

Role of Transcranial Endoscopy in Management of Sellar and Suprasellar Lesions Projecting in to Ventricular System

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Abstract

Introduction: This article is aimed to evaluate the role of Transcranial Endoscopy in management of sellar and suprasellar lesions projecting in to ventricular system with the particular focus on pros and cons of all the approaches surgeon take in the removal of the lesion. **Subjects and Methods :** 46 patients who had undergone tumor resection employing transcranial endoscopic surgical approach. They were included in the study. After the approval from the Institutional Ethical Committee, informed consent form was provided to all 46 patients and along with the brief presentation about study. After getting the consent, retrospective review of the case files of the patients was carried out. We went through symptoms presented by patients, location of tumor and its relation with adjacent structures, their preoperative and post-operative radiological images and results of Ophthalmological examinations, hispathological examinations, endocrinological tests and neuropsychological tests. In addition to this, all the complications occurred during surgery were noted. **Results:** Three patients developed symptoms of cerebrospinal fluid leak (CSF). two of patients recovered on their own within 3 days after the occurrence of CSF. Common neurological manifestations were shown in figure 1 in which headache was present in 45 patients, vomiting were noted in 39 patients, impaired vision were found in 35 patients, Diplopia and Ptosis were noted in 5 and 4 patients respectively. **Conclusion:** The Transcranial Endoscopy is still an effective approach. High-resolution 3D MPR MRI can be helpful to not only identify the shape of the tumor and involvement of optical canal but also to decide the best suited approach for a particular case.

Keywords: Trans cranial Endoscopy, Sellar region, Suprasellar lesions, Pituitary, Sella turcica.

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Introduction

The sellar region, a significant and a tiny compartment in basicranium, incorporates saddle shaped sella turcica and pea shaped hypophysis gland. The gland has two lobes; anterior and posterior. The entry to sellar region limited by cavernous sinus and internal carotid artery on both side laterally, on above by optic chiasma, optic nerves and arteries of circle of willis and on posterior aspect by basilar artery and the brainstem.

The sellar along with the suprasellar region is a sophisticated area where in numerous lesions and embryological anomalies can be seen. Cells rests which give rise to developmental tumor, collectively called craniopharyngioma, can be found present in the sellar and its adjacent areas, III ventricle and posterior wall of pharynx. Amongst all the tumors seen in this region, pituitary adenomas appear relatively more common than others and accounts for approximately 10-15% of all the tumors occurring intracranially, placing it on third

position.^[1,2] More over, incidence of adenomas of hypophysis is approx. 5 in hundred thousand.^[3,4]

Conventionally, transsphenoidal surgical approach was used to deal with lesions (pituitary adenoma, cysts of Rathke's cleft and craniopharyngioma) of sellar and its adjacent areas, however with the induction of endoscopic techniques in medical field, Neuroendoscopy, which provides vivid visual coverage, minimal trauma, high rate of total removal and speedy recovery, is gradually replacing the conventional method.^[5,6]

Meningiomas at tuberculum sellae is a slow-growing small benign tumor. Limbus of sphenoid, prechiasmatic sulcus, diaphragm sellae and the tuberculum are the sites where it is usually seen. In terms of the incidence, it is 3-10% of all the meningiomas occurring intracranially. Presence of important structures around tuberculum sellae makes the resection of tumor here complex and tough. Each patient presenting tumor

present peculiar situation so surgeons need to brainstorm to find a best method to resect bypassing all the structures. Due to the complexity of the surgery in this reason, resection of meningiomas has been one of the most difficult trail in neurosurgery. [7,8]

The tuberculum sellae is a ridged bony elevation in the sphenoid bone anterior to the hypophysis fossa which lodges pituitary gland. It is just behind the chiasmatic groove. The hypophysis fossa is covered superiorly by two layered sheet of dura mater called diaphragma sellae attaching anteriorly to the tuberculum sellae while posteriorly to posterior crinoid process. This flat sheet of dura mater has a round hole accommodating passage for stalk of pituitary. There are several important structures are around this landmark. Anteriorly, it is in relation with optic chiasma and anterior part of optic tract; posteriorly, there is parts of pituitary; laterally there is ICA artery, posterior communicating artery and clinoid process. [9]

There are several approaches adopted by surgeons from the resection of the tuberculum sellae meningiomas. Some are supraorbital keyhole, FTOZ, bifrontal, pterional, subfrontal, unilateral frontal. However with the induction of endoscopic techniques, surgeons are nowadays using it for visualisation. [9]

