Migraine in Otolaryngology

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Some SlidesCourtesy of:

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Learning Objectives

• Explain the pathophysiology of Vestibular Migraine.
• Discuss controversies in current thought on Vestibular Migraine.
• Implement appropriate diagnostic tests for Vestibular Migraine.

Disclosures

• None
Survey

• Is it on your radar?
• Who here has ever made a diagnosis of Vestibular Migraine?
• Who is comfortable w/ Vestibular Migraine?
• Treatment?
  – Refer?
  – Prescribed medication?
  – Counsel?

Goals

• Epidemiologic data
• Definitions
• Review the currently accepted pathophysiologic model of migraine
• Explore the possible relationship between Otolaryngologic disease and migraine
  • Clinical similarities
  • Physiologic similarities
• Clarify the potential role of migraine management in other Otolaryngologic disease.

Epidemiology

• 14% of Adults have Migraine
• Females > Males
• Peak of 30% of Women age 35
• ~33% of patients with Migraine have some Vertigo
• 1% of population have MAV (Migraine Associated Vertigo)
• 0.05% have Meniere’s Disease
• 50% of those with MD have MAV (overlap) = 0.025%
14% Population have Migraines

AGE- AND GENDER-SPECIFIC PREVALENCE OF MIGRAINE HEADACHE

GENETIC: Strong Familial
- Twin studies: MZ > DZ
- Migraine as an ion channelopathy – chromosome 19
  - Familial hemiplegic migraine
    - Mutations in the α1A subunit of the P/Q type voltage-gated Ca2+ channel on chromosome 19 (~50% of cases)
  - Linked to regular migraine
- Genetically heterogeneous
  - Na+ channels, Na+/K+ ATPase
  - Net result: neuronal hyperexcitability
WHAT IS MIGRAINE?

MIGRAINE IS:

- Disorder characterized by episodic attacks of headache pain and associated symptoms, such as nausea, sensitivity to light, sound, or head movement
- Highly variable presentation
- Headache not necessarily present

IHS Criteria (MO)

Migraine without aura (MO) diagnostic criteria
A. At least five headache attacks lasting 4 - 72 hours (untreated or unsuccessfully treated), which has at least two of the four following characteristics:
   1. Unilateral location
   2. Pulsating quality
   3. Moderate or severe intensity (inhibits or prohibits daily activities)
   4. Aggravated by walking stairs or similar routine physical activity
B. During headache at least one of the two following symptoms occur:
   1. Phonophobia and photophobia
   2. Nausea and/or vomiting

Classification and diagnostic criteria for headache disorders, cranial neuralgias and facial pain. Cephalalgia 1988; 8: 1-96
IHS Criteria (MA)

Migraine with aura (MA) diagnostic criteria
A. At least two attacks fulfilling MO criteria with at least three of the following:
   1. One or more fully reversible aura symptoms indicating focal cerebral cortical and/or brain stem functions
   2. At least one aura symptom develops gradually over more than four minutes, or two or more symptoms occur in succession
   3. Aura symptom lasts no more than 60 minutes; if more than one aura symptom is present, accepted duration is proportionally increased
   4. Headache follows aura with free interval of at least 60 minutes (it may also simultaneously begin with the aura)
B. At least one of the following aura features establishes a diagnosis of migraine with typical aura:
   1. Homonymous visual disturbance
   2. Unilateral paresthesias and/or numbness
   3. Unilateral weakness
   4. Aphasia or unclassifiable speech difficulty

Classification and diagnostic criteria for headache disorders, cranial neuralgias and facial pain. Cephalalgia 1988 8: 1-96

IHS Vestibular Migraine Criteria
- A. At least 5 episodes fulfilling criteria C and D.
- B. A current or past history of migraine with or without aura, using the IHS criteria.
- C. Vestibular symptoms of moderate or severe intensity, lasting between 5 minutes and 72 hours.
- D. At least 50% of episodes are associated with at least one of the following 3 migrainous features:
  - 1. Headache with at least two of the following four characteristics:
    - a). Unilateral location
    - b). Pulsating quality.
    - c). Moderate or severe intensity.
    - d). Aggravation by routine physical activity.
  - 3. Visual Aura. This is so rare as to be nearly useless
- E. Not better accounted for by another ICHD-3 diagnosis or another vestibular disorder.

