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Patient history and CT findings in predicting surgical outcomes for patients with rhinogenic headache

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Introduction

The concept that headaches can be triggered by nasal or sinus abnormalities is not new. Reports of patients experiencing an alleviation of headaches after nasal surgery date back more a century.[1] Interest in rhinogenic headaches was renewed with the advent of endoscopic sinus surgery and more precise surgical techniques.[2#4] Many investigators have published reports of significant improvement in headache symptoms after endoscopic sinus surgery.[5-10]

Despite these reports, the use of endoscopic sinus surgery for the treatment of headaches remains a subject of much debate, in part because of the lack of an objective means of identifying patients who might benefit from such surgery. To date, the most common diagnostic method used to identify possible surgical candidates has been the application of topical anesthetics and decongestants to suspected intranasal contact areas during a headache; subsequent pain relief is thought by many researchers to confirm the diagnosis of rhinogenic headache.[8,9] However, the experiences of other investigators suggest that this test is neither diagnostic of rhinogenic headache nor a predictor of which patients would benefit from surgery.[10,11]

In view of the lack of definitive data, we attempted to identify objective patient history and computed tomography (CT) parameters that can be used to reliably predict which headache patients will benefit from nasal or sinus surgery.

Patients and methods

For this prospective analysis, we studied 33 adults-26 men and 7 women-who presented with a primary complaint of headache from September 2004 through April 2005. All patients had a long-standing history of headaches, and none had ever experienced satisfactory relief from any previous attempts at treatment. We did not attempt to confirm a diagnosis of headache as rhinogenic by applying a topical decongestant and/or anesthetic to contact areas during an episode in view of the fact that some investigators believe that this is an unreliable test.[10,11]

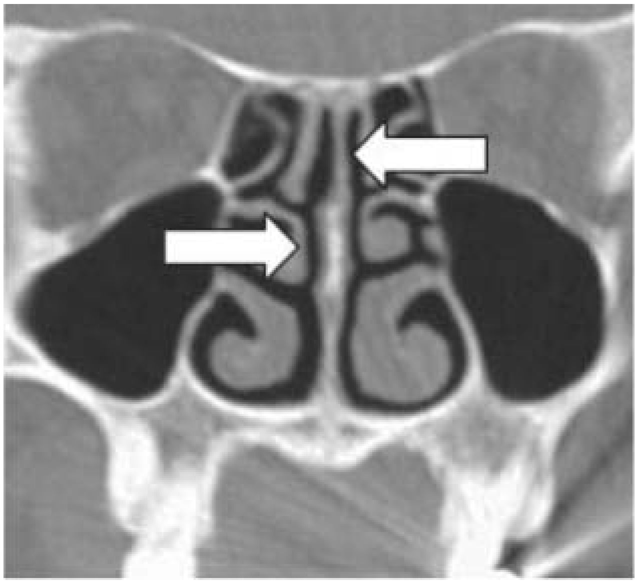
The criteria for study inclusion were (1) no history of nasal or sinus surgery, (2) findings on the history and physical examination that did not suggest another etiology, (3) the presence of anatomic abnormalities on sinus CT that were believed to contribute to headache symptoms, (4) minimal mucosal disease seen on CT, and (5) no desire on the part of the patient to pursue other treatment options.

Preoperatively, all patients were asked to quantify the frequency, duration, and intensity of their headaches. Intensity was rated subjectively on a scale of 1 (no pain) to 10 (worst headache ever).

An attempt was made to quantify the anatomic abnormalities seen on CT that were believed to contribute to the headaches by recording (1) each patient's Lund-Mackay score[12] for sinus occlusion (0 = no opacification, 1 = partial opacification, and 2 = complete opacification), (2) the presence or absence of a posterior septal spur with lateral contact, (3) the presence or absence of a concha bullosa, (4) the size of the concha bullosa in its greatest mediolateral dimension (<5 mm or ≥5 mm) when present, and (5) the length of the vertical contact between the septum at the superior turbinate and the septum at the middle turbinate on sequential images of a standard 3-mm coronal CT scan of the sinuses (figure).

Figure. The length of vertical contact between the septum at the superior turbinate (top arrow) and the septum at the middle turbinate (bottom arrow)

as seen on sequential 3-mm coronal CT is recorded.



