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Brief communication

Peri-ictal water drinking and other ictal vegetative symptoms: Localizing and lateralizing the epileptogenic zone in temporal lobe epilepsy? Two case reports and review of the literature

La sensation de soif et autres symptômes neurovégétatifs durant la crise : quelle valeur localisatrice et latéralisatrice dans les épilepsies du lobe temporal ? À propos de deux cas et revue de la littérature

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ABSTRACT

Peri-ictal behavior disorders can be helpful in localizing and lateralizing seizure onset in partial epilepsies, especially those originating in the temporal lobe. In this paper, we present the case of two right-handed women aged 36 and 42 years who presented with partial seizures of mesial temporal type. Both of the patients had drug resistant epilepsy and undergone presurgical evaluation tests including brain magnetic resonance imaging, video-EEG monitoring and neuropsychological testing. The two patients had hippocampal sclerosis in the right temporal lobe and exhibited PIWD behavior concomitant with right temporal lobe discharges documented during video-EEG recordings. Anterior temporal lobectomy was performed in one case with an excellent outcome after surgery. The patient was free of seizures at 3 years follow-up. We reviewed other publications of peri-ictal autonomic symptoms considered to have a lateralizing significance, such as peri-ictal vomiting, urinary urge, ictal pilo-erection. Clinicians should search for these symptoms, even if not spontaneously reported by the patient, because they are often under-estimated, both by the patients themselves and by physicians. Additionally, patients with lateralizing

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auras during seizures have a significantly better outcome after epilepsy surgery than those without lateralizing features.

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RÉSUMÉ

Les symptômes per critiques peuvent aider dans la localisation de la zone épileptogène en matière d'épilepsies, particulièrement les épilepsies du lobe temporal (ELT). À travers ce travail, les auteurs rapportent l'observation de deux patientes ayant une épilepsie mésio-temporale pharmaco-résistante en rapport avec une sclérose hippocampique droite. Ces patientes, droitières, âgées de 36 et 42 ans, bénéficièrent d'une évaluation préchirurgicale comportant une imagerie cérébrale par résonance magnétique, un enregistrement EEG-vidéo et un bilan neuropsychologique. La sensation de soif fut exprimée par les 2 patientes et coïncida avec une décharge épileptique au niveau temporal antérieur droit lors de l'enregistrement EEG-vidéo. Une lobectomie temporelle antérieure fut réalisée chez une patiente avec une évolution post-chirurgicale favorable après 3 ans (classe Ia d'Engel). Par ailleurs, les auteurs font une revue de la littérature des autres symptômes neurovégétatifs per critiques décrits comme ayant une valeur localisatrice et même latéralisatrice dans les ELT tels que : les vomissements, l'urgenturie, la pilo-érection. Ces symptômes doivent être recherchés lors de l'interrogatoire car, en plus, ils représentent un facteur de bon pronostic post-chirurgical lorsqu'ils sont présents.

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1. Introduction

The clinical features of focal epilepsy often help to localize the seizure onset zone. Autonomic symptoms, such as ictal vomiting or peri-ictal urinary urge are frequent during epileptic seizures and have a lateralizing significance. Peri-ictal water drinking (PIWD) has been reported in a few papers as a localizing and lateralizing symptom in temporal lobe epilepsy (TLE). TLE with hippocampal sclerosis (HS) is often drug resistant and requires surgical treatment and, ideally, complete resection of the epileptic zone. Diagnostic elements that help in the presurgical estimation of the epileptic zone are seizure semiology, electrophysiological recordings, neuro-imaging, functional testing and neuropsychological assessment. Ictal semiology improves lateralization and localization of the epileptic zone and adds additional informations to the ictal EEG. Additionally, patients with lateralizing auras during seizures have a better outcome after surgery than those without lateralizing features.

In this paper, the authors report the case of two patients who had TLE secondary to hippocampal sclerosis in the right side, with PIWD behaviour during their seizures. They also reviewed the literature using Pubmed for the expressions "peri-ictal drinking", "peri-ictal water drinking", "epilepsy AND drinking", and "thirst AND seizure", and evaluated the cases obtained for localization and lateralization of the epileptic focus. Other vegetative symptoms, reported in the literature in terms of temporal lobe epilepsy, are also discussed with evaluation of their localizing and lateralizing value.

