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Research Article

Evaluation Of Headache/Facial Pain Before And After Endoscopic Sinus Surgery In Patients With Sinonasal Polyposis.

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Running title: Headache Before and After Endoscopic Sinus Surgery

Abstract

Introduction: The aim of this study was to show the effect of endoscopic sinus surgery on headache/facial pain in patients with sinonasal polyposis.

Materials and methods: Patients with sinonasal polyposis who had not responded to medical therapy and were planned for endoscopic sinus surgery entered this study. Their symptoms, endoscopic examination and CT-scan characteristics were documented by sinonasal outcome test (SNOT-22), Lund-Kennedy and Lund-Mackay scoring systems, respectively. If they suffered from headache/facial pain, the HIT-6 questionnaire was filled, too and they were referred for neurological consult. The same data were gathered 6 and 12 months postoperatively except for the CT-scan.

Results: fifty-six patients with sinonasal polyposis underwent endoscopic sinus surgery. Forty-three were men and 13 women with a mean age of 38.29(range: 18-67 years). 21.4% had headache (58.3% sinus headache, 25% migraine and 16.7% other types).

The score of SNOT-22 preoperatively was significantly different between headache-positive and headache-negative patients. In addition, the headache-positive patients' symptoms changed over 6 and 12 months postoperatively much more significantly than those without headache (p-value<0.046).

Conclusion: Headache was present in 21.4% of our patients undergoing endoscopic sinus surgery of whom 58% had sinus headache. They benefited from surgery much more than the ones without headache.

Keywords : rhinosinusitis; polyposis; facial pain; headache; HIT-6 questionnaire; endoscopic sinus surgery.

INTRODUCTION

According to Nielson's worldwide research in 2007 the most common complaint ending in patients' referral to doctors is headache whose lifetime incidence seems to be at least 90% [1-2]. Many patients with headache are visited by otolaryngologists because they feel the pain in the sinonasal area and believe that the origin of the pain is exactly underneath. Wrong diagnoses occur due to the overlap of symptoms between rhinologic disorders and primary headaches.

Typically, sinus headache refers to episodes of pain over the sinus area, often associated with rhinorrhea, nasal congestion, facial pressure, lacrimation and nausea. However, there are some common diagnoses wrongly assumed as sinus headache as autonomic trigeminal cephalgias including cluster headache, hemicranias continua, paroxysmal hemicrania, trigeminal neuralgia and tension-type headache. Other causes include temporomandibular joint dysfunction, giant cell arteritis, medication overuse headache and migraine. Migraine is the most common diagnosis which can masquerade as sinus headache among all [3].

Sinonasal polyposis, a chronic inflammatory disease with unknown pathogenesis, is considered as one of the five main rhinological causes of facial pain and headache [4]. Facial pain and headache are indeed two of its diagnostic criteria whose mechanisms are still undiscovered [5-6]. However there have been some justifications such as: 1. Pressure differential across sinus ostia 2. Inflammation and bacterial toxins changing sensory nerve function and 3. Osteitis [7].

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Few studies have been conducted about headache in chronic rhinosinusitis with sinonasal polyposis, its relation with other symptoms, the grade of sinus involvement with polyps and the amount of improvement of headache after endoscopic sinus surgery. Therefore, we intended to search about such issues in this study.

METHODS

Our IRB-approved research (IR.TUMS.VCR.REC.1397.613) was designed as a quasi-experimental pre-post intervention study. Participation was voluntary and an informed consent was designed for each patient after a comprehensive oral explanation of the study according to the ethics committee's rules.

Fifty-six patients aged 18 to 75 years with sinonasal polyposis who consented to participate in the research were planned for endoscopic sinus surgery from October 2015 to October 2016. They had not responded to a 3-month course of medical therapy including 0.9% normal saline for irrigation and corticosteroids (either nasal spray or oral tablets).

They were excluded if they: 1. had diseases such as cystic fibrosis, Wegener's granulomatosis, sarcoidosis 2.had a history of facial trauma and 3. were unwilling to continue cooperation with the study.