All surgery was performed by one surgeon (L.J.M.) in accordance with the principles of the minimally invasive sinus technique (MIST) described by Setliff and colleagues.13-15 No nasal packing or postoperative debridement was performed.

Postoperatively, all patients were contacted by telephone and asked again to quantify the frequency, duration, and intensity of their headaches (average follow-up: 18.4 mo). They were also asked if their headaches were better than, worse than, or the same as they were preoperatively. To eliminate possible bias, these postoperative interviews were not conducted by the surgeon who had performed the operations.

Pre- and postoperative findings were compared, and statistical analyses were performed with the paired Student *t* test for multiple variables and the one-way ANOVA for categorical variables.

Results

On CT, the mean preoperative Lund-Mackay score was 2. Twenty-six of the 33 patients (78.8%) had a posterior septal spur with lateral contact. Five patients (15.2%) had a concha bullosa smaller than 5 mm in its greatest mediolateral dimension, and 9 patients (27.3%) had a larger one. The mean length of vertical contact measured on standard 3-mm coronal CT was 56 mm (table 1).

Preoperative CT findings (N = 33)

Parameter	Value
Lund-Mackay score (mean)*	2
Presence of a posterior septal spur w/lateral contact, n (%)	26 (78.8)
Presence of a concha bullosa <5 mm, n (%)	5 (15.2)
Presence of a concha bullosa ≥5 mm, n (%)	9 (27.3)
Length of vertical contact (mean)	56 mm

* Lund-Mackay scores: 0 = no opacification, 1 = partial opacification, and 2 = complete opacification.

Preoperative headache characteristics. Preoperatively, the study population experienced an average of 15 headaches per month, and these episodes lasted for an average of 8.3 hours each. On the 10-point scale, the average pain-intensity score per headache was 6.3 (table 2).

Comparison of mean pre- and postoperative findings (N = 33)

Headache characteristic	Preop	Postop	Statistical significance
Frequency	15/mo	5/mo	$t = 6.46$, $p < 0.01$
Duration	8.3 hr	4.8 hr	$t = 4.13$, $p < 0.01$
Intensity score*	6.3	3.8	$t = 5.78$, $p < 0.01$

* Self-rated score on a scale of 1 (no pain) to 10 (worst headache ever).

Postoperative headache characteristics. The average frequency of headaches postoperatively was 5 per month, a reduction of 10 per month, which is statistically significant *(t* = 6.46, *p* < 0.01). The average duration postoperatively was 4.8 hours per headache, a decrease of 3.5 hours-again, a statistically significant difference *(t* = 4.13, *p* < 0.01). Finally, the average pain intensity score dropped to 3.8 postoperatively, a statistically significant decrease of 2.5 points *(t* = 5.78, *p* < 0.001) (table 2).

When asked to subjectively rate their headaches as either better, worse, or the same, 28 patients (84.8%) said they were better and 5 (15.2%) said they were the same; no patient said they were worse (table 3). Statistical analysis of the history and CT parameters revealed no patterns that might explain the difference between the patients who improved and those who did not.

Self-rated nature of headaches at post-operative follow-up (N = 33)

Rating	n (%)
Better	28 (84.8)
Same	5 (15.2)
Worse	0

No major surgical complications such as cerebrospinal fluid leak or injuries to the orbit, optic nerve, or carotid artery were seen in this series.

Discussion

Reports of headache patients experiencing improvement following nasal surgery date back to the late 1800s.[1] In the 1920s, Sluder described sphenopalatine ganglia neuralgia and vacuum headaches as potential triggers of chronic headache symptoms.[16] In the 1940s, Wolff studied patterns of referred nasal pain by applying stimuli to the internal nasal structures.[17] A few decades later, the introduction of advanced visualization modalities[2] and more sophisticated and safer surgical techniques[3,4] rekindled interest in rhinogenic headaches. In 1988, Stammberger and Wolf suggested that mucosal irritation caused by contact could release substance P, thereby causing a trigeminally mediated cascade of events that leads to referred pain and headache.[5] This process has been elegantly described elsewhere.[5,6,18]

