

## Research Article

# Transsphenoidal hypophysectomy surgery

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### Abstract

#### Objective

The aim of this study was to systematically collect data of patients undergoing transsphenoidal hypophysectomy and analyse with regard to clinical presentation, short and long term complications and demographic details.

#### Methods

This is a prospective study of transsphenoidal pituitary surgery at National Hospital Sri Lanka from May 2013 to August 2019. 108 patients who underwent transsphenoidal hypophysectomy for pituitary tumours were included. All the patients who underwent the procedure for the first time and for revision surgery were included in the study.

#### Results

Out of 108 patients, there were 87 primary cases and 21 revision cases. The average age at presentation was 45.39 years. The youngest patient was 2 years and 6 months old while the oldest was 76 years. 55 patients were male and 53 patients were female. The most common complaint at presentation was headache which affected 36 patients (33.3%). The visual disturbance was the second most common presentation, occurring in 32 individuals (29.6%). 103 patients out of 108 have been operated using trans-nasal transseptal approach and rest (5) by trans labial transseptal method. The mean postoperative hospital stay was 9.8 days (range 3-17 days). The mean follow-up period was 35.7 months (range 3-75). 6 patients had died during the follow up period and 23 patients had defaulted follow up. Postoperative CSF leak occurred in 8 patients (7.4%) and anosmia was noted in 6 patients (5.5%).

#### Conclusion

Microscopic transsphenoidal pituitary is a safe and effective treatment for pituitary tumours, and the commonest complication is CSF leak. Anosmia is one of the complications of this procedure.

**Key words:** Hypophysectomy, Transsphenoidal Surgery

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## **Introduction**

Surgical treatment of a pituitary tumour has been described over the last 100 years. The first described procedure was a transcranial approach by Horsely in 1906. In 1909 Cushing described the sub labial transseptal approach to enter the sphenoid sinus. About 3 years later in 1912 Chiari described the trans ethmoidal and transsphenoidal route. During the last 20 years, with the development of endoscopic sinus surgery there have been many papers published about endoscopic pituitary surgery which claim better results than microscopic surgery.

Transsphenoidal hypophysectomy has been practiced as a combined surgical procedure by ENT and Neurosurgical teams at the National Hospital of Sri Lanka (NHSL) for last twenty years. However prospective collection of data and analysis of results had not been done before. This technique avoids the need for craniotomy and resulting complications of retraction of the brain. This study was designed to collect all the relevant data of these patients which will help us to see the outcome and the incidence of complications.

## **Patients and methods**

We performed a prospective study of 108 patients who underwent microscopic transsphenoidal hypophysectomy at National Hospital Sri Lanka between May 2013 and August 2019. Ethical approval was obtained from the ethical review committee of the National Hospital of Sri Lanka. Patients consent was obtained before surgery. All the patients who underwent this procedure for the first time and for revision surgery were included in the study. All patients were subjected to surgery by the same team of surgeons. In the immediate period patients were managed in the neurosurgery ICU and neurosurgery ward where initial data were collected. Patients were reviewed after 3 months and rigid nasal endoscopy was performed to examine the nasal cavity and the surgical site.

## **The Procedure**

The surgery was performed under general anaesthesia via oro-tracheal intubation. The patient was kept supine, with the head tilted toward the surgeon and at a 30° extended position. Fat and fascia were harvested from the periumbilical region of the abdomen. The patient, C-arm device, and the microscope were then draped following aseptic techniques.

