

4 HANDS REACHING OUT ENDOSCOPICALLY TO THE PITUITARY – OUR EXPERIENCE

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ABSTRACT:

Objective: To examine three minimally invasive techniques of approaching the sella in pituitary tumors.

Study design: Retrospective case review of patients out of whom 275 patients were underwent Endoscopic endonasal pituitary adenoma resection and rest by conventional methods between January 1996 and October 2016.

Patients: 500 cases of pituitary adenoma requiring surgical intervention were included in the study and thoroughly investigated prior to surgical intervention. The various techniques of endoscopic hypophysectomy have been compared in this study.

Main outcome Measure (S): Remission was defined as no radiological or hormonal evidence of recurrence within the time-frame of the follow-up.

Results: 10% recurrence was noted at the end of 1 year- 5% in Trans septal trans sphenoidal, 3% in Trans sphenoidal and 2 % by the 4 hand technique, which were re-operated successfully by the endoscopic trans sphenoidal 4 hand technique. Mean follow-up period was 24.2 months.

Conclusions: In our 20 yrs of experience, endoscopic trans sphenoidal 4 handed technique is a safe and effective method for complete pituitary tumor removal with better surgical outcomes and fewer complications compared to the trans septal trans sphenoidal technique

Keywords: Endoscopic hypophysectomy, Four hand technique, Trans sphenoidal.

INTRODUCTION:

Horseley (1906) was the first to decompress the pituitary gland by the transcranial route¹. In 1909, Cushing performed the sub labial trans septal approach. Chiari was credited for his demonstration of the trans ethmoidal trans sphenoid operation in 1912. By early 1980s trans sphenoidal approach came to stand. With the advent of modern endoscopic techniques, the momentum in the field of endoscopic pituitary surgery has steamed up providing panoramic view, superior visualization of microscopic relevant anatomy, better magnification and illumination for identification of critical anatomical landmarks within the sphenoid and

precise delineation of the sellar mass from its surrounding structures ensuring comprehensive tumor

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removal with favorable results and reduced postoperative morbidity³. In addition, angled endoscopes allow tumor remnants extending into the supra and parasellar areas to be seen improving the surgeon's ability to achieve complete tumor resection reducing the likelihood of recurrence⁴. An added advantage in endoscopic approaches is the possibility of a 4 hand technique for faster & accurate dissection by appropriate retraction and prompt hemostasis in a magnified surgical field as against the single hand endoscopic or 2 hand microscopic technique⁵.

Endoscopic pituitary surgery is a well-established technique for the treatment of sellar tumors. The efficacy and minimally invasive nature of Trans nasal endoscopic approach in the treatment of pituitary adenomas and other sellar lesions have provided a benchmark to ambitious skull base surgeons⁶.

Pituitary adenomas can present in any age equally affecting males and females. The clinical presentation of pituitary adenomas varies depending upon the location and severity of the tumor. Pituitary adenomas are a diverse group of benign neoplasms. The hormonally inactive, generally come to clinical attention secondary to local mass effect or pituitary deficiency. Whereas, the hormonally active tumors present with well-recognized syndromes and include growth hormone adenoma, prolactinoma, and corticotrophin adenoma⁷.

Indications for endoscopic hypophysectomy⁸:

Tumor with mass effect (Macro adenoma: > 1cm)

- Chiasmal compression and objective visual field defect
- Raised intracranial pressure Pituitary dependent Cushing's disease GH secreting tumor.

Prolactinoma

- Failure of medical of treatment
- Intolerance of medical management
- Patient preference

TSHoma

Contraindications for endoscopic hypophysectomy⁹:

Highly vascular lesion

Lesions with carotid artery anomaly, where the artery project into the sphenoid sinus and limit safe access.

Extensive lesions:

- Anterior to tuberculum over the planum sphenoidale
- Behind the clivus into the posterior fossa

AIM & OBJECTIVE:

To compare three minimally invasive techniques of approaching the sella in pituitary tumors and conclude on the most conducive option for best patient results.

MATERIALS AND METHODS:

A long-term retrospective study was done in patients who underwent Endoscopic Endonasal pituitary adenoma resection between January 1996 and October 2016. The data in patient records as well as the data obtained from postoperative follow-up visits were used to determine outcomes. From a total of 500 pituitary adenomas, (75)15% were hormonally active, while (425)85 % were non-functioning. The male to female ratio was 1: 1.5 (Male200:Female300), with average age group 35-50 years. In our 500 patints we have operated 10(2%) patients by trans- septal trans-sphenoidal approach and in the 215(43%) by trans-sphenoidal technique and in 275(55%) of them (2005 onwards) were by the 4 hand technique.

