Original Paper

Surgical Outcomes of the Endoscopic Endonasal Transsphenoidal Approach for Anterior Skull Base Lesions: Experience in Combined Military Hospital, Dhaka

Salek MAA[1], Faisal MH[2], Manik MAH[3], Choudhury AUM[4], Chowdhury RU[5], Islam MA[6]

DOI:https:// doi.org/10.3329/jafmc.v14 i1.42726

Abstract

Introduction: The endoscopic endonasal approach is a minimally invasive surgical technique for removal of skull base lesions by using nose and sinuses as natural corridors. This study represents our institutional experience with endoscopic endonasal trans-sphenoidal approach for anterior skull base lesions.

Objective: To find out surgical outcomes of endoscopic endonasal trans-sphenoidal approach for treatment of anterior skull base lesions.

Materials and Methods: Cross-sectional observational study of 38 consecutive patients who underwent endoscopic endonasal trans-sphenoidal surgery for anterior skull base lesions in Combined Military Hospital, Dhaka from July 2013 to June 2017.

Results: This study included 16 men and 22 women, ranging from 24 to 68 years of age where median was 38 years. Common presentations were visual disorder (60%), headache (30%), features of pituitary apoplexy (5%), Cushing disease (0.35%), acromegaly (0.7%), galactorrhoea (0.35%). Radiological evaluation revealed intrasellar (12), sellar and suprasellar (22), sellar and parasellar (1), tuberculum sella and planum sphenoidale (3), clival (1) lesions. Recurrent cases (3/38) were nonfunctioning pituitary macroadenoma, prolactinoma, and growth hormone secreting macroadenoma. The surgical resection in relation to post op imaging were 45% as gross total resection, near-total in 35%, subtotal in 15%, and partial in 5%. Fifteen patients experienced improvement in visual acuity, while one patient worsened. Common complications were transient diabetes insipidus (53%), new pituitary deficit (35%), endonasal adhesions (20%), and cerebrospinal fluid leak (5%). Surgical mortality was (0.35%). The histological diagnoses included twenty-eight pituitary adenomas, five craniopharyngiomas, three meningiomas, one Rathke's cleft cyst, and one clival chordoma.

Conclusion: Endoscopic endonasal transsphenoidal surgery is a valuable treatment option for an anterior skull base lesion.

Keywords: Endoscopic endonasal transsphenoidal approach; pituitary adenomas; pituitary apoplexy, acromegaly, craniopharyngioma, Cushing's disease.

Introduction

Primary tumors of the anterior skull base may be derived from the bone, paranasal sinuses, nasopharynx, dura, cranial nerves, pituitary gland and brain. Symptoms are caused mostly through mass effect but, if the tumor becomes aggressive, also through invasion. Selection of surgical approaches to the anterior skull base is based upon balancing risk reduction with maximizing extent of resection[1]. Surgical resection either transcranial or minimally invasive endoscopic endonasal approach remains the mainstay in treatment of these tumors, particularly in the hands of experienced surgeons exercising proper patient and case selection.

The endoscopic endonasal approach is an established surgical technique where the nose and sinuses are used as natural corridors. It is a preferred minimally invasive approach for treatment of patients with pituitary adenoma, but this method is also being used for treatment of patients with various skull base lesions[2]. The entirely endoscopic endonasal approach to lesions of the skull base is increasingly being used by neurosurgeons[3,4]. In this study institutional experience of endoscopic endonasal techniques was applied to trans-sphenoidal surgery surgical outcome for treatment of anterior skull base lesions was observed.

Materials and methods

This cross-sectional observational study was conducted at Combined Military Hospital Dhaka from July 2013 to June 2017. A total of 38 patients having anterior skull base lesions of sellar, suprasellar, parasellar, tuberculum sella, planum sphenoidale and clival region were included in this study.

1. **Lt Col Md Al Amin Salek**, MBBS, MCPS, FCPS, MRCS, Classified Specialist in Surgery, Combined Military Hospital, Dhaka 2. **Maj Md Hasnayen Faisal**, MBBS, MS, Graded Specialist in Surgery, Combined Military Hospital, Dhaka 3. **Maj Md Abdul Hye Manik**, MBBS, MS, Graded Specialist in Surgery, Combined Military Hospital, Dhaka 4. **Lt Col Ahmed-Ul-Mursalin Choudhury**, MBBS, FCPS, Classified Specialist in Surgery, Combined Military Hospital, Dhaka 5. **Col Rukun Uddin Chowdhury**, MBBS, FCPS, MS, MRCS, Classified Specialist in Surgery, Combined Military Hospital, Dhaka 6. **Col Md Aminul Islam**, MBBS, MS, Classified Specialist in Surgery, Combined Military Hospital, Dhaka.

Patients with extensive tumor invasion into a cavernous sinus and beyondwere excluded. The study included the following variables: demographic characteristics, radiological, endocrinological and ophthalmological evaluation, surgical outcome and its complications. Preoperative and postoperative magnetic resonance imaging (MRI) was obtained in every patient, and CT scan was obtained preoperatively in selective patients for exquisite definition of the bony boundaries.All patients were evaluated by endocrinologically and ophthalmologically both preoperatively and postoperatively irrespective of their hormonal and visual status. Data were analyzed by computer software SPSS 19.0.

