

Cross Cerebellar Diaschisis Causing Status Epilepticus with Stroke-Like Changes: Case Report and Review of the Literature

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Abstract

Crossed cerebellar diaschisis (CCD) is a rare phenomenon characterised by a reduction in hemispheric cerebellar blood flow and metabolism secondary to a supratentorial lesion. Although commonly identified following an ischaemic stroke, CCD can also occur during status epilepticus. We present the case of a 32-year-old woman with a history of epilepsy and chronic headaches who experienced a seizure episode with initial symptoms mimicking a stroke. Radiological findings revealed extensive cytotoxic oedema in the left hemisphere, accompanied by a smaller lesion in the right cerebellar hemisphere, indicating the rare occurrence of CCD. A diagnosis of status epilepticus was subsequently confirmed. Despite initial deterioration, the patient's condition improved after intensive treatment over several weeks. Recognising seizure activity in patients presenting with stroke-like changes on non-contrast CT scans is crucial, especially in the absence of arterial occlusion on angiography and in cases with asymmetric arterial vasodilation. Status epilepticus can mimic stroke, posing a significant diagnostic challenge.

Keywords: *Diaschisis; Epilepsy; Convulsions; Cerebral Edema; Cerebellum*

Introduction

Status epilepticus is a neurological emergency requiring prompt assessment and intervention. It is defined as a seizure lasting longer than five minutes or a series of seizures occurring in rapid succession without complete neurological recovery between episodes, raising the risk of long-term neuronal effects such as functional impairments and neuronal damage. Radiological findings in status epilepticus can vary, sometimes resembling other conditions such as stroke, which poses a significant diagnostic challenge. Stroke-like changes can result from numerous causes, including complex migraines, metabolic disorders, seizures, sepsis, CNS infections, non-stroke cardiovascular events, and functional disorders. Thus, status epilepticus can imitate stroke, complicating accurate diagnosis.

Crossed cerebellar diaschisis (CCD) is a rare condition characterised by reduced blood flow and metabolism in one cerebellar hemisphere, occurring contralateral to a supratentorial lesion. This results in tissue hypoxia, anaerobic glycolysis, and cytotoxic oedema. It is believed that CCD arises due to excessive excitatory neuronal activity along the cortico-ponto-cerebellar pathways. While often observed following ischaemic stroke, CCD can also be seen in status epilepticus. Neurological outcomes can vary significantly, from complete recovery to persistent disability, making early diagnosis and treatment essential.

In this report, we present a rare case of CCD in a patient with status epilepticus, initially showing stroke-mimicking changes. The electroencephalogram (EEG) initially failed to reveal typical findings for status epilepticus, with imaging suggesting a stroke. Radiological examination demonstrated extensive cytotoxic oedema in the left cerebral hemisphere, along with a smaller lesion in the right cerebellar hemisphere, indicating the rare occurrence of CCD in the context of status epilepticus.

Case Presentation

A 32-year-old woman was found in a state of generalised tonic-clonic seizure. No information was available regarding the seizure's duration or the circumstances surrounding its onset. The seizure was managed in the emergency department with 10 mg of diazepam, but she did not regain consciousness afterward. One year prior, she had experienced seven episodes of both partial and generalised seizures without lasting damage. Upon admission, her condition was compromised, with a Glasgow Coma Scale score of 9, blood pressure of 163/115 mmHg, and a heart rate of 100 bpm, indicating tachycardia. To assess possible brain injury, an MRI was performed, revealing extensive cytotoxic oedema throughout the left cerebral hemisphere, increased apparent diffusion coefficient (ADC) values, and a smaller area of oedema in the right cerebellar hemisphere, which also affected the cortical amygdala and indicated crossed cerebellar diaschisis (Figure 1).

