SURGICAL TREATMENT OF HEADACHE DISORDERS

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OBJECTIVES:

- The participant will be able to accurately diagnose headache disorders based on ICHD-III beta criteria.
- The participant will be able to describe surgical techniques that are employed for the treatment of migraine.
- The participant will be able to describe the evidence supporting the use of surgical techniques for the treatment of migraine.
ROAD NUMBER 1

- Red Flag in Headache History
- Neurologic Findings on Examination
- Concerning Medical History
- Concerning Family History
- Diagnostic Testing Suggestive of Secondary Headache requiring Urgent/Emergent Surgical Consultation!!!
THE SINISTER TRIO

- First
- Worst
- Cursed
THE FRIENDLY TRIO

- Normal History
- Normal Exam
- Benign Family History
ROAD NUMBER 1

- Secondary Headaches
  - Intracranial Tumors
  - Intracranial Hemorrhage
  - Vascular Malformations

- Clear and present danger

- Risk of no surgical intervention is potentially fatal

- Knee jerk response should appropriately be a surgical referral (even if patient had normal reflexes on examination)
ROAD NUMBER 2

- Elective Surgery
- Risk to benefit ratio is not clear
- Not performing surgical intervention does not have any life threatening consequences
RISKS OF SURGERY

- Meningitis/Encephalitis
- Intracranial Hemorrhage/Stroke
- Cranial Nerve Deficits/Neuralgias
- CSF Leaks
- Worsening of Pain
- Anesthesia Dolorsa
Botulinum toxin injections for the treatment of migraine
- Discovered incidentally in patients receiving cosmetic injections
- Larger studies demonstrated efficacy leading to FDA approval in 2010
- Relaxation of pericranial and pericervical musculature thought to be ONE mechanism of action
- Blocks the transmission of γ-motor neurons afferent muscle stretch information to the central nervous system.
  - May decrease hyperactive muscle contractions resulting in a reduction of pain
  - Affects some nerve terminals that contain substance P, calcitonin gene-related peptide, somatostatin, enkephalins, norepinephrine, adenosine triphosphate, neuropeptide Y, and nitric oxide,13-15 which play varying roles in the pathophysiology of migraine.
- Rat models demonstrated retrograde axonal transport from whiskers to facial nuclei

Plastic surgery for the treatment of migraine
- Bahman Guyuron, MD incidentally discovered improvement of migraines in patients who received cosmetic brow lifts
- Theorized that compressed nerves are serving as triggers for migraine
- Deactivation procedures for 4 potential trigger sites devised
  - Intranasal Trigger Site
  - Frontal Trigger Site
  - Temporal Trigger Site
  - Occipital Trigger Site

Migraine Pathophysiology:

- Genetic predisposition
- Cortical neuronal hyperexcitability
- Abnormal brainstem function

Triggers:

- Genetic predisposition
- Cortical neuronal hyperexcitability
- Abnormal brainstem function

Migraine initiation:

- Aura
- CSD

Activation and peripheral sensitization of TGVS:

- Neurogenic inflammation
- Central sensitization

Pain generation/perpetuation:

HEADACHE

TVS = trigeminovascular system.

The Natural Course of a Typical Migraine Attack


Premonitory phase
Aura
Headache phase
Sensory hyperexcitability
Resolution
Postdrome
Time

Triggers

Headache

MIGRAINE UNIVERSAL TRIGGERS

- Menstrual cycle
- Stress
- Sleep dysfunction
- Fatigue
- Delayed/skipped meals

OTHER MIGRAINE TRIGGERS

- Seasonal changes
- Weather changes
- Non-migraine pain & systemic illness
- Specific food triggers?
- Lights, sounds, smells
  - Is this part of the prodrome or part of the early headache?

