



# Sinus headache: changing the treatment paradigm

David W. Jang<sup>a</sup>, Frederick A. Godley<sup>b</sup>, and Ralph Abi Hachem<sup>a</sup>

## Purpose of review

Although the majority of patients with sinus headache do not have rhinosinusitis, many patients will unnecessarily undergo work-up and treatment for rhinosinusitis. This leads to a significant cost burden to the healthcare system. In the era of value-based care, more effective management paradigms need to be developed for sinus headache.

## Recent findings

Recent efforts to classify nonrhinogenic headache, namely the International Classification of Orofacial Pain, have served as an important step in advancing our understanding of this heterogeneous condition. In addition, a review of the literature points to certain clinical features that may allow for the identification of nonrhinogenic headache based on history.

## Summary

A greater understanding of nonrhinogenic headache as well as innovative tools to differentiate rhinogenic from nonrhinogenic headache are needed to change the paradigm in the management of patients with sinus headache.

## Keywords

facial pain, migraine, rhinogenic headache, rhinosinusitis, sinus headache

## INTRODUCTION

Sinus headache is a common complaint in the ambulatory care setting. However, categorizing sinus headache into rhinogenic versus nonrhinogenic causes is a difficult task. Primary care providers, who see the overwhelming majority of patients with sinus headache, but do not have access to point-of-care testing such as nasal endoscopy and computed tomography imaging, are forced to distinguish these entities based on symptoms alone. This leads to frequent misdiagnosis. Even with the availability of point-of-care testing, otolaryngologists are often left to wonder if findings on computed tomography or endoscopy are related to the patient's headache. This problem is further compounded by the fact that nonrhinogenic headache has become a wastebasket term for what is likely a group of related conditions that are neurologic in nature. Efforts to better define nonrhinogenic headache and establish diagnostic criteria and treatment algorithms for this entity should be at the forefront of our specialty.

## TERMINOLOGY

The definition of sinus headache can vary significantly based on context. For some otolaryngologists, 'sinus headache' is synonymous with a

rhinogenic (or sinogenic) headache, which can be defined as pain resulting from an abnormality of the sinonasal cavity. Rhinogenic headache typically encompasses headache associated with mucosal inflammation of the sinonasal cavity, and is in a sense, a symptom of acute or chronic rhinosinusitis. Objective evidence of mucosal inflammation on imaging or endoscopy would be necessary to make this diagnosis. For others, sinus headaches include headaches resulting from anatomic anomalies of the nasal cavity, such as mucosal contact points and narrow sinus ostia. To further confuse the terminology, patients refer to sinus headache as any pain or pressure overlying the midface and/or the periorbital areas, regardless of etiology. In this context, sinus headache is merely a symptom with no implication of etiology, and significant evidence points to the fact that sinus headache is largely nonrhinogenic. Finally, there is a group of patients who likely have a

<sup>a</sup>Department of Head and Neck Surgery & Communication Sciences, Duke University, Durham, North Carolina and <sup>b</sup>University Otolaryngology, Providence, Rhode Island, USA

Correspondence to David W. Jang, MD, 200 Trent Drive, DUMC 3805, Durham, NC 27710, USA. Tel: +919 681 7798; e-mail: david.jang@duke.edu

**Curr Opin Otolaryngol Head Neck Surg** 2022, 30:63–67

DOI:10.1097/MOO.0000000000000779

## KEY POINTS

- The inability to differentiate rhinogenic from nonrhinogenic headache leads to an overdiagnosis of rhinosinusitis and unnecessary treatments associated with this.
- Nonrhinogenic headache is likely a heterogeneous group of disorders consisting of migraine, tension-type headache, and trigeminal autonomic cephalalgias.
- Certain clinical features may offer clues on identifying patients with nonrhinogenic headache based on history.
- Initial treatment of nonrhinogenic headache with migraines medications should be included in the otolaryngologist's scope of practice.

nonrhinogenic mechanism for their pain, but have hyper-reactivity to nasal stimuli such as inhaled allergens and strong smells (i.e., osmophobia). For the purposes of this review, the term 'rhinogenic headache' will refer specifically to headache associated with acute or chronic rhinosinusitis, whereas other diagnostic entities not associated with rhinosinusitis will be referred to collectively as 'nonrhinogenic headache'. The term 'sinus headache' will refer to the presenting symptom without regard to etiology. Contact point headaches will not be addressed given their controversial nature and the lack of new significant information on this topic.

