

Fourth ventricle tumor surgery

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Surgery for a tumor in the fourth ventricle is a complex and delicate procedure due to the critical location of the ventricle within the brain. The fourth ventricle is a fluid-filled cavity located in the posterior fossa, between the brainstem and the cerebellum, and is part of the ventricular system that circulates cerebrospinal fluid (CSF). Tumors in this area can cause significant symptoms by compressing nearby brain structures or blocking the flow of CSF, leading to hydrocephalus (accumulation of fluid in the brain).

Approaches

Surgery for a fourth ventricle tumor requires careful planning and a tailored approach depending on the tumor's size, type, location, and involvement with surrounding structures. Key surgical approaches include:

1. Midline Suboccipital Craniotomy:

1. **Procedure:** This is the most common approach to access the fourth ventricle. The surgeon makes an incision at the back of the head and removes part of the occipital bone to expose the cerebellum and brainstem.
2. **Advantages:** Provides a direct route to the fourth ventricle and allows for precise tumor resection with minimal damage to surrounding structures.
3. **Considerations:** Careful dissection is needed to avoid damage to the brainstem and cranial nerves, which are close to the fourth ventricle.

2. Transvermian Approach:

The first fourth ventricle lesions were resected via transvermian approach ¹⁾, while telovelar approach was utilized more recently, avoiding damage to surrounding structures since approaching the

ventricle from the inferior, rather than superior ²⁾

1. **Procedure:** The surgeon may split the cerebellar vermis (the tissue connecting the two hemispheres of the cerebellum) to gain access to the fourth ventricle.
2. **Advantages:** Provides direct access to tumors in the midline or on the floor of the fourth ventricle.
3. **Considerations:** Risk of postoperative cerebellar mutism syndrome, a condition that can cause temporary speech and movement problems, particularly in children.

3. Telovelar Approach:

1. **Procedure:** This approach involves dissecting through the cerebellomedullary fissure, which avoids splitting the vermis.
2. **Advantages:** Allows access to the fourth ventricle without splitting the vermis, reducing the risk of cerebellar mutism syndrome and preserving cerebellar function.
3. **Considerations:** Technical demands are higher, and visualization can be challenging, depending on the tumor's location.

4. Endoscopic Approaches:

1. **Procedure:** Endoscopic techniques may be used to biopsy or partially remove small tumors, especially if they are causing hydrocephalus or if a less invasive approach is preferable.
2. **Advantages:** Minimally invasive, with potentially shorter recovery time and reduced surgical trauma.
3. **Considerations:** Limited by tumor size and location; complete resection is often not possible.

Surgical Goals and Considerations

The primary goals of surgery for a fourth ventricle tumor are to:

- **Remove as much of the tumor as safely possible:** Complete resection may be attempted depending on the tumor's nature and location. However, complete resection is not always possible due to the risk of damaging vital structures. - **Relieve compression and obstruction:** Decompressing the brainstem and restoring normal CSF flow are critical to alleviate symptoms and prevent complications like hydrocephalus. - **Obtain a tissue diagnosis:** Pathological examination of the tumor tissue is essential to determine the exact type of tumor, which influences further treatment decisions.

Complications

[Fourth ventricle tumor surgery complications.](#)

Postoperative Care and Further Treatment

- **Monitoring and ICU care:** Patients typically require close monitoring in an intensive care unit (ICU) after surgery, particularly to manage airway, breathing, and neurological function. - **Adjuvant therapy:** Depending on the tumor type and resection extent, additional treatments like radiation therapy or chemotherapy may be necessary. - **Rehabilitation:** Neurological rehabilitation, including

physical, occupational, and speech therapy, may be essential for recovery, especially if deficits are present post-surgery.

Fourth ventricle tumors are rare, and surgical series are typically small, comprising a single pathology, or focused exclusively on pediatric populations. This study investigated surgical outcomes and complications following fourth ventricle tumor resection in a diverse patient population. This is the largest cohort of fourth ventricle tumors described in the literature to date.

In an 18-year (1993-2010) retrospective review of 55 cases involving patients undergoing surgery for tumors of the fourth ventricle. Data included patient demographic characteristics, pathological and radiographic tumor characteristics, and surgical factors (approach, surgical adjuncts, the extent of resection, etc.). The neurological and medical complications following resection were collected and outcomes at 30 days, 90 days, 6 months, and 1 year were reviewed to determine patient recovery. Patient, tumor, and surgical factors were analyzed to determine factors associated with the frequently encountered postoperative neurological complications. **RESULTS** There were no postoperative deaths. Gross-total resection was achieved in 75% of cases. Forty-five percent of patients experienced at least 1 major neurological complication, while 31% had minor complications only. New or worsening gait/focal motor disturbance (56%), speech/swallowing deficits (38%), and cranial nerve deficits (31%) were the most common neurological deficits in the immediate postoperative period. Of these, cranial nerve deficits were the least likely to resolve at follow-up. Multivariate analysis showed that patients undergoing a transvermian approach had a higher incidence of postoperative cranial nerve deficits, gait disturbance, and speech/swallowing deficits than those treated with a telovelar approach. The use of surgical adjuncts (intraoperative navigation, neurophysiological monitoring) did not significantly affect neurological outcome. Twenty-two percent of patients required postoperative CSF diversion following tumor resection. Patients who required intraoperative ventriculostomy, those undergoing a transvermian approach, and pediatric patients (< 18 years old) were all more likely to require postoperative CSF diversion. Twenty percent of patients suffered at least 1 medical complication following tumor resection. Most complications were respiratory, with the most common being postoperative respiratory failure (14%), followed by pneumonia (13%). **CONCLUSIONS** The occurrence of complications after fourth ventricle tumor surgery is not rare. Postoperative neurological sequelae were frequent, but a substantial number of patients had neurological improvement at long-term followup. Of the neurological complications analyzed, postoperative cranial nerve deficits were the least likely to completely resolve at follow-up. Of all the patient, tumor, and surgical variables included in the analysis, surgical approach had the most significant impact on neurological morbidity, with the telovelar approach being associated with less morbidity ³⁾.

1)

. Dandy W (1932) The practice of surgery. The Brain. Hagerstown, MD: WF Prior 12

2)

Ebrahim KS, Toubar AF (2019) **Telovelar approach** versus **transvermian approach** in management of fourth ventricular tumors. Egypt J Neurosurg 34:10 10.1186/s41984-019-0036-9

3)

Ferguson SD, Levine NB, Suki D, Tsung AJ, Lang FF, Sawaya R, Weinberg JS, McCutcheon IE. The surgical treatment of tumors of the fourth ventricle: a single-institution experience. J Neurosurg. 2017 Apr 14:1-13. doi: 10.3171/2016.11.JNS161167. [Epub ahead of print] PubMed PMID: 28409732.

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