

## A clinical review of sinonasal headache: an update

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**Abstract:** Headache is nearly a universal human experience. It has a significant impact on public health and healthcare cost. Proper understanding, evaluation, and prompt management would go a long way in improving the quality of life of the patient of headache. And while headache is a common complaint in every day practice of otolaryngologists, sinonasal headache is a controversial, but distinct type of headache that has received an increased amount of attention in the literature over the past few years even so the true incidence of headache from this cause is unknown, because many specialties are involved in the management of this kind of headaches. Therefore, it is necessary to be proficient in evaluating headaches of both sinonasal and non sinonasal origin alike. As a somewhat unsettled topic, there is very little information in textbooks regarding this subject. This article will help us in understanding and refresh our knowledge regarding headache and sinusitis, define sinonasal headache, and review the literature supporting and opposing the existence of sinonasal headaches and its criteria.

### Introduction

Headache is nearly a universal human experience. The lifetime incidence of headache is estimated to be at least 90%. Moskowitz has described headache as the symptom produced by the nervous system when it perceives threat and as such is considered part of the protective physiology of the nervous system (1). When the cause of headache is a definable underlying pathologic process, the headache is diagnosed as a secondary headache. Causes include metabolic, infectious, inflammatory, traumatic, neoplastic, immunologic, endocrinologic and vascular entities. Patients with chronic headache pain often present to a variety of specialists, including their primary care physician, neurologist, dentist, otolaryngologist and even

psychiatrist. They present to otolaryngologist because they or their physician believe the headache to be related to underlying sinus pathology. The primary focus of the otolaryngologist is to exclude this possibility. The diagnosis of headache secondary to acute-sinusitis can be relatively straightforward. Diagnosing headache related to chronic sinus disease can be much more difficult depending on patient's presentation (1). When no clear pathologic condition can be identified, headache is considered to be a manifestation of a primary headache syndrome. The common primary headache disorders as defined by the International Headache Society (HIS) are migraine, probable migraine, tension type and cluster headache (2).

*Migraine:*

Migraine headaches are the most common neurological illness diagnosed in Europe and North America. It affects 14% 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 (3). 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 to severe in intensity, worsened by physical activity, and associated with light or sound sensitivity (4). The International Headache Society, an international multidisciplinary organization dedicated to treating headaches has issued the following diagnostic criteria for migraine without aura:

<b>Diagnostic Criteria for Migraine without aura</b>
<p>A. At least 5 attacks<sup>1</sup> fulfilling criteria B-D</p> <p>B. Headache attacks lasting 4-72 hours (untreated or unsuccessfully treated)<sup>2,3,4</sup></p> <p>C. Headache has at least two of the following characteristics:</p> <ul style="list-style-type: none"> <li>*unilateral location<sup>5,6</sup></li> <li>*pulsating quality<sup>7</sup></li> <li>*moderate or severe pain intensity</li> <li>*aggravation by or causing avoidance of routine physical activity (<i>e.g.</i>, walking or climbing stairs)</li> </ul> <p>D. During headache at least one of the following:</p> <ol style="list-style-type: none"> <li>1. nausea and/or vomiting</li> <li>2. photophobia and phonophobia<sup>8</sup></li> </ol> <p>E. Not attributed to another disorder<sup>9</sup></p>

*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 (10). The International Headache Society has issued the below diagnostic criteria for migraine with aura:

#### Diagnostic criteria for migraine with aura

- A. At least 2 attacks fulfilling criteria B-D  
 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)
- Fully reversible dysphasic speech disturbance  
 Headache has at least 2 of the following characteristics:
- 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
- Each symptom lasts >5 and <60 min  
 Headache fulfilling criteria B-D for migraine without aura begins during the aura or follows aura within 60 min  
 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% (11). Similar to most headaches, the exact mechanism is unknown. Typical features of a tension headache include bilateral pain, infrequent headache episodes, and headache duration last 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 for tension headache

- 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<sup>3</sup>.

