



Case Report

Low-grade fibromyxoid tumor of the dura: A new entity?

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ABSTRACT

Background: Low-grade fibromyxoid tumors are uncommon in children. Their differentiation from high-grade fibromyxoid tumors, as seen in adults, is imperative to diagnosis. Awareness of the entity and its subsequent behavior may guide management and predict outcomes.

Case Description: We describe the case of a previously unreported low-grade fibromyxoid tumor of the cerebellum in an 8-year-old male. Extensive immunohistochemical, next-generation sequencing, and attempted DNA methylation profiling are reported. There has been no recurrence during the 6-year follow-up. Screening excluded multiple myxoid tumors, including low-grade fibromyxoid sarcoma. The findings suggest that, with gross total resection, the lesions may not recur.

Conclusion: The case of fibromyxoid tumor with 6-year follow-up and the limited literature of similar tumors are reviewed.

Keywords: Dura, Fibromyxoid, Meningioma

INTRODUCTION

Dural-based neoplasms are relatively uncommon in children, and fibromyxoid dural tumors are even rarer.^[1,2,4,6-12] To date, although dural fibromas, myxoid variants of meningiomas, and myxoid solitary fibrous tumors are recognized by the World Health Organization, a specific clinicopathologic entity has not been assigned for pediatric fibromyxoid tumors that do not meet the aforementioned criteria. In this report, we describe a low-grade fibromyxoid tumor arising from the dura in a child.

CASE DESCRIPTION

An 8-year-old male presented after two weeks of progressively worsening headaches, nausea, and vomiting. Before that, he had fallen, hitting his head on cement. On examination, his speech was intact, and he had no visual changes, facial droop, weakness, issues with memory loss, or altered mental status. There had been no changes in his sense of smell, hearing, or taste.

He was well in school and had been free of any fever, cough, congestion, sore throat, chest pain, diarrhea, dysuria, difficulty breathing, neck pain, or pain elsewhere. There had been no weight loss.

The family history included pancreatic cancer in a maternal grandfather and breast cancer in a maternal grandmother. However, a teenage first cousin had a brain tumor.

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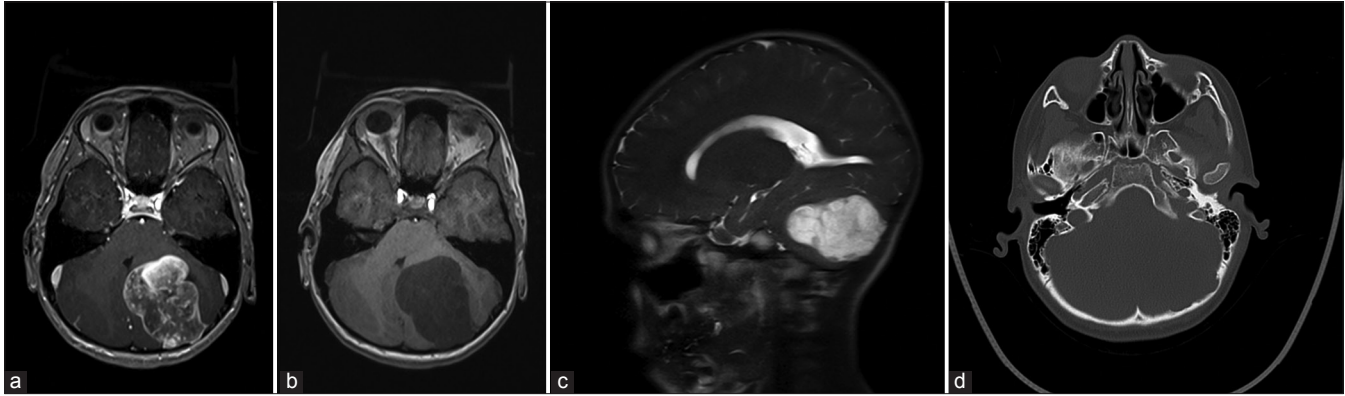


Figure 1: (a) MRI axial post gadolinium axial T1 weighted image. The tumor was a large well circumscribed, dura based, extra-axial mass in the left aspect of the posterior fossa. (b) The mass is predominantly hypointense on T1 weighted image. (c) The mass lesion showed marked hyperintensity on T2 weighted images. (d) Remodeling and scalloping of the inner table of the occipital bone was also seen.

