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Impact of endoscopic sinus surgery on the quality of life of patients with nasal polyposis

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Abstract. *Impact of endoscopic sinus surgery on the quality of life of patients with nasal polyposis. Objectives:* Chronic sinusitis with polyposis (CSWP) is associated with high direct and indirect annual costs. This condition affects several aspects of daily life, and CSWP patients usually suffer from decreased quality of life (QOL). Treatment with functional endoscopic sinus surgery (FESS) is reported to improve the QOL of patients with CS. Here we evaluated the factors that affected QOL improvement in CSWP patients who were candidates for FESS.
Methods: All patients with CSWP who were treated at the Imam Khomeini Hospital Complex in Tehan, Iran that were candidates for FESS were recruited. Patients with systemic or neurologic diseases that could affect their QOL were excluded. Clinical signs were recorded before and after FESS using the sinonasal outcome test (SNOT-22) and QOL questionnaires. The patient's history of allergic rhinitis, aspirin sensitivity, asthma and smoking was recorded. QOL and associations with clinical features were evaluated within twelve months after FESS.
Results: The study included 47 patients with a mean age of 39.5 ± 15.4 years (61.7% women). FESS resulted in significant improvements in QOL based on the SNOT-22 and QOL questionnaires ($p = 0.0001$ for both). Septal deviation was the only single characteristic that was significantly associated with QOL improvements.
Conclusion: FESS significantly improved the QOL of patients with CSWP. However, patients with septal deviation benefited the most from FESS.

Introduction

Chronic sinusitis (CS) is associated with high direct and indirect annual costs.[1] Indirect costs include missed work days and general loss of productivity.[2-4] Notably, CS ranks among the top 10 diseases that cause productivity loss in the US.[5] In the US, where CS prevalence is reported to be about 14%,[1,6] 12% of all prescribed antibiotics are for CS.[7]

Patients with CS suffer from a poor quality of life (QOL), especially in terms of the physical effects of CS.[8] Thus, improving patient QOL is one of the most important goals of CS treatment. Several studies have showed the positive effects of functional endoscopic sinus surgery (FESS) on the QOL of patients with CS.[9-11] However, the association between FESS and QOL improvement, as well as the role of factors that affect QOL, remain unclear. The aim of the present study was to evaluate the roles of factors that affect QOL in patients with CSWP and to determine which patients benefits most from FESS.

Subjects and methods

Study subjects

Forty-seven consecutive patients were selected who had a history of CS with nasal polyposis (CSWP). All selected patients were candidates for endoscopic sinus surgery and were resistant to maximal medical treatment (6 weeks of the following: a broad-spectrum antibiotic, co-amoxiclav, 625 mg tablets, TDS; nasal corticosteroid spray, fluticasone, 1 puff, BD; a mucolitic, guaifenesin, 400 mg, QID; and nasal saline wash). The mean pretreatment nasal polyposis staging was 2.17 ± 0.7, while after treatment the staging had improved to 1.48 ± 056. The study was initiated in January of 2009 and ended in December of 2010. All patients sought treatment at the rhinology clinic of a tertiary referral centre (Imam Khomeini Hospital Complex), and all were followed-up for one year after surgery.

Inclusion criteria

Diagnosis of CSWP was based on the patient's medical history and on imaging and endoscopic findings; sinusitis patients were included in the study only if they continued to have CS symptoms and sinus involvement as determined by CT scan after receiving at least 6 weeks of maximal medical treatment.

Exclusion criteria

None of the patients had psychological problems or systemic diseases such as sarcoidosis, Wegner granulomatosis or cystic fibrosis that could influence their QOL. None was on medications that interfered with postoperative treatment. Pregnant patients, patients younger than 18 years, immunodeficient patients, and individuals with neoplasia or fungal rhinosinusitis were excluded from this study. One patient who did not participate in the follow-up evaluation was excluded from the study. The characteristics of the patient who was lost to follow-up did not affect the final outcome and the patient's characteristics were not different from those of the other patients.

Ethics approval

The study protocol was approved by the Institutional Review Board of the Tehran University of Medical Sciences. All aspects of the study were conducted according to the tenets set forth in the Declaration of Helsinki. All participants provided informed consent for participation in the study.

Determination of patient characteristics

Subjective variables

Demographic data were collected for each patient along with the history of allergic rhinitis, aspirin sensitivity, asthma, smoking habits and symptom duration. Patients were asked about the symptoms associated with sinusitis using SNOT-22 and QOL preoperatively and 12 months after surgery under the supervision of one of the authors.

Objective variables

Nasal endoscopy

Each patient underwent a complete preoperative nasal examination that included nasal endoscopy to determine the presence of polyps, septal deviation and/or other anatomical variations.

