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Advances in the diagnosis and treatment of rhinogenic headache and facial pain – a narrative review

Marcin Straburzyński [1,A-F]

[1]Department of Family Medicine and Infectious Diseases, University of Warmia and Mazury, Poland

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Corresponding author
Marcin Straburzyński
Department of Family Medicine and Infectious Diseases, University of Warmia and Mazury,
Al. Warszawska 30, 10-082 Olsztyn, Poland;
e-mail: marcinstraburzynski@gmail.com
Phone: 604797385

Short author list:
Marcin Straburzyński

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Abstract:

This narrative review addresses the diagnosis and treatment of headaches and facial pain of rhinogenic origin. The majority of cases misdiagnosed as "sinus headache" actually meet the diagnostic criteria for migraine or non-rhinogenic facial pain syndromes, such as idiopathic midfacial pain (IMFP). The overlap between migraine and sinusitis phenotypes stems from the activation of the trigeminal-autonomic reflex and the release of neuropeptides, leading to the development of nasal cranial autonomic symptoms. Emerging evidence highlights the value of specific findings in differentiating between rhinogenic and non-rhinogenic headache/facial pain: rhinosinusitis is indicated by discolored nasal discharge, pronounced inflammatory changes on nasal endoscopy and paranasal sinus CT scans, and a prolonged symptom course. Conversely, primary headache and facial pain disorders are suggested by a relatively short attack duration (lasting up to 72 hours) and the presence of vegetative symptoms (hypersensitivity to light, sound, and smells; nausea). It is important to note that surgical interventions are not justified in cases of neurogenic headache and facial pain. Initial screening tools, such as the Sinus Headache Screener (SHS) questionnaire, along with proposed modifications to ICHD and ICOP criteria, facilitate improved differential diagnosis.

1. Introduction

Headache and facial pain localized to the region of the paranasal sinuses represent one of the most common diagnostic challenges in the outpatient practice of otolaryngologists, neurologists, and primary care physicians. Because of long-established conceptual patterns, patients reporting facial pressure and pain in the forehead, temples, or infraorbital regions are frequently diagnosed with "sinus headache" [1]. This, in turn, leads to ineffective pharmacotherapy and even unjustified otolaryngological surgery [2]. Meanwhile, there has long been a consensus that 80-90% of presumed "sinus headaches" actually meet the diagnostic criteria for migraine or non-rhinogenic facial pain syndromes, including idiopathic midfacial pain (IMFP) [3]. This narrative review analyzes the latest scientific evidence concerning pain in diseases of the nose and paranasal sinuses, with particular emphasis on data relevant to otolaryngologists: new evidence on the overlap between migraine and rhinosinusitis phenotypes, results of studies on a diagnostic tool facilitating differentiation of pain etiology in otorhinolaryngological practice, and proposals to modify the diagnostic criteria for truly sinus-related headache. In addition, the role of surgical treatment in primary headache disorders and the potential impact of new headache medications on the occurrence of upper respiratory tract infections are discussed.

2. Pain phenotype as a cause of diagnostic errors

Headache and facial pain triggered or aggravated by bending the head forward and localized to the region of the paranasal sinuses were for decades regarded as cardinal symptoms of chronic rhinosinusitis (CRS) or acute rhinosinusitis (ARS). Contemporary medical knowledge has led to a fundamental reassessment of this paradigm [2]. Population-based and clinical studies show that spontaneous facial pain without accompanying objective signs of inflammation on nasal endoscopy and computed tomography (CT) of the paranasal sinuses is rarely rhinogenic in origin [4]. In otolaryngological practice, patients with non-rhinogenic facial pain account for a substantial proportion of consultations [5]. One source of diagnostic error is the attribution to nasal disease of vasomotor manifestations, i.e. nasal cranial autonomic symptoms (CAS), such as nasal congestion or watery rhinorrhea accompanying migraine or cluster headache attacks [6]. This may result in the use of antibiotics and glucocorticosteroids, repeated imaging, and surgical procedures (e.g. functional endoscopic sinus surgery) that fail to relieve the patient's pain [3]. Understanding the pathophysiological overlap between migraine and rhinosinusitis symptoms requires consideration of the trigeminovascular system [7]. The first (V1) and second (V2) divisions of the trigeminal nerve innervate both the dura mater and the mucosa of the nose and paranasal sinuses. Stimulation of their endings activates a reflex involving a parasympathetic response mediated by the superior salivatory nucleus of the facial nerve. Activation of this trigeminal-autonomic reflex also occurs during migraine attacks, cluster headache, and even tension-type headache [8]. This results in the release of neuropeptides such as calcitonin gene-related peptide (CGRP) and vasoactive intestinal peptide (VIP) [9]. The consequence is peripheral vasodilation in the nasal mucosa, hyperemia, swelling of the nasal turbinates, and rhinorrhea. New data on the magnitude of this phenomenon were provided by the Migraine in Poland study conducted in 1,679 patients with migraine without aura (MwoA) [10]. In that study, 59.8% of patients with migraine without aura reported at least one rhinological symptom during a headache attack, while 20.3% apparently met the clinical criteria for acute rhinosinusitis according to EPOS 2020 during a migraine attack. Rhinological symptoms frequently occurred during migraine attacks: facial pressure (47.2%), facial tenderness on palpation (44.3%), nasal congestion (23.6%), anterior rhinorrhea (18.1%), postnasal drip (13.0%), and hyposmia (10.8%). In addition, 38.6% of patients reported lacrimation and 23.7% conjunctival injection during an attack. Importantly, the study also provided findings useful in differentiating migraine from rhinosinusitis. Facial tenderness to touch in patients with migraine strongly correlated with the presence of allodynia ($p < 0.001$). This suggests that tenderness on pressure over the sinus region in migraine is not a manifestation of local mucosal inflammation, but rather a consequence of central pain facilitation (sensitization). Hyposmia in patients with migraine, in turn, was mainly related to nasal obstruction ($p < 0.001$), rather than damage to the olfactory epithelium. Interestingly, osmophobia (hypersensitivity to odors) occurred in 66.3% of patients with migraine and proved to be a specific feature distinguishing migraine from acute rhinosinusitis.

