

## FUNCTIONAL ENDOSCOPIC SINUS SURGERY: UNIVERSITY OF OTTAWA EXPERIENCE AND AN OVERVIEW

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The treatment of chronic rhinosinusitis resistant to medical therapy has been historically managed by a variety of external and internal surgical procedures. The pathophysiology of chronic sinus disease has been elucidated through the work of Professor Messerklinger. He observed that chronic sinusitis is usually due to stenosis of the anterior ethmoid region.<sup>1,2</sup> Infection can spread from the anterior ethmoid and the middle meatal regions, to secondarily affect the maxillary and the frontal sinuses.<sup>2</sup> He noted that the mucosal changes that occur secondary to obstruction of the ostiomeatal unit (OMU), resolve when normal ventilation and mucociliary clearance is restored.<sup>1,3-6</sup> This knowledge has led to the acceptance of endoscopic sinus surgery as a valuable modality in the surgical management of sinus disorders. The important components of the OMU include the middle turbinate and meatus, maxillary ostium, infundibulum, uncinate process, ethmoid bullae, and hiatus semilunaris.<sup>7</sup>

Functional endoscopic sinus surgery (FESS) was introduced in the 1960s by Professors Messerklinger and Wigand. It was popularized in Europe by Stammberger and subsequently in North America by Kennedy.<sup>1,2,6,8</sup> The use of this approach has become more popular with improvement in the understanding of the anatomy of the lateral nasal wall and surgical training.

The indications for endoscopic sinus surgery have expanded to include not only the management of sinus infection resistant to medical therapy, but also the treatment of nasal polyposis, nasolacrimal duct obstruction, thyroid orbitopathy, CSF leaks, drainage of orbital abscess and hematoma, decompression of the optic nerve and globe, and surgical management of circumscribed benign and well-localized malignant neoplasms.<sup>1,8-12</sup>

It also remains an excellent modality for nasal examination. The objective of this study is to review our

experience in treating patients with chronic sinusitis, to compare the results with other centers and to identify which clinical conditions may best be treated using this approach.

### Material and Methods

There were 220 charts reviewed for patients treated by functional endoscopic sinus surgery over a 30-month period from July 1991 to December 1993. The procedures were carried out by three surgeons in two hospitals. Information regarding the main complaint, its duration, the surgical operative report, pathology report and any complications were obtained from the charts and the questionnaire.

The questionnaire asked patients to grade the severity of their symptoms (nasal obstruction, nasal discharge, nasal bleeding, recurrent infection, headache, loss of smell, facial pain, facial pressure and posterior nasal drip) before and after surgery. The patient's symptoms on presentation were studied, and each symptom was graded 0 to 3 (0 denoted none, 1 mild, 2 moderate and 3, severe problems) (Table 1). A minimum of six months' follow-up was required. Postoperative symptoms were also evaluated. Each symptom was reassessed and graded in severity from much worse (-2), worse (-1), no change (0), better (1+) or much better (+2). The results are summarized in Table 2.

One hundred and twenty-nine patients (59%) returned their questionnaires. Multivariate statistical analysis was carried out on this group of patients. All preoperative CT imaging was reviewed by one radiologist. The radiological findings in each patient were classified into five main patterns modified from Sonkens et al.<sup>13</sup>

Patients were treated by FESS only if at least six weeks of medical management failed to control the disease. The Messerklinger approach was used. The procedure was done under local anesthesia in 9.5% and under general anesthesia in 90.5%. Concurrent septoplasty and turbinate manipulations were done in 17.3%. The posterior ethmoid air cells, frontal recess and the sphenoid sinus were managed only if preoperative CT scan or endoscopy indicated disease. Sixty-seven percent of patients had

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Accepted for publication 25 May 1996. Received 27 June 1995.

TABLE 1. Symptoms graded by severity.

