




Recurrent seizures in a young woman: when video-EEG diagnoses a cardiac cause: a case report

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Background

While transient loss of consciousness is a frequent presenting symptom, differential diagnosis between syncope and epilepsy can be challenging. Misdiagnosis of epilepsy leads to important psychosocial consequences and eliminates the opportunity to treat patient's true condition.

Case summary

A 39-year-old woman presenting with recurrent seizures since her childhood was referred to neurological consultation. Electroencephalograms (EEGs) and magnetic resonance imaging previously performed were normal. A sleep-deprived video-EEG was performed and highlighted after 12 h of sleep deprivation a progressive dropping of the heart rate followed by a complete heart block without ventricular escape rhythm and asystole for about 30 s. Her EEG recording later showed diffuse slow waves traducing a global cerebral dysfunction and suffering. The diagnosis of vaso-vagal syncope with predominant cardioinhibitory response was made and a dual-chamber pacemaker with rate-drop response algorithm was implanted. After a 2 years of follow-up, the patient remained free of syncope.

Discussion

Patients presenting with loss of consciousness and convulsion are often diagnosed with epilepsy despite normal EEGs. In patients presenting with recurrent seizures with unclear diagnosis of epilepsy or in a situation of drug-resistant epilepsy, syncope diagnosis should always be considered and a risk stratification is necessary. The benefit of pacemaker implantation in patients with recurrent vaso-vagal syncope is still very controversial. Only patients presenting with spontaneous asystole should be considered for pacemaker implantation in case of recurrent vaso-vagal syncope.

Keywords

Vaso-vagal syncope • Epilepsy • Seizures • Video-EEG • Cardiac pacing • Case report

Learning points

- In patients presenting with recurrent seizures with unclear diagnosis of epilepsy, syncope diagnosis should always be considered.
- Video-EEG with simultaneous electrocardiogram recording may be very useful in such clinical situations.
- In case of recurrent vaso-vagal syncope, a strict patients' selection based on the detection of spontaneous symptomatic asystole is required before considering pacemaker implantation.

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Primary specialties involved other than cardiology: Neurology, neurophysiology

Introduction

Transient loss of consciousness is a frequent presenting symptom. Differential diagnosis between syncope and epilepsy can be challenging. While initial epilepsy diagnosis is mainly based on patient's clinical history, motor phenomena such as myoclonic jerks and tonic postures are common misleading symptoms. Epilepsy diagnosis has an important impact on patients' lives.¹ Seizure frequency is associated with impaired quality of life.² Moreover, patients with epilepsy report a high level of medication side effects.¹ Misdiagnosis of epilepsy not only leads to important psychosocial consequences but also eliminates the opportunity to treat patient's true condition.

Timeline

Time	Events
Childhood	Recurrent seizures described as diffuse abdominal pain and nausea for about 30 s followed by loss of consciousness with myoclonic jerks and absence of post-ictal confusion.
Adulthood	Similar episodes continued monthly. Two inter-ictal EEGs and one cerebral magnetic resonance imaging (MRI) didn't highlight any anomaly. Diagnosis of depression: introduction of Fluoxetine.
39-year-old	On sleep-deprived video-EEG, a complete heart block without ventricular escape rhythm for about 30 s was detected.
Day 1 (admission in neurophysiology department)	Transthoracic echocardiogram and cardiac MRI did not detect any underlying structural heart disease. A 3 days cardiac monitoring was performed and did not detect any recurrence of bradycardia or asystole.
Days 2–5 (admission in cardiology intensive care unit)	The diagnosis of vaso-vagal syncope with predominant cardioinhibitory response was assessed.
Days 6 and 7	A dual-chamber pacemaker with rate-drop response algorithm was implanted. The patient presented with a recurrence of abdominal pain and nausea without concomitant loss of consciousness; simultaneous electrocardiogram showed ventricular pacing in response to atrioventricular block.
2 years of follow-up	The patient remained free of syncope while being off medication.

Case presentation

A 39-year-old woman was referred to neurological consultation for recurrent seizures. She had no cardiovascular risk factors, no history of alcohol or drug abuse, and no family history.