Results

Patients mean age was 38 ± 11.2 with ranged 24-68 years. Out of 38 patients 16 (42%) were male and 22(58%) were female. Majority (84.2%) of the patients presented with visual disorder followed by headache (52.6%) (Table-I). Radiological findings were found predominantly insellar and suprasellar (55.3%) followed by intrasellar(31.6%) and combined lesion was found in 3 (7.9%) patients. Among histological findings there were 28 (73.7%) pituitary adenoma, 5 (13.2%) craniopharyngioma, 3 (7.9%) meningioma (Table-II). In our study visual disorder improved in 78.1% (25/32) cases, headache improved in 75% (15/20) cases and other neurological and hormonal deficits improved in 100% cases (Table-III). In resection status we found gross-total in 44.73%, near-total in 34.21%, subtotal in 15.79%, and partial in 5.26% of cases (Table-IV). In this study perioperative complications were-diabetes insipidus in 20 (52.7%) cases,worsening pituitary function in 13 (34.2%) cases, endonasal adhesions in 7 (18.4%), and cerebrospinal fluid leak in 2 (5.3%) cases. One patient died within 30 days postoperatively by nosocomial pneumonia (Table-V). During the follow-up time of 36 months there were tumor recurrence in 3 (7.89 %) patients who underwent re-operation for tumor regrowth. Recurrent cases were found in nonfunctioning pituitary macroadenoma, prolactinoma, and growth hormone secreting macroadenoma. All patients with gross total resection remain free of tumor.

Table-I: Distribution of common presentation (n = 38)

Clinical presentation	Frequency	Percentage
Visual disorder	32	84.2
Headache	20	52.6
Pituitary apoplexy	6	15.8
Cushing disease	1	2.6
Acromegaly	2	5.2
Galactorrhoea	1	2.6

**Multiple responses*

Table-II: Radiological distribution of lesions (n = 38)

Type of lesions		Frequency	Percentage
Radiological findings	Intrasellar	12	31.6
	Sellar and suprasellar	21	55.3
	Sellar and parasellar	1	2.6
	Tuberculum sella	2	5.2
	Planum sphenoidale	1	2.6
	Clival	1	2.6
	Combined	3	7.9
Histological findings	Pituitary adenoma	28	73.7
	Craniopharyingioma	5	13.2
	Meningioma	3	7.9
	Rathke's cleft cyst	1	2.6
	Clival chordoma	1	2.6

**Multiple findings*

Table - III: Summary of clinical outcome (n = 38)

Clinical outcome	Number (Total)	Percentage
Visual improvement	25 (32)	78.1
Headache improvement	15 (20)	75
Neurological recover Apoplexy with ophtahlmoplegia	1 (1)	100
Hormonal control of Cushing Disease	1 (1)	100
Hormonal control Acromegaly	1 (1)	100
Control of galactorrohea with prolactinoma with failed medication	1 (1)	100

Table- IV: Distribution of resection status (n = 38)

Resection status	Frequency	Percentage
Gross total resection	17	44.73
Near total resection	13	34.21
Subtotal resection	6	15.79
Partial resection	2	5.26

Table - V: Summary of surgical complications (n=38)

Complications		No. of patients (%)	Treatment/Remark
CSF leak		2 (5.3)	Lumbar drain
Diabetes insipidus	Temporary	18 (47.4)	Temporary use of desmopressin
	Permanent	2 (5.3)	Desmopressin
	Total	20 (52.7)	
Worsening of anterior pituitary function		13 (34.2)	Hormone replacement
Endonasal adhesions		7 (18.4)	Nasal toileting
Chronic sphenoidal sinusitis		1 (2.6)	Oral antibiotic medication
Worsening of vision		1(2.6)	Secondary optic atrophy
Death		1(2.6)	Nosocomial pneumonia

Discussion

Griffith and Veerapen reported an endonasal approach to the sella in 1987, although the transsphenoidal approach via the endonasal route has not gained popularity in the initial period[5]. Endoscopic endonasal transsphenoidal surgery is an established technical approach for dealing with sellar and parasellar lesions. Sheng Nie et al has adopted a sub-septum mucosal approach with comparable results in terms of safety and extent in tumor removal[6]. The angled endoscopes provide

added visualization advantage over an operating microscope for avoiding blind curettage of suprasellar tumors. Chabot et al[7] hypothesized that the endoscope provides a better visualization, therefore, protection of the optic apparatus and its blood supply, which ultimately leads to such improved outcomes. The retractorless endonasal technique provides a larger operating space, thus permitting free maneuvering of surgical instruments in the operating field. It also provides a panoramic view of the sphenoid sinus, which facilitates well recognition of the bony structures covering the carotid arteries and optic nerves[8]. An endoscopic technique has the limitation of working in a two-dimensional view as compared to the conventional microscopic surgery. But recent developments in 3D endoscopy hold much promise for better visualization and precision[9].

