# Anti-NMDA receptor encephalitis associated with ictal asystole

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ABSTRACT

Anti-N-methyl-D-aspartate receptor (NMDAR) encephalitis usually presents with psychiatric symptoms, behavioural changes, impaired consciousness, seizures and autonomic instability. Ictal asystole is a rare phenomenon associated with complex partial seizures. It is implicated as a potential cause of sudden unexpected death in epilepsy. We report a 41-year-old woman who presented with anti-NMDAR encephalitis. During continuous video electroencephalogram and cardiac monitoring, an episode of ictal asystole was detected. We discuss the potential link between anti-NMDAR encephalitis and ictal asystole. Treatment options for ictal asystole in the setting of anti-NMDAR encephalitis are also discussed.



## 1. Case report

A 41-year-old woman presented with frequent complex partial seizures associated with mania, paranoid delusions and emotional lability. Her electroencephalogram (EEG) showed bilateral non-specific slowing, maximal over the left temporal region. Cerebrospinal fluid (CSF) examination revealed $27 \times 10^6$ white cells/L (100% mononuclear) with normal protein and glucose concentrations and positive oligoclonal bands. Her serum was negative for oligoclonal bands. Her brain MRI showed a left mesial temporal lesion centred on the amygdala (Fig. 1).

The patient required mechanical ventilation due to worsening encephalopathy with frequent complex partial seizures. She was treated with high-dose corticosteroids without improvement. Unexplained episodes of bradycardia and asystole necessitated a temporary pacing wire. Baseline electrocardiogram and echocardiogram were normal.

During continuous video EEG monitoring, an electrographic ictal discharge of left temporal origin was recorded without overt clinical accompaniment, during which asystole occurred 60 s after seizure onset (Fig. 2). The asystole lasted 15 s and was terminated by the activation of the pacing wire. A permanent cardiac pacemaker was inserted and the seizures were eventually controlled with topiramate and levetiracetam.

Over the following weeks, she remained in a minimally responsive state without evidence of ongoing seizures. She developed orolingual dyskinesias with diffuse rigidity and dystonic posturing as well as fever without evidence of sepsis. Prednisolone (20 mg once daily) was started as empiric treatment for her fever and the topiramate discontinued. Shortly after, she had a marked neurological recovery and resolution of her fever over several days. She became independent with mobility and self-care with only minor residual impairment of anterograde memory.

Her serum was negative for the antibodies to NR1/NR2 heteromers of the N-methyl-D-aspartate receptor (NMDAR). However, a repeat CSF sample taken in the recovery phase had detectable anti-NMDAR antibodies (testing done at University of Pennsylvania, Philadelphia, USA by Professor J. Dalmau). CA-125 was negative while CT chest, abdomen and pelvis and a whole body F-18 fluorodeoxyglucose-positron emission tomography scan revealed no underlying malignancy, including ovarian teratoma.

## 2. Discussion

Anti-NMDAR encephalitis was first reported in 2007, predominantly in young women who frequently had an underlying ovarian teratoma.[1] However, more recent case series have shown that a wider range of patients can be affected. Dalmau et al. reported 100 patients aged 5 to 76 years, 9% of whom were males and 42% of whom had no detectable tumour.[2] Irani et al. reported a predominantly European series of 44 patients with anti-NMDAR encephalitis. A total of 29% of the patients were male and only 20% had an associated tumour.[3]

The clinical course of anti-NMDAR encephalitis is relatively stereotypic, initially involving psychiatric symptoms with behavioural changes and cognitive impairment, followed by impaired consciousness with seizures, autonomic instability and orolingual and limb dyskinesias. Anti-NMDAR antibodies are detected in the serum but sometimes, as in our case, only in the CSF.[4]

Ictal asystole is a rare phenomenon, in one series occurring in 0.27% of epilepsy patients.[5] However, in patients with intractable epilepsy monitored with an implantable loop recorder, significant bradycardia or asystole was found in 21%,[6] suggesting that ictal asystole is under-diagnosed. It has been predominantly

