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Gross-total resection of a suprasellar with recurrent cerebellopontine angle region craniopharyngioma by endoscopic far-lateral supracerebellar infratentorial approach: illustrative case

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BACKGROUND Craniopharyngiomas that rarely extend into the posterior fossa are treated with staged operations or combined approaches. The authors reported a patient undergoing gross-total resection of a suprasellar with recurrent cerebellopontine angle (CPA) craniopharyngioma using an endoscopic far-lateral supracerebellar infratentorial approach (EFL-SCITA).

OBSERVATIONS The patient was a 15-year-old boy who presented with headache and decreased vision that lasted for half a year. He previously received three surgeries related to CPA craniopharyngioma. Preoperative magnetic resonance imaging revealed a suprasellar with recurrent CPA craniopharyngioma. Gross-total resection of this suprasellar and CPA tumor was achieved through EFL-SCITA. All symptoms and signs were improved. There were no postsurgical complications except for mild facial paralysis.

LESSONS EFL-SCITA can be used not only for tumors in the posterolateral pontomesencephalon and ptero-clival-tentorial area but also for tumors in the suprasellar region with posterior fossa extension.

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KEYWORDS endoscopic; approach; craniopharyngioma; cerebellopontine angle extension

Craniopharyngiomas are relatively benign neoplasms that typically arise in the sellar/suprasellar region. They can occur anywhere along the infundibulum or craniopharyngeal canal.[1] Regarding the retroinfundibular type, craniopharyngiomas tend to grow with the nearby cisterns.[2] On rare occasions, large cystic or recurrent craniopharyngiomas extend into the posterior fossa.[3] In these few cases, staged operation or combined approach may be more acceptable.[4–6]

However, staged operations face more serious adhesions. Although the combined supra- and infratentorial approach provides wider exposure, it increases the risk of injury and complications. Herein, we report a novel endoscopic far-lateral supracerebellar infratentorial approach (EFL-SCITA) for gross total resection of a suprasellar with recurrent cerebellopontine angle (CPA) craniopharyngioma.

Illustrative Case

Presentation

A 15-year-old male patient presented with headache and decreased vision that had lasted for half a year. He had experienced left facial numbness and walked unsteadily for 4 months. His physical examination revealed bitemporal hemianopsia, and visual acuity of the right eye was 0.12. Romberg's sign was positive. Endocrine test results on the craniopharyngioma presented panhypopituitarism. Magnetic resonance imaging showed a large, cystic tumor in the left CPA, which caused compression of the brainstem and fourth ventricle. In addition, the recurrent solid-cystic craniopharyngioma in the suprasellar region extended into the third ventricle (Fig. 1). The patient had previously received three surgeries and radiotherapy for this craniopharyngioma. These previous three surgeries had been performed in other hospitals and

ABBREVIATIONS CPA = cerebellopontine angle; EFL-SCITA = endoscopic far-lateral supracerebellar infratentorial approach.

