Introduction:

Headache is a common complaint otolaryngologists evaluate in practice. Therefore, it is necessary to be proficient in evaluating headaches of both sino-nasal and non-sino-nasal origin alike. Rhinogenic headache is a controversial, but distinct type of headache that has received an increased amount of attention in the literature over the past twenty years. As a somewhat unsettled topic, there is very little information in textbooks regarding this subject. This paper aims to discuss diagnostic criteria for common headaches, define rhinogenic headache, and review the literature supporting and opposing the existence of rhinogenic headaches.

Background:

Migraine

Migraine headaches are the most common neurological illness diagnosed in Europe and North America. It affects 12% of women, which is double the rate in men. The exact cause of migraine headache is still unknown although vascular, neurogenic, and other mechanisms have been proposed. Migraines are broadly divided into two separate subtypes: with and without prodromal aura.

Migraine without Aura

Comprising 80% of all migraines, migraine without aura is a recurrent headache disorder that manifests itself as repeated headache attacks. Episodes typically last from 4-72 hours. Pain is typically unilateral, pulsating in quality, moderate/severe in intensity, worsened by physical activity, and associated with light or sound sensitivity. The International Headache Society, an international multidisciplinary organization dedicated to treating headaches has issued the following diagnostic criteria for migraine without aura:
Migraine with Aura:

Migraine with aura is a related, but distinct subtype of migraine with similar diagnostic criteria. In addition to recurrent headaches described above for migraine without aura, migraine with aura involves focal neurological symptoms that occur prior to or accompany a migraine. These symptoms have a gradual onset over a period of 5-20 minutes and last approximately one hour. To be considered a prodromal aura, the migraine headache must begin within 60 minutes of the end of aura symptoms. Migraine with aura is less common, encompassing 20% of migraines. The International Headache Society has issued the below diagnostic criteria for migraine with aura:

A. At least 2 attacks fulfilling criteria B–D
B. Aura consisting of at least 1 of the following, but no motor weakness:
   1. Fully reversible visual symptoms, including positive features (e.g., flickering lights, spots, or lines) and/or negative features (e.g., loss of vision)
   2. Fully reversible sensory symptoms, including positive features (e.g., pins and needles) and/or negative features (e.g., numbness)
   3. Fully reversible dysphasic speech disturbance
C. Headache has at least 2 of the following characteristics:
   1. Homonymous visual symptoms and/or unilateral sensory symptoms
   2. At least 1 aura symptom develops gradually over ≥5 min and/or different aura symptoms occur in succession over ≥5 min
   3. Each symptom lasts ≥5 and ≤60 min
D. Headache fulfilling criteria B–D for migraine without aura begins during the aura or follows aura within 60 min
E. Not attributed to another disorder
**Tension Headaches**

Tension headaches are the most common type of headache. The reported prevalence varies widely between sources, but lies somewhere between 30-78%. Similar to most headaches, the exact mechanism is unknown. Typical features of a tension headache include bilateral pain, infrequent headache episodes, and headache duration lasting minutes to days. Quality of the pain is often a mild/moderate and pressure or squeezing in nature. Unlike migraine, tension headache is not significantly exacerbated by physical activity. Patients may report either light or sound sensitivity, but not both. Nausea is not frequently associated with tension headache. The International Headache Society has issued the following diagnostic criteria for tension headache:

**Diagnostic criteria:**

A. At least 10 episodes occurring on <1 day per month on average (<12 days per year) and fulfilling criteria B-D

B. Headache lasting from 30 minutes to 7 days

C. Headache has at least two of the following characteristics:
   1. bilateral location
   2. pressing/tightening (non-pulsating) quality
   3. mild or moderate intensity
   4. not aggravated by routine physical activity such as walking or climbing stairs

D. Both of the following:
   1. no nausea or vomiting (anorexia may occur)
   2. no more than one of photophobia or phonophobia

