**World Journal of Medical Case Reports**
2021; 2(4): 73-75
http://www.sciencepublishinggroup.com/j/wjmcr
doi: 10.11648/j.wjmcr.20210204.13

# Management of Cervical Intramedullary Tumors: Case Report and Review of the Literature

**Manuel De Jesus Encarnacion[1, *], Rossi E. Barrientos Castillo[1], Durdica Lopez Vujnovic[2], Arturo Ayala Arcipreste[2], Juan Sebastian Castro[3], Alexander Volovich[3], Medet Dosanov[3], Renat Nurmukhametov[1], Boris Oleinikov[1], Ibrahim E. Efe[4]**

[1]Department of Neurosurgery, Russian People's Friendship University, Moscow, Russia

[2]Department of Neurosurgery, Hospital Juárez de México, Mexico City, Mexico

[3]Division of Spine Surgery, Central Clinical Hospital of the Russian Academy of Sciences, Moscow, Russia

[4]Department of Neurosurgery, Charité – University Medicine Berlin, Berlin, Germany

## Email address:

dr.encarnacionramirez@hotmail.com (M. De J. Encarnacion)

[*]Corresponding author

## To cite this article:

Manuel De Jesus Encarnacion, Rossi E. Barrientos Castillo, Durdica Lopez Vujnovic, Arturo Ayala Arcipreste, Juan Sebastian Castro, Alexander Volovich, Medet Dosanov, Renat Nurmukhametov, Boris Oleinikov, Ibrahim E. Efe. Management of Cervical Intramedullary Tumors: Case Report and Review of the Literature. *World Journal of Medical Case Reports*. Vol. 2, No. 4, 2021, pp. 73-75.
doi: 10.11648/j.wjmcr.20210204.13

**Received**: November 24, 2021; **Accepted**: December 14, 2021; **Published**: December 29, 2021

**Abstract:** *Background*. Cervical intramedullary tumors typically present with significant morbidity. Early surgical treatment is paramount to prevent neurological deterioration. Due to the complexity of the anatomy, these lesions still present a technical challenge to the neurosurgeon. We here present the surgical management of a large intramedullary tumor with the help of microsurgical tools and intraoperative monitoring. *Case information*. A 55-year-old woman presented with significantly reduced strength in her upper and lower extremities and subtle deficits in epicritic and proprioceptive sensation. MRI revealed a large intramedullary tumor in her cervical spinal cord, suggestive of ependymoma. Immediate surgical intervention was indicated. We made use of microsurgical techniques, ultrasound aspiration and monitoring of somatosensory and cortical potentials to achieve a maximally safe removal of the mass. To minimize mechanical stress on the spinal cord, we aimed to debulk the tumor first before resecting it along a dissection plane. Twenty-four hours following the surgery, the patient reported a discreet improvement of upper and lower limb strength and was discharged on postoperative day five in good condition. *Result*. Multimodal monitoring helped us limit our extent of resection and to achieve a maximally safe near-total removal of the mass. *Conclusion*. Microsurgical removal of large cervical intramedullary tumors under multimodal monitoring is safe and feasible.

**Keywords:** Spinal Surgery, Spinal Tumor, Spinal Ependymoma, Spinal Astrocytoma

## 1. Introduction

The first successful removal of an intramedullary spinal tumor was performed by Victor Horsley in 1887. [1] Intramedullary tumors are mostly benign. Primary intramedullary tumors originate from neurons, glial cells or other cells of the connective tissue. [2] Their incidence ranges from 3 to 10 per 100,000 inhabitants. Intramedullary tumors are more common in children where they represent half of all intradural tumors. In adults, intramedullary tumors compose less than one third of all intradural tumors. Gender distribution is relatively homogenous, although meningiomas are more common in females. MRI is the primary imaging modality to establish the diagnosis, determine the extent of the tumor and visualize associated cysts. With modern imaging and microsurgical techniques, percutaneous needle aspirations and biopsies are rendered obsolete. Positron emission tomography may help distinguish between a metabolically active tumor and scar tissue or gliosis. Gross total resection may be curative in most cases. [3] Despite advances in surgical precision, the clinical outcome depends largely on the histological type of the tumor. [4] We here

present the case of a female patient with a large cervical intramedullary mass and how we performed a near-total resection with the help of neuromonitoring and microsurgical techniques.

