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Functional Endoscopic Sinus Surgery: Morbidity and Early Results

Michael S. Benninger, MD,* Samuel A. Mickelson, MD,* and Kathleen Yaremchuk, MD*

Functional endoscopic sinus surgery is a new alternative to conventional sinus surgery as a means of managing recalcitrant sinus disease. This approach to sinus pathology focuses on the importance of the functional ostiomeatal complex and anterior ethmoid sinuses in the pathogenesis of sinus disease. In an effort to assess the morbidity and initial results of this procedure, 85 cases were reviewed. A total of 82% of the patients had bilateral maxillary and ethmoid sinusitis, and 45% had pansinusitis, frequently associated with allergic rhinitis (56%) and nasal polyps (58%). A total of 82% of the patients were operated on as outpatients under local anesthesia. There were no major complications associated with the surgery and minor complications were rare. Disease control was achieved in 88% of patients with short-term follow-up. (Henry Ford Hosp Med J 1990;38:5-8)

The management of apparently irreversible sinus disease has undergone a renaissance with the development of functional endoscopic sinus surgery. Developed and introduced by Messerklinger (1,2), Stammberger (3,4), and Wigand et al (5,6) and popularized in the United States by Kennedy et al (7,8), this therapeutic approach recognizes the importance of obstruction of the middle meatus, anterior ethmoid, and ostiomeatal complex in the development of sinus pathology (Fig 1). Reestablishing the patency of this vital area allows restoration of the normal sinus functions of ventilation and mucociliary transport with eradication of ethmoid, maxillary, and frontal sinus disease (7).

Performing functional endoscopic sinus surgery requires familiarity with sinus anatomy and expertise in the utilization of the endoscopes and follows intensive experience in the cadaver laboratory developing these skills. Although generally a safe procedure, major complication rates have been reported (6) as high as 8% (9). In addition, less severe complications as high as 21% have been reported (9). The complications of endoscopic sinus surgery are similar to those of traditional intranasal ethmoidectomy and include bleeding, cerebrospinal fluid leak, and blindness.

Although few long-term results have been reported (8), short-term results are satisfactory (8-10). The purpose of this study was to evaluate the morbidity associated with and the initial success of functional endoscopic sinus surgery in the management of irreversible sinus disease.

Materials and Methods

The medical records of 85 consecutive patients treated with functional endoscopic sinus surgery for sinus disease were reviewed retrospectively. The surgical technique described by Messerklinger (1,2) (or a minor variation thereof) was employed. At present we utilize endoscopic sinus surgery alone or in association with conventional sinus surgery for all cases of uncomplicated sinusitis. Although this approach is also used in the treatment of complicated sinusitis and neoplasms, some patients with these disorders are treated with conventional sinus surgery without endoscopy.

Information concerning the patient population, symptoms, previous treatment of nasal-sinus disease, preoperative and postoperative evaluations, surgical procedures, complications, and results to date was tabulated. Criteria utilized in the diagnosis of sinusitis included the medical history, findings on anterior and endoscopic rhinoscopy, and radiographic abnormalities. Computed tomography (CT) correlation was always obtained before the operation.

Results

Of the 85 patients who comprised the study group, 50 were males and 35 were females. Seventy-three were white, eight were black, and four were from other racial groups. Age of the patients ranged from less than 10 to over 70 years; 53 were in the 30 to 60 year age group. Only seven patients had had symptoms for less than six months and 46 reported symptoms present for more than five years.

Allergy skin testing was positive in 48 (56%) of the 60 patients evaluated. Thirty-seven (44%) patients were being treated for asthma and 42 complained of hyposmia or anosmia. Twenty-three (27%) patients had aspirin hypersensitivity reactions by history, and 49 (58%) had nasal polyps.

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*Department of Otolaryngology, Henry Ford Hospital.
Address correspondence to Dr Benninger, Department of Otolaryngology, Henry Ford Hospital, 2799 W Grand Blvd, Detroit, MI 48202.
The 81 previous surgical procedures performed on 32 (38%) of the patients are listed in the Table. Septoplasties had been performed for sinus complaints.