Stümberger classification was used to classify the extent of the polyposis: 1 = a polyp limited to the middle meatus, 2 = polyps that partially obscured the nasal space but did not reach the inferior meatus; 3 = polyps that reached the inferior meatus.[12]

All patients underwent nasal endoscopy one year after surgery, and the presence of any recurrence, discharge or synechiae was documented.

Radiography

All patients underwent complete computerized tomography. The images were evaluated according to Lund-Mackay scoring before surgery. All images were assessed and reported by the same radiologist.

Treatment

To reduce inflammation and mucosal swelling, and thus to make surgery easier, oral prednisolone (20 mg for an average adult) was administered to all patients 3 days before surgery. All operations were performed under general anaesthesia by one of the authors using the same method each time. The Messerklinger method of endoscopic surgery was used; in addition, the same pre- and postoperative protocol was used, including endoscopic debridement under the supervision of one of the senior authors. The authors tried to completely open all involved cells, especially in the base of the skull, and to preserve the mucosa of the unaffected areas. Additionally, the middle turbinate was partially resected if there were extensive polypoid changes. Septoplasty was performed when indicated.

All patients were treated with broad-spectrum antibiotics for two weeks after surgery. In addition, all patients continued treatment with the same medical regimen for nasal polyposis for at least six months after surgery: an inhaled nasal corticosteroid (fluticasone propionate) treatment two times daily, with the dosage adjusted depending on endoscopic findings, plus a nasal saline wash three times daily). In addition, a short course of oral corticosteroids (prednisolone 20 mg for an average adult) was administered to all patients for one week after surgery.

All subjects underwent endoscopic follow-up and any recurrence was documented. Subsequently, maximal medical treatment was used to treat any recurrence and, in case of failure, revision surgery was performed.

Statistical analysis

We analysed several factors to determine whether they were statistically associated with patient QOL outcome. These factors included the extent of the disease, age, sex, cigarette smoking and other risk factors. Data were analysed using Spearman's Correlation, chi square analysis, multivariate logistic regression and the student's t-test using SPSS version 11.5. P-values less than 0.05 were considered significant. Data were presented as means ± standard deviation.

Results

The study included 47 patients. The mean age was 39.5±15.4 years (range, 17–81), and 29 patients were female (61.7%). The average Lund-Mackay score was14.9 ± 6.2. Regarding previous FESS or nasal surgery, 5 (10.6%) and 4 (8.5%) patients had undergone FESS or nasal surgery once or twice, respectively, prior to this surgery. Table 1 shows the basic patient characteristics and their relationship with the improvement of QOL and SNOT 22 scores. The improvement was considered the difference between the preoperative SNOT-22 and QOL scores and postoperative SNOT-22 and QOL scores.

Regarding preoperative endoscopic findings, 31 patients (65.9%) had at least one polyp was found in the other patients during surgery. There were 12 (25.5%) cases with right septal deviation, 12 cases (25.5%) with left septal deviation and 2 patients (4.3%) with S-shaped septal deviation. Two patients (4.3%) had right-sided concha bullosa, and 3 patients (6.4%) had left-sided concha bullosa. Concha hypertrophy was seen in 2 (6.4%) patients on the right side and in 2 patients (6.4%) on the left side. Four patients (8.5%) had bilateral concha hypertrophy. There were 7 (14.9%) cases with right-sided (purulent) discharge, 2 cases (4.3%) with left-sided discharge and 9 cases (19.1%) with bilateral discharge. Five cases (10.6%) had right-sided post-surgical crust, while 2 cases (4.3%) had left-sided and 5 cases (10.6%) had bilateral post-surgical crust. Post-surgical adhesion was seen on the right side in 2 cases (4.3%) and on the left side in 1 case (2.1%).

The mean preoperative smell rating according to the SNOT-22 was 2.53 ± 0.8, and the mean postoperative rating was 3.9 ± 1.3. Table 2 shows the patients' pre- and postoperative endoscopic findings and their relationship with the QOL and SNOT-22 scores.

After the one-year follow-up period, recurrences were found in 4 (8.5%) patients. Three recurrences

Table 1

Basic data of patients and their relationship with improvement in SNOT22 and QOL.

	N (%)	SNOT-22 improvement	P-value	QOL improvement	P-value
Demographics					
Age (mean ± SD*)	39.5 ± 15.4				
Male	19 (38.3)	16.7 ± 8.2	0.094	11.1 ± 8.3	0.121
Female	29 (61.7)	12.8 ± 6.1		6.2 ± 5.1	
History					
Smoking	8 (17)	14.9 ± 5.8	0.893	8.6 ± 4.1	0.876
Smoking (pack. year)*	12.5 ± 8				
Allergic rhinitis	13 (27.6)	13.4 ± 7.9	0.324	12.6 ± 10.6	0.197
Aspirin sensitivity	1 (2.1)				
Asthma	7 (14.9)	14.3 ± 4.3	0.733	4.4 ± 3.7	0.205
Revision surgery					
Once	5 (10.6)	17.4 ± (6.2)	0.674	7.4 ± 4.8	0.884
Twice	4 (8.5)	12.7 ±6.6		9.2 ± 5.6	