A recent classification by Morisako et al., [10] gives a practical classification that classifies the tumours according to their site of origin. These tumours can thus either be intrasellar (arising within the sella), arising from anterior part of the stalk and growing into the prechiasmatic space, arising from the posterior part of the stalk and growing into retrochiasmatic space, and those located at the floor of the third ventricle being purely intraventricular craniopharyngiomas. The rare intrasellar or intracisternal tumours located in the subdiaphragmatic portion can be treated by a transsphenoidal approach. Tumours extending to the lower part of the third ventricle can be treated by the transcallosal or the transcortical approach. Small retrochiasmatic craniopharyngiomas can be removed by the subtemporal approach. For those tumours extending to the posterior fossa, the transpetrosal approach can be used. However, these tumours are very often of a mixed type.

Craniopharyngiomas extending from the sellar–suprasellar region to the third or lateral ventricle (that confirm to type III, IV, and V of Samii’s classification) present a particular problem because of the risk of damage to the optic pathways and the hypothalamus. [11] Multilobulated, multicompartamental craniopharyngiomas differ from the suprasellar tumours in presentation, endocrinological manifestations and surgical morbidity.

This article is aimed to evaluate the Role of Transcranial Endoscopy in management of sellar and suprasellar lesions projecting in to ventricular system with particular focus on

prons and cons of all the approaches surgeon take in the removal of the tuberculum sellae meningiomas. Even though surgeon nowadays use endoscopic tools for visualisation or resection but it has its own limitations and as well as criteria to employ; implying endoscopic technique isn’t suitable all lesions such as open transcranial surgical approach is more suited for larger tumor having extensive lateral invasion. [12,13]

Subjects and Methods

98 patients were admitted in Department of Neurology from July 2016 to August 2020 with sellar and suprasellar lesions. The lesions were confirmed by radiological and histopathological exams. In this study, 46 patients out of 98 had undergone tumor resection employing transcranial endoscopic surgical approach. They were included in the study. After the approval from the Institutional Ethical Committee, informed consent form was provided to all 46 patients and along with the brief presentation about study. After getting the consent, retrospective review of the case files of the patients was carried out. We went through symptoms presented by patients, location of tumor and its relation with adjacent structures, their pre-operative and post-operative radiological images and results of Ophthalmological examinations, histopathological examinations, endocrinological tests and neuropsychological tests. In addition to this, all the complications occurred during surgery were noted.

Inclusion criteria

1. TS or PS meningioma confirmed by radiological and histopathological examinations
2. Availability of pre- and postoperative MRI images
3. Availability of results of both pre- and postoperative Ophthalmic examinations including visual acuity, fundoscopy and visual field assessment; and
4. No history of surgery performed on the same meningioma.

Exclusion criteria

1. Lesion wholly enveloping the internal carotid artery (ICA) or anterior cerebral artery complex
2. History of surgery performed on the same meningioma.

To observe the extent of removal of tumor postoperative MRI scan and follow up was done and to remove any form of conflict of interest MRI and CT images were re-examined by independent neuro-radiologists. If there is total removal of MRI visible tumor then it was referred as Gross-total resection (GTR).

Results

There were 46 patients age ranged from 30 to more than 70 years were anticipated in this study. Distribution of patients according to age, Abnormal hormones, Degree of resection of the tumor After the operation and Cerebrospinal fluid leak were shown in [Table 1]. Three patients developed symptoms of cerebrospinal fluid leak (CSF). Two of patient s recovered on their own within 3 days after the occurrence of CSF. Common neurological manifestations were shown in figure 1 in which headache was present in 45 patients, vomiting were noted in 39 patients, impaired vision were found in 35 patients, Diplopia and Ptosis were noted in 5 and 4 patients respectively. Other Endocrinological manifestations and Uncommon manifestations were shown in figure 2. Common neurological manifestations were shown in [Figure 1] in which headache was present in 45 patients, vomiting were noted in 39 patients, impaired vision were found in 35 patients, Diplopia and Ptosis were noted in 5 and 4 patients respectively. Other Endocrinological manifestations and uncommon manifestations were shown in [Figure 2].

The TCA procedures included approaches such as frontobasal inter-hemispheric, sub-frontal and supraorbital. Surgeon opted a particular approach on the basis of his/her preference and the shape of tumor.

