet (migraine patients LOVE diets)
- Withdraw birth control pills if possible
- Regular sleep patterns
- Withdraw vasodilators if possible (e.g. nitrates, some calcium channel blockers)



### Dietary Factors in Migraine

- Monosodium glutamate (MSG)
- Cheese, especially blue cheese
- Alcohol (red wine)
- Chocolate (even dark)
- Caffeine (2 cups+)



### Dietary Factors in Meniere's very similar restrictions

- Furstenberg diet (1992)
  - Salt (includes mSg as in Migraine diet)
  - Sugar (e.g. chocolate too)
  - Alcohol (e.g. red wine too)
  - Caffeine (same as migraine)
  - Smoking

Furstenberg, A. C., et al. (1992). "Meniere's symptom complex: medical treatment, 1934." *Ann Otol Rhinol Laryngol* **101**(1): 20-31.


### Analgesics and anti-emetics

- Acetaminophen, ASA
- NSAIDS
- Metoclopramide (Reglan)
- Phenergan
- APAP



### Prophylaxis most important

- Unpredictable vertigo spells may prevent driving or be dangerous
- Migrainous vertigo rarely responds to vestibular suppressant medications



### Prophylaxis of Migraine - 2013

80% of those who get headache relief also get vertigo relief (Bikhazi et al, 1997)

- Antidepressants
- Anticonvulsants
- Antihypertensives
  - L-channel Calcium channel blockers
  - Beta blockers
- Botox

Bikhazi, P., C. Jackson, et al. (1997). "Efficacy of antimigrainous therapy in the treatment of migraine-associated dizziness." *Am J Otol* **18**(3): 350-4.


### Pregnancy Categories

(Almost all are Pregnancy C or D)

- A: Proven safe
- B. Probably safe
- C. Use caution
- D. Dangerous
- X. Don't use

### Venlafaxine (Effexor XL)

- Very effective – 50 to 80% (Bulut, 2004)
- Start with 1/3 of 37.5 XL, Increase to 37.5
- Side effects are minor:
  - A little activation – like a cup of coffee
  - Minor sexual side effects
  - No effect on weight
  - Pregnancy category C
- Warn patient not to “cold turkey” for larger doses (head-zaps)




Bulut, S., et al. (2004). "Venlafaxine versus amitriptyline in the prophylactic treatment of migraine: randomized, double-blind, crossover study." *Clin Neurol Neurosurg* 107(1): 44-48.

### Tricyclic antidepressants

#### 75% effective

- Very cheap and very effective
- Amitriptyline, Nortriptyline
- Side effects are **major**:
  - Fatigue, weight gain, hair loss
  - Antihistamine AND anticholinergic (vest. Suppressant)
  - Not a good drug for older people
  - Pregnancy category D
- Start with 10 mg, increase weekly to 25-50




### SSRI antidepressants

#### ?? effective ??

- Fluoxetine, Celexa, Paroxetine
- SSRI's don't work for migraine associated vertigo but can certainly use for depression.
- Some SSRI's cause tinnitus.
- All SSRI's cause nausea, at least on startup.

### L-channel Calcium Channel Blockers

- Verapamil 120-240 SR.
- 1 mg/pound initial dose
- Takes 2 weeks to work
- No sedation – great drug for this reason
- Hypotension rarely a problem
- Constipation main side effect – increase dose if not constipated after 2 weeks.
- Cheap (\$19/month). Pregnancy category C, interacts with statins (increases level).




Solomon, G. D., et al. (1983). "Verapamil prophylaxis of migraine. A double-blind, placebo-controlled study." *Jama* 250(18): 2500-2502.

### Other calcium channel blockers

- flunarizine (Sibelium) 5-10 mg.
- Not FDA approved, but VERY well studied -- 532 papers in Pubmed.
- Has a 30 day half-life and also serious side effects (dopamine blocker).
- Most other calcium channel blockers just don't work or make headache worse due to vasodilation.

### Beta Blockers

- Any beta blocker works – so pick an inexpensive one in a good pregnancy category. \$20/month
- Propranolol 60 LA (category C)
- Metoprolol 50 XL (category C)
- Bisoprolol (Bystolic) Low side effect
- Side effects
  - Fatigue, Slow pulse, Hypotension, sexual
- 1 month to work



Silverstein, S. D., et al. (2012). "Evidence-based guideline update: Pharmacologic treatment for episodic migraine prevention in adults." *JAMA* 307(17): 1337-1345.

