

## Case Report

# POSTERIOR THORACOTOMY APPROACH TO AID RESECTION OF POSTEROLATERAL ANAPLASTIC MENINGIOMA

## ABORDAJE MEDIANTE TORACOTOMÍA POSTERIOR PARA FACILITAR LA RESECCIÓN DE MENINGIOMA ANAPLASICO POSTEROLATERAL

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### Abstract

**Introduction:** Meningiomas of the spinal column are tumors that can cause compression of the spinal cord with progressive paraplegia. Its prognosis depends on a complete surgical resection. We propose surgical tips for these uncommon placed tumors in order to obtain free margins.

**Presentation of the case:** We report a patient with an invalidating and progressive pattern of pain in the thoracolumbar spine with paresthesias, loss of muscular strength in lower limbs and urinary retention due to an extensive anaplastic meningioma located posterolateral to the spinal cord with retroperitoneal and pleural invasion. An aggressive and extensive surgical approach was performed with retroperitoneal dissection and limited posterior thoracotomy to achieve complete tumor resection. There were no signs of recurrence one year after the intervention.

**Conclusions:** We have presented an unusual case concerning its presentation and surgical management. With our management we obtained free surgical margins and almost complete neurological recovery with no signs of recurrence one year after the intervention.

## Resumen

**Introducción:** Los meningiomas espinales son tumores que pueden producir sintomatología por compresión de la médula espinal, pudiendo debutar como una paraplejía progresiva. Su pronóstico depende de la realización de una resección quirúrgica completa. En este artículo proponemos algunos consejos quirúrgicos para la resección con márgenes libres de estos tumores de localización atípica.

**Presentación del caso:** Presentamos el caso de una paciente con dolor toracolumbar invalidante y progresivo, asociado a parestesias, pérdida de fuerza muscular en miembros inferiores y retención urinaria secundario a un meningioma anaplásico localizado en la zona posterolateral de la médula espinal dorsal, con invasión retroperitoneal y pleural. Se realizó un abordaje quirúrgico extenso, con disección retroperitoneal y una toracotomía posterior con el objetivo de realizar una resección tumoral completa. Al año de la intervención no se evidencian signos de recidiva tumoral.

**Conclusiones:** Hemos presentado el manejo quirúrgico complejo de un caso raro e inusual. Con este abordaje hemos conseguido una resección quirúrgica completa, con márgenes libres y una recuperación neurológica prácticamente completa, sin signos de recurrencia al año de la intervención.

## Introducción

Meningiomas of the spinal column are tumors that can cause compression of the spinal cord with progressive paraplegia. Prognosis depends of free resection margins, so it is important to perform a correct surgical resection even if the tumor is large with a wide extension. Our patient has an extensive posterolateral meningioma with retroperitoneal and pleural invasion. We propose surgical tips for these uncommon placed tumors, performing an aggressive and extensive surgical approach with retroperitoneal dissection and limited posterior thoracotomy to achieve complete tumor resection. This approach allowed us to obtain free margins, with no signs of recurrence one year after the intervention.

## Case presentation

A 44-year-old woman with history of Type II Diabetes Mellitus, obesity and depression began 10 months before with a progressive pattern of pain in the thoracolumbar spine irradiated to lower limbs and invalidating weakness in the lower extremities. She also had paresthesias in the feet and toes associated with urinary retention. Physical examination

showed spastic paraparesis, loss of muscular strength 1/5 right lower limb and 2/5 left lower limb and hypoesthesia with sensitive level dermatome D12. She visited the emergency department several times, doing plain X-rays without diagnostic, so MRI of spinal column was performed (figure 1), revealing a right paramedian

The spinal cord compression caused an invalidating symptomatology, so this case was presented in a committee of specialist in which it was decided to perform an extensive surgical approach and remove the tumor in a single surgical intervention. More conservative treatment consisting on a D11-D12 posterior laminectomy and spinal decompression, leaving for a second procedure the extra spinal component could have been performed.