Her symptoms began during childhood. Episodes were always described as diffuse abdominal pain, hot flashes and nausea for about 30 s followed by loss of consciousness with myoclonic jerks and absence of post-ictal confusion. Similar seizures continued monthly in adulthood. At first, epilepsy was suspected so two inter-ictal electroencephalograms (EEGs) were performed and did not show any anomaly. Her cerebral magnetic resonance imaging (MRI) was also normal and neurologic examination was unremarkable. Consequently, no antiepileptic treatment was introduced in this patient. No specific cause was found to explain the initial transient and diffuse abdominal pain. She was finally diagnosed with depression and a Fluoxetine treatment was introduced.

After many recurrences of seizures over the last past months, she was admitted to the neurophysiology care unit of a university hospital for a sleep-deprived video-EEG. After 12 h of sleep deprivation without any event, the patient suddenly described abdominal pain. A few seconds later, her heart rate progressively dropped (*Figure 1*) and she developed complete heart block without ventricular escape rhythm and asystole for about 30 s. Her EEG recording progressively showed diffuse slow waves (*Figure 2*) traducing a global cerebral dysfunction and suffering followed by diffuse flattening of the tracing (*Figure 3*). Clinically, the event started with a loss of consciousness, followed by clonic movements of the four limbs with head deviation and ocular revulsion during a few seconds. Then, burst of tonic movements of the four limbs with cyanosis and stertorous breathing were observed during 30 s (*Video 1*). The episode terminated spontaneously, and there was no obvious post-ictal confusion. The EEG tracing rapidly normalized after the episode.

Subsequently, she was admitted to cardiology intensive care unit. Her baseline electrocardiogram (ECG) showed normal axis and PR interval duration (180 ms), narrow QRS complex (90 ms width) and normal repolarization (*Figure 4*). Orthostatic hypotension test and carotid sinus massage were negative. Transthoracic echocardiogram and cardiac MRI were performed and did not detect any underlying structural heart disease. In particular, the interventricular septum did not show any granulomatous infiltration that could have been suggestive of sarcoidosis. A 3 days cardiac monitoring was performed and did not detect any recurrence of bradycardia or asystole. The patient also had a negative Lyme serologic test (Elisa method).

The diagnosis of vaso-vagal syncope with cardioinhibitory predominant response was made. Because of the recurrent syncopal episodes with severe bradycardia and asystole, it was decided to implant a dual-chamber pacemaker with rate-drop response algorithm. The day after pacemaker implantation, the patient presented with a recurrence of abdominal pain and nausea. An ECG was immediately recorded and ventricular pacing in response to atrioventricular block was noticed. The patient did not present with any loss of consciousness during this episode. After a 2 years of follow-up, the patient remained free of syncope.

