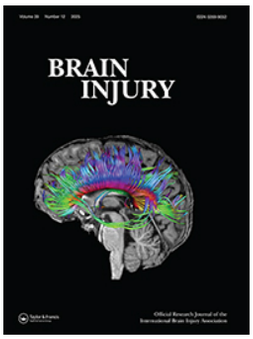

Brain Injury

ISSN: 0269-9052 (Print) 1362-301X (Online) Journal homepage: www.tandfonline.com/journals/ibij20

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To cite this article: Gabriel Rodríguez, Ricardo Garcia-Garcia, Valentina Ladera Fernandez & Andres Fonseca Vargas (23 Sep 2025): Non epileptic absence seizures and cognitive outcomes after cerebellar stroke in vermis and posterior lobe, Brain Injury, DOI: 10.1080/02699052.2025.2563605

To link to this article: https://doi.org/10.1080/02699052.2025.2563605

Published online: 23 Sep 2025.

BRAIN INJURY
https://doi.org/10.1080/02699052.2025.2563605

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CASE REPORT

Non epileptic absence seizures and cognitive outcomes after cerebellar stroke in vermis and posterior lobe

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ABSTRACT

Objective: Cerebellar Cognitive Affective Syndrome (CCAS) is traditionally characterized by impairments in executive functioning, visuospatial processing, language, and affective regulation. Classic descriptions emphasize symptoms such as irritability, apathy, depression, and disinhibited behaviors, frequently associated with vermian or hemispheric cerebellar lesions. We describe a case that diverges from these classical profiles.

Methods: A case report shows that patient demonstrated preserved overall cognition and absence seizures with context-dependent emotional dysregulation, while maintaining a generally stable mood during hospitalization. This pattern suggests that cerebellar lesions may present with heterogeneous cognitive – affective profiles and do not always conform to established CCAS criteria. These findings raise important considerations for clinical interpretation of the CCAS Scale, particularly when accounting for individual variability and contextual influences.

Results: The case prompts reflection on the traditional view of the vermis in emotional regulation. Although vermian lesions have often been linked to affective disturbances such as irritability, apathy, and emotional lability, our patient largely maintained appropriate emotional regulation despite vermian involvement.

Conclusions: This observation supports the possibility that vermian-related emotional or behavioral changes may be context-dependent and modulated by situational or environmental factors. A more nuanced understanding of CCAS presentations may enhance diagnostic accuracy and improve care for patients with cerebellar injury.

ARTICLE HISTORY
Received 26 August 2025
Revised 1 September 2025
Accepted 13 September 2025

KEYWORDS
cerebellum; stroke; neuropsychology; cerebellar cognitive affective syndrome

Introduction

Cerebellar strokes, while less frequent than cerebral infarctions, can lead to significant neuropsychiatric and emotional disturbances. Traditionally recognized for its role in motor coordination, the cerebellum is increasingly acknowledged for its contributions to cognitive and affective functions. Damage to this region can result in a variety of symptoms collectively termed Cerebellar Cognitive Affective Syndrome (CCAS), characterized by impairments in executive function, visuospatial skills, language, and emotional regulation (1). Recent studies have illuminated the cerebellum's involvement in emotion regulation. For instance, research indicates that the cerebellum contributes to the upregulation of negative emotions through its connections with the prefrontal cortex (2). Furthermore, alterations in cerebellar activity have been linked to changes in cognitive performance and emotional states, underscoring its role in higher-order cognitive functions (3). The interplay between cerebellar damage and psychiatric manifestations is complex. Patients with cerebellar lesions may exhibit emotional dysregulation, such as emotional lability or blunted affect, and cognitive impairments affecting memory and executive functions (4), and even in some cases, the clinical presentation is so heterogenous that does not meet the criteria for Cerebellar Cognitive Affective Syndrome (5). These findings suggest that the cerebellum's role extends beyond motor control to include significant contributions to emotional and cognitive processes. Understanding the cerebellum's role in psychiatric and emotional events is crucial for developing comprehensive rehabilitation strategies for patients recovering from cerebellar strokes. Addressing both motor and non-motor symptoms can lead to more effective interventions and improved patient outcomes.

