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■ Clinical commentary

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Epileptic Disorders

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Sexual orgasm as a trigger for reflex epilepsy

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ABSTRACT

Reflex epilepsy is a syndrome in which seizures can be elicited by a specific afferent sensory stimulus or an activity undertaken by the patient. Among all reported stimuli, orgasm has rarely been mentioned. We describe a woman presenting with seizures following orgasm. On interictal EEG, no epileptiform activity was found, even during hyperventilation. Brain MRI showed a small cyst next to the right choroid fissure, modulating the superior surface of the right hippocampus. We reviewed all published case reports of reflex epilepsy induced by orgasm in order to compare clinical, electroencephalographic and neuroimaging findings.

Key words: reflex epilepsy, orgasm

Reflex epilepsy (RE) is a syndrome in which seizures can be precipitated by external stimuli or an internal mental process. Patients may have seizures exclusively triggered by specific stimuli as well as spontaneously occurring seizures. The most frequent type of RE is photosensitive epilepsy, however, there are other external stimuli: simple stimuli such as hot water and tactile, vestibular, auditory or visual stimuli; and complex stimuli such as listening to music or reading. Internal stimuli are rarer and include movement, eating, emotion, thinking, calculation and other cognitive functions [1]. Reflex epilepsy should not be confused with symptomatic seizures induced by alcohol withdrawal or consumption, fever or sleep deprivation.

RE was defined for the first time in the International League Against Epilepsy (ILAE) classification in 1989. In the 2001 ILAE classification, the definition was restricted, defining RE as a syndrome in which all epileptic seizures are precipitated by sensory stimuli [2]. Since 2017, the new ILAE seizure classification does not include reflex epilepsy syndrome, and the seizures are only classified according to their type and aetiology [3]. RE represents 4 to 7% of all epileptic patients and up to 21% of idiopathic generalized epilepsy cases. RE patients may have any type of seizure [4]. The prognosis of RE varies according to the stimulus; photosensitive epilepsy has a favourable prognosis, however, musicogenic epilepsy is usually refractory [4, 5]. RE induced by orgasm is a very rare phenomenon, and has not previously been included in the ILAE classifications, moreover, very few reports are published [1, 6-11].

Different genetic factors may play a role in RE (such as *MECP2* mutations in eating epilepsy and *SCN1A* mutations in musicogenic epilepsy), however, the underlying pathophysiological mechanisms are not completely understood [12]. When a significant area of epileptogenic cortex is stimulated in response to a reflex activity (such as the visual cortex in patients with photosensitive

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epilepsy), it can reduce the seizure threshold and lead to generalized epileptiform activity or a clinical seizure (focal or generalized) via the interaction of some cortical and subcortical structures [12, 13]. Ictogenesis is initiated once seizure-suppressing mechanisms fail, as GABAergic inhibition [12]. More complex tasks recruit larger neuronal networks and are therefore more likely to reach the critical mass which is necessary for such propagation [13].

Case study

A 29-year-old woman was referred to our epilepsy clinic for diagnostic evaluation. She had had five generalized seizures, that lasted less than two minutes, between the ages of four and nine years. The seizures were controlled with valproate, which was tapered later on (she did not recall dosage nor the exact time of stopping medication). She had normal psychomotor development. There was no known family history of seizures or developmental impairment. She reported a seven-year history of generalized tonic-clonic seizures following orgasm. She did not report any aura and her husband did not describe any focal signs at seizure onset. Initially, not all orgasms were followed by a seizure, but at the time of the first appointment she had seizures whenever she had an orgasm. She denied any spontaneous seizure as well as other triggers including physical exercise or other situations implying hyperventilation. The neurological examination was unremarkable.

Routine laboratory tests were normal, and a brain computed tomography (CT) scan, requested by the general practitioner before referral to our epilepsy clinic, was also normal. Interictal three-hour video-EEG monitoring was performed after sleep deprivation, however, the patient failed to fall asleep. On video-EEG, no epileptiform activity was found, even during hyperventilation. 3T brain MRI, including 3D T1 and 3D FLAIR sequences, showed a small cyst with a diameter of six millimetres next to the right choroid fissure, modulating the superior surface of the otherwise normal right hippocampus.

