Seizure 21 (2012) 624–630

Contents lists available at SciVerse ScienceDirect

Seizure

journal homepage: www.elsevier.com/locate/yseiz

Epilepsy surgery after treatment of pediatric malignant brain tumors

Jeffrey G. Ojemann [a,b,c,d,*], Tamir Y. Hersonskey [i], Sergey Abeshaus [a,b], J. Russell Geyer [e,f], Russell P. Saneto [d,g,h], Edward J. Novotny [d,g,h], Peter Kollros [g,h], Sarah Leary [e,f], Mark D. Holmes [c,g]

[a] Department of Neurological Surgery, University of Washington, United States
[b] Division of Neurosurgery, Seattle Children's Hospital, Seattle, WA, United States
[c] Regional Epilepsy Center, University of Washington, United States
[d] Epilepsy Program, Seattle Children's Hospital, Seattle, WA, United States
[e] Department of Pediatrics, University of Washington, United States
[f] Division of Hematology-Oncology, Seattle Children's Hospital, Seattle, WA, United States
[g] Department of Neurology, University of Washington, United States
[h] Division of Neurology, Seattle Children's Hospital, Seattle, WA, United States
[i] Department of Neurological Surgery, University of Illinois, Chicago, IL, United States

ARTICLE INFO

Article history:
Received 26 May 2012
Received in revised form 6 July 2012
Accepted 7 July 2012

Keywords:
Pediatric epilepsy
Malignant glioma
PNET
Hemispherectomy

ABSTRACT

Epilepsy surgery is common in the face of benign brain tumors, but rarely for patients with a history of malignant brain tumors. Seizures are a common sequelae in survivors of malignant pediatric brain tumors. Medical management alone may not adequately treat epilepsy, including in this group. We report four cases of patients who previously underwent gross total resection, radiation therapy, and chemotherapy for successful treatment of malignant brain neoplasia, yet suffered from medically intractable seizures. All underwent surgery for treatment of epilepsy with extension of the original resection. Despite the aggressive primary treatment of the neoplasm, and the potential for diffuse cerebral insults, all benefited from focal surgical resection. Aggressive surgical management of intractable epilepsy can be considered in survivors of malignant brain tumors.

1. Introduction

Supratentorial brain tumors in the pediatric and adult population are frequently associated with seizures.[1,2] The frequency is higher among low grade tumors (60–85%) than among high grade tumors 20–40%.[3–13] Although treatment with initial anticonvulsants and surgery may be sufficient to prevent long-term epilepsy,[9,14,15] recurrent seizures occur[7,16] often in the setting of tumor recurrence.[10,17] Repeated seizures, refractory to medical management, has been reported in 14–20% of patients with primary brain tumors.[9,14,18]

Surgery for epilepsy in the setting of current, or previously treated, low grade gliomas is a commonstrategy.[4,11,19–22] When an epileptic focus is identified, surgery is considered in the setting of persistent epilepsy,[23,24] with a rationale for even earlier identification of intractability when associated with a structural lesion.[19,25] In appropriate candidates, surgical removal of epileptic foci is superior to medication alone[26] in providing seizure freedom. Other options for therapy, such as additional medication, polytherapy, and vagus nerve stimulation, may be palliative but have a much lower seizure cure rate than surgery in patients with focal onset.[27] Surgical treatment of tumors for epilepsy may use electrophysiology to maximize seizure outcomes[28,29] though this is not always employed.[16]

Patients with high-grade tumors are less often operated on solely for control of their seizure disorder, perhaps because of the decreased length of expected survival. Certainly, such patients are uncommon. Malignant gliomas represented a minority of patients with temporal lobe tumors presenting with seizures to a large referral center[30] and appear nearly absent from major pediatric epilepsy series.[20] Additionally, the need for therapies, such as radiation therapy and chemotherapy, that increase the risk of diffuse cerebral insult could, in theory, make these patients poorer candidates for focal resection to ameliorate their seizures.

We present four cases of patients who survived malignant primary brain tumors, in the pediatric setting, after aggressive surgery and adjuvant therapy, but developed medically intractable seizures. All underwent focal resection for their epilepsy, including the region of previous surgery. They responded well with seizure control and no new apparent neurological deficits. Seizure

* Corresponding author at: Department of Neurological Surgery, University of Washington, 4800 Sand Point Wy NE, W-7759, United States. Tel.: +1 206 987 4240; fax: +1 206 987 3925.
E-mail address: jojemann@uw.edu (J.G. Ojemann).

1059-1311/$ – see front matter © 2012 British Epilepsy Association. Published by Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.seizure.2012.07.003

outcomes were reported according to standard classification.[31] Medical records were reviewed according to a protocol approved by the Institutional Review Board of Seattle Children's Hospital.