Detailed notes on history of Headache, visual symptoms, amenorrhea, galactorrhea, general physical examination (Acromegalic features), CNS examination, complete ophthalmic and ENT examination, from the records were taken. Patients were subjected to various imaging studies. The CT scan gave invaluable information of the bony surgical anatomy of the nose and sphenoid sinus whilst the MRI was extremely useful for parasellar and vascular information. Hormonal assays like LH, FSH, T3 T4 TSH, Prolactin, GH and cortisol were done in patients suspected to have secreting tumors.

Surgery was indicated whenever there was evidence of compressive gland enlargement or development of pituitary hormonal imbalances. The first 10 patients were operated using the trans- septal trans-sphenoidal approach and the rest by trans-sphenoidal technique, of which around 275 patients (2005 onwards) were by the 4 hand technique in trans-sphenoidal technique. The average length of hospital

stay (LOS) was 1.5 days. Postoperatively, magnetic resonance imaging (MRI) was done after 1 month to assess residual or recurrent disease and those with hormonally active tumors had hormonal studies.

Surgical Technique:

Following general anaesthesia, the nasal cavities were decongested with nasal packs of 4% xylocaine with 1 in 10,000 units' adrenaline. The approach could be done by a 'Modified four handed technique' without the active participation of a neurosurgeon where in the Chief Endoscopic ENT surgeon holds the endoscope and one instrument and Assistant ENT surgeon aided through both nostrils for retraction, irrigation, suctioning etc. offering a bloodless field which would aid in finer dissection for tumor removal.

The endoscope was advanced to expose the anterior wall of the sphenoid sinus in the sphenoidal recess and ostia identified on both sides. Posterior septal branch of sphenopalatine artery cauterized bilaterally. Bilateral posterior ethmoidectomy and posterior septectomy were done for better visualization and to accommodate various instruments used in 4 hand technique. Bilateral sphenoid ostia widened and connected using a Kerrison's punch till the entire extend of the sphenoid sinus was well visualized (floor, sellar, planum, optic nerve and carotid artery bulge, opticocarotid recess medial and lateral). Intersphenoid septum and sphenoid mucosa were removed for better access to the anterior wall of sella whose thickness was assessed with a ball probe and drilled using a long diamond coarse cutting burr up to the dura. A horizontal H shaped incision is made over the dura and dural flap raised. A punch biopsy was taken from the prolapsed tumor mass for frozen section histopathology. Blunt ring curettes and 2 suction were used to remove the tumor completely in a systematic manner, usually starting from the floor, then laterally and finally along the supra sellar component with the help of 30-degree endoscope, thereby eliminating sources of any potential tumor recurrence. In case of solid tumors, sharp dissection was carried out using scissors and tumor removed with the help of forceps until the diaphragm descends freely with no attachments.

In case of bleeding, surgical was used within the sella for hemostasis. The preserved dural flap is

positioned over the anterior face of the sella. The sphenoid sinus is packed with gelfoam. A small merocel sponge is placed in nose. Pack removal was done after 24 hours of surgery.

In case of a CSF leak, we followed a 3 layered technique wherein the defect was identified and fascia lata graft was first placed with the edges tucked under the dural opening and reinforced with Hadad flap, fibrin glue and Merocel allowing pressure on the fascia during healing which was to be removed after 1 week. If the CSF leak was profuse, a lumbar drain was inserted postoperatively for 2 to 3 days.

Patient was discharged from hospital on the 1st postoperative day and reviewed after 1 week. Postoperative MRI scan was done 1 month after surgery and followed up MRI after 1 year.

Table-1: Clinical symptoms.

| Clinical symptoms | | |
|-------------------|-----|-----|
| symptoms | no | % |
| Headache | 165 | 60 |
| Visual symptoms | 69 | 25 |
| Acromegaly | 28 | 10 |
| Cushing's | 13 | 5 |
| TOTAL | 275 | 100 |

RESULTS AND DISCUSSION:

From a total of 500 pituitary adenomas, (75)15% were hormonally active, while (425) 85 % were non-functioning. The male to female ratio was 1: 1.5 (Male200:Female300), with average age group 35-50 years.

In our study, majority of patients had presented with headache (60%) followed by visual symptoms (25%), acromegalic features (10%) and Cushing's disease (5%) (Table 1). On further evaluation, 85 % were found to be non-secreting and 15% secreting in nature as compared to a study done in 300 patients by Kabil MS et al, who observed that 46 % were hormonally active and 54 % were non-functioning². Paolo Cappabianca et al in their study on 30 patients observed secreting or functioning adenomas in 53.33% and non functioning adenomas in 46.67%¹. In this respect our study is

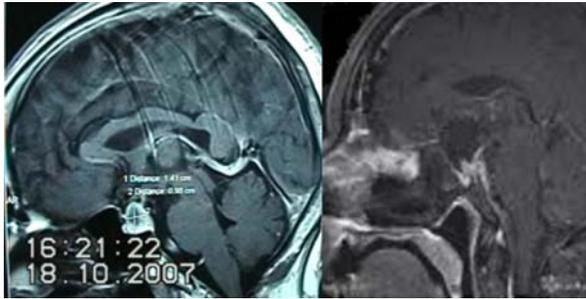


Fig-1: Pre and post-operative (1yr) MRI of a patient with pituitary macro adenoma.

