Concomitant Transsphenoidal Approach to the Anterior Skull Base and Endoscopic Sinus Surgery in Patients with Chronic Rhinosinusitis

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Abstract

Objectives To describe outcomes of endoscopic resection of sellar tumors with concomitant endoscopic sinus surgery for patients with chronic rhinosinusitis (CRS).

Design Retrospective chart review.

Setting Tertiary care medical center.

Participants Patients who underwent endoscopic transsphenoidal surgery for excision of anterior skull base lesions and simultaneous functional endoscopic sinus surgery (FESS) for CRS between January 2006 and January 2011 by senior authors (MRR and JJE).

Main Outcomes Measured Short- and long-term postoperative complications.

Results Fourteen patients were identified. Average follow-up was 27 months. All patients had preoperative symptoms consistent with CRS. No patients were treated with preoperative antibiotics. Surgical pathology revealed chronic sinusitis in all specimens. Pathology of the intracranial lesions included 11 pituitary macroadenomas, one craniopharyngioma, one chondrosarcoma, and one cholesterol granuloma. Short-term postoperative morbidities included a sphenoid polyp, one adhesion, and one case of pharyngitis. Long-term outcomes included one frontoethmoidal mucocele, one recurrence of nasal polyps, and three cases of acute sinusitis. There were no intracranial complications for the entire follow-up period.

Conclusions Transsphenoidal surgery can safely be performed in the setting of CRS without increased risk of intracranial complications.

Keywords

- endoscopic endonasal transsphenoidal approach
- anterior cranial base
- nasal complications
- pituitary
- endoscopic sinus surgery

Introduction

The introduction of endoscopes revolutionized paranasal sinus surgery, and the application of this approach to pitui-

tary surgery has been equally transforming. The possibility of seeding the infection from the nasal cavity to the brain remains a concern when using an endonasal technique for approaching intracranial tumors. Rhinosinusitis has long

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been considered a contraindication to the transsphenoidal approach to anterior skull base tumors. Some authors advocate a transcranial approach in the setting of acute or chronic sinusitis, or surgical treatment of chronic rhinosinusitis (CRS) in a staged fashion with a delayed second operation for the tumor once the CRS has resolved.^{1,2}

CRS is the most common chronic condition in the United States. Its prevalence is estimated at 14%,³ affecting over 30 million Americans per year. It is crucial to differentiate between acute and chronic infection with both nasal endoscopy and computed tomography (CT). CRS has not, in our experience, posed a risk to patients of intracranial infection, whereas acute and fungal sinusitis may.

Herein we retrospectively review our series of patients undergoing endoscopic skull base surgery with concomitant functional endoscopic sinus surgery (FESS) for simultaneous chronic sinusitis and intracranial sellar or parasellar pathology over the past 5 years.

Methods

A retrospective chart review over a 5-year period was performed between January 2006 and January 2011 at Thomas Jefferson University Hospital in Philadelphia, Pennsylvania, of all patients who underwent endoscopic transnasal transsphenoidal surgery for excision of anterior skull base lesions and simultaneous endoscopic sinus surgery for CRS by senior authors (MRR and JJE). Data collected included age, sex, comorbidities, history of prior sinus surgery, preop symptoms, postop symptoms, operative details, pathology, and outcomes. Short-term (defined as within 3 months from the date of surgery) and long-term (after 3 months) postoperative complications, as well as length of follow-up, were examined. The inclusion criteria for a diagnosis of CRS was based on the criteria described in the 2007 clinical practice guidelines for adult rhinosinusitis⁴: all patients had two or more symptoms, including mucopurulent drainage, nasal obstruction, facial pain, pressure, fullness, and decreased sense of smell for at least 12 weeks, and a CT of the paranasal sinuses demonstrating evidence of chronic disease. Patients recommended for FESS had a diagnosis of CRS and had failed medical therapy consisting of multiple courses of antibiotics and steroids (both oral and intranasal).

Neurosurgical indications for surgery included optic chiasm compression with visual field defects and growth hormone (GH)-secreting tumors with acromegaly. All patients underwent endocrinological and ophthalmological evaluation preoperatively, in addition to CT and magnetic resonance imaging (MRI) scanning.

