

Sinus Headache

Differential Diagnosis and an Evidence-Based Approach



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KEYWORDS

- Headache • Sinus headache • Facial pain
- International Classification of Headache Disorders • Sinusitis • Rhinosinusitis
- Chronic rhinosinusitis

KEY POINTS

- Rhinologic symptoms and headaches are common, and some patients will have both even though they may not be related.
- International Headache Society classification has replaced the term “headache secondary to disorders of sinuses” with “headache secondary to disorders of the nose or paranasal sinuses,” and this category only includes headache associated with sinusitis.
- There is international consensus to include facial pressure/pain as one of the symptoms associated with sinusitis, but also opposing evidence that eliminating this may increase the specificity of clinical diagnosis of chronic rhinosinusitis.
- Recognition of the broad differential diagnoses and a multidisciplinary approach are crucial in optimal management of headache disorders.

INTRODUCTION

The World Health Organization (WHO) ranks headache as 1 of the 10 most disabling conditions globally, and 1 of the 5 most disabling conditions in female individuals. An international collaboration of nongovernment organizations and WHO has identified 46% of the adult population with an active headache disorder, with 3% of the population having chronic daily headache. Of these patients, more than 10% were identified to be suffering from migraines, and approximately 40% tension-type headache, in which the total societal burden of the latter is thought to be even higher than migraines because of the high prevalence.¹ Furthermore, pain has been found to be the strongest predictor of depression after controlling for other variables, and vice versa, which contributes to the significant decline in quality of life.²

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The International Classification of Headache Disorders, 3rd edition (ICHD-3) is an evidence-based approach to the differential diagnoses, and the subsequent classifications of headache disorders (Table 1).³ Although the vast majority of headache disorders are able to be, and should be managed in the primary care setting, often there has not been adequate training in the diagnosis and treatment of headaches.⁴ Neurologists, neurosurgeons, dental/oromaxillofacial specialists, pain specialists, and otolaryngologists are some of the specialists who often receive referrals from primary care physicians for the diagnosis and management of headaches. Patients are often able to describe the location of the pain, but the identification of the origin of the pain is often identifiable only after careful workup and evaluation by the treating physician.

Sinus Headache

The term “sinus headache” has been superseded by the diagnosis “headache attributed to disorder of the nose or paranasal sinuses” in ICHD-3 because the former has been applied both to primary headache disorders and to headache supposedly attributed to various conditions involving nasal or sinus structures.³ Unfortunately, this distinction has yet to filter through to patients and even many treating physicians.

The new definition excludes primary headache disorders and is defined as headache caused by a disorder of the nose and/or paranasal sinuses and associated with other symptoms and/or clinical signs of the disorder. The subclassifications are headache attributed to acute rhinosinusitis and headache attributed to chronic or recurring rhinosinusitis (Tables 2 and 3).³ The diagnostic criteria of these subcategories are highly evidence based and valuable in defining “sinus headache” to patients and referring physicians.

Rhinosinusitis

Rhinosinusitis is the only sinonasal condition that the ICHD-3 has included in association with “headache attributed to disorder of the nose or paranasal sinuses.” The International Consensus on Allergy and Rhinology publication⁵ defines acute rhinosinusitis (ARS) as sinonasal inflammation lasting less than 4 weeks associated with the sudden onset of symptoms, which must include nasal blockage/

Table 1
The International Classification of Headache Disorders

Primary Headaches	Secondary Headaches	Other
1. Migraine	1. Trauma or injury to the head and/or neck	1. Painful lesions of the cranial nerves and other facial pain
2. Tension-type headache	2. Cranial and/or cervical vascular disorder	2. Other headache disorders
3. Trigeminal autonomic cephalgias	3. Substance or its withdrawal	
4. Other primary headache disorders	4. Infection	
	5. Disorder of homeostasis	
	6. Disorder of the cranium, neck, eyes, ears, nose, sinuses, teeth, mouth, or other facial or cervical structure	
	7. Psychiatric disorder	

From Stovner LJ, Hagen K, Jensen R, et al. The Global Burden of Headache: A Documentation of Headache Prevalence and Disability Worldwide. *Cephalgia*. 2016;27(3):193-210.

