Binasal Endoscopic Approach to the Sellar Region: Experience and Outcome Analysis of 80 Cases

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Abstract

A prospective study was performed on 80 cases of different types of sellar lesions during the period between January 2007 and December 2010. The binasal approach was used in all patients. Functioning lesions were diagnosed in 59 patients. The most common secretory tumors were prolactinomas (37 patients) followed by adrenocorticotrophic hormone producing tumors (11 patients) and growth hormone producing tumors (11 patients). Nonfunctioning lesions included: 14 pituitary adenomas, 2 chordomas, 2 metastatic lesions (ovarian carcinoma and thyroid carcinoma), and 1 case of sarcoidosis, Rathke's cleft cyst, and craniopharyngioma. Seven nonfunctioning cases developed apoplexy. Among the 59 patients with functioning pituitary lesions, postoperative endocrinological control was achieved in 51 of them (86.5%) 3 months postoperatively with normalization of pituitary functions and complete tumor resection as proved by postoperative magnetic resonance imaging. Postoperative visual field defect improvement was achieved in 15 out of 23 patients (65.2%), including the cases with apoplexy, with complete tumor resection. Postoperative discomfort such as headache, vomiting, or dizziness was minimal and hospitalization period was 2 to 3 days. Postoperative leak continued in one patient in whom revision surgical repair was performed 7 days later. The merits, outcome, and limitations of the approach were discussed.

Keywords

- pituitary
- sella
- binasal
- endoscopic approach

Introduction

The surgical corridor to the sella is a determining factor in tumor resection. It should provide the surgeon with a wide, safe, and easy access with good visualization of the pathology under adequate illumination especially at such a depth of ~9 to 12 cm from the nasion to the sella floor in the transnasal approaches. Of paramount importance during endonasal approaches is to visualize—at any time of the procedure—the important structures present along the lateral walls of the sphenoid sinuses, the sellar floor, and resection cavity. Ideally the approach should be associated with minimal morbidity in the postoperative period.

The transsphenoidal approach, via septal or sublabial incisions, has been preferred as an operative technique for many years in many centers because of its efficacy and low morbidity.^{1,2} The endoscopic transsphenoidal approach for the sellar region is currently gaining increasing acceptance as it provides a closer detail of the anatomy and a wider angle of vision in addition to viewing around corners especially when using the 30 or 70 degrees lenses.^{3–5} Frameless navigation is another asset, with known advantages and limitations, that may be used in some cases.^{6,7}

The present article was geared at presenting our experience in treating 80 patients with pituitary and other sellar lesions using the binasal endoscopic transsphenoidal approach.

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Patients and Methods

A prospective study was performed on 80 cases of different types of sellar lesions during the period between January 2006 and December 2010. An informed consent was obtained from all patients, and the study was approved by the Institutional Ethical Review Board of Alexandria University.

Radiologic evaluation was performed including computed tomography (CT) scans and magnetic resonance imaging (MRI). Preoperative nasal endoscopy was performed in all the patients.

The surgical team consisted of a neurosurgeon, a rhinologist, as well as their assistants. The endoscopic binasal four-hand approach was used in all cases.

Working through the two nostrils, the assistant held either the endoscope and suction cannula or any other instrument to share in the surgical maneuver. This allowed the main surgeon to operate bimanually. The surgery was commenced via the endonasal route, sphenoidotomy was performed on both sides as lateral as possible. A posterior septal window was created by removing the posterior part of the bony nasal septum to allow working through both nostrils. In some cases, partial superior turbinectomy and resection of the tail of the middle turbinate were necessary. The optic nerve and the carotid canal buttresses were visualized as landmarks. The floor of sella is identified and opened. Tumor removal started from the floor followed by the lateral pillars and finally, the suprasellar component if present. The diaphragma sellae may descend unequally where a pocket of tumor may be left behind impeding complete tumor resection. In this case, a small cottonoid was to prevent the descent of the diaphragma. Once the tumor has been removed, a 4-mm-angled endoscope, 30 degrees and 45 degrees, is used to examine all sellar and suprasellar recesses as well as the resection cavity for any remnant tumor to ensure complete achievement tumor resection.

