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*Video Abstract*

# Resection of a lumbar intradural tumor

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## ABSTRACT

**Background:** Myxopapillary ependymomas and schwannomas represent the most common tumors of the conus medullaris and cauda equina. Here, we present the surgical resection of a 64-year-old male with a lumbar intradural tumor.

**Case Description:** A 64-year-old male presented with several months of the lower extremity weakness, pain, and bowel/bladder dysfunction. Magnetic resonance imaging demonstrated a large L3–5 intradural lesion, and surgical resection using intraoperative neuromonitoring with somatosensory evoked potentials (SSEPs), motor evoked potentials (MEPs), free-running electromyography (EMGs), and direct sphincter monitoring was recommended. After an L2-S1 laminectomy was performed, intraoperative ultrasound was used to confirm the cranial and caudal extent of the tumor. The dural was opened using a midline approach, and the tumor was quickly visualized. Through careful dissection, the tumor was debulked and gross total resection was ultimately achieved through a piecemeal resection. Hemostasis was frequently required throughout the case, as the tumor was highly vascular. Postoperatively, the patient was at his neurologic baseline and was discharged to rehab on postoperative day 4. The final pathology revealed the intradural lesion was a paraganglioma.

**Conclusion:** Early intervention and gross total resection of spinal intradural tumors are associated with optimal patient outcomes. Additional adjuncts, such as ultrasound, are beneficial and can help achieve gross total tumor resection.

**Keywords:** Cauda equina tumor, Intradural spinal tumor, Lumbar tumor

**[Video 1]-Available on:**
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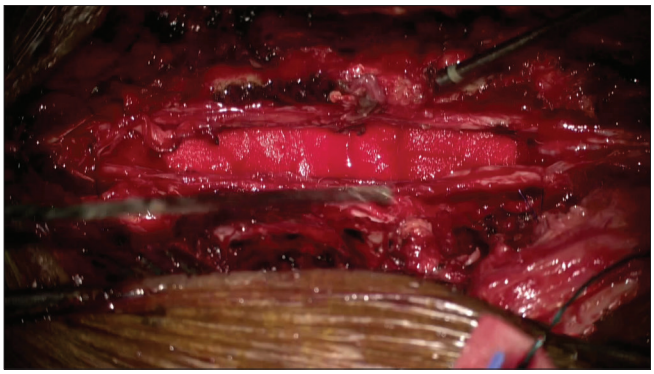

**Video 1:** Operative video of the resection of a lumbar intradural tumor

**Annotations**[1-5]

## 0:00 INTRODUCTION

Here, we present a case of resection of a lumbar intradural tumor centered around the cauda equina [Video 1].

**0:07 Case presentation**

The patient is a 64-year-old male who presented to the emergency department with urinary and bowel incontinence. Four months before this, he began to experience episodes of urinary incontinence as well as back and bilateral leg pain radiating down the backs of the legs. Two months before the presentation, he began experiencing lower extremity weakness, gait imbalance as well and fecal incontinence.

On physical examination in the emergency room, the patient had full strength in the upper and lower extremities and dedicated muscle group testing. Reflexes were generally normal except for the absent patellar reflexes bilaterally. His sensation was diminished to light touch in the lower extremities throughout, as well as the perineal region.

**0:44 Neuroimaging findings**

We will now go over the imaging findings. Sagittal and axial T2-weighted magnetic resonance imaging is seen here, with the intradural lesions spanning from L3 to L5. On the axial image, you can see remodeling of the bone, suggesting slow growth over time. Here, we see the sagittal and axial T1 with gadolinium images showing enhancing lesions in the intradural space from approximately L2, L3 to L5, similar to what we saw previously.

**1:13 Surgical discussion**

Surgical resection was recommended with the following rationale. The risks of surgery are listed here. Alternatives to surgery includes observation and just control of symptoms.

Our setup is detailed here, which includes putting the patient in a prone position on the Jackson table with Wilson frame attachment to allow for lumbar flexion and intraoperative neuromonitoring with SSEP, MEP, and free running EMG along with direct monitoring of the sphincter, intraoperative ultrasound, operating microscope, ultrasonic aspiration device, and microsurgical instruments. The key surgical steps are also listed here, which include meticulous muscle dissection with good hemostasis, a wide laminectomy cranial and caudal to the tumor, with the use of ultrasound before opening the door to determine that both cranial and caudal aspects of the tumor are well exposed, midline durotomy using the operating microscope followed by tumor resection and watertight dural closure.

