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Does the patient's hand hold the key to preventing secondary generalization in mesial temporal lobe epilepsy?

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Summary This study aimed to analyze the impact of ictal dystonic posturing (DP) in postoperative seizure outcome and to assess the influence of DP in generalized tonic—clonic seizure (GTCS) occurrence during video-EEG monitoring of patients with temporal lobe epilepsy with mesial temporal sclerosis. The impact of DP on surgical outcome remains controversial. Moreover, DP has been recently associated with brain networks avoiding GTCS occurrence.

Five hundred twenty-seven seizures of 171 patients who were submitted to standard anterior temporal lobectomy (ATL) between 2002 and 2010, with at least one year of post-surgical follow-up, were retrospectively analyzed and classified as with or without DP and as evolving or not to GTCS. The ictal semiologic correlates of DP, timing elapsed since precedent seizure and antiepileptic drug (AED) intake before each seizure were evaluated. Seizure outcome after ATL was assessed according to Engel's scale.

Fifty-eight out of 171 patients (34%) exhibited ictal DP, of which 91.5% were always unilateral and contralateral to the operated side. DP was related to shorter seizures ($p = 0.007$) and a much lower likelihood of the seizure evolving to GTCS ($p = 0.001$), even during AED withdrawal ($p = 0.002$). There was no association between DP and prognosis regarding seizure control as the

Abbreviations: DP, dystonic posturing; GTCS, generalized tonic—clonic seizures; ATL, anterior temporal lobectomy; AED, antiepileptic drugs; TLE, temporal lobe epilepsy; MTS, mesial temporal sclerosis; TLE-MTS, TLE patients with MTS; IPI, initial precipitant injury; ID, interictal discharges; RINCH, rhythmic ictal nonclonic hand; NMUEA, nonmanipulative proximal upper extremity automatisms.

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result of the surgical resection, either in patients with shorter or in those with longer period of follow-up. Our data support the hypothesis that DP reflects a brain network activation that helps avoid GTCS, even during AED withdrawal.

Introduction

Temporal lobe epilepsy (TLE) is the most common type of epilepsy requiring surgical treatment (ILAE, 1997), mainly if the pathological substrate for epilepsy is mesial temporal sclerosis (MTS) (Babb and Brown, 1987; Semah et al., 1998). Postsurgical prognosis is favorable regarding seizure control, with 60—70% of patients becoming seizure-free after surgery (Engel et al., 1993; Wiebe et al., 2001). However, longer follow-up leads to lower seizure remission rates (McIntosh et al., 2004; Janszky et al., 2005).

Unilateral ictal dystonic posturing (DP) is the most reliable lateralizing semiologic sign in complex partial seizures of TLE, occurring in 15—87% of patients (Kotagal et al., 1989; Fakhoury and Abou-Khalil, 1995). In TLE patients with MTS (TLE-MTS) this sign is contralateral to the epileptogenic lobe in more than 90% of cases (Kotagal et al., 1989; Chee et al., 1993; Fakhoury and Abou-Khalil, 1995; Bleasel et al., 1997; Williamson et al., 1998; Dupont et al., 1999).

Although DP occurrence during video-EEG monitoring of TLE-MTS patients frequently allows the correct lateralization of the epileptogenic temporal lobe (Dupont et al., 1999), it has been associated with a more extensive epileptogenic area (Bossi et al., 1984; Kuba et al., 2003; Rusu et al., 2005). Besides that, published data analysis suggests that ictal DP could be a marker of epilepsy severity, drug-resistance (Dlugos et al., 1999; Bouilleret et al., 2008; Chassagnon et al., 2009) and also worse surgical prognosis (Janszky et al., 2005). However, the impact of DP on postoperative outcome with respect to seizures remains controversial (Bossi et al., 1984; Kotagal, 1999; Rusu et al., 2005; Janszky et al., 2005; All-Watschinger et al., 2008).

Ictal DP has been associated with basal ganglia activation, mainly putamen (Newton et al., 1992; Dupont et al., 1998; Kuba et al., 2003; Mizobuchi et al., 2004; Chassagnon et al., 2009). Experimental data have demonstrated that basal ganglia activation can modulate convulsive seizures (McNamara et al., 1984; Vercueil and Hirsch, 2002; Usui et al., 2005). Furthermore, recent studies have suggested that DP could be the expression of an attempt of the human brain to avoid the imminent generalization (Cleto Dal-Cól et al., 2008; Chassagnon et al., 2009; Feddersen et al., 2012).

The present study aimed to analyze the relationship of ictal DP with postoperative seizure outcome and to assess the influence of DP in secondary generalization of seizures on pre-surgical video-EEG monitoring of TLE-MTS patients.

Methods

Patients

Patients with clinical diagnosis of TLE (Commission of ILAE, 1989), presenting high-resolution 1.5 T MRI findings consistent with unilateral MTS on visual inspection (Jackson et al., 1990) and submitted to surgical treatment at the Universidade Federal de São Paulo, Brazil, between 2002 and 2010, were included in this retrospective study. Standard anterior temporal lobectomy (ATL) was performed by the same neurosurgeon (RCS). At least one seizure available for analysis and one year of postsurgical follow-up were required for inclusion in the study. Exclusion criteria were age less than 15 years and presence of lesions besides MTS or cerebral calcifications on pre-surgical MRI.

Video-EEG monitoring

All patients were submitted to 2—6 days of continuous video-EEG monitoring with a 32-channel digital EEG machine (Biologic®, Ceegraph® software). Electrodes were placed according to 10—20 International System, plus additional intermediary temporal and bilateral sphenoidal electrodes. Interictal spikes were assessed by visual analysis of 5 min of artifact-free EEG per hour of video-EEG. During prolonged video-EEG monitoring, antiepileptic drug (AED) withdrawal was conducted according to the decision of the treating physicians.

Clinical data

Patients' medical data were reviewed, including gender, operated side, initial precipitant injury (IPI) occurrence, age at epilepsy onset, epilepsy duration, age at surgical procedure, generalized tonic—clonic seizure (GTCS) occurrence during life, history of status epilepticus, seizure frequency before surgery, interictal discharges (ID), and period of follow-up. ID was classified as ''unitemporal'' if at least 80% of ID predominated on the operated side, and ''bitemporal'' if more than 20% were contralateral (Risinger, 1992).

Seizure review

All available seizures were reviewed both by a board certified neurophysiologist (CGPU) and by a neurologist specialized in movement disorders (OGPB). In case of disagreement, an experienced epileptologist was consulted (EMTY). The investigators were masked regarding clinical data. Seizures were analyzed for symptoms appearing in the upper extremities, focusing on DP occurrence and semiologic correlates, such as manual automatisms, rhythmic ictal nonclonic hand (RINCH) motions, nonmanipulative proximal upper extremity automatisms (NMUEA), limb akinesia, and head turning. The side of motor signs, as well their association with DP, were plotted. Patients were classified as ''with DP'' when it occurred in at least one analyzed seizure. The duration of seizures and DP, as well as DP latency (time lag between clinical and DP onset) were measured. Also, all analyzed seizures were classified as evolving to GTCS or not.