The introduction of modern endoscopic techniques afforded the renaissance of the transsphenoidal routein which a wide exposure of the sellar floor is obtained from the medial walls of the cavernous sinus laterally,the tuberculum sellae cranially and the dural indentation of the clivus/inferior trans cavernous sinus caudally[10]. In our series of 41 operations in 38 patients, a two-nostril technique was applied for easy exposure and instruments handling. In their study Schwartz et al reported gross-total resection (GTR) of tumor was 58.5%[11]. In our study we could achieve 44.73%. In our series32 patients had visual disorder, among whom twenty-five patients (78.1%) experienced visual acuity improvementafter surgery. Similar results were described by recent endoscopic endonasal series, in which the rates of visual improvement achieved a mean of 75.5% (range 32.1%–97.7%[12]. The complications related to the endoscopic trans-sphenoidal surgery in our series had been didactically divided into two major groups, namely the immediate/short-term and late complications. From the first group the occurrence of CSF leak, transient DI and naso-sinusal disorders (sinusitis/epistaxis) were the most frequent. Shannon Fraser et al in their study found postoperative CSF leak (16.7%)[13], which is comparable to our study (5.3%). Conversely, the endocrine outcomes including new postoperative pituitary insufficiencyour study was 34.2%, which is more than other study within the range reported in the literature (3–14%)[14]. In this study transient DI was 47.4% in the immediate postoperative period, which is comparable with a reported incidence of 24.1%–53.6% of the patients[15].

Conclusion

In conclusion, endoscopic endonasal trans-sphenoidal surgery is a valuable treatment option for selective anterior skull base lesions. This less invasive method, associated with a small number of complications, provides excellent tumor removal rates and represents an important tool for the achievement of good results in the skull base surgery.

References

1. Ivan ME, Han SJ, Aghi MK. Tumors of the anterior skull base. Expert Rev Neurother 2014; 14(4):425-38.

2. Kalinin PL, Sharipov OI, Shkarubo AN et al. Damage to the cavernous segment of internal carotid artery in transsphenoidal endoscopic removal of pituitary adenomas (report of 4 cases). ZhVoprNeirokhirIm N NBurdenko 2013; 77:28–37.

3. Gendeh BS, Doi M, Selladurai BM et al. The role of endoscopic endonasal approach to pituitary tumours: HUKM experience. Med J Malaysia 2006; 61: 343-8.

4. Snyderman CH, KassamAB. Endoscopic techniques for pathology of the anterior cranial fossa and ventral skull base. J Am Coll Surg 2006; 202:563.

5. Griffith HB, Veerapen R: A direct transnasal approach to the sphenoid sinus. Technical note. Journal of Neurosurgery 1989; 66:140–2.

6. Nie S, Li K, Huang Y et al. Endoscopic endonasal transsphenoidal surgery for treating pituitary adenoma via a sub-septum mucosa approach. Int J Clin Exp Med 2015; 8(4): 5137–43.

7. Rutkowski MJ, Aghi MK. Medical versus surgical treatment of prolactinomas: an analysis of treatment outcomes. Expert Rev Endocrinol Metab 2018; 13(1): 25-33.

8. Chabot JD, Chakraborty S, Imbarrato G et al. Evaluation of outcomes after endoscopic endonasal surgery for large and giant pituitary macroadenoma: a retrospective review of 39 consecutive patients. World Neurosurg 2015; 84(4): 978-88.

9. Belotti F, Doglietto F, Schreiber A et al. Modular Classification of Endoscopic Endonasal Transsphenoidal Approaches to Sellar Region: Anatomic Quantitative Study. World Neurosurgery 2018; 109: e281-e291.

10. Singh A, Saraiya R. Three-dimensional endoscopy in sinus surgery. Curr Opin Otolaryngol Head Neck Surg 2013; 21(1):3-10.

11. Solari D, Villa A, Angelis MD et al. Anatomy and Surgery of the Endoscopic Endonasal Approach to the Skull Base. Transl Med UniSa 2012; 2:36–46.

12. Negm HM, Al-Mahfoudh R, Pai M et al. Reoperative endoscopic endonasal surgery for residual or recurrent pituitary adenomas. J Neurosurg 2017; 127(2):397-408.

13. Chone CT, Sampaio MH, Sakano E et al. Endoscopic endonasal transsphenoidal resection of pituitary adenomas: Preliminary evaluation of consecutive cases. Brazilian journal of otorhinolaryngology 2014; 80:146-151.

14. Fraser S, Gardner PA, Koutourousiou M et al. Risk factors associated with postoperative cerebrospinal fluid leak after endoscopic endonasal skull base surgery. Journal of Neurosurgery 2018; 128(4):1066-71.

15. Schreckinger M, Walker B, Knepper J et al. Post- operative diabetes insipidus after endoscopic transsphenoidal surgery. Pituitary 2013; 16(4):445-51.