In the transnasal technique, a 'Kilian' incision was made on the anterior septum on the right side and the mucoperichondrium was separated from the cartilage septum. The Mucoperichondrium over the bony septum is then elevated on both sides. The Bony septum is then removed and preserved in saline for later use. The rostrum of the sphenoid sinus is identified and removed to open the sphenoid sinus. The opening of the sphenoid sinus is sufficiently widened to insert the speculum blades in to the sinus. An incision is made along the right alar groove of the nose to get additional space for the speculum. The bony septum of the sphenoid sinus is carefully removed to get both side of the sinus is exposed (It is important to study the bony partition of the sphenoid sinus on CT scan before starting the surgery as some of the septa may insert near the carotid canal. These septa have to be carefully removed as otherwise the carotid artery may be damaged). Once the Sella is fully exposed the speculum is inserted and stabilized. The c-arm image is taken to confirm the approach. The ENT surgeon who performed up to this part of the surgery will then handover the patient to the neurosurgeon who will focus the microscope on the Sella and take another c-arm image to confirm this position. The anterior wall of the Sella is opened using curettes and Bone Rongeurs. The Dura mater was opened under microscopic visualization. The tumour was removed using micropituitary rongeurs, micro suction cannulas, and pituitary curettes while preserving the normal pituitary gland tissue. The arachnoid membrane was visualized after removal of the tumour. Haemostasis

was achieved using surgical<sup>TM</sup>. The cavity was filled with a fat graft and fascia was laid over it to prevent CSF leak. Tissue glue was used in patients where the arachnoid membrane was violated. Bony pieces of septum are replaced and the mucoperichondrium was sutured with absorbable suture. The Alar incision was repaired in two layers. Nasal packs are inserted to both nostrils which are usually removed after 72 hours.

In the sub labial transseptal technique, the mouth was cleaned with betadine and sub labial tissues were infiltrated with adrenaline 1: 200,000 solution. A Transvers incision (4cm) was made about 5cm above the gum margin and deepened up to the periosteum which was then incised along the same line. The Nasal spine is identified in the midline and a vertical incision was made to identify the caudal end of the nasal septum. The incision is deepened in to the subperichondrial plane and the dissection is continued on to the sphenoid.

## Results

Between May 2013 and August 2019, 108 patients underwent transsphenoidal hypophysectomy at the National Hospital Sri Lanka. There were 87 primary cases and 21 revision cases which met the inclusion criteria. The average age at presentation was 45.39 years. The youngest patient was 2 years and 6 months old while the oldest was 76 years. 55 patients were male and 53 patients were female. As demonstrated in the figure 1 most of the patients were between 31 to 60 years of age. Only 4 patients were operated below the age of 12.

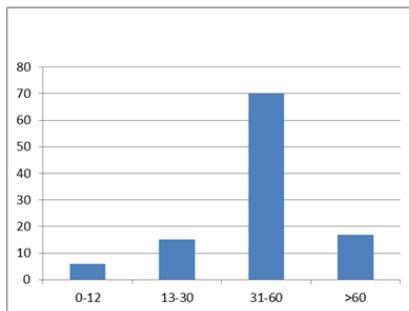


Figure -1: Age distribution

The most common complaint at presentation was headache which affected 36 patients (33.3%). The visual disturbance was the second most common presentation, occurring in 32 individuals (29.6%). Remaining 37.0 % had different types of presenting complains including hypopituitarism and convulsion.

103 patients out of 108 were operated using the trans-nasal trans septal approach and rest (5) by the trans labial trans septal method. Children and small made adults underwent trans-labial approach. The mean postoperative hospital stay was 9.8 days (range 3-17 days). The mean follow-up period was 35.7 months (range 3-75). 6 patients had died during the follow up period and 23 patients had defaulted follow up.

Postoperative CSF leak occurred in 8 patients and Septal perforations were noted in 5 patients. 3 patients had adhesion, 4 had epistaxis, 6 had anosmia and 3 patients complained nasal obstruction. Other possible complications, such as oro-nasal fistula, stenosis of nasal valve or epiphorea were not identified in this study.