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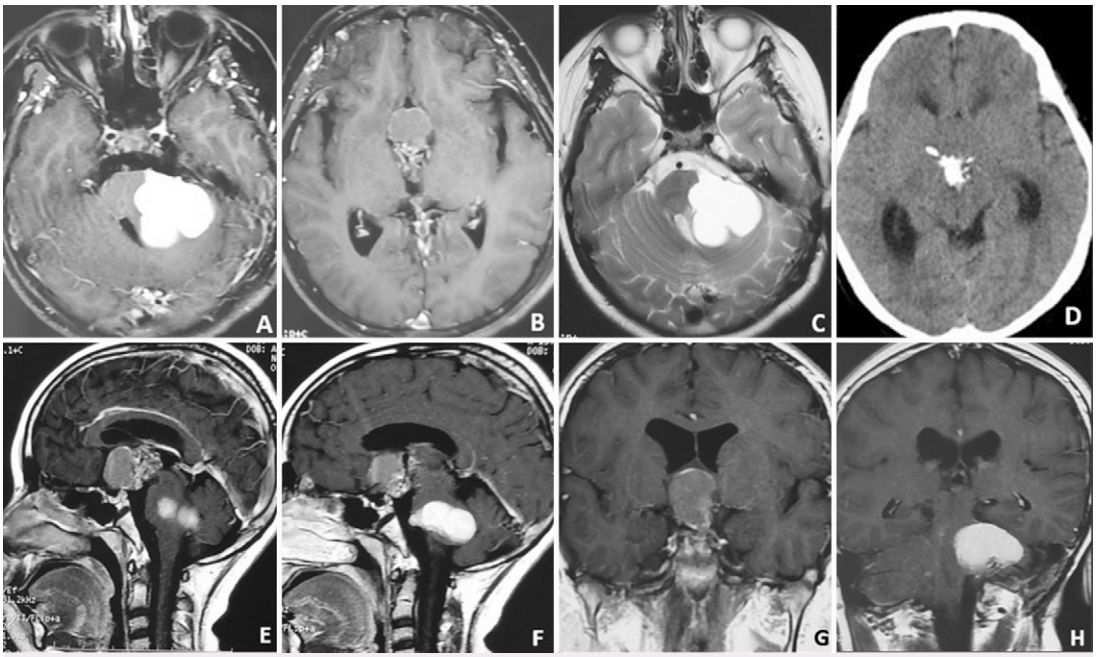

FIG. 1. Preoperative axial (**A and B**), sagittal (**E and F**), and coronal (**G and H**) enhanced magnetic resonance imaging (MRI) shows a suprasellar with recurrent CPA craniopharyngioma. Axial T2-weighted MRI (**C**) shows cystic craniopharyngioma compressing the brainstem and the fourth ventricle. Axial computed tomography scan (**D**) shows te calcifications of the craniopharyngioma in the suprasellar region.

only for the left CPA craniopharyngioma, not the suprasellar part. The boy was transferred to our hospital for surgery. Based on our previous EFL-SCITA experience in the petroclival region[7] (Fig. 2) and our anatomical study, the retroinfundibular area and the floor of the third ventricle could be directly exposed. The growth pattern of this craniopharyngioma could enlarge the surgical path. EFL-SCITA was ultimately chosen and designed as follows.

The patient had notable improvements in headache and decreased vision after the operation. He recovered from the facial numbness and walked unsteadily. There was mild facial paralysis (House-Brackmann grade II) after the operation. After 52 months of follow-up, there was no residual or recurrent craniopharyngioma.

Surgical Procedures

Patient Position

The patient was placed in the right lateral oblique position with the upper body elevated 30°. The head was placed in upper flexion and backward rotation to allow gravity retraction of the cerebellum (Fig. 3). The endoscope monitor (Karl Storz) and neuronavigator were placed in front of the patient. An endoscopic pneumatic arm

