

Sinonasal Findings on Paranasal Computed Tomography in Patients Presenting with Facial Pain

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Abstract

Background: Facial pain is one of the common complaints in otolaryngology. Patients often self-diagnose facial pain as "sinusitis". The sinonasal source of facial pain and headache could be one of the possible etiologies, which needs to be confirmed by nasal endoscopy or CT scan.

Aim: This study aimed to detect the frequency of variations and pathological findings in the sinonasal region of patients presenting with facial pain and sinonasal symptoms by PNS CT imaging.

Methods: This descriptive study was conducted in a tertiary referral hospital where consecutive patients presenting to the otorhinolaryngology clinic with facial pain and at least one of the sinonasal symptoms, including nasal obstruction, nasal congestion, rhinorrhea, reduction or loss of smell, and postnasal discharge, were included. For evaluation of facial pain, a paranasal sinus CT scan in coronal view was performed and analyzed by an otolaryngologist.

Results: A total of 64 patients including 27 males (42%) and 37 females (57.8%) were included. The average age was 35.5 ± 10.5 . Most patients experienced bilateral facial pain (78.1%). The most common location of pain was the forehead (76.6%). Fifteen patients (23.4%) had acute pain (<12 weeks) while 49 (76.6%) experienced chronic pain (>12 weeks). Cold weather was the most common triggering factor in 29 patients (45.3%). The most common sinonasal symptom was posterior nasal discharge (in 42 patients, 65.6%). A minority of patients, 8 (12.5%), had evidence of rhinosinusitis (acute or chronic). Ethmoid sinus was the most frequently involved sinus (9.3%), and sphenoid and frontal sinuses were the least commonly involved. 2 patients (3.1%) had unilateral complete opacification of the maxillary sinus.

Conclusion: Sinusitis was not the most common cause of facial pain in the present study, even in the presence of sinonasal symptoms. The definitive diagnosis of facial pain warrants confirmation by complementary imaging before starting therapy.

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Introduction

Facial pain is one of the most common complaints in otolaryngology because there is a common belief among the general public that facial pains are mostly caused by sinusitis. The term "sinus headache" is commonly used by

patients and primary care doctors and refers to facial pain or pressure adjacent to the paranasal sinuses, a symptom that is traditionally attributed to sinus disease (1). The incidence of facial pain is estimated to be higher in women

than in men and increases with age (2). Although facial pain is included in the major criteria for diagnosing sinusitis (3), only 16 to 20% of patients with purulent sinusitis and polyps complain of facial pain (4). Facial pain can be due to sinogenic or rhinogenic or non-sinogenic/rhinogenic causes. There are similarities between sinogenic/rhinogenic facial pain and pain from the non-sinogenic/rhinogenic origin in that both can be located over paranasal sinuses and are associated with nasal symptoms (5). Sinogenic/rhinogenic causes of facial pain include rhinosinusitis, contact points, mucocoele, and sinonasal tumors (2).

Non-sinogenic/rhinogenic causes include migraine, trigeminal neuralgia, cluster headache, facial post-herpetic neuralgia, occipital neuralgia with referred pain to the face, glossopharyngeal neuralgia, local facial neuralgias, glossopharyngeal neuralgia and atypical facial pain (2). Migraine is recognized as the most common non-sinogenic/rhinogenic cause in the majority of patients with “sinus headache” (6). Facial pain could have a significant adverse impact on quality of life. Patients with facial pain frequently visit specialist clinics, which increase the cost to the healthcare system.

The presumed significance of sinonasal origin as one of the causes of facial pain led us to investigate the sinonasal findings in patients with facial pain who visited the otolaryngology clinic at a tertiary referral center. Nasal endoscopy and paranasal sinus computed tomography (PNS CT) scans are usually used to examine the anatomical variations and pathologies of the nasal cavity and paranasal sinuses. These are also the primary diagnostic tools in patients with facial pain with a clinical suspicion of sinonasal causes. This study aimed to detect the frequency of variations and pathological findings in the sinonasal region of patients presenting with facial pain and sinonasal symptoms by PNS CT imaging.

