Endoscopic Endo-Nasal Trans-Sphenoidal Excision of Pituitary Tumors: An Institutional Experience

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Received: 8 January 2017 / Accepted: 1 September 2017 / Published online: 7 September 2017
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Abstract To analyze the clinical presentation, management and outcomes of patients with pituitary adenoma treated by Endoscopic Endo-nasal Trans-sphenoidal (EETS) excision. Study was conducted on the basis of medical records of 14 patients who had undergone EETS excision of pituitary adenomas. The data obtained was assessed for demographic and clinical characteristics, radiographic features and post-operative outcomes. Study included 10 males and 4 females. Mean age of patients was 46.43 years (range 16–70 Years). Most common presentation was diminished vision reported in 79% patients. Features of acromegaly encountered in 21% cases. Location of majority of tumors was sellar with supra-sellar extension (71%) followed by sellar (14%), sellar with parasellar extension (7%) and sellar with supra-sellar and parasellar extensions (7%). Total tumor resection was achieved in 64% cases and sub-total resection in 36% cases. One of the lesions on biopsy revealed granulomatous pathology. No post-operative complication was seen in 71% patients. Transient Diabetes Insipidus was observed in 21% cases that resolved within 3–4 days. One patient expired due to meningitis and septicemia. One patient had CSF leak that was effectively managed by placing lumbar drain. There was significant improvement in visual symptoms and hormonal levels. Average hospital stay was 13.54 days and mean follow up period was 13 months. EETS approach is safe, minimally invasive and effective surgical technique

for resection of pituitary adenomas with low post-operative morbidity, reduced hospital stay and better remission of symptoms.

Keywords Pituitary adenoma · Endoscopic endo-nasal surgery · Trans-sphenoidal approach

Introduction

Endoscopic Endo-nasal Trans-Sphenoidal (EETS) approach is a minimally invasive technique that has gained increased acceptability for removal of sellar and para-sellar tumors [1]. Griffith [2] first described the endonasal approach for removal of pituitary lesions in 1987 as modification of Hirsch's original approach. Jho et al. [3] have subsequently popularized the technique. Feasibility of technique with good surgical and functional outcome has made it popular among ENT and neurosurgeons over the last two decades [4]. Preference of EETS over the conventional trans-septal and sub-labial approach resulted from improved visualization and illumination of operative fields and low incidence of related morbidity [5]. Availability of wide angled scopes and high definition cameras allow much better control during surgery and hence significantly better results. This technique has been developed under minimally invasive surgical strategies for patients with pituitary adenoma, which eliminates the use of trans-sphenoid retraction and nasal packing [6, 7]. Unlike the sub-labial and trans-septal approach, this procedure involves only one incision in posterior nasal cavity [8]. The endoscope represents one of the latest innovations because of its ability to have a wider panoramic view through a narrow surgical corridor and its ability to provide angled 'close up view' to detect eventual tumor remnants [9]. A

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detailed study of lesion and anatomy of adjacent structures is important to improve the safety and accuracy of surgery. Although endonasal anatomical variations are frequent, they do not pose a relevant hurdle in this procedure [10]. Recent studies have affirmed that EETS approach is associated with minimum nasal complications, reduction in operative time and decreased hospital stay [11]. The present study has been conducted to assess the management and outcome in patients who have undergone surgical resection of pituitary adenoma by endoscopic endonasal trans-sphenoidal approach.

Materials and Methods

A retrospective study was conducted based on medical records of 14 patients who presented with pituitary lesions from 2013 to 2016. Study group included only those patients diagnosed as having pituitary adenoma based on MRI findings and submitted to endo-nasal endoscopic trans-sphenoidal surgery (EETS). All patients underwent 1 mm thickness CT scan for nose and PNS preoperatively. Pituitary adenomas are classified as microadenomas (<1 cm size) and macroadenomas (>1 cm). In present study, patient's demographic data, signs and symptoms, clinical and radiographic observations, hormonal profile, management model and surgical outcomes were recorded in a pre-structured proforma. The data so collected was tabulated for evaluation of results.