1.1. Case 1

A right-handed woman, 42 years old, manifested her first seizures at age 30. Ictal clinical symptoms included epigastric aura, distress, tachycardia, staring, unresponsiveness with

automatisms of hands, oro-alimentary automatisms, dystonic posturing of the left hand, ictal water drinking, and finally post-ictal confusion. Secondary generalisations were rare.

Because of drug resistance pharmacotherapy, she underwent presurgical evaluation with a non-invasive protocol including interictal EEG, video-EEG monitoring, brain MRI and neuropsychological testing. Interictal EEG (Fig. 1) revealed epileptic discharges in the right anterior temporal lobe. Ictal EEG (Figs. 2 and 3) localized the onset epileptic zone in the right anterior temporal lobe and the patient asked for water during the seizure. Brain MRI (Fig. 4) revealed right hippocampal sclerosis. Neuropsychological testing concluded to visual memory deficiency with preserved verbal memory. The patient benefited from anterior temporal lobectomy (ATL), as all data (clinical features, ictal EEG findings and MRI) were concordant. Since her ATL, she is seizure-free with a follow-up of 3 years.

1.2. Case 2

A right-handed woman aged 36 years old, started her epilepsy history at the age of 8. Her seizure semiology included epigastric aura, tachycardia, staring, hypersalivation, motor and verbal automatisms with feeling of thirst. Secondary generalisations were also rare in this patient. EEG, even interictal and ictal (Fig. 5), showed right temporal abnormalities in the anterior temporal regions. Brain MRI (Fig. 6) revealed hippocampal sclerosis in the right side. Neuropsychological testing resulted in visuospatial memory disorder with respect to verbal memory. The patient epilepsy was drug resistant, she is awaiting surgical treatment.

2. Discussion

Our two patients had focal epilepsy originating in the right temporal region, and both of them presented the PIWD

