



## Video Abstract

# Endoscopic resection of a low-grade ependymoma of the pineal region

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## ABSTRACT

**Background:** Full endoscopic resection of solid brain tumors represents a challenge for neurosurgeons. This can be achieved with modern technology and advanced surgical tools.

**Case Description:** A 23-years-old male was referred to our unit with raised intracranial pressure. Head computed tomography and magnetic resonance imaging (MRI) revealed obstructive hydrocephalus and a third ventricle lesion. Endoscopic third ventriculostomy and biopsy were performed, a left frontal external ventricular drain was left in place. A second-look surgery for endoscopic removal was planned. Decision to proceed with an endoscopic removal was supported by the following characteristics found during the first surgery: tumor exophytic, soft texture, scarce vascularity, and low-grade appearance. A rescue strategy for microscopic resection via transcallosal approach was decided. A straight trajectory to the tumor was planned with navigation. A further anterior left frontal burr-hole was performed, and the ventricular system was entered via the left frontal horn. Resection was carried out alternating laser for hemostasis and cutting, endoscopic ultrasonic aspirator, and endoscopic forceps for piecemeal resection. Laser hemostasis and cutting (1 Watt power at tip, continuous wave mode) were useful at the ventricular wall-tumor interface. Relevant landmarks guided the approach and the resection (foramen of Monro, mammillary bodies, aqueduct, pineal and suprapineal recess, and posterior commissure). The surgery was carried uneventfully. Histopathology confirmed a lowgrade ependymoma. Post-operative MRI showed residual tumor within the lower aqueduct. At 3 years follow-up, residual tumor is stable.

**Conclusion:** In selected cases, endoscopic resection for third ventricular tumors is feasible and safe, and represents a valid alternative to microsurgical approaches.

**Keywords:** Aqueduct, Endoscopy, Ependymoma, Hydrocephalus, Ventricle

[Video 1]-Available on:

www.surgicalneurologyint.com.

Annotations<sup>[1-6]</sup>

## 0.6 CASE PRESENTATION AND NEUROLOGICAL EXAM

Here, we demonstrate a case of a low-grade ependymoma of the pineal region, on a young patient, who presents with symptoms of raised intracranial pressure.

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## 0.18 NEURO-IMAGING FINDINGS: HEAD CT SCAN

Head CT obtained upon admission showed an obstructive hydrocephalus with a pineal region tumor, extended into the posterior part of the third ventricle.

## 0.27 RATIONALE FOR THE PROCEDURE: ENDOSCOPIC THIRD VENTRICULOSTOMY (ETV) AND ENDOSCOPIC BIOPSY

Raised intracranial pressure is initially managed with a standard ETV. An endoscopic biopsy is performed at the same time and an external ventricular drain left in place. A single-stage surgery with intraoperative frozen section was not considered due to abrupt clinical presentation overnight.

## 0.52 THIRD VENTRICULOSTOMY

Once standard ETV is performed, the prepontine cistern is carefully inspected and free from further arachnoid membranes. Opening of the third ventricular floor can be enlarged with endoscopic forceps.

## 1.10 NEURO-IMAGING FINDINGS: MRI AFTER ETV AND ENDOSCOPIC BIOPSY

Cerebral MRI confirmed an enhancing tumor of the pineal region and extending into the posterior part of the third ventricle and causing aqueduct obstruction. Full spine MRI was normal. Preoperative neuropsychological tests revealed attention and memory problems with minimal executive dysfunctions.

## 1.28 RATIONALE FOR THE PROCEDURE: ENDOSCOPIC RESECTION

Endoscopic resection is favored considering that the tumor is exophytic within the ventricle, is soft in texture and has a scarce vascularity. A rescue strategy for microscopic resection, via interhemispheric transcallosal approach, is also planned. This approach was not considered as first option as it carries significant risks of neuropsychological deficits from lesions of both fornices.

## 1.56 RISKS OF THE PROCEDURE AND ITS POTENTIAL BENEFITS. ALTERNATIVES AND WHY THEY WERE NOT CHOSEN (MICROSCOPIC APPROACH)

Endoscopic approach is limited to small, scarcely vascular, and soft tumors. Intraoperative bleeding, poor visibility, and loss of orientation are its main challenges. Microsurgical approach entails craniotomy, higher brain tissue manipulation, and potential higher risk of epilepsy, compared to microsurgery,

endoscopic approaches allow close-up views of deep structures.