Patient was operated in collaboration with the General Surgery department through an open posterolateral approach with single-side muscular dissection, extended to retroperitoneum, diaphragm and pleura opening. It was observed a large intraspinal lesion at D11-D12 that protruded like an hourglass through the hole of junction and extended widely through the retroperitoneum and at right basal pleura. With the help of intraoperative neurophysiological monitoring, a D11-D12 posterior laminectomy with

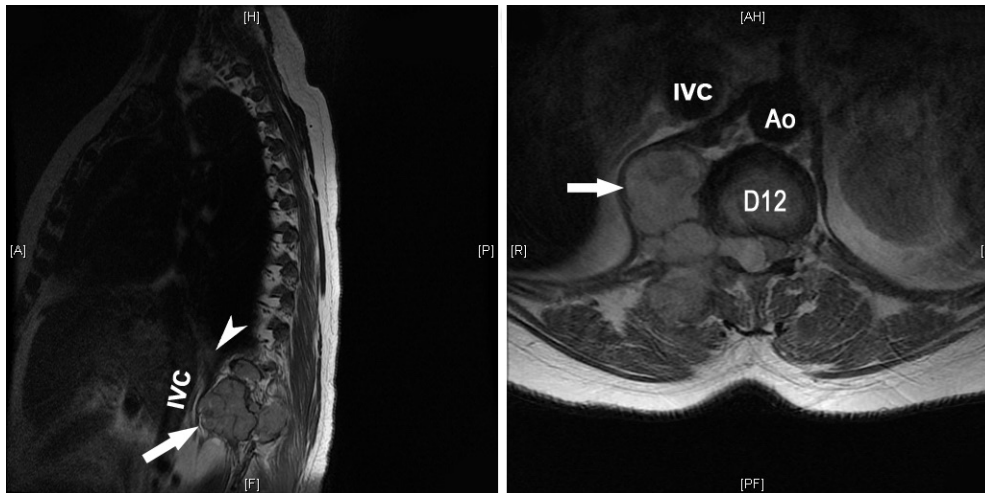


Image 1: Spinal column MRI. Arrow marks the tumor. Observe the proximity of the tumor to the inferior vena cava in its anterior surgical plane and diaphragm in its superior plane. IVC: inferior vena cava; Ao: aorta; arrowhead: diaphragm; D12: dorsal vertebra 12. MRI orientation: H: cranial; F: caudal; A: anterior; P: posterior; AH: anterior-high; PF: posterior-floor lesion at D12 with intradural component that compressed and displaced the medulla to the left and extra-spinal extension to pleura and retroperitoneum.

pedicle removal, D11-D12 foraminotomy, removal of the XII right costal arch and nerve root resection was necessary to resect en-bloc the tumor (figure 2). A limited posterior thoracotomy and blunt dissection inside the pleura allowed better delineating anterior surgical tumor margin achieving a complete removal of the tumor. Dural reconstruction was performed with fascia lata autograft. Finally, pleural and external lumbar drainages were placed. During the surgical

intervention, while placing the first pedicle screws for arthrodesis D9-L1, the patient presented hypotension, bradycardia and suffered a cardiac arrest secondary to a massive bilateral pulmonary embolism, which was recovered with cardiopulmonary resuscitation maneuvers, preventing the completion of the arthrodesis. After the surgery, our patient was threatened with anticoagulant therapy and had a complete pulmonary recovery, without sequelae.

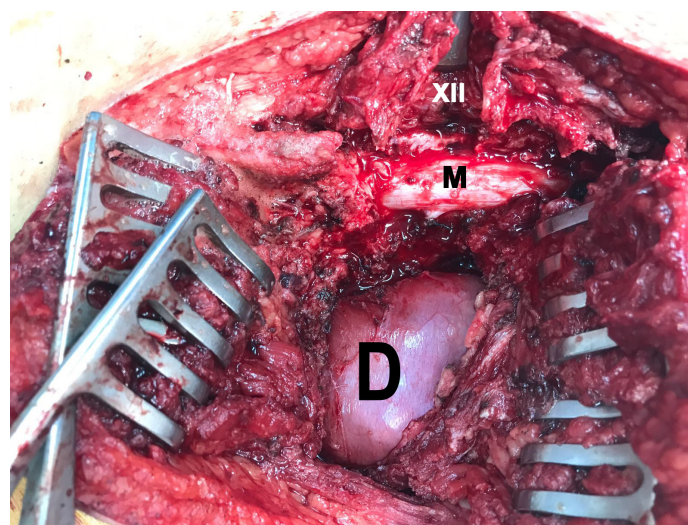


Image 2: Surgical resection of the tumor. Intrathoracic access allowed, with the help of blunt dissection, to delineate better the tumor and obtain tumor-free surgical margins, avoiding lesions of dangerous surrounding structures, such as the vena cava.

M: spinal medulla; D: diaphragm; XII: 12th right costal arch (removed).

After the surgery, our patient stayed 20 days in ICU. She had wound infection so went to surgery room again for wound cleaning. Once completely recovered, she started a program of motor rehabilitation in regular hospitalization ward and she was discharged from hospital 4 months after the first surgery.