Site and width of the tumor, preference of surgeon and asymmetry in blurring of vision were the factors affecting the direction of the approach. The dura mater was cut in a curvilinear style and meningioma was unmasked at tuberculum sellae. Bipolar cautery was used for devascularization along the floor of the planet and tuberculum. Then, cautious microdissection was done to debunk the tumor tissues to prevent in arachnoid membrane. Decompression of optic canal or Anterior clinoidectomy wasn't performed in all the cases. While doing TCA, opening of the falciform ligament was done first and then the removal of intra-canalicular part of the tumor at the entry point of the canal. If there is still some tumor tissue, complete unroofing of the optic canal was done with great care. Degree of resection of the tumor was performed in which 39 underwent complete resection and 7 had partial resection of the lesions.

Extensive adhesion to the adjacent vascular or ocular structures, residual tumor tissues within the optic canal and calcified mass of tumor were major reasons for partial resection. After TCA procedure, cerebral retraction-associated complications, including stroke - 2 patient, intra-cerebral hematoma - 1 patient, and subdural hematoma - 2 patients. Abscess, meningitis, and death from unknown causes were seen in some cases.

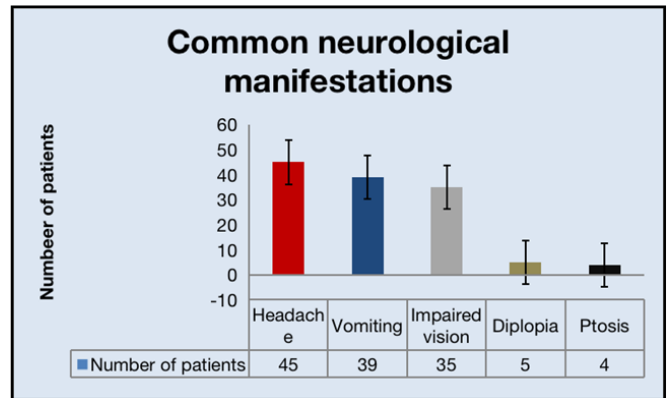


Figure 1: Common neurological manifestations

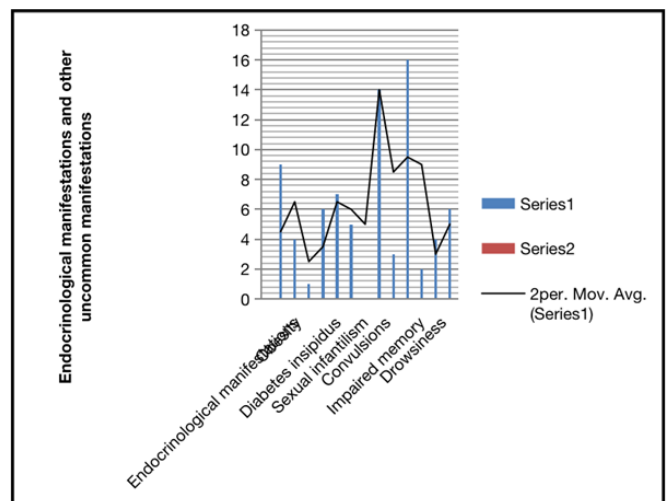


Figure 2: Endocrinological manifestations Uncommon manifestations

Discussion

There has no report of finding diffuse large B cell lymphomas in the tuberculum sellar region. There was only one malignant lymphoma reported in the study carried out in multi-institutional level in Germany where in 4122 cases with pituitary adenoma and mass in the sellar region was included. The type of the lymphoma wasn't disclosed. In USA, reported cases with primary CNS lymphoma was only 3% of the total cases.^[14] While reviewing the literature, primary pituitary lymphoma was rare and finding of such lymphoma was scarce. In the study carried out in 2015, they stated that they had found 33 cases of primary lymphoma generally being B cell type (diffuse large B cell lymphoma) without any systemic involvement in patients with normal immune response. In our study we found 3 such cases. Among the 33 cases, 4

Table 1: Distribution of patients with Age, Abnormal hormones, Degree of resection of the tumor After the operation and Cerebrospinal fluid leak

Age	No.	Abnormal hormones					Degree of resection of the tumor		Cerebrospinal fluid leak	
		ACTH	GH/IGF-1	PRL	TSH	Other	Entire	Partial	No r	Repairing
30-40	2	-	-	-	2	-	2	-	-	-
41-50	5	-	-	-	2	3	5	-	1	-
51-60	8	3	2	1	2	-	6	2	-	1
61-70	13	2	3	1	1	6	12	1	-	1
>70	18	5	3	2	1	7	14	4	2	-