Simplified

Migraine without aura (MO) 5 attacks: Headache with sound and light sensitivity and/or nausea / vomiting lasting hours to days
1. One-sidedness
2. Pulsating
3. Bad enough to limit activities
4. Aggravated by physical activity

Migraine with aura (MA) 2 attacks lasting hours to days
Aura types: One-sided Visual disturbance, Numbness, Weakness, Speech problem
1. Fully reversible aura
2. Gradual over >4 minutes
3. Duration: < 60 minutes per symptom
4. Headache follows aura with free interval >60 minutes
**Li’s Vestibular Migraine Criteria**

- Episodic Vertigo lasting 5 minutes - 72 hours.
- Sometimes: Bad one sided Headache with sound and light sensitivity and/or nausea / vomiting lasting hours to days
- No other explanation ie NOT BPPV, Menieres, Labyrinthitis...
- Responsive to Migraine Meds
- Patients tend to be HYPERSENSITIVE to everything...VNG yikes!

**IHS Criteria are cumbersome and presumptuous**

**Prefer to have 5 or more episodes to seal the deal**

**Some patients don’t seem to ever have headache manifestations.**

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**Typical Presentation**

- Patient has the trait.
- Many potential triggers
- Patients usually have some sort of warning
- Can abort if caught early.
- Start of symptoms: Vertigo 5 min – days.
- +/- Headaches
- Return to normal
- Repeat cycle variable intervals.
- Burnout over years.

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**Vestibular Migraine**

- Tendency to younger patients
- The symptoms may be described as vertigo (spinning, rocking, swaying, etc.) or simply disequilibrium.
- The symptoms may be quite variable in duration, lasting seconds to days in episodic cases, or may present as constant disequilibrium lasting for months.
- Triggerability by foods, stress, environment
- Intolerance to movement of the head or the visual world is a frequent finding.
Vestibular Migraine

- Typical migraine headaches occur during the vertigo spells in only about half of cases.
- Often the patient has a prior history of migraine headaches, but feels that they have resolved.
  Milder head or neck pain or pressure may replace the pounding headaches and accompany the dizzy symptoms.
- A family history of migraine may be helpful in the diagnosis.
- May occur because of cortical, brainstem or thalamic phenomenon.
- May also include symptoms from the inner ear.

Vestibular Migraine ENG

- ENG may show a caloric weakness in 15-35%
- Abnormal saccades, sinusoidal tracking in a young patient
- Cannot finish the caloric testing
- ENG may provoke long incapacitating attack

Cutrer, Headache, 1992:32
Kuritzky, Headache, 1981:21
Bir et al, J Otolaryngol, 2003:32

Symptom Variability in Migraine
Cortex +/- Vessels +/- Brainstem

- Aura ± Pain ± Brainstem ± Parasympathetic
- Incompletely developed Pain
- Episodic (seconds to days) or Constant
- Headaches become less severe over time.
- Neurological symptoms may become more prominent
- Migraine equivalent
- Migraine may even damage the inner ear causing more symptoms in some
  - BPPV
  - Menieres disease
Triggering Migraine

- Attacks may be triggered by:
  - Environment
  - Diet
  - Physiologic changes

- For many patients no factor can be identified

Common Environmental Triggers for Migraine Symptoms

- Odors
- Bright Lights - computer
- Noise
- Excessive head motion
- Excessive motion of visual surround
- Weather changes
- Altitude

Common Physiologic Triggers for Migraine Symptoms

- Anxiety, stress
- Fatigue, lack of sleep
- Oversleeping
- Hunger
- Exercise
- Allergy
- Hormone changes
- Pain - especially C2 cervical pain (whiplash), TMJ, and sinusitis or ostia obstruction
- Travel - Stress, letdown, altitude, alcohol, dehydration, time change
Common Food Triggers for Migraine Symptoms