# 2. Case Description

### *2.1. Examination*

A 55-year-old female patient presented to our department. She was alert, cooperative, oriented to time, place, and person with a Glasgow coma score of 15/15. Her pupils were isochoric and normoreflexive. Her mucous membranes appeared dehydrated. Cranial nerve examination showed no abnormality. Muscle strength was reduced in both left and right extremities: 3/5 in upper, 4/5 in lower limbs. No fasciculations were noticed. Biceps reflex (involving spinal segments C5 and C6), triceps reflex (C7), abdominal reflex (T6-T12), patellar reflex (L4) and ankle jerk reflex (S1) were all preserved. The patient had mild alterations to her epicritic and proprioceptive sensation. Magnetic resonance imaging revealed a large intramedullary lesion in the patient's cervical spinal cord (Figure 1).

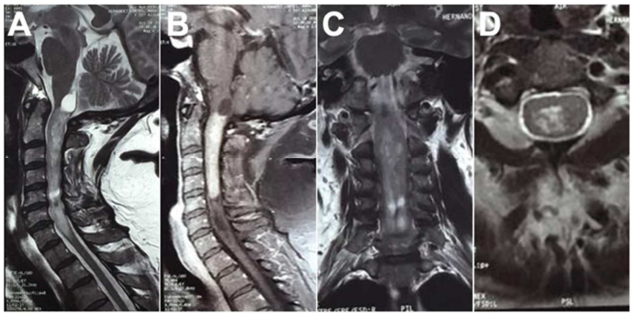


***Figure 1.*** *Magnetic resonance imaging revealed a large cervical intramedullary tumor extending from the foramen magnum to the cervicothoracic junction: sagittal T2* (A), sagittal STIR (B), coronal (C) and axial contrast-enhanced (D) sequences.*

### *2.2. Treatment*

Surgical removal of the mass was indicated. The patient was put in prone position with the neck in neutral position. Abdominal pressure avoided to prevent epidural venous plexus congestion. After radiographic control to confirm the level of entry, the skin incision was performed. Muscles were separated using scalpel and monopolar coagulation. Subperiosteal dissection was done with the help of a gauze sponge. A suboccipital craniotomy of 1.5 cm was done. The yellow ligament was partially separated and the posterior arch of C1 was removed. Bilateral laminectomies at the C2 to C7 segments were done. Under high magnification using the surgical microscope or loupes, we proceeded to remove the yellow ligament to expose the epidural space. A cottonoid was introduced to protect the dural sac. A midline dural incision was followed by a myelotomy at the level of the posterior medullary groove. We first debulked the tumor before identifying a cleavage plane. This is crucial to avoid traction or pressure on the spinal cord. Debulking can be done using an ultrasound aspirator (CUSA). We used the CUSA to reduce the tumor volume from the inside out. With the help of microdissectors, we then identified a resection plane. The tumor and the spinal cord could be told apart by a subtle change in color. Multimodal monitoring was done using somatosensory and cortical potentials throughout the surgery. When manipulating the inferior bulbar region, cardiac rhythm alterations were noticed. Resection was immediately stopped and extent of removal remained subtotal. Roughly 10% of the tumor mass remained in adherent to the brain stem. The dura was closed and a laminoplasty was done using 7 mm titanium screws. To avoid postoperative pain, we avoided forced approximations of the muscles. We made little use of electrocoagulation and did not place any drainage.

### *2.3. Follow-Up*

The patient was monitored in the intensive care unit depending on mechanical ventilation for 24 hours. Sedation was reduced on the following day. Glasgow coma score was 15 and a discreet improvement in upper and lower limb strength and sensation was noticed. The patient was discharged on postoperative day five in good condition.

# 3. Discussion

The surgical management of cervical intramedullary tumors remains a challenge. We here described the use of microsurgical techniques, ultrasound aspiration and multimodal monitoring which have improved the safety of these procedures significantly. [5]

The surgeon should meticulously respect the plane between the tumor mass and the spinal cord. To avoid mechanical stress on the cord, the tumor should first be debulked. A CUSA can be used for a controlled intratumoral resection. Intratumoral cysts and hematomas may be encountered and should be removed to further lax the spinal cord. After debulking, a dissection plane should be identified. A cleavage plane can be found in the majority of ependymomas and in approximately 30 to 40% of astrocytomas. [6-9] Using two microforceps, the tumor can then be gently peeled off the surrounding walls. [5] Patients should undergo an MRI examination within 48 hours postoperatively to assess for residual tumor and to allow for monitoring of lesion progression or recurrence. Tumors that do not contrast-enhance can often present as hyperintense signals in T2-weighted imaging.