Table 2 Diagnostic criteria of headache attributed to disorder of the nose or paranasal sinuses: acute rhinosinusitis	
<p>A. Any headache fulfilling criterion C</p> <p>B. Clinical, nasal, endoscopic and/or imaging evidence of acute rhinosinusitis</p> <p>C. Evidence of causation demonstrated by at least 2 of the following:</p> <ol style="list-style-type: none"> 1. Headache has developed in temporal relation to the onset of rhinosinusitis 2. Either or both of the following: <ol style="list-style-type: none"> a. Headache has significantly worsened in parallel with worsening of the rhinosinusitis b. Headache has significantly improved or resolved in parallel with improvement in or resolution of the rhinosinusitis 3. Headache is exacerbated by pressure applied over the paranasal sinuses 4. In the case of a unilateral rhinosinusitis, headache is localized and ipsilateral to it <p>D. Not better accounted for by another International Classification of Headache Disorders, 3rd edition diagnosis.</p>	<p>Note:</p> <p><i>Migraine and Tension-type headache can be mistaken for Headache attributed to acute rhinosinusitis because of similarity in location of the headache, and in case of migraine, because of the commonly accompanying nasal autonomic symptoms. The presence or absence of purulent nasal discharge and/or other features diagnostic of acute rhinosinusitis help to differentiate these conditions.</i></p> <p>Comments:</p> <p>Pain due to pathology in the nasal mucosa or related structures is usually perceived as frontal or facial, but may be referred more posteriorly. Simply finding pathological changes on imaging of acute rhinosinusitis, correlating with the patient's pain description, is not enough to secure the diagnosis. Treatment response to local anesthesia is compelling evidence, but may also not be pathognomonic. An episode of migraine may be triggered or exacerbated by nasal or sinus pathology.</p>

From Headache Classification Committee of the International Headache Society (IHS) The International Classification of Headache Disorders, 3rd edition. Cephalalgia. 2018;38(1):1-211.

obstruction/congestion or nasal discharge (anterior/posterior) and facial pain/pressure or reduction/loss of smell. A diagnosis of chronic rhinosinusitis is made when the symptoms of nasal obstruction/congestion/blockage, nasal drainage (mucopurulent) that may drain anteriorly or posteriorly, facial pain/pressure/fullness, and decreased or loss of sense of smell persist over 12 weeks. Recurrent ARS has been defined as 4 episodes per year of ARS with distinct symptom-free intervals between episodes. Patients may also experience acute exacerbations of chronic rhinosinusitis when a previous diagnosis of chronic rhinosinusitis exists, and a sudden worsening of symptoms occurs, with a return to baseline symptoms following treatment. This consensus document also supports facial pressure/headache as one of the symptoms of all the aforementioned types of sinusitis. This is supported by the American Academy of Otolaryngology Head and Neck Surgery clinical practice guideline, which includes facial pain-pressure-fullness as one of the cardinal symptoms of rhinosinusitis.⁶

However, there is also evidence demonstrating that rhinosinusitis does not necessarily lead to facial pain or headache, where more than 80% of patients with visible purulence endoscopically had no facial pain,⁷ and a significant proportion of patients with facial pain and sinusitis had persistent symptoms postoperatively.⁷⁻⁹ Aggregate evidence suggests that headache and facial pain are symptoms experienced by some patients with rhinosinusitis, but not universally, and the contradicting evidence may be a reflection of the complexity of correctly diagnosing and classifying a headache