Methods

We conducted a descriptive study on consecutive patients presenting with “facial pain and pressure” who visited the otorhinolaryngology clinic at our institution. The inclusion criteria were all patients over 18 years of age who suffered from sinus headaches and had at least one of the sinonasal symptoms, nasal obstruction, nasal congestion, rhinorrhea, reduction or loss of smell, or postnasal discharge. We excluded patients with a previous diagnosis of sinusitis or sinonasal polyps or with previous surgery on the sinus or nose. A comprehensive history was taken and routine ENT examinations including anterior rhinoscopy were performed. Based on the duration of pain and pressure, patients were divided into two groups that included acute (less than 12 weeks) and chronic (more than 12 weeks) pain. We selected patients who insisted on the diagnosis of sinusitis as the cause of their facial pain for a variety of reasons and who did not want to undergo endoscopy as a diagnostic procedure. PNS CT imaging was performed in coronal view (64-channel, Siemens). CT scan was analyzed by an otolaryngologist and sinusitis, anatomical variations, and other pathological findings were recorded. The following anatomical variants were studied: nasal septum (septal deviation or spur), turbinate (paradoxical middle turbinate, concha bullosa of middle turbinate, concha bullosa of superior turbinate), uncinate process (paradoxical uncinate process attachment), ethmoid cells (Agger nasi, Giant ethmoid bulla, Haller, onodi), and hyperpneumatization of the frontal sinus. The pathologies in the paranasal sinuses that were recorded included mucosal thickening, gas-fluid level, complete opacification, and sclerotic thickened bone. The mucosal lining greater than 3 mm was considered pathological (7). We did not consider the retention cyst in the sinus as a sinus pathology. The data were analyzed using the SPSS software version 22. The Research Ethics

Committee of Shahid Beheshti University of Medical Sciences approved this study.

Results

The demographic characteristics of patients are presented in Table 1. Sixty-four patients, 27 males (42%) and 37 females (57.8%), were included in the study. The average age was

35.5±10.5. Most patients experienced bilateral facial pain (78.1%). The most common site of pain was the forehead (76.6%) (Table 1). The sensation of “pressing” was the most frequent type of pain described by patients. Fifteen patients (23.4%) had acute pain while 49 (76.6%) patients experienced chronic type.

Table 1. Clinical and Demographic Characteristics of the Participants in the Study.

Demographic and Clinical Characteristics		Total (n=64)
Sex	Male	27 (42%)
	Female	37 (58%)
Location of pain	Maxillary portion	38 (59.4%)
	Forehead	49 (76.6%)
	Periorbital	33 (51.6%)
	Unilateral	14 (21.9%)
	Bilateral	50 (78.1%)
Character of pain	Dull	13 (20.3%)
	Pressing	34 (53.1%)
	Pulsatile	12 (18.8%)
	Radicular	5 (7.8%)
	Chronic (> 3 moths)	49 (76.6%)
Triggering factors	Acute (< 3 moths)	15 (23.4%)
	Stress	6 (9.4%)
	mental anguish	18 (28.1%)
Past drug history	Cold contact	29 (45.3%)
	Antibiotics	50 (78.1%)
	Irrigation (normal saline)	33 (51.5%)
	Antihistamines	19 (29.6%)
	Nasal sprays	30 (46.8%)
Concurrent sinonasal Symptoms	Analgesics	54 (84.3%)
	Nasal congestion	17 (26.6%)
	rhinorrhea	18(28.1%)
	Nasal obstruction	25 (39%)
	Post-nasal discharge	42(65.6%)
Associated Symptoms	reduction or loss of smell	4(6.25%)
	fever	0(0%)
	Otalgia and fullness	2(3.1%)
	cough	5(7.8%)
	Halitosis	6(9.37%)
	fatigue	5(7.8%)

As summarized in Table 1, contacting cold weather was the most common triggering factor

for facial pain. Eleven patients reported no aggravating factor. Fifty (78.1%) patients had a

history of treatment with antibiotics. The most common sinonasal symptom was posterior nasal discharge (65.6%). The incidence of anatomical variations in CT imaging is summarized in Table 2.

The most common findings on CT were nasal septum deviation (35.9%) and concha bulosa (26.6%). Of note, frontal sinus hyperpneumatization was not observed in any cases.

Table 2. The Incidence of Anatomical Variations on Computed Tomography (CT scan).

Findings on CT	Number (percent)
Nasal septal deviation or spur	23 (35.9%)
Concha bullosa of middle turbinate	17 (26.6%)
Paradoxical middle turbinate	5 (7.8%)
Concha bullosa of superior turbinate	5 (7.8%)
Paradoxical uncinate Process	2 (3.1%)
Agger nasi cell	59 (92.1%)
Haller cell	7 (10.9%)
Onodi cell	8 (12.5%)
Giant ethmoid bulla	5 (7.8%)
Hyperpneumatization of frontal sinus	0 (0%)
	Lamina papiracea 47 (73.4%)
	Fovea ethmoidalis 13 (20.3%)
Attachment of uncinate process	
	Middle turbinate 4 (6.25%)

Table 3. The Degree of Opacification in Paranasal Sinuses on Computed Tomography (CT scan).

