

Lingual epilepsy partialis continua in a girl

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ABSTRACT – Epilepsia partialis continua (EPC) is characterized by focal seizures that cannot be stopped. The most common cause of EPC in children is Rasmussen's encephalitis. In this video case report, we describe an 11-year old female with continuous lingual EPC for two years. She has shown no signs of Rasmussen's Encephalitis or other neurodegenerative process and structural MRI is normal.

[Published with video sequences]

Key words: Epilepsia Partialis Continua, epilepsy, Rasmussen's encephalitis, dysarthria

Epilepsia partialis continua (EPC) can be defined as continuous muscle jerks of cortical origin (Cockerell *et al.* 1996). Its prevalence was estimated to be less than one per million. The most common etiology of EPC in children is Rasmussen's encephalitis (RE), while in adults it is usually caused by cerebrovascular disease or neoplasms (Cockerell *et al.* 1996). There are also case reports of EPC as a manifestation of a variety of conditions such as diabetes mellitus (Huang *et al.* 2005, Kumar 2004, Olson *et al.* 2002, Placidi *et al.* 2001), autoimmune thyroid encephalopathy (Aydin-Ozemir *et al.* 2006), paraneoplastic encephalitis due to small cell lung carcinoma (Kiniro *et al.* 2006, Mut *et al.* 2005), mitochondrial disorder (Elia *et al.* 1996), Kufs' disease (Gambardella *et al.* 1998), cortical dysplasia (Misawa *et al.* 2004, Nakken *et al.* 2005), multiple sclerosis (Spatt *et al.* 1995), cat scratch disease (Nowakowski and Katz 2002) and human immunodeficiency virus infection (Bartolomei *et*

al. 1999). Interestingly, EPC has unknown etiology in approximately 19% of cases (Cockerell *et al.* 1996).

In this report, we describe an 11-year-old female who has had continuous lingual EPC since 9 years of age without signs of RE or other systemic or neurodegenerative process. Previously, Nayak *et al.* (2006) reported a case of a 25-year-old male who in addition to frequent left focal seizures, at age 15, also developed continuous EPC of the left side of his tongue. The patient was diagnosed with probable RE based on clinical, radiological, and electrographic findings. At age 22, while anti-convulsant therapy reduced the arm and leg component of his left focal seizures, he continued to suffer from the continuous lingual EPC. This tongue movement caused a disabling dysarthria which was successfully treated by a focal cortical resection. Interestingly, despite having had the disease for 15 years, this patient did not develop hemiparesis.



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Continuous lingual EPC has been associated with paraneoplastic limbic encephalitis caused by small cell lung carcinoma in a 48-year-old woman (Kinirons *et al.* 2006). Paroxysmal lingual EPC was included in a case series of 83 patients, including three children (Jabbari & Coker, 1981). These children had paroxysmal and rhythmic lingual movement that occurred during sleep in association with episodic desynchronization on electroencephalogram (EEG), thought to represent unusual subcortical seizures (Jabbari & Coker 1981). Our case is distinct from those found in the literature due to the unrelenting quality of EPC in a child, now spanning two years, without signs of RE or other cause.

Case report

The patient is an 11-year-old, left-handed female who was healthy prior to the onset of focal seizures at age nine. She is a product of an uneventful pregnancy and delivery and her developmental progression was normal. At six months of age, the patient underwent surgery for tethered cord with a lipoma, which occurred without any complications or sequelae. Her family history is negative for epilepsy or other chronic neurological conditions. The patient is an above average student and participates in gymnastics.

The onset of her focal seizures was preceded by several days of fever, sore throat, and stomachache. First, she developed bilateral tingling of cheeks, followed by subtle, chewing movements, both occurring bilaterally but more pronounced on the left side. Although not always aware of them, she had periodic writhing movements of the tongue. These seizures occurred about 12-15 times per day and occasionally at night; they were not associated with a change in consciousness. She demonstrated expressive aphasia, being able to think of what she would like to say, but was unable to enunciate the words. Occasionally, the episodes were associated with numbness in the left arm that did not affect the strength or coordination. Ictal and interictal EEG was unremarkable. Also normal were her complete blood count, basic metabolic panel, thyroid function studies and electrocardiogram. Her brain magnetic resonance imaging (1-Tesla MRI) showed mild increase in the sizes of Sylvian and choroidal fissures on the right side without signs of atrophy, findings consistent with a normal variant. We felt that this MRI finding did not contribute to her EPC.

Within 4 days of onset, the focal seizures increased in frequency, severity, and duration, evolving to several episodes of secondary generalization lasting up to 15 minutes. Interictally, the patient remained conscious, and could speak normally, but developed a flaccid (Todd's) paralysis of the left arm lasting up to 90 minutes. She was treated with fosphenytoin and lorazepam and then prescribed oral phenytoin together with leviteracitam.

Nine days after seizure onset, the patient experienced continuous tongue twitching and intermittent tingling in her face and mouth which continue to date. Prolonged video-scalp EEG monitoring performed at Riley Hospital showed no clear cut ictal EEG correlate of the mouth movements. Electromyogram (EMG) from skin electrodes placed on submentalis muscles showed continuous, rhythmic twitching at 3-4 Hz. The movement was at times noticeable in the palate and involved both the anterior and posterior aspects of the tongue (*see video sequence*). Laryngoscopic examination by an Ear, Nose and Throat specialist (BHM) confirmed normal anatomy and ruled out the presence of palatal myoclonus. The movements did not seem to bother the patient and did not affect her ability to swallow or speak clearly. The rest of the neurological examination was unremarkable. Single photon emission tomography (SPECT) study of the brain did not reveal perfusion abnormalities. Patient had negative serology for Bartonella, and antiphospholipid antibodies; serum lactate was normal.