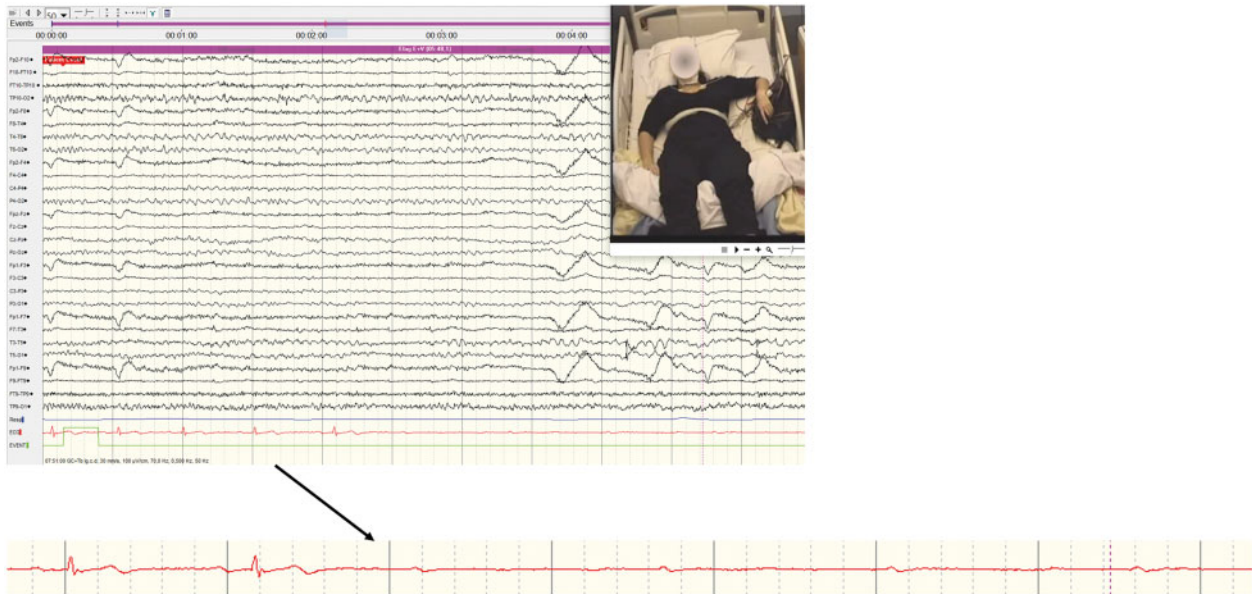


Figure 1 Video-EEG and electrocardiogram recording 30 s after the patient started to complain about abdominal pain. The patient's heart rate progressively drops and she develops complete heart block without ventricular escape rhythm.



Figure 2 Video-EEG and electrocardiogram recording after the loss of consciousness. EEG shows diffuse slow waves traducing a diffuse cerebral dysfunction and suffering. The patient simultaneously presents with loss of consciousness, ocular revulsion, and clonic movements of the four limbs.