Patients' sinonasal symptoms, endoscopic examination and CT-scan characteristics were documented by sinonasal outcome test (SNOT-22), Lund-Kennedy and Lund-Mackay scoring systems, respectively. If they suffered from headache/ facial pain, the HIT-6 questionnaire, which has already been validated was filled, too. It includes six items and is used in screening and monitoring patients with headaches in both clinical practice and research [8]. The patients were referred for neurological consult to investigate non-sinus related headaches such as migraine, cluster headache, neuralgias, etc. Except for the CT-scan all scores were again gathered 6 and 12 months postoperatively.

The patients underwent endoscopic sinus surgery. All the sinus ostia were opened and all the ethmoidal septa were removed considering preservation of the mucosa. Finally, the skull base was visible and the frontal, maxillary and sphenoidal ostia were widely opened. Nasal packing was usually removed the day after surgery and the patients were instructed to irrigate their nasal cavity with 0.9% normal saline four times daily. They received oral antibiotic (Cephalexin 500mg, Qid) for a week after surgery and the nasal corticosteroid spray (fluticasone) was started 2 puffs per nostril, twice per day.

HIT-6, Lund Kennedy and SNOT-22 questionnaires were scored 6 and 12 months after the operation in patients' routine follow-ups.

The data was analyzed by software SPSS-20(IBM SPSS, V20, Armonk,NY,USA) and the p-value<0.05 was considered significant. Considering the few numbers of patients with headache, Kolmograv test was used for parametric variables and the Wilcoxon test for the non-parametric ones.

The sample size was estimated with the formula for a cross-sectional study.

Z1-a/2=1.96; d (absolute precision) =3; SD=11.02 (calculated by a pilot study).

RESULTS

From a total of fifty-six patients who fulfilled the inclusion criteria, 43 (65.2%) were men with the average age (SD) of 38.29 (12.34); (35.38(13.31) in men and 39.16(12.23) in women).

Twelve patients (21.4%) suffered from headache/facial pain before endoscopic sinus surgery which decreased to one patient (1.7%) and 2 patients (3.5%), 6 and 12 months after operation respectively. In accordance with neurologic consult before and after surgery, 3 out of 12 headache-positive patients (25%) were migraineous. Seven (58.3%) turned out to have sinus headache and 2 (16.7%) were non-classifiable. In other words, headache improvement in 6 and 12 months after surgery were 92% and 83.6% in order.

Patients' preliminary SNOT-22 scores were checked by Kolmograv normality test and their distribution was normal on the contrary to Lund Kennedy and Lund Mackay scores.

Headache-positive and headache-negative patients' preoperative SNOT-22 scores were significantly different (Independent Sample T-test, t=-5.12, P-Value<0.001). We were not encountered by such difference about Lund Kennedy and Lund Mackay scores (Mann-Whitney; P-Value=0.87, P-Value=0.78) (**table 1**).

Table 1. Descriptive information of SNOT-22 and Lund Kennedy scores based on having headache and HIT-6 scores before, 6 and 12 months after endoscopic sinus surgery.

Questinnnaires	Before Surgery		6 month after surgery		12 month after surgery	
	Mean (SD)		Mean (SD)		Mean (SD)	
SNOT-22	Headache- positive (12 patients)	59.5(15.28)	Headache-positive (11patients)	20.91(21.22)	Headache-positive (11patients)	22.27(18.33)
	Headache-negative (44 patients)	35.89(13.48)	Headache-negative (33patients)	10.27(9.01)	Headache-negative (33patients)	10.82(9.04)
Lund kennedy	Headache- positive (12patients)	10.75(1.96)	Headache-positive (11patients)	2.64(2.20)	Headache-positive (11patients)	2.55(3.11)
	Headache-negative (44patients)	10.43(2.25)	Headache-negative (33patients)	2.85(1.92)	Headache-negative (33patients)	2.72(2.20)
HIT-6	Headache- positive (12patients)	61.58(9.01)	Headache-positive (11patients)	37.36(4.52)	Headache-positive (11patients)	40.09(9.7)

Assessing correlation of SNOT-22, Lund Kennedy and HIT-6 questionnaire scores 6 and 12 months postoperatively, no significant relation was found (Spearman's test; P-Value>0.05) (**table 2**).

