The Laryngoscope
Lippincott–Raven Publishers, Philadelphia

Long-term Results of Functional Endoscopic Sinus Surgery

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Although much has been reported on the short-term outcomes of functional endoscopic sinus surgery (FESS), little has been reported with regard to its long-term impact on chronic sinusitis. The senior author (D.W.K.) previously reported detailed subjective and endoscopic follow-up on 120 patients at a mean of 18 months following surgery. This current study represents a long-term follow-up (average, 7.8 years) of 72 patients (60%) from the same cohort. Of patients responding to a question about overall symptoms, 98.4% (n = 66) reported improvement compared with before surgery. There was a trend toward continued subjective improvement in symptom scores with longer follow-up, but the changes did not reach statistical significance. Thirteen patients (18%) required subsequent surgical procedures. Preoperative stage, prior surgery, and other factors that might affect outcome were evaluated. The study demonstrates that excellent subjective results following FESS can be maintained in the long term with appropriate postoperative management. The study also validates the concept that patients in whom the cavity can be normalized following surgery are unlikely to require further surgery

***Laryngoscope*, 108:151–157, 1998**

INTRODUCTION

Since its introduction to United States by Kennedy et al.[1] in 1985, the techniques of functional endoscopic sinus surgery (FESS) have been widely accepted and applied to inflammatory diseases of the paranasal sinuses. Reported results of these techniques have been very good.[1–8] In general, however, these reported results have been plagued by two major shortcomings—relatively short follow-up and an absence of information with regard to the influence of computed tomographic (CT) stage on long-term symptoms and surgical recurrence. Moreover, several studies have demonstrated that symptom improvement does not correlate well to objective endoscopic evidence of disease persistence, at least in short- to medium-term follow-up.[6,9]

Therefore the aims of this study were to perform detailed evaluation of long-term subjective results on a previously identified patient cohort, to reexamine the influence of CT stage on long-term results, and to evaluate the importance of endoscopically identified postoperative inflammation on long-term results.

Experience with traditional sinus surgery has shown that, if symptomatology is used to evaluate results, rather than objective endoscopic follow-up evaluation, persistent and recurrent disease may not become apparent for many years. Neel et al.[10] reported a series of frontoethmoidectomies that highlighted this issue. Failure rates tripled when patients were followed for an additional 7 years to a total of 20 years after surgery. In the majority of FESS series, however, the length of follow-up has been short, generally less than 2 years, with the longest period being 4 years.[7]

In 1992, Kennedy[9] reported on the outcome of FESS in 120 patients with inflammatory sinus disease followed prospectively, on average, for 18 months after surgery. Patient ages ranged from 15 to 77 years. Eighty-five patients (71%) had undergone previous surgery for sinonasal complaints. The prior surgeries included conventional sinus surgery, endoscopic sinus surgery, turbinectomy, septoplasty, and rhinoplasty. Forty-nine percent of the patients had undergone prior ethmoidectomy, but frequently it was not possible to know the extent to which this surgery had been performed with an endoscope, microscope, or headlight. Approximately half of the patients who had had prior surgeries had undergone multiple prior procedures (maximum, 13). Therefore many of these patients could be considered recalcitrant to both prior medical therapy and prior surgical procedures. Sixty-nine patients (57%) had positive results on allergy testing, and 38 (32%) had asthma. Eight patients (7%) had Samter's triad. Because of the extent of disease, the most commonly performed procedure was complete endoscopic sphenoethmoidectomy (108 sides), although the extent of surgery was tailored to

Presented at the Meeting of the Eastern Section of the American Laryngological, Rhinological and Otological Society, Inc., Boston, Massachusetts, February 2, 1997.

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the disease that was present. Adjunctive septoplasties were performed in 16 patients to allow adequate access.

In that review, 97.5% of individuals noted improvement (85%, marked improvement; 12.5%, mild improvement) of their sinus-related complaints. Fewer patients, however, showed a completely normal sinus cavity on objective endoscopic assessment at final follow-up (45%), and this objective measure of results was very strongly dependent on CT stage. While asthma, aspirin triad, environmental allergies, and nasal polyps are all risk factors for poorer objective outcome, individuals with such factors were found to simply have more extensive sinus disease, with the primary predictor the extent of preoperative disease.

