



## ENDOSCOPIC APPROACH FOR SKULL BASE TUMOURS: A RETROSPECTIVE STUDY.

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### ABSTRACT

**Introduction:** Endoscopic endonasal trans-sphenoidal surgery is increasingly being recognized as a surgical method for the treatment of brain tumours and skull base neoplasms [1]. Endoscopic endonasal trans-sphenoidal surgery has long been considered the “gold standard” in surgical treatment of pituitary tumours [2]. Minimally invasive techniques allow a more comprehensive removal of the tumour with less operative trauma and fewer complications [3–5]. The Endoscopic endonasal approach allows surgeons to treat many hard to-reach tumours, even those tumours, once considered “inoperable,” without disturbing face or the brain. **Objectives:** The aim of study is to analyze the outcomes in patients who underwent endoscopic endonasal approach to skull base tumours. **Material and methods:** All patients undergoing an endoscopic endonasal trans-sphenoidal approach for skull base tumours, were included, and data were retrospectively retrieved from the patient records. **Results:** Of 62 patients 37 were females and 25 males. Most belonged to 41–50 yrs age group. The commonest presenting symptom was Headache. Visual symptoms, like decreased visual acuity, decreased in visual field, diplopia, seizures, hormonal imbalance were the other symptoms. The most common tumour was pituitary macroadenoma (66%), followed by craniopharyngioma (13%), meningioma (10%). Headache improvement seen in 100% patients and visual improvement seen in 83% of patients. Gross total resection (GTR) was done in 88 % patients. CSF leak was reported in 6.6% of patients. **Conclusion:** Endoscopic endonasal trans-sphenoidal approach provides advantages like lack of external incision and scar, decreased trauma to soft tissue and bone, close up view of anatomy, enlarged working angle which gives increased panoramic vision inside surgical area in terms of mass removal, reduced risk of neurological damage, improvement in clinical symptoms, decreased complication rate, faster recovery time.

**KEYWORDS :** skull base tumours, pituitary macroadenoma, Diabetes insipidus.

### INTRODUCTION

Endoscopy endonasal trans-sphenoidal surgery is increasingly being recognized as a surgical method for the treatment of brain tumors and skull base neoplasms [1]. Endoscopic endonasal trans-sphenoidal surgery has long been considered the “gold standard” in surgical treatment of pituitary tumours [2]. This method has become a routine medical technique and is currently used as the conventional microsurgery technique in world's major centre. Endoscopy endonasal surgery can be used to gain direct access to brain lesions while minimizing brain retraction during craniotomy. This endoscopic approach provides access to lesions through a natural opening, nostril or through an incision, minimizing or entirely preventing brain retraction. Previous reports on this medical technique highlight the benefits of endoscopic surgery and its superior visualization. Minimally invasive techniques allow a more comprehensive removal of the tumor with less operative trauma and fewer complications [3-5]. All regions of the skull base tumours situated anterior to the foramen magnum are accessible through endoscopic endonasal surgery. Endoscopic surgery access not only skull base tumours but also cerebrospinal fluid (CSF) leaks of traumatic or other origin, certain chronic infections and congenital malformations.

The Endoscopic endonasal (EEA) approach allows surgeons to treat many hard to-reach tumors, even those tumors, once considered “inoperable,” without disturbing face or the brain. The skull base tumors removed through EEA include pituitary adenoma, meningioma, chordoma, craniopharyngioma, and ossifying fibroma [6-10]. EEA offers patients a number of benefits that improve their quality of life, including less trauma to brain and nerves, no facial incisions or disfigurement, fewer side effects and shorter recovery time.

Skull base is one of the most complex anatomic regions and it forms the floor of the cranial cavity. Skull base surgical approaches include open, endoscopic, and microscopic approaches to the posterior cranial fossa or the anterior middle fossa [11,12]. Middle skull base opened via different corridors from the planum sphenoidale to the sellar floor, namely the endoscopic-based endonasal transplanum-transsphenoidal approach to lesions of suprasellar area and standard Endoscopic endonasal approach method for lesions of the sellar region

[13]. Endonasal transcribiform approach from the frontal sinus is being used to access anterior skull base [14]. Access to the parasellar region, i.e. Meckel's cave region and the cavernous sinus made by transpterygoid approach [15]. Exposure of posterior and the middle skull base from the clivus to craniocervical junction done by using the endoscopy-based endonasal transclival approach [16].