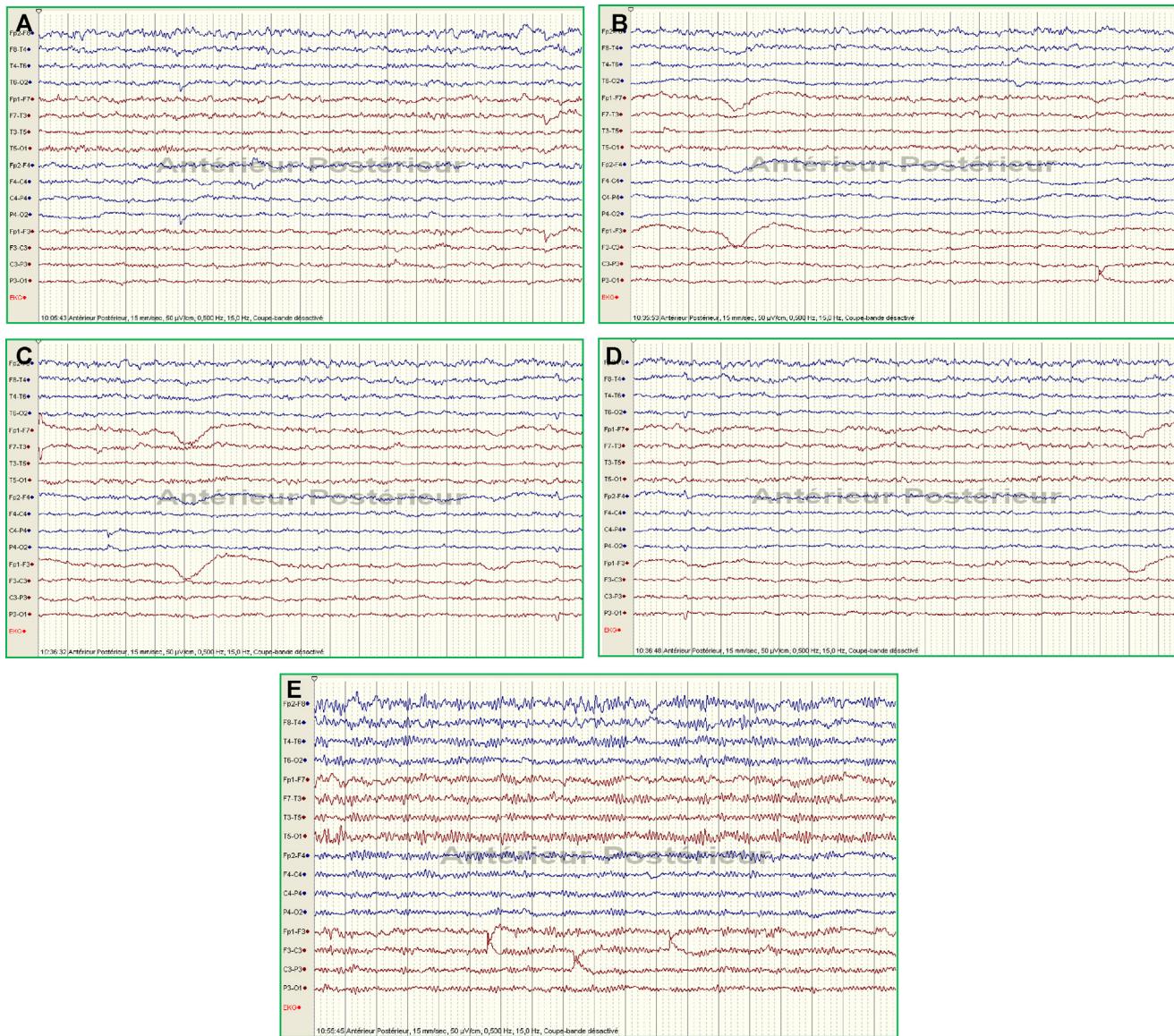


Fig. 1 – A to E: Interictal EEGs showing an overload of slow theta waves occupying consistently the right anterior temporal region and these slow waves are more frequent as we approach the crisis (E).

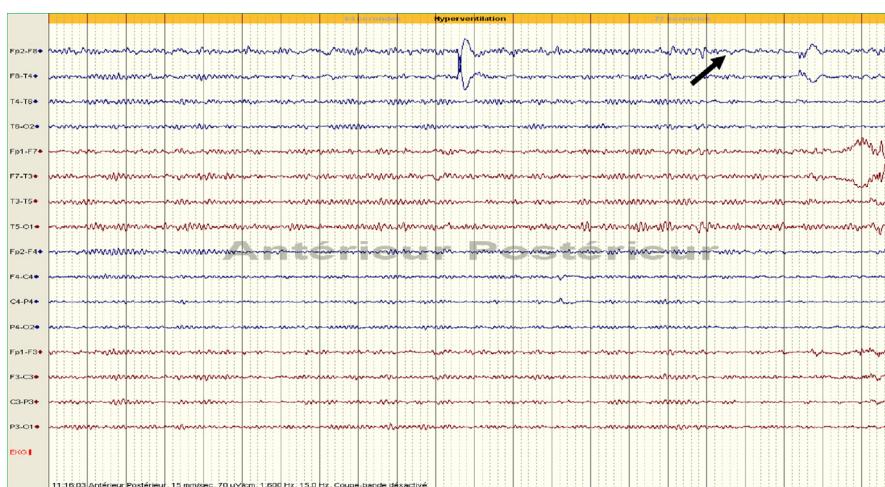


Fig. 2 – Ictal EEG showing aura (arrow) and the onset (rapid rythms) in the right anterior temporal lobe coinciding with sensation of thirst in case 1.