Although the Lund-McKay staging system (Table I) has now been recommended for use internationally, it has not yet been uniformly adopted.[11] Staging of sinus disease has not been performed in all reported surgical series, and some otolaryngologists have questioned the necessity for staging, since the short-term subjective result of surgery is independent of radiographic stage.[9] Our earlier study[9] demonstrated that, although staging by the Kennedy system (Table II) did not correlate well with subjective improvement, it had close correlation with the probability of persistent disease by objective evaluation. Therefore one aim of this study was to determine whether patients with persistent endoscopic evidence of inflammation were more likely to have symptomatic recurrence and to require further surgery in the longer term.

For this study, we followed up the originally reported cohort of patients for an average of 7.8 years after surgery (range, 6.3 to 11 years) and correlated the results to the preoperative Kennedy stages originally reported.[9]

MATERIALS AND METHODS

One hundred twenty patients operated on by the senior author (B.A.S.) were evaluated. All patients had undergone FESS from 1985 to 1990 for persistent chronic sinusitis resistant to medical therapy (intranasal steroids, antibiotics) and, in certain cases, surgical therapy. This was followed by careful postoperative medical management and weekly postoperative endoscopic debridement during the healing period.[1] In all patients, appropriate antibiotic therapy was continued until healed, in addition to intranasal steroids; oral steroids were tailored to the individual case. The necessity for longer-term follow-up was individualized based on normalization of the cavity mucosa.

Seventeen of the original cohort could not be located. All remaining 103 (86%) patients were sent follow-up questionnaires evaluating the impact of FESS on specific symptoms associated with chronic sinusitis. In addition, applicable information regarding asthma, inhaler usage, steroid usage, and antibiotic usage was collected. Responses were received from 72 patients for an overall response rate of 60%, although not all patients answered every question on the questionnaire.

The questionnaire utilized a design developed in 1989. The pattern was that of categorical responses rather than continuous response variables; because of this, nonparametric analyses were performed. Therefore analysis of variance and linear regression could not be used as with normally distributed continuous data sets.

The specific symptoms of sinusitis that were assessed included headache, nasal discharge, congestion, smell disorder, recurrent infection, and overall level of improvement. Individuals were asked to estimate the level of improvement with respect to individual symptoms and overall improvement compared with before their endoscopic procedure performed by us. The subjective responses for each symptom (e.g., improvement of 25%, 50%, 75%, or 100%) were then compared with one another at 1.5 years after surgery and 7.8 years after surgery. Wilcoxon's matched-pair, signed-rank test was applied to assess significant changes in symptom improvement between follow-ups. This information was evaluated with respect to basic demographic information, including the type of FESS procedure performed and presence or absence of allergy, asthma, and smoking. These results were correlated to the patient's CT stage.

Patients who underwent revision surgical procedures subsequent to their initial FESS procedures were analyzed separately to identify features that may predispose to the need for revision surgery. Features examined included history of surgery before the study, CT stage, presence of endoscopic mucosal abnormalities at the 1.5-year follow-up evaluation, and the presence or absence of allergy, asthma, previous surgery, and smoking.

RESULTS

Overall, the symptom improvement seen at 1.5 years was maintained or slightly improved at 7.8 years (Fig. 1; Tables III and IV). Sixty-three of 64 respondents to this question (98.4%) reported overall improvement compared with prior surgery. Only one individual (1.6%) reported that symptoms were unchanged or worse following surgery. Although patients noted a slight further improvement in overall symptoms at 7.8 years compared with 1.5 years following surgery (71% vs. 68% average improvement), this was not statistically significant (Wilcoxon's matched-pair, signed-rank test; $z = 0.558$, $P = 0.577$). Thirteen patients underwent subsequent additional surgery during the study period and were included in the calculation.

TABLE I.
Lund-MacKay Radiologic Staging System.

Radiologic grading*	
Maxillary	
Anterior ethmoids	
Posterior ethmoids	
Sphenoid	
Frontal	
Ostiomeatal complex	(0, 2 only)

*Graded on a scale of 0 to 2: 0 = no disease; 1 = partial opacification; 2 = complete opacification.

TABLE II.
Kennedy Computed Tomography (CT) Staging System.