She had no benefit from levetiracetam but remained seizure-free after starting lacosamide, currently with 18 months of follow-up.

Discussion

Sexual orgasm is not explicitly considered as a trigger for reflex epilepsy in the new 2017 ILAE seizure classification and is rarely reported, unlike other sensory and cognitive stimuli [2, 3, 5, 14]. However, a growing number of reports confirm that it is a potential seizure trigger (*table 1*).

There is some uncertainty about the role of hyperventilation in orgasm-induced seizures. In other reported cases, epileptiform activity was not specifically triggered during hyperventilation, as in our case. We specifically asked our patient about other situations implying hyperventilation, however, such situations did not induce seizures. Also, we subjected the patient to intense hyperventilation over six minutes during EEG recording, without any seizure or any epileptiform changes on EEG.

The majority of cases reported are in women (only three in men), between the third and fourth decade of life, and the seizures were mostly focal impaired awareness seizures with localization in the right hemisphere. Neuroimaging was normal or revealed multiple lesions, such as hippocampal sclerosis and post-traumatic scarring [1, 6-11]. Our patient was a female in the third decade of life, thus within the demographic scope of most of the reported cases. Our patient's seizures were described as generalized tonic-clonic, without reference to any focal feature, however, since we did not record any seizure, a focal origin cannot be excluded. Unlike most reported cases, our patient had no epileptiform activity on EEG. No epileptiform activity and no epileptogenic lesion on neuroimaging was previously reported in only one case [10]. In our case, there was only a small cyst on the right choroid fissure, that modulated the superior surface of the right hippocampus, without any abnormal sign intensity. Based on the reported semiology, this lesion did not seem to be a likely cause of our patient's epilepsy, although it was on the right hemisphere, as were the foci in seven of the nine cases reported with known EEG epileptiform activity.

The fact that the epileptogenic area was located in the right hemisphere in most of the reported cases may indicate this hemisphere as a locus for human sexual function. This has already been suggested in previous studies. For example, increased cerebral blood flow in the right prefrontal cortex was demonstrated during masturbation-induced orgasms in men [15]. In a similar study using EEG recordings, a greater wave amplitude over the right hemisphere was shown [16].

The predominance of female gender is evident in the reported cases and may be explained by anatomical and functional sexual dimorphism, involving mostly the right temporal region. This gender dominance is also seen in orgasm-reflex seizures, which also tend to be lateralized to the right hemisphere [17]. Furthermore, this difference in gender may be related to higher rates of medical consultation and a lower threshold for revealing intimate details in females.

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▼ **Table 1.** Features of previously published cases.

Authors, year	Age (yrs)	Gender	Seizure type	Infancy epilepsy	Spontaneous seizure	EEG epileptiform activity	Neuroimaging lesion	Medical treatment response
Hoening *et al.*, 1960 [6]	23	Female	FIAS	Unknown	Unknown	RFT	None	Refractory
Bancoud *et al.*, 1971 [7]	20	Female	FIAS	Unknown	Unknown	RT	Astrocytoma	Unknown
Remillard *et al.*, 1983 [8]	36	Female	FIAS	Unknown	Unknown	RP	Posttraumatic scar	Unknown
Remillard *et al.*, 1983 [8]	35	Female	FIAS	Unknown	Unknown	Unknown	Unknown	Unknown
Berthier *et al.*, 1987 [9]	43	Male	FIAS	Unknown	Unknown	Unknown	Posttraumatic scar	Unknown
Ozkara *et al.*, 2006 [1]	20	Female	GTCS	No	Yes	Unknown	None	Complete seizure control
Ozkara *et al.*, 2006 [1]	30	Female	FIAS, FBTCS	No	Yes	BT (R>L)	None	Complete seizure control
Ozkara *et al.*, 2006 [1]	24	Female	FIAS, FBTCS	Yes	Yes	LF	FCD	Refractory
Ozkara *et al.*, 2006 [1]	20	Female	FIAS	No	Yes	RT	HS	Refractory
Ozkara *et al.*, 2006 [1]	32	Female	FIAS	Yes	No	RT	HS	Refractory
Ozkara *et al.*, 2006 [1]	20	Female	FIAS	No	Yes	RT	None	Refractory
Sengupta *et al.*, 2010 [11]	31	Male	FBTCS	No	No	LT	None	Refractory
Chaukimath *et al.*, 2015 [10]	33	Male	GTCS	No	No	None	None	Complete seizure control