MIGRAINE SURGERY

- Surgical Deactivation of 4 Potential Trigger Sites
  - Intranasal Trigger Site
    - Trigeminal nerve irritation from contact between intranasal structures
    - Septoplasty and turbinectomy

MIGRAINE SURGERY

- Surgical Deactivation of 4 Potential Trigger Sites
  - Frontal Trigger Site
    - Supraorbital and supratrochlear nerves
    - Resection of corrugator supercilii, depressor supercilii muscles, lateral procerus

MIGRAINE SURGERY

- Surgical Deactivation of 4 Potential Trigger Sites
  - Temporal Trigger Site
    - Zygomatictemporal branch of Trigeminal Nerve through the temporalis muscle
    - Avulsion of the nerve

MIGRAINE SURGERY

- Surgical Deactivation of 4 Potential Trigger Sites
  - Occipital Trigger Site
    - Greater occipital nerve
    - Resection of small portion of semispinalis capitis muscle and shielding of the nerve with a subcutaneous flap (fat pad)
    - If there is contact between the occipital artery and occipital nerves, the artery is at times also resected

MIGRAINE PRE-SURGERY EVALUATION

- Botulinum Toxin injections result in the temporary weakening of the muscles that impinge on the nerves which have been pinpointed as trigger areas for migraine headaches
  - In surgical trials botulinum toxin injections at sub-paradigm doses can cause improvement of pain
  - 25 unit test dose provided improvement in some subjects
    - Why not proceed with 155 unit therapeutic dosing instead of surgery?

- In practice, some plastic surgeons also use response to nerve blocks to predict response to surgery
  - Nerve blocks can have lasting effects on pain long after the time of anesthesia has resolved in areas not directly treated by the nerve block


Mathew PG. Cranial Peripheral Nerve Blocks. In: Principles & Practice of Pain Medicine, 3rd Ed, Bajwa, Wootton, Warfield
“The practice of making a decision to proceed with migraine surgery based on such nonspecific screening tests as BTX injections or nerve blocks would be like a spine surgeon using lidocaine patches as a screening tool for low back pain, and proceeding with a laminectomy in patients who responded positively to lidocaine patches.”

– In dental terms…like proceeding with a root canal if a patient responds to oxycodone
MIGRAINE PRE-SURGERY EVALUATION

- New surgical diagnostic algorithm: nerve block performed if patient has active pain in office and botulinum toxin if there is no pain in office.
  - Powerful persuasion if pain resolved with blocks
- “Although positive responses to botulinum toxin A and nerve block are very helpful and reliable in confirming the trigger sites, negative responses must be interpreted with extreme caution.”

MIGRAINE PRE-SURGERY EVALUATION

- Doppler Evaluation
  - Headache point of origin identified with 1 finger by patient
  - Site is explored with Doppler.
  - If an arterial Doppler signal is identified at the site, it is considered an active arterial trigger site.

“Based on the 5-year follow-up data, there is strong evidence that surgical manipulation of one or more migraine trigger sites can successfully eliminate or reduce the frequency, duration, and intensity of migraine headache in a lasting manner.”

100 treated received Botox and 25 controls received saline
- 100 → 91 had surgery → 89 presented for 1 year follow-up → 10 had second procedure after 1 year follow-up → 79 at 5 year follow-up
- After 1 year “controls” were given the option for surgery
- At 5 years
  - 61 had a positive response
  - 20 had complete migraine elimination (29%)
  - 41 had “significant” improvement of migraine (59%)
    - 50% reduction of frequency, intensity, or duration
    - Total headache days not included based on methods
    - Some subjects may have had less migraines but more headaches
  - 8 had no significant change (12%)
  - No mention of other preventatives used or abortive medications used

Diagnosis confirmed by neurologist, but most patients had episodic migraine (Less than 15 headache days per month).

Not all patients had the same trigger site treatment and some had multiple procedures at once
- 6 (8.7%) had 1 site
- 15 (21.7%) had 2 sites
- 30 (43.5%) had 3 sites
- 18 (26.1%) had 4 sites

No sham surgery for “control” group

Migraine index of frequency x duration x intensity was a marker

Not covered by most insurance providers
- $8378 estimate for consultation, laboratory work, electrocardiography, chest radiography, surgery, anesthesia, and facility fees
  - Mean surgeon’s fee was $5445.84

Side Effects
- 20 had occasional itching
- 3 had hair thinning at surgical site
- 2 had hypersensitivity (frontal)
- 2 had hyposensitivity (frontal)
- 2 had numbness (frontal)
- 3 had mild occipital stiffness or weakness
- 1 had facial nerve injury with complete recovery

STUDY SUMMARY

- Numerous methodological flaws
  - Unclear patient selection
  - Unmatched groups
  - Blinding issues
  - Performance of multiple procedures simultaneously
  - Lack of appropriate controls for comparison
  - No record of medication usage before or after the intervention
  - Use of endpoints that have not been validated

- Studies have appeared in plastic surgery journals, and have been frequently rejected based on methodology from neurology/headache medicine journals
Despite reports of "significant improvement" after initial deactivation surgery, some subjects underwent additional procedures during the follow-up periods.

