Seizure: European Journal of Epilepsy 61 (2018) 83–88

Contents lists available at ScienceDirect

Seizure: European Journal of Epilepsy

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

Ictal nausea and vomiting – Is it left or right?

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ARTICLE INFO

Keywords:
Video-EEG monitoring
Electroencephalography
Lateralizing signs
Nausea
Vomiting
Retching

ABSTRACT

Purpose: Ictal nausea/vomiting has been linked to the non-dominant hemisphere and has been considered a lateralizing sign. However, small case series and single cases have reported seizure localisation in the dominant hemisphere. Here we aimed to determine the seizure localisation and lateralization in cases with ictal nausea/retching/vomiting to test the hypothesis that these signs are of lateralizing value.

Methods: We searched two large tertiary epilepsy-center video-EEG databases (period: 1980–2017) for reports on ictal nausea/retching/vomiting and retrieved ictal EEG seizure location, lateralization and clinical symptoms.

Results: We identified 13 patients with focal epilepsy and video-EEG-documented ictal nausea (n = 2), nausea and retching (n = 3), retching followed by vomiting (n = 5) or only vomiting (n = 3). Aetiology was genetic (n = 1), structural/metabolic (n = 7) or of unclear origin (n = 5). While in 12/13 patients epileptic discharges were temporal, a single case was parietal. A left-sided seizure origin was more frequent than a right-sided origin (62 vs. 38%). Assuming a left-sided language dominance in the single left-handed patient and in those two patients with unclear handedness (based on the known distribution of hemispheric speech-dominance), the distribution of ictal nausea/retching/vomiting to the dominant vs. non-dominant hemisphere was not significantly different from a random distribution (8 vs. 5, p = 0.581).

Conclusion: Ictal nausea/retching/vomiting are most frequently of temporal origin. In contrast to previous studies, our ictal video-EEG data suggests that these signs have no lateralizing value. Thus, video-EEG should be performed and while this clinical sign points to a temporal seizure origin, it does not determine its lateralization.

1. Introduction

In the focal epilepsies clinical signs can provide useful information in determining the brain area involved during epileptic seizures, i.e. the symptomatic zone. Amongst various signs, ictal nausea and vomiting, which are found in about 1.9–10% of all patients with temporal lobe epilepsy (TLE) [1–3], have been linked to seizure onset in the non-dominant (i.e., mostly right) hemisphere, suggesting a functional asymmetry for gastrointestinal control [2,4–8]. Specifically, in a case series with 31 TLE patients, the authors reported a “strong correlation between epigastric sensation and ictal vomiting in psychomotor seizures arising from the right but not the left temporal “lobe [2]. From a series of 450 patients who underwent video-EEG monitoring, nine cases with ictal retching or vomiting were reported, in all nine seizure activity was located in the right hemisphere and involved temporal lobe structures [4]. These authors distinguished three categories: (1) retching only, (2) retching followed by ejection of gastric contents, (3) projectile vomiting, i.e. ejection of gastric contents without video evidence of preparatory retching or nausea. Usually, patients are unaware that they vomited [4]. Furthermore, late ictal vomiting was noted in a case series (n = 3) with initial right occipital lobe seizures during photic stimulation spreading to right mesio-temporal structures [9].

In a recent review, the lateralizing value of ictal nausea and vomiting was judged to be 81% for the non-dominant hemisphere [10]. The diagnostic value of these signs, however, has been put in question. Single case reports and small case series demonstrated a seizure onset in the dominant hemisphere [3,7,11,12]. Chen and colleagues described ictal vomiting associated with left temporal epileptic discharges in two cases, however, emphasized that due to restriction to surface EEG, ictal EEG spread in the deep area of the right temporal lobe at the time of vomiting could not be completely excluded [3]. One out of 11 patients with ictal vomiting was found to have a seizure onset in the dominant hemisphere when reviewing the EEG database from the Mayo Clinic [7]. Importantly, handedness, hemispheric dominance and spread of epileptic activity must be taken into account. Devinsky and colleagues reported a left-temporal seizure onset in two patients with ictal

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https://doi.org/10.1016/j.seizure.2018.08.011
Received 23 June 2018; Received in revised form 9 August 2018; Accepted 11 August 2018

vomiting, but in one patient with left-hemispheric dominance for language vomiting did not occur until the epileptic discharges spread to the contralateral (right) temporal lobe and the other patient was left-handed and was right-dominant for language [13].

In view of these conflicting findings, we hypothesized that ictal nausea and vomiting are not lateralizing signs and predicted similar frequency of epileptic discharges in the dominant and the non-dominant hemisphere. This would further emphasize the role of video-EEG recordings in order to localise ictal discharges in these patients. To test this hypothesis, we searched two large video-EEG databases for cases with ictal nausea, retching or vomiting and documented epileptic discharges on video-EEG.