* Standard deviation

Table 2
Endoscopic findings and their relationship with improvement in SNOT22 and QOL

Endoscopic findings	N (%)	SNOT-22 improvement	P-value	QOL improvement	P-value
Preoperative					
Septal deviation	26 (55.3)	15.3 ± 7.9	0.896	8.1 ± 5.1	0.456
Concha bullosa	5 (10.7)	14.8 ± 4.5	0.900	6.4 ± 4.4	0.544
Concha hypertrophy	10 (21.4)	15.2 ± 7.5	0.995	14.1 ± 9.1	0.100
Postoperative					
Discharge	18 (38.3)	15.2 ± 6.3	0.995	7.7 ± 4.3	0.469
Crust	12 (25.5)	7.7 ± 2.2	0.507	9.1 ± 5.2	0.950
Adhesion	3 (6.4)	12.3 ± 4.1	0.508	13.7 ± 7.7	0.456
Stumberger staging					
I	15 (48.4)	17.1 ± 8.7	0.037*	13.9 ± 6.9	0.019*
II	8 (25.8)	16.2 ± 3.6		3.6 ± 2.7	
III	8 (25.8)	9.8 ± 3.2		3.9 ± 2.7	

* significant

Table 3
The effect of FESS on SNOT22 and QOL (Mean ± SD).

	Before FESS	After FESS	Absolute difference	P value
SNOT22	24.8 ± 9.9	9.6 ± 6.1	15.2 ± 7.7	0.0001*
QOL	62.3 ± 16.7	71.5 ± 16.7	9.2 ± 6.5	0.0001*

* significant

were limited to the middle meatus (stage I), while the recurrence was beyond the middle meatus in one patient. The three limited recurrences were treated medically, and the last patient was selected for revision surgery.

The multivariate logistic regression analysis showed that septal deviation had a statistically significant and dependent correlation with improvement between the SNOT-22 and QOL scores (p = 0.043). FESS resulted in significantly improved SNOT-22 and QOL scores (p = 0.0001) (Table 3). Age predicted only 7.9% (p = 0.600) and 10.4% (p = 0.473) of the changes in the SNOT-22 and QOL scores, respectively. Regarding smoking (packs/year), the coefficient of correlation was 0.137 (p = 0.764) for the improvement in the SNOT-22 scores and 0.427 (p = 0.0291) for the improvement in the QOL scores. The coefficients of correlation between the Lund-Mackay index and the improvement in SNOT-22 and QOL scores were 0.015 (p = 0.918) and 0.051 (P = 0.732), respectively. The improvements in the SNOT-22 and QOL scores were not statistically significant according to the severity of the selected clinical signs (Tables 4 and 5).

Discussion

Our results showed that FESS was associated with improved QOL in patients with CS. The main signs and symptoms of CS (nasal obstruction, postnasal drip and headache), as well as other clinical features, significantly decreased after FESS in the present study. Using the SF-36 questionnaire, Teul *et al*.[8] showed that in addition to simply being annoying, CS affected several aspects of patients' daily life. However, our study focused on the QOL of patients with CS after FESS. Our results showed the significant impact of FESS on QOL in these patients in the 12 months after surgery. Notably, Metson *et al*.[13] suggested that more than 6 months is needed to achieve significant changes in QOL. In contrast, some other studies have showed changes in QOL within 6 months after FESS.[14,15] This effect may be explained by changes in CS after the early postoperative period.

In agreement with several other studies,[16-18] we did not find any correlation between age and sex and QOL improvements. However, only one study has reported that men and patients younger

Table 4
Mean of improvement in SNOT-22 in different severities of clinical signs.

Sign / Severity	None	1	2	3	4	5	P value
Nasal obstruction	17.6 ± 8.1	14.9 ± 7.9	15.9 ± 9.2	14.3 ± 8.1	15.5 ± 7.2	15.1 ± 5.7	0.354
Reduced sense of smell	18.1 ± 9.3	17.1 ± 8.6	14.9 ± 6.4	16.4 ± 9.3	13.1 ± 7.7	15.9 ± 7.2	0.415
Post nasal drip	14.9 ± 5.5	18.4 ± 10.1	15.9 ± 6.8	14.8 ± 6.1	14.1 ± 7.8	16 ± 8.7	0.541
Facial pain	15.1 ± 9.3	16.8 ± 7.2	15.9 ± 6.7	14 ± 6.8	16.1 ± 11.1	13.4 ± 4.7	0.365

Table 5
Mean of improvement in QOL in different severities of selected clinical signs.

