Original article with video sequences

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Ictal swearing: a case series and review

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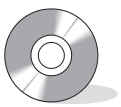
ABSTRACT – Seizures can manifest with ictal swearing but few studies have investigated the localising value of this epileptic manifestation. In this case series and review of the literature, we attempted to determine whether ictal swearing could help localise the epileptic focus. We review two previously published cases and report eight additional epileptic patients with ictal swearing for whom the epileptic focus was determined based on clinical, structural, electrophysiological, and surgical outcome data. Results indicated that ictal swearing occurs more commonly in male subjects and lateralises to the non-dominant hemisphere, but has poor localisation value, arising either from the frontal, parietal, temporal or occipital lobes in different patients. We discuss the significance of these findings. [*Published with video sequences*]

Key words: epilepsy, swearing, seizure

Previously reported studies have described a variety of ictal epileptic vocal automatisms (such as humming, singing, laughing, crying, and swearing) (Driver *et al*., 1964; Chase *et al*., 1967; Bartolomei *et al*., 2007; Bentes *et al*., 2008; Enatsu *et al*., 2011; Blumberg *et al*., 2012). Some have been associated with seizures of a specific origin, such as humming in patients with temporal lobe epilepsy (Bartolomei *et al*., 2007). It is unclear if ictal swearing has any localising value. In this study, we review two previously published cases and report eight additional cases in which swearing during seizures was manifested, in order to determine whether this ictal semiological feature can help localise the epileptic focus.

Materials and methods

Using the keywords "ictal swearing", "epilepsy" and "seizure", we searched the Pubmed database to identify original and review articles on ictal swearing. Additionally, we searched in our epilepsy monitoring unit database for patients manifesting ictal swearing. We retrospectively collected clinical, radiological, and electrophysiological data for all identified cases through chart and video analyses. The study was approved by our institutional ethics committee.



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Results

Among 484 patients admitted to our epilepsy monitoring unit between 1974 and 2012, we identified 8 cases of epilepsy incorporating swearing as an ictal manifestation (1.7%) (8 males; mean age: 39.5 years; range: 21 to 69 years). Six of 8 patients were right-handed and 2 of 8 patients were left-handed (one of whom had left dominance on Wada testing). Ictal swearing occurred inconsistently during seizures and generally co-existed with other verbal or motor automatisms. Seizure onset localisation for these patients, based on clinical (8/8), structural (7/8), electrophysiological (8/8 scalp EEG, 5/8 intracranial EEG), and surgical outcome (7/8) data, is summarised in *table 1*. All subjects had right-sided seizures confirmed by video-EEG, but focus localisation varied: orbitofrontal and frontopolar (*n*=1), inferior dorsolateral frontal (*n*=2), medial parietal (*n*=1), parieto-occipital (*n*=1) and medial temporal (*n*=3). Patient 7 had independent left medial temporal lobe seizures as well. *Figure 1* illustrates the MRI or MEG findings for Patients 1, 3 and 4.

Our search of the literature disclosed only two case reports of epileptic patients with ictal swearing. Again, both patients were male. One right-handed patient had right medial temporal lobe epilepsy (Driver *et al*., 1964). The other, a left-handed patient, had bilateral medial temporal interictal activity and right medial temporal lobe seizures (Chase *et al*., 1967). Although Wada testing or cortical stimulation was not performed (or results not reported), language was most likely lateralised to the left hemisphere since the patient was reported to have a verbal IQ of 119, compared to a performance IQ of 90 on the Wechsler test, and he presented other ictal speech automatisms without articulatory errors (Chase *et al*., 1967) (*table 1*).

