Endoscopic Endonasal Surgery for Purely Intrathird Ventricle Craniopharyngioma

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BACKGROUND: **Extended endoscopic transsphenoidal surgery (EETS) is a safe and effective treatment for many suprasellar craniopharyngiomas, including those with third-ventricle involvement. Craniopharyngioma entirely within the third ventricle (purely intraventricular type), however, is generally regarded unsuitable for treatment with EETS.**

CASE DESCRIPTION: **Three patients underwent total removal of a purely intraventricular craniopharyngioma with inferior extension via EETS by direct incision of the bulging, stretched ventricular floor and fine dissection from the ventricular wall. In 2 patients with an anteriorly displaced chiasm, the space between the chiasm and pituitary stalk created a wide corridor to the ventricle, whereas in the third case, in which the infrachiasmal space was somewhat narrowed, partial sacrifice of the pituitary gland was necessary to obtain sufficient space. Despite preservation of the stalk in 2 patients, hypopituitarism and diabetes insipidus developed after surgery. There was no other complication including obesity.**

CONCLUSIONS: **Selected patients with purely intraventricular craniopharyngioma can be treated effectively and safely with EETS. Those with inferior extension in the interpeduncular fossa and anterior displacement of the chiasm may be suitable candidates.**

INTRODUCTION

Treatment of craniopharyngioma has been one of the biggest challenges confronting neurosurgeons since the era of Harvey Cushing. The surgical treatment for craniopharyngioma depends on their location. For those located either totally or partially within an enlarged sella (subdiaphragmatic-type), the standard transsphenoidal surgery (TSS) has been used. In contrast, those originating in the suprasellar region, the supradiaphragmatic-type, had been considered a contraindication for TSS. In the late 1980s, however, transsphenoidal removal of suprasellar tumors became possible by adopting what is termed *extended TSS*, through either the sublabial or the endonasal route.[1] This approach allows excellent midline access and visibility to the suprasellar region without brain retraction and with minimal neurovascular manipulation. We have also adopted this approach for the treatment of supradiaphragmatic craniopharyngiomas since 1998 at Toranomon Hospital in Tokyo.[2] The extended TSS became more common among neurosurgeons after the widespread use of endoscope in TSS, the extended endoscopic TSS (EETS).[2-10] However, EETS still has some limitations and is considered to be unsuitable for some craniopharyngiomas including those localized entirely within the third ventricle (purely intraventricular type).[1,2,5,8-10] We report herein our experience of 3 patients with purely intrathird ventricle craniopharyngioma who were successfully treated by EETS (Table 1).

CASE PRESENTATIONS

Case 1

A 65-year-old woman presented with a 2-month history of visual disturbance (bitemporal hemianopsia) and mild headache. Her past medical history was unremarkable. Basal levels of the anterior pituitary and its related hormones were all within the normal range. Magnetic resonance imaging (MRI) demonstrated an enhancing, round, solid tumor located entirely within the third ventricle and showing inferior growth down into the suprasellar space and interpeduncular fossa (Figure 1A, B). She underwent an EETS. Through a space between the

Key words
- Craniopharyngioma
- Endoscopic surgery
- Extended transsphenoidal approach
- Third ventricle

Abbreviations and Acronyms
BMI: Body mass index
EETS: Extended endoscopic transsphenoidal surgery
MRI: Magnetic resonance imaging
TSS: Transsphenoidal surgery

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anteriorly displaced optic chiasm and the stalk, the bulging, stretched floor of the third ventricle was incised in the midline (Figure 1E) (Video 1). A yellow-colored, soft, elastic tumor was dissected from the thin ventricular floor. There was a well-defined plane of cleavage between the tumor and the wall of the third ventricle, apart from the reverse side of the stalk, the tuber cinereum, where the tumor showed adhesion. The tumor was completely resected, with preservation of the stalk (Figure 1C, D). The large dural defect was repaired with a fascial patch graft[2] and a nasoseptal vascularized flap.[11] Her postoperative course was uneventful, and visual disturbance fully improved. Despite stalk preservation, panhypopituitarism and partial diabetes insipidus developed. One year after surgery, her body mass index (BMI) remained normal.

Video available at WORLDNEUROSURGERY.org

Case 2

A 29-year-old woman presented with a 2-month history of visual disturbance (bitemporal hemianopsia) and amenorrhea. She had hypogonadism, but pituitary function was otherwise normal. MRI demonstrated an enhanced, solid tumor in the third ventricle that showed inferior extension (Figure 2A, B). She underwent an EETS. Because the chiasm was displaced anteroinferiorly, the infrachiasmal space was somewhat narrow, which necessitated partial sacrifice of the pituitary gland during the tumor resection (Figure 2E). The tumor was dissected from the ventricular wall and was completely resected. Since tight adhesions between the tumor and the ventricular floor involved the stalk, the stalk was sacrificed (Figure 2C, D). She developed panhypopituitarism and diabetes insipidus, but her postoperative course was otherwise uneventful and visual disturbance fully improved. Her BMI was 20.6 and 23.8 before and 10 months after surgery, respectively.

Case 3

A 5-year-old boy presented with acute headache, vomiting, and double vision. MRI and computed tomography demonstrated a mostly cystic tumor with some calcification, localized entirely within the third ventricle and associated with obstructive hydrocephalus (Figure 3A, B). Endocrine examination revealed a severe growth hormone deficiency. He underwent extended TSS with an endoscope and a microscope. The stretched ventricular floor (Figure 3E) was sharply incised through the corridor between the anteriorly displaced chiasm and the stalk, allowing visualization of a mostly cystic tumor. The wall of the tumor cyst, which contained deep xanthochromic-like fluid with cholesterin materials, was dissected from the ventricular wall. Although the tumor was completely resected, with anatomic preservation of the stalk (Figure 3C, D), panhypopituitarism and diabetes insipidus developed after surgery. Double vision and full headache improved. His BMI Z-scores were +0.64 and +1.38 before and 30 months after surgery, respectively, and thus not regarded as obesity.

DISCUSSION

EETS is a safe and effective approach to the treatment of many suprasellar craniopharyngiomas, including those involving the third ventricle.[3,6,7,9,12] Despite the great surgical exposure

Table 1. Summary of 3 Patients with Intrathird Ventricle Craniopharyngioma

	Case 1	Case 2	Case 3
Age and gender	65-year-old woman	29-year-old woman	5-year-old boy
Visual disturbance	Yes	Yes	Yes
Preop. pituitary function	Normal	Hypogonadism	GH deficiency
Tumor size (mm)	20	30	38
Intratumoral cyst/calcification	−/−	−/−	+/+
Displacement of chiasm	Anteriorly	Anteriorinferiorly	Anteriorly
Resection	Total	Total	Total
Preservation of stalk	Yes	No	Yes
Histologic type	Papillary	Papillary	Adamantinomatous
Postoperative Pituitary function	Panhypopituitarism	Panhypopituitarism	Panhypopituitarism
Postoperative diabetes insipidus	Partial	Complete	Complete
BMI (preoperative/postoperative)	16.3/15.7	20.6/23.8	0.64*/1.38*
Recurrence	No	No	No
Follow-up period (months)	14	11	30

BMI, body mass index, >25 obesity.
*BMI Z-score, >+2SD obesity.