## SCOPE OF THE PROBLEM

Recent evidence suggests that the inability to differentiate rhinogenic from nonrhinogenic headache leads to rampant antibiotic overutilization and unnecessary physician visits in the United States. The landmark Sinus, Allergy, and Migraine Study by Eross *et al.* revealed that out of 100 patients with self- or physician-diagnosed sinus headache, only 3% had sinusitis, whereas 86% met criteria for migraine and other headache types [1]. A study by Schreiber *et al.* examined a cohort of 2991 patients with self-described or physician-diagnosed sinus headache to reveal that 88% actually met criteria for migraine-type headache [2]. More recently, a study by Novis *et al.* reported that over 99% of acute and chronic sinusitis diagnoses made in the primary care setting did not meet established criteria [3]. Another study by Barham *et al.* found that over 95% of patients with acute sinus symptoms had no objective findings on computed tomography imaging at the time of presentation [4]. In addition, Al-Hashel *et al.* reported that the delay time for the correct diagnosis

for patients with migraine was close to eight years [5]. The annual direct cost of chronic rhinosinusitis is estimated at \$10 billion, the vast majority of which is for antibiotic prescriptions and physician visits in the primary care setting [6,7]. One can then extrapolate the tremendous cost burden to society that this clinical problem poses.

## PHENOTYPING NON-RHINOGENIC HEADACHE: IS IT ALL MIGRAINE?

While nonrhinogenic headache largely remains a nebulous diagnosis made after excluding rhinosinusitis, a differential diagnosis must be kept in mind for patients with this presentation. Common conditions that can cause midfacial pressure or pain include obstructive sleep apnea, temporomandibular joint dysfunction, and dental infections. Beyond this, nonrhinogenic headache likely represents a group of related neurologic conditions that include but are not limited to migraine. A number of studies and classification schemes have attempted to characterize varying forms of nonrhinogenic headache.

A strong body of evidence points to nonrhinogenic headache as being migraine related. Some have shown that many patients meet criteria for migraine as defined by the International Headache Society (IHS) [8]. However, some patients with a complaint of sinus headache will report pain *localized only to the midface*, or along the distribution of the second branch of the trigeminal nerve, without concomitant pain along the first branch as is typically associated with headaches. To account for such patients, the term 'orofacial migraine' has been utilized and recently included in the first edition of the International Classification of Orofacial Pain (ICOP) [9].

The criteria for orofacial migraine are in line with IHS criteria for episodic and chronic migraine. Both entities describe a pain that is unilateral in nature. However, patients with nonrhinogenic headache often complain of *bilateral* symptoms. In order to account for this entity, a mid-facial pain condition analogous to tension headaches has been described. A study by Jones describes what the author terms 'midfacial segment pain', which presents as a pressure-type sensation of the bilateral midface, and often associated with a sensation of nasal obstruction or hyperesthesia [10]. Agius *et al.* later termed this condition 'tension-type midfacial pain' as a distinct entity from facial migraine but with overlapping features. They reported that the vast majority of patients presenting to the otolaryngology clinic with sinus headache met criteria for tension-type midfacial pain, followed by migraine. The majority of patients were women in their 20–40s

who reported a pressure-type sensation over the nasal and frontal regions. ICOP includes this entity as ‘tension-type orofacial pain’ with diagnostic criteria nearly identical to the IHS definition for tension headache. Despite these important efforts to classify nonrhinogenic headache, the terminology has not been adopted universally and consistently applied to otolaryngologic patients.