Complication type	Number of cases	n-108 %
CSF Leak	8	7.4
Epistaxis	4	3.7
Nasal Obstruction	3	2.7
Anosmia	6	5.5
Septal Perforation	5	4.6
Adhesions	3	2.7

Table 1: Complications

### Discussion

Harvey Cushing, an American neurosurgeon is the one who introduced transsphenoidal approach for pituitary surgery in the early 20<sup>th</sup> century. The surgical management of pituitary lesions, as in many other fields of medicine, has significantly advanced during last few decades. Transsphenoidal surgery is the mainstay of treatment for most kinds of pituitary adenomas and other sellar masses. It is important to assess the pneumatization of the sphenoid sinus, as poorly pneumatized sphenoid sinuses (Figure-2) are not suitable for this approach.

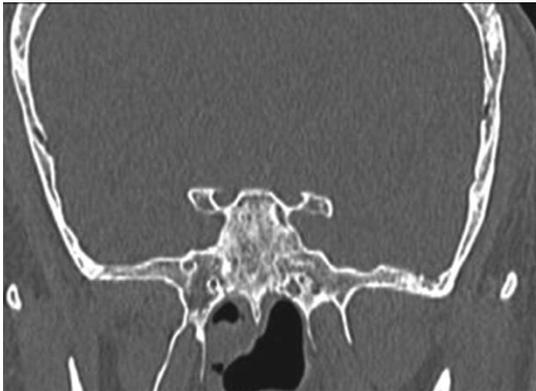


Figure 2 - CT image showing poorly pneumatized sphenoid sinuses

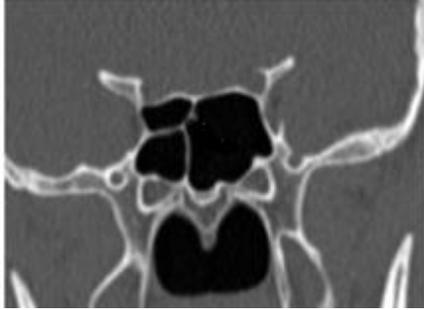


Figure-3: CT image showing well pneumatized sphenoid sinuses

We have reported our experience of Transsphenoidal pituitary at National Hospital Sri Lanka from May 2013 to August 2019. In our study we analysed a total of 108 patients who underwent transsphenoidal hypophysectomy in neurosurgical department. Mean follow up period was 35.7 months and the majority of patients (98%) utilized the trans-nasal transseptal approach and others the trans-labial transseptal route. In this series 7 patients had died during the follow up period from which 6 patients had died from the disease related cause. The disease related mortality in our study population was 5.5 %. This figure is significantly high compared to the results of previous studies described in the literature which is between 0.9% - 1.4%.

The mean age was 54.4 years and most of the patients were between 31 to 60 years. Majority of patients were male (57.5%) while female patients represented 42.5%. Compared to similar studies in literature which also show same age distribution and mean age between 30-60y. Most of the studies regarding transsphenoidal surgery show female predominance which was evidenced in our series as well. [4,5]

As in most hospitals worldwide, pituitary tumours are managed by a multidisciplinary team in our hospital. It involves collaboration of multiple specialties, notably, Otorhinolaryngologists, Neurosurgeons, Endocrinologists and Radiologists. This multidisciplinary approach has improved patient care and has given a great opportunity to share current knowledge between each field. Apart from that, recent advancement of these subspecialties has, synergistically, played an essential role in decreasing morbidity and mortality of pituitary surgery. [7,8] With the elevation of the average life expectancy of the Sri Lankan population and the advancement of subspecialties mentioned above, the number of pituitary neoplasms diagnosed in our hospital is significantly increased during the last decade. Widespread use of MRI and CT studies has also largely contributed for this.

Because of the close relationship to orbital structures and cribriform plate, transsphenoidal approaches to the pituitary needs accurate understanding of the relevant anatomical relationships and possible anatomical variation. This task can be challenging in patients with poor anatomical landmarks, especially in those who have had previous surgery or who have disease invading or engulfing the surrounding structures. [9,11] We have experienced that hyper extension of the head increases the risk of CSF leak by unintentionally directing the dissection toward the base of the skull. To minimize this from happening we always make sure to keep the neck flexed and head extended with chin up and turning head toward slightly to the right side.