Table2. Spearman's correlation analysis of difference of questionnaire scores (SNOT-22, Lund Kennedy and HIT-6) at three time periods (before, 6 and 12 months after surgery).

scores*	Correlation Coefficient	P-value
dSNOT-22b-dHIT-6b	0.20	0.55
dSNOT-22a-dHIT-6a	-0.15	0.64
dLund Kennedyb- dHIT-6b	-0.186	0.58
dLund Kennedya - dHIT-6a	-0.475	0.14

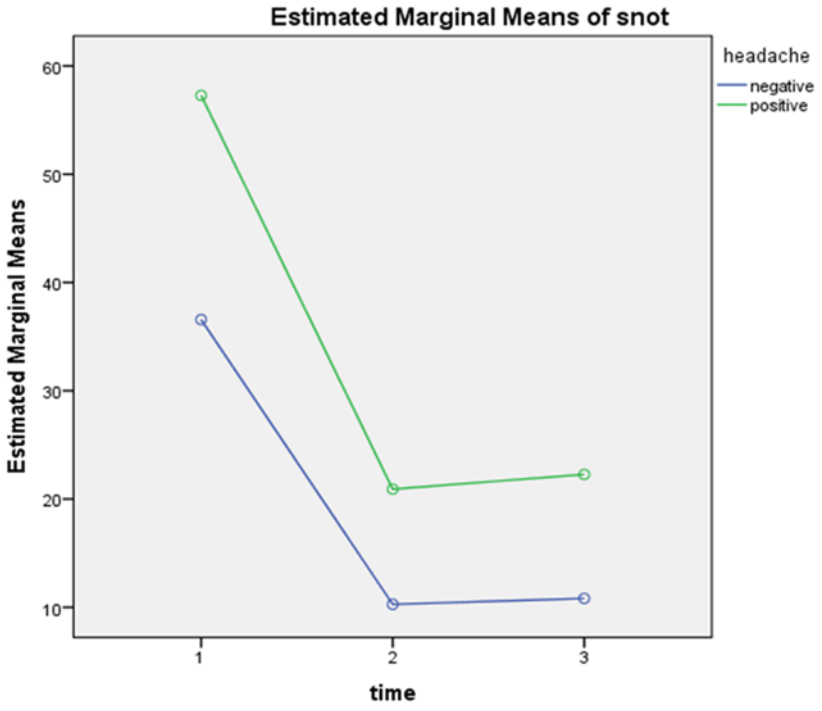
*

dSNOT-22a=SNOT-22 score 6 months after surgery- SNOT-22 score before surgery
dSNOT-22b=SNOT-22 score 12 months after surgery- SNOT-22 score before surgery
dLund Kennedya=Lund Kennedy score 6 months after surgery- Lund Kennedy score before surgery
dLund Kennedyb =Lund Kennedy score 12 months after surgery- Lund Kennedy score before surgery
dHIT-6a =HIT-6 score 6 months after surgery- HIT-6 score before surgery
dHIT-6b=HIT-6 score 12 months after surgery- HIT-6 score before surgery

However, the amount of SNOT-22 score reduction in 6 and 12 months after the operation was significantly different between patients with and without headache. As a matter of fact, the amount of SNOT-22 score reduction was more prominent in headache-positive patients compared with headache-negative ones (General Linear Model (GLM), Greenhouse Geisser, F=3.42, P-Value<0.04). Such relation was not found about Lund Kennedy score change 6 and 12 months after endoscopic sinus surgery (P-Value>0.05).

Analyzing SNOT-22 questionnaire with scrutiny, questions number 2, 10, 16 and 20 were answered differently 6 and 12 months postoperation which resulted in meaningful changes of scores (**diagram 1**).