Case presentation: medical history

This is a 41-year-old male patient, health professional, with history of anxiety and obsessive-compulsive disorder diagnosis was admitted to an emergency department following cardiac/respiratory arrest. Emergency services found the patient on the ground in the apartment with agonal breathing and unresponsive. There was no initial rhythm, however, did have an automated external defibrillator which indicated patient was shocked. Patient was shocked once and achieved return of spontaneous circulation. During transport, the patient was intubated by emergency services. Computed tomography head on admission showed moderate volume ventricular

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hemorrhage and parenchymal hemorrhage within the cerebellum. Based on presenting neurological exam no surgical interventions were recommended. The patient was admitted to the neurocritical care unit for further observation and management. Neurosurgery reevaluated and decided to place external ventricular drain. Tracheostomy placement 6 days after admission. Shunt placement for obstruction of hydrocephalus on during the 1st week at intensive care at 0.5 settings. No further adjustments needed during hospitalization. The patient was then sent to an intensive rehabilitation hospital for hospitalization course was for 7 weeks. The patient was oriented, alert, cooperative and verbalizing understanding of care being received. Reported double vision and a patch was ordered for right eye. During week 1 of acute rehabilitation therapy, the patient began exhibiting unresponsiveness episodes when taken to the therapy gym or to public places like the patio. Several electroencephalograms were ordered, all of them returned clean and negative for seizures. Furthermore, an unresponsiveness episode occurred during the electroencephalogram exam, ruling out, in situ the possibility of seizures. These episodes are going to be described below. Computed tomography of head (Figure 1) shows a clearly visible hypodense area in the midline of the cerebellum, consistent with a lesion primarily involving the cerebellar vermis. The hypodensity suggests an acute or subacute process such as an ischemic infarct or edema. The injury predominantly affects the posterior lobe of the cerebellum, with extension into the superior and posterior vermian regions and minimal spread into the medial aspects of both cerebellar hemispheres.

Neuropsychological testing

The patient underwent a series of neuropsychological assessments over a 7-week hospitalization period to evaluate his cognitive, linguistic, and emotional functioning following a cerebellar stroke. Initial testing using the WAIS-IV Verbal Comprehension subtests (Similarities, Information, and Comprehension) revealed mildly below-average scores, ranging from scaled scores of 7 to 8, suggesting normal performance. Verbal fluency, assessed using the F.A.S. test, showed significant improvement over time. In week 1, the patient generated only 12 words, indicating possible language production deficits or executive dysfunction. However, by week 5, his score increased to 30, reflecting improvement in lexical retrieval and frontal lobe-mediated verbal output. The Montreal Cognitive Assessment-Blind (MoCA-B), a brief cognitive screener, was administered at three different times. The patient scored 18/22 in week 2, then 17/22 by week 5, and 18/22 by week 7. MoCA-Blind was administered given that the patient was having double vision. No red flags during MoCA-Blind however CACS-Scale was brought given that literature review suggests this scale to capture more subtle deficits than MoCA and identifies cognitive – affective deficits in most cases (6). The patient was unable to complete items 5 (cube copy) and 6 (clock drawing) of the CCAS Scale due to diplopia and related visual limitations. Consequently, only 8 of the 10 items were administered. On all eight administered items, the patient performed within normal limits and did not fail any. According to proportional interpretation guidelines (7) the absence of failures across the administered items does not meet criteria for possible or probable CCAS. These findings, along with preserved affective regulation and intact verbal and executive performance, support the conclusion that the patient was not presenting the cognitive-affective profile typical of CCAS. Nevertheless, even at week 7, some deficits persisted relative to expected norms, indicating lingering cognitive inefficiencies. Cognitive affective cerebellar syndrome scale was not administered given that the patient was presenting double vision and could not complete visuospatial skills. Performance on the Oral Trail Making Test, which evaluates attention, processing speed, and cognitive flexibility, was fair. He completed part A in 27 s and Part B in 76 s during week 5. Although these times fall within functional range, they may reflect residual executive function difficulties, especially for divided attention and task-switching, given the longer duration on Part B. The Orientation Log (O-Log) averaged 28/30 over the 7 weeks, indicating good orientation to time, place, and situation – a strength in his cognitive profile (Table 1).

Nonepileptic seizures

During the 1st week of hospitalization the patient began experiencing unresponsive episodes when taken to the rehabilitation facility gym or when taken to the patio and public places within the hospital, during all these episodes, his vital signs were normal. As mentioned above, one of these unresponsiveness episodes occurred during one of the electroencephalogram exams, ruling out, in situ, the existence of seizures. These episodes are going to be described below. Several electroencephalograms were ordered at different times and came back unremarkable for nonepileptic absence seizures. Furthermore, an unresponsiveness episode occurred during the electroencephalogram exam, ruling out, in situ the possibility of seizures. These episodes lasted minutes from 10 to 20 and once an episode passed, the patient would have poor memory and did not recall having the episode. The frequency

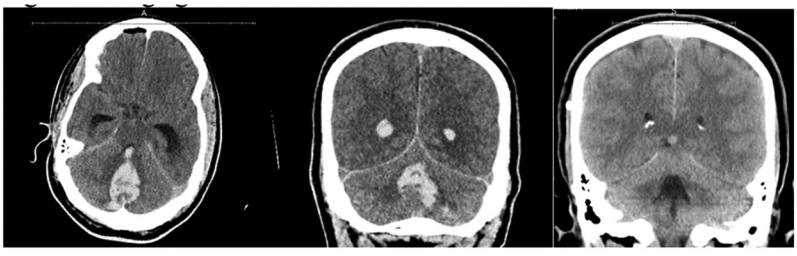

Figure 1. Computed tomography head. A = Computed tomography Axial plane, B and C = Computed tomography coronal plane.

