Primary intracranial Ewing sarcoma in an infant

Clarice Ho,1 Ali Nael,2,3 Mariko Sato,4 John Ross Crawford4,5

DESCRIPTION

A previously healthy infant presented to the emergency department with altered mental status following a first onset seizure preceded by a 1 week history of reported left arm weakness. Physical examination demonstrated macrocephaly and left hemiplegia with hyperreflexia. CT revealed a large hyperdense mass centred in the right parietal lobe (figure 1A). MRI demonstrated reduced diffusivity, mixed solid and cystic features, heterogeneous enhancement and susceptibility artefact (figure 1B–F). The radiographic differential included infantile high-grade glioma, embryonal tumour (atypical teratoid rhabdoid tumour, embryonal tumour with multi-layered rosettes) and anaplastic ependymoma. The patient underwent near total tumour resection. Histopathological findings revealed a highly cellular tumour composed of cells with round uniform nuclei with open chromatin, small distinct nucleoli and scant cytoplasm (figure 2A). Tumour cells showed immunohistochemical reactivity for NKX2.2 and CD99 with a high Ki67 proliferation index (figure 2B–D). A sarcoma targeted gene fusion panel confirmed the presence of an EWSR1::FLI1 fusion, consistent with a diagnosis of primary intracranial Ewing sarcoma (ES). Staging evaluations included a whole-body positron emission tomography scan, bone marrow study and cerebrospinal fluid cytology, all of which excluded evidence of systemic disease. The patient was treated with focal proton radiation therapy followed by an Ewing tumour-based chemotherapy regimen of vincristine, doxorubicin and cyclophosphamide alternating with ifosfamide and etoposide. The patient has no evidence of disease 3 years post therapy with normal development and mild left hemiparesis.

ES accounts for 1% of all paediatric malignancies and commonly arises from long bones or the axial skeleton.1 Extraosseous ES is rare, and the primary intracranial subtype accounts for only 1%–4% of the extraosseous type.1 Primary intracranial ES frequently originates from the meninges and may be misdiagnosed as supratentorial embryonal tumours or other common primary central nervous system tumours, such as meningoencephalocele.2 One literature review reported approximately 50 cases of primary intracranial ES and peripheral primitive neuroectodermal tumour, both included in the Ewing’s sarcoma family of tumours due to their genetic overlap.3 Primary intracranial ES has a median age at first onset of 15 years.3 To our knowledge, our case is 1 of 3 primary intracranial ES reported in an infant.3

![Figure 1](image1.png)

**Figure 1** Neuroimaging features of a primary intracranial Ewing sarcoma. CT at presentation reveals a large left frontal hyperdense mass without evidence of calcification or haemorrhage (A). MRI of the tumour demonstrates reduced diffusivity on apparent diffusion coefficient sequences (B) and mixed solid/cystic features on T2 and T1 weighted sequences (C–D). There is heterogeneous artefact on susceptibility-weighted sequences (E) and heterogeneous enhancement on post T1 gadolinium sequences (F).

![Figure 2](image2.png)

**Figure 2** Histopathological features of a primary intracranial Ewing sarcoma. (A) Histological features reveal sheets of tumour cells characterised by small, round, uniform nuclei with open chromatin, small nucleoli and scant cytoplasm (H&E stain, magnification 200×). The tumour cells demonstrate immunohistochemical reactivity for (B) NKX2.2 (C) CD99, with (D) high Ki67 proliferation index (B–D, magnification ×200).

1Department of Pediatric Neurology, Children’s Hospital Orange County, Orange, California, USA
2Department of Pediatrics, University of California Irvine, Irvine, California, USA
3Department of Pediatrics, University of California Irvine, Irvine, California, USA
4Department of Pediatrics, Children’s Hospital Orange County, Orange, California, USA
5Department of Pediatrics, University of California Irvine, Irvine, California, USA

Correspondence to

Dr John Ross Crawford, Department of Pediatrics, Children’s Hospital Orange County, Orange, CA 92866, USA; john.crawford@choc.org

Accepted 11 August 2023


© BMJ Publishing Group Limited 2023. No commercial re-use. See rights and permissions. Published by BMJ.

BMJ Case Rep: first published as 10.1136/bcr-2023-255110 on 27 August 2023. Downloaded from http://casereports.bmj.com/ on September 7, 2023 by guest. Protected by copyright.
Images in...

the clinical, neuroimaging, histopathological and molecular findings of a successfully treated primary intracranial ES in an infant without well-defined standard of care therapy.

Learning points

► Primary intracranial Ewing sarcoma (ES) may be considered in the differential diagnosis of intracranial brain tumours in infants.
► A sarcoma targeted gene fusion panel should be considered when histopathological findings demonstrate evidence of a meningeal small round blue cell tumour for accurate diagnosis and treatment guidance.
► A multimodal treatment regimen consisting of surgery, chemotherapy and radiation may improve the prognosis of paediatric patients with primary intracranial ES.

Contributors Ms Ho was responsible for the design and writing of the case report. Dr Nael was responsible for the design and writing of the case report. Dr Sato was responsible for the design and writing of the case report. Dr Crawford was responsible for the design and writing of the case report. The following authors gave final approval of the manuscript: Dr’s Ho, Nael, Sato, Crawford.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Consent obtained from parent(s)/guardian(s)

Provenance and peer review Not commissioned; externally peer reviewed.

Case reports provide a valuable learning resource for the scientific community and can indicate areas of interest for future research. They should not be used in isolation to guide treatment choices or public health policy.

REFERENCES