Findings on CT	Mucosal thickening	Complete opacification	Gas-fluid level	Sclerotic thickened bone	Bilateral	Unilateral
Frontal	2 (3.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (3.1%)	0 (0.0%)
Maxillary	2 (3.1%)	2 (3.1%)	1 (1.5%)	0 (0.0%)	3 (4.7%)	2 (3.1%)
Sphenoid	2 (3.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (1.5%)	1 (1.5%)
Ethmoid	5 (7.8%)	1 (1.5%)	0 (0.0%)	0 (0.0%)	6 (9.3%)	0 (0.0%)

The distribution of the degree of opacification in paranasal sinuses is presented in Table 3. The majority of patients did not have any sign of rhinosinusitis on CT scan (56, 87.5%), while there was evidence of rhinosinusitis (acute or chronic) in 8 (12.5%) patients. The ethmoid sinus was the most frequently involved (9.3%), while the sphenoid and frontal sinuses were the least commonly involved (3.1%). In all cases where sphenoid and frontal sinuses were involved, the ethmoid sinus was also involved. All of the patients with the involvement of ethmoid cells had bilateral disease. Complete opacification was found in three patients: ethmoid sinus in one and maxillary sinus in two patients. In two patients with complete

opacification of the maxillary sinus, other sinuses were not involved, fungal sinusitis (fungus ball) was found in one, while a large retention cyst that filled the entire sinus was observed in the other, which led to sinusitis, with the location of pain correlating with the affected sinus. Only in a patient, Gas-fluid level (a sign of acute rhinosinusitis) detected bilaterally in maxillary sinuses. There were no sclerotic thickened bones, tumors, or masses detected on CT imaging

Discussion

In the present study, investigating the sinonasal changes on paranasal CT scan in patients with facial pain and sinonasal symptoms, we observed these main findings: i) the most

common site of pain was in the forehead (~77%), ii), symptoms were bilateral in ~78% and chronic in ~77% of patients, iii) the most common sinonasal symptom accompanied by facial pain was posterior nasal discharge (~66%), iv) ~78% of all patients received antibiotics before entering the study v) nasal septum deviation and spur (~36%) was the most common finding on CT scan, vi) in 8 (12.5%) patients, rhinosinusitis (acute or chronic) was detected, ethmoid sinus was the most frequently involved sinus (9.3%). Facial pain is a common complaint in patients that are reviewed by otolaryngologists and general physicians. Patients often self-diagnose sinusitis as the cause of their symptoms, which is due to the proximity of the sinuses to the face. Acute rhinosinusitis (ARS) is described as sinonasal inflammation lasting less than 4 weeks, with sudden onset of symptoms including nasal blockage/ obstruction/congestion or nasal discharge (anterior/posterior) and facial pain/pressure or decreased/loss of smell (8). In acute rhinosinusitis, the pain is often severe, and unilateral and is accompanied by fever in 50% of cases and with nasal obstruction (9). Chronic rhinosinusitis (CRS) is characterized by nasal obstruction/congestion/blockage, anterior or posterior mucopurulent nasal discharge, facial pain/pressure, and reduction or loss of sense of smell for more than 12 weeks. A diagnosis of recurrent acute rhinosinusitis is made with four episodes per year of acute rhinosinusitis with symptom-free intervals between the episodes (9). Acute exacerbation of chronic rhinosinusitis is defined when in the context of chronic sinusitis, a sudden exacerbation of symptoms occurs, which after treatment returns to the baseline condition (8). Although facial pain is considered one of the main symptoms of rhinosinusitis (10), it does not necessarily occur following rhinosinusitis (11,8,12). In chronic rhinosinusitis, patients usually do not have pain however pain may exist during acute exacerbations (9). In our study, only 8 (12.5%) patients had evidence of

sinusitis on CT, of which one patient had a gas-fluid level, a sign of acute rhinosinusitis, in maxillary sinuses accompanied with mucosal thickening of the ethmoid, sphenoid and frontal sinuses. Moreover, only three patients had complete opacifications of sinuses, one in the ethmoid and two in the maxillary sinus. In the patient with complete opacification of ethmoids, mucosal thickening was seen in the maxillary, sphenoid, and frontal sinuses. 4 patients had only mucosal thickening in ethmoid sinuses.