At the end of surgery, if intraoperative cerebrospinal fluid (CSF) leak had occurred, the sella was plugged with abdominal fat, and fascia lata were used to seal the defect. The sellar floor was reconstructed by bone harvested from the nasal septum or by a reflected sellar floor bone flap hinged on the sphenoid mucosa, supported by fascia lata and sphenoidal plug constructed of a mixture of fibrin glue, Surgicel (Ethicon, San Angelo, TX, USA), and Gelfoam (Pharmacia, Bridgewater, NJ, USA). A pedicled septal mucosal rotational flap based on the septal branch of the sphenopalatine artery was then fashioned to ensure a vascularized repair. The nose was packed by Merocel (Medtronic, Minneapolis, MN, USA). A lumbar subarachnoid catheter drain was placed postoperatively in these circumstances for 3 days.

During the postoperative period, the patients were monitored for any CSF leak, signs of meningitis, hemorrhage, visual, neurologic, or endocrinologic complications. Nasal packing was removed on the second or third postoperative day, and the patient was discharged. The patients were followed up weekly for the first month and then every 2 weeks for another month. Complete healing usually took place after 4 to 8 weeks. Hormonal and radiologic follow-up were performed at 3, 6, and 12 months.

Results

The endoscopic transsphenoidal technique was performed using the binostril approach in 80 patients (44 females and 36 males) with different sellar lesions. The age of the patients ranged from 18 to 70 years with a mean age of 44 years (± 1.8 years).

A summary of the histopathological and clinical results of the study is presented in **Table 1**. Functioning pituitary lesions were diagnosed in 59 patients. The most common secretory tumors were prolactinomas (37 patients) followed by adrenocorticotrophic hormone producing tumors (11 patients) and growth hormone producing tumors (11 patients). Nonfunctioning lesions included: 14 pituitary adenomas, 2 chordomas, 2 metastatic lesions (ovarian carcinoma and thyroid carcinoma), and 1 case of sarcoidosis, Rathke's cleft cyst, and craniopharyngioma. Seven nonfunctioning tumors developed apoplexy.

Among the 59 patients with functioning pituitary lesions, postoperative endocrinological control was achieved in 51 of them (86.5%) 3 months postoperatively with normalization of pituitary functions and complete tumor resection as proved by postoperative MRI (**Figs. 1 and 2**). Patients with endocrinological improvement included all patients with microadenomas (100%) and 26 patients with macroadenoma (76.5%). Postoperative visual field defect improvement was

Table 1 Summary of Histopathological and Clinical Results

Histopathology	80 Patients
Functioning lesions	59 patients
Prolactinomas	37
Microadenoma	6
Macroadenoma	31
ACTH	11
Microadenoma	11
Macroadenoma	-
Growth hormone	11
Microadenoma	8
Macroadenoma	3
Nonfunctioning lesions	21 patients
Nonfunctioning adenoma	14
Microadenoma	-
Macroadenoma	14
Sarcoidosis	1
Craniopharyngioma	1
Rathke's cyst	1
Metastasis	1
Chordoma	2
Postoperative hormonal improvement:	51/59 patients (86.5%)
Microadenoma	25/25 patients (100%)
Macroadenoma	26/34 patients (76.5%)
Postoperative visual field defect improvement	15/23 patients (65.2%) had partial visual field recovery

ACTH, adrenocorticotrophic hormone.

Figure 1 A case of pituitary microadenoma. (A) Preoperative magnetic resonance imaging. (B) Postoperative magnetic resonance imaging.

achieved in 15 out of 23 patients (65.2%) with complete tumor resection (→Fig. 3).

Postoperative Complications

Postoperative discomfort such as headache, vomiting, or dizziness was minimal and hospitalization period was 2 to 3 days. Five patients developed diabetes insipidus (DI) during the postoperative course: in two of them it was temporary, whereas the remaining three patients required vasopressin therapy. Postoperative leak continued in one patient in whom revision surgical repair was performed 7 days later.

