



Case Report

Intradural extramedullary pleomorphic xanthoastrocytoma: A case report

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ABSTRACT

Background: Pleomorphic xanthoastrocytomas (PXAs) are uncommon intradural and typically intramedullary astrocytic central nervous system tumors. Although they commonly occur supratentorially, they are rarely seen in the spine.

Case Description: A 43-year-old male presented with cervical neck pain and right-sided radicular symptoms. He was found to have an intradural extramedullary mass at the C5–C6 level. The lesion was fully excised and proved to be a PXA. Of interest, the lesion did not recur on postoperative MR imaging studies obtained 7 months later.

Conclusion: While rare, primary intradural extramedullary spinal PXA has been reported. Here, we review such a lesion occurring in a 43-year-old male who did well following gross total excision of the tumor.

Keywords: Pleomorphic xanthoastrocytoma, Primary, Spinal cord tumor

INTRODUCTION

Pleomorphic xanthoastrocytomas (PXAs) are uncommon, low-grade glial neoplasms that involve the central nervous system; they account for 1% of all astrocytic tumors.^[6,11,16] These tumors are most commonly seen in children and young adults. They are typically seen supratentorially, arising in the temporal lobes.^[3,7] Primary spinal PXAs are extremely rare, with only nine prior cases reported in the literature.^[3,4,6-9,13,17,18] Notably, the majority of these are intramedullary, with only one prior reported case of a primary spinal intradural, extramedullary PXA.^[3]

CASE DESCRIPTION

A 43-year-old Caucasian male presented with 5 months of persistent posterior cervical neck pain radiating to the right shoulder, accompanied by paresthesias and right upper extremity radiculopathy. Although both his motor and sensory exams were intact, he was diffusely hyperreflexic (3+ bilateral biceps, brachioradialis, triceps, patella, and ankles [two beats of unsustained clonus in his right foot]) with bilateral Babinski signs. Hoffman's signs were negative bilaterally.

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The cervical MRI demonstrated a T1 isointense, T2 hyperintense, enhancing intradural, extramedullary mass measuring $2.4 \times 1.4 \times 1.1$ cm at the C5–C6 level [Figure 1]. It was eccentrically located to the right, compressing the cervical spinal cord without abnormal hyperintense T2 spinal cord signal. The predominant differential diagnoses included a benign nerve sheath tumor versus meningioma.

He underwent a cervical laminectomy for gross total microsurgical resection of the tumor. The tumor was intradural and completely extramedullary; it appeared to arise from a C6 nerve rootlet. Gross total resection of the tumor was achieved and the entire lesion for sent for pathologic analysis.

Histology

The pathologic findings were most consistent with a PXA (WHO Grade II). The tumor was a well-circumscribed neuroepithelial neoplasm arranged in fascicles, sheets, and nests [Figure 2]. The tumor cells were variably pleomorphic and occasionally showed an epithelioid, xanthomatous, or ganglionic appearance. Scattered eosinophilic granular bodies and focal collections of perivascular lymphocytes were also noted. Up to 4–5 mitoses/10 high-power field were counted. Immunohistochemistry demonstrated GFAP, SOX10, synaptophysin, S100, SOX10 (red), and CD34 reactivity in most of the neoplastic cells. Staining with inhibin, NSE, MelanA, HMB45, NeuN, and H3K27M was

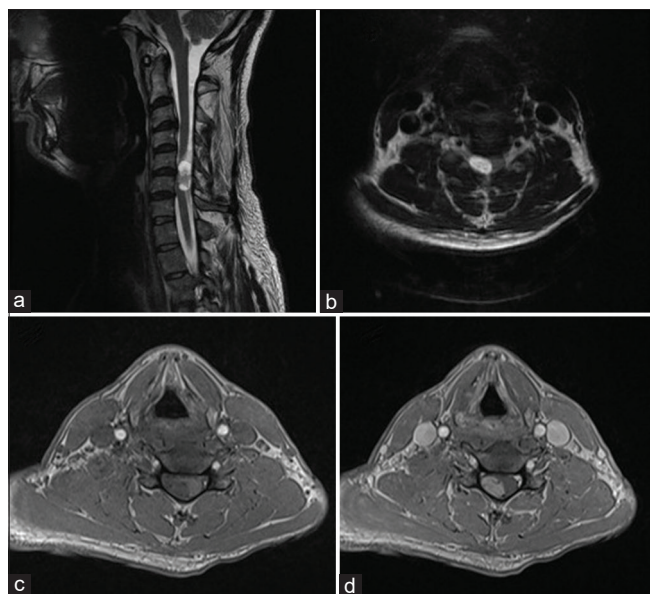


Figure 1: Sagittal (a) and axial T2-weighted (b) images demonstrated an intradural extramedullary cervical spine mass, displacing the spinal cord anteriorly and to the left. Axial T1 precontrast (c) and axial T1 postcontrast images (d) demonstrate heterogeneous enhancement of the mass, with a convex border abutting the spinal cord.

negative. ATRX and INI1 were retained. No IDH1R132H mutation was detected. The reticulin stain highlighted only the blood vessels. A mutation of V600E in the BRAF gene was not detected on PCR. The DNA methylation analysis revealed no additional information. No reportable germline and somatic variants were detected with the PBTP Next-Generation Sequencing panel.

