[11] Matsumura H, Takimoto H, Shimada N, et al. Glioblastoma following radiotherapy in a patient with tuberous sclerosis. Neurol Med Chir (Tokyo) 1998;38:287–91.
[12] Nicolardi L, DeAngelis LM. Response to chemotherapy of a radiation-induced glioblastoma multiforme. J Neurooncol 2006;78:55–7.
[13] Shamisa A, Bance M, Nag S, et al. Glioblastoma multiforme occurring in a patient treated with gamma knife surgery. Case report and review of the literature. J Neurosurg 2001;94:816–21.
[14] Tsutsumi S, Yasumoto Y, Ito M. Pediatric multicentric glioma occurring after cranial irradiation. J Clin Neurosci 2009;16:1086–8.
[15] Yang SY, Wang KC, Cho BK, et al. Radiation-induced cerebellar glioblastoma at the site of a treated medulloblastoma: case report. J Neurosurg 2005;102:417–22.
[16] Balasubramaniam A, Shannon P, Hodaie M, et al. Glioblastoma multiforme after stereotactic radiotherapy for acoustic neuroma: case report and review of the literature. Neurooncology 2007;9:447–53.
[17] Gessi M, Maderna E, Guzzetti S, et al. Radiation-induced glioblastoma in a medulloblastoma patient: a case report with molecular features. Neuropathology 2008;28:633–9.
[18] Gottfried ON, Liu JK, Couldwell WT. Comparison of radiosurgery and conventional surgery for the treatment of glomus jugulare tumors. Neurosurgery 2004;17:E4.
[19] Suárez C, Rodrigo JP, Bödeke CC, et al. Jugular and vagal paragangliomas: systematic study of management with surgery and radiotherapy. Head Neck 2013;35:1195–204.
[20] Brada M, Ford D, Ashley S, et al. Risk of second brain tumour after conservative surgery and radiotherapy for pituitary adenoma. BMJ 1992;304:1343–6.
[21] Salvati M, Frati A, Russo N, et al. Radiation-induced gliomas: report of 10 cases and review of the literature. Surg Neurol 2003;60:60–7 [discussion 67].
[22] Huang CI, Chiou WH, Ho DM. Oligodendroglioma occurring after radiation therapy for pituitary adenoma. J Neurol Neurosurg Psychiatry 1987;50:1619–24.
[23] Hader WJ, Drovini-Zis K, Maguire JA. Primitive neuroectodermal tumors in the central nervous system following cranial irradiation: a report of four cases. Cancer 2003;97:1072–6.
[24] Kitanaka C, Shitara N, Nakagomi T, et al. Postradiation astrocytoma. Report of two cases. J Neurosurg 1989;70:469–74.
[25] Paulino AC, Mai WY, Chintagumpala M, et al. Radiation-induced malignant gliomas: is there a role for reirradiation? Int J Radiat Oncol Biol Phys 2008;71:1381–7.
[26] Raffel C, Edwards MS, Davis RL, et al. Postirradiation cerebellar glioma. Case report. J Neurosurg 1985;62:300–3.
[27] Donson AM, Erwin NS, Kleinschmidt-DeMasters BK, et al. Unique molecular characteristics of radiation-induced glioblastoma. J Neuropathol Exp Neurol 2007;66:740–9.
[28] Robison LL, Bhatia S. Late-effects among survivors of leukaemia and lymphoma during childhood and adolescence. Br J Haematol 2003;122:345–59.
[29] Carret AS, Tabori U, Crooks B, et al. Outcome of secondary high-grade glioma in children previously treated for a malignant condition: a study of the Canadian Pediatric Brain Tumour Consortium. Radiother Oncol 2006;81:33–8.
[30] Paulino AC, Mai WY, Chintagumpala M, et al. Radiation-induced malignant gliomas: is there a role for reirradiation? Int J Radiat Oncol Biol Phys 2008;71:1381–7.
[31] Madden JR, Addo-Yobo SO, Donson AM, et al. Radiation-induced glioblastoma multiforme in children treated for medulloblastoma with characteristics of both medulloblastoma and glioblastoma multiforme. J Pediatr Hematol Oncol 2010;32:e272–8.