Procedure

The procedure was done under general anesthesia. To start with, a large fat graft was harvested from upper lateral aspect of thigh. Hadad septal flap raised from the concave side all the way to the anterior wall of sphenoid sinus and reflected down in nasopharynx with its intact blood supply. Posterior end of the nasal septal bone along with the opposite mucoperichondrium removed using micro-debrider thus creating a septal perforation posteriorly. Both the sphenoid ostia widened and joined. Floor of sella exposed completely after removing the sinus mucosa and confirmed by using a C-arm as well. Following this, the bone over the sellar floor removed using drill or Kerrison's punch as the case may be. A cruciate incision given in dura and dural flaps reflected on all the sides. After complete exposure, the tumor was removed with curettage and suction. After removal of sellar part of lesion, the supra sellar mass extension drops down and becomes easily viewable for surgical removal. Valsalva was also done in order to bring the lesion into view. Angled endoscopes were used to look for removal of any residual part. Surgical defect

repaired with autologous fat, bone chips and rotated septal flap. Bilateral nasal packs kept in nasal cavity and removed on fifth post-operative day.

Results

In the present study, 36% of cases were in the age group of 20–40 years. Patients between 40–60 years and elderly patients above 60 years each accounted for 29% of cases. One patient (7%) in this series was 16 years old. Mean age was found to be 46.43 years (Range 16–70 years). Seventy-one percent of subjects were males and 29% females (Table 1). Most common presenting complaint was disturbance in vision reported in 79% of patients. Decreased visual acuity was present in 64% patients. Bitemporal hemianopia observed in 7% cases and 7% had bitemporal quadrantanopia. Second common presentation was headache observed in 50% of cases. Vomiting was observed in 29% cases only. Twenty-one percent of patients presented with features of acromegaly (Table 2). MRI findings in 71% cases were suggestive of pituitary adenoma whereas 29% showed pituitary adenoma with apoplexy. Location of tumor was found to be sellar in 14%, sellar with supra-sellar extension in 71%, sellar with parasellar extension in 7% and sellar with supra-sellar and parasellar extensions in 7% subjects. Data on pre-operative hormone profile was also retrieved which showed that 79% of adenomas were non-secretory whereas 21% were growth hormone (GH) secreting tumors (Table 3). Repair of surgical defect was carried out by using fat, bone and septal mucosa in all cases. Total resection of lesion was achieved in 64% cases whereas in 36% sub-total resection was reported in post-operative MRI scans. Biopsy reports of 93% tumors confirmed these lesions as pituitary adenomas with 21% showing intra-lesional hemorrhage. One of the tumors (7%) on biopsy revealed granulomatous pathology (Table 4). Seventy-one percent of patients did not have any post-operative complication. Transient Diabetes Insipidus (hyponatremia) was the most common complication

Table 1 Demographic characteristics

Variables	Frequency (n = 14)	Percentage (%)
Age (years)		
<20	01	07
20–40	05	36
41–60	04	29
>60	04	29
Gender		
Males	10	71
Females	04	29

Table 2 Clinical characteristics

Presenting symptoms/signs	Frequency (n = 14)	Percentage (%)
Visual disturbances		
Decreased visual acuity	09	64
Bitemporal hemianopia	01	07
Bitemporal quadrantanopia	01	07
Headache	07	50
Vomiting	04	29
Features of acromegaly	03	21

Table 3 Diagnostic characteristics

Variables	Frequency (n = 14)	Percentage (%)
MRI findings		
Type of tumor		
Pituitary adenoma (PA)	10	71
PA with apoplexy	04	29
Location of tumor		
Sellar	02	14
Sellar with supra-sellar extension	10	71
Sellar with para-sellar extension	01	07
Sellar with supra- and para-sellar extensions	01	07
Size of lesion		
Macroadenomas (>1 cm)	12	86
Microadenomas (<1 cm)	02	21
Pre-operative hormonal status of tumor		
Non-secretory	11	79
Secretory (growth hormone secreting tumors)	03	21

noticed in 21% cases. One patient with growth hormone secreting adenoma developed meningitis followed by septicemia and expired on seventeenth post-operative day. Eighty-two percent of patients who had visual abnormalities showed marked improvement in visual symptoms whereas no improvement observed in remaining 18% cases. Two-thirds of patients with elevated hormone levels showed good response to surgery with normalization of hormone levels. Post-operative CSF leak was seen in one patient (Table 5). Mean hospital stay was 13.54 days (Range 08–21 days). Mean follow up period was 13 months.

