

Case Report**Endoscopic transsphenoidal resection of craniopharyngioma**

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ABSTRACT

Background: Endoscopic surgery techniques had been advancing in this last two decades. Transsphenoidal approach endoscopic surgery to the skull base provides better visualization of the operation field compared to microscopic surgery, and also brought lower morbidity than other techniques. **Purpose:** To report a transsphenoidal endoscopic skull base surgery for craniopharyngioma resection. **Case Report:** A case of craniopharyngioma in a 47-year-old man. The tumor resection was performed with transsphenoidal endoscopic approach, in collaboration with a neurosurgeon. **Clinical Question:** Is transsphenoidal endoscopic skull base surgery approach, the appropriate surgical procedure for craniopharyngioma management? **Review Method:** Evidence based literature study of skull base surgery with transsphenoidal endoscopic approach in craniopharyngioma through database Cochrane library, Pubmed Medline, and hand searching. **Result:** Skull base surgery with transsphenoidal endoscopic approach was minimally invasive with maximally invasion compared to transcranial surgery, and also provided better view, and could reduce complication rate. **Conclusion:** Skull base surgery with transsphenoidal endoscopic approach offers more advantage in skull base lesion management compared to other techniques. Collaboration between neurosurgeon and otorhinolaryngologist using this technique could reduce complication and morbidity rate.

Keywords: skull base surgery, endoscopic endonasal transsphenoidal, craniopharyngioma

ABSTRAK

Latar belakang: Teknik operasi endoskopi mengalami perkembangan pesat dalam dua dekade terakhir. Bedah basis kranii dengan pendekatan endoskopi transfenoid memberikan kualitas visualisasi lapang pandang operasi lebih baik dibanding menggunakan mikroskop, dan juga mengakibatkan morbiditas lebih rendah dibanding teknik lainnya. **Tujuan:** Melaporkan keberhasilan bedah basis kranii dengan pendekatan endoskopi transfenoid pada kraniofaringioma. **Laporan kasus:** Seorang laki-laki 47 tahun dengan diagnosis kraniofaringioma yang dilakukan tindakan reseksi tumor dengan pendekatan endoskopi transfenoid berkolaborasi dengan ahli bedah saraf. **Pertanyaan Klinis:** Apakah bedah basis kranii dengan pendekatan endoskopi transfenoid merupakan teknik operasi yang tepat untuk tatalaksana kraniofaringioma? **Telaah literatur:** Telaah literatur berbasis bukti mengenai bedah basis kranii dengan pendekatan endoskopi transfenoid pada kraniofaringioma melalui database Cochrane library, Pubmed Medline, dan pencarian manual. **Hasil:** Bedah basis kranii dengan pendekatan endoskopi transfenoid memberikan akses minimal dengan invasi maksimal, visualisasi lebih baik, dan dapat menurunkan angka komplikasi. **Kesimpulan:** Bedah basis kranii dengan pendekatan endoskopi transfenoid merupakan teknik operasi lesi basis kranii yang lebih unggul dibandingkan teknik lainnya. Kolaborasi antara ahli bedah saraf dan THT dapat mengurangi angka komplikasi dan morbiditas tindakan ini.

Kata kunci: bedah basis kranii, bedah endoskopi transfenoid endonasal, kraniofaringioma

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INTRODUCTION

Skull base surgery has been evolving by the advancement of endoscopic endonasal surgery.¹⁻³ These techniques were initially developed for paranasal sinus surgery, but their indications had been gradually extended to include endoscopic resection of pituitary tumors, and subsequently lesions of the clivus, olfactory cleft, planum sphenoidale, and also the petrous apex or infratemporal fossa.¹

The history of endoscopic skull base surgery is de facto the history of pituitary surgery. The first pituitary operation was performed by Sir Victor Horsley in 1889 via a transfrontal approach. But it was Schloffer who published the possibility of pituitary surgery via a transsphenoidal approach in 1906. Then in 1910, Oskar Hirsh, an otolaryngologist, introduced a transseptal transsphenoidal approach to the pituitary gland, an operation which is still in use nowadays.⁴

In 1992, Jankowski reported the first successful surgical cases using the endoscopic transsphenoidal approach to the hypophysis. This was the less traumatic route to the sella turcica, avoiding brain retraction, and also permitting good visualization, with lower rates of morbidity and mortality when compared to the transcranial route.⁵ It was Hardy however, who deserved much of credit for reestablishing the validity of the transsphenoidal approach when in 1960s he combined fluoroscopy and microsurgical techniques to further augment transsphenoidal pituitary tumor resection. All operations were performed via a single/double nostril approach.⁶

Endoscopic techniques have undergone tremendous advancement in the past years.

