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Case Report

Rare Case of Ischemic Infarction in the Splenium of the Corpus Callosum: Diagnostic Complexity and Therapeutic Outcomes in a 60-Year-Old Male

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Abstract

Background: Corpus callosum infarction, although relatively uncommon, represents a significant clinical entity with diverse and subtle presentations [1]. This report highlights a case of ischemic infarction in the left corpus callosum, underscoring its diagnostic complexity, clinical significance, and impact on patient outcomes.

Case Description: We present a case of a 60-year-old male with a history of hypertension, coronary artery bypass grafting (CABG), and diabetes mellitus presented with cognitive changes and gait abnormalities, initially misattributed to metabolic causes. Imaging revealed a hypodense area in the left corpus callosum on CT, with MRA confirming T2-weighted hyperintensity in the splenium and adjacent regions, suggestive of acute ischemia. Additional findings included 70% stenosis of the left internal carotid artery and a dominant right vertebral artery. The patient received conservative treatment with dual antiplatelet therapy (DAPT) and atorvastatin, resulting in significant functional recovery.

Conclusion: This case underscores the importance of recognizing corpus callosum infarction as a rare but clinically significant condition often associated with systemic atherosclerosis and cerebrovascular compromise. Multimodal imaging plays a critical role in early diagnosis, while management focuses on addressing underlying vascular risk factors and optimizing neurological recovery [2, 3]. Enhanced awareness and further research are essential to improve the understanding, diagnosis, and management of this underrecognized cerebrovascular pathology.

Keywords: *Corpus Callosum Infarction, Ischemic Stroke, Neuroimaging, Dual Antiplatelet Therapy, Vascular Risk Factors*

Introduction

The corpus callosum is the largest commissural structure in the brain, composed of dense white matter fibers that connect the left and right cerebral hemispheres. It plays a critical role in integrating sensory, motor, and cognitive functions between the hemispheres [4]. Given its robust vascular supply from both the anterior and posterior circulation, ischemic infarction of the corpus callosum is relatively uncommon [5]. However, when it occurs, it represents a clinically significant neurological event with often subtle and diverse manifestations.

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Corpus callosum infarctions can be challenging to diagnose due to their atypical clinical presentation, which may include cognitive disturbances, motor deficits, or gait abnormalities. These symptoms can easily be misattributed to other conditions, especially in patients with comorbidities such as metabolic disorders or neurodegenerative diseases [3]. Early recognition and accurate diagnosis are crucial to initiating appropriate treatment, preventing further complications, and optimizing patient outcomes.

Magnetic resonance imaging (MRI), particularly diffusion-weighted imaging (DWI), remains the gold standard for early detection, offering superior sensitivity compared to other imaging modalities [2, 6].

Case Presentation

A 60-year-old man with a significant medical history of hypertension, coronary artery bypass grafting (CABG), and diabetes mellitus presented to the clinic with progressive cognitive changes and gait abnormalities. Initially, these symptoms were misattributed to metabolic derangements associated with his chronic conditions. However, the persistence and worsening of symptoms prompted further evaluation.

A non-contrast computed tomography (CT) scan of the brain revealed a hypodense area in the left corpus callosum, raising suspicion for an ischemic event in this region. Subsequent magnetic resonance angiography (MRA) provided greater detail, showing T2-weighted hyperintensity in the left corpus callosum, particularly involving the splenium. The ischemic changes extended to the adjacent periventricular centrum semiovale, accompanied by multiple ipsilateral lacunar infarcts, indicative of acute ischemic damage.

Further vascular imaging revealed additional findings. Bilateral internal carotid arteries (ICA) were noted to have symmetric trajectories, but with a kink in the right petrous segment. Of particular significance, the left ICA showed approximately 70% stenotic narrowing over a 2 cm extension in the petrous segment. The vertebral artery anatomy revealed a dominant right vertebral artery, with the basilar artery and posterior cerebral arteries (PCAs) displaying normal trajectories and calibers bilaterally. A fetal configuration of the right PCA was also identified, which is a variant that can influence collateral circulation dynamics in ischemic events. (Fig 1).

