Spinal Meningioma

58

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58.1 Definition

The spinal meningiomas are usually well-defined, benign, and slow-growing tumors with dural attachment. If untreated, they may cause significant morbidity.

Meningiomas constitute approximately 30% of intradural extramedullary spinal tumors. Their incidence is approximately 3:100,000 and they are more common in women than in men (3:1).

The meningiomas are arising from the layers around the spinal cord (arachnoidal cap cells).

Radiation and NF are recognized risk factors of meningiomas.

The meningiomas are located predominantly in the thoracic area (80%). The rest are distributed in the cervical segment (15%) and less frequently in the lumbosacral area (5%).

58.2 Natural History

Meningiomas are usually slow-growing tumors. The tumors tend to be diagnosed between the fifth and the seventh decade of life. Diagnosis of meningioma at an earlier age suggests more aggressive tumor behavior which has an incidence of <2% [1].

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Meningiomas may reach considerable size with severe radiological spinal cord compression before becoming symptomatic.

Once the compression on the spinal cord and/or nerves becomes significant, the patients may present various degrees of sensory and motor dysfunction with progressive deterioration of balance and coordination, occasional falls. Occasionally, the patients may describe vaguely localized pain in the spinal area, which is more pronounced at night (Chap. 41).

In advanced stages, if untreated, the mobility may be lost, and the patients may develop sphincter dysfunction.

58.3 Physical Examination

The clinical examination should look for signs of spinal cord/nerve compression. It is essential to perform careful neurological examination with assessment of gait, muscle power, tonus, reflexes, proprioception, and sensation (Video 58.4).

Positive long tract signs with positive Romberg probe, brisk reflexes, abnormal proprioception, and clonus should be a strong indication for magnetic resonance imaging (MRI) scan of the spine.

58.4 Imaging

MRI scan is the method of choice for the diagnosis of spinal meningiomas. On the MRI scan, the meningiomas appear as well-defined intraspinal lesions isointense with the spinal cord on T1- and T2-weighted images. They homogeneously enhance contrast on T1WI with gadolinium.

The presence of dural tail with a wider dural base helps to differentiate meningiomas from the nerve sheath tumors [2] (Fig. 58.1a). The MRI scan will confirm the level and degree of spinal cord compression.

Computed tomography (CT) can help to assess tumor calcification (Fig. 58.1b). Myelo-CT can be an imaging alternative in cases when MRI is contraindicated.

58.5 Differential Diagnosis

Biopsy is important; the following conditions should be considered (Video 58.8):

- Nerve sheath tumors.
- Myxopapillary ependymoma.
- Dermoid/epidermoid tumors.
- Calcified thoracic disc herniation.
- Myelopathy of another cause.