Stage	Definition
I	Anatomic abnormalities
	All unilateral sinus disease
	Bilateral disease limited to ethmoids
II	Bilateral ethmoid disease with involvement of one dependent sinus
III	Bilateral ethmoid disease with involvement of two or more dependent sinuses on each side
IV	Diffuse sinonasal polyposis

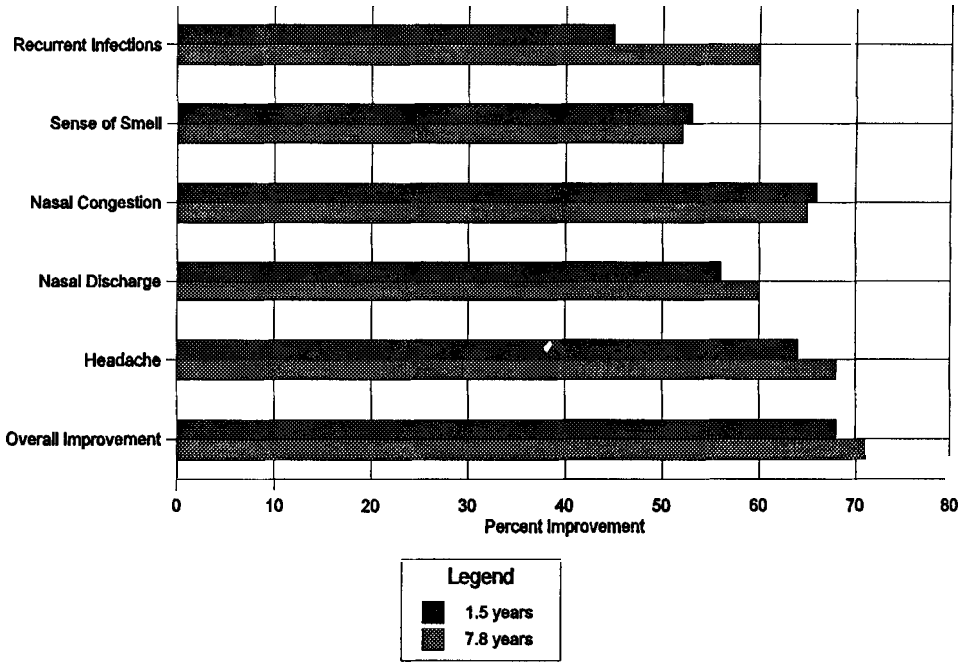

Fig. 1. Overall result and symptomatic results of functional endoscopic sinus surgery at 1.5 and 7.8 years after surgery.

Regarding specific symptoms of headache, nasal discharge, nasal congestion, change in sense of smell, and recurrent infections, improvements were noted in 80% (sense of smell) to 97% (nasal congestion) of individuals. The average degree of reported symptom improvement ranged from 52% (sense of smell) to 68% (headache). Headache, nasal discharge, and recurrent infections were all seen to show greater improvement at 7.8 years after surgery compared with the 1.5-year follow-up evaluation, although this was not statistically significant. Levels of improvement with nasal discharge, nasal congestion, and change in sense of smell remained constant over the follow-up period. Examining symptom improvement and extent of original disease, no significant correlation between symptom improvement and CT stage was identified at either follow-up period.

Medication usage was analyzed (Table V). At initial follow-up 1.5 years after surgery, 62% reported needing less antibiotic than before surgery, while 38% reported no change. At 7.8 years after surgery, antibiotic usage showed continued decline with 82% reporting less antibiotic usage and only 5% reporting more usage than before surgery. During the year before surgery, patients reported that average duration of antibiotic usage was 21 weeks (n = 25); at 1.5 years after surgery, usage had declined to 7.4 weeks, and at 7.8 years after surgery, to 6.1 weeks (71% overall decrease). Similar declines in oral steroid requirements were seen in patients who had required treatment preoperatively with oral steroids for their sinus disease and/or asthma. Of that group, 69% noted a decline in steroid requirement at 1.5 years after surgery, increasing to 75% at 7.8 years after surgery. Intranasal steroid use showed a small decline over the years following surgery. At 1.5 years after surgery, 60 of 70 patients (85.7%) reported using intranasal steroid. At 7.8 years, usage had declined to 51 of 70 patients (72.9%), reflecting a 13% drop in usage over that time period.

