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Case Report

A case of cervical epidural meningioma with atypical image findings

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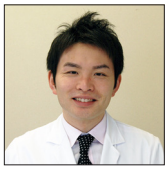

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ABSTRACT

Background: Spinal extradural meningiomas are rare and must be distinguished from malignant tumors due to their invasive nature and intense activity. We report a case of a cervical epidural meningioma presenting with atypical imaging findings.

Case Description: A 51-year-old woman presented with progressive paresis in both the upper and lower limbs. Magnetic resonance imaging revealed an extradural lesion at the C2–C4 level with homogeneous contrast enhancement. The lesion extended from the intervertebral foramen into the posterior cervical musculature. Computed tomography demonstrated diffuse calcification, spanning from the spinal canal to the posterior cervical musculature. The patient underwent tumor resection and decompression surgery, which led to an improvement in her neurological symptoms. Pathological examination confirmed the diagnosis of a psammomatous meningioma.

Conclusion: Cervical epidural meningiomas are extremely uncommon, and differential diagnosis can be challenging, especially in cases involving invasion into the posterior cervical muscles and calcification. Severely invasive lesions are often difficult to resect completely and necessitate careful follow-up.

Keyword: Calcification, En-plaque, Extradural meningioma, Spinal tumors, Spine

INTRODUCTION

Meningiomas most commonly occur intracranially but are also a frequent type of spinal cord tumor. They are typically intradural in origin, whereas extradural spinal meningiomas are uncommon. These extradural meningiomas often require differentiation from malignant neoplasms due to their invasive and aggressive behavior. Compared to intradural meningiomas, extradural spinal meningiomas exhibit higher rates of postoperative recurrence.[3]

Spinal epidural meningiomas are generally round, but occasionally, an en-plaque type may develop, spreading in a sheet-like fashion along the dura mater. This en-plaque type may invade the intervertebral foramen or even extend beyond it into adjacent soft tissues. When such extension occurs, the tumor can take on a dumbbell shape, often mimicking schwannoma.

In this report, we present a rare case of an epidural meningioma that involved the intervertebral foramen, vertebral artery, and posterior cervical musculature, necessitating differentiation from a malignant tumor.

CASE REPORT

A 51-year-old woman with no significant medical history initially noticed numbness in both legs 6 months prior. One month later, the numbness progressed to her knees, and 4 months later, she experienced difficulty climbing stairs. By the 5th month, she developed numbness and weakness in both hands, rendering her unable to perform fine motor tasks.

Neurological examination revealed sensory deficits in both hands and fingers. Motor testing showed 3/5 muscle strength in the fingers bilaterally. Muscle strength in both lower extremities remained at 5/5, but spastic gait was observed. In addition, hyperreflexia was noted in the triceps and lower extremity tendon reflexes. Laboratory tests were within normal limits.

Magnetic resonance imaging identified a lesion at the C2–C4 levels in the extradural spinal canal, predominantly on the left side. The lesion extended from the intervertebral foramen at C3 and C3/4 to the region surrounding the vertebral artery and into the posterior cervical musculature. On T1-weighted imaging, the lesion was isointense, while T2-weighted imaging showed hypointensity with uniform enhancement on contrast imaging [Figure 1]. Computed tomography (CT) revealed heterogeneous calcification of the lesion and scalloping of the neural foramen without significant bone destruction [Figure 2].

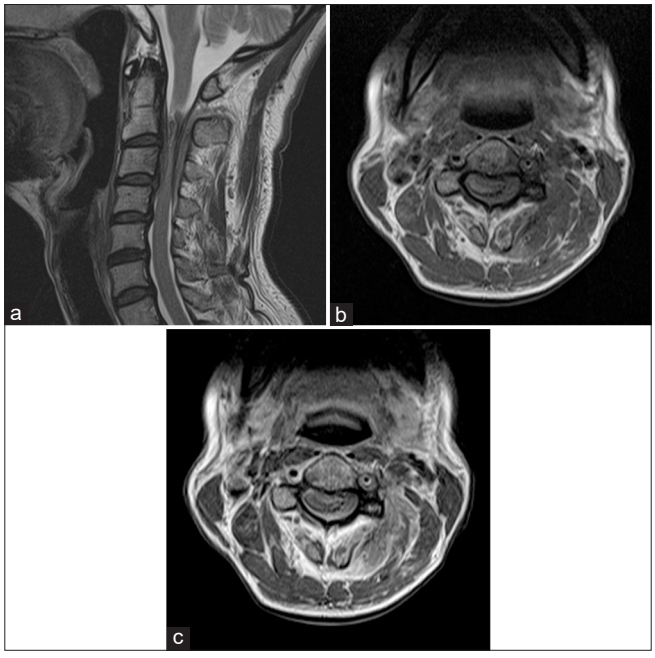

Figure 1: (a) Sagittal T2-weighted magnetic resonance imaging (MRI) showing an isointense lesion extending from C2 to C4. (b) T1-weighted MRI revealed an epidural lesion compressing the cervical spinal cord from the left to the right. (c) T1-weighted MRI with contrast enhancement demonstrating uniform contrast uptake by the lesion.

