

Uncommon, exceptional and atypical: a case of frontal lobe epilepsy due to cortical dysplasia

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ABSTRACT – We report a case of frontal lobe epilepsy due to focal cortical dysplasia that included three independent unusual features. The patient, a 45-year-old, right-handed woman, had her first seizure at age 29, well into adulthood. Seizures had been easily controlled with medication for 15 years, then without provocation they became medically intractable during a single, identifiable day. Resection of the dysplastic tissue in the posterior dorsolateral *right* frontal cortex rendered the patient seizure-free, but produced a significant, non-fluent, Broca type, crossed aphasia. In addition, the seizure semiology was striking and remarkable, a common finding in frontal lobe epilepsy.

[Published with video sequences]

Key words: frontal lobe epilepsy, cortical dysplasia, crossed aphasia, seizure semiology



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Epilepsy associated with focal cortical dysplasia (FCD) usually presents in childhood, and has a variable natural history (Bartolomei *et al.* 1999, Siegel *et al.* 2005). Some patients remain seizure-free with anti-epileptic drug (AED) treatment, while others require surgical resection of the abnormal tissue to achieve seizure control. Whether new onset seizures in a patient with a localization-related epilepsy will remit with AED treatment is typically apparent within the first few years of treatment (Kwan and Brodie 2000). We report a patient with frontal lobe epilepsy (FLE) due to FCD whose seizures began in adulthood, were easily controlled with AED monother-

apy for 15 years, became medically refractory at a definitive moment in time, and were cured with resection of the dysplastic tissue.

Case study

Seizure semiology

Seizures were highly stereotyped. Without warning the patient would experience intense fear and a powerful sensation of falling backward, usually accompanied by a well-articulated scream such as, “help, help I’m falling”. Usually the patient would forcefully grab any nearby object (including once her neurologist’s

necktie), as if to prevent the impending fall. Although some seizures ended at this point, frequently they would progress to include leftward eye deviation, partial unresponsiveness, and clonic jerking of the left hemibody including some combination of face, arm, torso, and leg. Sometimes there were irregular “bicycling” movements of both legs (see video sequence). Clinical generalization did not occur. Much to her disappointment, the patient always had a vividly intact memory of the initial sensation of fear and falling, and largely intact memory for subsequent seizure behaviors. The individual psychic and motor components of the seizures are all known to occur in FLE (Williamson and Jobst, 2000, Kellinghaus and Luders 2004). Although much of the semiology is neither lateralizing or localizing within the frontal lobes (Williamson and Jobst 2000), the hemibody jerking and eye deviation implicate involvement of right frontal motor and eye fields, while the intense fear indicates propagation to limbic circuits.

Clinical history

The patient was born at term without complication, and development was entirely normal. The first seizure occurred at age 29, three weeks after delivering her first child. Details of the initial evaluation are not available, but the patient was told that routine EEG and head CT scan were normal. Treatment with carbamazepine was initiated, and for 15 years seizures were very infrequent, occurring only when the serum carbamazepine level was unusually low. At age 44, without provocation or intercurrent illness, the patient had several seizures in a single day while on a tranquil seaside vacation. From that day forward, until curative surgery 16 months later, seizures occurred from 1 – 10 times per day, despite intensive treatment with several AEDs. Interestingly, one factor contributing to a delay in referral to an epilepsy center was suspicion on the part of treating physicians that the spells were of psychogenic origin, given their bizarre semiology and the explosive transition from controlled to refractory status.

Brain magnetic resonance imaging (MRI) revealed focal thickening and abnormal signal in the posterior right frontal cortex, seen best on fluid-attenuated inversion recovery images (FLAIR), consistent with FCD (*figure 1*). Many clinical seizures were recorded during extracranial video-EEG monitoring, but no associated electroencephalographic changes were observed despite placement of additional electrodes in the right fronto-central region. Intracranial video-EEG monitoring was performed, with an 8 x 8 electrode grid centered over the region corresponding to the abnormal MRI signal (*figure 2*, left). About two seconds prior to onset of the clinical seizure there was diffuse attenuation of background activities throughout most of the grid, evolving in 4-6 seconds into an equally diffuse ictal pattern consisting of either sharply contoured