Diagnostic criteria for cluster headaches
<ul style="list-style-type: none"> <li>• At least 5 attacks fulfilling criteria B-D</li> <li>• Severe or very severe unilateral orbital, supraorbital and/or temporal pain lasting 15-180 minutes if untreated</li> <li>• Headache is accompanied by at least one of the following:               <ul style="list-style-type: none"> <li>• ipsilateral conjunctival injection and or lacrimation</li> <li>• ipsilateral nasal congestion and/or rhinorrhoea</li> <li>• ipsilateral eyelid oedema</li> <li>• ipsilateral forehead and facial sweating</li> <li>• ipsilateral miosis and/or ptosis</li> <li>• a sense of restlessness or agitation</li> </ul> </li> <li>• Attacks have a frequency from one every other day to 8 per day</li> <li>• Not attributed to another disorder<sup>3</sup></li> </ul>

*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 (10). 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, rhinorrhoea, 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 (11). 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 criterion 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: Of note, the AAO/HNS does not recognize headache as a feature of chronic rhinosinusitis.

**Diagnostic Criteria for acute rhinosinusitis**

Major factors	Minor factors
Purulence in nasal cavity	Headache
Facial pain, pressure, congestion, and fullness	Fever (all no acute)
Nasal obstruction, blockage, discharge, and	Halitosis
Purulence	Fatigue
Fever (acute rhinosinusitis only)	Dental pain
Hyposmia and anosmia	Cough
	Ear pain and fullness

*Definition of Sinogenic Headache:*

Sinonasal origin 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 (12). It has multiple synonyms used frequently in the literature which include rhino-

pathic headache, sinogenic headache, middle turbinate headache, nasal spur headache, four finger headache, sinus headache, contact point headache, and Sluder headache (13). The International Headache Society recognizes rhinogenic headache, but states that the evidence for its existence is limited.

Diagnostic criteria of sinonasal headache
<p>A. Intermittent pain localized to the periorbital and medial canthal or temporozygomatic regions and fulfilling criteria C and D.</p> <p>B. Clinical, nasal endoscopic and/or CT imaging evidence of mucosal contact points without acute rhinosinusitis.</p> <p>C. Evidence that the pain can be attributed to mucosal contact based on at least one of the following:</p> <ol style="list-style-type: none"> <li>1. Pain corresponds to gravitational variations in mucosal congestion as the patient moves between upright and recumbent postures.</li> <li>2. Abolition of pain within 5 minutes after diagnostic topical application of local anaesthesia to the middle turbinate using placebo- or other controls<sup>3</sup>.</li> </ol> <p>D. Pain resolves within 7 days, and does not recur, after surgical removal of mucosal contact points.</p>

Abolition of pain means complete relief of pain, indicated by a score of zero on a visual analogue scale (VAS). Mucosal contact point headache is a new entry to the classification for which evidence is limited (14).

*Historical Perspective:* The concept of sinonasal 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 vacuum in a sinus cavity.

McAuliffe et. al. performed a frequently-sited study in 1943 regarding the origin of headache and facial pain (15). 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 with severe facial pain that required facial nerve ablation for symptomatic relief. Different areas of the nasal cavity and para-nasal sinuses were stimulated by a metal probe, an electric

current, and a 1:1000 epinephrine solution (15, 16). 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, top 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 Rhinosinogenic Headache:* With the advent of endoscopic sinus surgery, a renewed interest in headache surgery began in the late 1980's. Stammberger and Wolfe described a potential mechanism for nasal mucosal contact point headaches in 1988 (17). 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. This vascular phenomenon may be responsible for

migraine-like headache symptoms (17, 18). 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 rhinosinogenic 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 rhinosinogenic 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 (18). 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 rhinosinogenic headache:* A number of obstacles exist concerning the proposed mechanism of sinonasal headache. First, McAuliffe's findings have not been reproduced since his experiment in the 1940's. Abu-Bakra and Jones recreated 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 (3). 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 (17). 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 (3, 17).

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. Forth, the quality of evidence supporting sinonasal 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 (3). All patients experienced improvement between 2-12 months, but three 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 difficult. 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 (11). His study did not find an association between surface area of contact points and patient's improvement after surgery. Since the number of treated patients in all the combined studies of rhinosinogenic headache is small, further research is still needed.

A high quality, prospective, controlled 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 rhinosinogenic headache remains very controversial and sinonasal 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 informed about the controversial role of surgery and the lack of definitive proof that rhinosinogenic headaches can be improved in the long-term with

surgery. There are multiple studies that say that approximately 80 to 85% of patients complain of a sinus headache 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. The problem is that sinus surgery does not get rid of headaches, though, nearly 100% of patients got relief for a few months only (19).

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