## 2.21 POSITIONING

A straight trajectory to the tumor is planned with navigation. A further anterior left frontal burr-hole is performed, and the ventricular system is entered via the left frontal horn.

## 2.32 STANDARD LANDMARKS

Once the left lateral ventricle is entered, standard landmarks are identified.

## 2.41 ANY NECESSARY EQUIPMENT

All procedure is carried out with an endoscopic holder attached at the operating table, to allow more stability, avoid losing orientation during tumor bleeding while rinsing warm saline. Resection is methodically carried out alternating laser for hemostasis and cutting, endoscopic ultrasonic aspirator, and endoscopic forceps for piecemeal resection. Laser hemostasis and cutting are particularly useful at the ventricular at the boundaries between the tumor and the ventricular wall.

## 3.29 TUMOR REMOVAL IN THE AQUEDUCT AND PINEAL RECESS

Relevant landmarks guide approach and resection. In the posterior part of the third ventricle, we identified the aqueduct, the pineal recess, the suprapineal recess, and the posterior commissure. Ultrasonic aspirator tip of 2.2 mm of outer diameter allows accurate and safe removal of the exophytic parts. As the tumor is also occupying the pineal recess, a Fogarty balloon is gently introduced prior to the ultrasonic aspirator to gain more room. Posterior commissure, aqueduct, and pineal recess are eventually identified.

## 4.30 HISTOPATHOLOGY CONFIRMED A LOW GRADE EPENDYMOMA

Histopathological examination confirms a low-grade ependymoma, with a MIB1 index of 2%.

## 4.38 DISEASE BACKGROUND

Pineal region tumors extending into the posterior part of the third ventricle frequently present with symptoms of raised intracranial pressure due to aqueduct obstruction. Current literature reports favorable outcomes for the intraventricular endoscopic approach, which allows to treat both the hydrocephalus and tumoral lesion with a less invasive approach.<sup>[1-6]</sup>

#### 4.58 MRI AFTER ENDOSCOPIC RESECTION

The tumor is completely resected in the ventricle, with a remnant of 2 mm in the lower aqueduct, probably difficult to resect also via microsurgical approach. We did not attempt further resection within the aqueduct to avoid any postoperative midbrain dysfunction including oculomotor palsy. Given the young age of the patient, the localization of the tumor and the low-grade histology, an MRI-based follow-up was offered.

#### 5.27 POSTOPERATIVE FOLLOW-UP

Minor memory problems were detected at the immediate postoperative neuropsychological exam, probably due to manipulation of the left fornix. At 3 months follow-up, these problems were resolved, and the patient resumed his studies.

#### 5.43 RADIOLOGICAL FOLLOW-UP

Residual tumor is stable at 3 months, 1 year, and 3 years.

#### 5.55 CONCLUSION

In selected cases, pure endoscopic resection for pineal region tumors is safe and carries acceptable, low, and transient morbidity. Gross total resection remains the standard treatment modality of ependymomas.

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#### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

#### Conflicts of interest

There are no conflicts of interest.

#### REFERENCES

1. Abbassy M, Aref K, Farhoud A, Hekal A. Outcome of single-trajectory rigid endoscopic third ventriculostomy and biopsy in the management algorithm of pineal region tumors: A case series and review of the literature. *Childs Nerv Syst* 2018;34:1335-44.
2. Ahmed AI, Zaben MJ, Mathad NV, Sparrow OCE. Endoscopic biopsy and third ventriculostomy for the management of pineal region tumors. *World Neurosurg* 2015;83:543-7.
3. Chibbaro S, Di Rocco F, Makiese O, Reiss A, Poczos P, Mirone G, *et al.* Neuroendoscopic management of posterior third ventricle and pineal region tumors: Technique, limitation, and possible complication avoidance. *Neurosurg Rev* 2012;35:331-8; discussion 338-40.
4. Mottolese C, Szathamari A, Beuriat PA *et al.* Neuroendoscopy and pineal tumors: A review of the literature and our considerations regarding its utility. *Neurochirurgie* 2015;61:155-9.
5. Roth J, Kozyrev DA, Richetta C, Dvir R, Constantini S. Pineal region tumors: An entity with crucial anatomical nuances. *Childs Nerv Syst* 2021;37:383-90.
6. Schroeder HW. Intraventricular tumors. *World Neurosurg* 2013;79 Suppl 2:S17.e15-9.

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