Ependymomas are the most common intramedullary primary tumors of the spinal cord in adults. Complete removal is achieved in over two thirds of patients. [10] Previous reports showed that 48 to 75% of patients remain functionally stable after surgery. Thus, timely intervention is needed to avoid neurological deterioration. Ten to 40% of patients improve whereas 9 to 15% worsen postoperatively. Subtotal resection is associated with lack of clinical improvement and with tumor recurrence. The ten-year overall survival rate has been reported to be over 80%. [10, 11]

The benefit of preoperative high-dose methylprednisolone in patients undergoing intramedullary surgery is controversially debated. The 1990 Second National Acute Spinal Cord Injury Study (NASCIS II) described improved neurological recovery in patients with spinal cord injury. [12] Recent studies, however, failed to show any significant impact of preoperative corticosteroids in surgery for intramedullary spinal cord tumors. [13]

## 4. Conclusion

Surgery is the primary treatment in the majority of spinal cord tumors. The main objective is to preserve the patient's sensory and motor functions. Postoperative results depend on the preoperative neurological status, the tumor grade and location and the surgeon's experience.

## References


[1] M. P. Powell, "Sir Victor Horsley at the birth of neurosurgery," *Brain*, vol. 139, no. 2, pp. 631–634, Feb. 2016, doi: 10.1093/brain/awv345.

[2] *Tumors of the spine*. Philadelphia: Saunders - Elsevier, 2008.

[3] S. R. Garfin, F. J. Eismont, G. R. Bell, C. M. Bono, and J. Fischgrund, *Rothman-Simeone the Spine E-Book*. 2017.

[4] B. M. Stein, "Intramedullary Spinal Cord Tumors," *Neurosurgery*, vol. 30, no. CN_suppl_1, pp. 717–741, Jan. 1983, doi: 10.1093/neurosurgery/30.CN_suppl_1.717.

[5] R. G. Ellenbogen, L. N. Sekhar, and N. D. Kitchen, Eds., *Principles of neurological surgery*, Fourth edition. Philadelphia, PA: Elsevier, 2018.

[6] J. Brotchi, "Intrinsic Spinal Cord Tumor Resection," *Neurosurgery*, vol. 50, no. 5, pp. 1059–1063, May 2002, doi: 10.1097/00006123-200205000-00021.

[7] J. Brotchi, M. Bruneau, F. Lefranc, and D. Balériaux, "Surgery of intraspinal cord tumors," *Clin Neurosurg*, vol. 53, pp. 209–216, 2006.

[8] M. Bruneau and B. George, "The lateral approach to the V1 segment of the vertebral artery," in *Pathology and surgery around the vertebral artery*, Paris: Springer Paris, 2011, pp. 125–141. doi: 10.1007/978-2-287-89787-0_12.

[9] T. H. Schwartz and P. C. McCormick, "[No title found]," *Journal of Neuro-Oncology*, vol. 47, no. 3, pp. 211–218, 2000, doi: 10.1023/A:1006414405305.

[10] L. Ferrante, L. Mastronardi, P. Celli, P. Lunardi, M. Acqui, and A. Fortuna, "Intramedullary spinal cord ependymomas? a study of 45 cases with long-term follow-up," *Acta neurochir*, vol. 119, no. 1–4, pp. 74–79, Mar. 1992, doi: 10.1007/BF01541785.

[11] N. Svoboda, O. Bradac, P. de Lacy, and V. Benes, "Intramedullary ependymoma: long-term outcome after surgery," *Acta Neurochir*, vol. 160, no. 3, pp. 439–447, Mar. 2018, doi: 10.1007/s00701-017-3430-7.

[12] M. B. Bracken *et al.*, "A Randomized, Controlled Trial of Methylprednisolone or Naloxone in the Treatment of Acute Spinal-Cord Injury: Results of the Second National Acute Spinal Cord Injury Study," *N Engl J Med*, vol. 322, no. 20, pp. 1405–1411, May 1990, doi: 10.1056/NEJM199005173222001.

[13] A. D. Bhimani *et al.*, "Preoperative steroids do not improve outcomes for intramedullary spinal tumors: a NSQIP analysis of 30-day reoperation and readmission rates," *J Spine Surg*, vol. 4, no. 1, pp. 9–16, Mar. 2018, doi: 10.21037/jss.2018.03.18.