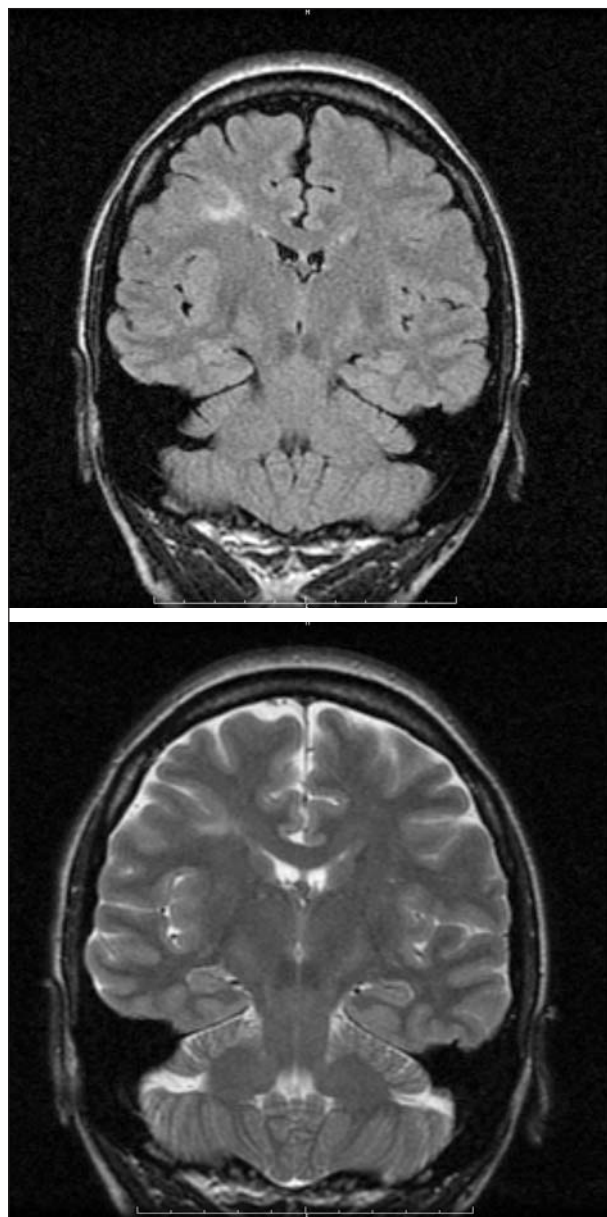


Figure 1. Coronal FSEIR (T2-FLAIR) image demonstrating a region of increased signal extending between grey and white matter of right frontal lobe. TR 2800/TE 133, 3 mm thickness (*top*). Coronal T2-weighted image showing that the region of abnormal cortex is thickened and displaced inward. FSE; TR 4000/TE 90/Ef; 3 mm thickness (*bottom*).

rhythmic theta or alpha activity, or rhythmic spike and slow wave discharges. In conjunction with the neuroimaging data, these intracranial EEG findings were interpreted to indicate seizure onset within the subcortical dysplastic region, with rapid propagation to a broad region of overlying cortex. Since depth electrodes were not used, definitive electrographic localization of seizure onsets to the dysplastic tissue could *not be made*.