Table 1. Key findings in the differential diagnosis of migraine and rhinosinusitis [4, 10].

Feature / symptom	Migraine without aura	Acute / chronic rhinosinusitis
Episode duration	Usually paroxysmal, lasting 4-72 hours	Symptoms are prolonged (> 5 days in ARS, > 12 weeks in CRS)
Nausea / vomiting	Very common	Usually absent
Hypersensitivity to light and sounds	Very common	Usually absent
Hypersensitivity to odors	Present in approximately 66% of patients	Usually absent
Nasal discharge	If present, clear and watery	Purulent, discolored (yellow/green)
Tenderness on palpation over the paranasal sinuses	A manifestation of allodynia	Present mainly in bacterial ARS
Nasal endoscopy / CT	Normal or mild changes	Significant abnormalities

A practical algorithm for differentiating the most common rhinogenic and non-rhinogenic causes of headache and facial pain localized to the paranasal sinus region is presented in Figure 1.

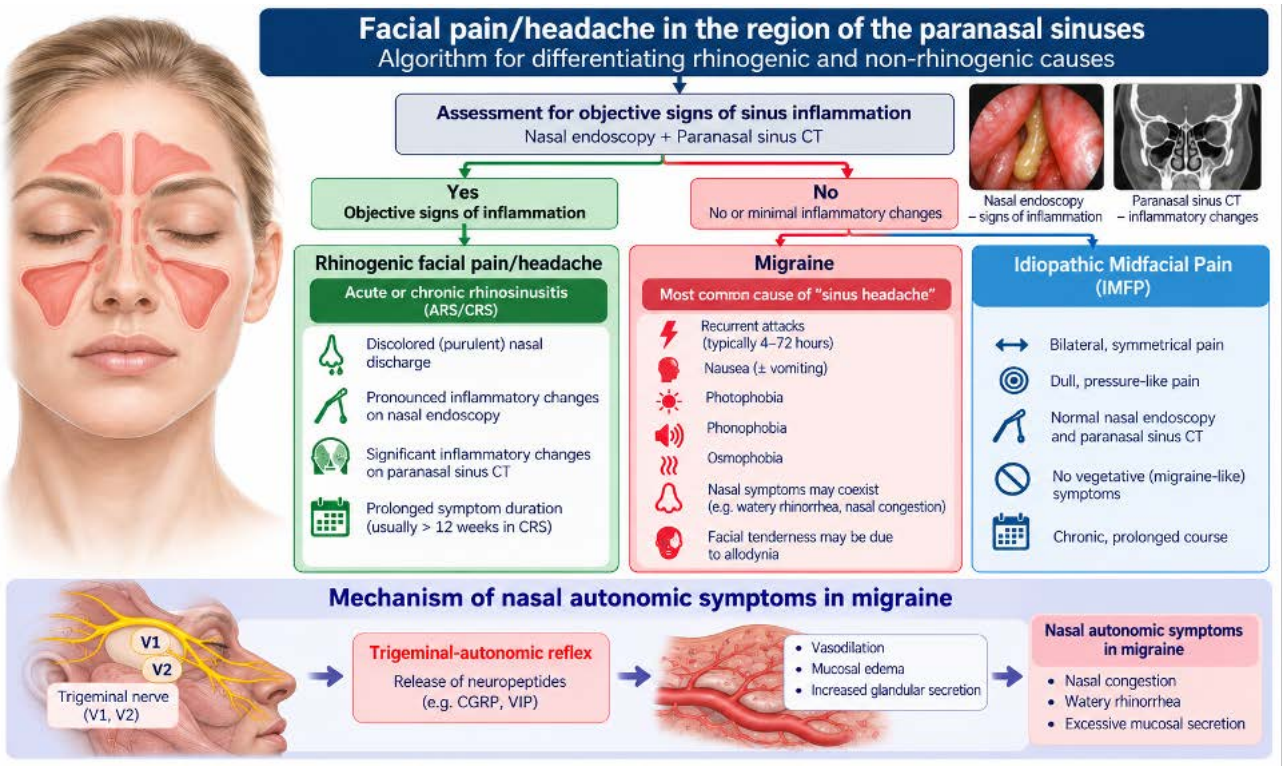


Figure 1. Algorithm for differentiating rhinogenic and non-rhinogenic headache and facial pain localized to the paranasal sinus region.