It re-emphasizes the notion that objective evidence for rhinosinusitis as a cause for facial pain and a sinonasal symptom was scarce. In this study, we examined patients who had one of the sinonasal symptoms associated with sinusitis in addition to facial pain. It should be noted that nasal symptoms such as nasal congestion and discharge are common complaints in the population and may not specifically be related to sinusitis. Consistent with this, only 18% of patients with sinonasal disease at anterior rhinoscopy, endoscopy, or CT have reported facial pain, of which only in 11% of cases the pain was related to sinus involvement (12). Moreover, in another study of 108 patients with mucopurulent nasal secretions at nasal endoscopy, only 31 (29%) had facial pain (11). In a study of 100 patients with self-diagnosed sinus headaches, the pain was located mostly in the face (97%), and clinical diagnoses were migraine or probable migraine (86%), rhinosinusitis (3%), cluster headache (1%), hemicrania continua (1%), and non-classifiable (9%) (13). In 63 patients, migraine headaches were mistaken as sinus headaches. Triggers of pain were weather changes (83%), seasonal variation (73%), exposure to allergens (62%), and changes in altitude (38%). The most common symptom associated with pain included nasal congestion (56%), eyelid edema (37%), rhinorrhea (25%), conjunctival injection (22%), lacrimation (19%), and ptosis (3%) (13). Furthermore, consistent with the present study, in a cross-

sectional study of 58 patients with the diagnosis of sinus headache made by a primary care physician, the most common site of headache was the frontal region and the most common triggering factor was cold contact (14). After a complete evaluation, diagnoses were migraine (68%), tension-type headache (27%), and chronic sinusitis with recurrent acute episodes (5%) (14). Antibiotic therapy, sinus endoscopy, or nasal septoplasty were performed in 96%, 56%, and 29% of patients before the study, respectively (14). Compared to the last two studies, the diagnosis of rhinosinusitis was higher in our study, which could be due to the inclusion of patients with sinonasal complaints and facial pain in our study. Although the sinonasal source of facial pain/headache is one of the suspected etiologies, we found that the majority of patients did not have sinusitis. Migraine is the most common etiology that is misdiagnosed as a sinus headache (15). This can be due to similarities with chronic rhinosinusitis in symptoms (facial pain or fullness, nasal congestion, and discharge) and precipitating factors (weather alterations, allergies, and environmental irritants) (16). On the other hand, due to the high incidence of chronic rhinosinusitis and migraine in the general population, these two disorders could occur frequently as comorbidities (9). In our patients, the forehead was the most common site of pain, which is also a common location for pain in migraine and sinusitis (14). Rhinogenic headache or facial pain is described as recurrent facial pain involving that is generated by mucosal surfaces in contact with each other in the nose without signs of inflammation, hyperplasia of the mucosa, discharge, polyps, or mass (9). The pain is generally felt unilaterally around the orbit, the canthus (medially and superiorly), or the zygomatic-temporal region (9). The pain may last for hours with painless intervals (9). Contact point pains are created by stimulation of intranasal receptors that are innervated by the afferent C fibers of ophthalmic and maxillary

branches of the trigeminal nerve; therefore, the pain is felt in the dermatomes, which matches with innervation of these two branches (17). To propose the contact point as the cause of pain, three conditions must be present: a region of mucosal contact confirmed by endoscopy or CT, and relief of pain after infiltrating the suspicious region with local anesthesia for 5 minutes as well as relief of the pain within a week (9).

In our study, the most common anatomical variations were septal deviation and concha bulosa. Nevertheless, we did not perform an infiltration test with local anesthesia, and a definite diagnosis of rhinogenic pain could not be made in the present study. In addition, a systematic review suggested that most persons with contact points do not experience facial pain, thus finding a contact point is not a significant predictor of pain (18).

Conclusion

In conclusion, in the present descriptive study of 64 patients with facial pain and nasal symptom, the majority of patients did not have any sign of sinusitis on paranasal CT imaging. In patients presenting with facial pain even in the presence of nasal symptoms, other diagnoses should be considered as more likely. Before unnecessary use of antibiotics or other medications is started, a complete examination with nasal endoscopy or CT imaging is warranted.

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Conflicts of Interest

The authors declare no conflicts of interest.

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Ethics

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