Original article

Epileptic Disord 2017; 19 (3): 315-26

Atonic seizures in children with surgically remediable epilepsy: a motor system seizure phenotype?

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Received September 28, 2016; Accepted May 23, 2017

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Aggressive behaviour in Epileptic patients

- Global incidence is not superior to other brain disease patients
- Three different forms of aggressive behaviors have been described in epileptic patients on the basis of their temporal relationship with seizures: interictal, post-ictal and ictal (Tassinari et al., 2005; Bronsard and Bartolomei, 2013)
- In seizures affecting brain regions involved in emotion processing, ictal or post-ictal aggressive behavior may occur. Defensive-like behavior can be observed and aggressive behavior is often related to minimally unpleasant stimulation or attempts to restrain the patient (Tassinari et al., 2005)
- The current view of the neurobiology of aggressive behavior is based on a model of an imbalance between regulatory regions (essentially prefrontal) and regions engaged in emotional and behavioral responses (amygdala, hypothalamus, brain stem) (Rosell and Siever, 2015)

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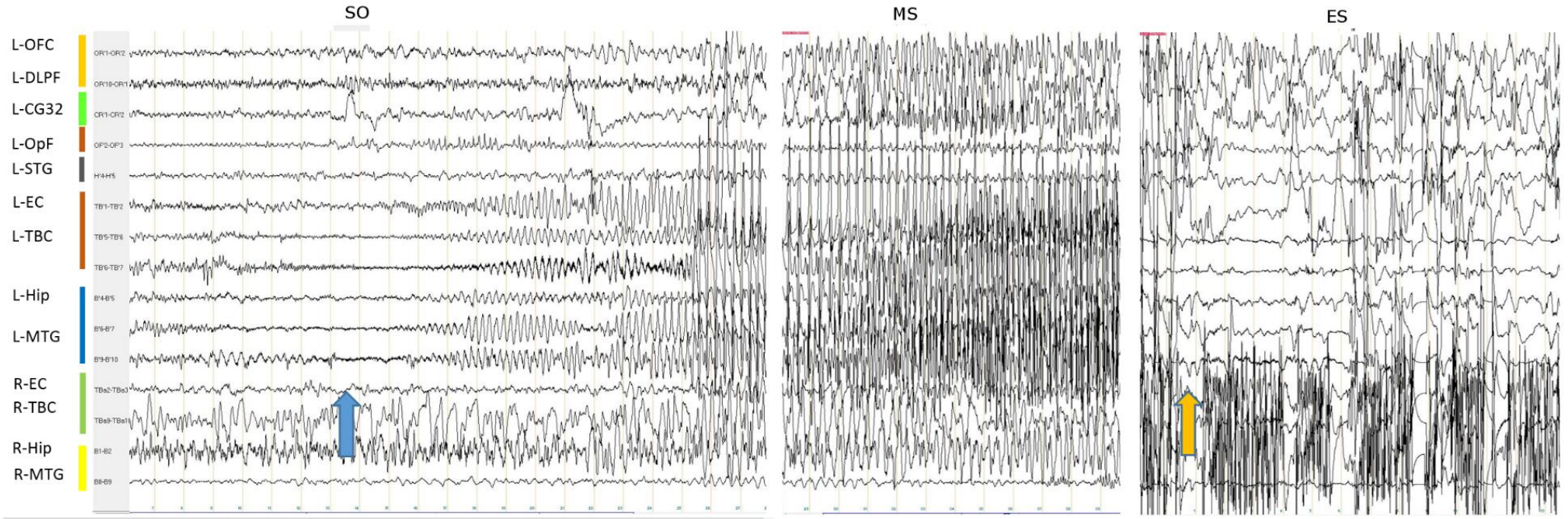
BRONSARD, G. & BARTOLOMEI, F. 2013. Rhythms, rhythmicity and aggression. J Physiol Paris, 107, 327-34.; SIEVER, L. J. 2008. Neurobiology of aggression and violence. Am J Psychiatry, 165, 429-42.; TASSINARI, C. A et al. 2005. Biting behavior, aggression, and seizures. Epilepsia, 46, 654-63.