Twenty-seven of thirty (90%) of those with asthma reported improvement in the asthma at 7.8 years after surgery. Asthma was found to be more likely in those with

TABLE III.
Number of Individuals Experiencing Improvement for Specific Symptoms 7.8 Years After Surgery.

Symptoms	No. of Patients/Total	Improvement (%)
Overall	63/64	98.4
Headache	47/51	92.2
Nasal discharge	57/61	93.4
Nasal congestion	68/70	97.1
Sense of smell	32/40	80
Recurrent infections	65/71	92
Asthma	27/30	90

TABLE IV.
Degree of Improvement for Specific Symptoms at 1.5 and 7.8 Years After Surgery.

			Wilcoxon Matched-Pairs Signed-Rank test	
	1.5 years (%)	7.8 years (%)	(z)	(*P*)
Overall	68	71	0.558	0.577
Headache	64	68	0.256	0.890
Nasal discharge	56	60	−0.138	0.890
Nasal congestion	66	65	−0.536	0.592
Sense of smell	53	52	0.447	0.655
Recurrent infections	45	60	0.397	0.691

TABLE V.
Medication Usage for Sinusitis.

	More	Less	Same
	n (%)	n (%)	n (%)
Antibiotics			
1.5 y (n = 21)	0	13 (61.9)	8 (38.1)
7.8 y (n = 60)	3 (5)	49 (81.7)	8 (13.3)
Oral steroids			
1.5 y (n = 29)	1 (3.4)	20 (69.0)	8 (27.6)
7.8 y (n = 32)	2 (6.3)	24 (75.0)	6 (18.8)

more severe sinus disease as determined by CT stage. Of patients with mild to moderate disease, (stages 1 to 2), only 20% reported a history of asthma, whereas 51% of those with more severe disease (stages 3 to 4) reported a history of asthma ($\chi^2[df = 1] = 5.755$; $P = 0.016$). No correlation between smoking or allergy and extent of disease was seen ($\chi^2[df = 1] = 0.944$; $P = 0.331$); ($\chi^2[df = 1] = 3.175$; $P = 0.075$).

Revision endoscopic sinus surgery was reported in 13 patients (18%). This group was analyzed in detail in an attempt to identify predictive factors. However, because of the small size of the group, few features could be identified with statistical significance, although some trends were seen. There was no difference between the level of symptom improvement at 1.5 years when comparing patients who had revision surgery (revision patients) and those who did not (nonrevision patients) (Table VI). However, at 7.8 years following surgery, while nonrevision patients showed continued improvement in sense of smell and recurrent infection, revision patients showed less improvement in both of these symptoms. The difference in these symptoms reflected a trend that was not statistically significant (two-tailed Mann-Whitney U test; $P = 0.444$ for sense of smell and $P = 0.130$ for recurrent infection).

Preoperative CT staging was reviewed and correlated to a need for subsequent revision surgery. Fifty-nine patients did not undergo revision surgery; from these patients 49 preoperative CT scans were available for review. Twenty-two (45%) had mild to moderate disease (CT stages 1 to 2), and 27 (55%) had severe disease (CT stages 3 to 4). In the revision group (n = 13), only 3 (23%) had mild/moderate disease, and 10 (77%) had severe disease (Table VII). A significant trend toward greater disease resulting in increased need for revision surgery is present, approaching statistical significance ($\chi^2[df = 1] = 3.281$, $P = 0.07$).

An attempt was made to correlate endoscopic appearance of the cavity at 1.5 years following surgery to the ultimate need to undergo revision surgery. At that time, cavities were considered abnormal if there was any evidence of discharge, inflammation, mucosal hypertrophy, scarring, crusting, or polyps in any of five specific areas within the sinonasal cavity (ethmoid, frontal recess/sinus, maxillary

TABLE VI.
Degree of Symptom Improvement for Revision and Nonrevision Patients Grouped by Computed Tomography Stage.