### MATERIAL & METHODS

This study was carried out in Department of Neurosurgery, Stanley government medical college. All patients in our tertiary referral centre undergoing an endoscopic endonasal trans-sphenoidal approach for skull base tumours, between January 1st 2019 and December 31st 2022 were included, and data were retrospectively retrieved from the patient records. The following factors were analyzed,

- 1) Age & Gender distribution
- 2) Clinical Presentation
- 3) Surgical resection
- 4) Histopathology
- 5) Vision improvement
- 6) Post-op complications

The collected data was systematically analyzed and results were obtained.

### RESULTS

62 patients were included in the study, 37 females and 25 males. Highest number of patients found in 41–50 yrs age group. Youngest patient was 22 yrs male with diagnosis of craniopharyngioma, whereas oldest was 65 yrs male. 6 patients underwent revision surgery for recurrence.

#### 1. Gender distribution:

37 females (60%) and 25 males (40%), total 62 patients were included in this study.

#### 2. Age distribution:

Majority of patients were in the age group of 31–40 yrs and 41–50 yrs age group. Age of Youngest patient was 22 yrs and oldest patient was 65 yrs.

**3. Clinical and biochemical manifestation**

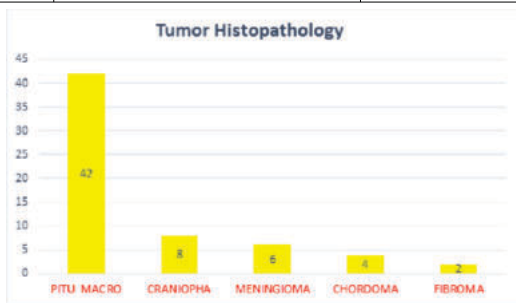
Most common presenting symptom was Headache, presenting in almost all 62 patients. 56 patients reported with Visual symptoms, like decreased visual acuity, decreased in visual field, diplopia. 4 patients presented with seizures. Biochemical evaluation revealed that 18 patients had hormonal imbalance. In that, 9 patients were prolactin hormone secreting tumours. 5 patients were having growth hormone secreting tumour. 4 patients reported corticotropes imbalance.

**4. Tumour histology**

Most common histological diagnosis was Pituitary macroadenoma (68%) followed by Craniopharyngioma (12%), meningioma, clival chordoma and ossifying fibroma.

**Table 1a : Tumour histological types**

Sr. No.	DIAGNOSIS	NO. OF PATIENTS
1	PITUITARY MACROADENOMA	42
2	CRANIOPHARYNGIOMA	8
3	SKULL BASE MENINGIOMA	6
4	CLIVAL CHORDOMA	4
5	CEMENTO OSSIFYING FIBROMA	2
	TOTAL	62



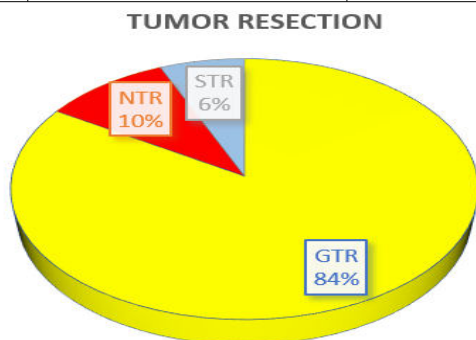
**Figure 1 : Tumour histological types**

**5. Tumour resection**

Gross total resection was done in 52 patients. 6 patients in which tumour was adherent to vessels so that small amount of tumour left behind leading to near total resection. 4 patients had profuse bleeding from cavernous sinus/ICA causing impaired visualisation resulting in subtotal resection with control of bleeding.

**Table 2 : Tumour resection types in endonasal endoscopic surgery**

Sr. No.	RESECTION	NO. OF PATIENTS
1	GROSS TOTAL RESECTION (GTR)	52
2	NEAR TOTAL RESECTION (STR)	6
3	SUBTOTAL RESECTION (STR)	4



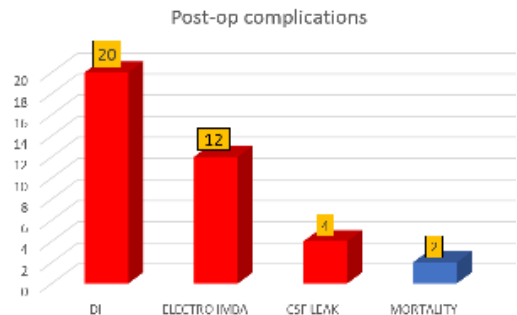
**Figure 2 : Tumour resection types in endonasal endoscopic surgery**

**6. Symptoms improvement**

- Improvement in headache (100%) was there in all patients.
- 56 patients were having vision complains in those 47 patients (83%) reported vision improvement.
- 8 patients were having same vision as preop & 1 patient reported vision deterioration after surgery.