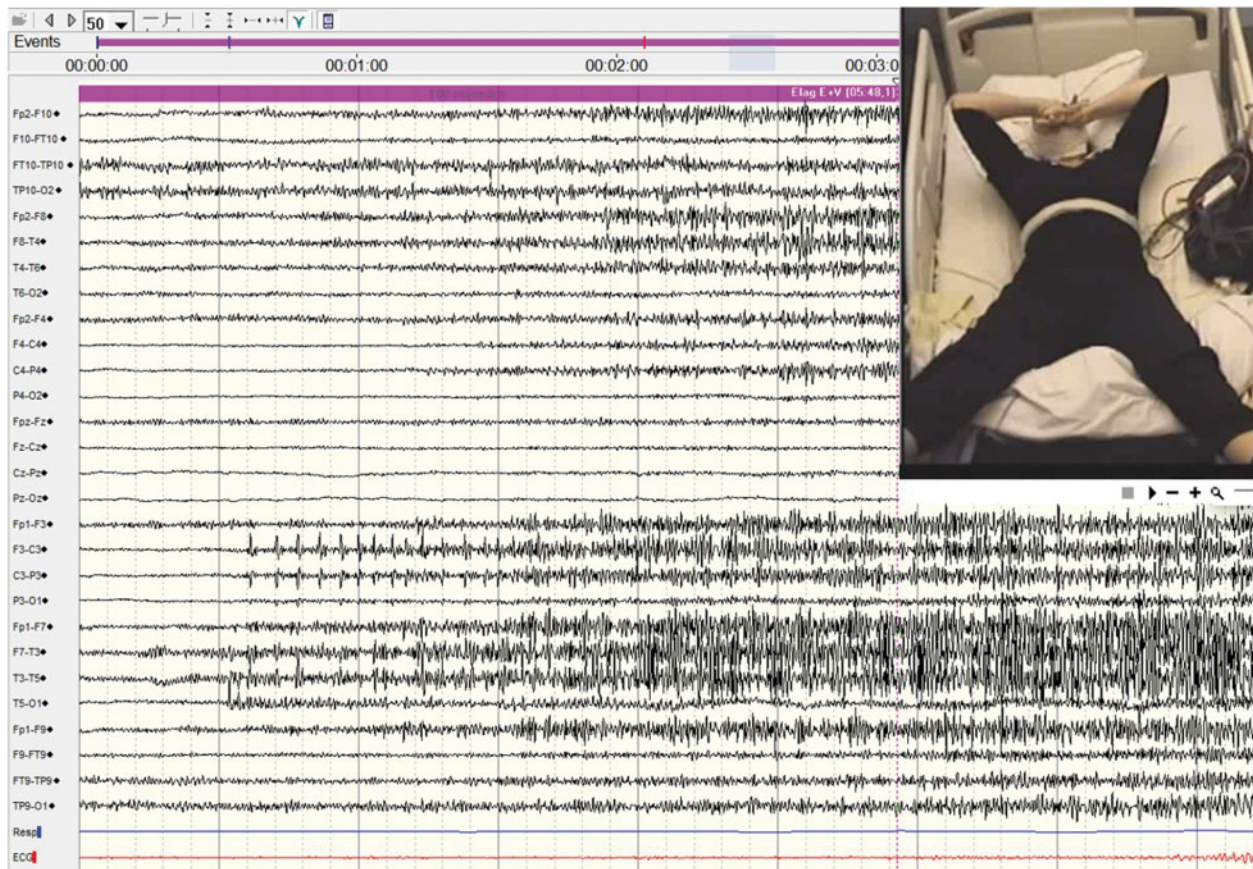


Figure 3 Video-EEG recording during asystole. EEG shows diffuse flattening of the tracing. The patient simultaneously presents with burst of tonic movements of the four limbs with cyanosis and stertorous breathing.

Discussion

Patients presenting with loss of consciousness and convulsion are often diagnosed with epilepsy despite normal EEGs. In the present case, motor phenomena described by the patient's entourage were misinterpreted as epilepsy. The initiating factor such as abdominal pain was overlooked. However, those prodromes may also have suggested temporal lobe epilepsy.³

In patients presenting with recurrent seizures with unclear diagnosis of epilepsy or in a situation of drug-resistant epilepsy, syncope diagnosis should always be considered. Approximately 20–30% of epileptic patients may have been misdiagnosed.⁴ Neurocardiogenic syncope is the most frequent differential diagnosis. Interestingly, da Rocha Rodrigues *et al.*⁵ studied 55 consecutive patients presenting with falls, convulsions and normal EEGs who were first referred to neurologists. After a cardiac screening including at least clinical evaluation, ECG and transthoracic echocardiography, vasovagal syncope was finally found in 22 (40%) patients and carotid sinus hypersensitivity in 6 (11%). Importantly, life-threatening ventricular arrhythmia was also detected in seven (13%) patients. Thus, patients with unclear diagnosis of epilepsy should always undergo cardiac evaluation. A risk stratification following the ESC syncope guidelines⁶ is also necessary to recognize patients with high-risk cardiovascular conditions.

Syncope and epileptic seizures may also coexist in some patients. Ungar *et al.*⁷ evaluated in the OESYS study (Overlap between Epilepsy and Syncope Study) 107 patients with possible (63) and drug-resistant (44) epilepsy. Isolated syncope was finally diagnosed in around 70% of patients with possible epilepsy; syncope and epilepsy coexisted in 66% of drug-resistant epilepsy. These findings highlighted an important overlap between syncope and epilepsy also confirmed by other studies. In a younger population (mean age of 39-year-old), Rangel *et al.*⁸ found out the co-existence of syncope and epilepsy in 21% of the patients with refractory epilepsy.

In some very rare cases, epileptic seizures can also trigger syncope. Whereas tachycardia is observed in most of epileptic seizures, ictal asystole has a mean prevalence of 0.3% in patients with refractory epilepsy⁹ and is more frequently associated with temporal lobe or insular epilepsy.^{3,10} Ictal bradycardia and asystole are often self-terminating, but may nevertheless require pacemaker implantation.^{11,12} They are probably not involved in unexpected sudden death (observed more frequently in epilepsy) as sudden cardiac arrest in patients with epilepsy is generally due to an underlying cardiac disease.¹³

