Posterior third ventricle tumor endoscopìc approach

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- Endoscopic Supracerebellar Infratentorial Transpineal Approach for Posterior-Medial Thalamic Lesions: Surgical Technique and Clinical Experience
- Neuroendoscopic transventricular transchoroidal approach for access to the posterior zone of the third ventricle or pineal region
- Neurosurgical application of pineal region tumor resection with 3D 4K exoscopy via infratentorial approach: a retrospective cohort study

Description: This minimally invasive approach uses an endoscope, a small camera with instruments, to access the third ventricle through a small burr hole in the skull. The endoscope is advanced through the lateral ventricle to reach the third ventricle.

Advantages: Minimally invasive with smaller incisions, reduced recovery time, and less brain tissue disruption. It is particularly useful for small tumors or cysts causing obstruction within the ventricles. Disadvantages: Limited ability to remove large or complex tumors. It requires specialized equipment and training and may have limited visibility and maneuverability compared to open approaches.

The endoscopic approach to posterior third ventricle tumors is a minimally invasive surgical technique that utilizes an endoscope, a small, flexible tube with a camera and light, to access and treat tumors within the third ventricle. This approach is increasingly favored for certain types of tumors and conditions due to its ability to minimize brain tissue disruption and reduce recovery time.

Indications for Endoscopic Approach The endoscopic approach is particularly suited for:

Colloid Cysts: These are benign, fluid-filled cysts that can obstruct cerebrospinal fluid (CSF) flow, leading to hydrocephalus. The endoscopic approach is often used to remove these cysts or create an alternative CSF pathway.

Small Tumors or Cysts: Tumors such as small astrocytomas, some pineal region tumors, and other cystic lesions can be managed endoscopically, especially if they are causing CSF obstruction or are accessible through the ventricular system.

Hydrocephalus Relief: The endoscopic approach can be used for procedures like endoscopic third ventriculostomy (ETV) to relieve hydrocephalus caused by tumor-induced obstruction.

Biopsies: When the tumor's exact nature needs to be determined, an endoscopic biopsy allows for tissue sampling with minimal invasiveness.

Endoscopic Surgical Techniques The endoscopic approach to the posterior third ventricle can involve several specific techniques, depending on the tumor's location, size, and the surgical goals. Commonly used techniques include:

Endoscopic Transventricular Approach:

Description: This technique involves accessing the third ventricle via a small burr hole in the skull, typically through the right frontal lobe. The endoscope is navigated through the lateral ventricle, foramen of Monro, and into the third ventricle. Procedure: Entry: A small incision is made in the scalp, and a burr hole is drilled through the skull to access the lateral ventricle. Navigation: The endoscope is carefully advanced through the lateral ventricle, across the foramen of Monro, and into the third ventricle. Tumor Resection or Biopsy: Depending on the tumor's characteristics, various tools (such as biopsy forceps, graspers, or ultrasonic aspirators) are used to resect or biopsy the tumor under direct visualization. Closure: After the procedure, the endoscope is removed, and the incision is closed. Endoscopic Third Ventriculostomy (ETV):

Description: ETV is often performed to relieve hydrocephalus by creating a new CSF pathway. It can be done alongside tumor biopsy or resection if the tumor is causing CSF obstruction. Procedure: Access: The surgeon accesses the third ventricle as described above. Creating a Stoma: A small opening is made in the floor of the third ventricle to allow CSF to flow directly into the basal cisterns, bypassing the obstruction. Assessment: The patency of the stoma is confirmed endoscopically, and any additional procedures, such as tumor biopsy, are performed. Advantages of the Endoscopic Approach Minimally Invasive: Requires smaller incisions and less brain tissue manipulation, which can lead to fewer complications and a quicker recovery.

Reduced Morbidity: Lower risk of infection, hemorrhage, and neurological deficits compared to traditional open surgeries.

Direct Visualization: Provides a clear view of the ventricular system and adjacent structures, allowing precise tumor resection or biopsy.

Shorter Hospital Stay: Patients often experience shorter hospital stays and faster overall recovery times compared to more invasive procedures.

Limitations and Challenges Limited Access: The endoscopic approach is generally limited to smaller tumors or cysts and may not be suitable for larger or more complex lesions that require extensive dissection.

Restricted Instrument Maneuverability: Due to the confined space within the ventricles and the relatively rigid nature of the endoscope, maneuverability and access to some areas can be challenging.

Risk of Complications: Potential complications include bleeding, infection, injury to critical structures within the ventricles (such as the thalamus, hypothalamus, or fornix), and CSF leaks.

Learning Curve: Endoscopic neurosurgery requires specialized training and experience, as the technique differs significantly from traditional open surgeries.

Postoperative Care and Follow-Up After endoscopic surgery, patients typically undergo a period of observation in the hospital to monitor for complications such as CSF leaks, infections, or neurological changes. Imaging studies (usually MRI or CT scans) are often performed postoperatively to assess the extent of tumor resection and ensure there are no immediate complications. Long-term follow-up includes regular imaging and clinical assessments to monitor for tumor recurrence or regrowth and manage any persistent or emerging symptoms.

Conclusion The endoscopic approach to posterior third ventricle tumors represents a significant advancement in neurosurgery, offering a less invasive alternative to traditional open surgeries for selected patients. With the potential for reduced morbidity and faster recovery times, this approach is increasingly being utilized for appropriate cases. However, careful patient selection and a skilled surgical team are crucial to achieving optimal outcomes with this technique.

One formalin-fixed cadaver human head was dissected. Five different endoscopic approaches were performed: interhemispheric transcallosal transchoroidal approach, frontal transforaminal transchoroidal approach, supraorbital subfrontal translamina terminalis approach, expanded endonasal approach, and supracerebellar infratentorial approach. An anatomical description of the different approaches was conducted and quantitative measurements (craniocaudal and latero-lateral distances) were taken using the StealthStation ® workstation after performing a CT scan of the specimen.

The interhemispheric transcallosal transchoroidal, frontal transforaminal transchoroidal, and supraorbital subfrontal translamina terminalis approaches provided great view of all the structures of the posterior wall of the third ventricle. Maximum craniocaudal distance was obtained through the supraorbital subfrontal translamina terminalis approach (10.6 mm), with great difference from the expanded endonasal approach (5.2 mm). The widest latero-lateral distance from inside the third ventricle was achieved through the interhemispheric transcallosal transchoroidal approach (4.6 mm), similar to the expanded endonasal (4.1 mm), and differing from the supraorbital subfrontal translamina terminalis (2.4 mm).

The endoscopic approaches provided an adequate alternative to more traditional microsurgical approaches to the posterior wall of the third ventricle, with a great view of all its structures. The selection of the approach must be taken under consideration in each case [1)]

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Otero-Fernández P, Abarca-Olivas J, González-López P, Martorell-Llobregat C, Flores-Justa A, Villena-Martín M, Nieto-Navarro J. Endoscopic approaches to the posterior wall of the third ventricle: An anatomical comparison. Clin Neurol Neurosurg. 2024 Aug 19;245:108511. doi: 10.1016/j.clineuro.2024.108511. Epub ahead of print. PMID: 39180812.