Symptoms	No problem 0	Mild 1	Moderate 2	Severe 3	Total symptomatic 1+2+3
Nasal obstruction	30	6	43	50	99 (76%)*
Nasal discharge	47	17	31	34	82 (63.5%)
Nasal bleeding	91	25	7	6	38 (21.7%)
Recurrent infection	48	6	27	48	81 (62.7%)
Headache	33	13	34	49	96 (74.4%)
Loss of smell	56	16	18	39	73 (56.5%)
Facial pain	64	14	28	23	65 (50.3%)
Facial pressure	46	16	28	39	83 (64.3%)
Post-nasal drip	49	16	35	29	80 (62%)

\*The last column indicates the percentage affected before FESS out of 129 patients.

anterior ethmoidectomy and maxillary ostium enlargement, 24% involved the posterior ethmoids and only 1.4% had sphenoid sinus surgery. The majority (92%) had bilateral FESS.

### Results

Our study group of 129 patients ranged in age from 20 to 70 years. The mean age was 45 years—68 (53%) males and 61 (47%) females. The most common complaints included nasal obstruction (76%), headaches (74.4%), facial pressure (64.3), nasal discharge (63.5%), recurrent nasal infection (62.7%), postnasal drip (62%), loss of smell (56.5%), facial pain (50.3%) and nasal bleeding (21.7%) (Table 1). Postoperative symptoms after at least six months of follow-up were assessed. As expected, the degree of perceived improvement increased with the severity of each symptom. The most significant improvement (69%) was noticed by patients with nasal obstruction. The least improvement occurred in patients with hyposmia (40%) (Table 2). There was a good correlation between chronic sinus disease and allergy. Sixty-two percent of the patients tested positive for allergy.

Minor complications including mild to moderate nasal bleeding were occasionally encountered. These cases were treated conservatively. No blood transfusions were required. Postoperative synechiae were the most common problem, encountered in 33 (26%) patients. These were easily controlled with local debridement. Facial swelling occurred in nine patients, six had eye pain, and reported eye swelling, and two noted a change in vision, although

TABLE 2. Symptom changes after at least six months from surgery (based on 129 patients).

Symptoms post-surgery	N=failure			N=success		
	Much worse -2	Worse -1	No change 0	Better 1	Much better 2	Success=% 1+2/129
Nasal obstruction	1	2	37	42	47	89/129=69%*
Nasal discharge	2	7	58	41	21	62/129=48%
Nasal bleeding	1	9	89	22	8	30/129=23%
Recurrent infection	5	3	53	35	33	68/129=53%
Headache	2	3	48	44	32	76/129=59%
Loss of smell	1	6	71	29	22	51/129=40%
Facial pain	1	2	67	35	24	59/129=46%
Facial pressure	0	0	5	30	30	60/129=47%
Post-nasal drip	2	7	59	42	19	61/129=47%

\*The last column indicates percentage of improvement per symptom.

no objective abnormalities were found on examination.

Major complications included one injury of the internal carotid artery in a 34-year-old-male. He was managed successfully with immediate nasal packing, fluid replacement and blood transfusions. Angiography confirmed the defect and intra-arterial balloon occlusion was used. The patient had no neurological sequela. Two patients developed orbital hematoma. Fortunately, no loss of vision was encountered. The complications were comparable to other studies (Table 3).<sup>1,11,14,15</sup> There were 85.1% of the patients who had a favorable opinion of the procedure and would recommend it to others with similar problems.

Preoperative CT imaging is essential for the diagnosis of sinus disease, for operative planning and as an excellent intraoperative guide.<sup>7,16,17</sup> If CT and endoscopic examination show no evidence of sinus disease, FESS should not be undertaken.<sup>18</sup> Preoperative coronal CT scans were reviewed and classified after Sonkens et al.<sup>13</sup> Seventy-five percent of patients had a mixed pattern which did not fit classification criteria. This rendered this classification useless for prognostication purposes.

### Discussion

Functional endoscopic sinus surgery has been accepted as a minimally invasive technique for the treatment of nasal polyposis, and chronic and acute recurrent sinusitis resistant to medical therapy. The most important part of

TABLE 3. Comparison of complications of FESS for different studies.