Chart review study of 185 patients
- Initial headache location where surgery was performed considered primary trigger site
- Sites that became active after surgery, but not before surgery were considered secondary, which occurred in 17.8% of subjects
- Attempts to recognize a pattern may result in more surgical procedures than initially planned.

MIGRAINE SURGERY

- Placebo response…5 years would be a very long time
  - Actual sham surgery trial involved incisions without structural adjustments yielded control subjects who experienced benefit 1 year after intervention
  - Are we missing something?

Other studies have boasted similar positive results. Some possible reasons include:

- Poor reporting and presentation of data
  - Including only migraine days rather than headache days
  - Duration of headache as a marker of success
  - Migraine Index
- The procedure is treating another medical problem, which is occurring in addition to headaches that meet criteria for migraine

INTRANASAL TRIGGER SITE

- Referred to as contact point headache in the neurology literature
- Nasal septal deviation with a contact point on the lateral nasal wall can trigger episodic or daily headache
- Lidocaine block led to improvement, and surgical removal of contact point led to complete remission of 1 patient (bifrontal HA) and 80% improvement of another (bitemporal, vertex, and occipitonalzal HA)
  - Both had migrainous headaches

1. Rozen, TD. Intranasal contact point headache: Missing the "point" on brain MRI. Neurology 2009;72:1107
SINUS/ALLERGY HEADACHE

- The great mimicker
  - Pressure in the face
  - Thin liquid nasal discharge
  - Worse with weather changes
  - Seasonal association
  - Responds to steroids
    - Like headaches
  - Responds to antibiotics
    - Headache would have resolved anyway

- Sinus Triad
  - Thick purulent discharge
  - Fever
  - Imaging evidence of sinus disease

- Migrainous features?

- The vast majority have migraine in the absence of neurologic and ENT findings

SINUS/ALLERGY HEADACHE

- ENT referrals in the following situation
  - Retro-nasal/Retro-orbital pressure/pain
  - Trouble breathing through nose at baseline
  - Rhinorrhea/Post Nasal Drip
  - Chronic sinus infections
  - Chronic congestion
  - Snoring
  - Diagnosed/concerned about an underlying sleep disorder
  - CT/MRI evidence of intranasal contact point
  - Refractory to typical headache treatment
FRONTAL, TEMPORAL, OCCIPITAL TRIGGER SITES

- If nerve compression is serving as a trigger for migraines, why are branches of the trigeminal nerve being resected rather than decompressed in the temporal region.
  - Based on the trigeminal neuralgia literature, damaging or destroying a peripheral nerve can lead to numbness, paresthesias, dysesthesias, and even worsening of preoperative pain.

- If nerve compression is thought to be occurring, why do these patients not have numbness, paresthesias, or neuralgiaform pain in the distribution of the suspected nerve compression.
  - Supororbital, Supratrochlear, Auriculotemporal, and Greater/Lesser Occipital Neuralgia may have existed in these patients in addition to migraine.
  - Decompression of the nerve improved/resolved the neuralgia, which has a tendency to improve, but not CURE migraine.