Anatomopathological exam of the specimen showed a grade III anaplastic meningioma of the WHO with free surgical margins (grade I at Simpsons classification). With this result, the patient received 31 sessions of adjuvant radiotherapy (60 Gy).

One year after the surgery, the patient presents as sequelae hypoesthesia and hypoaesthesia from D12 to

sacral levels with good sphincter control, without residual pain. With an intensive program of motor rehabilitation, patient was completely independent for ambulation and without signs of tumor recurrence, requiring only a thoracolumbar corset until further surgery to stabilize the thoracolumbar spine. In the last thoracolumbar CT control (figure 3), spontaneously fusions together that stabilizes the D11-D12-L1 junction was observed, maybe due to the external stabilization applied by the corset, so she probably will not need arthrodesis in the future, although we must be cautious due to the short follow-up. After one year follow-up, our patient has no signs of recurrence in CT scan.

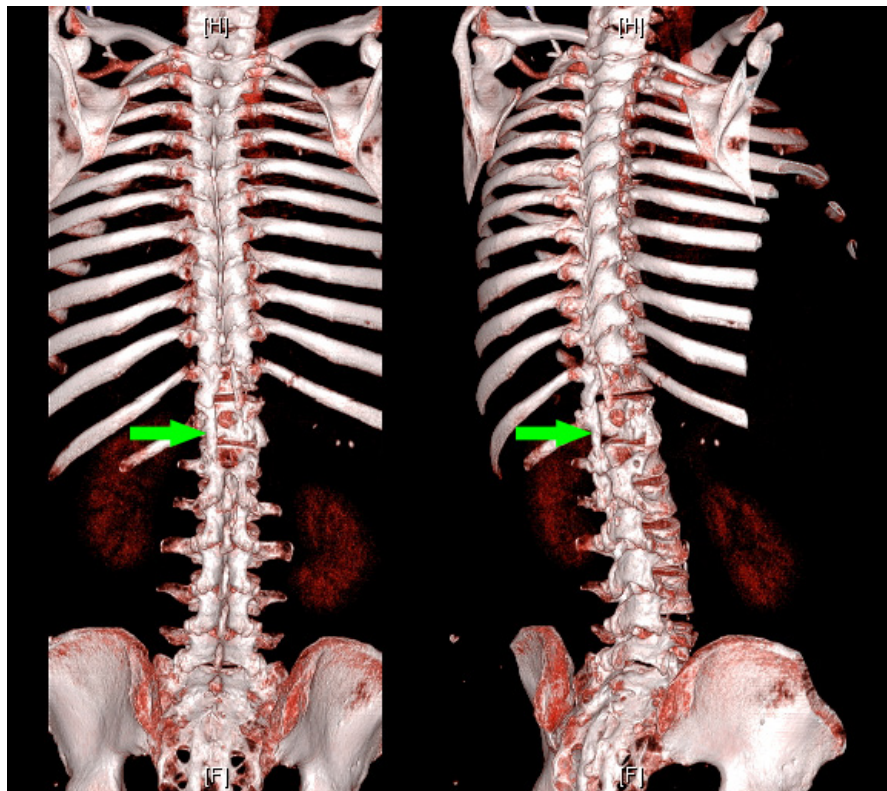


Image 1. One year after surgery thoracolumbar CT 3D reconstruction. Arrow marks spontaneous fusions together of D11-D12-L1 left pedicles that stabilize the lumbar spine.



## Discussion

Meningiomas of the spinal column are less frequent than intracranial tumors [1]. Represent 25-33% of the primary tumors of the nervous system, with an estimated incidence of 1.8: 100000 men and 3.4: 100000 women [2], with a peak incidence between 40 and 60 years old [3]. These tumors originate in the cells of the arachnoid layer of the dura mater in the extramedullary intradural space, and they are mostly benign. Its most frequent location is in the thoracic spine (67-84%), followed by the cervical spine (14-27%) and lumbar spine (2-14%) [4]. These tumors are usually originated lateral to the spinal cord, although in 15-27% are anterior to it, which makes its surgical resection more complex [5]. They grow slowly, expanding through the subarachnoid space, so their diagnosis is delayed.

According to the World Health Organization (WHO), they are classified in three grades: Grade I: benign meningiomas, which represent 94.6%; grade II: atypical meningiomas, which represent 4.2%; grade III: anaplastic meningiomas, which represent 1.2% [6]. Its histology is the most important prognostic factor of these tumors.