- Byproducts of food aging – e.g. tyramine
  - Fermented products like red wine
  - Aged cheese
  - Yeast in fresh bread, yogurt
- Amines or chemicals similar to our own neurotransmitters
  - Caffeine
  - Nitrates and other preservatives (lunchmeat)
  - MSG
  - Chocolate

Common Food Triggers for Migraine Symptoms

- Many surprise foods: Bananas, nuts, peanut butter, citrus
- Effects may come immediately or even days later
- Dietary, Physiologic and Environmental triggers are additive and synergistic
  - Chocolate - no problem
  - Red wine - no problem
  - Chocolate + red wine - problem

Symptom Generation in Migraine
Brainstem Hyperactivity in Migraine

- Sensitized trigeminal nucleus
- Hypothalamic nuclei
- Vestibular nuclei
- Cochlear nuclei


MIGRAINE AURA

Karl S. Lashly 1941


Vascular Changes in Migraine

Vascular Changes in Migraine


Trigeminal outflow causes local tissue inflammation and vascular changes

- Extravasation of inflammatory neuropeptides from c-fibers VIP, Neuropeptide Y
- Meninges – meningitis-like headaches
- Nasal and sinus mucosa – congestion and pressure
- Inner ear – another possible source of hearing loss, vertigo
  Vass et al. Neuroscience 2001;103:189-201

Migraine Symptoms
Parasympathetic Outflow

The migraine attack is associated with increased parasympathetic outflow.

- Lacrimation
- Rhinorrhea
- Nasal congestion
- Soft tissue swelling
- Fluid retention
- GI symptoms
- Cardiac symptoms
### Otologic Symptoms From Migraine

- Brainstem hyperactivity
  - migrainous vertigo, motion intolerance, hyperacusis
- Cortex
  - vertigo as aura/spreading depression
- Referred pain to the ear - C1-2 or V1 inflammatory peptides
  - otalgia, aural pressure
- Inner Ear - V1
  - BPPV, Ménière’s disease, acute vestibulopathy
- VIII N
  - Recurrent vestibular neuritis, recurrent vestibulopathy of unknown etiology (RVUE)

### Vanilloid Receptors in Man

- Ca++ channels present on unmyelinated sensory c-fibers
  - Heat >42 °C
  - Protons pH < 6.2
  - Mechanical force
  - Burning sensation
    - Substance P
    - CGRP
    - VIP
    - Neuropeptide Y
- Overstimulation results in partially reversible denervation
  - Capsaicin Therapy

### Vanilloid Receptors in the Inner Ear

- Cochlea vessels, AICA, Basilar a. innervated by V1
- Regulate activity of Organ of Corti
- Regulate CBF

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*Speakers: [Authors' Names]*

*Conference: [Event Name]*

*Location: [Location]*
The labyrinth may experience physiologic effects as a result of events occurring elsewhere in the V1 distribution.
Migraine in the Cochlea
MD and Migraine: Epidemiology

- Prevalence of IHS migraine is (4.6%MV)
  American Migraine Study II, 1999
  prevalence of IHS migraine in MD
  Radtke: Neurology, 2002; 59
  Rasgheli: Laryngoscope, 1992;102
  Parker; Arch Oto HNS, 1995; 121

- In MD lifetime migraine prevalence is 43% in women and 19% in men
  Parker: Acta Otolaryngol HNS 1995, 121
Hydropic ears have 70% fewer c-fibers
Hydropic ears have impaired cochlear blood flow
Experimental hydrops reduces capsaicin induced CBF changes
Vestibular Symptoms in Migraine are Common

- Prevalence of IHS migraine is 13%
- 27% of IHS migraineurs report vertigo
  - Prevalence of migraine with vertigo = 3%
  
  Neuhauser, Cephalgia, 2004
- Prevalence of MD is:
  - 0.02% Japan
  - 0.2% US
  - 0.4% Italy
  
  Wladislawosky et al. Laryngoscope, 1984:94
  Shojaku H, Acta Oto-laryngologica 528:94-6, 1991