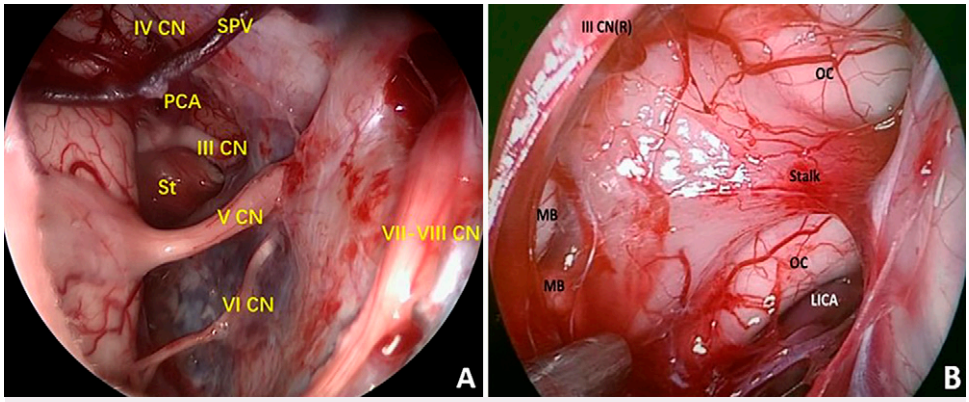

FIG. 2. A: The previous wide view of EFL-SCITA after removing the cholesteatoma in the right CPA. The pituitary stalk and oculomotor nerve can be seen. **B:** The previous close observation of EFL-SCITA after removing the right trigeminal neurinoma. The suprasellar retroinfundibular space and the floor of the third ventricle can be exposed clearly. LICA = left internal carotid artery; MB = mamillary body; OC = optic chiasma; PCA = posterior cerebral artery; SPV = superior petrosal vein; St = pituitary stalk; III CN = oculomotor nerve; IV CN = trochlear nerve; V CN = trigeminal nerve; VI CN = abducens nerve; VII-VIII CN = acoustic-facial bundle.

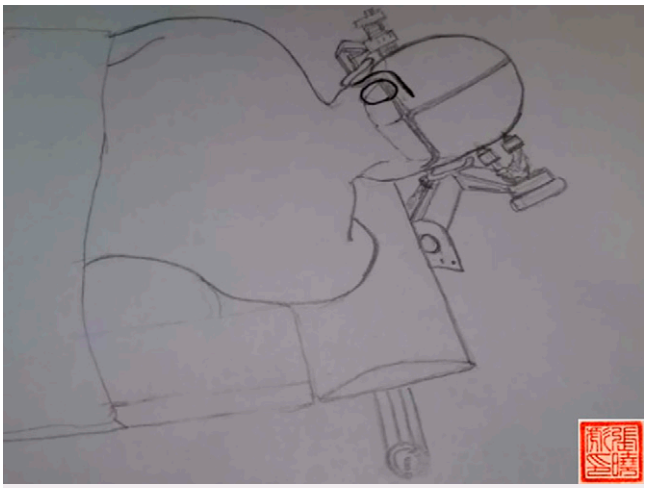

FIG. 3. Patient position, incision, and bone window of the left EFL-SCITA.

holder (Mitaka) was placed on the contralateral bedside to facilitate one-hand adjustment. Intraoperative monitoring (Nim-eclipse system, Medtronic) spontaneous electromyography was used during the entire surgery.

Incision and Bone Flap

A rotated L-shaped (containing the previous incision), postauricular 7-cm incision was performed. The musculocutaneous flap was flipped downward to expose the suboccipital area. The suboccipital craniotomy (3 × 3 cm) exposed the inner edge of the sigmoid sinus but exceeded the superior margin of the transverse sinus to increase the freedom of the upper fixing of the endoscope to avoid conflicting instruments (Fig. 3). The semilunar dural flap was opened and turned over to the margin of the transverse sinus.

Tumor Removal

Microdissection under the endoscope was performed. In the process of tumor removal, the endoscope (0°, 30°, Hopkins II, STORZ) was fixed to a pneumatic holder (Mitaka) so that the tumor could be removed with both hands and the endoscope could be adjusted as needed. Gravity retraction expanded the infratentorial space, allowing full exposure of the cystic wall of the CPA craniopharyngioma. After releasing the cyst fluid, cranial nerves V/VII/VIII and the brainstem were carefully dissected from the cystic wall. The superior petrosal vein was well protected. The previously placed shunt tube was removed, and the abducens nerve was intact. Under the trigeminal nerve, the endoscope went forward to expose the oculomotor nerve, dorsum, and suprasellar craniopharyngioma. By means of angled instruments, the suprasellar craniopharyngioma was removed piece by piece below the oculomotor nerve. After total resection of the tumor, the neurovascular structures in the interpeduncular cistern and the third ventricle were visible. The posterior cerebral artery at the edges of the tentorial incisura was identified (Fig. 4).