Results

Fourteen patients were identified who underwent FESS in conjunction with an endoscopic endonasal approach to a sellar or parasellar intracranial lesion (►Table 1). The 14 patients included eight women and six men. The mean age was 51 (range, 25 to 81 years). The most common comorbidities included gastroesophageal reflux disease (GERD) (4),

hypertension (4), and diabetes (3). Two patients had a history of nasal polyps but only one of these had a history of previous FESS. One patient had a history of two craniotomies 7 years prior for two separate pathologies, a craniopharyngioma, and a subsequent meningioma. All patients had preoperative symptoms consistent with CRS, and one patient additionally had active nasal polyps. No patients were treated with immediate preoperative antibiotics.

All 14 patients underwent simultaneous FESS and endoscopic transsphenoidal approach to the anterior skull base. One patient had a left-sided uncinctomy, maxillary antrostomy, and anterior ethmoidectomy. The remaining 13 patients underwent bilateral uncinctomies, maxillary antrostomies, and anterior ethmoidectomies; 12 patients also had posterior ethmoidectomies and submucous resection of inferior turbinates. All patients had bilateral sphenoidotomies and small posterior septectomies for binarial access to the skull base lesion (►Fig. 1). The skull base approach was performed prior to the sinus portion in all cases.

Surgical pathology revealed evidence of chronic sinusitis in all specimens of the sinonasal contents. The pathology of the intracranial lesions included 11 pituitary macroadenomas (9 nonfunctional, 1 growth hormone secreting, and 1 pituitary carcinoma). The remaining three intracranial lesions included a craniopharyngioma, a chondrosarcoma, and a cholesterol granuloma (►Fig. 2). Average follow-up was 27 months (range, 4 to 48 months), with one patient being lost to follow-up. All patients were treated with postoperative antibiotics (cefdinir 300 mg twice daily) for 1 week and sinus debridement was performed at 1 week, 3 weeks, and 5 weeks postoperatively. At the first postoperative visit, all patients were started on sinus irrigations with saline.

Short-term postoperative morbidities occurring within the first 3 months included a sphenoid polyp at 4 weeks (removed in the office), one case of adhesions (lysed in the office), and one case of strep pharyngitis. Two patients with pituitary adenomas had residual tumor requiring radiotherapy within 2 months of resection. Long-term morbidities included recurrence of nasal polyposis at 2 years in the patient with known preoperative polyps, which is consistent with this disease course, and one frontoethmoidal mucocele at 5 months. The mucocele occurred in a patient with a history of two previous craniotomies. This patient underwent a Draf III frontal sinus drill out and has had no further complications. There were three episodes of acute sinusitis, all occurred during long-term follow-up, more than 3 months postoperatively (diagnosed at 4 months, 6 months, and at 1 year postop). None were thought to be related to the surgery. There were no intracranial complications, meningitis, or sepsis for the entire follow-up period.

Discussion

Simultaneous FESS and transsphenoidal approach to skull base lesions appears to be a safe and effective method of treatment for patients with synchronous CRS and sellar or parasellar pathology. The rate of intracranial complications did not increase with concurrent treatment for both disease