At this moment, endoscopic endonasal procedures are rapidly becoming an important method in the hands of otorhinolaryngologist and skull base surgeon.⁷

A large number of publications reflected the increasing appeal of this new technique. The growing interest of otorhinolaryngologists and neurosurgeons in this “minimally invasive” surgery is due to the major progress made over recent years. Constant progress in imaging, navigation systems, and instrumentations has also largely contributed to the widespread acceptance of this surgery.¹⁻²

Craniopharyngiomas are benign but locally invasive tumors of the sellar/suprasellar region that occur as two histological subtypes: adamantinomatous type (aCP) which occurs mainly during childhood, and papillary type (pCP) which is found exclusively in adults. The aCP is much more common than pCP with ratio 9:1. Craniopharyngiomas occur with an incidence of 0.13 per 100.000 person years with no gender differences. Age of diagnosis shows a bimodal distribution with peaks at 5-14 and 65-74 years.⁸

The transsphenoidal nasoendoscopic approach is considered providing better results in the management suprasellar tumors than craniotomy. Tumor resection with transsphenoidal endoscopic approach could be used in management of craniopharyngiomas effectively and safely. Over the past decade there have been further improvements in the transsphenoidal endoscopic technique that have resulted in lower complication rate compared to microscopic surgery.⁹

We would like to report a case of craniopharyngioma which was resected through endoscopic transsphenoidal skull base surgery procedure by otorhinolaryngologist in collaboration with a neurosurgeon.

CASE REPORT

A 47-year-old man was consulted to the Otorhinolaryngology Head-Neck Surgery Polyclinic of dr. M. Djamil General Hospital Padang, in July 14, 2019, from Neurosurgery Division with working diagnosis of sellar-suprasellar cystic tumor. Two days previously a ventriculoperitoneal (VP) shunt had been installed due to obstructive hydrocephalus. Patient was planned for transnasal endoscopic tumor resection. Patient complained of recurrent severe headache since 2009, with nausea and vomiting. There was a history of recurrent seizure attacks lasting for about 1 minute. No history of decreased of consciousness, limb weaknesses, or visual disturbances. There was no history of head trauma, and patient was given phenytoine 1x100 mg by the Neurosurgery clinic since 2009.

The physical examination revealed good general condition, compos mentis, and vital signs were within normal range. Nasal cavity was normal, eutrophic concha inferior and concha media, no septum deviation, no secretion. Ear and throat were normal. There was no lymph nodes enlargement in neck region.

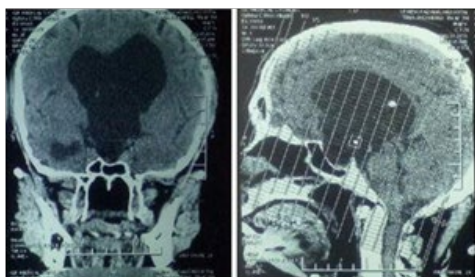


Figure 1. Paranasal sinus in coronal and sagittal plan

CT-Scan of paranasal sinus showed a lesion with cystic density in suprasellar region extending to anterior, obliterating and narrowing the 3rd ventricle. There was a dilated lateral ventricle system, with a VP shunt tip inside the ventricle opening. The conclusion was arachnoid cyst with obstructive hydrocephalus (Figure 1).

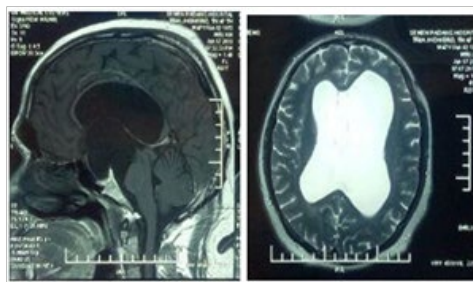


Figure 2. MRI brain sagittal and axial plan

Brain MRI images showed a lesion with cystic signal intensity (similar with cerebrospinal fluid/homogenous hyperintensity in T2WI [T2Weighted Image]) and not enhanced with contrast administration, in suprasellar region. The lesion was lobulated, with clear margin, regular contour, thin wall, and expanding to superior which compressing and narrowing the 3rd ventricle and showing dilatation of both lateral ventricles. The image was suggesting a suprasellar arachnoid cyst with obstructive hydrocephalus (Figure 2).

Based on anamnesis, physical examination, and supporting examinations, the working diagnosis was cystic tumor in sella-suprasellar region. The plan was to perform tumor resection through transsphenoidal endoscopic approach in general anesthesia, collaborating with a neurosurgeon. The risks and surgery procedures were explained to patient and his family, and they signed the informed consent. The pre-operative laboratory result, internal medicine and anesthetic examinations were normal.