Two months after presentation the patient underwent repeat video-scalp EEG monitoring for 24 hours at the Cleveland Clinic Epilepsy Center, which showed three 40-second runs of rhythmic slowing intermixed with sharp waves in the right hemisphere, maximum frontotemporal, with no clinical signs. These appeared to be EEG seizures. However, no EEG changes were seen during the rest of the time, while the child had nearly continuous twitching of the tongue. Interictal slowing and sharp waves were seen in the right temporal region. A repeat brain MRI showed no change from the initial scan with the persistence of the widened right central sulcus seen previously. Positron emission tomography (PET) showed hypometabolism in the right insula and adjacent inferior frontal and supratemporal regions as well as right temporal lobe.

Over the next two months, the patient's medications were changed to minimize the side effects of difficulty with learning and concentration. She was placed on topiramate and carbamazepine. The lingual EPC has decreased somewhat in intensity but still continues unabated. She occasionally experiences auras as stomach upset with left arm and leg numbness and weakness lasting up to 15 minutes. Although she describes school work as more difficult, requiring more time to complete than previously, she has maintained average grades. She shows no signs of cognitive deterioration, except a mild decrease in cognitive processing speed attributable to the use of anticonvulsants. The neurological examination shows mild flattening of the left nasolabial fold resulting in an asymmetric smile with continuous 3 Hz tongue twitching. No change has been seen on semiannual brain MRIs performed over the past two years. Video-EEG 9 months after onset showed only mild generalized intermittent slowing, with no epileptiform discharges and again no changes during tongue twitching.

Discussion

We suspected that this girl had RE, the most common cause of EPC in children. RE is chronic inflammatory encephalitis of unknown etiology that affects one cerebral hemisphere. Its hallmarks are intractable focal seizures and slow neurological deterioration with the development of permanent, but stable, deficits such as reduced mental capacity, hemiparesis, and visual field defects (Swaiman *et al.* 2006). Bien *et al.* (2002) divided the natural history of RE into three stages. First, the prodromal stage is characterized by relatively low seizure frequency and rarely by some degree of hemiparesis. This stage is mainly observed in adolescent and adult patients. In contrast, all patients experience the second, acute stage of the disease. This stage consists of frequent simple partial motor seizures which in up to 70% of patients take the form of EPC with the development of hemiparesis. Brain MRI scans during this stage show inflammatory, monofocal lesions that later spread across the ipsilateral hemisphere. The median duration of this stage is eight months ranging between four and eight months. The acute disease stage is followed by a residual stage that is characterized by permanent and stable hemiparesis.

The clinical and neuroradiologic picture that emerges in our case does not fit the natural history of RE described by Bien *et al.* (2002). Despite the presence of continuous lingual EPC for two years, our patient did not develop hemiparesis and she was able to maintain the same level of academic performance, albeit with more effort, in the regular classroom setting. In part, her slow processing speed may be attributable to topiramate and other antiepileptic medications. Interestingly, the patient with RE and continuous lingual EPC in the report by Nayak *et al.* (2006) similarly did not develop hemiparesis. The authors did not comment on his cognitive function. However, serial brain MRIs of Nayak *et al.*'s patient revealed progressive atrophy of the right perisylvian area and caudate nucleus, as well as hyperintensities in the right lentiform and caudate nuclei. In contrast, our patient's serial MRI scans did not identify inflammatory lesions, atrophy, or other abnormalities that would explain the EPC. This is relevant, especially when one considers that MRI abnormalities are often associated with intractable focal seizures and focal slowing on EEG. This way the findings are usually established within the first 4 months of RE onset (Granata *et al.* 2003). However, our understanding of the natural history of RE may be biased as it is based on studies of relatively few patients in tertiary epilepsy centers who may be more severely affected (Nayak *et al.* 2006). Unfortunately, no tests are available to help determine if our patient is suffering from some form of latent RE. The antibodies to glutamate receptor GluR3 are non-specific (Mantegazza *et al.* 2002) and may not be helpful in distinguishing RE from chronic EPC (Takahashi *et al.* 2005).

The non-progressive nature of our patient's EEG recordings is also atypical of RE. Nine months after the onset of the lingual EPC, video-scalp EEG monitoring recorded only mild intermittent generalized and lateralized slowing sometimes over the left and sometimes independently over the right hemisphere without epileptic discharges. Capovilla *et al.* (1997) reported a longitudinal EEG study of a patient with RE, which included recordings from the time of the first seizure to the onset of EPC. The initial recordings showed focal slowing in the left temporal region, which increased and then spread to left frontal and parietal areas over a period of two months. Six months after onset of the illness, two seizures were recorded that originated from two different regions on the left side. One month later, their patient developed right facial EPC and the EEG recording revealed an epileptic focus in the left rolandic region characterized by rare spikes and continuous slow activity. Interestingly, serial brain MRI scans demonstrated that MRI abnormalities first appeared six months after the disease onset.

The differential diagnosis of EPC includes a variety of conditions besides RE. For example, tongue EPC may be a transient phenomenon related to acute unilateral opercular lesion of vascular or tumor origin (Thomas *et al.* 1995). Brain lesions, however, have been ruled out in the present case by the negative serial brain MRI scans. Further, our patient has been found to have negative serology for Bartonella thereby excluding the possibility of an atypical presentation of Cat scratch disease, she demonstrated normal serum lactate, which is evidence against mitochondrial disease, and no elevation in antinuclear antibody, or antiphospholipid antibodies which reduces the likelihood of systemic lupus erythematosus or related autoimmune conditions. The etiology of EPC remains unknown in our patient, even after a long follow-up as is the case in 19% of patients presenting with this disorder (Cockerell *et al.* 1996). □

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