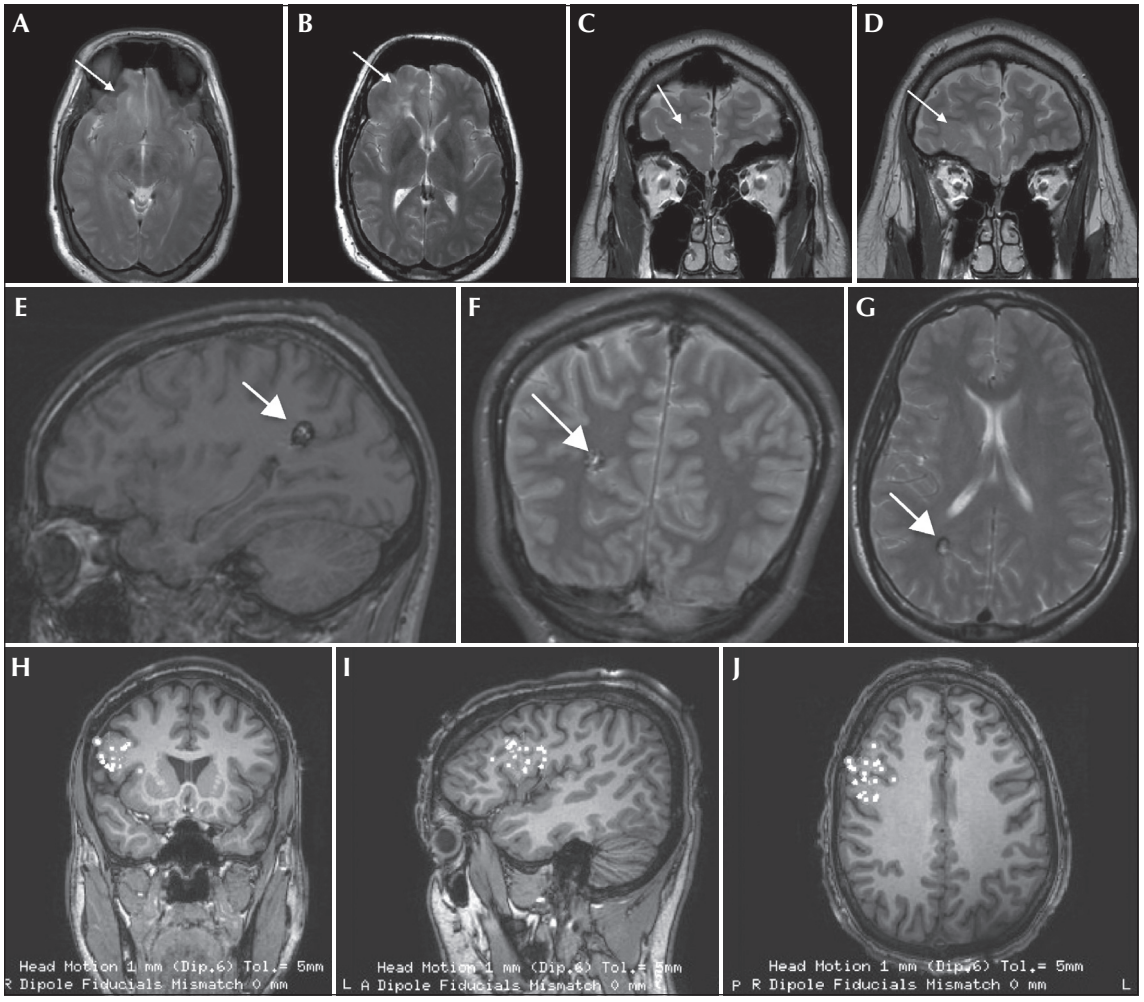

Figure 1. MRI or MEG findings for Patients 1, 3 and 4: axial (A, B) and coronal (C, D) T2-weighted views of orbitofrontal/frontopolar cortical dysplasia in Patient 1; sagittal (E), coronal (F) and axial (G) T2-weighted views of the right medial parietal cavernoma in Patient 3; and coronal (H), sagittal (I), and axial (J) views of magnetic source imaging of Patient 4, revealing a cluster of source localisations in the right inferior frontal gyrus.

Table 1. Patient characteristics, non-invasive/invasive presurgical findings, and surgical results.