Table 1. Neuropsychological test results.

Domain	Test/Subtest	Score	Week
Verbal Comprehension	WAIS IV Similarities	Scaled score = 8	Week 3
	WAIS IV Information	Scaled score = 7	Week 3
	WAIS IV Comprehension	Scaled score = 7	Week 3
Verbal Fluency	F.A.S	Score = 12	Week 2
	F.A.S	Score = 30	Week 5
Brief cognitive screener	MoCA- Blind	Score = 18/22	Week 2
		Score = 17/22.	Week 5
		Score = 18/22.	Week 7
	Oral Trail Making Test	A:27 seconds	Week 5
		B: 76 seconds.	Week 5
Orientation	Orientation Log (O-Log)	7-week average score 28/30	
Cognitive affective	CCAS-S	Score: 0/8	Week 3
	w/o items 5 & 6.	Score 0/8	Week 6
Affective	BDI II	Score: 3	Week 3 Week 5
		Score:3	

Note: WAIS IV: Wechsler Adult Intelligence Scale 4th Edition. SS = Scaled Score Verbal Comprehension Index. F-A-S: Letter specific verbal fluency test. Avg = Average. MoCA = Montreal Cognitive Assessment.
Source: Author's elaboration (2025).

of episodes increased from twice a week to twice a day during 6 weeks. For therapies that occurred inside the patient's room, such as speech therapy or neuropsychology, the episodes did not occur, which led the team to suspect that fear and intense social anxiety when taken to crowded public places as part of his therapy with specific gym equipment could be mediating and triggering this unresponsiveness episodes.

The patient also staring exhibiting odd episodes marked by the patient demanding to be called 'doctor' (his profession) before asking him a question. The staff would ask the patient if there was a reason why he needed to hear the word doctor first with the patient responding: 'I don't know why I am demanding this.' This, for the staff, was also suggestive of transitory metacognitive disruption. Collateral interviews with family members ruled out history of anxiety or depression. During 5 of the 7 weeks of hospital stay, these episodes were a significant barrier when in physical therapy, occupational therapy or speech therapy. The staff needed to add the word 'doctor' before asking the patient to perform a desired motor movement or follow a command. Sometimes both events happened on the same day and about one after the other, in other words, the patient would be taken to the gym for physical therapy, started demanding to be called 'doctor' first, and then become unresponsive for minutes with normal vital signs confirmed by rapid response brigades attending the unresponsiveness. The episodes and rigidity of being called "Doctor' started to fade after the encounter seven with Psychology which administered Cognitive Behavioral Therapy. As for the psychogenic episodes also started to fade to the point of being extinct. The patient remained with appropriate mood for context and agreed to listen to his preferred music when engaging in therapies. Referrals for a comprehensive psychotherapy program and further cognitive testing were made, and the patient was discharged at the end of week number 7.

Heterogeneous cerebellar cognitive-affective manifestations

The patient's neuropsychological profile does not align with the classic features of Cerebellar Cognitive Affective Syndrome (CCAS). Standard CCAS presentations typically include impairments in executive functioning, abstract reasoning, memory, and language, along with emotional instability such as apathy or disinhibition. In contrast, our patient demonstrated preserved performance across multiple neuropsychological measures. On repeated administrations, MoCA-Blind scores ranged between 17 and 18/22, verbal comprehension and fluency measures (WAIS-IV Similarities, Information, Comprehension; FAS) were within normal limits, and the Oral Trail Making Test times were appropriate for age and clinical context. Orientation Log scores averaged 28/30 over 7 weeks, and CCAS-S scores were 0/8 (excluding unadministered items 5 and 6) on two separate occasions, all indicating normal range performance. These findings suggest an absence of the diffuse cognitive – affective deficits typically required for a CCAS diagnosis. Furthermore, acute-phase series report high rates of CCAS using the CCAS-S (6), which could suggest that our negative profile could likely reflect true variability rather than under-detection.

The comparison with established CCAS characteristics further highlights this discrepancy. As summarized in Table 2, CCAS is usually associated with vermian or cerebellar lobe lesions accompanied by unstable affect, apathy, and

Table 2. Similarities and differences CCAS and our case report.

