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Video Abstract

Microsurgery resection of giant cervicothoracic spinal ependymoma: Two-dimensional operative video

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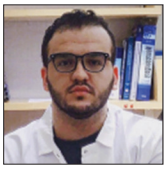

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ABSTRACT

Background: Ependymomas, rare glial brain tumors, account for <5% of all brain tumors. Interestingly, over 60% of ependymomas occur in the spinal cord of adults, including those originating from the filum terminale, while the rest are found within the brain. The World Health Organization (WHO) categorizes ependymomas into three grades: subependymomas and myxopapillary ependymomas ([MEPNs]; WHO grade I), classic ependymomas (WHO grade II), and anaplastic ependymomas (WHO grade III). Spinal ependymomas generally exhibit a more favorable prognosis compared to their intracranial counterparts and are primarily treated through gross total resection, which is considered the most effective surgical approach. As such, they are recognized as a distinct clinical entity that demands tailored management strategies. MEPNs, which constitute 13% of ependymomas, typically occur in the cauda equina and sometimes extend into the conus medullaris. Most other spinal ependymomas are of the classic type and predominantly arise in the cervical and thoracic regions of the spine. The mean age at diagnosis is 45 years of age. While prognosis varies based on molecular subtypes, complete resection is associated with improved survival.

Case Description: Here, we demonstrate the technical nuances to safely achieve gross total resection of a giant spinal ependymoma in a 29-year-old female with a medical history notable for sept-optic dysplasia, and panhypopituitarism. The patient presented with progressive neck pain, upper and lower extremity weakness, and numbness for 1 year. On physical examination, she demonstrated mild weakness in her left arm. The preoperative magnetic resonance imaging revealed a cervicothoracic intramedullary mass extending from C4 to T2 with an associated syrinx at C4. Under intraoperative neural monitoring (somatosensory evoked potentials, motor-evoked potentials, and epidural direct wave recordings), the patient underwent a C4 – T2 laminectomy. In addition, spinal ultrasonography helped differentiate solid tumor mass from syrinx formation, thus guiding the focus and extent of the decompression .

Conclusion: Gross total resection was achieved; at 18 postoperative months, the patient had mild residual motor deficit. The pathological evaluation revealed a WHO grade II ependymoma**.** Subsequent sequential enhanced MR studies at 3, 6, and 12 months confirmed no tumor recurrence.

Keywords: Two-dimensional, Ependymoma, Intradural, Microsurgical, Operative, Video

[Video 1]-Available on:
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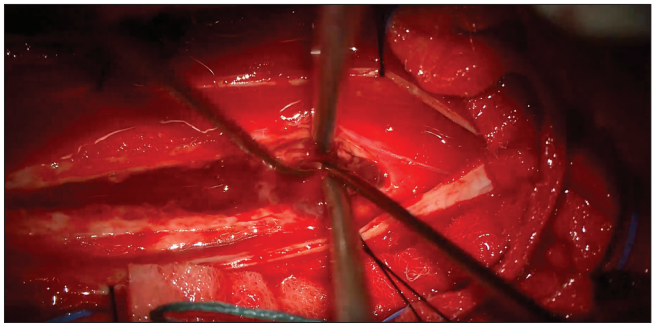
Annotations

00:00 – Introduction

This operative video illustrates the complete resection of a giant cervicothoracic ependymoma.

Table 1: A table provides a summary of significant case reports on the resection of giant spinal ependymomas published over the last decade. Each entry includes key details such as the year of publication, the title of the study, a brief description of the case report, and a reference to the original article.