The surgery was conducted on September 10th, 2019. Patient was placed in reverse Trendelenburg position. Septic and aseptic measures were performed in the surgery field. The operation was commenced first by the otolaryngologist by installing epinephrine and lidocaine 1:4 nasal packing in both nasal cavities, followed by the infiltration of epinephrine and lidocaine 1:200.000 in bilateral nasal septum. Posterior septum mucosa was incised, the cartilage and

mucoperichondrial were separated. Rostrum was lifted and right and left sphenoid sinuses were joined. After the sellar base was identified, the surgery was taken over by the neurosurgeon. The superior wall of the sphenoid was drilled (Figure 3a).

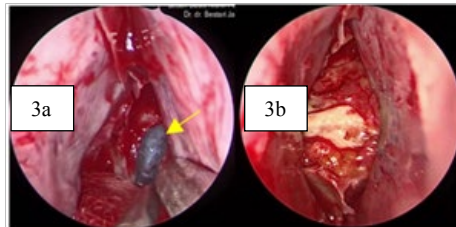


Figure 3. **3(a)** A mass was seen at the sellar base after sphenoid wall had been drilled **3(b)** Postoperative defect sealed with fat graft

A cystic mass was in view, then it was incised and a reddish oily fluid flowing out. Afterwards the tumor capsule was extirpated. The postoperative defect was patched using periumbilical fat graft smeared with fibrine glue, and finally the postoperative wound was closed with nasoseptal flap (Picture 3). The bleeding was controlled and anterior packs were placed in both nasal cavities. The surgery lasted two and a half hours. Patient was placed in Intensive Care Unit for one day, and received Ringer Lactate fluid drips, Ceftriaxone injection 2x1 gr and Omeprazole 2x40 mg.

On September 13th, 2019, 4 days postoperative, the anterior nasal packs were taken out and evaluation was performed with anterior rhinoscopy. Nasal cavity was clear, eutrophic concha inferior and media, blood clot was present, and no bleeding. Patient was discharged on September 17th, 2019 and given Paracetamol 3x500 mg and Phenitoin 3x100 mg.

Patient came for follow up examination in Neurosurgery Polyclinic 2 weeks after surgery. He had minimal complaint of postoperative pain (Visual Analog Score 3). No more seizures, no visual disturbances, nor-ausea and vomiting. The histopathologic result showed keratin tissue with fibers

and lymphocyte cells, which confirmed the diagnosis of craniopharyngioma. Follow up in ENT Polyclinic on December 6th, 2019 (3 months postoperative) showed no nasal congestion, no nasal secretion, no bleeding, no post nasal drip, no nasal foul smell, no severe headache, no seizures, and no vomiting.

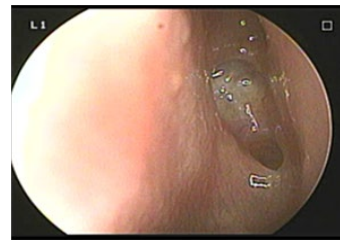


Figure 4. Nasoendoscopic view of sphenothmoidal recess 3 months postoperative

Nasoendoscopic examination showed clear right and left nasal cavities, eutrophic inferior and medial conchae, no secretion, and no septal deviation (Picture 4). The Peak Nasal Inspiratory Flow (PNIF) examination obtained the highest score 100. Patient was diagnosed as post craniopharyngioma resection through transsphenoidal endoscopic approach.

CLINICAL QUESTION

Is trans-sphenoidal endoscopic base skull surgery approach, the correct technique for craniopharyngioma management?

REVIEW METHOD

Literature search was performed with keywords “skull base surgery” AND “transsphenoidal endoscopic approach” AND “craniopharyngioma” through database Cochrane library, Pubmed Medline, and hand searching.

The selection of literatures was based on inclusion criteria, which were: 1) craniopharyngioma patients. 2) skull base surgery using transsphenoidal endoscopic

approach. The exclusion criterion was craniopharyngioma management using transcranial approach. The critical review was conducted on 41 literatures, before applying inclusion and exclusion criteria.

RESULT

The literature search obtained scientific publications which were released in the last 10 years, relevant with the topics and the complete academic scripts were available.

Based on Schwartz,¹⁰ prospective research for 3 years in New York, he concluded that endonasal endoscopic skull base surgery provided positive results. This approach was minimally invasive with maximally invasion compared to transcranial surgery.

Cagnazzo,⁹ in his systematic review of surgical outcomes over two decades from 48 articles and 1,186 patients over a period of 1995-2016, stated that craniopharyngioma surgery with transsphenoidal endoscopic approach brought better results, higher effectivity compared with transsphenoidal microscopic surgery. The transsphenoidal endoscopic method gave better visualization of surgery field, and reduced complication rates. He concluded that more complex lesions with difficult locations could be effectively treated with endoscopic surgery.