Diagram 1. Comparing SNOT-22 scores in 3-time courses according to headache status The darker line (below) shows the average of SNOT-22 scores in headache-negative patients and the lighter line (above) shows that of headache-positive ones.

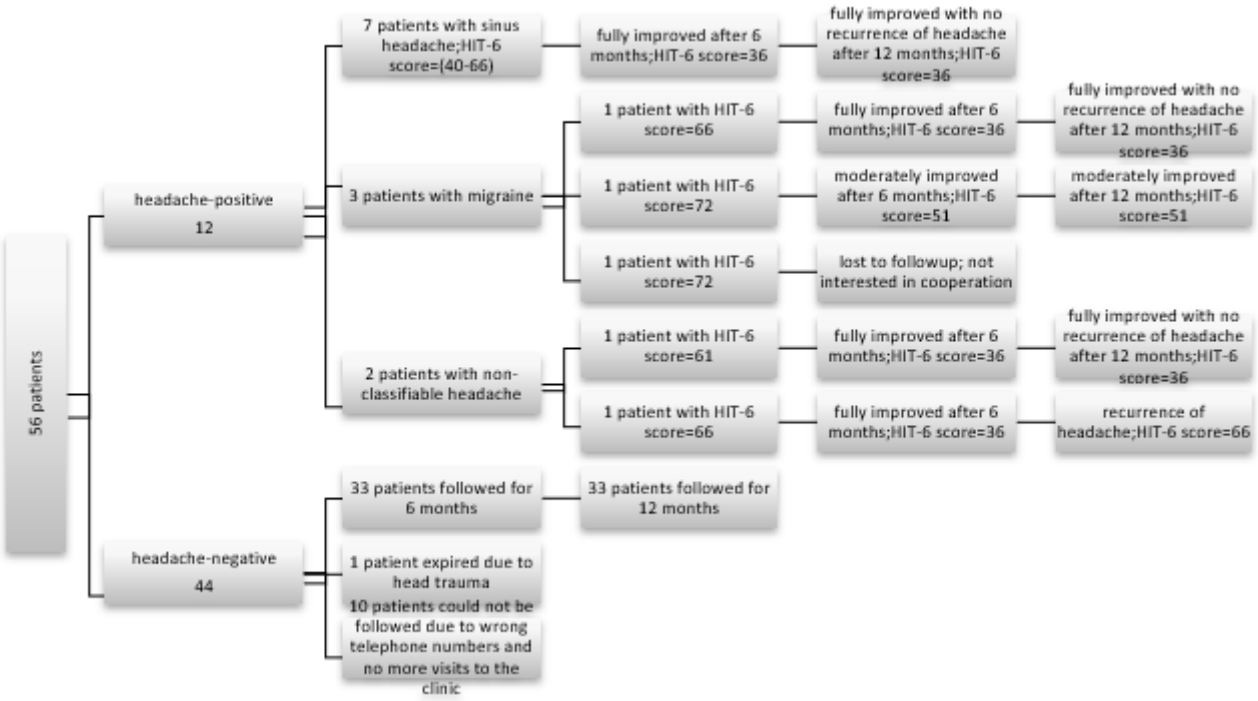


Regarding patients with headache, SNOT-22 and Lund Kennedy scores were not statistically different between migraneous patients and the cases with sinus headache. Lund Mackay scores did not vary between the groups, either (Mann-Whiteney; P-Value=0.46). The data of patients with headache and follow of all patients are fully presented in **table 3** and diagram 2 in order.

Table 3. Descriptive information of patients with headache based on SNOT-22, Lund Kennedy, Lund Mackay and HIT-6 scores before, 6 and 12 months after endoscopic sinus surgery.