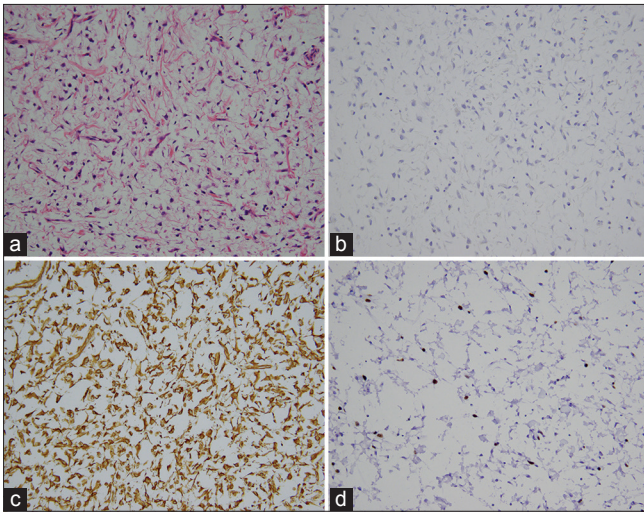


Figure 2: (a) Myxoid tumor with spindle cells. (Hematoxylin and eosin, original magnification $\times 200$). (b) Epithelial membrane (EMA) immunohistochemistry. No brown EMA immunoreactivity was detected in spindle cells. (Hematoxylin counterstain and diaminobenzidine chromogen (brown); original magnification $\times 200$). (c) Vimentin immunohistochemistry. Tumor cells displayed extensive vimentin immunoreactivity (brown). (Hematoxylin counterstain and diaminobenzidine; original magnification $\times 200$). (d) Ki-67 immunohistochemistry. Ki-67 labeling (brown) was variable (Hematoxylin counterstain and diaminobenzidine; original magnification $\times 200$).

The patient had no significant past medical history. He had four healthy siblings.

On examination, he had a blood pressure of 92/42 mmHg, pulse 52, and temperature of 37.2°C. No lymphadenopathy was found. The neurologic examination revealed mild truncal ataxia, an abnormal tandem gait, and a heel-shin test on the left side. His laboratory analyses revealed a normal but slightly elevated lactate dehydrogenase. An initial computed tomography scan revealed a complex

multiloculated cystic mass centered within the left cerebellar hemisphere, with moderate mass effect and partial effacement of the fourth ventricle. There was minimal dilatation of the supratentorial ventricular system. Magnetic resonance imaging (MRI) revealed a large, well-circumscribed mass centered within the left cerebellar hemisphere, with apparent exophytic extension through the posterolateral cortical margin and suggested adherence to the overlying endosteal dural layer [Figure 1].

Clinically, a diagnosis of atypical pilocytic astrocytoma was favored. However, the tumor was heterogeneous on imaging, leading to a consideration of other possible diagnoses, such as a medulloblastoma or a malignant glioma.

At surgery, the left-sided intradural, extra-axial tumor was found to have eroded through the dura with a consistency of an extra-axial meningioma. Gross total resection was achieved. MRIs 9 months after surgery revealed no abnormal enhancement or evidence of recurrence.

The sections revealed a tumor with large hypocellular and moderately cellular areas with scattered stellate and spindle cells.

The toluidine blue stain revealed scattered mast cells. Alcian blue staining was extensive. The periodic acid schiff (PAS) showed no loss with periodic acid schiff, diastase (PASD). Stellate and spindle cells showed scattered epithelial membrane antigen (EMA), S100, rare progesterone receptor, no pan-cytokeratin, no CK18, and no calretinin immunoreactivity. There was neurofilament immunoreactivity in one of two blocks, and focally, collagen bundles were found, but no notable collagen IV immunoreactivity was found. No ALK1, CD1a, or CD117 immunoreactivity was seen. CD68 and CD163 highlighted macrophages [Figure 2].

Vimentin immunostaining was extensive. Beta-catenin was cytoplasmic. Langerin was found in scattered cells.

In some areas, several mitoses were found, and the Ki-67 labeling is focused at approximately 13% or higher [Figure 2].