Case	Age (yr)/ gender	Handed-ness	Onset (yr)	Epilepsy duration (yr)	Sz frequency	Sz type	MRI	Ictal SPECT	TEP	MEG	EEG and Video-EEG findings	icEEG	Surgery	Outcome (Engel), FU	Known or presumed focus
1	29/m	R	2	27	d	Staring, arrest, ± verbal or motor automatisms, swearing, ± GTCS	R orbito F + R F polar	iiSPECT: ↑F polar + SFG	↓bi F mesial, R orbito F	-	iiEEG: R F; iEEG: diffuse	-	R orbito F + R F polar	IIIA (18mo)	R orbito F + F polar
2	37/m	R	26	11	d	Discomfort, breathlessness, verbal automatisms (laughter or swearing) ± leg/arm movements ± rare GTCS	N	Multi-focal	Discrete ↓ L T + orbito F	R aINS + IFG	iiEEG: R F; iEEG: diffuse	R IFG → orbito F → medial FG	R IFG + aINS	IA (11mo)	R IFG-aINS
3	22/m	R	14	8	m	Blurred vision, fading sounds, *déjà vécu*, confusion, ± swearing, manual automatisms ± R hand dystonia, L head + eye deviation, ± rare GTCS	R medial P cavernoma	Multi-focal	Discrete ↓R T	-	iiEEG: R T; iEEG: R T	-	GKS	IV (2mo)	R medial P
4	21/m	R	6	15	d	Auditory sx ± R facial SSS ± laughter/swearing, lower limb automatisms ± rare GTCS	N	L T, R T, cingu-late, R IFG	Slight ↑R T	R IFG	iiEEG: R F; iEEG: diffuse	R IFG → medial FG	R F polar (Engel IV)→R IFG	1A (8mo)	R IFG
5	50/m	L*	21	29	d-w	Mainly nocturnal, staring, behavioural arrest, oral and verbal automatisms (including swearing). Rarely: L SSS	Retrosplenial cyst	↑R inferior central	-	-	iEEG: B P T O	ii: R mesio T, lat T, posterior cingulate i: R P O onset → mesio T propagation	Lesionectomy (failed) → R P O cor-ticectomy	IIIA (10yr)	R P O
6	69 / m	R	29	40	d	BS: vertigo, cephalic aura, L head and eye deviation, swearing, confusion, aggressive behaviour, ± rare GTCS	AS: (CT only) R ATL + R T atrophy; R F hypodensity (old infarct?)	-	-	-	iiEEG: R F T; iEEG: R F T	R mesio T → R F propagation	R ATL	IIC (37yr)	R T
7	24/m	R	18	6	m, a	Staring, oral and manual automatisms (including swearing), ± L arm dystonic posturing, frequent GTCS	Discrete L HA	Multiple	↓ L T	-	iiEEG: bi T; iEEG: R T and L T	-	-	-	Inde-pendent R and L T
8	64/m	L (Wada: L domi-nance)	8	56	m	Vocalisation, fist clenching, body stiffening, drooling, oral automatisms (including swearing), aggressivity	-	-	-	-	R F T	R mesio T	ATL	IIC (34yr)	R T
9 Driver *et al*. (1964)	38/m	R	26	12	d-w	Epigastric aura, depersonalisation ± sight and hearing loss, ± loss of consciousness ± speech and vocal automatisms ± L head deviation with abduction of the L arm and elbow flexion ± staring	-	-	-	-	iiEEG: R F T; iEEG: R F T	R mesio T → R lat T → R hemisphere	R SAH	IIB (1yr)	R medial T
10 Chase *et al*. (1967)	24 / m	L	8?	16	?	Depersonalisation ± inability to maintain continuity of thought ± sensory sx and nausea ± loss of consciousness ± motor and verbal automatisms	-	-	-	-	iiEEG: bi T; iEEG: R T	ii: bi inferior F and bi mesio T	-	-	R medial T

*Cortical stimulation of electrodes in the temporal and parietal structures did not elicit language disturbances. Epilepsy surgery in the right parieto-occipital region did not provoke any language difficulties.
Yr: year; Sz: seizure; ic: intracranial; FU: follow-up; EZ: epileptic zone; d: daily; w: weekly; m: monthly; a: annually; mo: months; yr: years; R: right; L: left; bi: bilateral; lat: lateral; O: occipital; P: parietal; T: temporal; F: frontal; i: ictal; ii: interictal; N: normal; GTCS: generalised tonic-clonic seizure; GKS: gamma knife surgery; sx: symptoms; SSS: somatosensory symptoms; ATL: anterior temporal lobectomy; FG: frontal gyrus; IFG: inferior frontal gyrus; SFG: superior frontal gyrus; aINS: anterior insula; HA: hippocampus atrophy; SAH: selective amygdalo-hippocampectomy; FU: follow-up.