Type of Headache	SNOT-22; Mean (SD)			Lund Kennedy;Mean(SD)			HIT-6; Mean (SD)			Lund Mackay; Mean(SD)
	Before surgery	6 months after surgery	12months after surgery	Before surgery	6 months after surgery	12months after surgery	Before surgery	6 months after surgery	12months after surgery	Before surgery
Sinus Headache	52.29(14.46) 7patients	11.43(9.93) 7patients	11.43(9.93) 7patients	10.43(2.14) 7patients	1.43(0.97) 7patients	0.57(0.97) 7patients	57.43(9.27) 7patients	36(0.00) 7patients	36(0.00) 7patients	19.71(4.53) 36(0.00) 7patients
Migraine	73.33(9.29) 3 patients	43.5(28.99) 2 patients	35(16.97) 2 patients	10.67(2.30)	3.50(0.70) 2 patients	4(0.00) 2 patients	70(3.46) 3 patients	43.50(10.60) 2 patients	43.50(10.60) 2 patients	17.33(7.02) 3 patients
Non-Classifiable	64(12.72) 2 patients	31.50(34.64) 2 patients	47.50(7.77) 2 patients	12(0.00) 2 patients	6(2.82) 2 patients	8(0.00) 2 patients	63.50(3.53) 2 patients	36(0.00) 2 patients	51(21.21) 2 patients	22(2.82) 2 patients

Diagram 2. illustration of follow-up of all patients, specifically the ones with headache.



DISCUSSION

Sinus headache as a common but nonspecific diagnosis is attributed to headaches associated with facial pain and pressure accompanying rhinologic symptoms. However, the International Headache Society (IHS) has not validated chronic rhinosinusitis as a cause of headache due to the often confusion with migraines [9]. Nevertheless in 2013, the criteria for headache attributed to rhinosinusitis came out insisting on its acute stages [10].

Facial pain and headache are two of the criteria for diagnosis of rhinosinusitis according to the consensus of expert opinions since 1997[5]. However, their mechanisms are still unknown and there are many reports claiming that sinus headache is erroneously diagnosed as other types of primary headaches especially migraine.

In a study conducted by Fahy et al, 973 patients with rhinosinusitis symptoms and/or facial pain were followed for 2 years and 2 months. 220 of these patients had sinonasal polyposis. Only 39(18%) had facial pain and pressure. 190 patients out of 220 with sinonasal polyposis had polyps without purulent discharge and 5(2.6%) patients' facial pain was related to sinus disease. 30(13.6%) patients suffered from polyposis with purulent discharge out of whom 24(79%) complained of facial pain as well. 19(80%) of patients with pain and purulent discharge responded to treatment for their sinus disease which was a much better response than that of the group with polyps without pus. According to this study we must be careful in relating facial pain and pressure to paranasal sinuses disease because it is more likely to be due to a neurological problem and a coincidental event.

Comparing Fahy's study with ours it must be said that the prevalence of headache and/or facial pain were almost the same in both studies (21.4% vs.18%). However, their patients were not necessarily candidates of surgery [11].

Moretz et al gathered the data of 201 patients in 2 years and compared headache and mean SNOT-22 scores pre- and 2 years postoperatively in chronic rhinosinusitis patients with and without polyps. They were all operated in 3 years and 78 of them had polyposis. Their headache score was documented by VAS (visual analogue scale) which decreased from 4.7 to 0.8, two years postoperatively (p-value<0.0001) and the score of headaches of 123 patients without polyps was higher than that of 78 patients (5.1 vs.4.1, p-value<0.05). The mean SNOT-22 scores were 28.7 and 6.7 respectively (p-value<0.0001). In general, headache was present in 73.6% of patients undergoing surgery and the mean headache score decreased in 2 years [7].

In Moretz's study, chronic rhinosinusitis patients both with and without polyposis were evaluated and operated on. Yet, in our study only the ones with polyposis were allowed to enter the study. Also, the rate of headache announced in their study was much higher than ours (73.6%. vs. 21.4%) [7].