The patient was managed conservatively with dual antiplatelet therapy (DAPT), comprising aspirin and clopidogrel, and high-dose atorvastatin (80 mg daily) for aggressive lipid-lowering. Blood pressure control was optimized, and efforts were made to address other modifiable vascular risk factors, including glycemic control and lifestyle modifications.

Over the course of treatment, the patient demonstrated significant functional recovery. His cognitive symptoms gradually improved, and his gait abnormalities resolved, allowing him to return to a satisfactory quality of life. Regular follow-up assessments confirmed sustained improvement, with no evidence of recurrent ischemic events.

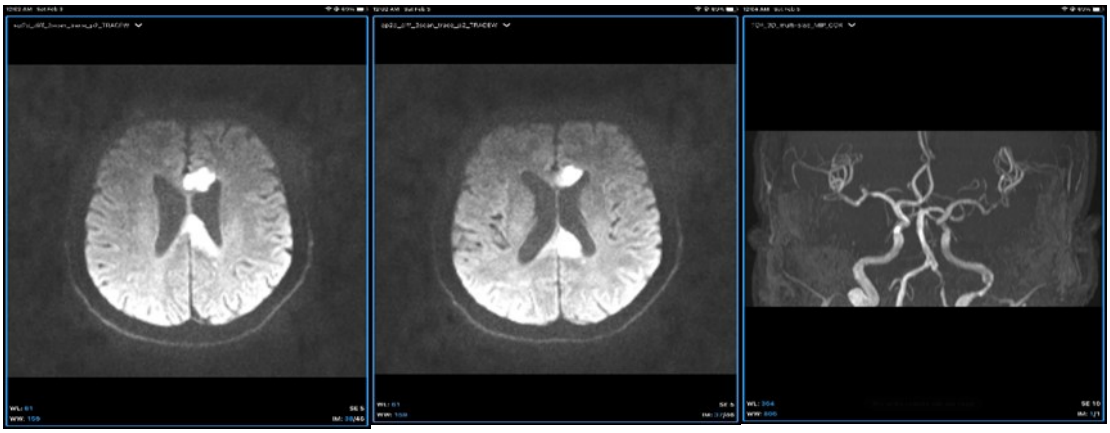

Fig 1. *MRA: ischemic lesions in splenium and left corpus callosum. 70% stenosis of left ICA.*

Discussion

The corpus callosum is the largest commissural fiber bundle in the brain, responsible for connecting the left and right cerebral hemispheres. It facilitates the integration and coordination of sensory, motor, and cognitive information between homologous association areas of both hemispheres, playing a crucial role in maintaining interhemispheric communication. This unique structure is anatomically divided into four regions: the rostrum, genu, body, and splenium, each with distinct functional roles and vascular supplies [4].

Ischemic infarction of the corpus callosum is a rare occurrence, largely due to its robust and dual blood supply from both the anterior and posterior circulations [5]. The main feeding arteries include the pericallosal artery, a branch of the anterior cerebral artery (ACA); the posterior pericallosal artery, a branch of the posterior cerebral artery (PCA); and smaller arteries such as the subcallosal and medial callosal arteries, which arise from the anterior communicating artery. This intricate vascular architecture provides significant redundancy and collateral circulation, reducing the likelihood of ischemia. However, when infarction occurs, it often reflects severe underlying vascular pathology or a compromise in multiple vascular territories [5, 4].

The most significant risk factors contributing to corpus callosum infarction include systemic atherosclerosis, hypertension, hyperlipidemia, long-term smoking, diabetes mellitus, and coronary artery disease [7]. These factors are commonly associated with generalized vascular dysfunction and endothelial injury, which predispose individuals to cerebrovascular events. Among the regions of the corpus callosum, the splenium is most frequently affected, followed by the body and genu [1]. Isolated callosal infarcts are particularly rare and often result in atypical clinical presentations that can delay diagnosis [3].