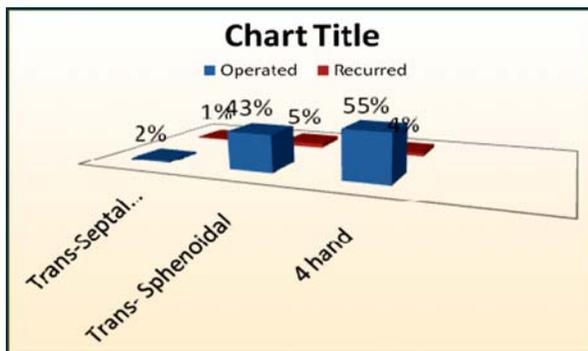


Fig-2: Chart showing types of surgery adopted.

significantly different. In our 500 patients we have operated 10(2%) patients by trans-septal trans-sphenoidal approach and in the 215 (43%) by trans-sphenoidal technique and in 275 (55%) of them (2005 onwards) were by the 4 hand technique. P Cappabianca et al in their study in 30 patients 10 surgeries were done by endoscopic endonasal transsphenoidal approach and 20 were done by traditional transnasal transsphenoidal approach (TTA)¹. Remission was defined as no radiological or hormonal evidence of recurrence within the time-frame of the follow-up period. In our series 10% recurrence was noted at the end of 1 year (1% in Trans septal trans sphenoidal, 5% in Trans sphenoidal and 4 % by the 4 hand technique), which were reoperated successfully by the endoscopic trans sphenoidal 4 hand technique. Our Mean follow-up period was 24.2 months. Mean follow-up period was 38.2 months in study of Kabil MS et al². Paolo Cappabianca et al followed up their patients after 6 months of follow up by MRI and hormonal study and found improvement in pituitary function post operatively in 4 patients, out of 10 patients whereas pituitary hormone deficiency was present in 14 out of

30 patients¹. D'Haens J et al observed that there is not much significant hormonal improvement in either endoscopic endonasal surgery or the traditional microscopic techniques⁶. They reported the endocrinologic outcome in 2 series of patients at the same institution using these 2 different techniques⁶. The remission rate for the pituitary adenomas in 4 hand technique was 90 % (in 248 patients out of 275 patients). D'Haens J et al observed remission rate of 63% in endoscopic group and 50% in microscopic group however they did not mention about any 4 hand techniques and they operated in 60 hormonally active patients⁶. Kabil MS et al reported better results as far as complications are concerned in endoscopic approaches in comparison to conventional microscopic approaches². However they concluded that more complete tumor removal is necessary in reducing complications. We encountered CSF leak in 10 % cases (28) in 4 hand technique which was repaired successfully by the 3-layer technique. The morbidity with the endoscopic technique was reported to be higher in respect to the rate of postoperative CSF leaks (10%) in the study by D'Haens J et al⁶.

In our experience, adopting the endoscopic 4 hand technique offers the best approach to the pituitary by providing excellent magnification, angular visualization, supra and para sellar tumour access. We noted not just a marked reduction in complications but also an improved outcome was evident with the above technique. approach are: less traumatic, faster, panoramic magnified view, increased exposure, angled view with the use of different endoscopes, absence of skin incisions- brain retraction - cranial nerve dissection and possibility to explore the sella for residual tumor at the end of operation. Its disadvantages are the lack of 3D view and the need for an assistant to hold the endoscope¹⁰. In our 20 yrs of experience, endoscopic trans sphenoidal 4 handed technique is a safe and effective method for complete pituitary tumor removal with better surgical outcomes and fewer complications compared to the trans septal trans sphenoidal technique.

CONCLUSION:

Advancements in endoscopy and experience in pituitary surgery drives endoscopic ENT surgeons toward new horizons. The advantages of endoscopic approach are: less traumatic, faster, panoramic

magnified view, increased exposure, angled view with the use of different endoscopes, absence of skin incisions- brain retraction - cranial nerve dissection and possibility to explore the sella for residual tumor at the end of operation. Its disadvantages are the lack of 3D view and the need for an assistant to hold the endoscope¹⁰. In our 20 yrs of experience, endoscopic trans sphenoidal 4 handed technique is a safe and effective method for complete pituitary tumor removal with better surgical outcomes and fewer complications compared to the trans septal trans sphenoidal technique.

DISCLOSURES:

- (a) Competing interests/Interests of Conflict- None
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- (d) No financial disclosures
- (e) Animal rights-Not applicable

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