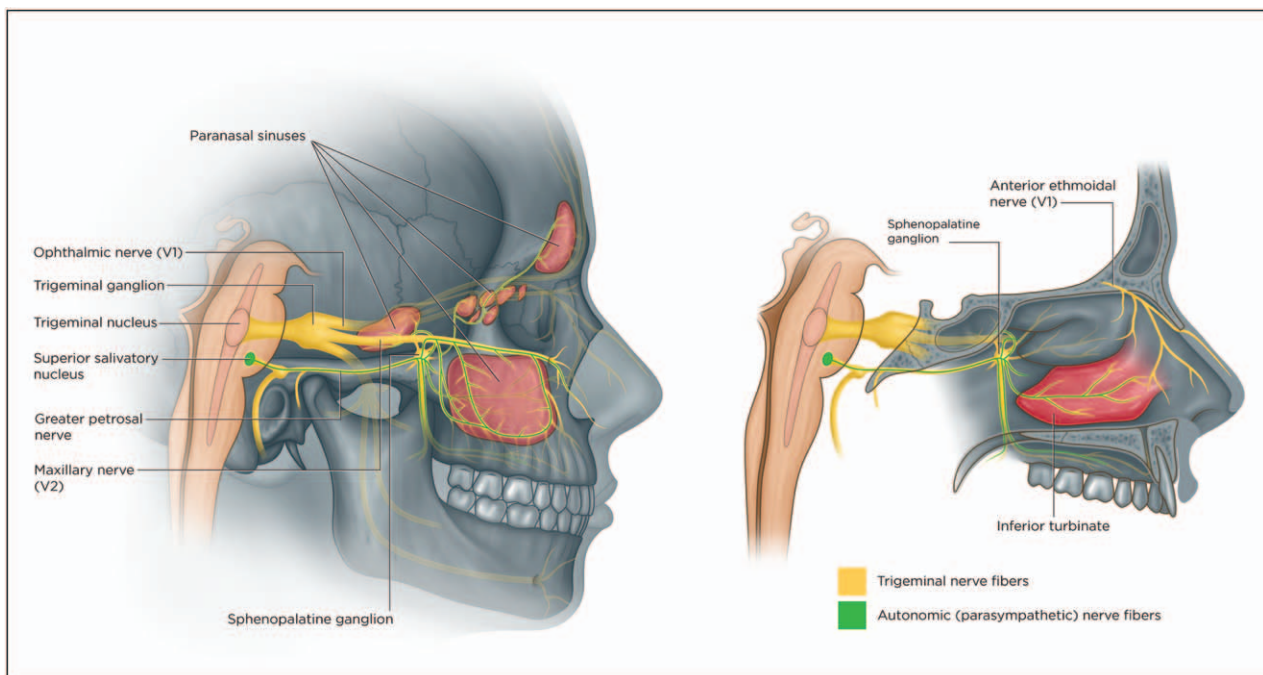
### NASAL SYMPTOMS ASSOCIATED WITH NON-RHINOGENIC HEADACHE

An important aspect of nonrhinogenic headache is its association with nasal symptoms. The autonomic innervation of the sinonasal cavity as transmitted by the trigeminal nerve produces symptoms such as congestion and rhinorrhea in addition to other autonomic symptoms, such as lacrimation, periorbital edema, and sweating. Figure 1 depicts trigeminal innervation to the sinonasal cavity. A few studies have documented concurrent nasal symptoms with migraine, leading to a possible link between migraine and vasomotor rhinitis. Schreiber *et al.* reported that 63% of patients meeting criteria for migraine had nasal congestion and 40% had rhinorrhea. Lambru *et al.* also reported a 40% prevalence of nasal blockage or rhinorrhea in patients with facial migraine. At the same time, both the IHC and ICOP contain a group of unilateral pain syndromes with concomitant autonomic symptoms termed trigeminal autonomic

cephalalgias and trigeminal autonomic orofacial pain, respectively. These include cluster headaches and paroxysmal hemicrania, which can be both episodic and chronic.

### BAROMETRIC PRESSURE-RELATED SINUS HEADACHE VS. BAROSINUSITIS

A common feature in patients presenting with sinus headache is symptoms triggered by changes in barometric pressure [1,11]. Pain associated with barometric or weather changes has a strong link to migraine and can likely serve as a predictor for nonrhinogenic headache. However, this feature is often mistaken for a mild form of barosinusitis and attributed to ostial narrowing or obstruction. Barosinusitis, in contrast to barometric pressure related headaches, is produced by large and drastic changes in ambient pressure as often seen in descent on an airplane or scuba-diving. Such pressure differentials would not be achieved by routine changes in atmospheric pressure. Nonetheless, patients are given a diagnosis of sinusitis and likely undergo unnecessary treatments, particularly balloon sinus dilation. A landmark study by Laury *et al.* demonstrated that balloon dilation offered no benefit to patients with barometric pressure-related sinus headaches compared to a sham procedure [12<sup>22</sup>]. Perhaps more important, this study offers insight into the natural history of nonrhinogenic headache, which improved in both groups during



**FIGURE 1.** Sensory and autonomic innervation of the paranasal Sinuses. Published with permission from the Association of Migraine Disorders.

the 6-month follow-up period. This is consistent with seasonal variations as reported by Eross *et al.* [1].