**2:07 Initial skin incision**

The midline incision is used after the skin is carefully prepped and draped.

**2:14 Intraoperative ultrasound**

Subperiosteal dissection is performed, as well as laminectomy using X-ray fluoroscopy to determine the levels. Once laminectomy is completed and self-retaining retractors are in position, ultrasound is used to determine that both cranial and caudal aspects of the tumor are visualized. On axial ultrasound, one can see where the tumor ends and the nerve roots begin or end. This is very helpful in confirming we are above and below the tumor.

**2:43 Midline durotomy**

Finally, the operating microscope is brought to the field, and the dura is opened in a midline fashion. In this particular case, the dura was very thin, given the expansile tumor growth, which had likely been ongoing for several years. Several layers are opened, including a thickened arachnoid layer and a dura. The dura tacked up using 5-0 prolene sutures at several points along the dural opening.

**3:13 Tumor identification**

The tumor is immediately visualized, as can be seen here, and it did seem to be associated with the filum terminale. We are carefully determining the cranial aspect of the tumor by careful dissection using micro instruments with occasional use of bipolar cautery as the tumor was relatively vascular. You will see that we transition between exposing the cranial portion of the tumor and the caudal portion of the tumor.

Here we see an element of the filum that seemed to be diving into the tumor and associated with it. The filum was sectioned after stimulation. Again, there are nerve roots radially located around the lesion, and we work to keep these intact throughout the case. The tumor had a relatively clear boundary which was helpful.

Here, we are identifying the caudal edge of the tumor, and you can see that it is very tightly associated with these nerve roots, given our confined intradural space.

**4:20 Tumor debulking**

Here, we are able to remove a piece of the tumor with several instruments in the field using a four-hand technique. This piece was sent to Frozen Pathology. You can see the ultrasonic aspirator does play a role throughout this case, but the difficulty here is the bleeding associated with the lesion, which frequently required hemostasis, and progress was relatively slow for this reason.

**4:49 Tumor resection**

The tumor is ultimately removed in a piecemeal fashion, as can be seen here. Again, a combination of instruments is used here. The tumor forceps allow us to provide some traction over the tumor whereas micro scissors and two suctions are required to maintain visualization. Bipolar cautery again

is brought to stop any bleeding associated with the lesion. Shortly, you will see we will reach the ventral aspect of this lesion, and it is quite clear once we get there, as you will see the arachnoid again, as well as nerve roots.

We will start to roll the tumor down from its cranial aspect toward the caudal aspect and subsequently from caudal to cranial using these cottonoids to maintain the plane that is developed. Fortunately, this lesion had relatively clear margins and was not stuck to the nearby nerve roots. Ultimately, the scissor and a slight degree of traction on the tumor were very helpful toward the end, and removing the large pieces once it was disconnected circumferentially. Finally, the last segment of the tumor is removed, and we then focus on hemostasis using the thrombin-soaked gel foams.

These are kept in the field, and several rounds of thrombin-soaked gel foam are used to establish good hemostasis. Once this is established, we will then focus on the dural closure, which we did spend a significant amount of time on given the large dural opening using the 5-0 prolenes.

**6:29 Postoperative care**

Fortunately, watertight dural closure was achieved, and the remaining closure progressed in the usual fashion. We typically use a Hemovac drain in epidural space kept on suction for about 12 h and then transition to gravity and this was the case for our patient here. He woke up well with no new neurologic deficits, in fact, felt improvement in his leg numbness.

**6:50 Disease background**

The most common tumors in the intradural lumbar region are schwannomas and myxopapillary ependymomas.[2] Symptoms typically arise from compression of the nearby neural elements.[2] An intervention is typically dictated by symptom progression, whereas earlier intervention often leads to better neurological outcomes.[4] Urinary dysfunction is a negative prognostic indication.[4] Despite initial suspicions, the final pathology was paraganglioma.

**7:18 Review of clinical and imaging outcomes**

Fortunately, the patient's course was uneventful, and he was discharged to rehab on postoperative day 4. His physical examination was stable on discharge. Postoperative imaging was obtained in the hospital. Sagittal T2-weighted images are seen here, with subsequent axial images also T2-weighted. Here, we can see that the closure was adequate and that the tissues were reapproximated. Next, the contrast-enhanced images were seen here where no contrast-enhancing mass was seen, and gross total resection was confirmed.

**Declaration of patient consent**

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

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**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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