Discussion

Old transsphenoidal approaches to the sella that dates back to ancient Egyptians have been recently revived the endonasal transsphenoidal approach which is now very popular and widely used for surgery in and around the sella. During the last few decades, the endoscopic assisted and purely endoscopic transsphenoidal approaches to the pituitary fossa have been described by several authors.^{8–13}

The primary goals of pituitary tumor management are to reduce the size of the adenoma, reduces visual manifestations, and control endocrinologic dysfunction. Several treatment modalities were suggested. In the present series,

Figure 2 A case of pituitary macroadenoma. (A) Preoperative magnetic resonance imaging. (B) Postoperative magnetic resonance imaging.

postoperative endocrinological control was achieved in 51 out of the 59 secretory adenoma patients 3 months postoperatively (86.5%). Likewise, postoperative visual field improvement was noted in 15 out 23 patients (65.2%) of those who had preoperative field deficit. No endonasal synechiae, septal perforations, or nasal deformity were encountered postoperatively. On the other hand, three patients developed persistent DI and another patient had CSF leak that required surgical repair. These results support the safety and efficacy of the approach and agree with the pooled complication rates reported by Tabaei et al.¹⁴

The advantages of the endoscopic approach in respect to traditional microscopic one are well known.⁶ Endonasal endoscopic pituitary surgery enables the surgeons to verify the diagnosis, and to extirpate or at least reduce considerably the size of all the adenomas to be amenable to alternate complimentary treatment modalities such as radiosurgery or hormonal therapy.^{15,16} Furthermore, the endoscopic approach provides a more mobile, panoramic, and close-up view of the anatomical structures with the ability to check the recesses and the lateral extensions of the tumor when using different angled lenses. This is not possible with the operating microscope, which works in a straight field.^{11,15}

The final endoscopic sellar floor exposure should be wide, bilateral, and in the midline to make surgery more

Figure 3 A case of pituitary macroadenoma associated with apoplexy. (A) Preoperative magnetic resonance imaging. (B) Postoperative magnetic resonance imaging.

comfortable and complete. For this reason, the sphenoidotomy is performed bilaterally and enlarged down toward the floor of the sphenoid sinus and medially toward the sphenoid rostrum. Laterally, its extension must take into account neurovascular bundle at the lateral wall of the sphenoid sinus.^{3,4,17}

Endoscopic surgery has some limitations.¹⁷ The use of two or three surgeons at the same time using four or even six hands facilitates surgery and allows the neurosurgeon to operate bimanually at the same time and overcome one of its main limitations. Moving the endoscope slightly in or out during the procedure helps to negate the drawback of lost three-dimensional vision inherent in current biplane endoscopic monitors display.

In the present series, the navigation system was used whenever needed. However, it is to be noted that despite recent advances in image guidance, surgery continues to rely on CT and MRI datasets obtained before surgery that cannot be updated during the procedure. As surgery commences, spaces are opened, resected mass is removed, and landmarks may be displaced from their preoperative position, making the system progressively less accurate. Intraoperative MRI—though expensive—is one option to overcome this shortcoming.¹⁸

The results of the present study support those of D'Haens et al¹⁹ and Goudakos et al²⁰ who reported similar rates of complete tumor excision, with less perioperative complications and a shorter hospital stay. Several factors might have contributed to the high success rates of the binasal endoscopic approach to the sellar region. The multidisciplinary teamwork with four hands is definitely one of these factors. The use of navigation system whenever needed especially in close proximity to vital structures such as the optic nerves and carotid arteries gives the surgeon confidence to do more complete resection of the lesion. Avoidance of unequal descent of the diaphragma with a small cottonoid protects against leaving small pockets of tumor. Examination of all sellar and suprasellar recesses as well as the resection cavity, with angled endoscopes, for any remnant tumor ensures complete achievement of tumor resection. The routine use of multilayered repair of the operative defect in the skull base minimizes the incidence of postoperative CSF leak. Finally, the use bipediced septal flap based on the septal branches of the sphenopalatine artery ensures a vascularized repair.

In summary, the present research has shown that the binasal endoscopic transsphenoidal approach is an added safe, minimally invasive but maximally effective approach to the sellar region. The approach allowed excellent control of the lesions and adequate decompression of the optic apparatus. At the same time, it also minimized the incidence of known complications of sellar surgery.

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