Table 3 Diagnostic criteria of headache attributed to disorder of the nose or paranasal sinuses: chronic or recurring rhinosinusitis	
<p>A. Any headache fulfilling criterion C</p> <p>B. Clinical, nasal endoscopic and/or imaging evidence of current or past infection or other inflammatory process within the paranasal sinuses</p> <p>C. Evidence of causation demonstrated by at least 2 of the following:</p> <ol style="list-style-type: none"> 1. Headache has developed in temporal relation to the onset of chronic rhinosinusitis 2. Headache waxes and wanes in parallel with the degree of sinus congestion and other symptoms of chronic rhinosinusitis 3. Headache is exacerbated by pressure applied over the paranasal sinuses 4. In the case of a unilateral rhinosinusitis, headache is localized and ipsilateral to it <p>D. Not better accounted for by another International Classification of Headache Disorders, 3rd edition diagnosis.</p>	<p>Comment:</p> <p>It has been questioned whether chronic sinus pathology can produce persistent headache. Recent studies seem to support such causation. However, pathological changes seen on imaging or endoscopy correlating with the patient's pain description are not on their own enough to secure this diagnosis.</p>

From Headache Classification Committee of the International Headache Society (IHS) The International Classification of Headache Disorders, 3rd edition. Cephalalgia. 2018;38(1):1-211.

disorder. Furthermore, potential origins of pain from the nose and paranasal sinuses is not limited to rhinosinusitis, and certainly goes beyond inflammatory processes. However, these are classified under separate headings in ICHD-3 (eg, secondary to cranial and/or cervical vascular disorder, painful lesions of the cranial nerves and other facial pain). Therefore it is still pertinent for the otolaryngologist to have a systematic approach to the diagnosis and management of patients with headache disorders beyond simply considering whether there is presence of sinus inflammation.

Pain Pathway Overview

Headache and facial pain are thought to be secondary to central sensitization of the trigeminal nucleus by myofascial, vascular, or supraspinal input.¹⁰ This sensitization is thought to increase pain from established disease, or provoke pain in the absence of disease. Pain also has a marked emotional and psychological overlay, but the presence of these does not exclude an underlying organic pathology.

The skin of the face and scalp has sensory fibers mainly in the ophthalmic and maxillary divisions of the trigeminal nerve, with minor contribution from the facial nerve, in which the greater superficial petrosal branch supplies the periauricular region. The mucosa of the sinus ostia, turbinates, and the nasal septum also gain supply from the first and second division of the trigeminal nerve.

The frontal sinus innervation is via the dural and cutaneous branches of the ophthalmic nerve. Anterior ethmoid air cells gain innervation via the anterior ethmoid nerve, and supraorbital nerves, both branches of the ophthalmic nerve. The posterior ethmoid and sphenoid air cells are by both the maxillary nerve, via the orbital and lateral posterior superior nasal branches of the pterygopalatine ganglion, and the

posterior ethmoid nerve, a branch of the ophthalmic nerve. The maxillary sinus is supplied by the infraorbital, superior alveolar branches, and greater palatine branches of the maxillary nerve.

Otalgia often overlaps with headache disorders as well,^{11,12} which is not surprising, given the sensory innervation of the ear is derived from trigeminal, facial, glossopharyngeal, vagus, and cervical plexus nerve branches, all with overlapping regions of innervation.

Anatomic Approach

The ICHD-3 covers secondary headache or facial pain according to anatomic subsites,³ and provides an excellent framework:

- Headache attributed to disorder of cranial bone
- Headache attributed to disorder of the neck
 - Cervicogenic headache
 - Headache attributed to retropharyngeal tendonitis
 - Headache attributed to craniocervical dystonia
- Headache attributed to disorder of the eyes
 - Headache attributed to acute angle-closure glaucoma
 - Headache attributed to refractive error
 - Headache attributed to ocular inflammatory disorder
 - Trochlear headache
- Headache attributed to disorder of the ears
- Headache attributed to disorder of the nose or paranasal sinuses
 - Headache attributed to ARS
 - Headache attributed to chronic or recurring rhinosinusitis
- Headache attributed to disorder of the teeth
- Headache attributed to temporomandibular disorder
- Headache attributed to inflammation of the stylohyoid ligament
- Headache or facial pain attributed to other disorder of cranium, neck, eyes, ears, nose, sinuses, teeth, mouth, or other facial or cervical structure

Another way of approaching the origin of headache in the paranasal sinus region anatomically, beyond rhinosinusitis already discussed, would be to consider the tissue types of the craniocervical region. A vascular cause may present as migraine, cluster headache, paroxysmal hemicrania, or temporal arteritis. Several neuralgias have also been described, including trigeminal, glossopharyngeal, post-herpetic neuralgias, and SUNCT (short-lasting unilateral neuralgiform headache and conjunctival injection and tearing). Contact point headache from nasal septal spur^{13,14} would be an example of neuralgia, as would be Eagle syndrome. An odontogenic/masticatory headache could include dentin or enamel periodontium defects causing dental pain, temporomandibular joint dysfunction, and myofascial pain.