FRONTAL, TEMPORAL, OCCIPITAL TRIGGER SITES

- Migraine and Painful Cranial Neuralgias
  - 35 consecutive occipital neuralgia cases, 15 had both occipital neuralgia and migraines
  - Chances are good that many patients with migraines and focal neuralgias are only being diagnosed with migraines
  - Patients being treated with decompression procedures for focal neuralgias rather than migraine have done well

FRONTAL, TEMPORAL, OCCIPITAL TRIGGER SITES

- Questions to ask…
  - Do you have quick stabs of pain lasting seconds at a time in addition to your typical migraine pain?
  - Can this pain be triggered by contact to the area or lying down in a manner that applies pressure to the area in question?
  - Can this pain be triggered by neck movements like looking over your shoulder while driving?
  - Does the pain radiate in a particular nerve distribution?
OCCIPITAL NEURALGIA EXAM

- Exam maneuvers to perform...
  - Cranial tinel’s sign demonstrating pain/paresthesias along nerve distribution
  - Neck passive range of motion elicits pain
  - Best results: Lancinating pain occurs with tinel’s and PROM when patient denies any significant headache otherwise
CRITIC OF THE CRITIC

- Insult to study neurologists
- Two separate diagnoses cannot co-exist at the same time in the same patient.
  - That would be like having gingivitis and temporomandibular joint dysfunction due to disk erosion at the same time

• Greedy, unethical, poorly trained surgeons are the ones having bad results
  – Who is properly trained to perform these procedures? Claiming a “CURE”
  – Is there a certification?
  – Why are some surgeons calling themselves headache specialists when they are neither fellowship trained or board certified in headache medicine?
MT ROYAL, NJ (April 13, 2012) – In light of several recent news items about the growing use of surgical interventions in migraine treatment, the American Headache Society has issued the following statement. Unfortunately, there is no cure for migraine. Many therapies, including medications, alternative therapies and surgical interventions, are aimed at reducing migraine frequency or stopping the pain and associated symptoms after they’ve begun, but none are “cures”. In light of recent news reports about the growing use of surgical intervention in migraine, the American Headache Society® is urging patients, healthcare professionals and migraine treatment specialists themselves, to exercise caution in recommending or seeking such therapy. In our view, surgery for migraine is a last-resort option and is probably not appropriate for most sufferers. To date, there are no convincing or definitive data that show its long-term value. Besides replacing the use of more appropriate treatments, surgical intervention also may produce side effects that are not reversible and carry the risks associated with any surgery. It also can be extremely expensive and may not be covered by insurance. Most importantly, it may not work for you at all. The hallmarks of good therapies are: proven results in randomized controlled trials with adequate numbers of subjects, data reviewed and published in established peer-reviewed publications, reproducible results by other investigators, regulatory approval where appropriate, and endorsement by key opinion leaders and professional organizations in the field of headache medicine and migraine. The search for effective treatments and ultimately a cure for migraine is a primary goal of the American Headache Society and American Migraine Foundation. We will continue to advocate for the advancement of migraine science for the more than 36 million Americans and millions of others around the world who suffer with this sometimes highly disabling disease. The American Headache Society® is a professional society of health care providers dedicated to the study and treatment of headache and facial pain. The Society’s objectives are to promote the exchange of information and ideas concerning the causes and treatments of headache and related painful disorders. Educating physicians, health professionals and the public and encouraging scientific research are the primary functions of this organization. AHS activities include an annual scientific meeting, a comprehensive headache symposium, regional symposia for neurologists and family practice physicians, publication of the journal Headache and sponsorship of the AHS Committee for Headache Education (ACHE). www.americanheadachesociety.org
CONCLUSIONS:

- A thorough history, physical examination, and appropriate diagnostic tests should be performed to make the appropriate primary or secondary headache diagnosis.

- Clear and present danger should always prompt the appropriate surgical referral.

- Elective surgery should ONLY be considered with caution after failure of best medical management including injectable therapies and evaluation by a board certified headache specialist.

- Elective surgery should ONLY be considered after careful assessment of the risks and benefits of the procedure, and in the setting of a clinical trial.

- Future studies should consider MRI/MRA imaging to demonstrate compression like with trigeminal neuralgia evaluation before microvascular decompression surgery.
MAYO CLINIC PEARL:

• “When you cut through a pain sensitive structure, chances are good that you may worsen the pain.”
  – Dr. F.M. Cutrer
If you enjoyed the clinical content...

Dr. Mathew (4 chapters)
If you enjoyed the humor...

Sinus headache or sign-us up for a migraine consultation

Spinning out of control: Vertigo

Snored to death: The symptoms and dangers of untreated sleep apnea

Unlocking the lock jaw: Temporomandibular Joint (TMJ) dysfunction

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