http://dx.doi.org/10.1016/j.jocn.2014.07.022

Progressive dysembryoplastic neuroepithelial tumour

Hamish Alexander [a,*], Anthony Tannenburg [b], David G. Walker [a], Terry Coyne [a]

[a] BrizBrain and Spine and NEWRO Foundation, The Wesley Hospital, Evan Thomson Building, Suite 20, Level 10, Chasely Street, Auchenflower, Brisbane, QLD 4066, Australia
[b] QML Pathology, Brisbane, QLD, Australia

ARTICLE INFO

Article history:
Received 17 June 2014
Accepted 15 July 2014

Keywords:
Brain tumours
DNET
Dysembryoplastic neuroepithelial tumour

ABSTRACT

Dysembryoplastic neuroepithelial tumour (DNET) is a benign tumour characterised by cortical location and presentation with drug resistant partial seizures in children. Recently the potential for malignant transformation has been reported, however progression without malignant transformation remains rare. We report a case of clinical and radiologic progression of a DNET in a girl 10 years after initial biopsy.

1. Introduction

Dysembryoplastic neuroepithelial tumour (DNET) is a benign tumour characterised by its cortical location and presentation with drug resistant partial seizures in children. They are mixed neuronal-glial tumours classified as World Health Organization grade I [1]. These lesions are generally considered benign or hamartomatous in nature and surgical removal for tissue diagnosis and seizure control is considered curative.

There is a common belief that progression or post-surgical recurrence of these tumours is not seen and indicates an incorrect diagnosis. Recently a number of case reports have described recurrence or progression in the setting of a malignant transformation of these tumours [2–4]. The patient reported here illustrates clinical and radiological progression of a DNET without malignant transformation.

2. Case report

The patient presented at 16 years of age complaining of intermittent visual disturbances with two episodes of loss of consciousness associated with the visual blurring. She was otherwise well with no other medical conditions and physical examination, including visual field examination, was unremarkable.

Her past history was unremarkable prior to the age of 15 months when she suffered febrile convulsions followed by a seizure type event whilst at kindergarten aged 5 years. From the age of 10 years she described regular episodes of visual blurring, particularly aggravated by physical activity.

MRI of her brain revealed a 5.2 cm mass in the right occipital lobe with cystic changes and remodelling of the overlying skull (Fig. 1A). There was no enhancement with gadolinium or mass

* Corresponding author.
E-mail address: hamishalexander@gmail.com (H. Alexander).

effect. These findings were regarded as consistent with DNET. Inter-ictal electroencephalogram was unremarkable.

The patient was started on carbamazepine for control of visual seizures. While resection of this lesion was not thought to be appropriate due to the risk of visual field defects she did undergo biopsy to obtain a tissue diagnosis. At surgery the cerebral cortex appeared pale and expanded. A generous sample was taken for histological examination and was reported as a DNET with Ki67 proliferation index less than 1% (Fig. 2A–C).

Postoperatively she had no deficit and remained clinically well for an extended period with only occasional visual seizures. She remained on carbamazepine and 12 monthly MRI scans were performed. During this time the pattern of enhancement of the lesion varied with the overall size remaining constant but with periodic enhancement of nodules within the tumour (Fig. 1B).

Ten years following the original surgery she re-presented with headache and lethargy following a mild head injury. There had been no change in seizure activity and no visual field deficit was present on examination. MRI revealed progression in the lesion size with enlargement of both cystic areas and an enhancing nodule (Fig. 1C). There was mass effect and oedema.