E. Not attributed to another disorder

**Cluster Headache**

Cluster headaches are acute headache attacks that occur in a series (also known as a cluster period). Cluster periods last from a few weeks to several months with remission periods that can last multiple years. These clustered attacks can be triggered by certain identifiable irritants such as alcohol, histamine, and nitroglycerin. Typical features include orbital, supra-orbital, or temporal pain. During a cluster period, the headache tends to be on the same side but can switch sides between different cluster periods. The pain from a cluster headache is frequently excruciating and patients can be debilitated during an acute attack. Other ipsilateral symptoms also classically accompany a cluster headache including conjunctival injection, lacrimation, nasal congestion, rhinorrhea, forehead and facial sweating, miosis, ptosis, and eyelid edema. The mechanism is thought to involve activation of the posterior hypothalamic gray matter. Cluster headaches afflict men at 3-4 times the rate of women. The International Headache Society has created the following diagnostic criteria for cluster headache:
Acute Sinusitis

The American Academy of Otolaryngology/Head and Neck Surgery (AAO-HNS) has created diagnostic criteria for acute rhino-sinusitis. Diagnosis requires two major criteria or one major criteria with two minor criteria. Headache identified as a minor criteria for diagnosis, although headache features are not discussed. The diagnostic criteria issued by the AAO/HNS for acute rhino-sinusitis are listed below:

<table>
<thead>
<tr>
<th>Major factors</th>
<th>Minor factors</th>
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<tbody>
<tr>
<td>Purulence in nasal cavity</td>
<td>Headache</td>
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<tr>
<td>Facial pain, pressure, congestion, and fullness</td>
<td>Fever (all nonacute)</td>
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<tr>
<td>Nasal obstruction, blockage, discharge, and purulence</td>
<td>Halitosis</td>
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<tr>
<td>Fever (acute rhinosinusitis only)</td>
<td>Fatigue</td>
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<td>Hyposmia and anosmia</td>
<td>Dental pain</td>
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<td>Cough</td>
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<td>Ear pain and fullness</td>
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Of note, the AAO/HNS does not recognize headache as a feature of chronic rhino-sinusitis

Definition of Rhinogenic Headache:

Rhinogenic headache is a headache or facial pain syndrome secondary to mucosal contact points in the nasal/sinus cavities in the absence of inflammatory sino-nasal, purulent discharge, sino-nasal polyps, sino-nasal masses, or hyperplastic mucosa. It has multiple synonyms used frequently in the literature which include rhinopathic headache, sinogenic headache, middle turbinate headache, nasal spur headache, four finger headache, sinus headache, contact point headache, and Sluder headache. The International Headache Society recognizes rhinogenic headache, but states that the evidence for its existence is limited. The diagnostic criteria is listed below:
Diagnostic criteria:
A. Intermittent pain localised to the periorbital and medial canthal or temporozygomatic regions and fulfilling criteria C and D
B. Clinical, nasal endoscopic and/or CT imaging evidence of mucosal contact points without acute rhinosinusitis
C. Evidence that the pain can be attributed to mucosal contact based on at least one of the following:
   1. pain corresponds to gravitational variations in mucosal congestion as the patient moves between upright and recumbent postures
   2. abolition of pain within 5 minutes after diagnostic topical application of local anaesthesia to the middle turbinate using placebo- or other controls
D. Pain resolves within 7 days, and does not recur, after surgical removal of mucosal contact points
   Note:
      1. Abolition of pain means complete relief of pain, indicated by a score of zero on a visual analogue scale VAS)
Comment:
A11.5.1 Mucosal contact point headache is a new entry to the classification for which evidence is limited. Controlled trials are recommended to validate it, using the listed criteria for patient selection.

Historical Perspective:

The concept of rhinogenic headache secondary to mucosal contact points is not new. J.O. Roe is credited with first describing them in 1888. In the 1920’s, Sluder theorized that headaches could occur from the sinuses in the absence of inflammation or infection by the creation of a vacumm in a sinus cavity. McAuliffe et. al. performed a frequently-sited study in 1943 regarding the origin of headache and facial pain. Questioning the mechanism of “sinus headache”, McAuliffe believed that headache pain originated from the nasal cavity, sino-nasal ducts, and sinus ostia rather than from the mucosal lining of the para-nasal sinuses themselves. The study included five healthy subjects and ten patients severe facial pain that required facial nerve ablation for symptomatic relief. Different areas of the nasal cavity and para-nasal sinuses were stimulated a metal probe, an electric current, and a 1:1000 epinephrine solution. Each subject’s fingers were dipped in soft red wax. When an area in the nose was stimulated, the patient would touch the area on the face where he or she experienced pain. Patients then rated the pain on a scale from 1-9+ in intensity. The sensitivity for each area stimulated was the following:

- -tongue: 1+
- -septum: 1-2+
- -turbinates 4-6+
- naso-frontoduct: 5-7+
- sinus ostium: 6-9+
- sinus lining: 1-2+

In addition, he mapped areas stimulated to the location of pain experienced. The superior nasal structures were found to correlate with headache in the front of the head, topic of the head, and between the eyes. The middle/inferior nasal structures correlated with headache experienced in the zygoma, temple, teeth, and jaw.

**Mechanism of Rhinogenic Headache:**

With the advent of endoscopic sinus surgery, a renewed interested in headache surgery began in the late 1980’s. Stammberger and Wolfe described a potential mechanism for nasal mucosal contact point headaches in 1988. According to their theory mechanical contact between two mucosal surfaces in the nose or sinuses creates a sensory stimulus which is known as axonal reflex. Sensory nerve endings primarily from V1 and V2 extend into the nasal mucosa and nearly to the cell surface. The axonal reflex results in the release of substance P, a vasoactive neuropeptide found in unmyelinated C fibers. Substance P causes vasodilation, plasma extravasation, histamine release, and other inflammatory events. These vascular phenomenon may be responsible for migraine-like headache symptoms. Since V1 innervates the dura, this mechanism may also involve referred pain described above from V2/V3.

**Supporting Evidence in the Literature:**

Once described by Stammberger and Wolfe in 1988, multiple case series (9 identified by this review) were published showing success in operative management of rhinogenic headache. All case series shared very similar features. They each had a very high success rate for surgery (60-100% improvement). Sample sizes were very small (3-36 patients in each series). Strict selection criteria were used to isolate a small subgroup of patients with headaches. Patients had long-lasting, frequent, severe headaches without other identifiable sino-nasal disease. Both CT and nasal endoscopy were used to identify nasal mucosal contact points and rule out other pathology. Furthermore, most studies used a topical block test or cocaine test to confirm the presence of rhinogenic headache. Using this test, topical anesthetic was applied to a mucosal contact point while a patient was actively experiencing headache. A positive test occurred when application of the anesthetic relieved the headache. Some authors injected the mucosal contact point with anesthetic if topical administration did not relieve the pain. Each patient was also evaluated by a multi-disciplinary team consisting of a neurologist, ophthalmologist, spine specialist, and internist to rule out other possible causes of headaches. Finally, patients were managed by medical therapy first without success. Surgically corrected contact points in these case series included septal deviation contacting nasal wall, septum to middle turbinate, septum to inferior turbinate, concha bullosa, superior turbinate pneumatization, and any other visualized mucosal contact point.
Problems with mechanism of rhinogenic headache:

A number of obstacles exist concerning the proposed mechanism of rhinogenic headache. First, McAuliffe’s findings have not been reproduced since his experiment in the 1940’s. Abu-Bakra and Jones re-created the experiment in 2001. Mucosal areas of the nasal cavity and para-nasal sinuses were stimulated with a metal probe, 1:1000 epinephrin, substance P, and placebo (cotton with sterile water). No subjects experienced referred headache or facial pain. The authors concluded that nasal mucosal contact points are coincidental.

Second, there is no clear evidence that substance P is produced by mucosal contact points. Stammberger described that substance P is stored in localized sensory C-fibers in human nasal mucosa, but did not provide a mechanism for release by mucosal contact points. Additionally, there is no evidence that mucosal contact points elsewhere in the body create pain.

Third, there is no clear evidence of a causal relationship between mucosal contact points and headache. Abu-Bakra and Jones performed a retrospective review of 973 patients evaluated to determine the correlation of headache complaints and nasal mucosal contact points. They found that the percentage of contact points was the same in both patients with and without headache. Abu-Bakra and Jones again concluded that contact points are coincidental.