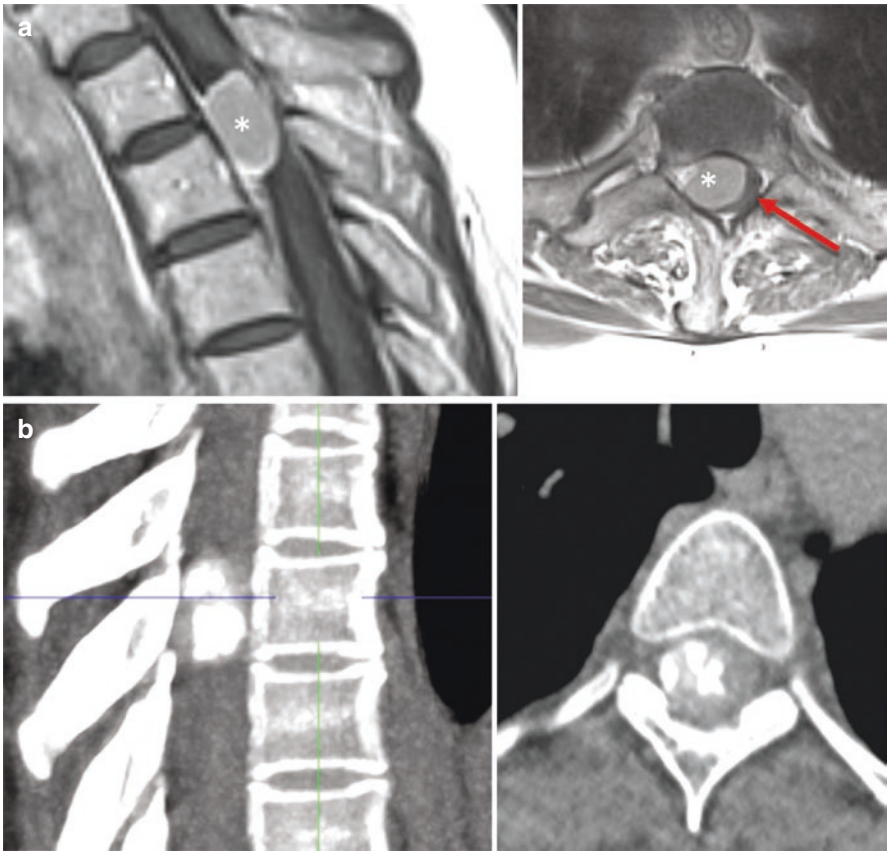

Fig. 58.1 (**a**) T1WI MRI with contrast. Spinal meningioma (*) located anterolateral to the spinal cord (arrow). Tumor has a visible dural tail. (**b**) CT thoracic spine demonstrated a highly calcified intradural tumor. This can be particularly challenging if located anterior to the spinal cord

58.6 Treatment Options

Surgery remains the mainstay of treatment of meningiomas and can be curative in the vast majority of patients.

The surgery has two main goals:

1. Spinal cord decompression.
2. Prevention of tumor recurrence.

The patient is placed prone. Even if the tumor is located anterior to the spinal cord, it still can be resected via the standard posterior approach. Either en bloc laminotomy using a craniotom (with the goal of its re-attachment after tumour is removed - laminoplasty) or standard laminectomy is performed (Laminoplasty as

described by Raimondi has the benefit of lower risk of postoperative kyphosis comparing to laminectomy [3]. Laminotomy is the surgical removal and subsequent reinsertion of laminae and spinous process; the term laminotomy is often incorrectly used to describe a partial laminectomy. A laminectomy is defined as complete removal of the lamina.

Surgery of the tumors located anterior or anterolateral to the spinal cord (40%) is usually more challenging due to narrow corridor and the potential need for gentle manipulation of the spinal cord. This could be particularly challenging when the tumor is calcified (Fig. 58.1b). Intraoperative neurophysiological monitoring is helpful in cases when the spinal cord needs to be mobilized.

We recommend dural exposure of at least 5 mm cranial and caudal to the tumor poles. This can be confirmed with intraoperative ultrasound [4, 5] (Fig. 58.2).

Under microscopic magnification, meticulous hemostasis is performed before opening the dura. After midline dural opening, the dural edges are stitched laterally. At this stage, the tumor should be visible (Fig. 58.3).

In most cases, the spinal meningiomas are fleshy, red-purple, sometimes fibrous, and occasionally calcified tumors. There is normally a thin arachnoid layer between the tumor and the neural structures, which prevents adherence to the spinal cord and allows tumor mobilization and separation. Dissection of the tumor base with coagulation of the vessels helps to reduce the intraoperative bleeding.

By debulking the tumor (either with an ultrasonic aspirator or piecemeal removal), the pressure on the spinal cord is decreased (Fig. 58.3). It allows mobilization of the tumor capsule away from the spinal cord. If the tumor is located anteriorly, the dentate ligament can be divided, and the spinal cord can be gently rotated laterally with the guidance of intraoperative neurophysiological monitoring.

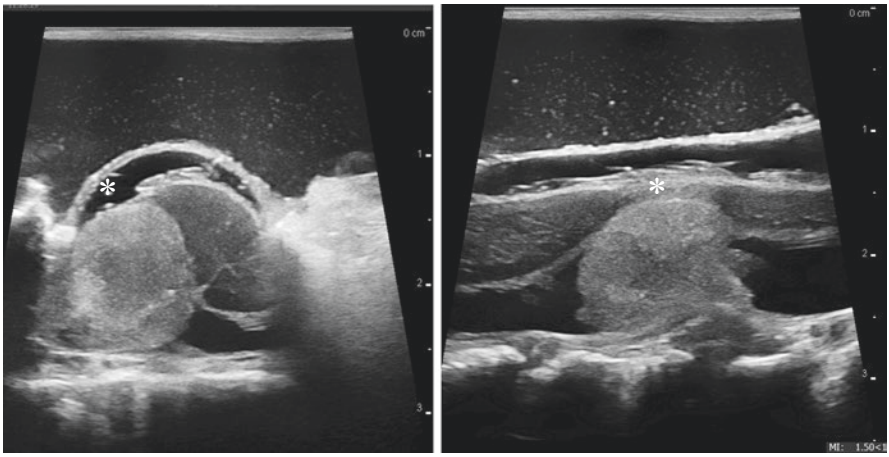

Fig. 58.2 Intraoperative ultrasound can be helpful to confirm tumor location and adequate dural exposure before opening the dura. The ultrasound demonstrates tumor (*) located anterolateral to the spinal cord