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**Abortive Medications for Migrainous Vertigo**

- Generally ineffective
- Vestibular suppressants helpful in only 20%
- Promethazine is a good choice PO/PR because it suppresses nausea and has a central migraine abortive effect
- Many patients have such brief and frequent attacks that episodic management is not possible
- Most patients require Prophylaxis/Diet

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**Does vertigo respond to migraine treatment?**

- Patients with migrainous vertigo(MV) and complex dizziness of undetermined etiology(CDUE) responded to migraine treatments.
  - 46% responded to nortripyline
  - 25% responded to topiramate
  - 16% responded to caffeine cessation
- 75% of MV and 50% of CDUE responded to these treatments

Migraine and BPPV

Can migraine cause BPPV?

- Plasma extravasation or other peripheral inflammation could damage the superior vestibular nerve or the utricle.
- Release of otoconia could start BPPV.

- Pts with recurrent BPPV have a very high prevalence of migraine. Recurrent episodes respond to migraine treatment.
Migraine and BPPV

LIFETIME PREVALENCE OF BPPV - 2.4%
1 YEAR PREVALENCE OF BPPV - 1.6%

- In individuals with migraine the odds ratio for BPPV is 7.5 over age- and sex-matched controls. (95% CI: 3.9–14.2)
- The frequency of migraine is 3x higher in idiopathic BPPV than in BPPV secondary to head trauma or surgery.
- Prevalence of migraine in patients with BPPV is 2x as high as that in age and sex matched controls.

The Intersection of Headache, Migrainous Vertigo and BPPV

Migraine and Otalgia
Migraine Associated Otalgia

2003-2010:
• 48 patients who presented with otalgia were offered migraine treatment:
  - Negative exam/imaging
  - Failed other treatment (tubes, surgery, trial of PPI)

Teixido et al. Otology & Neurotology
32:322-325 2011

Migraine Characteristics in Otalgia Patients Responsive to Migraine Treatment

Migraine and Sinusitis
Otolaryngologic Presentations of Migraine
Sinus Pressure

75% of undiagnosed migraine sufferers receive other medical diagnoses

Why are so many migraineurs misdiagnosed with “sinus” headache?

- Physicians tend to conceptualize nasal and ocular symptoms as being uncharacteristic of migraine
  - IHS criteria do not list these symptoms as criteria for assigning a migraine diagnosis
- Patients may conceptualize nasal and ocular symptoms as “sinus”
  - Advertising of over-the-counter sinus medications has repeatedly conveyed that pounding pain associated with these symptoms are “sinus” headache
- Decongestants work
- Weather change sensitivity is commonly conceptualized as consistent with sinus headache
- Many patients improve, at least temporarily, with surgery

REASONS FOR MISDIAGNOSIS OF MIGRAINE AS SINUSITIS

- Up to 50% of migraine patients report their headaches are influenced by weather
- 45% of migraine patients report attack related ‘sinus’ symptoms including lacrimation, rhinorrhea, nasal congestion associated with increased parasympathetic outflow, neuropeptide release
- Migraine is bilateral in up to 40% of patients

The Sinus, Allergy and Migraine Study

• classify the headache types that those with self-diagnosed sinus headache experience
Treatment of Sinus Headache with Triptans

- 54 patients with self reported “sinus headaches” who did not have findings of sinusitis on endoscopy and CT
- similar demographics of patients with migraine
- 73% met IHS criteria (56% never diagnosed)
- 82% had a significant response to empiric treatment for sinus headaches with triptans.


Treatment of Sinus Headache with Valproic Acid

- 104 patients with self reported sinus headache
- 69% normal CT/endoscopy-Valproic acid
  - 71% response rate at 3 months
  - 15% no response
  - 14% no f/u or withdrew

Dadgarnia et al. AAO-HNS meeting 2010

Allergy and immunotherapy: are they related to migraine headache?