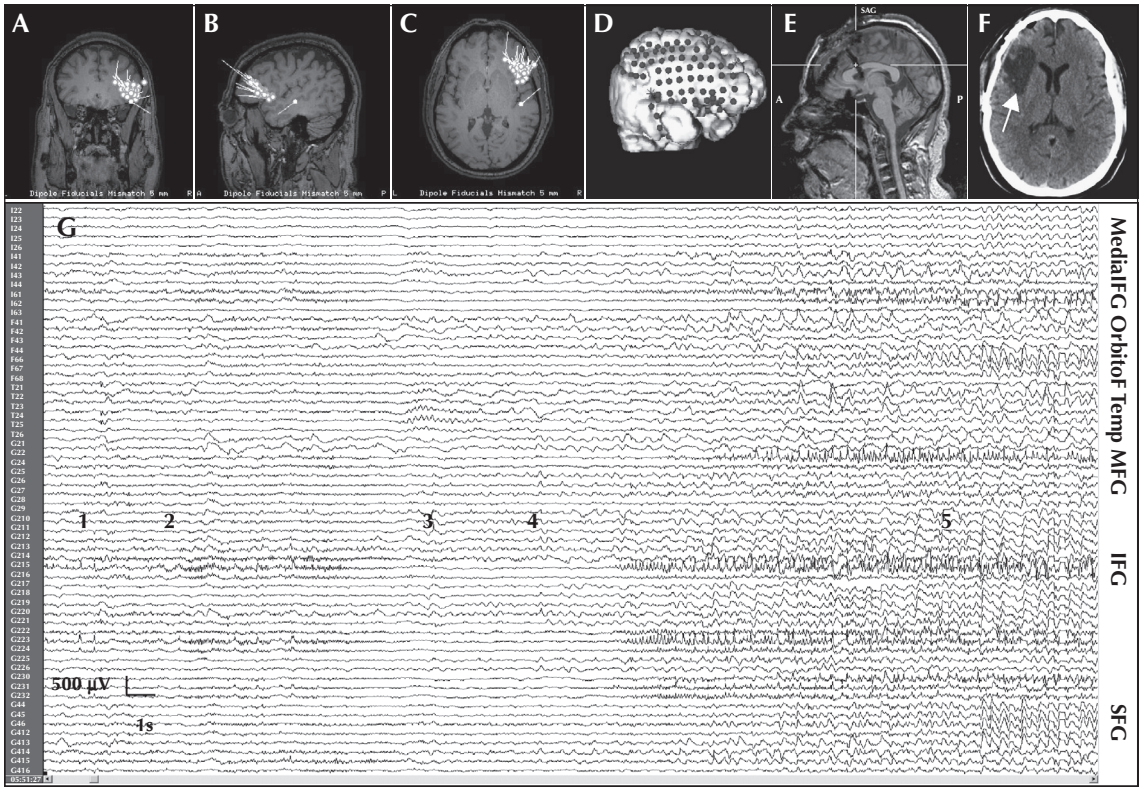

Figure 2. Imaging and intracranial EEG data for Patient 2: coronal (A), sagittal (B), and axial (C) views of the magnetic source imaging study of the patient, revealing a cluster of source localisations in the inferior frontal gyrus, extending to the anterior-superior insula; (D) 3-D representation of intracerebral electrode contacts; (E) position of interhemispheric subdural electrodes; and (F) postoperative scan showing the extent of the resection of the right inferior frontal gyrus and the anterior superior insula. (G) Intracranial EEG recording for Patient 2 showing: (1) interictal spikes over the right inferior frontal gyrus, (2) onset of a seizure over the inferior frontal gyrus (in the form of low-voltage fast activity) with quick spread to the medial frontal gyrus. Clinically, the patient awoke from sleep (3), exhibited minimal motor movements of the hands and started vocalising (4). Swearing was noted (5) as the ictal discharge had spread to other areas, notably the medial frontal, middle, superior, and orbitofrontal gyri.
MedialFG: medial frontal gyrus; OrbitoF: orbitofrontal; Temp: temporal; MFG: middle frontal gyrus; IFG: inferior frontal gyrus; SFG: superior frontal gyrus; 35-Hz low-pass filter, 75 µV/mm sensitivity.