2. Case 1

A 23-year old underwent gross total resection of a right frontal astrocytoma (grade III) after presenting at age 3 with developmental delay. He received whole brain radiation therapy and chemotherapy (lomustine, vincristine, hydroxyurea, procarbazine, cisplatin, cytosine arabinoside, dacarbazine, and methylprednisolone). He developed progressive seizures over the subsequent years and underwent a repeat surgery at age 9 for seizures and a concern for residual tumor. The seizure recurred, evolving to a frequency of twice daily, characterized by staring, left facial drop, interruption of speech and unusual behaviors such as repeated jumping, climbing, and going to the wash room. He remained poorly controlled on therapeutic doses of carbamazepine, lamotrigine, and levetiracetam. His history was notable for hypopituitarism (anterior) related to radiation therapy. He had cognitive delay but was employed part-time, participated in Special Olympics, and was without focal neurologic findings. Neuropsychological testing demonstrated an IQ of 58 with global cognitive impairment. MRI revealed bilateral white matter changes along with encephalomalacia in the region of his original right frontal resection (Fig. 1A). These white matter changes had been stable over several years and no evidence of recurrent tumor seen. A cavernous malformation was seen in the periventricular region posterior to the resection cavity.

Interictal EEG demonstrated frequent spike-wave discharges that were more over the right frontal lobe (Fig. 1B). Ictal EEG and ictal SPECT also suggested a right frontal focus. He underwent repeat right frontal craniotomy for resection of epileptogenic focus, using

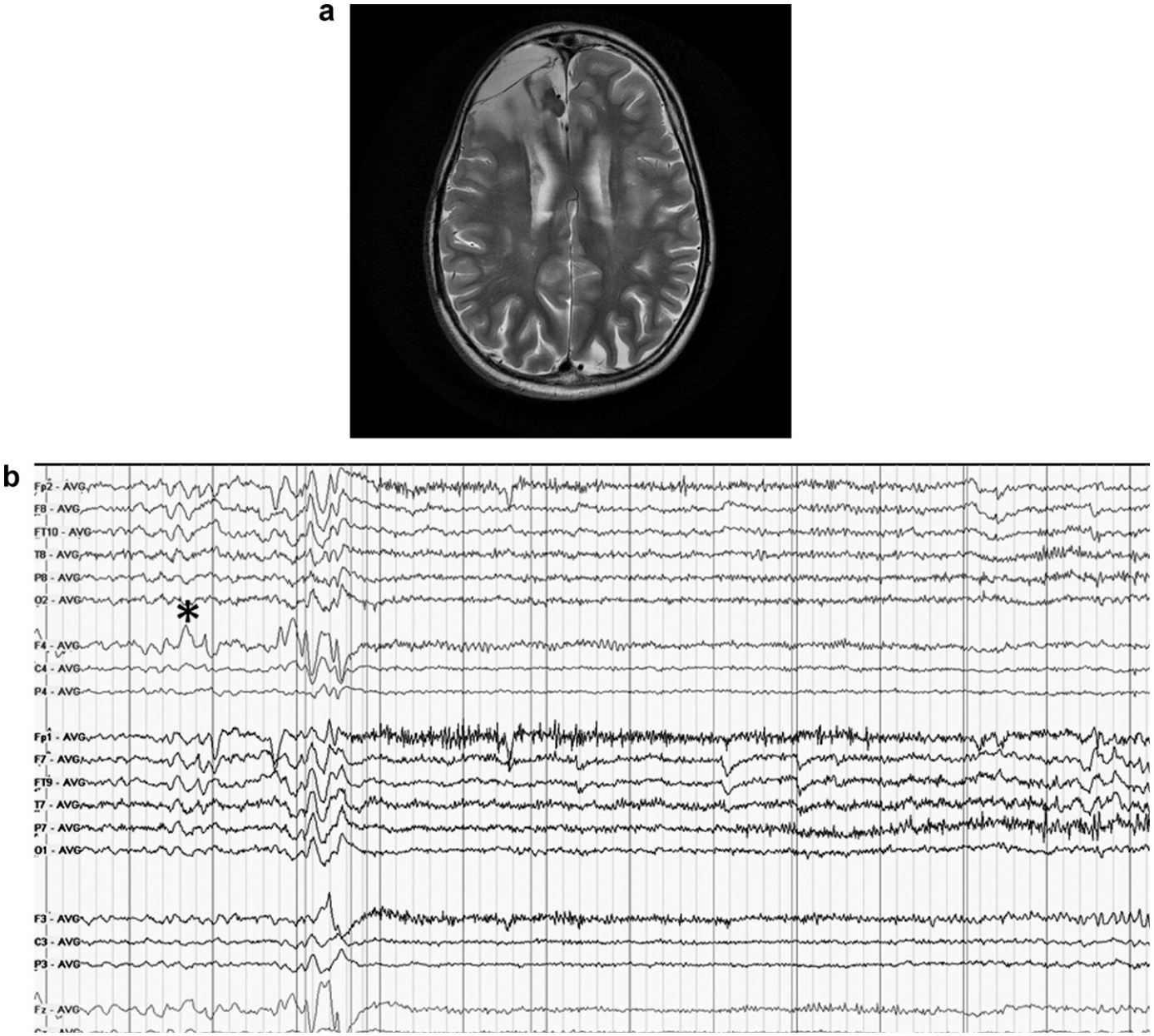

Fig. 1. (A) MRI scan of case 1 showing the old right frontal resection cavity and multiple subcortical regions with increased T2 weighted changes. These non-specific diffuse changes were found throughout both hemispheres. (B) Scalp EEG recording at the beginning of a typical seizure. Changes seen early over both frontal lobes were stronger on the right (*), consistent with seizures arising from the vicinity of his previous resection.