Complications	Stammberger, 1990	Hosemann, 1991	Vleming, 1992	Present study
No. of cases	500	220	1235 (sides)	129
Synechia	15%	0.5%	1.2%	26%
Loss of smell	—	—	—	—
Orbital hematoma	—	0.4%	1.6%	1.6% (2)
Blindness	—	—	—	—
Bleeding	2.2% (11)	1.5%	0.89% (11)	—
CSF	—	—	2%	—
Internal carotid	—	—	—	0.8% (1)
Death	0	0	0	0

patient evaluation remains the history. This should document nasal obstruction, facial pain, headache, postnasal drip, recurrent infection, nasal bleeding, and loss of smell. Previous allergy, bronchial asthma, and nasal surgery should be included. The physical examination should include anterior rhinoscopy with inspection of the nasal mucosa, turbinates and middle meati. Patients should be evaluated for allergy and infection. They should receive appropriate medical therapy for at least six weeks. CT imaging is an essential preoperative requirement. We tried to classify our findings as recommended by Sonkens et al.<sup>13</sup> This, unfortunately, did not prove helpful since most of our patients presented with a mixed pattern.

History remains the most important factor in predicting the patients who may benefit most from FESS. In this series, patients with severe nasal obstruction and headache not otherwise explained except for the associated chronic sinus diseases benefitted most, while those with postnasal drip and loss of smell experienced the least amount of relief (Table 2).

The Messerklinger approach was used by all surgeons. This approach starts by adequate nasal decongestion followed by uncinectomy. This exposes the middle meatus area and the ethmoid bullae. The maxillary ostium is opened if found obstructed and the ethmoid bullae air cells are then cleaned. When indicated by disease, this procedure includes a posterior ethmoidectomy and sphenoidotomy.<sup>10</sup>

Generally, complications of endoscopic sinus surgery are divided into nasal, orbital and intracranial complications. Nasal complications include bleeding, infection, synechia and anosmia. Orbital complications include epiphora, ocular muscle damage (especially the medial rectus muscle), orbital hematoma, optic nerve injury, globe rupture and loss of vision. The intracranial complications include damage to the internal carotid artery (this occurs at the lateral wall of the sphenoid sinus), intracranial hematoma and brain injury.<sup>14,15</sup> These complications are

also classified according to their severity into minor and major complications.

The most common complication encountered involved intranasal synechia in 33 patients (25%). Close outpatient postoperative care with meticulous cleaning of the nasal cavity under endoscopic guidance can easily prevent most of these adhesions.<sup>6,8</sup> We advise patients to use nasal saline irrigation two to three times daily to prevent dryness and crusting for at least two weeks postoperatively. The use of gel film has been reported to be effective in preventing synechia formation between the middle turbinate and the lateral nasal wall; others prefer Silastic.<sup>1,18</sup> We encountered three major complications, one internal carotid artery injury and two intraorbital hematomas. The patient who had internal carotid injury during sphenoidotomy was immediately managed with nasal packing, fluid replacement and blood transfusion. After his bleeding was controlled and he became stable, angiography was performed and showed the site of the defect. Intra-arterial balloon occlusion was performed successfully with no neurological sequela.

Intraorbital hematoma may present with lid edema, lid ecchymosis, chemosis, loss of color vision, proptosis, ophthalmoplegia and blindness. These signs may appear rapidly or slowly over 48 hours. Visual acuity may decrease, followed by the loss of pupillary reflexes. Immediate ophthalmology consultation, urgent CT scan of the orbit, and medical and surgical intervention are required. Medical treatment includes immediate removal of packing, head elevation, eye massage, diuretics (acetazolamide 500 mg IV boluses can be given every 2-4 hours and mannitol 1-2 mg/kg body weight is infused as a 20% infusion over 30 to 60 minutes), and steroids (decadron 1-5 mg/kg IV followed with 0.5 mg/kg body weight every six hours as required). Surgical treatment includes lateral canthotomy, and inferior cantholysis should be done in those who show no improvement in vision within 90 minutes (Pelausa et al.).<sup>19</sup>

One patient had rapid signs and symptoms and was treated successfully with aggressive medical and surgical intervention and the second patient presented five days after surgery and was treated conservatively. Both patients retained normal vision.

Functional endoscopic sinus surgery is the new standard of care for the diagnosis and treatment of chronic sinus disease and acute recurrent sinusitis. It restores sinus drainage and ultimately improves sinus mucociliary function. It promotes sinus ventilation and preserves sinus mucosa. Our patients with nasal obstruction and headache related to chronic sinus disease benefited the most. Those with hyposmia and postnasal drip had poorer results.

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