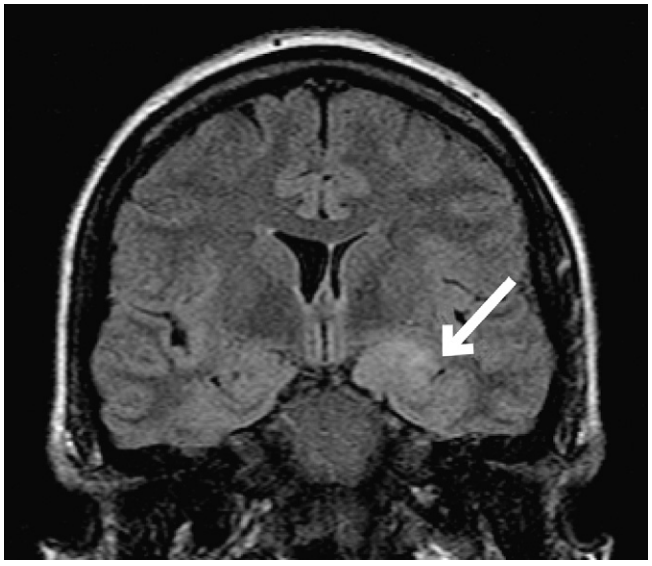

**Fig. 1.** Coronal fluid-attenuated inversion recovery MRI showing a swollen and hyperintense left amygdala without significant contrast enhancement (arrow).

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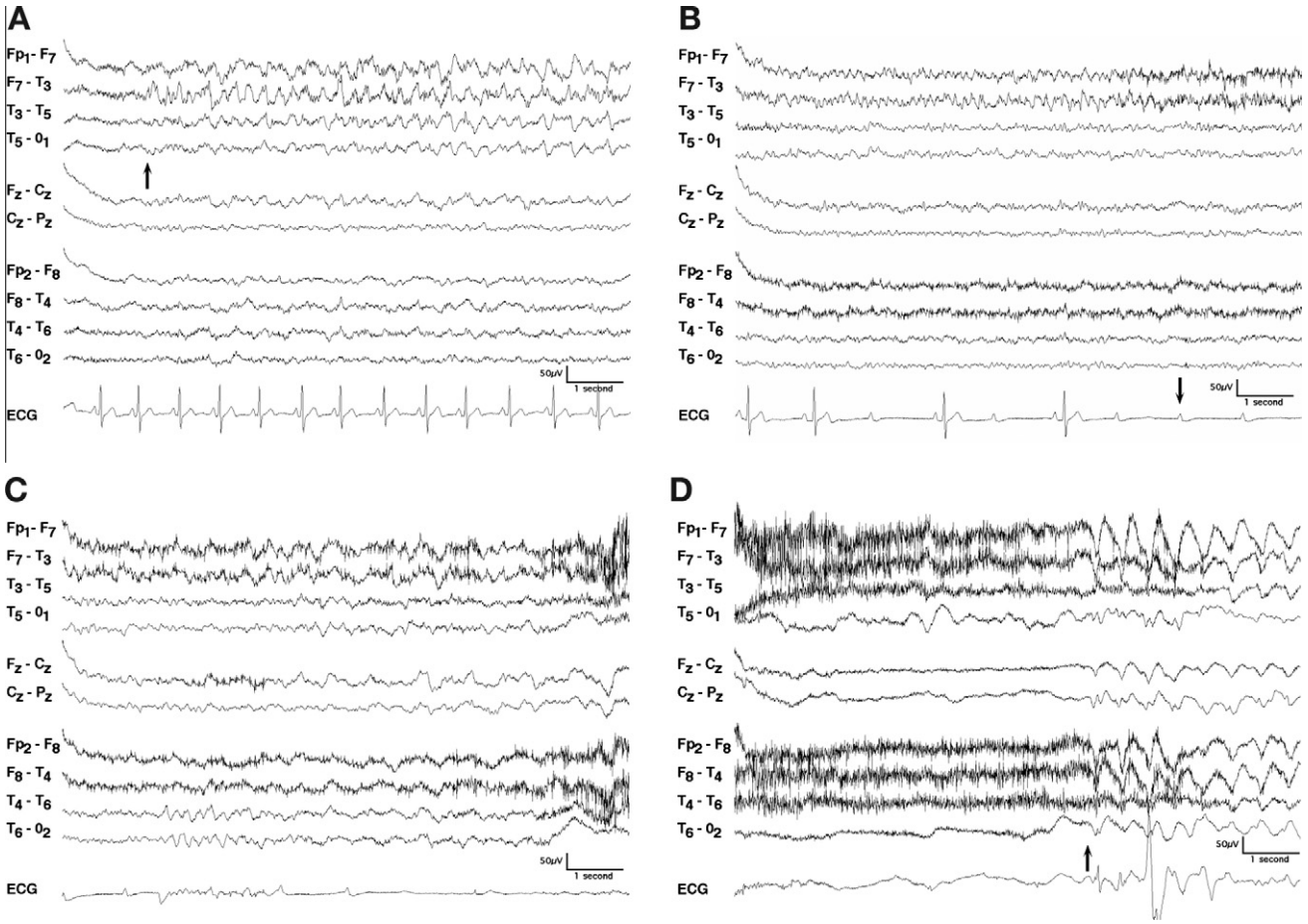