Table 1 Results

Age	Sex	Comorbidities	Prior FESS	Operative procedure	Pathology	Complications with in 3 mos	Complications after 3 mos	F/U (mos)
63	F	None	N	TSA, AE, PE, M, U, IT	Pituitary macroadenoma	None	Acute sinusitis	24
53	F	None	N	TSA, AE, PE, M, U	Pituitary macroadenoma	Sphenoid polyp	None	3
36	M	None	N	TSA, left sided M, AE, U	Pituitary macroadenoma	Acute strep pharyngitis	None	22
25	F	Thyroid disorder, anemia	N	TSA, AE, PE, M, U IT	Pituitary macroadenoma	Adhesions	None	24
37	M	None	N	TSA, AE, PE, M, U, IT, C	Pituitary macroadenoma	None	Acute sinusitis	22
81	M	CAD, DM sinusitis, GERD, UC, skin CA	N	TSA, AE, PE, M, U, IT, C	Pituitary macroadenoma	None	None	36
58	M	GERD, OSA HTN, skin CA, asthma, nasal polyps	N	TSA, AE, PE, M, U, IT	Cholesterol Granuloma	None	None	31
57	F	DM	N	TSA, AE, PE, M, U, IT	Pituitary Macroadenoma	NA	NA	Lost to FU
64	M	Sinusitis, epistaxis, GERD, skin lesions	Septoplasty only	TSA, AE, PE, M, U, IT	Pituitary Macroadenoma	None	None	4
57	F	None	N	TSA, AE, PE, M, U, IT	Chondrosarcoma	None	Acute sinusitis	45
78	F	HTN, DM, GERD, sinusitis, s/p craniotomies x2 for meningioma & craniopharyngioma	N	TSA, AE, M, U, IT	Recurrent Craniopharyngioma	None	Frontoethmoidal mucocele	37
75	M	HTN, arthritis, back pain, Parkinson's	Y	TSA, AE, PE, M U, IT	Pituitary macroadenoma	None	None	48
43	F	HTN, HL, s/p resection of atrial myxoma	N	TSA, AE, PE, M, U, IT	GH secreting Pituitary macroadenoma	None	None	33
63	F	Nasal polyps, mitral v. prolapse	N	TSA, AE, PE, M, U, IT	Pituitary macroadenoma, nasal polyps	None	Recurrent sinusitis, nasal polyps	33

Abbreviations: AE, anterior ethmoidectomy; C, concha bullosa; CA, cancer; CAD, coronary artery disease; FU, follow-up; GERD, gastroesophageal reflux disorder; HTN, hypertension; IT, inferior turbinectomy; OSA, obstructive sleep apnea; PE, posterior ethmoidectomy; TSA, transsphenoidal approach; U, uncinectomy.

Fig. 1 (A) Coronal computed tomography (CT) showing bilateral maxillary and ethmoid disease. (B) Coronal CT showing bilateral sphenoid mucosal thickening. (C) T1-weighted postcontrast magnetic resonance imaging (MRI) showing pituitary macroadenoma (white arrow). (D) T1-weighted postcontrast MRI demonstrating cavity postresection (white arrow). After transsphenoidal resection of the pituitary tumor, endoscopic sinus surgery was performed concomitantly.

processes in our study. Heo et al recently reported on a cohort of 11 patients who underwent FESS for CRS and an endoscopic or endoscopic-assisted transsphenoidal resection of a pituitary adenoma.⁵ As in our study, there were no postoperative intracranial complications. In contrast to our series, all 11 were treated with preoperative antibiotics and the sinuses were also irrigated with antibiotics intraoperatively. In our study, no patients were treated with immediate preoperative antibiotics, and we did not irrigate any sinuses with antibiotic solution intraoperatively. Postoperatively, this group had a 9% rate of postoperative sinusitis occurring within 14 days following surgery compared with our series, which had no cases of postoperative sinusitis in the initial 90 days following surgery. Three patients had episodes of acute sinusitis within a year following surgery (one at 4 months, one at 6 months, and one at 12 months), which is consistent with the disease of CRS and was not thought to be related to the surgery. Antibiotics were not used preoperatively in our cohort because all patients had chronic disease, and we have found that using antibiotics preoperatively without acute infection does not change postoperative outcomes and may encourage resistance.

In the past, disease involving the sphenoid sinus was additionally considered a contraindication to an endoscopic skull base approach necessitating a craniotomy.^{1,2} In our series, 50% (7/14) had sphenoid disease. None of these

patients had any intracranial complications postoperatively. Given these findings, bilateral chronic sphenoid rhinosinusitis may not be a contraindication to a concurrent FESS and endoscopic approach to the anterior skull base; neither a staged procedure, nor a craniotomy should be necessary.

The skull base portion of the surgery is performed prior to the sinus portion. The nasal cavity should be inspected to rule out acute infection and any polyps can be removed or septoplasty may be performed for access, but there is better hemostasis when the skull base portion is performed first, making it technically less challenging. There is less bleeding and swelling during the resection of the tumor when the FESS is performed after the skull base portion of the operation.