Discussion

Pituitary tumors account for about 15% of intracranial neoplasms. Trans-sphenoidal approach has become a standard procedure to access pituitary and sellar region

Table 4 Surgical repair and histopathological findings

Variables	Frequency (n = 14)	Percentage (%)
Repair of surgical defect		
Fat, bone chip and septal flap	14	100
Extent of resection (post-op MRI)		
Total resection	09	64
Sub-total resection	05	36
Biopsy report		
Pituitary adenoma (PA)	09	64
PA with apoplexy	04	29
Granulomatous lesion	01	07

Table 5 Post-operative complications and outcomes

Variables	Frequency (n = 14)	Percentage (%)
Post-operative complications		
Nil	10	71
Transient diabetes insipidus (hyponatraemia)	03	21
Meningitis	01	07
CSF rhinorrhoea	01	07
Persistent diabetes insipidus	00	00
Functional improvement		
Improvement in visual symptoms (n = 11)		
Normalized	09	82
Partial improvement	02	18
Hormonal remission (n = 3)		
Normalized	02	66
Post-operative mortality	01	07
Hospital stay		
<02 weeks	09	64
>02 weeks	05	36

[4, 12]. Traditionally pituitary surgery comes under the realm of neurosurgeon but introduction of endonasal endoscopic trans-sphenoidal (EETS) approach to sella turcica has made otorhinologist an active partner in surgical management [9]. Jankowski et al. [13] were first to use EETS for excision of pituitary adenoma. In present study, demographic characteristics of patients who underwent EETS for resection of pituitary adenoma revealed that mean age of patients was 49.78 years (range 16–70 years). A wide mean range varying from 39.8 to 50.8 years have been reported in literature [14]. Occurrence of pituitary adenoma showed male preponderance over females in present study. Previous studies [8] have reported higher frequency of affliction of females by pituitary tumors than males. The most common presentation in present study was progressive reduction in visual acuity (79%). The classical

bi-temporal hemianopia and bi-temporal superior quadrantanopia each accounted for 7% cases. These symptoms and signs were the result of compression effect exerted by expanding tumor on optic nerve and optic chiasma. Kiboi et al. [14] have reported higher incidence of diminished visual acuity (87%) and bilateral hemianopia (56.9%). In our study 82% of patients regained normal visual function after resection of tumor. In 18% cases, no improvement in visual function observed. The results of visual recovery are comparable with the results presented by previous researchers [3, 4, 6]. Excellent recovery in visual disturbances is the result of effective decompression of optic nerve and chiasma via endoscopic approach. Headache with or without visual abnormalities was noticed in 50% of patients in our series when compared to 18% patients presenting with these symptoms in a study conducted by Chih-Pei et al. [8]. Data retrieved in our study showed that 21% cases had features of acromegaly because of growth hormone (GH) secreting adenomas. The patients responded well to surgical resection of tumor with progressive return of hormone levels to the reference range of endocrinology. One of the tumors reported to be pituitary adenoma on MRI showed findings suggestive of granulomatous pathology on biopsy. Transient Diabetes Insipidus (hyponatraemia) developed in 21% of patients that recovered within 3–4 days. This complication is attributable to neurogenic trauma to hypothalamic vasopressin secreting neurons [15]. One patient expired due to infective meningitis and septicemia. In the present study, one patient (7%) developed CSF leak that was treated with lumbar drain with resolution of leakage. Previously published studies have mentioned the rates of CSF leaks ranging from 1.3 to 15% tallying with the present figures. Occurrence of these leaks may be associated with adenomas with supra-sellar extensions, which required extended resection in the region of diaphragm sellae [15]. In present study, mean hospital stay of 13.54 days (range 8–21 days) was observed. In majority of patients (64%), stay in hospital was less than two weeks that is consistent with the findings of Hsu et al [8]. Mean follow up period was 13 months.

Conclusion

Endonasal endoscopic trans-sphenoidal surgery is a safe, minimally invasive, effective and preferential technique for resection of pituitary adenomas. Detailed magnification of working field provided by endoscope provides an additional armament in the hands of surgeon to visualize the defect and effectively repair it thereby minimizing morbidity and mortality. The procedure is associated with good post-operative remission, reduced hospital stay and relatively few complications.

Compliance with Ethical Standards

Conflict of interest The authors declared that they have no conflicts of interest.

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