Based on the neurological symptoms and imaging findings, we diagnosed myelopathy secondary to the tumor. Given the rapid symptom progression and imaging characteristics, malignancy – such as chondrosarcoma – was considered. Due to the tumor's suspected invasiveness, we anticipated that total resection would be challenging and prioritized decompression surgery to alleviate the progressive myelopathy and obtain a histological diagnosis.

The surgery involved a C2 laminectomy and a C3 laminoplasty [Figure 3]. Strong adhesion was observed between the tumor, dura mater, and nerve roots, leading to partial tumor resection. As the tumor had invaded the vertebral artery through the intervertebral foramen, the ventral portion was preserved to avoid vascular injury. Although complete removal was not achieved, spinal canal decompression was sufficient. The left C2 and C3 nerve roots were preserved. Tumor tissue, yellow ligament, paraspinal muscles, and the vertebral arch were sent for pathological examination, which confirmed a psammomatous meningioma [Figure 4]. The tumor had invaded the paraspinal muscles and vertebral arch but not the yellow ligament.

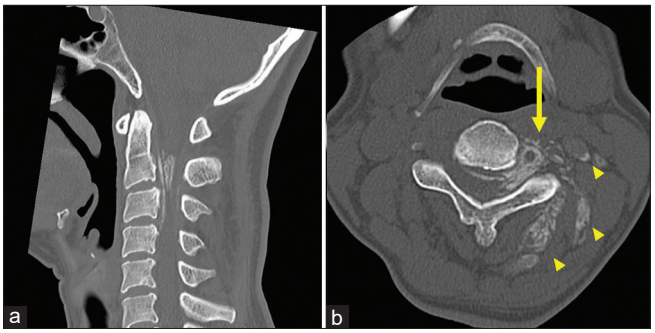

Figure 2: (a) Preoperative computed tomography scan of the cervical spine showing a calcified lesion extending from C2 to C4. (b) The extradural mass extends through the widened left neural foramen without evidence of bony destruction. The left vertebral artery is encased by the lesion (arrow), which also infiltrates the epidural soft tissue and posterior cervical musculature (arrowheads).

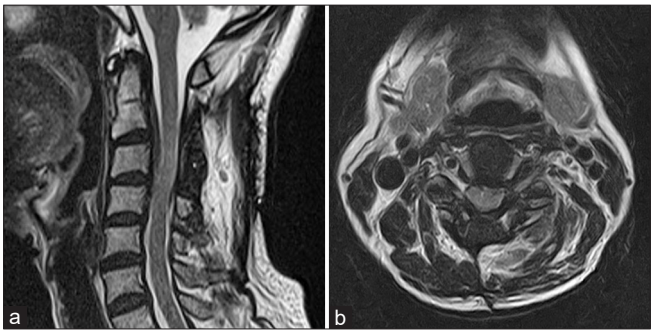

Figure 3: (a) Postoperative T2-weighted magnetic resonance imaging showing enlargement of the spinal canal. (b) Posterior decompression resulting in the release of cervical spinal cord compression.

The perioperative course was uneventful, and the patient experienced gradual improvement in paralysis and numbness, allowing her to resume daily activities. Postoperatively, her finger paralysis and spastic gait resolved rapidly. She returned to work as her condition improved. Over the 3-year follow-up period, there has been no recurrence of the tumor.

DISCUSSION

Meningiomas account for approximately 25% of spinal tumors.[1] These tumors typically originate within the extramedullary dura and arise from meningothelial cells of the arachnoid membrane. Epidural meningiomas are exceedingly rare, comprising an estimated 2.5–3.5% of all spinal tumors.[13] Among these, the thoracic spine is the most common site (80%), followed by the cervical (16%) and lumbar (4%) regions.[8] Calcification, although helpful for diagnosis, is observed in only 1.0–4.6% of spinal meningiomas.[6]

Compared to the more common intradural meningiomas, epidural meningiomas demonstrate more aggressive growth and a higher likelihood of clinical deterioration.[5] Imaging findings often reveal infiltrative features, with some cases showing invasion into the nerve plexus, soft tissues, or intervertebral foramina. Most extradural meningiomas in the cervical spine remain confined to the spinal canal. However, there are rare reports of tumors extending beyond the intervertebral foramen, forming a dumbbell-shaped mass[11], or invading the brachial plexus.[10] Instances of extradural meningiomas with both calcification and invasion into the muscle layer are exceedingly rare. To the best of our knowledge, only one previous case of cervical epidural meningioma with muscle layer invasion has been reported [4], and no case has been described with calcification similar to our case [Table 1].