Postoperative course

The patient did well postoperatively, with improvement in his preoperative radicular pain and paresthesias. He was discharged home on postoperative day 2. In addition, he returned to work part-time 1 month following surgery, noting only mild right cervical paraspinal discomfort with activity.

The postoperative MRI demonstrated no residual disease, and the MRI of the brain, thoracic, and lumbar spine showed no other lesions. On follow-up MR 7 months later, the tumor had not recurred [Figure 3].

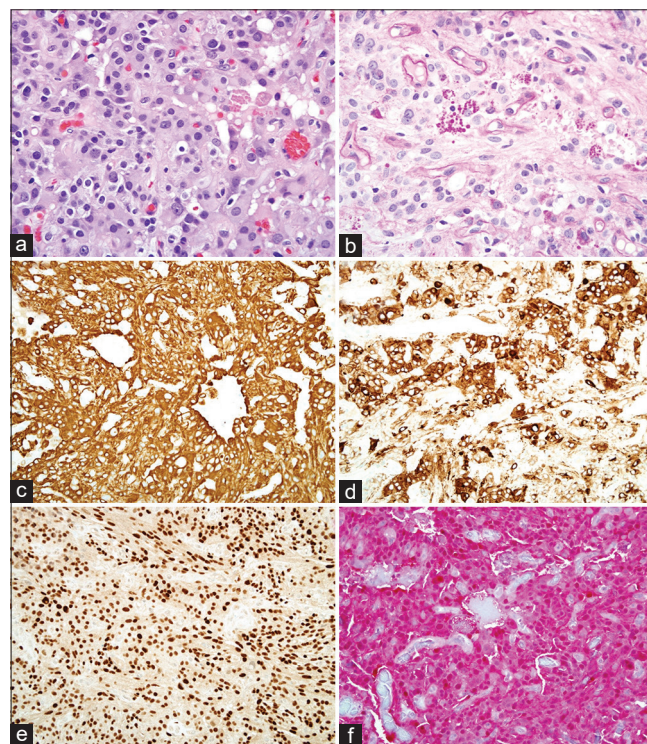


Figure 2: Hematoxylin and eosin stain (a) shows an astrocytic neoplasm with moderately pleomorphic nuclei and many eosinophilic granular bodies. Periodic acid–Schiff with diastase (b) highlights the eosinophilic granular bodies as well as blood vessels. By immunohistochemistry, the tumor cells show cytoplasmic positivity for GFAP (c) and synaptophysin (d), nuclear positivity for SOX10 (e), and both nuclear and cytoplasmic positivity for S-100 (f). (a,b) Viewed at $\times 200$ magnification. (c–f) Viewed at $\times 400$ magnification.

DISCUSSION

Frequency

PXAs are rare, slowly growing central nervous system neoplasms, thought to arise from subpial astrocytes or their precursors.^[16] These tumors were first described by Kepes *et al.* in 1979,^[10] and incorporated into the WHO classification of tumors in 1993. PXAs most commonly occur in children and young adults; however, they have been reported in patients ranging from 2 to 68 years in age.^[16] Up to 98% of PXAs occur supratentorially, with the most common site being the temporal lobes.^[1,3,7,11] Outcomes are generally favorable, with overall survival rates greater than 80% and 75% at 3 and 5 years, respectively.^[16]

Histopathology

Histologically, these neoplasms demonstrate large pleomorphic cells, either epithelioid or spindled, which are occasionally lipidized. Multinucleated cells and eosinophilic granular bodies are frequently seen.^[11] These neoplastic spindle cells may be arranged in fascicles, often accompanied by hypercellular reticulin staining.^[3,13,17] Focal collections of perivascular lymphocytes are also noted. Most are classified

as the WHO Grade II; however, 15–20% demonstrate anaplastic features and are classified as the WHO Grade III.^[11,15] Anaplastic features include high mitotic activity (>5 mitoses/10 high-power fields) and areas of necrosis.^[5] The neoplastic cells are positive for GFAP, S-100 protein, and CD34.^[11,19] Neuronal differentiation has been reported.^[4,13,16] BRAF mutations are found in approximately 75% of Grade II PXAs, with a lower frequency in anaplastic PXAs.^[9,11,17,18]