2. Materials and methods

This retrospective study was approved by the Cantonal ethics commission Zurich (BASEC 2018-00257). It was in accordance with the ethical standards laid down in the Declaration of Helsinki for research involving human subjects from 1964/2013 (7th revision). Since this was a retrospective database analysis, written informed consent from the participants before the introduction of requesting for general informed consent in every patient presenting to either the University Hospital Zurich or the Swiss Epilepsy Center in 2014 could not be retrieved. This approach was in accordance with the approval from the ethics committee. Prior to the data analysis, patient records and patient-related information was anonymized and de-identified.

2.1. Data search

We searched the video-EEG databases (period: 1980–2017) of two large tertiary epilepsy centers in Zurich, Switzerland (Department of Neurology, University Hospital Zurich and Swiss Epilepsy Center, Clinic Lengg) for cases with reported episodes of nausea, retching and / or vomiting during video-EEG recording that occurred during lateralized / localised ictal seizure patterns in the surface EEG. All video-EEG recordings were read by expert neurophysiologists/epileptologists (MI, ILL). In all cases inter-ictal epileptiform / epilepsy typical potentials (as defined by Gloor) [14] were strictly unilateral with their localisation corresponding to the site of seizure onset. One patient with Panayiotopoulos syndrome in which ictal vomiting occurs in about 77% of cases [15] was excluded because of its known non-lateralising value in this syndrome. Specifically, ictal EEGs did not relate to any specific region of EEG activation and it is postulated that the clinical (autonomic) manifestations are likely to be generated by variable and widely spread epileptogenic foci [16]. In addition, two patients with opercular seizures were also excluded. This due to the fact that the ictal vomiting in opercular seizures is not primarily an autonomic sign but is a result of choking/gagging due to oropharyngeal/laryngeal motor involvement [17].

2.2. Data retrieval and data analysis

In cases suitable for inclusion, we analysed both ictal EEG (lateralization and localisation of epileptic discharges) and clinical/video-documented findings and reviewed the patients' medical records. Information regarding the aetiology of the seizures and the spectrum of clinical presentation were collected as well and handedness was obtained from the patient history. The distribution of the different clinical and EEG presentations was calculated and analysed with regard to a left- vs. right and dominant vs. non-dominant hemispheric location of the EEG discharges using R 3.4.3. One of the included cases (#11) had been previously published as a case report [12].

3. Results

Based on the video-EEG database search, we identified 20 potential cases for further evaluation. Seven cases were subsequently discarded, reasons for exclusion were opercular seizures (n = 2), Panayiotopoulus syndrome (n = 1), patients in which the vomiting occurred only after the epileptic discharges had stopped (i.e., reflecting postictal vomiting, n = 3) and denial of general informed consent (n = 1). Finally, 13 patients with video-EEG documented ictal nausea, retching and/or vomiting (6 females and 7 males) were included in this retrospective data analysis (10 from the Swiss Epilepsy Center, 3 from the University Hospital Zurich). These cases were collected between 1998 and 2017. Mean patient age (± 1 standard deviation) was 25.8 ± 10.7 years at the time of video-EEG recording. All patients were diagnosed with focal epilepsy, being genetic in one case (Rett syndrome), structural / metabolic in seven cases and of unclear origin in five cases (see Tables 1 and 2 for details).

Table 1
epidemiologic data and clinical presentation.

	side of epileptic discharges on surface EEG		
	right	left	both
gender			
female	4	2	6
male	1	6	7
ictal presentation			
nausea	1	1	2
nausea and retching	1	2	3
retching followed by vomiting	1	4	5
vomiting	2	1	3
diagnosis (focal epilepsy in all cases)			
genetic			
Rett syndrome	1	0	1
structural/metabolic			
TLE with hippocampal sclerosis	1	2	3
limbic encephalitis	0	1	1
astrocytoma[a]	1	0	1
focal cortical dysplasia[b]	0	2	2
unclear origin	2	3	5
seizure lateralization and localization			
specific localizations			
temporal			
temporal only	5	6	11
temporo-centro-parietal	0	1	1
extratemporal			
parietal	0	1	1
all localizations	5	8	13
handedness			
right-handed	2	8	10
left-handed	1	0	1
unclear	2	0	2

Abbreviations: TLE = temporal lobe epilepsy.

[a] In a single case, a pilocytic astrocytoma was located in the right temporomesial lobe.

[b] Focal cortical dysplasia was located to the left precentral area (n = 1) and to both occipital lobes (microgyria, n = 1).

3.1. Ictal presentation of our cases

In the 13 patients included, ictal epileptic discharges on surface EEG were simultaneously accompanied by nausea (n = 2), nausea and retching (n = 3), retching followed by vomiting (n = 5) or only vomiting (n = 3). Epileptic discharges were strictly unilateral (right hemisphere = 5, left hemisphere = 8) and most frequently temporal (n = 11), but also included other areas (temporo-centro-parietal (n = 1)) or were extra-temporal (parietal; n = 1) only. Focusing on right-handed patients, discharges were lateralized to the dominant hemisphere in 8/10 cases and to the non-dominant hemisphere in 2/10 cases. This distribution was not significantly different from a random distribution (two-sided exact binomial test, p = 0.109). An illustrative