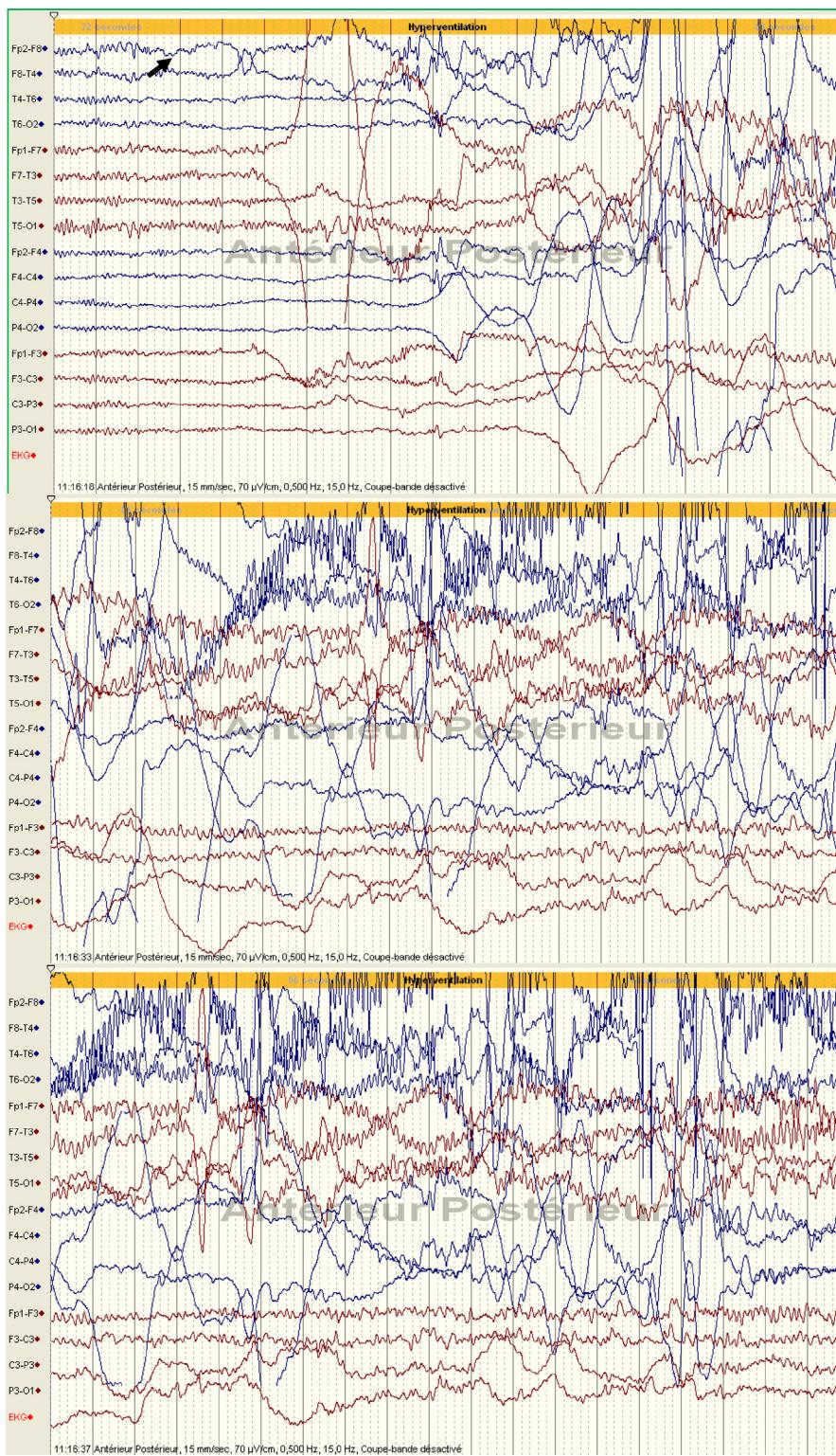


Fig. 3 – Ictal EEG showing a flattening of background activity (arrow) in the right anterior temporal region.