### DIFFERENTIATING RHINOGENIC FROM NON-RHINOGENIC HEADACHE

With the autonomic elements associated with non-rhinogenic headache, there is significant overlap in symptoms of acute or chronic rhinosinusitis and symptoms of nonrhinogenic headache. As stated previously, nasal endoscopy and point-of-care computed tomography imaging are useful tools but are largely unavailable for most primary care doctors and even otolaryngologists. In addition, healthcare practitioners are likely biased towards a diagnosis of sinusitis. To address this issue, Wu *et al.* explored use of the 22-Item Sinonasal Outcomes Test to help diagnose nonrhinogenic headache [13]. At the same time, a careful review of the literature reveals associated symptoms that are characteristic of nonrhinogenic headache. Eross *et al.* found that weather changes (83%), seasonal variations (73%), and exposure to allergens (62%) were common triggers in patients with nonrhinogenic headache [1]. Agius *et al.* reported a 29% and 27% incidence of photophobia and nausea, respectively, for tension-type midfacial pain, and a 74% and 51% incidence for facial migraine [14]. A study by Schulz *et al.* sampled otolaryngology patients with a positive migraine screen and found significant rates of vestibular-type symptoms (up to 48%), sensitivity to smells (32.3%), as well as symptoms triggered by weather changes (47%) and stress (69%) [11]. Schreiber *et al.* reported similar findings from their study of patients with migraine-related sinus headache. They found a high incidence of severe pain intensity (97%), pulsing or throbbing quality of pain (89%), worsening with activity (85%), photophobia (79%), nausea (73%), and phonophobia (67%). A summary of these symptoms can be found in Fig. 2. From the authors' experience, nonrhinogenic headache also tends to respond to oral decongestants such as pseudoephedrine, underscoring the vasoactive pathophysiology of migraine. Knowledge of these features is currently the most effective way

**FIGURE 2.** Clinical features associated with nonrhinogenic headache.

- |  |
|--|
| <ul style="list-style-type: none"> <li>Triggered by weather/barometric pressure changes</li> <li>Triggered by inhalants or allergens</li> <li>Seasonal variations</li> <li>Nausea/vomiting</li> <li>Worsening with physical activity or stress</li> <li>Moderate/severe intensity of pain</li> <li>Photo/phono/osmophobia</li> <li>Vestibular-type symptoms (unsteadiness, lightheadedness)</li> </ul> |
|--|

to make the correct diagnosis and direct patients to the appropriate treatment path.

### TREATMENT OF NONRHINOGENIC HEADACHE

If the clinical suspicion for nonrhinogenic headache is high, it behooves the clinician to appropriately educate the patient on why their sinus headache is not actually related to sinusitis. A diagnosis of non-rhinogenic headache can create confusion and even denial, thereby harming the patient-physician relationship. Therefore, such a conversation needs to be approached carefully. Negative computed tomography imaging can be useful in convincing a skeptical patient. In addition to education, initiating medical treatment can potentially provide significant relief and help to confirm the diagnosis. Very few studies investigating treatments specifically for nonrhinogenic facial pain exist, but well-established treatment algorithms backed by level 1 evidence for migraine and other primary headache disorders can provide guidance. For patients with episodic migraine-type symptoms, a trial of triptans can be both therapeutic and diagnostic. A randomized placebo-controlled trial by Ishkanian *et al.* demonstrated efficacy of sumatriptan for patients with self- or physician-diagnosed sinus headache [15]. For patients with chronic symptoms, prophylactic medications such as topiramate, propranolol, and tricyclic antidepressants can be considered. However, these medications often act nonspecifically and are associated with significant adverse effects. More recently, calcitonin-gene related peptide inhibitors as prophylactic and abortive therapies have provided a more targeted, migraine-specific treatment option with fewer side effects and drug interactions. While prescribing of such medications are typically considered within the scope of a neurologist's practice, otolaryngologists and primary care providers can be educated on the prescribing of these medications.

### NEED FOR PARADIGM SHIFT

The approach to diagnosing and managing patients with sinus headache needs to undergo a significant change in order to avoid the costly sinusitis work-up and delay in diagnosis that characterize the current approach. We propose the adoption of the term 'sinus migraine' to include any nonrhinogenic pain or pressure condition affecting the areas overlying the sinuses, regardless of laterality or chronicity. Although there is clearly overlap with migraine, tension-type headache, and trigeminal autonomic cephalalgias, use of this term provides a common

language among otolaryngologists and more important, validates the patient experience. The second need is for a validated screening tool that can help to differentiate rhinosinusitis from sinus migraine. This would provide a means to direct more patients with sinus migraine to the correct treatment path, rather than pointing them to empiric treatment with antibiotics based on current rhinosinusitis guidelines. Finally, a treatment algorithm for sinus migraine needs to be developed and disseminated to otolaryngologists and beyond. The practice of referring all patients with normal computed tomography scans and endoscopy to a neurologist is likely not feasible for most clinicians given the high prevalence of sinus migraine.