Ictal Aggressive Behaviour and SEEG correlations

- 33-year-old male patient
- Infectious encephalitic illness at the age 21
- Seizures developed 6 months later and were resistant to antiepileptic drugs.
- Intracerebral EEG (stereoencephalography; SEEG) was performed for presurgical evaluation
- Episode of ictal aggression recorded during a left-sided seizure. During the course of the seizure (1 min after the onset), a nurse arrived in the room and interacted verbally with the patient
- At this moment, the patient became aggressive, showing combative behavior with groaning, swearing and threatening the nurse with his fist. Despite verbal reassurance, the patient then grabbed the nurse and attempted to strangle her
- Electro-anatomo-clinical correlations: the seizure started from the left temporal region (lateral and medial parts), becoming rapidly bilateral and spreading to the prefrontal cortex.
- Aggressive behavior coincided with marked slowing of bilateral frontal region activity, occurring in the last part of the seizure and was associated with the persistence of ictal activity under the form of burst activities in the right medial temporal lobe



SEEG traces showing the seizure onset (SO) and a discharge starting from the left temporal neocortex (blue arrow), before spreading (MS, middle seizure) to the suprasylvian cortices (H', OF') and the frontal cortices (OR') and affecting the right temporal lobe. The last part (ES, end of seizure) is characterized by a slowing of the left regions and a burst activity in the right temporal electrodes.
Abbreviations: L: left; R: right; OFC: orbitofrontal cortex, DLPFC: dorsolateral prefrontal; CG32: cingulate gyrus Brodmann's area 32; OPF: frontal operculum; STG: superior temporal gyrus; TBC: basal temporal cortex; Hip: hippocampus, EC: entorhinal cortex; MTG: middle temporal gyrus;

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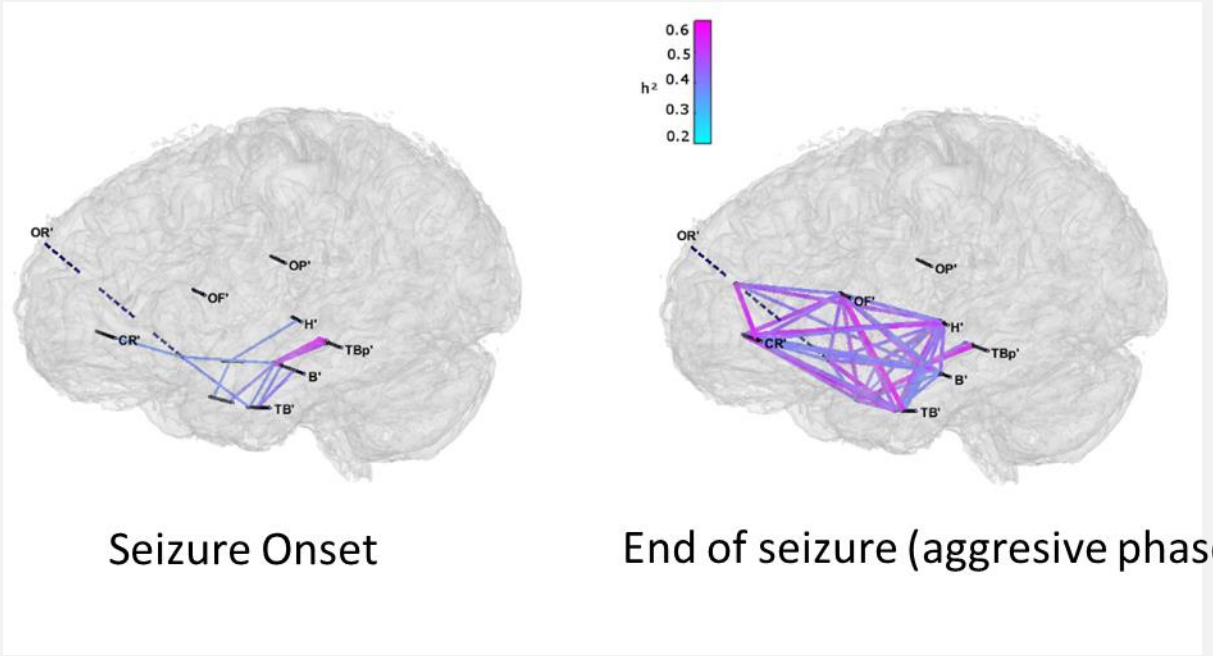
Changes in brain connectivity during aggression

- Connectivity study (non-linear correlation analysis)
- Seizure onset is associated with connectivity changes limited to the left temporal regions (increased)
- Aggressive phase (end part of the seizure) : increased connectivity is observed bilaterally, affecting most of the recorded connections between frontal and temporal regions.



Changes of connectivity are illustrated on a 3D mesh of the MRI with the position of electrodes and the graphs thresholded (h^2>0.25). Color scale indicates the h^2 values.

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