Cranial Closure

The dura was closed in a watertight fashion with reserved fascia, the bone flap was replaced with titanium plates, and the muscle and skin incision were closed.

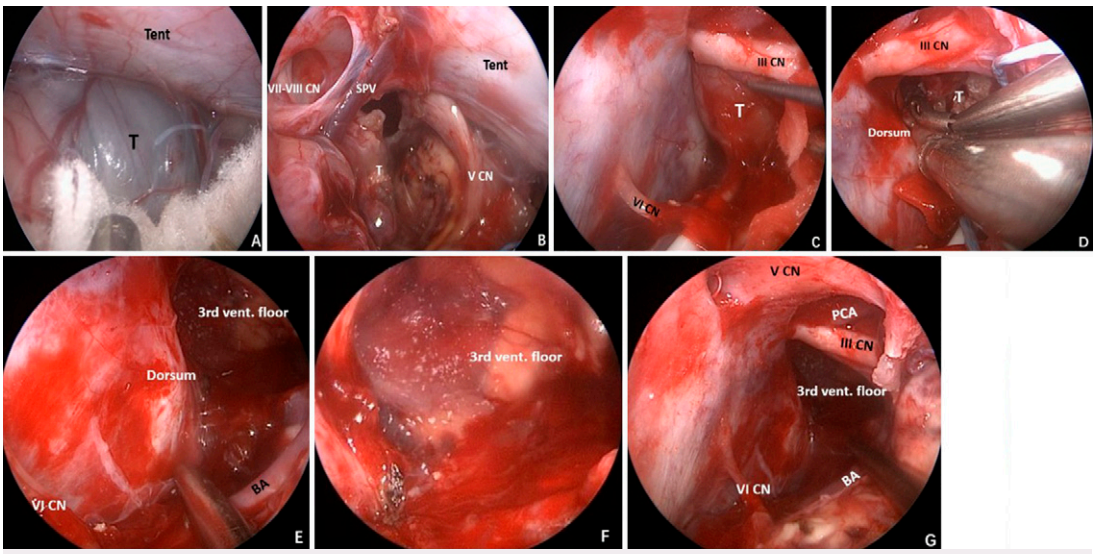

FIG. 4. Endoscopic views of resection of the suprasellar with recurrent CPA craniopharyngioma via EFL-SCITA. **A:** A cystic tumor was seen in the infratentorial area. **B:** The cystic wall was dissected from cranial nerves V and VII–VIII. **C:** The suprasellar craniopharyngioma was seen from the EFL-SCITA, and the previously placed drainage tube and abducens nerve were exposed. **D:** The suprasellar craniopharyngioma was removed piece by piece under the oculomotor nerve. **E and F:** After tumor resection, the floor of the third ventricle and interpeduncular cistern could be seen. **G:** Endoscopic full view of the EFL-SCITA after the operation. BA = basilar artery; Dorsum = dorsum sellae; PCA = posterior cerebral artery; SPV = superior petrosal vein; T = tumor; Tent = tentorium; III CN = oculomotor nerve; V CN = trigeminal nerve; VI CN = abducens nerve; VII-VIII CN = acoustic-facial bundle.