The clinical manifestations of corpus callosum infarction are diverse and depend on the specific region involved. Patients may present with cognitive impairment, memory deficits, gait abnormalities, motor incoordination, or disconnection syndromes such as alien hand syndrome [1, 3]. These nonspecific symptoms often lead to initial misdiagnosis, particularly in individuals with comorbid conditions such as neurodegenerative diseases or metabolic disturbances.

Neuroimaging plays a pivotal role in the diagnosis of corpus callosum infarction. Magnetic resonance imaging (MRI) with diffusion-weighted imaging (DWI) is the most sensitive and specific modality for detecting acute ischemic changes. Restricted diffusion in the affected region is typically the earliest detectable sign [2, 6]. Additional findings may include T2 hyperintensities and, occasionally, variable contrast enhancement in the acute phase. Computed tomography (CT) is less sensitive but may reveal hypodense areas in cases of larger infarctions [2].

Management of corpus callosum infarction primarily involves addressing the underlying vascular risk factors and preventing further ischemic events. Antiplatelet therapy, such as aspirin or dual antiplatelet regimens, is the cornerstone of treatment. Statins are also essential for lipid control and plaque stabilization [8]. Blood pressure optimization and glycemic control are equally critical. In selected cases with severe arterial stenosis, revascularization procedures such as carotid endarterectomy or stenting may be considered [9]. Dual antiplatelet therapy (DAPT) has been shown to mitigate recurrent ischemic events by reducing platelet aggregation, particularly in high-risk patients with significant vascular stenosis [9]. Rehabilitation tailored to individual impairments is essential for recovery, emphasizing motor, cognitive, and functional improvement [8].

This case report underscores the complex and multifaceted repercussions of corpus callosum strokes, emphasizing the need for a multidisciplinary approach in patient evaluation and management. Collaboration among neurologists, radiologists, and vascular specialists is vital for timely diagnosis and optimal treatment. Further research and clinical exploration are needed to enhance our understanding of this rare condition, refine diagnostic algorithms, and develop targeted rehabilitation strategies to improve long-term outcomes in affected patients.

Conclusion

In summary, corpus callosum infarctions are rare and present unique diagnostic and therapeutic challenges due to their atypical clinical manifestations and limited representation in the medical literature. These infarctions often mimic other neurological or metabolic conditions, making early recognition crucial for timely intervention. Their infrequent occurrence, coupled with the complexity of their vascular supply, contributes to gaps in understanding and an underestimation of their clinical significance within the medical community.

Increased awareness among healthcare professionals is essential to improving diagnostic accuracy and ensuring that these infarcts are not overlooked. Multimodal imaging, particularly MRI with diffusion-weighted imaging, should be emphasized as the gold standard for detecting early ischemic changes in the corpus callosum. Comprehensive vascular assessments are also critical in identifying underlying risk factors such as atherosclerosis, hypertension, diabetes, and hyperlipidemia, which require targeted management to prevent recurrence.

Management of corpus callosum infarctions necessitates a multidisciplinary approach involving neurologists, radiologists, and vascular specialists to address both acute treatment and long-term risk reduction. Antiplatelet therapy, aggressive lipid control, blood pressure management, and lifestyle modifications form the foundation of care. Rehabilitation strategies tailored to the individual's functional impairments, whether cognitive, motor, or sensory, are vital for optimizing recovery and quality of life.

Future research efforts should focus on clarifying the pathophysiological mechanisms underlying corpus callosum strokes, identifying predictive markers for early diagnosis, and exploring innovative therapeutic approaches. Collaborative clinical studies and case reports can contribute to building a more robust understanding of this rare cerebrovascular entity, ultimately improving outcomes for affected patients. A comprehensive and proactive approach to the diagnosis, management, and follow-up of these infarctions is essential to address this distinctive subset of cerebrovascular pathologies effectively.

Conflicts of Interest

The authors declare no conflicts of interest.

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