According to Nguyen et al's report, endoscopic sinus surgery decreased facial pain, headache and its physical, psychological and social effects on patients with sinonasal polyposis. Overall, 107 patients with sinonasal polyposis filled DyNaChron questionnaire for headache one day before surgery and six weeks afterwards. Fifty percent of patients suffered from moderate to severe facial pain before surgery

which turned to 20% after surgery. This rate of reduction was statistically significant. Patients with grade 1 polyposis benefited from surgery less than the ones with more severe disease regarding headache. The time of follow-up in this study was shorter than ours and a different headache questionnaire was used. The rate of headache was different in studies, too (21.4% vs. 50%) [12].

Regarding Poetker's study in 2007, patients with sinonasal polyposis had less headache and facial pain after endoscopic sinus surgery. Forty-three patients with sinonasal polyposis and 76 patients with chronic rhinosinusitis without polyposis were followed for one year and a half after endoscopic sinus surgery. CT- scan, endoscopy, quality of life and visual analogue scale (VAS) scores were compared before and after surgery. Patients with sinonasal polyposis compared to the ones without polyps had less headache and facial pain both before and after endoscopic sinus surgery. However, despite more significant improvement in nasal congestion, no significant difference in improvement of headache and facial pain after surgery was found compared to the patients without polyps [13].

Patients with and without sinonasal polyposis were compared in Dr. Poetker's research. In consistence with our study, they found a significant improvement in headache and facial pain after endoscopic sinus surgery as did we.

According to a study by Eross et al on 100 patients who believed their headache has a sinus origin, 52% suffered from migraine. 11% had migraine with overmedication, 23% probable migraine,1% cluster headache and 1% hemicrania continua. Three percent of patients had headache due to rhinosinusitis and 9% were non-classifiable. In this study, patients were not necessarily candidates of surgery which explains why they reported 3% sinus headache and 52% migraine which is totally different from ours [14].

In general, the prevalence of headache in patients with sinonasal polyposis is reported to be 16 to 36 and even 50% [15-16]. In our study, it turned out to be 21.4% which is in the same range. Yet, the proportion of sinus headache and migraine to other types of headaches were 58.3% and 25%, respectively which is different from other studies. Migraine was still the most common headache disorder after sinus headache. Many authors believe headache in sinus area is experienced in migraine due to the excitation of meninges. On the other hand, nasal symptoms such as congestion, rhinorrhea and lacrimation can be seen in migraineous people by the parasympathetic system [17].

Moreover, the effectiveness of endoscopic sinus surgery in relieving headache of patients with sinonasal polyposis has been noted in other studies. Senior et al reported improvement of headache both 1.5 and 7.8 years after surgery [19]. Moretz et al showed 91.9% of patients' headache improved 2 years after operation [7].

In the most recent systematic review and meta-analysis by Heiland et al printed in 2024 it was shown that patients with and without sinonasal polyposis reported substantial reductions in facial pain and headache according to SNOT-22 and VAS questionnaires. Symptom reductions were greater in patients without polyps. However, they suggested that regardless of polyp status, patients with chronic rhinosinusitis benefit significantly from surgery considering their facial pain and headache status [19].

Similarly, in our research the headache symptom ameliorated 92% and 83.6%, 6 and 12 months after the operation. The reason for the drop of the percentage was recurrence of polyps and symptoms in a patient with Samter's triad.

Improvement of patients' symptoms in the group with headache was much more significant than the group without it and symptoms such as productivity and embarrassment changed the most. This indicates that headache plays a very important role in quality of life.

Different surgeons performing the surgery despite the same technique seems to propose the weak point of this study. In addition, significant improvement of the symptom "sneezing" cannot be explained.

CONCLUSION

Headache plays an interactive role in reducing patients' symptoms after endoscopic sinus surgery and patients with headache benefit from the surgery more than the ones without headache. A multidisciplinary approach to such patients involving other specialists cannot be more emphasized [20].

We propose that the surgery be done by one person so that the bias of different surgeons operating would be omitted. In addition, the study should be conducted in more patients with a longer follow-up time in order to assure omitting the placebo effect of surgery. Despite changing the balance of neuronal activity in the trigeminal caudal nucleus temporarily, the placebo effect has been shown to subside within months in some studies [11].

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Conflicts of interest

Authors have no conflict of interests to declare.

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