Management

The same systematic approach taken by otolaryngologists in treating any patient applies to the management of patients with “sinus headache,” beginning with obtaining a comprehensive history. This should go beyond a sinonasal history, and cover the full head and neck region, including eyes and oromaxillofacial region, as evidenced by the aforementioned differential diagnoses. Also critical is obtaining history regarding primary headache disorders, particularly when 70% of the adult population report having had episodic tension-type headaches,⁹ and the percentages of the adult population with an active headache disorder are 46% for headache overall, 11% for migraine,

42% for tension-type headache, and 3% for chronic daily headache.¹ Migraines can present in numerous ways, with multiple commonly overlapping symptoms associated with true sinus issues, like nasal congestion and rhinorrhea, and triggered by weather changes, allergies, and environmental irritants, making the distinction difficult for those without computed tomography (CT) and endoscopy at their disposal.^{15,16} It is important for otolaryngologists to be aware that migraines can often be without aura, and may be bilateral.

A nasal endoscopy alone should not be deemed sufficient when managing patients with “sinus headache,” and a comprehensive head and neck examination, including neurologic examination is required. Further targeted examination (eg, temporomandibular joint) may be necessary based on the patient history. A CT scan of the paranasal sinuses may follow depending on the history and nasal endoscopy findings, and any sinus disease should of course be treated appropriately. Other than acute and chronic rhinosinusitis, as classified by the ICHD-3 as conditions leading to headache from nose and paranasal sinuses, recurrent acute sinusitis, various anatomic variations, including middle turbinate concha bullosa, mucosal contact points,^{17,18} and barotrauma,¹⁹ are conditions that may lead to medical and/or surgical interventions by otolaryngologists. If one of these interventions is considered, especially surgery, an in-depth discussion about etiologies of headache and how surgery may or may not relieve this symptom if the sinuses turn out not to be the primary cause in the end, is wise.

For non-sinogenic causes of headache on history, examination, and imaging, input from other specialties is often required, as well as ongoing communication with the referring primary care physician. Given the high prevalence of migraines, empiric treatment with triptans may have a role,²⁰⁻²² along with a referral to a neurologist, so the patient can carry information to the neurologist about whether or not they responded and time to true diagnosis and treatment is not wasted. Although a neurology referral is often indicated, otolaryngologists should have a working understanding of the more common headache syndromes and their treatment options, so they can get patients started on something with likely benefit while waiting for the specialist appointment. Examples include triptans for migraines, high-flow oxygen for cluster headaches, massage and physical therapy for tension headaches, and indomethacin for hemicrania continua or paroxysmal hemicrania continua.²⁰

SUMMARY

Nasal symptoms, such as nasal obstruction and rhinorrhea, are extremely prevalent, and may or may not be associated with underlying primary headache disorders. Headache is one of the most common disorders of the nervous system.¹⁵ The International Consensus Statement on Allergy and Rhinology, the American Academy of Otolaryngology Head & Neck Surgery, and the International Headache Society all support facial pain/pressure to be associated with rhinosinusitis. However, the differential diagnoses of headache disorders are plentiful and any one of those mentioned previously may coexist with nasal symptoms. In fact, eliminating facial pain and headache from the clinical diagnostic criteria for chronic rhinosinusitis was found to have a significantly improved specificity for diagnosis of sinusitis as confirmed via CT or nasal endoscopy.¹⁶ Otolaryngologists are one of the multiple groups of physicians who assess and manage patients with headache disorders, and it is critical to have a systematic framework when approaching patients, and to practice a multidisciplinary approach to the assessment and management of sinus headache.

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