- Patients with migraine and allergy n=536
- Lower degrees of atopy associated with less frequent and disabling migraine in younger subjects. Higher degrees were associated with more frequent headache.
- Significant reduction in migraine frequency and disability with immunotherapy in patients under 45

Allergy in migraine

- Non-allergic migraineurs have higher IgE levels than controls
- Histamine levels increase during migraine pain

Scandinavian Journal of Immunology, 57, 286-290 2003

Why do patients get better only temporarily with surgery?

- FESS: c-fiber denervation may remove OMC as a trigger and as a site susceptible to mediator release


Migraine or Sinusitis?

**Migraine**
- Congestion/rhinorrhea only at time of headache
  - triggerable
- Facial pressure
- Symptoms last for Hours
- Infected drainage NO
- Mucosa normal
- CT usually normal
- Responds to decongestants
- Episodes prevented by capsaicin, migraine specific meds

**Sinusitis**
- Congestion/rhinorrhea is perennial or seasonal
  - not triggerable
- Facial pressure
- Symptoms last for Days
- Infected drainage YES
- Mucosa allergic/vasomotor
- CT abnormal
- Responds to decongestants
- Episodes not prevented by capsaicin, migraine specific meds
So, how can I be sure it’s migraine?

Maintain a high degree of suspicion in the patient with:

- Chronic / recurrent facial or head pain
- No structural lesions to explain pain
- Associated neurological symptoms – e.g. sinus headache with vertigo
- No response to usual therapy- e.g. persistent headache after FESS
- Triggerability
- Past history of migraine
- Family history of migraine or symptoms similar to the patient’s

Practical Treatment of Sinus Headache

• If migraine and sinus headache co-exist empirically treat migraine as well
• If allergy and sinus headache co-exist treat allergy as well
• If migraine suspected try empiric therapy before surgery
  – Abortive, OTC or migraine specific
  – Prophylaxis
• Patients may benefit by elimination of other unrecognized migraine related symptoms

WHERE DO MIGRAINE SUFFERERS SEEK MEDICAL CARE?

This represents only 50% of IHS migraineurs.

Pts with otolaryngic presentations will come to ENT and will not find help elsewhere.
Management of Migraine

Migraine Treatment
- Patient education
- Trigger identification and avoidance
- Abortive therapy
  - Anti-inflammatory agents: NSAIDs, steroids
  - Migraine abortive agents: triptans
- Migraine prophylaxis: Beta blockade, Na+ or Ca++ channel blockade, Carbonic anhydrase inhibition
- Combined therapy: prophylaxis/abortive
- Lifestyle improvement
- No narcotics, barbiturates

Medications for Migraine Prophylaxis
Tricyclic Antidepressants
- Nortriptyline – safe / effective
- Serotonin-norepinephrine reuptake inhibitor (SNRI)
- Inhibits sodium channels and L-type calcium channels
- Often good response at low doses (20mg)
- 10mg HS x 7d then 2 HS.
  Increase over weeks as needed/tolerated to 50 mg.
- If morning sedation take HS dose earlier in evening
- Dry mouth, weight gain at higher doses
- Depression side effect profile does not apply
Medications for Migraine Prophylaxis

Beta-blockers

- Do not use with asthma, diabetes or low blood pressure
- Propranolol LA 60mg/day starting dose
- Increase as needed to 180mg/day
- May worsen depression

Calcium Channel Blockers

- Well tolerated
- Diltiazem CD 120mg starting dose
- Increase as needed to 240-480 mg/day
- Divide dose at higher doses
- Constipation, hypotension

Anticonvulsants

Topirimate (Topamax)
- Anticonvulsant and carbonic anhydrase inhibitor
- Good evidence for efficacy as 1st line agent
- Slow dose escalation needed
- Cognitive side effects can be limiting
- Start 12.5-25 mg daily, then BID, then increase weekly to 100 BID.
- Risks include kidney stones, rare form of glaucoma
- Weight loss a plus!
Summary

- Migraine is a common clinical problem
- Defined neurovascular mechanisms are responsible for symptom generation
- Otolaryngologists will encounter many patients with atypical presentations of migraine who will not be served by others
- Migraine management by Otolaryngologists is necessary for optimal patient care
- Migraine management should be added to the otolaryngology curriculum

Thank You