Tilt testing (not carried out in our centre) could have provided more information on the pathophysiological mechanism of complete atrioventricular block and asystole, as a positive cardioinhibitory

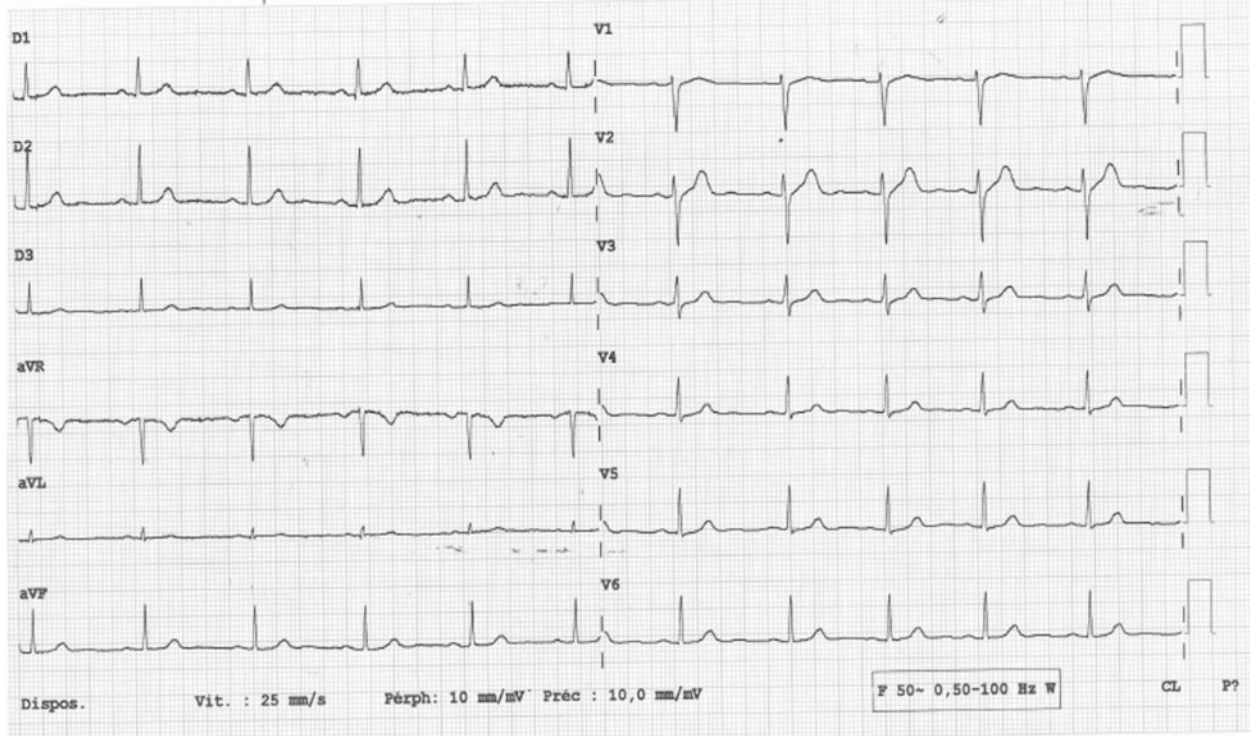


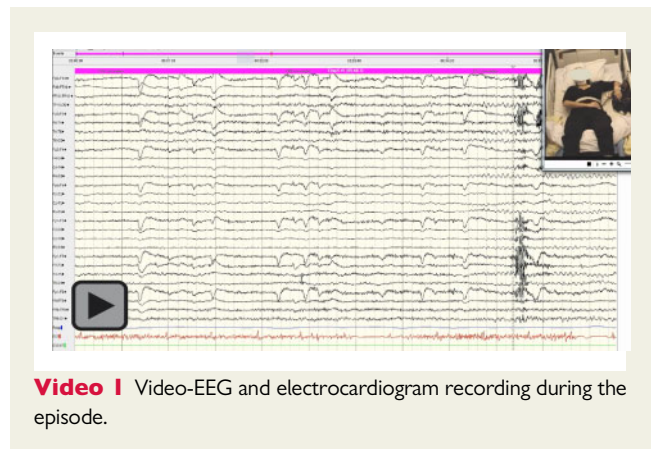
Figure 4 A 12-lead baseline electrocardiogram.