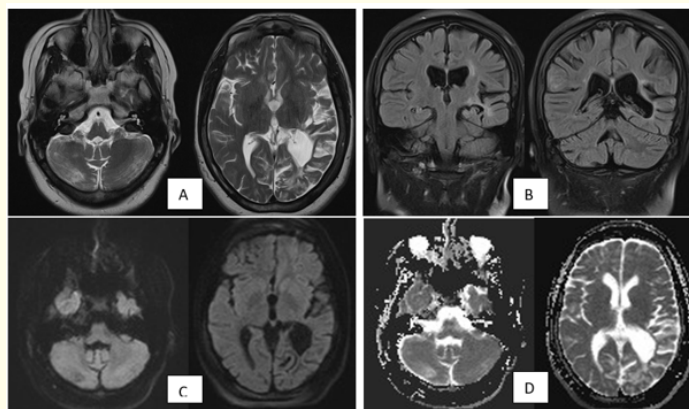


Figure 1: Axial T2 slices (A); coronal FLAIR (B); axial Diffusion (C) with ADC mapping (D). These images show mild vasogenic oedema in the left cerebral hemisphere, including the occipital, parietal, temporal, and insular lobes, as well as the right cerebellar hemisphere, with atrophy and dilation of the left lateral ventricle, likely due to a previous seizure.

Following laboratory tests and MRI results, the EEG showed a diffuse background of disorganised theta slowing. Epileptiform activity was observed in the left frontal region, and the patient was transferred to the neurology and neurovascular unit, where treatment with carbamazepine and levetiracetam was initiated.

She continued on the anticonvulsant therapy of levetiracetam and carbamazepine for 15 days, and over the following days, began to exhibit spontaneous movements in her eyes and legs, though the EEG continued to show polymorphic slowing of the baseline rhythm on both sides of the brain. A follow-up brain MRI showed no changes, although her condition remained severe. She was conscious but unresponsive to commands, maintained a distant gaze, occasionally moved her hands spontaneously, and responded to painful stimuli with facial grimaces. She remains on treatment within the neurology department.

Discussion

This case highlights both the diagnostic challenges of correctly identifying status epilepticus and the rare occurrence of crossed cerebellar diaschisis associated with it. Initially, emergency physicians were unable to gather the patient's complete medical history due to the absence of her medical records and her unconscious state. The initial MRI, showing stroke-mimicking signs, indicated that the cytotoxic edema in the lesion was causing oxygen deprivation. This assumption was supported by asymmetrical arterial vasodilation in the left cerebral hemisphere, likely in response to increased neuronal excitation and metabolism. Stroke mimics are defined by the acute onset of focal neurological symptoms, later identified as non-vascular in origin. When dealing with stroke mimics, it's crucial to assess cerebral blood flow and look for narrowing of the vessel lumen, double lumen filling, or abnormal expansions, all of which were negative in this case, ruling out a vascular cause for the observed changes.

The transneuronal depression of cerebellar metabolism observed in crossed cerebellar diaschisis results from disruption along cerebro-cerebellar pathways and damage to primarily excitatory corticopontine-cerebellar projections. Although the precise mechanisms of crossed cerebellar diaschisis are not yet fully understood, in this case, it can be reasonably inferred that the cytotoxic edema seen in the right cerebellar hemisphere was likely a result of this phenomenon. Interestingly, while the lesion in the left cerebral hemisphere showed no reduction in size or intensity, the right cerebellum exhibited no lasting effects. This indicated that despite the radiological appearance, the cerebellar lesion did not involve neuronal cell death.

Analysis of the patient's ADC values and vascular flow in the right cerebellum revealed no significant reduction in ADC values or changes in blood flow, suggesting that although the lesion persisted on MRI, it exhibited different characteristics compared to the cerebral lesion. This finding implies that the cerebro-cerebellar pathways might not have fully conveyed the epileptiform activity and might have transmitted only certain types of information through these pathways.

In a follow-up MRI, ADC values in the left cerebral hemisphere had not normalized, indicating that the lesion might be only partially reversible or even irreversible, with the potential for subsequent atrophy.

Conclusion

Status epilepticus is a key cause of stroke-like changes on CT imaging, making it an important differential diagnosis in cases where CT angiography shows no arterial occlusion but reveals asymmetric arterial vasodilation. It is also essential to perform CT angiography on patients with suspected stroke for a more accurate assessment.

The diagnostic and radiological evaluations in this case also provide valuable insights into the mechanisms of crossed cerebellar diaschisis and the information conveyed through its neural connections. It can be concluded that the epileptiform activity in the left cerebral hemisphere did not transfer the same severity of impact, as indicated by differing ADC values and vascular characteristics [1-8].

Conflicts of Interest

The authors declare no conflicts of interest.

Author Contributions

Dr. Ajertil is the primary author, and Professor Abdeljalil El Quessar contributed to the development of this work by providing her expertise in writing.

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