### Anticonvulsants

(Don't affect BP, cognitive issues)

- Gabapentin (Neurontin) – category C
- Sodium Valproate (Depakote) – category D
- Topiramate (Topamax) – category D
  - 10% cleft palate
- Levetiracetam (Keppra) – category C
- Lamictal (Lamotrigine) – category C

Silberstein, S. D., et al. (2012). "Evidence-based guideline update: Pharmacologic treatment for episodic migraine prevention in adults." *78(17): 1337-1345.*


### Gabapentin (Neurontin)

- Dose: 100 tid to 800 tid
- Extremely safe
- Not very effective – adjunctive agent
- Also suppresses vertigo and nystagmus
- Also useful for pain in general (arthritis)
- Pregnancy category C

Silberstein, S. D., et al. (2012). "Evidence-based guideline update: Pharmacologic treatment for episodic migraine prevention in adults." *78(17): 1337-1345.*

### Anticonvulsants: Topiramate (Topamax)

- Dose: 25 mg to 150 mg, Start with 25, increase weekly
- 50% response
- Associated with weight loss !
- Moderate doses – speech disturbance
- “Dopamax” – can't talk or think
- Tingling in hands and feet too
- Pregnancy category D



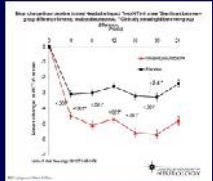
Tablets  
Sprinkles  
Topamax (topiramate)

Silberstein, S. D., et al. (2012). "Evidence-based guideline update: Pharmacologic treatment for episodic migraine prevention in adults." *78(17): 1337-1345.*

### Botox for Migraine

“you mean my insurance will pay for this ?”

- Strong evidence for a small effect in many (roughly 10%). Large ‘n’.
- Trials funded by Botox manufacturer, Allergan
- Difficult to understand how paralyzing scalp works.
- Very expensive ! About \$1000 JUST drug. q3m




Mean headache frequency (number of headache days per month) over 12 weeks. Botox group shows a slight decrease compared to placebo.

Jackson, J. L., A. Kuriyama, et al. (2012). "Botulinum toxin A for prophylactic treatment of migraine and tension headaches in adults: a meta-analysis." *JAMA 307(16): 1736-1745.*

### Abortive medications

- Triptans (sumatriptan, etc.).
- Useful for diagnosis
  - Generic – sumatriptan
  - Powerful – Relpax/Maxalt
  - Long acting – frovatriptan (36 hour)



Holland, S., S. D. Silberstein, et al. (2012). "Evidence-based guideline update: NSAIDs and other complementary treatments for episodic migraine prevention in adults." *Neurology 78(17): 1346-1353.*

### Alternative Medications for Migraine

- Magnesium 500 mg/day (two “cal-mag”)
- Petadolex 50 mg TID (? Miracle drug ?)

• Grossman, W. and H. Schmidraml (2001). "An extract of *Petasites hybridus* is effective in the prophylaxis of migraine." *Altern Med Rev 6(3): 303-310.*  
 • Branson, A. (2003). "A newly developed extract (Zc 339) from bumblebee (*Petasites hybridus* L.) is clinically efficient in allergic rhinitis (hay fever)." *Phytotherapy Res 17(1): 40-42.*  
 • Cui, H. S., et al. (2005). "Protection by petasipholide A, a major neuroprotective compound in the bumblebee extract of *Petasites japonicus* leaves, against oxidative damage in the brains of mice challenged with lactic acid." *J Agric Food Chem 53(2): 8526-8532.*  
 • Brune, K., et al. (1993). "Gastro-protective effects by extracts of *Petasites hybridus*: the role of inhibition of peptidyl-leukotriene synthesis." *Pharm Med 59(6): 494-496.*

Holland, S., S. D. Silberstein, et al. (2012). "Evidence-based guideline update: NSAIDs and other complementary treatments for episodic migraine prevention in adults." *Neurology 78(17): 1346-1353.*

### Medications of last resort

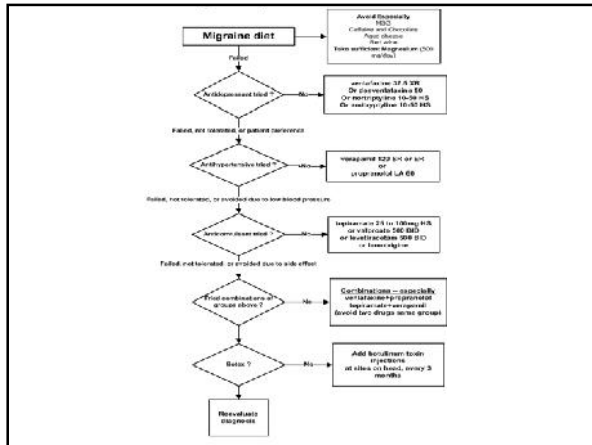
- MAO inhibitors (e.g. tranylcypromaine – Parnate; phenelzine -- Nardil)
- Narcotics

These medications have substantial potential for toxicity.

### Migraines don't respond to:

- Physical therapy, including the Epley maneuver
- Diuretics (i.e. HCTZ-triamterine)
- Meclizine or scopolamine patches

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### Returning to our case

- Patient tried verapamil for 1 month. No response.
- Patient then tried on propranolol 60 LA. Headaches and dizziness greatly reduced.
- Plan was to continue on propranolol, with attempts to D/C every 2 years till post menopause.

### Summary

- Migraine associated vertigo is very common, more so than Meniere's disease
- Meniere's and Migraine overlap substantially
- Diagnosis is via clinical judgment, combined with judicious tests to exclude dangerous alternatives.
- Drug treatment is generally very successful