behaviour during their seizure in the video-EEG recordings concomitant with discharges in the right anterior temporal region. A total of 35 PIWD cases with TLE were found in the literature (Table 1). The epileptogenic zone was located in the right or non-dominant temporal lobe in 22 cases (63%). In a

series of 65 patients with focal epilepsy, Trinka et al. (2003) identified 10 patients with PIWD (15%). A previous report by Rémillard et al., 1981 discussed 20 patients with complex partial seizures associated with ictal desire for water or actual water consumption. All of their patients had EEG evidence of

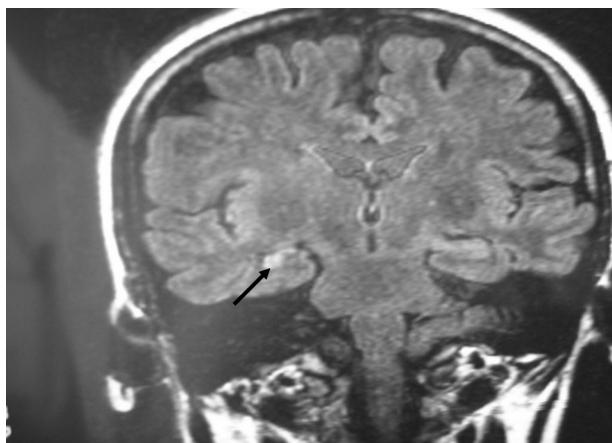


Fig. 4 – Brain MRI, with FLAIR sequence in case 1, showing a hypersignal in the right hippocampus.

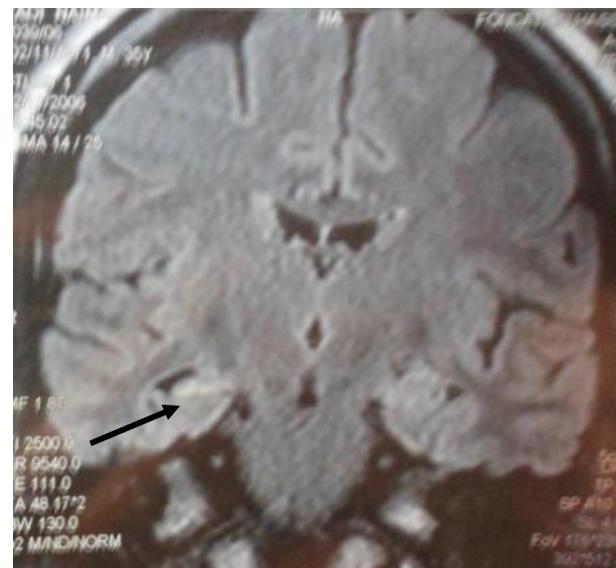


Fig. 6 – Brain MRI, with FLAIR sequence in case 2, showing a hypersignal in the right hippocampus.

non-dominant temporal involvement; six of them were documented with ictal EEG. In another series of 55 TLE patients (Szucs et al., 2007), PIWD was observed in one or more recorded seizures of eight patients (14.5%). Five patients had left temporal and three had right temporal lobe resections. At 2–10 years of follow-up, all operated patients were reported as