Antibiotics had been prescribed in the previous 12 months to 73 (86%) patients. Twenty-nine patients were undergoing allergy immunization at the time of surgery. Asthma therapy, antihistamines, decongestants, and steroid nasal sprays were being used frequently. Sixteen (19%) patients were steroid-dependent asthmatics at the time of treatment.

Anterior rhinoscopy revealed evidence of acute or chronic sinusitis with either purulent nasal drainage, nasal polyps, or mucosal thickening in the middle meatus in 69 patients. Despite nasal decongestion, normal anterior rhinoscopy was found in the others. Subsequent nasal endoscopy was performed in 14 of these patients, and 13 were found to have middle meatal complex abnormalities on endoscopic evaluation. Nasal endoscopy with rigid endoscopes was accomplished in 29 patients.

Plain sinus x-rays, performed in 52 patients, were normal in only six cases (Fig 2A). The majority showed evidence of maxillary sinus opacification while ethmoid disease was noted in ten.

CT, performed on all patients, was abnormal in every case. Ethmoid or ostiomeatal complex disease was noted in all but three patients. Two of these patients had isolated sphenoid sinus abnormalities, one of which was a mucocele and the other a unilateral sphenoid sinus opacification. The third patient had significant concha bullosa. CT was positive despite normal plain x-rays in six patients (Figs 2A and 2B). Moreover, the plain films failed to demonstrate the extent of the disease noted on CT. Eighteen patients had frontal and sphenoid sinus opacification on CT. Of the 12 with sphenoid opacification, only two were demonstrated by the plain films. Of the 11 patients with frontal sinus opacification, only four could be seen on the plain sinus radiographs.

Five patients were operated on for other than sinusitis and nasal polyposis. In two patients, inverted papillomas were excised by a combined Caldwell-Luc and intranasal ethmoidectomy, sphenoidotomy approach. One patient had bilateral ethmoid mucoceles, one a sphenoid mucocele, and one a unilateral sphenoid opacification.

All patients underwent functional endoscopic sinus surgery. During this procedure, 41 patients had a sphenoidectomy and 27 additional procedures were performed. Fourteen septoplasties were required because extensive septal deviation prevented adequate exposure of the ethmoid sinus complex. Five patients had resection of a concha bullosa, four had nasal antrostomies, and four had unilateral Caldwell-Luc procedures. Two of the latter were performed for inverted papillomas and the other two patients had large antral choanal polyps. Two of the latter were performed for inverted papillomas and the other two patients had large antral choanal polyps. Two of the latter were performed for inverted papillomas and the other two patients had large antral choanal polyps. Two of the latter were performed for inverted papillomas and the other two patients had large antral choanal polyps.

Only 13 patients required extensive nasal packing postoperatively. Eleven of these were patients who either had Caldwell-Luc or septoplasty concomitantly with functional endoscopic sinus surgery. The remaining patients received a general anesthetic, most of which were at the request of the patients. The remainder had surgery with local anesthesia and mild intravenous sedation.

No major complications occurred. Three minor complications in the perioperative and postoperative periods were caused by formation of nasal synechiae after surgery. One patient who had a septoplasty at the time of his functional endoscopic sinus surgery developed a septal hematoma.

Present follow-up is from one to 24 months. Residual disease which could not be completely removed at surgery is present in two patients. Eight additional patients have developed recurrences (residual/recurrence rate 12%). Subsequent revision surgery has been performed in one patient.

**Discussion**

Functional endoscopic sinus surgery provides a directed approach to the ethmoid sinus and the functional ostiomeatal unit. Obstruction of this area either by mechanical or inflammatory processes impedes sinus ventilation and mucociliary transport with consequent propagation of the sinus disease. Mechanical obstruction can occur from deviation of the septum, hyper-
trophic or deflected turbinates, synechiae, polyps, or tumors. Inflammatory processes such as infection or allergy can result in edema which obstructs the ostia. The technical advantage of directed endoscopic assessment is increased visualization of focal disease processes.

Surgical therapy should only follow adequate assessment and intensive medical management. Office anterior rhinoscopy with decongestion may not be sufficient to evaluate the ostiomeatal unit. In patients with persistent symptoms who have normal anterior examination, office endoscopy provides a means of directly accessing the middle meatal complex. In the present study, 13 (15%) patients had normal anterior rhinoscopic examinations despite persistent symptoms, and endoscopic rhinoscopy revealed a focal disease process. Previous reports (11-13) emphasize the importance of office endoscopy to discover hidden disease.