Year	Title	Patient	Level
2023	Thoracic laminectomy and midline myelotomy for resection of a spinal ependymoma.[9]	Male, 60	T2–T3
2023	Resection of a ventral intramedullary spinal cord ependymoma through an anterior cervical approach: Illustrative case.[2]	Male, 49	C4–C5
2023	Resection of a large thoracolumbar intradural ependymoma: A 2D operative video.[1]	Female, 33	T9–L3
2022	Complete resection of dual ependymoma spinal metastasis using a fixed tubular retractor-a pediatric case report.[4]	Male, 12	C1–C2
2022	Resection of giant remote recurrence of ependymoma after 41 years	Male, 47	
2021	Microsurgical resection of giant thoraco-lumbo-sacral ependymoma with hybrid spinal reconstruction using multilevel laminoplasty and up-front thoracolumbar posterior fixation: two-dimensional operative video.[3]	Male, 14	T2–T5, T11–L2
2021	Microsurgical resection of a giant cervical-medullary ependymoma: 2D-dimensional video.[8]	Female, 23	C7–T2
2021	C4–T3 Replacement Laminoplasty and microsurgical resection of ependymoma: two-dimensional operative video.[7]	Female, 47	C4–T3
2014	Resection of cervical ependymoma.[5]	Female, 55	C6–T2
2014	Microsurgical resection of intramedullary spinal cord ependymoma.[6]	Male, 38	T2–T3



Video 1: The surgical video is accessible from the portal.

00:06 – Clinical presentation.

A 29-year-old female with progressive neck pain and bilateral arm weakness for one year presented with acute onset of left arm numbness and tingling she has a history of septum pellucidum agenesis and panhypopituitarism. She is on chronic steroids with no surgical history. neurological exam showed bilateral deltoid and biceps weakness bilateral hand weakness bilateral numbness tingling involving the upper and lower extremities.

00:49 – Preoperative MRI.

Pre-operative MRI showed an extensive intramedullary lesion from C4 to T2

01:08 – Rationale for the procedure.

The rationale for this procedure was to provide resection, diagnosis, and decompression of cervical cord and nerve roots and allow for postoperative treatment options. Gross total resection of this tumor will ensure the best long-term outcome. posterior midline approach provides direct exposure down to the lesion facilitating safe gross total resection without acutely destabilizing the spinal column.

01:33 – Risks and benefits of this surgery.

Benefits include tumor diagnosis, spinal cord decompression, symptom relief, and neurological preservation. Risks include extension into the spinal cord, cord ischemia, spinal cord involvement and injury, CSF leak, postoperative infection, and unintended spinal destabilization.

01:52 – Alternative approaches:

Alternative approaches for this case were either observation or radiation. Due to the size and symptoms observation was not commended as an option for this patient. Additionally, the patient wished for maximum resection. Moreover, radiation without resection carries the risk of radiation effects to the spinal cord. Additionally, the role of neoadjuvant radiation is not defined in the treatment paradigm of intramedullary spinal ependymomas.

02:01 – Surgical setup:

Preoperative steroids were initiated. The patient was positioned prone with Mayfield 3-point fixation and Jackson table with all pressure points padded. Neurophysiology monitoring including somatic sensory potentials, motor evoked potentials, and direct waves was implemented. C4 to T2 laminectomies followed by intramedullary section were performed.

02:25 – Key Surgical steps:

02:41 – Surgical Video:

08:40 – Disease background:

Intramedullary spinal ependymomas are rare tumor that are mostly of low grade.

Complete surgical resection has been established as the first line of treatment for these tumors. [Table 1]

Evidence supporting the use of adjuvant radiation therapy or chemotherapy is not definitive.

09:04 – Clinical Outcome:

Gross total resection was achieved.

The patient woke up with right-side weakness.

She continued to demonstrate improvement with rehabilitation.

Superficial wound essence and infection were a complication of the surgery that needed plastic surgery intervention and closure.

The patient received no adjuvant therapy.

09:43 – Pathology:

The pathology came back as ependymoma WHO grade 2.

Unmethylated MGMT promoter

copy number loss of chromosomes 14q and 22q.

09:46 – Postoperative MRI:

Post-operative MRI showed complete resection of the tumor and the vision remains tumor-free at her six months MRI follow-up and has retained her baseline function.

Ethical approval

The Institutional Review Board approval is not required.

Declaration of patient consent

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

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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