Seizure 33 (2015) 66–71

Contents lists available at ScienceDirect

Seizure

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

Lateralizing value of unilateral relative ictal immobility in patients with refractory focal seizures – Looking beyond unilateral automatisms

Priya Agarwal [a], Bhavna Kaul [a], Garima Shukla [a,*], Achal Srivastava [a], Mamta Bhushan Singh [a], Vinay Goyal [a], Madhuri Behari [a], Ashish Suri [b], Aditya Gupta [b], Ajay Garg [c], Shailesh Gaikwad [c], C.S. Bal [d]

[a] Department of Neurology, All India Institute of Medical Sciences, New Delhi, India
[b] Department of Neurosurgery, All India Institute of Medical Sciences, New Delhi, India
[c] Department of Neuroradiology, All India Institute of Medical Sciences, New Delhi, India
[d] Department of Nuclear Medicine, All India Institute of Medical Sciences, New Delhi, India

ARTICLE INFO

Article history:
Received 28 June 2015
Received in revised form 18 August 2015
Accepted 19 August 2015

Keywords:
Refractory focal epilepsy
Lateralizing value
Semiology
Relative ictal immobility
Automatisms
Epilepsy surgery

ABSTRACT

Purpose: Ictal motor phenomena play a crucial role in the localization of seizure focus in the management of refractory focal epilepsy. While the importance of unilateral automatisms is well established, little attention is paid to the contralateral relatively immobile limb. In cases where automatisms mimic clonic or dystonic movements and in the absence of previously well-established signs, unilateral relative ictal immobility (RII) is potentially useful as a lateralizing sign. This study was carried out to examine the lateralizing value of this sign and to define its characteristics among patients of refractory focal epilepsy.

Methods: VEEGs of 69 consecutive patients of refractory focal epilepsy who had undergone epilepsy surgery at our center over last four years were reviewed and analyzed for the presence of RII. Unilateral RII was defined as a paucity of movement in one limb lasting for at least 10 s while the contralateral limb showed purposive or semi-purposive movements (in the absence of tonic or dystonic posturing or clonic movements in the involved limb). The findings were seen in the light of VEEG, radiological and nuclear imaging data, and with post-surgical outcome.

Results: Unilateral RII as a lateralizing sign was found in 24 of 69 patients (34.78%), consisting of both temporal and extra temporal epilepsy, with 100% concordance with VEEG and MRI data. All patients demonstrating this sign had a good post-surgical outcome.

Conclusion: RII, when well characterized is a frequent and reliable lateralizing sign in patients of refractory focal epilepsy.

1. Introduction

Nearly 30% of patients with epilepsy suffer from medical refractoriness [1]. A significant proportion among these can benefit from surgical treatment. With epilepsy surgery having been the chosen treatment strategy for patients with refractory epilepsy over the last few decades, and long term follow up data now being available, the proportion of patients with significantly favorable outcome is not very high. A number of factors play a major role in determining the outcome of epilepsy surgery, yet accurate localization of the epileptogenic substrate is crucial. The two main presurgical evaluation tools are video telemetric assessment and MRI. Clinical semiology and ictal EEG are equally important parts of VEEG evaluation. Proper definition and recognition of various clinical signs can contribute significantly toward correct identification of epileptogenic regions in patients undergoing presurgical evaluation.

A number of motor signs viz. clonic movements, tonic posturing, head version and others, have been studied and found to be extremely valuable in identifying the hemisphere as well as

Abbreviations: VEEG, video encephalograms; RII, relative ictal immobility.

* Corresponding author at: Department of Neurology, Neurosciences Center, All India Institute of Medical Sciences, Room #2, 6th Floor, New Delhi, India. Tel.: +91 11 26593785.
E-mail address: garimashukla@hotmail.com (G. Shukla).

http://dx.doi.org/10.1016/j.seizure.2015.08.009
1059-1311/

the lobe of seizure onset. Kotagal et al. had emphasized the importance of dystonic limb posturing as a lateralizing sign in temporal lobe seizures [2]. Most of these are positive, visually engaging motor signs, which are also readily reported by caregivers. However, unilateral ictal immobility of limbs is possibly not frequently looked for or appreciated. In the absence of specific testing for this sign in VEEG recordings however, the relative immobility of one side compared to the other, forms the basis of recognizing this sign and hence the inclination toward the term 'relative ictal immobility' in recent literature [3]. It typically occurs in the arm contra lateral to the seizure onset, and its occurrence is often noticed by the presence of automatisms in the contra lateral limb. One of the reasons for this sign to not feature frequently among reliable lateralizing signs is that being a transient negative motor phenomenon, it is less dramatic than most other ictal phenomenology and may go unnoticed by the patients, family members and also by personnel reading VEEG studies.