The use of CT is essential in the diagnostic workup. Plain sinus x-rays often fail to reveal the extent of involvement and may be completely normal despite detection of disease by CT. In 12% of our patients whose plain x-rays revealed no evidence of disease, CT disclosed the probable source of the symptoms. Furthermore, the plain films frequently failed to reveal the extent of the disease process. Finally, CT provides visualization of important adjacent structures, such as the lamina papyracea, orbit, roof of the ethmoid sinuses, and carotid arteries. Coronal CT helps to localize the site of any obstruction and provides radiologic information from the anatomic perspective of the surgeon. Axial CT provides information as to the extent of disease but is less valuable in planning surgery. Some suggest that axial CT need not be routinely obtained (14), but information relative to the sphenoid sinuses, the location of the carotid arteries, and presence of the structure of adjacent bone may be essential to successful operation.

Patients with local ostiomeatal complex disease are the best candidates for functional endoscopic sinus surgery. Localized disease is often easily removed, and irreversible mucosal changes generally do not occur. Furthermore, the risks to adjacent structures are low. Patients with advanced disease, extensive polyps, pansinusitis, allergies, asthma, and aspirin hypersensitivity are more difficult to manage but are nonetheless good candidates for functional sinus surgical management. Although initial success in these patients is encouraging, long-term evaluation is needed to assess this difficult group. Conventional sinus surgery frequently is also less successful in patients with advanced disease. Studies in children with cystic fibrosis and nasal polyps show that endoscopic sinus surgery is safe with less morbidity than conventional sinus surgery (15).

The major advantage of functional endoscopic sinus surgery is its low morbidity. The surgery is generally performed as an outpatient procedure with local anesthesia. The number of patients requiring a general anesthetic is diminishing as we gain experience. Postoperative admissions are reserved for patients with difficult asthma or other major medical problems, and these patients may be discharged the next day in contrast to conventional surgery with which two- or three-day admissions are frequent. Previous sinus surgery does not seem to increase greatly the risk of perioperative or postoperative complications. Preoperative assessment with nasal endoscopy and CT facilitates surgical planning and reveals potential sources of complications in all patients but is especially valuable in those operated on previously. For example, one patient was shown by CT to have absent lamina papyracea bilaterally, but with this information and good intraoperative visualization by the endoscopes, disease control was achieved.

Major complication rates of 2% to 8% have been reported (6,9), but no major complications occurred in this series. Subsequent to this review, an additional 35 patients have been operated on, still with no major complications. Minor complications have not been evaluated in this additional group.

Preoperative evaluation is essential to expose possible sources of complication. Frequent intraoperative monitoring to assess the entire ethmoid complex is also necessary for optimum results. Use of a zero degree endoscope is recommended to give a wide field of vision during most of the procedure. Thirty degree and seventy degree endoscopes can be utilized to examine focal areas of disease, such as the frontal-ethmoidal recess and sphenoid and maxillary sinuses. If the integrity of the lamina papyracea or periorbital are disrupted, careful palpation of the eye will reveal bulging into the ethmoid sinus. Careful initial hemostasis and local anesthesia prevent excessive bleeding which might compromise visualization. With the patient awake, periorbital discomfort may indicate orbital intrusion.
Minor complications occasionally occur in both the perioperative and postoperative periods. Perioperative bleeding can occur, but few patients require more than minimal packing with telfa. An occasional patient required at least unilateral gauze packing, which was removed on the first postoperative day. Late complications, primarily synechiae, are more frequent in patients with significant septal deviations which were not corrected at the time of their sinus surgery. Frequent careful postoperative cleaning along with saline nasal sprays and douches help minimize this development. Synechiae that do not obstruct the ethmoid complex are usually asymptomatic.

In this study no attempt has been made to compare long-term results of functional endoscopic sinus surgery with conventional sinus surgery. There has been a less than 10% recurrence rate during one to 24 months of follow-up despite an aggressive disease process in a high percentage of patients. Theoretically, we feel that this approach may be superior to conventional surgery because it reestablishes normal sinus aeration and drainage and does not remove normal mucosa. Others have supported this suggestion (2,3,7,16).

References