Over the past 15 years, several investigators have attempted to treat rhinogenic headache with endoscopic sinus surgery. The vast majority of these authors have reported impressive results based on follow-up periods of up to 10 years.[19] However, diagnostic criteria and specific treatment recommendations are lacking. Most authors have described fairly aggressive surgical intervention, including turbinate resection, aggressive marsupialization of the ethmoid cavity, nasal packing, and postoperative debridements. In their 1988 report, Stammberger and Wolf wrote that “functional endoscopic sinus surgery with usually minimal operations often can provide dramatic relief of symptoms.”[5] In our study, we adhered to that belief, as our surgical approach with MIST was as limited as possible and directed at eliminating contact areas.

Our primary goal, however, was not to try to show that surgery can be effective, as this has already been well documented by many others. Instead, our goal was to try to identify some characteristic patient history and/or CT factors that would be helpful in identifying potential surgical candidates. We are not aware of any previous attempt to radiographically quantify the amount of contact seen on a sinus CT scan. Also, to the best of our knowledge, no previous attempt has been made to categorize anatomic abnormalities of the nose and paranasal sinuses seen on CT that might have some bearing on the genesis of chronic headaches and be of some use in identifying surgical candidates.

Although we were unable to detect any patient history and/or CT factors that would predict which patients would be good surgical candidates, we can still make some observations. For example, it has long been held that patients with posterior septal spurs with lateral contact can develop a condition called *Sluder neuralgia.* We were unable to show any statistically significant improvements in symptoms between patients who did and did not have such septal deformities. In fact, all 5 patients who reported no improvement did have posterior septal spurs with lateral contact that were surgically corrected.

Also, while other authors have implicated the amount of mucosal contact as being of some importance in the diagnosis of rhinogenic headaches,[11] we found no such association. We carefully recorded the amount of contact and analyzed its impact on the predictability of a positive or negative postoperative clinical response, and we found no pattern to support the theory that an increase in the surface area of mucosal contact is of any significance in terms of diagnosis or prognosis.

Our inability to identify any parameters that were useful in predicting surgical outcomes may be attributable to several factors. First, perhaps there are other history or CT parameters that we should have included. For example, we did not include International Headache Society (IHS) criteria[20] for the classification of headaches as part of the history. Although the issue of migraine was addressed with our patients, it was not part of the study. Other studies in the otolaryngology literature similar to ours likewise did not include IHS criteria.[7,10,21]

With regard to CT findings, other contact areas may be of importance. For example, it is frequently noted at the time of surgery that the middle turbinate and the agger nasi are in contact. Perhaps an assessment of this area should have been included in the CT evaluation process.

Perhaps a more important consideration is the possibility that the pathologic process that leads to rhinogenic headaches might not be limited to mucosal contact. Poor sinus ventilation resulting in a pressure differential may also play a part in the pathogenesis of these headaches. As mentioned, Sluder[16] described vacuum headaches in the 1920s, and Stammberger and Wolf in their 1988 report[5] mentioned hypoxia secondary to pressure differentials within sinuses as another possible mechanism for the release of substance P.

Since the vast majority of patients in our study (84.8%) did, in fact, experience improvement with surgery, it is likely that a similar study in a much larger cohort would be sufficiently powered to identify statistically significant predictive parameters. While other reports have shown similarly positive results, most of them were relatively small series.[9-12] Moreover, a multicenter analysis with strict historical and radiographic inclusion criteria might provide adequate patient numbers to identify diagnostic criteria. Many otolaryngologists recognize that some headache patients will benefit from endoscopic sinus surgery, but without guidelines for diagnosis and recommendations for treatment, some are reluctant to consider surgery as an option. A multicenter controlled study would help establish such guidelines and recommendations.

In conclusion, minimally invasive sinus surgery is frequently very helpful in the treatment of refractory headaches that are believed to be of nasal origin. Our results with MIST are similar to those of other investigators who used standard endoscopic sinus techniques for the treatment of headaches.[9-12] The decision whether or not to perform surgery is based primarily on the clinical judgment of the practitioner. Concrete guidelines need to be established so that more otolaryngologists will feel comfortable in making the diagnosis and more confident when they offer surgery as an option.

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