3. Sinus Headache Screener (SHS)

In response to the clinical challenges associated with distinguishing non-rhinogenic facial pain (predominantly a migraine phenotype) from CRS, a research team from Duke University published the results of work on the Sinus Headache Screener (SHS) [11]. The questionnaire was developed using qualitative concept-elicitation techniques and cognitive interviews conducted in three rounds among patients attending rhinology clinics. Inclusion criteria comprised midfacial pain/pressure lasting ≥ 3 months, with a normal nasal endoscopy and no significant abnormalities on imaging of the paranasal sinuses. The published version of the SHS consists of 89 questions divided into eight sections:

- Screening question (confirming the presence of pain, pressure, or discomfort involving the face, head, teeth, or jaw).
- Symptoms during a typical attack.
- Characteristics of episodes.
- Attack triggers.
- Symptoms during the interictal period.
- Treatment effectiveness.
- Family and childhood history.
- Symptom severity.

The study provided data on differences in symptom profiles between migraine and CRS, although the findings were validated in a small sample (n = 26) [11]. Symptoms typical of rhinosinusitis (CRS) included ear popping, which occurred in 100% of patients with CRS and only 30.0% of those with migraine. Discolored nasal discharge, cough (90.9% vs 46.7%), and difficulty breathing through the nose (90.9% vs 53.3%) predominated in the CRS group. Patients with CRS reported episodes lasting from several days to a month or a chronic condition. In contrast, features more specific to non-rhinogenic facial pain included hypersensitivity to sounds (phonophobia): 66.7% vs 18.2% in CRS; nausea: 66.7% vs 27.3%; and tooth pain without a dental cause: 73.3% vs 36.4% in CRS. Patients with non-rhinogenic pain described shorter attacks (less than 24 hours), recurring episodically with complete symptom remission between attacks. Response to treatment was another differentiating factor. Patients with non-rhinogenic pain frequently reported relief after antimigraine medications (triptans) and conventional analgesics. In contrast, patients with CRS improved mainly after oral corticosteroids (5/7) and antibiotics. Following validation in larger patient populations, the SHS may in the future become a useful tool for differentiating the causes of pain in otorhinolaryngological practice.

4. Proposed changes to the diagnostic criteria for headache and facial pain attributed to rhinosinusitis

In light of new scientific evidence, an international multidisciplinary expert group published a proposal to revise the International Classification of Headache Disorders, 3rd edition (ICHD-3), with regard to headache and facial pain attributed to disorders of the nose or paranasal sinuses [12]. The aim of this proposal is to achieve better harmonization with validated definitions of rhinosinusitis [4, 13]. One recommended modification is the removal of unreliable diagnostic criteria. This applies, among others, to pain exacerbation by pressure over the sinuses. As demonstrated in the study cited above, tenderness on pressure is not specific to rhinosinusitis and commonly occurs in patients with migraine as a manifestation of allodynia [10]. A modification has also been proposed to the criterion concerning unilateral pain and nasal symptoms, which is currently considered supportive of rhinosinusitis: unilateral facial pain occurs in bacterial ARS, whereas in typical viral ARS and CRS the pain is usually not strictly unilateral. The proposal also emphasizes that normal endoscopy and CT findings substantially reduce the likelihood that active rhinosinusitis is the cause of pain. The publication further presents strong arguments for abandoning the concept of "mucosal contact point headache." It notes the absence of reliable scientific evidence

that anatomical mucosal contact without inflammation causes recurrent headaches and concludes that surgical correction of anatomical variations within the nasal cavity solely for the treatment of headache is unjustified [12]. In addition, the experts advocate the formal inclusion in ICHD-4 and the International Classification of Orofacial Pain (ICOP) of the condition currently referred to as idiopathic midfacial pain (IMFP) [12]. Phenotypic studies indicate that IMFP is characterized by symmetrical, bilateral pain localized to the region of the nose, zygomatic bones, and orbits; a pressure-like/dull quality; absence of vegetative symptoms; and normal nasal endoscopy and paranasal sinus CT findings [14, 15]. These patients frequently first seek consultation from otolaryngologists.

5. Summary

Most cases described as "sinus headache" actually represent neurological disorders - primarily migraine and non-rhinogenic facial pain syndromes, including idiopathic midfacial pain (IMFP). Accompanying rhinological symptoms such as nasal congestion or facial tenderness are not specific to rhinosinusitis and may occur in neurological disorders. The absence of abnormalities on nasal endoscopy and computed tomography substantially reduces the likelihood of active rhinological disease. The implementation of new diagnostic tools, such as the Sinus Headache Screener, together with the proposed modifications to the ICHD and ICOP criteria, offers the prospect of more precise differential diagnosis in otolaryngological practice. This may help reduce unnecessary rhinological treatment, including surgical interventions, in patients with primary headache and facial pain disorders.

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