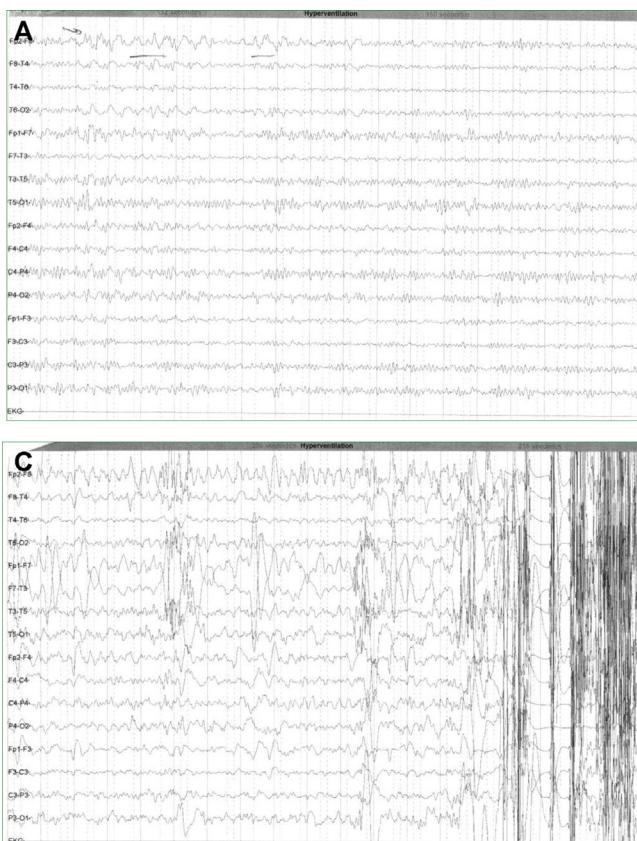


Fig. 5 – A: Interictal EEG showing, few minutes before ictal recording, slow waves in the right anterior temporal lobe. B: Ictal EEG in case 2, with sensation of thirst (dotted arrow) and the aura (arrow) coinciding with rapid rhythms in the right anterior temporal lobe. C: Ictal EEG with spike and waves exhibited in the anterior temporal lobes with clear predominance in the right side. D: Post ictal EEG with delta slow waves in the right anterior temporal lobe.

Table 1 – PIWD in various publications in the literature suggesting a lateralization of the epileptogenic zone in the non-dominant temporal lobe.

Author	Suspected side of epileptogenic region	Cerebral lesion	Imaging method	Interictal EEG	Seizure pattern	Video-EEG monitoring	Operation
Crapanzano et al. (1993)	Right	Right hippocampal atrophy	MRI	Right temporal sharp waves and slowing in drowsiness	Right temporal	Not recorded	
Cascino and Sutula, 1989	Right	Right hippocampal sclerosis	MRI	Right anterior temporal	Right temporal	Yes	Right temporal anterior lobectomy
Rémillard et al. (1981)	Left amygdala, Hippocampus in 4/10 cases Right temporal in 6/10 cases	Widening of the anterior horn of left temporal lateral ventricle (2) Postmeningitis (1) Right hemispheric atrophy (2) others (5)	PEG	Bitemporal (2), right temporal (6), left temporal (2),	Left temporal (deep electrodes) (2), right hemispheric slow and sharp activity trains (2), not recorded (6)	Yes (2), not recorded (8)	None (10)
Despland et al. (1985)	Right	Right frontotemporal tumor		Right temporal epileptic abnormality	Not recorded	Not recorded	Operation of the tumor
Trinka et al. (2003)	7 Right			Yes	Right temporal		Right temporal resection
Janszky et al. (2007)	3 Right			Yes	Right temporal		Right temporal resection
Szucs et al. (2007)	3 right and 5 left	Left hippocampal sclerosis (3), right hippocampal sclerosis (1), bilateral, R > L hippocampal sclerosis (1), normal MRI (1), right temporal oligoastrocytoma (1), left temporal cavernoma (1)	MRI	Bitemporal independent Spikes (3), right temporal sharp waves (2), left anterior temporal Spikes (3)	Right temporal rhythmic theta or rhythmic activity (3), left temporal rhythmic crescendo pattern (5)	Yes	Left temporal resection (5), right temporal resection (3)

Table 2 – Other localizing and lateralizing peri-ictal vegetative symptoms.

Lateralizing ictal features (Symptoms and authors references)	Presumed brain region
Ictal spitting Caboclo et al. (2006) Renier, 2004 Kellinghaus et al. (2003)	Dominant TL/ Non-dominant TL
Ictal vomiting Sekimoto et al. (2007) Schindler and Wieser, 2006 Schauble et al., 2002 Devinsky et al. (1995)	Right or left TL
Postictal nose wiping Hirsch et al., 1998	Ipsilateral TL
Ictal pallor Fogarasi et al., 2005a	Left TL
Ictal smile Fogarasi et al., 2005b	Right TL
Ictal urinary urge Gurgenashvili et al. (2011) Loddenkemper et al. (2003) Baumgartner et al. (2000)	Non-dominant TL
Unilateral ictal piloerection Haykal and Abou-Khalil, 2012	Ipsilateral TL

having an Engel I or 2 outcomes. In a series of 97 TLE patients, [Musilová et al. \(2010\)](#) reviewed 380 seizures. All their patients were classified as Engel I at least 2 years after surgery. PIWD was noted in 25% of patients and occurred significantly more often in patients with TLE of the non-language-dominant hemisphere.