She underwent craniotomy and gross total resection of the lesion without complication. At surgery the cortex appeared tense and bulging. The tumour was soft with variable appearance of pale grey/pink and golden brown areas. The cyst contained golden fluid. Histological examination revealed cortical nodules with variable stromal myxoid change and oligodendroglioma-like appear-

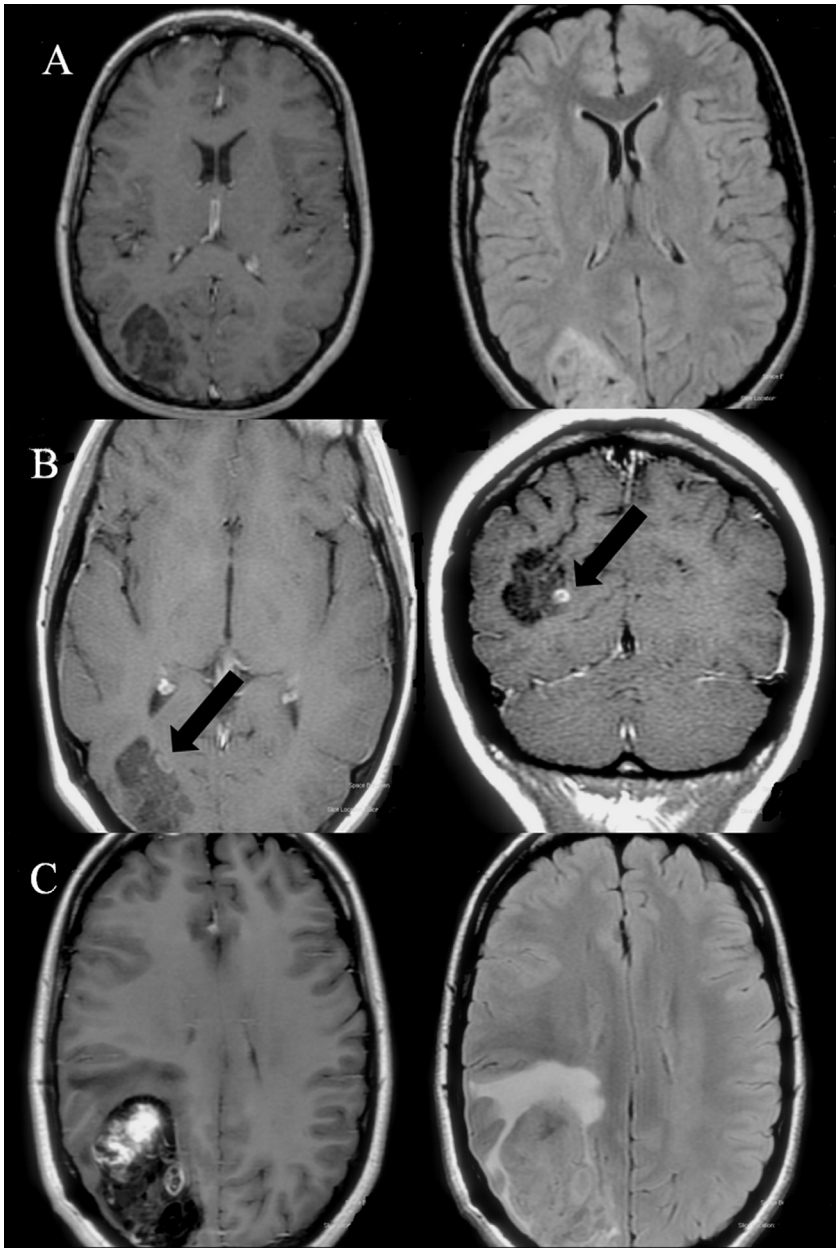

Fig. 1. MRI of the lesion. (A) Axial T1-weighted with gadolinium (left) and fluid attenuated inversion recovery (FLAIR; right) images at presentation demonstrating the 5.2 cm mass in the right occipital lobe with cystic changes and remodelling of overlying skull. (B) Axial (left) and coronal (right) T1-weighted with gadolinium contrast images taken at different time points demonstrating varying intensity of the enhancing nodule without change in size. (C) Axial T1-wighted with gadolinium (left) and FLAIR (right) images show progression in the lesion size after 10 years with enlargement of both cystic areas and the enhancing nodule with mass effect and oedema.