response is predictive of spontaneous asystolic syncope.⁶ However, a negative response would not have excluded the diagnosis of vaso-vagal syncope as around 30–40% of patients with recurrent vaso-vagal syncope have false-negative tilt tests.¹⁴ Moreover, there are around 10–15% of false-positives¹⁵ and a positive tilt test would not have totally ruled out the diagnosis of temporal epilepsy. Following the ESC syncope guidelines, tilt testing should be considered as a means of demonstrating a hypotensive tendency rather than as a diagnostic test for vaso-vagal syncope.⁶ Finally, as previously discussed, there is a significant overlap between epilepsy and vaso-vagal syncope and both mechanisms could have coexisted in this patient.

There were several arguments in favour of vaso-vagal syncope rather than ictal asystole. Prodromes such as abdominal pain and hot flashes were consistently followed by a loss of consciousness, whereas those auras symptoms are often isolated in epilepsy, without systematic generalization. Moreover, there was no postictal confusion. Finally, the cerebral MRI was strictly normal and there were no EEG abnormalities suggesting temporal epilepsy, either per-critical, inter-critical or post-critical.

In any case, regardless of the underlying mechanism, the implantation of a pacemaker seemed unavoidable in our patient given the prolonged asystole and the recurrent syncope episodes.

The benefit of pacemaker implantation in patients with recurrent vaso-vagal syncope is still very controversial. Non-placebo-controlled trials showed some benefits in reducing syncope recurrence.^{16,17} However, in SYNPACE trial where all patients received a dual-chamber pacemaker randomly assigned to DDD or ODO



Video 1 Video-EEG and electrocardiogram recording during the episode.

mode, there was no significant difference between those two groups in terms of syncope recurrence at 24 months of follow-up.¹⁸ In all the studies above, patients were selected using Tilt-test results. In the ISSUE-3 study,¹⁹ patients with an asystolic pause >6 s or a syncopal asystolic pause >3 s received a dual-chamber pacemaker and were randomized to active or placebo (PM off) therapy. The primary endpoint of first syncope recurrence after PM implantation was significantly reduced (21.1% vs. 48.7%, $P = 0.039$) in the active PM group.¹⁹

A recent systematic review of the literature found out a significant 70% reduction in recurrent syncope in groups of patients with pacemaker as compared with control groups without pacemakers (open-

label studies).²⁰ However, data from double-blinded studies, showed a non-significant 27% reduction in syncope episodes when the pacemaker was active.²⁰

All those data showed the uncertain benefit of PM implantation in vaso-vagal syncope and the importance of a strict patient selection. Only patients presenting with spontaneous asystole detected by an implantable loop recorder or other ECG monitoring techniques should be considered for pacemaker implantation in case of recurrent vaso-vagal syncope.

Conclusion

Syncope is the main differential diagnosis of epilepsy in case of recurrent seizures or drug-resistant epilepsy. The present case highlights the importance of not overlooking differential diagnosis and the usefulness of video-EEG-ECG monitoring in such a situation.

Lead author biography



Corentin Chaumont was born in France in 1992. After 6 years of general medical training, he completed 4 years of cardiology residency in Rouen University Hospital. He is currently doing a master's degree in Science (MSc) in Paris and his research focuses on the influence of metabolic stress on atrial remodeling. He will then specialize in clinical electrophysiology and cardiac pacing in Rouen University Hospital.

Supplementary material

[Supplementary material](#) is available at *European Heart Journal - Case Reports* online.

Slide sets: A fully edited slide set detailing this case and suitable for local presentation is available online as [Supplementary data](#).

Consent: The author/s confirm that written consent for submission and publication of this case report including image(s) and associated text has been obtained from the patient in line with COPE guidance.

Conflict of interest: F.A. is consultant for and has received lecture fees from Boston Scientific, Medtronic, Microport CRM.

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