Rare intracranial *EWSR1*-rearranged myxoid mesenchymal tumour in a teenager

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DESCRIPTION

A 14-year-old girl presented with 10 months of worsening headaches with associated nausea and 1 month of visual impairment, including blurry and double vision. Her headaches initially occurred monthly but increased in frequency and became intractable to medical management. Physical examination was significant for papilloedema on fundoscopic examination and a right inferior quadrantanopia but was negative for other neurological abnormalities. MRI revealed a peripherally located, homogeneously hyperenhancing mass in the left posterior supratentorial compartment that was T1-hypointense and T2-hyperintense with slight heterogeneity (figure 1). Cortical vasculature displacement indicated extra-axial location. No dural tail or calcifications were appreciated, but hyperintensity of the white matter involving the left parietal lobe and compression of the left occipital lobe. The neuroradiographic differential diagnoses included meningioma, atypical haemangiopericytoma, lymphoma and gliosarcoma. The patient underwent surgical resection where neuropathology revealed spindle cell proliferation of low cellularity with angulate, hyperchromatic nuclei and thin strands of cytoplasm separated by an abundant myxoid background (figure 2). Sparsely scattered rosette-like structures with a central core of densely eosinophilic, hypocellular collagenous material were detected. Little mitotic activity was observed, and reticulin staining revealed abundant network deposition around the tumour cells. The histological differential diagnoses for myxoid soft tissues include myxoma, myxoid liposarcoma, myxoid chondrosarcoma, low-grade fibromyxoid sarcoma and myxoid undifferentiated pleomorphic sarcoma (myxofibrosarcoma). Immunohistochemistry showed diffuse and strongly positive staining for CD99 and slight epithelial membrane antigen and desmin positivity. Few (<1%) Ki-67 + nuclei were noted, and a subset of tumour nuclei stained positive for beta-catenin. Scattered CD68 + cells throughout the lesion were noted. Immunostaining was negative for S100, SMA, synaptophysin, GFAP, CD34, STAT-6, NF, myogenin and ALK-1. Features customarily observed in angiomatoid fibrous histiocytosis (AFH)—fibrous pseudocapsule, lymphoplasmacytic infiltrates and blood-filled cystic spaces were not appreciated. Next-generation sequencing detected a variant of unknown significance in *TOP2A* (c97A>C) but no known clinically significant variants. Microarray likewise detected no clinically significant abnormalities. Fluorescence in situ hybridisation demonstrated rearrangement of the

Figure 1 Neuroimaging features of central nervous system mixed mesenchymal tumour. MRI reveals a large left posterior tumour with surrounding vasogenic oedema on T2-weighted sequences (A), with no evidence of reduced diffusivity (B) or susceptibility-weighted artefact (C) that shows homogeneous enhancement on T1-post gadolinium weighted sequences (D).

EWSR1 gene at 22q12. These findings were most consistent with a diagnosis of *EWSR1*-rearranged myxoid mesenchymal tumour. The patient underwent complete tumour resection and has been

Figure 2 Neuropathology of central nervous system mixed mesenchymal tumour. H&E stained section reveals a spindle cell proliferation of low cellularity with angulate, hyperchromatic nuclei and thin strands of cytoplasm separated by an abundant myxoid background. Scattered 'rosette-like' structures with a central core of densely eosinophilic, hypocellular collagenous material. Mitotic activity is inconspicuous. Reticulin stain showed abundant background deposition around tumour cells and diffuse positivity for CD99 (not shown) consistent with a diagnosis of mixed mesenchymal tumour.

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Images in...

recurrence free 3 years post-resection with resolution of right inferior quadrantanopia.

Genetic rearrangement featuring *EWSR1* fusion can occur in a diverse array of mesenchymal neoplasms.¹ However, *EWSR1*-rearrangement mesenchymal tumours in the central nervous system are exceedingly rare and were unreported until recently, with the presentation of a small case series of adolescents and young adults with intracranial myxoid mesenchymal tumours positive for *EWSR1* rearrangement.² Subsequent literature has sought to determine whether these tumours are a novel neoplastic entity or represent a myxoid variant of AFH,³ but emerging case reports and a recent effort to summarise this spectrum of neoplasms have revealed considerable variability in their histology and clinical course,^{2–11} complicating this effort. Further case descriptions are necessary to refine our understanding of these tumours. We add to the current literature the case of a 14-year-old girl with a rare intracranial, *EWSR1*-rearranged myxoid mesenchymal tumour.

Learning points

- Intracranial *EWSR1*-rearranged myxoid mesenchymal tumour (IMMT) is a rare neoplasm thought to occur most frequently in adolescents and young adults.
- Whether IMMT is a novel neoplastic entity or represents an intracranial myxoid variant of angiomatoid fibrous histiocytoma is yet undetermined.
- IMMT should be considered with the support of histology and genetic analyses within broad radiological and histological differential diagnoses, including meningioma, atypical haemangiopericytoma, lymphoma, gliosarcoma, myoepithelial tumours, myxoma, myxoid liposarcoma and myxoid chondrosarcoma.

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