**Fig. 2.** An electroencephalogram (EEG) showing evolving left temporal ictal discharge and asystole; modified longitudinal bipolar montage with temporal and midline derivations shown, high frequency filter 70 Hz, low frequency filter 0.5 Hz, 50 Hz (''notch'') filter on. (A) Onset of electrographic seizure over left temporal region (arrow). (B–D) Sequential 10 s epochs of EEG showing (B) ongoing left temporal seizure discharge and, on electrocardiogram, onset of ventricular asystole (arrow) with (C) subsequent generalised slowing followed by (D) diffuse attenuation consistent with cerebral hypoperfusion in association with asystole. Arrow shows EEG artefact related to initiation of cardiopulmonary resuscitation and activation of pacing wire.

documented in conjunction with complex partial seizures. While some feel that it is a benign condition,[5] others have implicated ictal asystole as a cause of sudden unexplained death in epilepsy.[6]

Ictal asystole is thought to be related to a direct effect of the seizure discharge on central nervous system (CNS) control of cardiac rhythm. The insular, orbitofrontal and anterior cingulate cortices and the amygdala are involved in the modulation of cardiac sympathetic and parasympathetic outflow. Seizure activity in these regions may lead to autonomic cardiac responses including bradycardia and asystole.[7]

Cardiac arrhythmias occur frequently in anti-NMDAR encephalitis. In a series of 100 patients with anti-NMDAR encephalitis, 37 were reported to have cardiac arrhythmias including tachycardia and bradycardia. Seven patients were described as having prolonged cardiac pauses, the duration of which were not specified but four patients required pacemakers.[2] It is not stated whether any of the arrhythmias were related to seizures. Tachycardia, bradycardia, cardiac pauses and asystole have also been reported in other case series of anti-NMDAR encephalitis[8–10] and are presumed to be related to central autonomic dysfunction.

The coexistence of centrally mediated cardiac autonomic dysfunction and seizures may make patients with anti-NMDAR encephalitis particularly vulnerable to ictal asystole. Although anti-NMDAR encephalitis is increasingly recognised, ictal asystole has not yet been reported in association with this condition but may not be identified without concurrent EEG and cardiac monitoring. It remains possible however that in our case the ictal asystole occurred due to the complex partial seizure alone rather than being a specific feature of anti-NMDAR encephalitis.