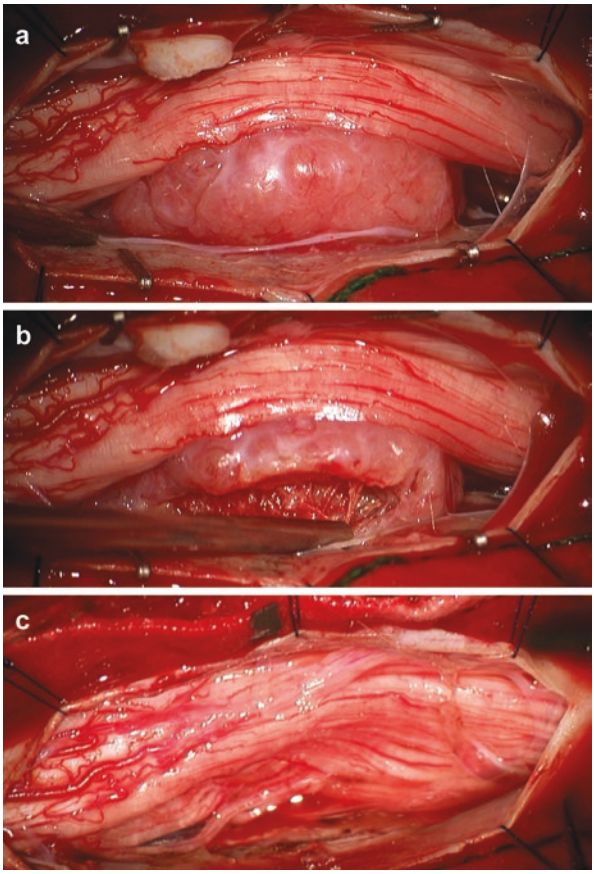

Fig. 58.3 Intraoperative image – spinal meningioma located anterolateral to the spinal cord. Surgical steps: view after (**a**) dural opening, (**b**) tumor debulking, (**c**) tumor excised, and spinal cord decompressed

After the tumor is removed and hemostasis achieved, the dura is inspected for any residual which should be excised. The dural base is coagulated (Fig. 58.3).

Dura is closed in a watertight fashion with non-resorbable stitches. When laminotomy is performed, posterior instrumented fusion is recommended; on the other hand, in case of laminoplasty, the "posterior shutter" is placed back and fixed with stitches, and the patient is immobilized (cast) until fusion is achieved.

58.7 Expected Outcomes

Surgery for excision of spinal meningioma is usually a gratifying procedure with generally good outcomes. Once the tumor is removed, the progressive neurological deficit is halted. Patients that had incomplete neurology before surgery will usually notice some improvement or even return to normal. Most of the improvement will happen within the first 2 to 3 months from surgery, and usually by 12 months it will reach a plateau.

The risk of recurrence is generally low. However, it is possible, even after many years; therefore, surveillance MRI is recommended. The proliferation index Ki-67 and the arachnoid invasion are the risk factors for recurrence of spinal meningiomas [6].

The postoperative outcome may be negatively influenced by the anterior location of the tumor with regard to the spinal cord, increased size, transdural expansion, degree of spinal cord compression, calcification of the tumor, poor preoperative neurological status, and aggressive histological status.

58.8 Potential Complications

Untreated patients can develop progressive neurological deficit and potentially loss of neurological function below the level of compression.

Surgical risks can be divided in:

- Intraoperative and early postoperative:
  - Spinal cord or nerve injury.
  - Bleeding.
  - Infection—superficial or deep wound infection and meningitis.
  - CSF leak.
  - General/anesthetic risks.
- Delayed complications:
  - Arachnoiditis.
  - Tumor recurrence.
  - Spinal deformity or possible osteoporotic fractures at the level of laminectomy.

58.9 What Should Patient and Family Know?

Tumors may be incidental findings. If asymptomatic – they may stay dormant for many years without obvious progression. Therefore, "watch and see" attitude is acceptable in such cases, in particular in patients with low life expectancy.

Nevertheless, in most cases, the tumor will continue to slowly grow, and in symptomatic patients with good life expectancy, it is recommended to excise the tumor early.

Usually the tumor is benign, and in the vast majority the surgery is curative. However, recurrence is possible; therefore, long-term MRI surveillance is recommended.

Further Readings

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