Tumor cells showed no immunoreactivity with SMA, MSA, synaptophysin, glial fibrillary acidic protein, desmin, and CAM 5.2. CD34 was confined largely to blood vessels. Fluorescence *in situ* hybridization for FUS (16p11.2) revealed no rearrangement of the gene. Subsequently, DNA sequencing revealed no mutations in AKT1, ALK, BRAF, CDK4, CTTNB1, DDR2, EGFR, ERB2-4, FGFR12 and 3, IGH1 and 2, JAK2 and 3, KIT, KRAS, PAM2K1 and 2, MET, MTOR, PDGFRA, PIK3CA, RAF1, PET, ROS, and SMO genes. Genome-wide DNA methylation at Knight Diagnostic laboratory, attempted multiple times on two different tissue blocks, was unsuccessful due to low DNA concentration. The tumor was classified as a low-grade fibromyxoid lesion.

Six years after surgery, the patient has had no recurrence. He is clinically well and active in sports, requiring balance and fine motor skills.

DISCUSSION

Fibromyxoid tumors must be differentiated from a number of fibrous and myxoid lesions including fibromas,^[10] myxomas,^[2] myxoid meningiomas,^[3,5,8] angiofibroxanthomas of the dura,^[9] myxoid solitary fibrous tumors, myxoid liposarcomas,^[11] myxoinflammatory fibroblastic sarcoma,^[12] and intracranial mesenchymal tumor with FET: CREB fusion.^[7,11] One case of a “myxoid meningioma” has been reported in a seven years old. However, typically, the myxoid variant of meningioma is associated with the falx and is also more common in older females (mean age = 57 years).^[6,8] While the degree of EMA immunoreactivity may be limited, at least focal immunostaining is found using monoclonal antibodies. Myxoid liposarcomas may rarely metastasize to the dura but display notably different histologic features.^[1] Similarly, myxo-inflammatory fibroblastic sarcoma has not been described at this site and has a FUS gene mutation.^[1,4] Intracranial mesenchymal tumors with FET: CREB fusion can occur in young subjects and have myxoid stroma, but these are high-grade tumors. Those with EWSR1:CREB1 fusion may have more spindle cells and can have CD99 immunoreactivity.^[7] Thus, the classification of myxoid tumors requires an extensive evaluation.

The age, absence of identifiable areas of classic meningioma, and lack of expression of EMA and progesterone receptor immunoreactivity argue against a myxoid meningioma. The lesion does appear to be fibromatous, but the lack of cellularity and cellular atypia would be unusual for a meningeal fibroma. The lesion has some features suggestive of myxo-inflammatory fibroblastic sarcoma, including atypical binucleated cells and inflammatory infiltrates. Nonetheless, this is a rare

tumor that usually arises in soft tissue in acral sites and shows a FUS gene rearrangement.^[1]

The low-grade fibromyxoid tumor here was a hypocellular lesion composed of rare cells with elongated nuclei, dense collagen with no mitotic activity, and notable alcian blue staining highlighting the myxoid component. The chromosomal analysis did not identify additional features associated with neoplasia. In our case, the designation fibromyxoid tumor was tentatively descriptive and suggestive of a tumor with a low risk of recurrence and aggressive growth. Follow-up for six years supported this. The designation is not meant to imply that this is a variant of a low-grade fibromyxoid sarcoma. The latter tumors are distinct from this tumor by age and location, as well as lack of FUS gene region rearrangement. In addition, our tumor was different from the myxoinflammatory fibroblastic sarcomas’ tendency to occur in the distal extremities of adults.^[1,4]

CONCLUSION

The classification and pathogenesis of this and similar tumors remain to be established. In the absence of other descriptions of similar tumors, it may represent a new entity different from fibromyxoid tumors in adults. Given the favorable, essentially curative outcome with surgery alone, awareness of its behavior is important.

Statement of ethics

Written consent was obtained from the parents for publication of the details of the medical case and images.

Author’s contributions

MDJ made the diagnosis and wrote the manuscript (MS). HS performed the surgery and contributed to the MS. DK contributed to the MS. AH provided images and contributed to the MS. DH performed the molecular analysis and contributed to the MS.

Ethical approval

Institutional Review Board approval is not required.

Data availability

There are no datasets. All information is in the MS.

Declaration of patient consent

Patient’s consent not required as patient’s identity is not disclosed or compromised.

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Nil.

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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