Fourth, the quality of evidence supporting rhinogenic headache is poor. The evidence in the literature supporting the existence of headaches from mucosal contact points and effectiveness of surgery in correcting them are limited largely to uncontrolled cases series with short follow-up periods. Abu-Bakra and Jones reported a small case series of four patients who underwent surgery for rhinogenic headache. All patients experienced improvement between 2-12 months, but 3 patients had return of symptoms by two years. They argued that improvement in headache after surgery could be from the placebo effect or a temporary alteration in sensory pathways caused by surgical trauma. An exception to mention is the study by Ramadan in which 8 patients who refused surgery were used as a control. An additional exception worth mentioning is the Welge-Lessen study published in 2003 in which patients were followed for 10 years after surgery. 13 of 20 patients still reported improvement in intensity, frequency, and duration of headache after surgery.

Finally, diagnosis of patients who might benefit from surgery is difficulty. Mariotti et. al. published a case series of 33 patients who underwent surgery for rhinogenic headache. Mariotti theorized that patients with a greater surface area of mucosal contact would tend to benefit the most from surgery. He created a numerical scoring system to rate CT scans to identify patients with the most area of mucosal contact. He study did not find an associated between surface area of contact points and patient improvement after surgery.

Future Research Needs:

Since the number of treated patients in all the combined studies of rhinogenic headache is small, further research is still needed. A high quality, prospective, controlled
A trial is needed to establish better diagnostic criteria. This would likely require a multi-institutional study to obtain enough subjects for adequate power.

**Practice Considerations:**

Today, operating on patients for rhinogenic headache remains very controversial and rhinogenic headaches remains a diagnosis of exclusion. Before surgery is considered, the patient should be evaluated by other relevant specialists and treated medically for a sufficient period of time. Diagnosing headaches from mucosal contact points typically requires a number of tools including CT, endoscopy, and anesthetic block testing. Patients desiring surgery should be educated about the controversial role of surgery and the lack of definitive proof that rhinogenic headaches can be improved in the long-term with surgery.

**DISCUSSANTS: Patricia Maeso, MD & Bruce Leipzig, MD**

**Dr. Patricia Maeso:**

That was a great review of the literature of a very difficult topic. You know these patients are extremely difficult and so I really commend you on that. I do have some things I want to share with everybody regarding this topic because it’s one that really interests me in that it baffles me daily in my practice where I really have to sit down and really think about what I’m going to do with this patient and how I’m going to best treat them. There are multiple studies that say that approximately 80 to 85% of patients complain of a sinus headache where you sort of have some migrainous issue and we have to be sure that we know those characteristics so that we don’t get confused into operating on those patients who will not get better.

**Dr. Bruce Leipzig:**

I agree that this is a problem that is a curse. I see it often, if not daily in my practice. Everybody’s got a headache. The problem is that sinus surgery does not get rid of headaches. It was very important to us in our office in that we were very careful to tell our sinus surgery patients that if their headache went away it was a matter of luck, not of a matter of plan and if they were having surgery for sinus headache, they ought to think through it twice because you could certainly take care of inflammatory sinus disease and you can make anyone better for a short period of time but the real relief of the headache was just willy nilly. After seeing thousands of patients I still can’t tell you any pattern in my experience that would give you a clue as to whose headaches are going to go away permanently and whose wouldn’t. I will say this, though, that nearly 100% of patients got relief for a few months. People come to a surgeon and they want surgery. You see this a lot with the tension and cluster headaches that you dealt with. I got a lot of referrals from neurologists not because they really thought these people had sinus headaches but because they just couldn’t get them better. You know, they’re looking for someone else to take over. These patients want pain medicine and you can’t blame them because headaches are really debilitating to a lot of people. I tended to be
someone who gave headaches instead of getting them but these people are looking for medicine and if you gave them medicine you could often satisfy them.

Back in my training days we called these headaches "mucosal contact headaches" or "Sluder headaches". And when I was first in practice I thought I could treat any of these easily by resecting the middle turbinate, which was the most common source of those contact headaches and everybody got better for a few weeks, or a few months, but in the long run, nobody got better. They all got these horrible crusting problems and they became your patients for life, but they weren't your happy patients. I think surgery for so-called rhinogenic headache is a very contentious thing.

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