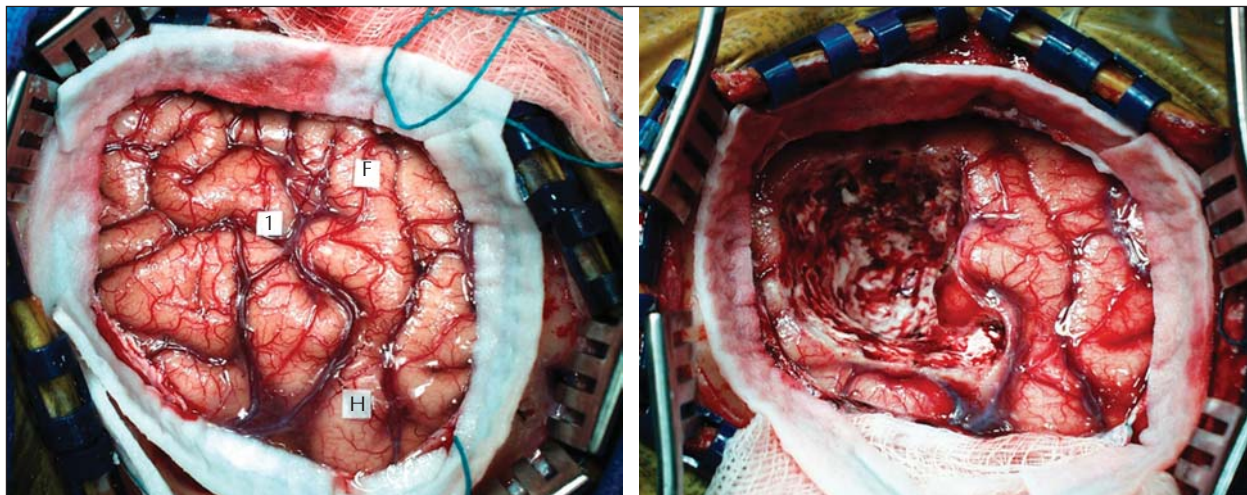


Figure 2. Intraoperative photographs of right frontal convexity. Anterior is to the left and inferior is towards the top. F and H: motor areas of the face and hand, respectively, elicited by bipolar stimulation within the precentral gyrus. 1: surface location of the underlying lesion as determined by frameless stereotactic navigation (*left*). Post-resection appearance (*right*). Note that the resection was taken posteriorly to the anterior bank of the precentral gyrus.

Complete lesionectomy

A complete lesionectomy was performed (*figure 2, right*). The resection encompassed the MRI-defined lesion with an approximately 1 cm margin where possible. Posteriorly, the resection was limited by the precentral gyrus, while the resection extended ventrally into the deep white matter. The tissue was appreciably abnormal, being firmer and grayer in color than the surrounding white matter. Pathological examination of the surgical specimen revealed severe, focal cortical dysplasia.

Although the patient is right-handed, post-operatively she had a moderately severe, non-fluent, crossed aphasia that affected both speech and writing. The language dysfunction gradually resolved over the following year, and during three years of follow-up the patient successfully discontinued AED treatment and remains seizure-free.

Discussion

This case of FLE due to FCD has at least three unusual features, which taken together make it a truly remarkable occurrence. First, only about 10% of patients with FCD-associated epilepsy who ultimately undergo epilepsy surgery have seizure onset in adulthood, as this patient did (Siegel *et al.* 2005). We consider this feature to be “uncommon”. Second, not only did the patient experience 15 years with a benign clinical course, but her seizures became medically refractory on a single identifiable day. Although the transition from medically controlled to refractory epilepsy can occur 10 or more years after seizure onset (Berg *et al.* 2003), this is the exception rather than the rule. Furthermore, the transition interval can rarely, if

ever, be narrowed to a single day. We consider this feature to be “exceptional”. Third, a posterior, dorso-lateral, right frontal lesionectomy resulted in a significant, non-fluent aphasia in a patient right-handed from birth. Based on current terminology, this is considered a mirror-image crossed aphasia, because at least part of Broca’s area would have been included in a homologous resection of left frontal cortex (Coppens *et al.* 2002, Marien *et al.* 2004). Although the fact that the location of the cortical injury produced a crossed aphasia is not surprising (e.g. Riecker *et al.* 2004), we consider the fact that the patient had a crossed aphasia to be “atypical”. Finally, the patient’s seizure semiology was indeed striking and memorable, as is often the case in frontal lobe epilepsy (Williamson and Jobst 2000, Kellinghaus and Luders 2004). This case illustrates that once in a while a single patient can be truly singular. □

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Legend for video sequence

Typical seizure. The patient’s mother is at the bedside, and the patient repeatedly exclaims: “Mom”, “No”, “I’m falling”. When her mother steps away from the bed, the patient cries out several times: “Don’t leave me!”. Conjugate leftward eye deviation is apparent, as are irregular bilateral leg movements under the bed sheets.

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