	Overall	Headache	Nasal Discharge	Nasal Congestion	Sense of Smell	Recurrent Infections
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Nonrevision						
Mild/moderate disease (Stages 1–2)						
1.5 y	22 (67)	17 (63)	20 (52)	21 (64)	8 (49)	11 (42)
7.8 y	21 (71)	16 (69)	17 (57)	21 (64)	10 (58)	22 (58)
Severe disease (Stages 3–4)						
1.5 y	26 (71)	19 (63)	20 (64)	25 (71)	6 (43)	6 (58)
7.8 y	23 (72)	18 (68)	22 (64)	25 (66)	17 (56)	24 (66)
Total						
1.5 y	48 (69)	36 (69)	40 (58)	46 (68)	14 (46)	17 (48)
7.8 y	44 (72)	34 (68)	39 (61)	46 (65)	27 (57)	46 (62)
Revision						
Mild/moderate disease (Stages 1–2)						
1.5 y	3 (55)	3 (63)	3 (25)	3 (25)	0 (0)	2 (25)
7.8 y	3 (38)	3 (38)	3 (17)	3 (42)	1 (0)	3 (33)
Severe disease (Stages 3–4)						
1.5 y	10 (70)	6 (72)	9 (59)	10 (63)	2 (63)	1 (25)
7.8 y	9 (70)	6 (79)	9 (64)	10 (65)	9 (38)	10 (50)
Total						
1.5 y	13 (67)	9 (69)	12 (51)	13 (54)	2 (63)	3 (25)
7.8 y	12 (62)	9 (65)	12 (48)	13 (60)	10 (35)	13 (48)

TABLE VII.
Asthma, Smoking, and Allergy in Revision and Nonrevision Patients Grouped by Computed Tomography Stage.

	Asthma	Smoking	Allergy
Nonrevision			
Mild/moderate disease (stages 1–2)	n = 22	n = 18	n = 21
	No = 17 (77%)	No = 14 (78%)	No = 12 (57%)
	Yes = 5 (23%)	Yes = 4 (22%)	Yes = 9 (43%)
Severe disease (stages 3–4)	n = 27	n = 22	n = 27
	No = 14 (52%)	No = 22 (100%)	No = 8 (30%)
	Yes = 13 (48%)	Yes = 0 (0%)	Yes = 19 (70%)
Total	n = 49	n = 40	n = 48
	No = 31 (63%)	No = 36 (90%)	No = 20 (42%)
	Yes = 18 (37%)	Yes = 4 (10%)	Yes = 28 (58%)
Revision			
Mild/moderate disease (stages 1–2)	n = 3	n = 3	n = 3
	No = 3 (100%)	No = 3 (100%)	No = 2 (67%)
	Yes = 0 (0%)	Yes = 0 (0%)	Yes = 1 (33%)
Severe disease (stages 3–4)	n = 10	n = 8	n = 9
	No = 4 (40%)	No = 5 (63%)	No = 5 (56%)
	Yes = 6 (60%)	Yes = 3 (38%)	Yes = 4 (44%)
Total	n = 13	n = 11	n = 12
	No = 7 (54%)	No = 8 (73%)	No = 7 (58%)
	Yes = 6 (46%)	Yes = 3 (27%)	Yes = 5 (42%)

sinus/middle meatal antrostomy, sphenoid sinus, nasal cavity). For the calculation, each abnormality was given a score of 1 (highest possible score, 40), although no patient had a score higher than 10. Chi-squared analysis demonstrated that nonrevision patients were significantly more likely to have received endoscopic appearance scores less than 3 ($\chi^2[df = 2] = 7.777, P = 0.020$).

Medication use was investigated for differences between revision and nonrevision groups. Consistent use of intranasal steroids occurred for both groups, with slight declines by the second follow-up. Compliance was 92.3% at 1.5 years after surgery and 84.6% at 7.8 years in the revision group, and 84.2% at the 1.5-year and 70.2% at the 7.8-year follow-up in the nonrevision group. A chi-squared analysis sought to determine whether members of either group were more likely to discontinue medication use between follow-ups, but the result was not significant ($\chi^2[df = 1] = 1.258, P = 0.262$). Average duration of antibiotic use was greater at both follow-up intervals in those requiring revision surgery: 12.8 weeks a year versus 4.7 weeks in the nonrevision group at first follow-up, and 9.7 weeks versus 5.3 weeks at second follow-up. Because of the very high standard deviations in both groups, no statistical significance between these results was seen.