This sign assumes importance in clinical localization of seizures in certain situations [4]. For instance, in the presence of prominent unilateral automatisms with unrecognized paresis on the contra lateral side, one may falsely interpret the automatisms as positive motor ictal phenomena and conclude that the side of seizure onset is contralateral to the automatisms. False lateralization is especially likely if the automatisms are more rhythmic and resemble clonic activity.

This study was undertaken with the objective of evaluating the lateralizing value of 'relative unilateral ictal limb immobility' among patients with refractory focal seizures. In addition, an attempt was made to better characterize this sign in terms of time of onset and duration of ictal paresis.

2. Material and methods

This study was a retrospective analysis of VEEG data of patients operated upon for epilepsy surgery at the Neurology department of the All India Institute of Medical Sciences, New Delhi, India, over a 4-year period from Sept 2010 to March 2014.

VEEG recordings of consecutive patients suffering from intractable epilepsy, who had undergone epilepsy surgery during the study period, were reviewed independently by two blinded observers, at least one neurologist with specialized training in Epileptology (BK or PA) and one senior epileptologist (GS). The data had been acquired using the 10–20 International system on NicoletOne® video EEG equipment.

Approval of the ethical committee was sought and informed consent taken from all the patients.

Inclusion criteria were defined as:

1. Post epilepsy surgery patients with a history of drug-refractory focal epilepsy on regular follow up with at least one visit during last six months.
2. Good surgical outcome, as measured through Modified Engel's outcome scale [5] (Class I and II).

Exclusion criteria:

1. Seizures, in which, clear unilateral clonic activity of limbs or face and/or unilateral dystonic posturing co-occurred with unilateral RII, were also excluded.
2. Seizures in which any one limb was not visible in the video recording for more than half of the total duration; for instance in small children who were held by a parent, or a patient whose hand was tied for fear of falling, were excluded from analysis.

Details of all common lateralizing and localizing clinical signs recognizable for each seizure in the given patient were noted and tabulated on a pre-structured format. Details of 'relative ictal immobility of limbs' (RII) were noted in particular by both blinded investigators.

2.1. Definition

RII was defined as a "unilateral paucity of limb movement (upper or lower or both) compared to the opposite side, which in turn would be performing purposive or semi-purposive movements (automatisms) during the seizure. RII was recorded to occur only if the involved limb was not dystonic or tonically postured".

2.2. RII timing and duration

After having identified the presence of RII, the time of onset of RII was noted from the time one limb started to move with paucity of movement on the contra lateral side and the end was determined at the time of either (a) the commencement of purposive or semi purposive movement in the involved limb or (b) cessation of movement in the opposite limb, or (c) cessation of the clinical seizure or (d) beginning of secondary generalization. This onset timing was determined in relation with the EEG onset of the respective seizure. Also, the duration of the immobility was noted for all seizures. Duration of at least 10 s was chosen as the minimum cutoff for this sign. Time intervals were determined using a clock-generated time signal appearing simultaneously on the video screen and on the digital EEG computer screen.

2.3. Blinding of investigators

Analysis of videos was noted and tabulated in the pre-structured format by two independent investigators (GS and PA or GS and BK) as the first step for each patient, while each of them were blinded to the patients' history (including demographic details), physical examination, imaging findings and post-surgical outcome details. Ictal and interictal EEG details were noted only after this detailed video analysis and tabulation. Later, the side of occurrence of RII was compared to localization on VEEG, MRI, nuclear imaging data and post-surgical outcome. Concordance versus discordance with each of these was studied.

3. Results

During the study period, 69 patients (30 females and 39 males) who had undergone epilepsy surgery, were included. The mean age of the patients was 16.43 ± 7.2 years. All patients had focal epilepsy with a single identifiable lesion. RII was seen in 24 (34.78%) patients, and in 67 out of 151 seizures (44%). Of the seizures in which RII was seen, 9 (13.43%) were recorded during sleep. It was usually the upper limb which was found to be immobile, seen in 92.53% of all seizures. The lower limb alone was involved in 4 seizures, all in 1 patient only (Table 1). The mean time from EEG onset was 20.17 s (+18.5) and it lasted for a mean duration of 26.23 s (+15.2). RII was found to occur contra lateral to the side of EEG localization, MRI substrate and side of surgery, in all patients (100% concordance – Table 2). The surgical outcome in all patients, in whom this sign was observed, was Engel class 1 or 2, as per inclusion criteria, with an average follow up duration of 18 ± 8 months after surgery (Fig. 1).

4. Discussion

In this study we found relative ictal immobility to be a frequent and consistent sign lateralizing the seizure onset to the contralateral hemisphere with 100% concordance to the video-EEG and MRI localization, as well as with the side of successful resective epilepsy surgery. Walker and Scarborough [6], in 1988, investigat-