9 Prior cases reported of PXA in the spine

Only nine prior cases of primary spinal PXA have been reported; of these, only one was in an intradural, extramedullary location, the remainder being intramedullary lesions.^[3,4,6-9,13,17,18] Classically, PXAs present as cortically based tumors with cystic and solid components, usually isointense on T1-weighted and hyperintense on T2-weighted images, with marked postcontrast enhancement.^[16] Spinal PXAs [Table 1] are typically solid, enhancing masses, with only two demonstrating a cystic component. Most lesions occur in the cervical and thoracic spine, with only two reported cases involving the proximal lumbar spine at the T11-L2 and T12-L1 levels. Notably, the one prior reported case of an intradural, extramedullary PXA arose in the

Table 1: Literature review of pleomorphic xanthoastrocytoma originating in the spinal cord

Reference	Age/ Sex	Location	MR characteristics	Extent of resection	Adjuvant therapy	Overall survival
Herpers <i>et al.</i> , 1994	66/M	T2–T4 Intramedullary	Partially cystic mass, enhancement of solid component	GTR followed by STR	RT following 2 nd surgical resection	>8 months, alive at time of publication
Fouladi <i>et al.</i> , 2001	12/M	Not reported	Solid mass, contrast- enhancing	STR	RT, CTX	Death 24 months after diagnosis
Nakamura <i>et al.</i> , 2006	33/F	Cervical spine Intramedullary	Partially cystic mass, enhancement of solid component	GTR	N/A	No recurrence at 36 months
Gill <i>et al.</i> , 2010	23/F	T11–L2 Intramedullary	Solid mass	STR followed by GTR	Oral CTX	No recurrence at 6 months
Simal-Julian <i>et al.</i> , 2010	60/F	C4–C5 Intramedullary	Solid mass, contrast- enhancing	GTR	N/A	No recurrence at 36 months
Das <i>et al.</i> , 2014	15/M	C5–C6 Intramedullary	Solid mass, contrast- enhancing	STR	N/A	Progressive disease at 24 months
Hong <i>et al.</i> , 2017	31/M	T12–L1 Intramedullary	Solid mass, contrast- enhancing. Leptomeningeal spread at diagnosis	STR	RT, CTX	Progressive disease, death 62 months after diagnosis
Sharma <i>et al.</i> , 2017	23/F	T8–T10 Intramedullary	Solid mass, contrast- enhancing	GTR	N/A	No recurrence at 12 months
Daoud <i>et al.</i> , 2019	49/M	C3–C7 Intradural, extramedullary	Solid mass, contrast- enhancing	STR	RT	No recurrence at 7 months
Index patient	43/M	C5–C6 Intradural, extramedullary	Solid mass, contrast- enhancing	GTR	N/A	No recurrence at ___ months

GTR: Gross total resection; STR: Subtotal resection; RT: Radiation therapy; CTX: chemotherapy

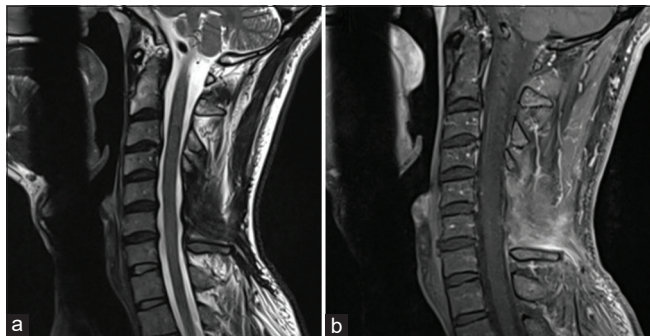


Figure 3: Sagittal T2-weighted (a) and T1 FS postcontrast (b) images of the cervical spine demonstrate no residual or recurrent tumor 7 months postoperatively.

cervical spine,^[3] as in our patient. Imaging of the entire neuraxis is indicated to exclude additional lesions, although drop lesions from intracranial PXA have only rarely been reported.^[2,14,20]

Treatment protocols

There are no well-established treatment protocols for spinal PXA. Of interest, 80% of patients (4 out of 5) who underwent gross total resection were alive and without evidence of recurrent disease at time of the publication of their respective articles [Table 1]. In contrast, 75% of patients (3 out of 4) who underwent subtotal resection had progressive disease, with half of them eventually succumbing to their tumors. While there is not strong evidence that radiotherapy or systemic chemotherapy increase survival for patients with primary PXA, they both have been used, especially in the setting of progressive and/or recurrent disease.^[12] In our case, the lesion was fully excised, the patient's symptoms resolved, and there was no evidence of tumor recurrence on the 7-month postoperative MR.

CONCLUSION

Here, we presented a patient with a primary WHO Grade II PXA involving the spinal cord in an intradural, extramedullary location. With gross total resection, the tumor has not recurred on 7-month postoperative follow-up.

Declaration of patient consent

Patient's consent not required as patients identity is not disclosed or compromised.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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