For patients requiring both FESS and endoscopic removal of skull base pathology, the option for staging the procedures exists. The benefit of the simultaneous surgery is less exposure to anesthesia, decreased hospital stay, and decreased recovery time with resultant decreased cost. Eliminating an entire additional surgery is clearly advantageous, but there may still be instances when the surgeries should not be performed concurrently.

The circumstances that preclude concomitant surgery include fungal sinusitis and acute sinusitis. Fungal sinusitis should be addressed with FESS and shown to be resolved by visual inspection, imaging, and/or cultures prior to the endoscopic removal of any intracranial tumors. We recommend a

Fig. 2 (A) Coronal computed tomography (CT) showing opacified left maxillary sinus (arrow) and right concha bullosa (arrow). (B) Coronal CT showing bilateral sphenoid mucosal thickening (arrows). (C) T1-weighted postcontrast magnetic resonance imaging (MRI) showing left petrous apex cholesterol granuloma (white arrow). (D) T1-weighted postcontrast MRI demonstrating postresection cavity (white arrow). The petrous apex lesion was resected via the transnasal endoscopic route and sinus surgery was performed concomitantly.

month between surgeries to ensure eradication. Intracranial fungal infections are extremely difficult to treat and are often fatal.⁶ The most common organisms causing intracranial infection are *Aspergillus*, *Cryptococcus*, mucormycosis-causing fungi, *Candida*, *Cladosporium*, and dematiaceous fungi.⁷ These infections generally occur in immunocompromised individuals. If fungal sinusitis is encountered unexpectedly, the intracranial portion of the case should be postponed until the fungal sinusitis is adequately treated. Although there is no definitive literature to prove this consequence, we feel that the potential catastrophic consequences of fungal spread warrant a greater degree of caution.

Acute bacterial infection of the sinus cavities in a similar fashion to fungus poses too great a risk of potential intracranial spread and resultant meningitis or sepsis. Lubbe et al describe abandoning the pituitary portion of their case after encountering acute sinusitis; they then assessed this patient weekly until complete resolution was realized prior to reattempting the procedure.⁸ The potential for unrecognized acute sinusitis highlights the importance of preoperative endoscopy. Acute sinusitis should be identified preoperatively on nasal endoscopy and treated with culture-directed antibiotics. Similarly, as is the case with fungal sinusitis, we lack the evidence to prove this definitively, but given the potential risk, we feel this is the most prudent recommendation.

In addition there are emergent instances when the presence of CRS may not need to preclude the transsphenoidal approach, necessitating an open approach. In the case of pituitary apoplexy or sudden visual loss due to compression, even in the setting of CRS, it is likely that a transsphenoidal approach could be executed without adding undue risk to the patient, based on our findings.

Medical management remains an option for patients with CRS—continued treatment with antibiotics, steroids, and sinus rinses can avoid FESS entirely in appropriate patients. This article is focused on those who have failed a medical regimen.

There are certainly some limitations to this study, primarily the small sample size. This is due to the low number of patients presenting with concomitant skull base pathology and CRS. As endoscopic endonasal transsphenoidal approaches become the accepted method for pituitary surgery,⁹ the patient presenting with both CRS and pituitary pathology will become increasingly common, given the prevalence of CRS, and this will allow for larger studies on this issue. Intracranial infection has a low incidence in endoscopic transsphenoidal anterior skull base surgery. In a large meta-analysis of over 1,900 cases, the risk was actually 1%¹⁰, making it more difficult to draw conclusions from a small cohort of patients.

The evolution of transnasal endoscopic approaches to the anterior skull base continues to evolve. This study lends evidence to the literature supporting a reduced number of

operations required for patients presenting with concurrent CRS and a skull base tumor. This decreases the number of unnecessary open approaches and the complications of additional anesthesia.

Conclusions

In patients with CRS and pituitary or parasellar pathology, simultaneous FESS and endoscopic transsphenoidal approach to the pituitary can be performed. Increased intracranial complications were not observed in this cohort. Further larger studies will be necessary to support these conclusions.

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