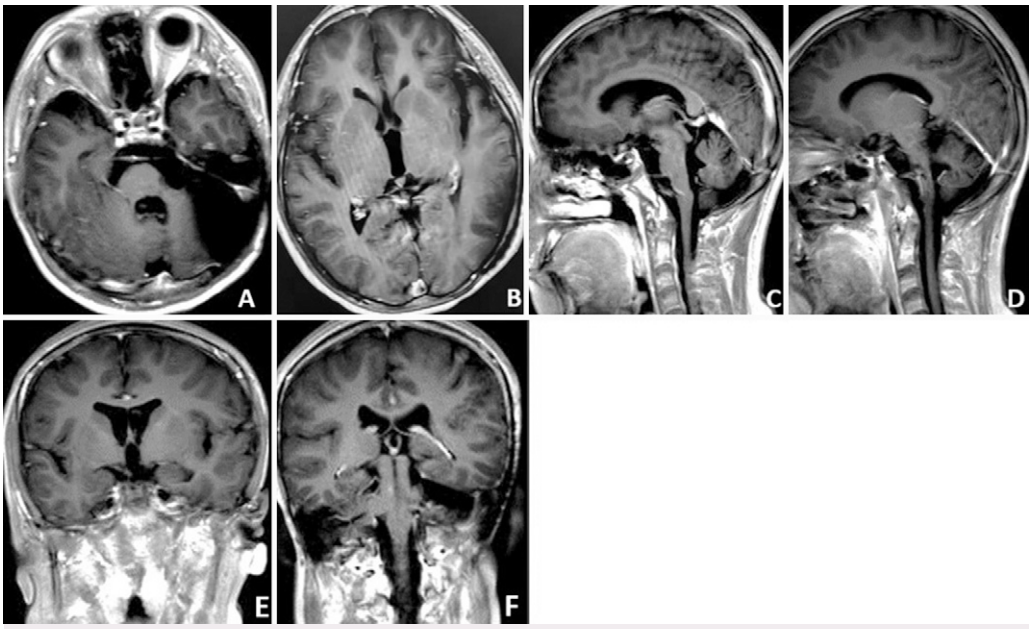

FIG. 5. Fifty-two–month postoperative axial (**A and B**), sagittal (**C and D**), and coronal (**E and F**) enhanced MRI showed that the suprasellar with recurrent CPA craniopharyngioma was totally removed.

Discussion

Observations

Craniopharyngiomas that extend into the posterior fossa are a relatively rare subtype.[3] This subtype is mainly cystic and retroinfundibulum and is more common in children.[3] In the present case, EFL-SCITA was applied to this subtype. With this novel approach, both the suprasellar and posterior fossa parts can achieve a total, one-stage resection (Fig. 5). This patient recovered from all the preoperative symptoms and signs and returned to school. There were no postsurgical complications except for mild facial paralysis.

Lessons

For most craniopharyngiomas, a frontotemporal approach or endonasal transsphenoidal approach is sufficient to expose and resect the tumor.[3,8] Regarding the retrochiasmatic and retroinfundibulum types, the frontotemporal approach needs to be performed in the space between the carotid artery and the optic nerve or oculomotor nerve, and the exposure is limited. The endonasal transsphenoidal approach is challenging because of insufficient operating space and risk of cerebrospinal fluid leaks. Endonasal posterior clinoidectomy can expand the exposure, but it increases the risk of complications. Furthermore, for tumors arising from the sellar region and extending into the posterior fossa, selecting a proper approach is more complicated. A staged operation, combined approach, cyst drainage, and subsequent radiotherapy (internal phosphorus-32 radionuclide or external) are optional.[3–6,9]

EFL-SCITA, in this case, was a novel surgical strategy for this craniopharyngioma subtype. Obviously, this approach can directly access the interpeduncular cistern and the floor of the third ventricle, but the oculomotor nerve is the main obstacle. Furthermore, cystic craniopharyngioma expands the surgical space. When the cystic fluid is aspirated, the surgical freedom obviously increases in EFL-SCITA. The suprasellar part of the craniopharyngioma was not operated on in the previous surgeries, so this surgery is easy to separate without serious adhesion. Broadly speaking, this approach is applicable for cystic tumors (e.g., craniopharyngioma, cholesteatoma) in the suprasellar or interpeduncular cistern region with posterior fossa extension. For pure suprasellar solid tumors, EFL-SCITA may be a challenge. The indication and application of this pilot approach should be further explored.

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Disclosures

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

Author Contributions

Conception and design: both authors. Drafting the article: both authors. Critically revising the article: Zhang. Reviewed submitted version of manuscript: Zhang. Approved the final version of the manuscript on behalf of both authors: Zhang. Study supervision: both authors.

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