Important differential diagnoses include calcified spinal glioblastoma multiforme and chondrosarcoma, although both are rare.[14,20] Most epidural meningiomas are classified as World Health Organization (WHO) grade I tumors.

Complete removal of spinal epidural meningiomas can be challenging, particularly in cases involving en-plaque lesions or calcification due to strong adhesions to surrounding tissues.[26] These factors also contribute to the higher recurrence rate of epidural meningiomas compared to intradural meningiomas.[9] In the present case, infiltration of

Table 1: Review of cervical extradural meningioma located only extradural with MRI images.

Author	Year	Age	Gender	Location	Calcification	Intraforaminal invasion	Muscle invasion	Pathology
Chen *et al.*[4]	1992	14	Female	C2–6	-	-	-	Meningothelial
Sato and Sze[18]	1997	39	Male	C2–3	-	-	-	Atypical
Buchfelder *et al.*[3]	2001	72	Female	C7–T2	-	+	-	Meningothelial
Gamache *et al.*[7]	2001	63	Female	C3–6	+	-	-	Unknown
Messori *et al.*[12]	2002	14	Female	C5–7	+	-	-	Meningothelial
Takeuchi *et al.*[22]	2006	50	Male	C3–4	-	+	-	Meningothelial
Restrepo *et al.*[16]	2006	57	Female	C7–T2	-	+	-	WHO1
Yamada *et al.*[24]	2007	22	Female	C1–5	+	-	-	Meningothelial
Frank *et al.*[6]	2008	45	Female	C5–7	-	+	-	Psammomatous
Benzagmout *et al.*[1]	2010	65	Female	C7–T1	-	+	-	Meningothelial
Yilmaz *et al.*[25]	2016	17	Male	C2–3	-	-	-	Unknown
Yaldiz *et al.*[23]	2014	48	Female	C7–T2	-	+	-	Psammomatous
Savardekar *et al.*[19]	2014	35	Female	C3–6	-	+	-	Meningothelial
Bettaswamy *et al.*[2]	2016	50	Male	C1–4	-	+	-	Meningothelial
Bettaswamy *et al.*[2]	2016	41	Male	C3–7	-	-	-	Meningothelial
Sivaraju *et al.*[21]	2017	50	Male	C5–7	+	+	-	Psammomatous
Pant *et al.*[15]	2017	50	Male	C5–7	-	+	-	Meningothelial
Lai *et al.*[10]	2018	35	Male	C1–4	-	+	+	Meningothelial
Sakamoto *et al.*[17]	2018	75	Female	C6-T1	+	-	-	Fibrous
De Eulate-Beramendi *et al.*[5]	2019	42	Male	C2–7	-	-	-	Meningothelial
Present case	2021	51	Female	C2–4	+	+	+	Psammomatous

WHO: World Health Organization, MRI: Magnetic resonance imaging

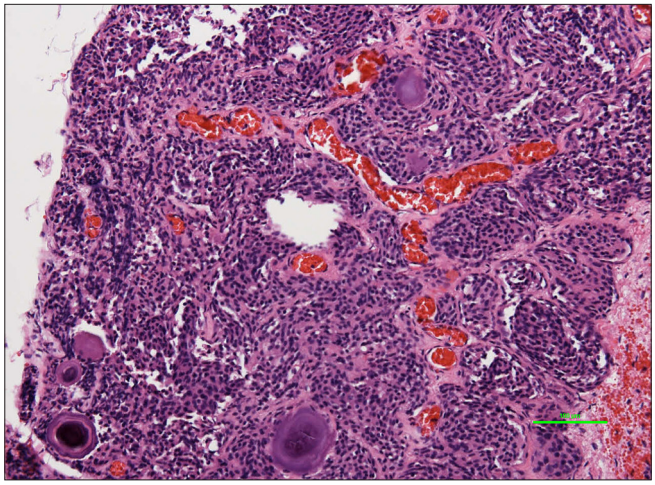

Figure 4: Hematoxylin and eosin-stained section showing meningothelial cells and psammoma bodies [scale bar (green line)] Magnification: 200x.

the posterior cervical muscles and vertebral artery made total resection particularly difficult.

CONCLUSION

Cervical epidural meningiomas are extremely rare, and differential diagnosis is challenging, especially in cases with posterior cervical muscle invasion and calcification. Severely invasive lesions are difficult to resect completely and require careful follow-up. Given the patient's relatively young age, long-term monitoring is essential. Should recurrence occur, sacrificing the vertebral artery and employing posterior fixation may be considered for total resection.

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