Sign / Severity	1	2	3	4	5	6	P value
Nasal obstruction	6.9 ± 2.1	10.1 ± 5.4	8.1 ± 6.6	8.1 ± 6.2	7.9 ± 5.2	10.9 ± 7.2	0.318
Reduced sense of smell	9.9 ± 6.4	8.1 ± 5.8	10.3 ± 4.5	9.8 ± 5.1	10.3 ± 7.8	7.4 ± 3.8	0.487
Post nasal drip	8.8 ± 4.1	10.3 ± 7.6	10.6 ± 7.1	8.9 ± 5.3	9.6 ± 5.9	8.1 ± 4.9	0.480
Facial pain	12.1 ± 7.2	9.6 ± 4.9	10.1 ± 7.1	10.6 ± 8.1	8.2 ± ±5.7	8.1 ± 4.5	0.208

than 50 years old showed more improvements in QOL.[19] There are several conflicting reports in the literature regarding the effects of smoking on QOL. While Briggs *et al*.[20] reported a negative predictive value for smoking in changing QOL after endoscopic sinus surgery for sinusitis patients, Das *et al*.[21] reported that smokers showed greater improvement in QOL in a short period as compared to non-smokers. Similar to our findings, Das *et al*.[22] reported that smoking did not affect QOL changes. The differences in the findings may be due to our relatively small sample size compared to the populations studied by others.

We found that asthma and allergic rhinitis, which are the most common co-morbidities of CS, did not significantly impact patients' QOL. Thus, regardless of background diseases, FESS can improve QOL in all patients with CS. However, eliminating background factors is still a good way to prevent a recurrence of complaints. Smith *et al*.[23] found that FESS had a significant effect on the improvement of QOL in patients with CS. That group also found that this effect was independent of age, sex, asthma, allergies and history of asthma. However, they reported negative predictive values for depression and aspirin sensitivity, although QOL improvements were seen in patients with these complaints. Similar to smoking habits and age, because only 14% of our patients suffered from asthma and because their results did not significantly differ from the rest of our patients, probably we could reach similar results with other reports with larger sample size and higher number of asthma and smoking.

Smith *et al*.[24] reported greater improvements in QOL after a first FESS as compared to revision surgery, while we did not find any relationship between improvements in QOL and surgery frequency. This may be due to the limited sample size in our study. Like other studies,[1,25-27] we found no relationship between CT scan results and the improvement in the QOL score. Bradley *et al*.[27] found that despite improvements in clinical signs, endoscopic examinations after FESS showed no improvement in most of the patients. Thus, improvement in clinical features is not necessarily concomitant with normal sinus examination findings. In fact, while CT scan is useful for evaluating the anatomy of the sinuses, for assessing the mucosal pattern, and for devising an appropriate plan for FESS, the severity of the CT findings is not a suitable criterion for choosing patients for FESS.

Some of the differences in our findings versus those of the abovementioned studies may be related to the use of different surgical approaches. FESS with maximal mucosal preservation was the primary surgical method in our patients. In addition, we tried to open all involved ethmoid cells, especially over the skull base, as they are common sites of residual diseases. Further, we performed partial resection

of the middle turbinate to prevent lateralization if a floppy middle turbinate created in the end of surgery or polypoid changes were present during endoscopic sinus surgery. These characteristics may affect surgical outcome; therefore, we propose comparing these differences in surgical approaches in future studies.

The multivariate logistic regression analysis showed that patients with septal deviation who underwent septoplasty and FESS benefited more from FESS than patients without septal deviation. Interestingly, findings such as inferior concha hypertrophy, purulent discharge and concha bullosa were not associated with changes in QOL. At least one nasal polyp was found in about two-thirds of the cases. Using the Stumberger criteria, we found that most polyps were stage I. Unexpectedly, the patients with stage I polyps experienced more improvement in QOL than those with stage II or III polyps. This may be because compared with individuals with stage I polyps, those with stage II and III polyps sought treatment later. Thus, over time, they may have developed greater tolerance to their symptoms compared with patients who more recently developed nasal obstruction and polyp(s). Moreover, it seems likely that the use of Stumberger's classification in this series may not have been optimal for classifying the polyps; accordingly, other staging methods, like the Davos method, may be better for future studies. There was no association between the presence of crust or adhesion with changes in QOL. To the best of our knowledge, no studies have assessed QOL changes according to clinical features. We tested four common signs of sinusitis, including facial pain, nasal obstruction, postnasal drip and loss of smell, for their association with QOL. We found that patients whose chief complaints were facial pain and nasal obstruction experienced significantly more improvement in QOL compared to patients with other complaints. Thus, we suggest that performing FESS in patients with facial pain and nasal obstruction should be a priority.

Conclusion

Despite the possible impact of several factors on FESS outcome, such as age, sex, medical history, and endoscopic and CT scan findings, all patients with CSWP can benefit from FESS.

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