**7. Post operative complication**

- Diabetes insipidus was most common post operative complication followed by electrolyte imbalance and csf leak.
- 20 patients developed Diabetes Insipidus post operatively. In that, 18 patients got cured with inj. vasopressin or tab desmopressin. 2 patients required long term treatment with tab, desmopressin for 6 months.
- 12 patients developed electrolyte imbalance. 2 patients had hypernatremia, 8 patients had hyponatremia and 2 patients had hypokalaemia. All patients were managed with medical management except 1 patient of hypokalaemia who was also having delayed csf leak and meningitis, not responded to medical management and eventually expired.
- 4 patients had csf leak after surgery. 3 patients presented in post op day 1, they were immediately taken for revision surgery. Leak was identified and sealed by 3-layer reconstruction using fat, fascia and Haddad flap done. Patients were improved completely post-op with no CSF leak. 4th patient presented with delayed csf leak and she develops meningitis, hypokalemia & patient eventually expired.
- 2 patients died after surgery. One patient did not recover from anaesthesia. Another patient died after surgery due to meningitis/hypokalemia due to delayed csf leak which happened in 3rd week. This patient was previously operated, this was her 2nd revision surgery. Adequate Flap was not available. Flap was raised from remaining part of septum & floor nasal cavity. Pt developed delayed flap necrosis leading delayed csf leak. Pt developed hypokalemia which not responding to medical management. Pt GCS deteriorates rapidly & eventually patient expired.



**Figure 3 : Post operative complications**

**8. Surgical outcome**

**Table 3 : Surgical outcomes in endonasal endoscopic surgery**

Sr.No.	OUTCOME	NO. OF PTS	%
1	GTR	52	84
2	NTR	6	10
3	STR	4	6
4	Headache improvement	62	100
5	Vision improvement	47	83
6	Diabetes insipidus	20	32
7	Electrolyte imbalance	12	19
8	CSF leak	4	6
9	Meningitis	1	2
10	Mortality	2	3

**DISCUSSION**

- Recent years, endoscopic endonasal trans-sphenoidal surgery becomes most popular choice for neurosurgeons to operate skull-based tumours. This is because of minimal invasiveness, low complications rate, and lower morbidity and mortality rates compared to the traditional approaches.[17]
- Majority of patients were between age of 41-50 yrs (29%) and 31-40 yrs (34%). In this study, 60% patients were females & 40% patients were male. In a study of 94 patients done by Faraj & Wissam J. Sagban, 54% patients were females and 46 % patients were males.[18]
- Most common presenting symptom was Headache seen in all patients (100%).
- In our study, vision complains were seen in 56 of patients, in those 47 patients (83%) shows visual improvement. In a study done by Fernandes and Nunes, 77.8% patients presented with visual symptoms. Out of these 80.8 % patients showed visual improvement.[19] In study of Kutlay M, Durmaz A et al rate of visual improvement was 84%.[20]

- The most frequently encountered tumour was pituitary macroadenoma (66%), followed by craniopharyngioma (13%), meningioma (10%), clival chordoma (7%) & ossifying fibroma (3%). in study of Wissam, most frequent tumour was pituitary macroadenoma (67%), which was followed by craniopharyngioma (11%), Meningioma 6%.[18]
- Gross total resection (GTR) was done in 88 % patients in our study as compare to Kutlay M, Durmaz A, Özer İ, A et al. study which shows 75% GTR in 88 patients.[20]
- Most common post operative complication was diabetes insipidus in about 32% of patients followed by Electrolyte imbalance in 19% patients.
- CSF leak reported in 6.6% of patients. 7.3 % csf leak reported in Van Garven & Zhen study.[17]
- 3% mortality seen in this study (2 death in 62 patients). Faraj and Wissam study [18] showed 2.1% mortality.[18]

## CONCLUSION

The development of endoscopic techniques has opened up vast perspectives in the field of skull base surgery. Trans-sphenoidal endoscopic approach from skull base tumours has become a well-established method for treating skull base lesions. Endoscopic surgery provides access to wide range of lesions in a wide range of sites by using the natural surgical corridor of the nasal cavities. The major factors that predict the success of endoscopic approach are appropriate patient selection along with good pre- and post-operative specialized care.

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