CCAS	This case
Location: vermis, cerebellar lobes.5	Location: vermis, cerebellar lobes.
Emotion/behavior: unstable, apathy, depression, disinhibition and childlike behaviors (8)	Emotionally stable as shown by BDI-II with occasional context-dependent absence seizures.
Cognitive impairments in abstract reasoning, organization and memory (9). Language processing, spatial reasoning (1), verbal fluency (10)	Cognitively preserved, all neuropsychological tests scores from in normal average ranges.
CCAS-S scale scores consistent for CCAS syndrome (7).	CCAS-S scores in normal range. Administered twice.

Source: Author's elaboration (2025).

childlike behaviors, whereas our patient remained emotionally stable (BDI-II scores of 3) with only occasional context-dependent absence seizures. Cognitive impairments in reasoning, organization, and language are hallmark CCAS features, yet this patient's test scores were consistently in normal ranges across all domains assessed. Finally, CCAS-S scores, typically consistent with syndrome criteria in CCAS, were normal in this case despite being administered twice. Taken together, the neuropsychological and behavioral findings support that this presentation represents a heterogeneous or atypical manifestation of cerebellar injury rather than classic CCAS (Table 2).

Discussion

This case illustrates a presentation that does not fully align with the classical descriptions of Cerebellar Cognitive Affective Syndrome (CCAS). While CCAS has been widely associated with irritability, apathy, childish behaviors, and depression (8), the patient in this case showed a different pattern, consistent with what other recent case reports, have similarly found which underscored that CCAS may not always follow the classic affective – cognitive pattern (5), further supporting the need for refined diagnostic frameworks. The clinical picture was characterized by preserved cognitive abilities and absence seizures with context-dependent emotional dysregulation, while maintaining a stable mood throughout the hospital stay. Screening with the CCAS Scale yielded findings within the expected range for the administered items and did not reveal the typical array of cognitive – affective deficits described in CCAS. According to proportional interpretation guidelines (1), this pattern falls below thresholds for possible or probable CCAS. Moreover, recent methodological updates to the CCAS-S have aimed to improve its specificity by reducing false positives in healthy controls while preserving detection in cerebellar disease (11). In this context, the negative CCAS-S profile observed in our case appears consistent with these refinements, as the absence of failures is this case is unlikely to represent a false-negative finding but rather reflects a genuine preservation of cognitive – affective functioning

Another important consideration is that the patient's cultural background, high level of educational attainment, and cognitive reserve may have attenuated or masked subtle cerebellar-related cognitive changes, together with the need for further refinement of CCAS interpretation when controlling for educational and cultural variations (7); in fact, this is compatible with contemporary CCAS-S data, where education effects are modest in healthy controls and higher education in cerebellar disease relates to fewer failed domains.

From an educational perspective, this case provides important learning opportunities for medical teams and students: it highlights that cerebellar lesions can manifest with heterogeneous cognitive and emotional profiles rather than always following the classic CCAS presentation; it reinforces the importance of understanding proportional scoring principles on the CCAS Scale and the impact of sensory or motor limitations on test administration; it draws attention to the role of cognitive reserve in shaping clinical expression; and it encourages a reexamination of the traditional assumption that vermian lesions invariably lead to emotional dysregulation.

Furthermore, this case invites a reconsideration of the traditional view of the vermis in emotional and cognitive regulation. Although vermian lesions have classically been associated with affective disturbances such as irritability, apathy, and emotional lability (9), our patient maintained appropriate emotional regulation for most of the time despite vermian involvement. We invite reflection on the possibility that vermian-related emotional and behavioral dysregulation may be context-dependent and modulated by the interpretation of specific situational or environmental factors. Finally, given this case and similar reports in the literature, we propose considering an additional category such as *indeterminate* when scoring the CCAS-S, as this may better capture clinical presentations that may not entirely fit the *possible*, *probable* and *definite* categories from CCAS-S such as scoring zero on different takes or a mixed presentation that does not fit the criteria.

Limitations

We acknowledge as a limitation not having functional imaging that could have helped us narrow more precise conclusions. Due to diplopia and associated visual limitations, the patient was unable to complete items 5 (cube copy) and 6 (clock drawing), and therefore only 8 of the 10 items were administered. We acknowledge that these items could have drawn us into more conclusive results or propositions.

Disclosure of interest

The authors declare no conflict of interest and no sponsorship or funding from any organization. Permission for publication is signed by spouse. The collection and evaluation of all protected patient health information was performed in compliance with Health Insurance Portability and Accountability Act (HIPAA).

Funding

The author(s) reported that there is no funding associated with the work featured in this article.

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The authors declare no conflict of interest and no sponsorship or funding from any organization. Permission for publication is signed by spouse. The collection and evaluation of all protected patient health information was performed in compliance with Health Insurance Portability and Accountability Act (HIPAA).

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