Demographics of the revision and nonrevision groups were also examined (Table VII). Specifically, we assessed for the presence or absence of asthma, allergy, and smoking in both groups. While asthma was seen to be more prevalent in those with more extensive sinus disease, it was also seen to be more prevalent in those requiring revision surgery but not statistically different from nonrevision patients (46% and 37%, respectively) ($\chi^2[df = 1] = 1.809, P = 0.179$). Allergy was also more prevalent among those with more extensive disease (60.6%), but the relationship was only marginally significant ($\chi^2[df = 1] = 3.175, P = 0.075$); similarly, patients requiring revision surgery were not significantly more likely to suffer from allergy ($\chi^2[df = 1] = 0.151, P = 0.698$). With respect to smoking, a trend appeared to be present with more smokers requiring revision surgery: in the nonrevision group, 10% were smokers (n = 40), whereas in the revision group, 27% were smokers (n = 11; ($\chi^2[df = 1] = 1.672, P = 0.196$). This trend was significant when considering stage of disease, whereas for those with

TABLE VIII.
Previous Surgery in Revision and Nonrevision Patients.

	Septoplasty n (%)	Nasal Antral Window n (%)	Polypectomy n (%)	Ethmoidectomy n (%)	Caldwell-Luc n (%)	Turbinate Surgery n (%)
Revision (n = 13)	9 (69)	7 (54)	10 (77)	5 (38)	3 (23)	6 (46)
Nonrevision (n = 59)	17 (29)	23 (39)	17 (29)	15 (25)	17 (29)	16 (27)

stages 3 to 4 disease no smokers were present in the nonrevision group, while 38% smoked in the revision group (two-tailed Fisher's Exact Test, $P = 0.012$). Indeed, all smokers with stages 3 to 4 disease ultimately required revision surgery.

As a group, those undergoing revision surgery were found to have been more likely to have undergone previous sinus surgery than those not having revision (92% and 73%, respectively) but this relationship was not significant ($\chi^2[df = 1] = 0.167$, $P = 0.683$). Table VIII illustrates the details of these previous surgeries. Of note, revision patients had, on average, 3.1 previous procedures per patient, and nonrevision patients had, on average, 1.8 prior procedures per patient. With respect to specific procedures, polypectomy was more likely to have been previously performed in revision patients (77%) than in nonrevision patients (29%).

DISCUSSION

In this study we have attempted to quantify subjective levels of improvement both overall and with regard to specific symptoms, following FESS and meticulous postoperative care involving both debridement and medical therapy. It is important to interpret the results in terms of disease severity and the type of care delivered at that time. From 1985 to 1990, during surgery some attempt was made at mucosal preservation in the ethmoid sinus, particularly in the frontal recess. However, the importance of ethmoid mucosal preservation was not as well appreciated as it is currently, and instrumentation was less precise. The extent of dissection was determined by the extent of disease, but because of referral patterns, the patients typically had had prior surgeries (up to 13) and tended to have extensive disease. Therefore in general the patients tended to have more extensive surgery and worse disease than in some other series. The duration of postoperative care was determined by the endoscopic appearance of the cavity and in some cases was prolonged.

Previous reviews of the results of endoscopic sinus surgery have reported excellent subjective results with overall improvements of about 90% in the short term.[4–9] Our results demonstrate that excellent clinical results (>98% of patients improved) can be maintained at nearly 8 years following surgery, even in patients with multiple prior surgeries and extensive disease, with meticulous surgery and meticulous postoperative care.

With respect to the specific symptoms of headache, nasal discharge, congestion, change in sense of smell, and recurrent infection, improvement was noted in 80% to 100% of individuals. Greatest improvement was seen in nasal congestion with 97% of individuals reporting 66% mean improvement over the study period. Slightly less improvement was seen in nasal drainage, sense of smell, and recurrent infections. Symptom improvement was noted to be stable in the majority of patients and showed a trend toward further improvement for symptoms of headache, nasal discharge, and recurrent infections, with longer follow-up. This was most prominent with recurrent infection, although because of the small sample size, statistical significance was not reached. Somewhat to our surprise, 90% of patients with asthma reported improvement at 7.8 years. Detailed analysis of this group and their medication requirements will be performed and published separately.