Clinically, motor, sensory and gait alterations are observed in more than 80% of spinal meningiomas [7]. Other symptoms are muscle weakness and atrophy, bladder incontinence, urinary retention, hypertonia of the lower limbs and dorsolumbar pain.

MRI is the preferred noninvasive modality for suspected meningioma [8]. These tumors are isointense to the healthy spinal cord in T1 and T2 sequences with homogeneous enhancement after intravenous administration of gadolinium [9]. The average delay in diagnosis is estimated between one and two years [10]. In our case, due to the malignancy of the tumor and the rapid growth of it, a relatively early diagnosis was obtained because of her multiple visits to the Emergency Department.

Treatment of symptomatic meningioma is complete surgical resection and decompression of the spinal cord. Medullary manipulation must be minimized to prevent spinal cord injury and postoperative clinical worsening. If laminectomies at multiple levels or a vertebral corporectomy are performed, arthrodesis is necessary to avoid postoperative spinal instability. Misra and Morgan [11] proposed a scheme to classify bone resections in spinal meningiomas and defined

the need for spinal stabilization according to the approach taken.

For tumors located in the ventral area, transthoracic approaches have been described, which provide direct access to the anterior surface of the spinal cord, allowing the non-tractional resection of the spinal cord [12,13]. Tola et al. [14] described the posterior approach with hemilaminectomy for the resection of ventral tumors, which presents potentially fewer complications than the transthoracic approach because it is less aggressive.

Our patient had a huge posterolateral tumor in relation to the spinal cord with anterior retroperitoneal and pleural extension so we decided a posterior approach with a limited posterior thoracotomy. We used this surgical tip in order to obtain free surgical margins. Blunt dissection and diaphragm opening let us resect en-bloc the tumor. The main problem of this approach is the higher pulmonary mobility and slower postoperative recovery. This can be prevented by doing early postoperative pulmonary rehabilitation.

As benign tumors, they are usually potentially resectable and their prognosis after surgical resection is excellent, with rapid functional recovery. Presence of free surgical margins is an important prognostic factor. The two most important points in tumor recurrence are the extent of surgical resection and the use of adjuvant radiotherapy. The rate of recurrence of benign meningiomas (WHO grade I) is estimated at 1.3-6.4%; they do not require adjuvant radiotherapy treatment after surgical resection, only follow-up. However, the risk of recurrence increases to 17% in incomplete surgical resections and in anaplastic meningiomas (WHO grade III) [10], therefore, the use of adjuvant radiotherapy is indicated in anaplastic and atypical meningiomas (WHO grade II) if a subtotal surgical resection has been performed or they have recurred. Dziuk et al. [15] compared the disease-free survival rate two years after surgery with respect to radiotherapy-associated surgery: a survival rate of 94% if surgery is associated to radiotherapy versus 61% in surgery without it. In addition, better results have been observed in several studies with the administration of higher doses of radiotherapy (> 60 Gy) [16]. Anaplastic meningiomas (WHO grade III) are very aggressive tumors, with high risk of recurrence despite a complete tumor resection; therefore they require adjuvant radiotherapy after complete surgical resection to reduce the risk of recurrence. However, radiotherapy is associated with short and long term

neuro-toxicity that can produce neurocognitive alterations and cerebrovascular accidents. Moliterno et al. [17] demonstrated, in a study conducted with 37 patients, an increase in the survival rate in anaplastic tumors that were completely resected (3.2 years) compared with subtotal resections (1.3 years). A study [18] conducted by Palma et al. in 79 patients showed a 95% survival rate at 5 years and 79% at 10 years for atypical meningiomas; and 64.3% at 5 years and 34.5% at 10 years for anaplastic, which improves when a resection is performed Simpson's grade I.

## Conclusion

We have reported an unusual case of a thoracolumbar anaplastic meningioma concerning its presentation, huge size and unusual surgical management. Surgical tips for these uncommon placed tumors are proposed with intratoracic approach first in order to delineate the tumor and obtain free margins. Patient had an extensive tumor with pleural and retroperitoneal invasion and required an aggressive and extensive surgical approach, with a triple posterior, retroperitoneal and pleural approach. Medullary decompression was achieved with almost complete neurological recovery and with no signs of recurrence one year after the intervention.

Arthrodesis in order to stabilize the spine after surgery has been postponed due to pulmonary embolism and surprisingly because of spontaneous fusion seems to be achieved.

## Conflict of interest

The authors declare no conflict of interests.

## Patient's informed consent

The authors declare have obtained patient's informed consent before writing the article.

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