B: bilateral; F: frontal; FBTCS: focal to bilateral tonic–clonic seizures; FCD: focal cortical dysplasia; FIAS: focal impaired awareness seizures; GTCS: generalized tonic-clonic seizure; HS: hypocampal sclerosis; L: left; P: parasagital; R: right; T: temporal

Conclusion

We add another case to the existing literature on orgasm-induced seizures, a phenomenon that is so far relatively rarely reported, but possibly underestimated. Orgasm is a more demanding task, recruiting larger neuronal networks, therefore making it more likely to reach the critical mass that leads to generalized epileptiform activity or a clinical seizure. We highlight the importance of considering orgasm as a possible seizure trigger, and of questioning patients regarding this possible trigger, as intimate details about sexual life are an embarrassing subject and patients may not provide this information spontaneously. Patients tend towards trigger avoidance, thus this condition, if untreated, may cause sexual dysfunction, marital conflict and may negatively influence the patient's well-being. ■

Supplementary material.
Summary slides accompanying the manuscript are available at www.epilepticdisorders.com.

Disclosures.
The authors haven't declare their potential conflicts of interest.

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TEST YOURSELF

(1) What is the most frequent type of reflex epilepsy?

(2) Which of the following is considered a reflex epilepsy stimulus?
A. alcohol withdrawal
B. alcohol consumption
C. fever
D. sleep deprivation
E. hot water

(3) Reflex epilepsy patients:
A. may have all types of seizures
B. only have generalized seizures
C. only have focal seizures

Note: Reading the manuscript provides an answer to all questions. Correct answers may be accessed on the website, www.epilepticdisorders.com.

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- Reflex epilepsy is a syndrome in which seizures can be elicited by a specific afferent sensory stimulus or an activity undertaken by the patient.

- The most frequent type of this kind of epilepsy is photosensitive epilepsy, however, there are other external stimuli: simple stimuli such as hot water and tactile, vestibular, auditory or visual stimuli, and complex stimuli such as listening to music or reading. Internal stimuli are rarer and include movement, eating, emotion, thinking, calculation and other cognitive functions.

- RE patients may have any type of seizure. The prognosis of RE varies according to the stimulus: photosensitive epilepsy has a favourable prognosis, however, musicogenic epilepsy is usually refractory.

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- When a significant area of epileptogenic cortex is stimulated in response to a reflex activity (such as the visual cortex in patients with photosensitive epilepsy), it can reduce the seizure threshold and lead to generalized epileptiform activity or a clinical seizure (focal or generalized) via the interaction of some cortical and subcortical structures. Ictogenesis is initiated once seizure-suppressing mechanisms fail, as GABAergic inhibition. More complex tasks recruit larger neuronal networks and are therefore more likely to reach the critical mass required for such propagation.

- RE induced by orgasm is a very rare phenomenon.

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- We highlight the importance of considering orgasm as a possible seizure trigger, and of questioning patients regarding this possible trigger, as intimate details about sexual life are an embarrassing subject and patients may not provide this information spontaneously.

- Orgasm is a more demanding task, recruiting larger neuronal networks which are therefore more likely to reach the critical mass required to generate generalized epileptiform activity or a clinical seizure.

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