Physiologically, normal drinking behavior is controlled by tissue osmolality and vascular volume. Information from peripheral receptors is processed in the hypothalamus and then is conveyed to various brain structures that initiate a search for water and drinking. The hippocampus and the amygdala are linked with the hypothalamus by a variety of multisynaptic reciprocal pathways. Thus, epileptic activity generated in the mesial temporal lobe may propagate into the hypothalamus and inappropriately activate water seeking. The lateralizing value of PIWD can be explained by a possible hemispheric specific representation of fluid control, thirst and water seeking behaviour. These assumptions need to be confirmed by invasive EEG recordings or ictal SPECT studies. The lateralizing value of PIWD in our cases, like in the other series, relies on postoperative seizure freedom. According to [Szucs et al., 2007](#), the difference of these results could be explained by the fast contralateral propagation in some cases, because in cases of quick contralateral spread, the laterality of any semiological element may be unclear. In these cases, it is uncertain which of the two involved temporal lobes generated the PIWD. Another explanation for the contradictory data might be that the numbers of patients in these studies were too small. A well-powered study involving more patients can resolve this problem.

The authors reviewed other peri-ictal (ictal or postictal) vegetative symptoms (PIVS) described in both adult and childhood epilepsy ([Table 2](#)), and are of clinical and scientific importance. In adults, these symptoms are commonly observed in temporal lobe epilepsy (TLE) and can include cardiovascular

(blood pressure changes, heart arrhythmia— tachycardia/bradycardia), respiratory (hyperventilation/bradypnea or apnea), gastrointestinal (hypersalivation, nausea, retching, and vomiting), cutaneous (pilo-erection, or “goose bumps,” and sweating), pupillary (mydriasis, miosis), genital, sexual, and urinary or bowel (urinary urge and flatulence) manifestations. Some of them are rare, such as coughing, water drinking, vomiting, spitting, urinary urge, flatulence, yawning, and pilo-erection. The literature data concerning the lateralization value of these PIVS are mostly controversial. Most articles analyzing their lateralizing value have demonstrated that PIVS are mostly linked to the temporal lobe of the non-speech-dominant hemisphere. Other studies and case reports have excluded a lateralizing value for these symptoms ([Fauser et al., 2004; Caboclo et al., 2006; Scücs et al., 2007; Janszky et al., 2007](#)).

Looking for these symptoms is of particular interest in our department since we started epilepsy surgery in patients with drug resistant mesial temporal lobe epilepsy in 2005. We rely on a basic non-invasive presurgical evaluation protocol including brain magnetic resonance imaging, video-EEG monitoring, long-term interictal EEG and neuropsychological assessment ([Lahjouji et al., 2007](#)). Surgery was indicated if a good electro-clinico-radiological correlation was obtained. About 70 TLE patients benefited from temporal lobectomy with an Engel class I outcome in 90% at 3 years of follow-up.

3. Conclusion

Lateralizing signs in seizure semiology are an important face in the complete presurgical evaluation of epilepsy patients. Knowledge and recognition of semiological lateralizing signs during seizures are important in the presurgical evaluation of epilepsy surgery candidates and add further information to video/EEG monitoring, neuro-imaging, functional mapping, and neuropsychological evaluation.

In our country, presurgical evaluation relies exclusively on clinical data and non-invasive tests. Thus, symptoms with lateralizing value are very important to search.

Peri-ictal water drinking behaviour is rarely reported in the literature. It has a good localizing and lateralizing significance in the non-dominant temporal lobe. Nevertheless, this sign, as the others, cannot lateralize the epilepsy focus with 100% certainty. Confirmation by other associated signs and symptoms in the same patient, and moreover by invasive EEG recordings and or ictal SPECT is required.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

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