## CONCLUSION

The inability to differentiate rhinogenic from non-rhinogenic headache is a common problem in clinical practice and is associated with high costs due to unnecessary antibiotics prescriptions, physician visits, and delays in correct diagnosis. Recent efforts to define nonrhinogenic headache conditions are an important step to tackling this problem. With a better understanding of these conditions, new tools such as screening questionnaires and treatment algorithms can be developed to help clinicians identify and treat nonrhinogenic headache.

## Acknowledgements

None.

## Financial support and sponsorship

None.

## Conflicts of interest

*D.W.J. and R.A.H. receives research funding from Amgen. DWJ is on the Specialty Advisory Board for the Association of Migraine Disorders. F.G. is president*

*of the Association of Migraine Disorders and is on the speaker's bureau for Amgen, Novartis, and Biogen.*

## REFERENCES AND RECOMMENDED READING

Papers of particular interest, published within the annual period of review, have been highlighted as:

- of special interest
- of outstanding interest

1. Eross E, Dodick D, Eross M. The Sinus, Allergy and Migraine Study (SAMS). *Headache* 2007; 47:213–224.
2. Schreiber CP, Hutchinson S, Webster CJ, *et al.* Prevalence of migraine in patients with a history of self-reported or physician-diagnosed 'sinus' headache. *Arch Intern Med* 2004; 164:1769–1772.
3. Novis SJ, Akkina SR, Lynn S, *et al.* A diagnostic dilemma: chronic sinusitis diagnosed by nonotolaryngologists. *Int Forum Allergy Rhinol* 2016; 6:486–490.
4. Barham HP, Zhang AS, Christensen JM, *et al.* Acute radiology rarely confirms sinus disease in suspected recurrent acute rhinosinusitis. *Int Forum Allergy Rhinol* 2017; 7:726–733.
5. Al-Hashel JY, Ahmed SF, Alroughani R, *et al.* Migraine misdiagnosis as a sinusitis, a delay that can last for many years. *J Headache Pain* 2013; 14:97.
6. Jang DW, Lee HJ, Chen PG, *et al.* Management of chronic rhinosinusitis prior to otolaryngology referral: an opportunity for quality improvement. *Otolaryngol Head Neck Surg* 2021. June 15; 1945998211017486.

This study demonstrates that the majority of healthcare resource utilization for chronic rhinosinusitis consists of primary care visits in which antibiotics are prescribed.

7. Smith KA, Orlandi RR, Rudmik L. Cost of adult chronic rhinosinusitis: a systematic review. *Laryngoscope* 2015; 125:1547–1556.
8. Headache Classification Committee of the International Headache Society (IHS). *The International Classification of Headache Disorders*, 3rd edition. *Cephalalgia* 2018; 38:1–211.

9. International Classification of Orofacial Pain, 1st edition (ICOP). *Cephalalgia* 2020; 40:129–221.

This is a novel classification scheme for orofacial pain largely based on the International Classification of Headache Disorders.

10. Jones NS. Midfacial segment pain: implications for rhinitis and sinusitis. *Curr Allergy Asthma Rep* 2004; 4:187–192.
11. Schulz KA, Esmati E, Godley FA, *et al.* Patterns of migraine disease in otolaryngology: a CHEER network study. *Otolaryngol Head Neck Surg* 2018; 159:42–50.
12. Laury AM, Chen PG, McMains KC. Randomized controlled trial examining the effects of balloon catheter dilation on 'sinus pressure' /barometric headaches. *Otolaryngol Head Neck Surg* 2018; 159:178–184.

This is a landmark study demonstrating that barometric pressure headaches are likely nonrhinogenic and therefore should not be treated with balloon dilation of sinuses.

13. Wu D, Gray ST, Holbrook EH, *et al.* SNOT-22 score patterns strongly negatively predict chronic rhinosinusitis in patients with headache. *Int Forum Allergy Rhinol* 2019; 9:9–15.
14. Agius AM, Jones NS, Muscat R. Prospective three-year follow up of a cohort study of 240 patients with chronic facial pain. *J Laryngol Otol* 2014; 128:518–526.
15. Ishkanian G, Blumenthal H, Webster CJ, *et al.* Efficacy of sumatriptan tablets in migraineurs self-described or physician-diagnosed as having sinus headache: a randomized, double-blind, placebo-controlled study. *Clin Ther* 2007; 29:99–109.