Apart from this, in our institution, we currently use intraoperative c-arm x-rays for all transsphenoidal approaches to the pituitary. This helps with vertical orientation to the sella turcica defining the superior and inferior margins of it. Knowing the superior and inferior limits of the sella turcica minimize unnecessary opening of the planum sphenoidale and the risk of cerebrospinal fluid leak and anosmia [9, 10]. In our study there were 8 patients who had CSF leak where 6 of them were settled with conservative management and other 2 were treated with surgical repair.

In our study 7% of patient developed anosmia following surgery. The human olfactory mucosa includes approximately 1.25% of the nasal mucosa and comprise 2 cm<sup>2</sup> of the superior portion of the nasal vault, overlying the superior nasal septum, cribriform plate, and superior aspect of the superior turbinate. [20] During transseptal surgeries certain degree of surgical trauma to these areas is not uncommon. This can lead to direct trauma to the olfactory epithelium especially by crush injury caused by the nasal speculum resulting olfactory dysfunction. Other possible reasons have been identified for this loss of olfactory function is due to change of air flow dynamics within the olfactory mucosa following surgery. Therefore, we suggest surgeons should handle the intranasal structures in a meticulous fashion including the olfactory neuroepithelium. Apart from that, since nasal packs are kept for 72 hours postoperatively in all of our patients, this may also have contributed to the high number of anosmia detections. Therefore, we have decided to extend our study while keeping the pack in situ only for 48 hours and compare the results. Development of a new techniques like endoscopic surgery decrease injury to the olfactory epithelium minimizing olfactory dysfunction [18, 19, 20]. This could preserve quality of life.

Three-dimensional image-guided navigation system (IGNSs) has been introduced to our institution recently and few transsphenoidal Hypophysectomies were done under its guidance. Literature indicates that the use of navigation system improves the accuracy of the dissection, reduces the intervention time, improves the quality of the life, reduces the morbidity, and decreases in intensive care stays and hospital costs. It is more beneficial when operating on revision cases and patient with obscure anatomy. [11, 12]

There are several different techniques for transsphenoidal pituitary surgery that have been described and among them, the sub-labial transseptal approach and transnasal transseptal approach are used most commonly. In our study, there were 103 patients who underwent transnasal transseptal approach and 5 patients with sub-labial transseptal approach. Use of the endoscope for pituitary tumour resection was recently started in our hospital. Endoscopic pituitary surgery represents significant advancement in pituitary surgery and it has replaced traditional microscopic approach at many institutions. Excellent anatomic visualization by the endoscope especially angled-lens views such as 30, 45 and 70° facilitate direct visualization at the suprasellar region and around various anatomical corners. This eliminated the need to blindly curette for a suprasellar tumour which is the usually practice in microscopic surgeries.

Endoscopic transsphenoidal approaches are considered minimally invasive and have well recognized advantages over microscopic surgeries. The duration of hospital stay of patients is significantly lower than the microscopic transsphenoidal surgery. It is ranged from 3.2 to 3.7 days for the endonasal endoscopic approach and 5.3 to 8.3 days for open transseptal approach. [13] It has also been shown to result in a significantly lower rate of rhino-otological complications. (White et al.) Complications occurred in 33.3% of endoscopic procedures and 43.4% of open procedures [13]. Other than that recurrence was more common after microscopic surgery (28.4%) than after endoscopic surgery (18.2%; p = 0.219). In our study the recurrent rate was 19.4% which is a little low compare to available data.

## **Conclusion**

Transsphenoidal microscopic surgery has been in practice in the National Hospital of Sri Lanka over last 20 years. This method has been established very well with the participation of ENT and neurosurgeons. Although, previous data was not available, the presented data suggest that the recurrence rate in our series is lower than the other published data of the transsphenoidal microscopic surgery. Also some modification of the technique and post-operative management may help to reduce the complications future.

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