Recurrence of unusual dysembryoplastic neuroepithelial tumour with novel molecular features presenting 10 years after gross total resection

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DESCRIPTION

A 16-year-old girl with a prior history of a dysembryoplastic neuroepithelial tumour (DNET) diagnosed at the age of 6 years, treated with a gross total resection and followed by serial imaging, who had been seizure-free, presented with a focal seizure. MRI revealed recurrence of a peripherally enhancing tumour at the prior operative site that was initially non-enhancing without evidence of reduced diffusivity on diffusion-weighted sequences (figure 1). The patient underwent a repeat right occipital craniotomy with gross total resection of the peripherally enhancing tumour. Neuropathology showed a moderately cellular background with mucin-rich areas intervening with thin vessels. There was a specific glioneuronal element formation with 'floating' neurons in pools of myxoid material (200×) consistent with a diagnosis of DNET (figure 2). The histopathological features of the original tumour diagnosed 10 years prior were identical.

Next-generation sequencing performed on the recurrent tumour showed no clinically significant somatic variants, but showed variants of unknown significance in Notch receptor 2 (NOTCH2) (c.4922A>C) and Abelson homolog 2 (ABL2) (c.2148G>C). Chromosomal microarray of recurrent tumour demonstrated gains of chromosome 4q, 5, 6, 7p, 9, 10 and 20 and a high copy of chromosome 7q. The patient has been seizure-free 5 years post second recurrence with no evidence of recurrent disease on neuroimaging.

DNETs are glioneuronal benign tumours more often seen in the paediatric population, present with seizures and have a favourable outcome post surgery.[1 2] Histologically, DNETs are identified by specific glioneuronal elements of axons lined by uniform oligodendroglioma-like cells with intervening floating neurons in a mucin-rich background. Presently, there are three histological types: simple (specific glioneuronal elements only), complex (specific glioneuronal elements and glial nodules) and non-specific (glial nodules without any specific glioneuronal elements).[3] Complex types are often tied to focal cortical dysplasia.[4 5] DNETs are most commonly found in the temporal lobe of the brain. MRI typically shows hyperintensity on T2-weighted images, but low intensity on T1. MRI features of DNETs are classified into three types: type 1 (cystic/polycystic-like, well-delineated and strongly hypointense on T1), type 2 (nodular-like with heterogeneous signal) and type

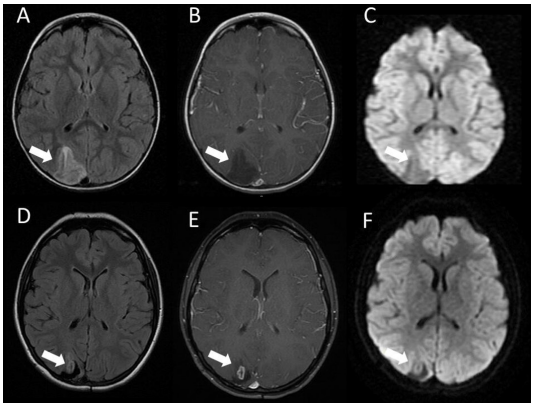

Figure 1 Neuroradiographical features of dysembryoplastic neuroepithelial tumour at initial diagnosis and recurrence 10 years after initial surgery. MRI reveals a right occipital cortical and subcortical tumour (arrow) that is hyperintense on fluid-attenuated inversion recovery (FLAIR) (A), and non-enhancing on post T1-gadolinium weighted sequences (B), and without reduced diffusivity on diffusion-weighted sequences. Ten years post initial gross total resection, neuroimaging reveals a small right occipital tumour recurrence (arrows) on FLAIR sequences (D), with ring-like contrast enhancement on post T1-gadolinium weighed sequences (E), without reduced diffusivity on diffusion weighted sequences (F).

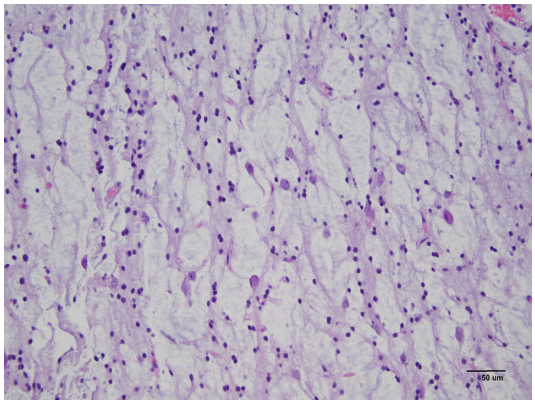

Figure 2 Neuropathological features of dysembryoplastic neuroepithelial tumour (DNET). Pathology of the original and recurrent tumour share similar histological features of a moderately cellular background with mucin-rich areas intervening with thin vessels. There is specific glioneuronal element formation with 'floating' neurons in pools of myxoid material (200×), consistent with a diagnosis of DNET.

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3 (dysplastic-like, iso-signal/hyposignal T1, poor delineation and grey–white matter blurring).[5] Simple and complex DNETs always present as type 1, while non-specific DNETs can present as either type 2 or 3. Additionally, 30%–51% of DNETs have a v-raf murine sarcoma viral oncogene homolog B1 (BRAF) mutation (BRAF V600E).[6] The most frequent copy number aberrations identified in DNETs are gains at chromosomes 5, 6 and 7.[6 7] DNETs can be difficult to distinguish radiographically from other low-grade gliomas, and both can lead to observation of a T2-fluid-attenuated inversion recovery mismatch sign. Advanced MRI techniques, such as diffusion, perfusion and spectroscopy, can help prevent misdiagnosis as they can help identify the pathognomonic specific glioneuronal elements found in many DNETs.[8 9] Late recurrences have been reported and are extremely rare.[10] Our case highlights the rare instance of late recurrence of a DNET following an initial gross total resection associated with novel molecular features, adding to the diversity of this rare tumour subtype.

Learning points

- Dysembryoplastic neuroepithelial tumours (DNETs) are glioneuronal benign tumours more often seen in the paediatric population typically manifesting as seizures.
- Late recurrence of DNET is rare in cases of gross total resection and repeat neuroimaging should be considered in patients with recurrent seizures
- Next-generation sequencing can provide additional tumour characterisation and guide future studies in phenotype–genotype correlations.

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