Illustrative case: Patient 2

This 37-year-old, right-handed man with no past medical history started having seizures at age 26. Seizures occurred daily and were characterised by an aura of discomfort and breathlessness, quickly followed by verbal (laughter or swearing) and gestural automatisms *(see video sequence)*. Secondary generalised tonic-clonic seizures were rare. Presurgical evaluation disclosed no epileptogenic lesion on MRI, multiple activation sites on ictal single-photon emission computed tomography, and discrete left fronto-temporal hypometabolism on positron emission tomography. Video-EEG revealed right interictal frontal spikes and diffuse ictal fast activity. Magnetoencephalographic localisation of single spikes using the electrical current dipole model indicated a focal irritative zone in the right inferior frontal gyrus, extending to the superior-anterior insula *(figure 2A to C)*. An intracranial EEG study was performed to better delineate the epileptogenic zone, sampling the right frontal (dorsolateral, medial, and orbitofrontal areas), temporal, and insular lobes (*figure 2D and E*). Active interictal spiking was noted over the inferior frontal gyrus. Seizures started in the same area with rapid spread to the medial frontal gyrus. Swearing occurred as the ictal discharge propagated to the middle, superior, and orbitofrontal gyri (*figure 2G*). Resection of the right inferior frontal gyrus and the anterior superior insula led to complete seizure freedom (after 11 months of follow-up) *(figure 2F)*.

Discussion

Our data suggest that ictal swearing is rare, more commonly seen in male subjects, and lateralises to the non-dominant hemisphere, but has poor localisation

value. Indeed, although a fair number of patients presented with mesial temporal lobe epilepsy, we also found cases of frontal, parietal, and parieto-occipital lobe epilepsy. To the best of our knowledge, this is the largest series of ictal swearing, as our search of the literature disclosed only two prior case reports, both of which also featured male patients with right-sided seizures (Driver *et al*., 1964; Chase *et al*., 1967).

Driver *et al*. proposed that swearing is a form of emotional or compulsive speech and that ictal swearing is the direct result of epileptic activity in the right hemisphere. Support for this hypothesis comes from the reported patients with severe aphasia (due to left hemispheric damage or left hemispherectomy) but intact swearing (Van Lancker and Cummings, 1999). Furthermore, ictal swearing patients also exhibit other emotional manifestations such as laughing or aggressiveness. The exclusive presence of ictal swearing in males remains unclear but one could surmise that men express their emotions by swearing more often than women. Alternatively, others have suggested that ictal involvement of one hemisphere releases the other hemisphere from its control (Driver *et al*., 1964; Jasper, 1964; Rashid *et al*., 2010). Thus, ictal swearing might be produced by language areas of the dominant hemisphere, which is no longer controlled by the non-dominant hemisphere. A similar neurophysiological mechanism has been proposed for ictal speech (including ictal speech in a foreign language), a well-accepted lateralising sign to the non-dominant hemisphere in temporal lobe epilepsy (Serafetinides and Falconer, 1963; Gabr *et al*., 1989; Montavont *et al*., 2008). Indeed, both phenomena require intact articulation derived from the language-dominant areas. Still, ictal speech is defined as clearly intelligible propositional speech during a period of altered consciousness, whereas our patients' ictal swearing often occurred as repeated utterances, isolated in time from propositional speech. Thus, ictal swearing and ictal speech are probably generated by different neurophysiological processes (Chase *et al*., 1967).

The main limitation of our study lies in its retrospective nature, and since patients were not assessed in a standardised way, a recall bias was likely. As ictal swearing is not present in all seizures, its recognition or documentation is very much dependent on history-taking skills and detailed attention of the examiner. □

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Legends for video sequences

Ictal swearing. Onset of seizure occurred at 00:02, followed by onset of swearing at 00:05, end of swearing at 00:52, and end of seizure at 01:23.

Key words for video research on www.epilepticdisorders.com

Syndrome: focal non-idiopathic (localization not specified)
Etiology: not applicable
Phenomenology: swearing (ictal)
Localization: non-dominant hemisphere

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