DISCUSSION

The tumor resection in this craniopharyngioma case had been conducted with transsphenoidal endoscopic approach.

Yang,³ stated that skull base surgery using transsphenoidal endoscopic method had several superior concepts than microscopic surgery. This technique provides wider visualization for assessing tumor involvement to adjacent structures. The skull base corridor for endoscopic endonasal approach could be divided into four ways: transnasal,

transsphenoidal, transethmoidal and transmaxillary.¹¹

For this patient transsphenoidal approach was chosen, taking into consideration the lesion was located in suprasellar-sellar region and the location of sphenoid sinus was at the cross section of sagittal and coronal cut.

Zhan,¹² conducted sellar region tumor resection with transsphenoidal endoscopic approach in patients with sellar lesion and reported a positive results. Comer,¹³ stated that transsphenoidal endoscopic technique could reduce the duration of surgery procedure. Quon,² reported that transsphenoidal endoscopic approach was safe and effective to be performed in pediatric skull base lesions.

This was due to transnasal endoscopy with various lens angles gave wider visual field of sella and suprasellar areas compared to microscopic surgery. Other benefit of transsphenoidal endoscopic technique is avoiding damage to adjacent structures which could be happened in transcranial approach.

The anatomical pathology result had disclosed that the tumor was craniopharyngioma. Muller,¹⁴ stated that surgery method was chosen according to tumor location and its expansion. For favorably localized tumors, the aim of treatment was to attempt preserving visual, hypothalamic, and pituitary functions. While for unfavorably localized tumors which was too close or involving the optic nerve, and/or the hypothalamus, a controversy existed over whether complete resection could still be attempted or whether a planned limited resection (biopsy, partial/subtotal resection) should be preferred.

Lee,⁴ disclosed that although craniopharyngioma was a benign tumor, it had a high risk tendency because the location is close to vital intracranial structures and the management protocol was still in controversy. Anyhow total tumor resection was superior than partial resection.

Postoperative defect could be closed with fat graft, smeared with fibrine glue. The

use of fat graft with overlay technique was recommended for transsphenoidal endoscopic surgery. Fat graft could prevent and stopped cerebrospinal fluid leakage and could be laminated with other layers. Transnasal endoscopic procedures for the closure of small and large skull base defects had proven to be reliable and more successful than craniotomy surgery. Successful management of these complex procedures requires a close interdisciplinary collaboration as well as continuous education and training of all team members. Verilaud¹ affirmed that use of fibrin glue for graft fixation could ensure water resistance, and maintain the mucosa and graft healing integration.

In this patient, a nasoseptal flap was also placed as an attempt for reconstruction of postoperative defect. Solares,¹⁶ stated that with the use of this flap, overall leak rate had been reduced to around 5%. Tewfik,¹⁷ confirmed that the nasoseptal flap (NSF) had dramatically reduced the rate of postoperative cerebrospinal leakage from 20% to <5% following expanded endoscopic skull base surgery.

Thompson,¹⁸ in his retrospective study on 93 patients who underwent transsphenoidal endoscopic skull base surgery, found out if less manipulation was done along the nasal corridor during the endoscopic procedure and preserving nasal physiological condition, the patients' postoperative symptoms may improve sooner. The patients also underwent posterior nasal septal resection to broaden surgical visual field, and there was no nasal complaint at 3 months postoperatively.

Maira,¹⁹ stated that amongst 36 patients which underwent sellar region tumor total removal using transsphenoidal endoscopic approach, all patients had good clinical results. Postoperative cerebrospinal fluid leakage occurred in 10 patients, but only one case required sellar surgical repair. Eight patients had tumor recurrence, 8 cases had diabetes insipidus, and two cases died of late complications. No patients had meningitis, and 16

out of 19 patients who had visual disturbance, experienced visual improvement.

Follow up of this patient until 3 months postoperative showed no complaints of severe headache, no seizures, no nausea nor vomiting, neither declining consciousness. According to Varshney,⁶ the otolaryngologist provided the exposure, and the neurosurgeon resected the tumor. Such collaboration had resulted in decreased rates of complication and morbidity.

From this case report, it could be concluded that transsphenoidal endoscopic base skull surgery approach for craniopharyngioma produced a satisfying result. This method gave good anatomical structure visualization, wider and clearer visual field, minimal neurovascular structure manipulation, and increased patient's quality of life. It is important to emphasize that the collaboration of neurosurgeons and otorhinolaryngologists could reduce complication and morbidity of this surgical approach.

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