The management of ictal asystole is debated.[11] In the setting of an acute and potentially reversible CNS insult such as anti-NMDAR encephalitis, treatment of the seizures and the encephalitis may be sufficient to reduce the risk of further episodes of ictal asystole but in general this cannot be relied upon and implantation of a permanent pacemaker is appropriate. Given that this case report raises the possibility of increased risk of ictal asystole, cardiac monitoring should be considered during the dysautonomic phase of anti-NMDAR encephalitis. If doubt exists regarding the aetiology of any arrhythmias, continuous video EEG should be performed.

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# Stent-based mechanical thrombectomy in acute basilar artery occlusion

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ABSTRACT

Stent-based mechanical thrombectomy was recently proposed as an effective alternative to other mechanical techniques to achieve recanalization of large-vessel embolic occlusions in the anterior circulation. To our knowledge, there are no reports of the use of this technique in acute basilar artery occlusion (ABAO). We present a patient with complete endovascular recanalization of ABAO using a stent-based thrombectomy technique. Advantages and limitations of this technique in the management of ABAO are discussed. The stent-thrombectomy technique is promising, and will need further evaluation in posterior circulation stroke.



## 1. Introduction

Stent-based mechanical thrombectomy was recently proposed as a very effective alternative to other mechanical techniques to achieve recanalization of large-vessel embolic occlusions of the anterior circulation.[1–4] Surprisingly high recanalization rates were achieved with this technique across the full range of carotid occlusion patterns.[2] However, there are no reports of the use of this technique in acute basilar artery occlusion (ABAO).

In the anterior circulation, stent-based thrombectomy requires proximal occlusion of the internal carotid artery (ICA) with a large lumen balloon-tipped guiding catheter, followed by gentle but thorough suction during the thrombectomy step. This may be a limitation of the technique in the posterior circulation due to the smaller diameter of the vertebral arteries and bilateral supply to the basilar artery (BA). We present a complete angiographic recanalization of an ABAO using stent-based thrombectomy.

## 2. Case report

A 52-year-old male presented with a history of multiple uncontrolled vascular risk factors and ischemic heart disease. For 5 days before admission he complained of dizziness and headaches. At admission he was stuporous and agitated, with right hemiparesis, right mydriasis, and absence of the right corneal reflex.

The patient was intubated and evaluated by head CT scan and MRI following stroke protocols. Neuroradiological studies confirmed subocclusive stenosis of the ostium of the right vertebral artery (VA) and embolic occlusion of the middle third of the BA, as well as a large diffusion abnormality on the right posterior inferior cerebellar artery (PICA) territory causing mass effect and compressing the brainstem. There were signs of infarction of the right mesencephalon and pons.

The patient was taken to the interventional neuroradiology suite and a 6 Fr femoral introducer was placed into the right femoral artery. After access was obtained, 2500 units of heparin were given. An angiogram confirmed proximal occlusion of the right VA and the middle third of the BA (Fig. 1A and B). No collateral supply was provided via the posterior communicating arteries. A 6 Fr guiding catheter was placed at the left cervical VA. The basilar occlusion was crossed with a Transend 0.014-inch microguidewire (Boston Scientific, Natick, MA, USA) and Rebar 18 microcatheter (ev3, Plymouth, MN, USA). The length of the embolus was estimated as 7 mm, the distance between the vessel cut-off on the initial catheter angiography and the beginning of the normal posterior cerebral artery distal to the clot on microcatheter angiography (Fig. 1C). A long, 4 mm by 20 mm Solitaire AB stent (ev3) was fully deployed, extending across the entire occluded segment (Fig. 1D). Repeat angiogram confirmed reconstituted flow through the occluded segment (the transient endovascular bypass).

After 3 minutes, the proximal third of the stent was resheathed and the partially deployed stent was slowly pulled back (the mechanical thrombectomy) under gentle continuous aspiration through the guiding-catheter. The rotating haemostatic valve was then disconnected from the guiding catheter to allow removal of the stent and the trapped clot. Gentle continuous manual suction was repeated with the aid of a 50 mL syringe, to ensure the

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