Given the prolonged period of follow-up, the number of prior surgeries that many of the patients had had, and the extent of disease, the number of patients requiring additional surgery in the follow-up period was low. Patients who ultimately required revision surgery had no significant difference in overall symptom improvement at the initial follow-up, when compared with those who did not have revision surgery. While encouraging in terms of subjective improvement, this demonstrates the folly of equating subjective improvement to resolution of disease. A trend toward better improvement at initial follow-up in congestion and recurrent infection in nonrevision patients is offset by a paradoxically better improvement in headache and sense of smell in revision patients. There appears to be no particular symptom that, in the earlier postoperative period, is predictive of an eventual need for revision. At the late follow-up, however, symptomatic improvement in nonrevision patients is better than or equal to revision patients in every category. This trend is particularly prominent with respect to change in sense of smell and recurrent infections. Patients who did not require revision show continued improvement in these symptoms, whereas revision patients show a decline in the degree of their improvement and increased antibiotic use (9.7 weeks and 5.3 weeks, respectively). On clinical examination we have also found subjective olfactory change an early marker of recurrent disease.

Several authors have suggested that asthma and allergy are risk factors associated with worse surgical outcome,[12] but this was not demonstrated in our data. Both diseases tended to be more prevalent in the presence of significant disease; however, they were not seen more commonly in revision patents. Asthma was slightly more common in the patients requiring revision surgery (46% vs. 37% of nonrevision patients), but the difference was not significant. Allergy was more common in the patients who did not require revision (58% vs. 42%).

Not surprisingly, the data suggests that smoking at the time of the original surgery is detrimental to long-term outcome. There was an overall trend toward having more smokers in the revision group (27% vs. 10% in the nonrevision group). However, this difference became more prominent when comparing by extent of disease. For those with severe disease (stages 3 to 4), 100% of those who smoked required additional surgery, constituting 38% of all patients in these stages who required revision. With this in mind, we are now reluctant to perform elective sinus surgery on patients until they have stopped smoking.

A trend was seen with more patients likely to require revision surgery when they had undergone previous procedures, particularly polypectomy, but no statistical significance was seen. This trend could result from the aggressiveness of the disease. However, the fact that the incidence was highest with a prior history of polypectomy raises the possibility that incomplete prior surgery might increase the potential for continued inflammation and subsequent disease recurrence.

The usefulness of endoscopic postoperative evaluation is emphasized by the finding that endoscopic evidence of persistent disease at initial follow-up correlated with a need for later revision surgery.

While a significant trend toward more patients with moderate to severe sinus disease was seen in the revision group, it is perhaps more important to emphasize that only one in three patients with extensive disease (stages 3 and 4) required additional surgery. This calls into the question the assertion by some authors that those with nasal polyps are doomed to repeated surgeries throughout life.[13]

Overall, the long-term results from endoscopic sinus surgery appear to remain very encouraging when patients with good indications for surgery undergo FESS and meticulous postoperative surgical and medical management is performed. This is an important achievement for otolaryngology, not only because of the significant percentage of the population with chronic sinus symptoms, but also because the effects of chronic sinusitis on quality of life have, in the past, been underestimated. Gliklich and Metson[14] have previously shown that patients with chronic sinusitis have more bodily pain and worse social functioning than those with chronic obstructive pulmonary disease, angina, congestive heart failure, and back pain. Similarly, morbidity and mortality from asthma has been suggested to be on the rise. This study provides corroborative evidence that in carefully selected patients FESS with careful postoperative follow-up can positively influence the life of these individuals.

CONCLUSION

This report comprises a comprehensive long-term follow-up of a prospectively defined cohort of patients who underwent FESS for inflammatory sinus disease. The majority of the patients had severe sinus disease and had undergone one or more prior nasal and sinus surgeries. Following FESS, careful postoperative debridement, and prolonged medical therapy, patients had a stable overall symptom improvement with a trend toward further improvement over time. Over a nearly 8-year period, 18% of these patients required additional surgery. Ninety-eight percent reported improvement in symptoms at final follow-up. Our prior study[9] demonstrated that our ability to create an endoscopically normal cavity was significantly dependent on preoperative radiographic staging. In this study we demonstrated that patients in whom we were able to develop an endoscopically noninflamed cavity by 1.5-year follow-up had a lower recurrence rate than those with persistent inflammation.

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