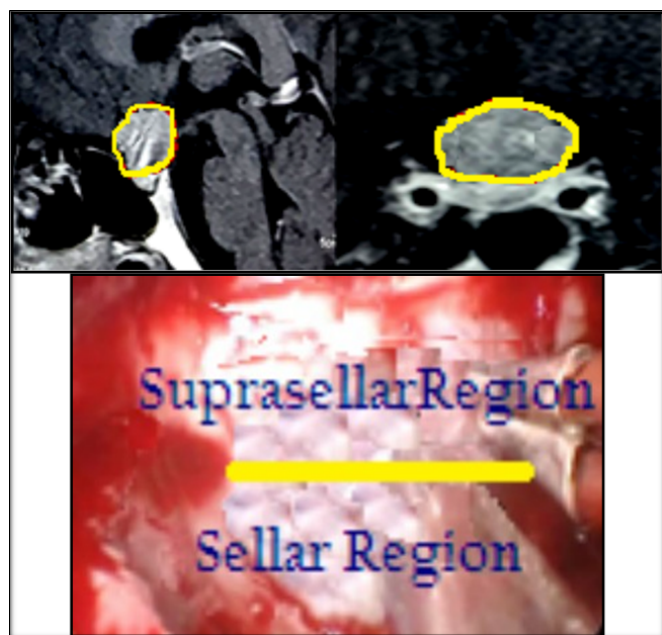


Figure 3: The solid mass is in the saddle and suprasellar area, showing uneven enhancement. (Coronal and sagittal view of MRI), b-After removal of the saddle floor bone, we can see the boundary between the saddle and suprasellar area.

patients had pituitary adenoma along with the primary pituitary lymphoma while 3 has hypophysitis.^[15] While analysing the data in the basis of gender, female cases were predominant with average age of 59 years. The most common symptoms being the headache. Approximately 61% patients had CN deficit in the cavernous sinus while 70% of the patients presented hypopituitarism.^[15] These presentations don't give clear distinction between primary pituitary lymphoma and pituitary adenoma. However, diabetes insipidus was seen in 36% of the cases which isn't that common with respect to

the pituitary adenoma.^[15] MPNST is a rare finding in the sellar region. In the study conducted by Saeger et al., only 9 sarcomas was reported among total 4122 sellar tumors, out of which 7 was chondrosarcomas while 2 were histologically unspecified sarcomas. MPNSTs are the soft tissue sarcomas primarily seen in the upper and lower extremities. Its rare in head and neck region. According to the database of the Surveillance Epidemiology and End Results, only 324 MPNST cases of head and neck has been reported till now in comparison to the 1680 cases at other different locations.^[16]

Ajlan et al,^[17] reported that both transcranial and endoscopic approach are similar in terms visual

outcomes. Even though from the statistical analysis of two approaches; transnasal endoscopic and transcranial, it showed there was less complication in transnasal endoscopic approach but there more instances of partial resection.^[18,19] In this study, transcranial approach showed much better outcome than that of transnasal. In case of transnasal there were several cases increased leakage of cerebrospinal fluid. But in terms of the number of the cases in which both approaches were performed, transnasal procedure was done in far less number of the cases. Thus, this isn't the best data to make the final conclusion on both the approaches.

Endonasal approach is better suited for the carcinopharyngiomas of sellar, and suprasellar region in comparison to the transcranial approach. Its is tough to evaluate the transcranial approach to that of trans-sphenoid approach as transcranial approaches is employed in cases of larger tumors having greater lateral invasion, encasement of vascular structures and significant calcification in periphery while transnasal is performed in smaller size tumors present in intrasellar region.^[20]

Conclusion

With the induction of endoscopic technique having better visual field and upgrade in this approach with each case and experience of other different approaches has extended

the area of approach in resection of tumor in sellar and its adjacent region. The surgical endeavour i.e pathology, once thought to be achieved only via transcranially approach can be also done with less invasive transnasal approach. Endoscopic approach is a complex surgery. It requires fine skill and familiarity with the endoscopic equipment. It can be achieved though specialised training in lab along with the ad hoc anatomical dissections and observation during operation. After performing significant number of standard sellar operations and gaining skills and knowledge of endoscopic anatomy, complication arising during operation or post-operative period can be avoided. Transcranial endoscopic approach is still an effective approach. High-resolution 3D MPR MRI can be helpful to not only identify the shape of the tumor and involvement of optical canal but also to decide the best suited approach for a particular case.

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