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Case Report

Isolated Traumatic Corpus Callosum Hematoma in a Child: A Case Report

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Abstract

Traumatic brain injury (TBI) is a major cause of morbidity and mortality in the pediatric population worldwide. Among traumatic intracranial lesions, involvement of the corpus callosum is relatively uncommon and is usually associated with diffuse axonal injury resulting from high-energy acceleration-deceleration trauma. In contrast, isolated traumatic corpus callosum hematoma is an exceptionally rare entity in children and has been only rarely described in the literature. Because of its deep anatomical location and nonspecific clinical presentation, diagnosis may be challenging, particularly in the acute setting. Non-contrast computed tomography (CT) remains the imaging modality of choice for the initial assessment of pediatric head trauma, allowing rapid detection of intracranial hemorrhage and associated injuries, while magnetic resonance imaging (MRI) provides a more detailed evaluation of corpus callosum integrity and possible accompanying axonal lesions. Early recognition of this rare entity is essential to guide appropriate management, assess prognosis, and improve clinical outcomes.

Keywords: *Corpus Callosum Hematoma; Pediatric Traumatic Brain Injury; Computed Tomography; Diffuse Axonal Injury; Neuroimaging*

Introduction

Traumatic brain injury (TBI) is one of the leading causes of morbidity and mortality in the pediatric population and represents a major public health concern worldwide. The spectrum of traumatic intracranial lesions includes extra-axial hematomas, cerebral contusions, diffuse axonal injury (DAI), and intraparenchymal hemorrhages. Among these lesions, involvement of the corpus callosum is relatively uncommon and is typically associated with high-energy acceleration-deceleration mechanisms, most often occurring as part of diffuse axonal injury. Owing to its central anatomical location and dense white matter composition, the corpus callosum is particularly vulnerable to shearing forces generated during severe head trauma [1-3].

Isolated traumatic corpus callosum hematoma is an exceptionally rare entity, particularly in the pediatric population. Unlike corpus callosal injuries associated with diffuse axonal injury or multiple intracranial traumatic lesions, isolated hematomas confined to the corpus callosum have only rarely been reported in the literature [1,2]. Their clinical manifestations are often nonspecific, making early diagnosis challenging. Computed tomography (CT) remains the imaging modality of choice in the emergency setting because of its rapid availability and high sensitivity for detecting acute intracranial hemorrhage, whereas magnetic resonance imaging (MRI) provides a more comprehensive assessment of corpus callosal injuries and associated axonal damage [1,3].

Herein, we present the case of an isolated traumatic corpus callosum hematoma in a child following a road traffic accident. This report highlights the characteristic imaging findings, discusses the possible mechanisms of injury, and reviews the current literature regarding its diagnosis, management, and clinical outcome.

Case Report

A 4-year-old boy with no significant past medical history was admitted to the emergency department following a road traffic accident associated with head trauma. On admission, he presented with transient alteration of consciousness, repeated vomiting, and generalized tonic-clonic seizures following the injury. Neurological examination revealed no focal neurological deficits. A non-contrast brain computed tomography (CT) scan was performed as part of the initial trauma assessment. CT demonstrated an isolated hyperdense intraparenchymal hematoma involving the corpus callosum, without associated skull fracture, extra-axial hemorrhage, or other intracranial traumatic lesions. These imaging findings were consistent with an isolated traumatic corpus callosum hematoma.

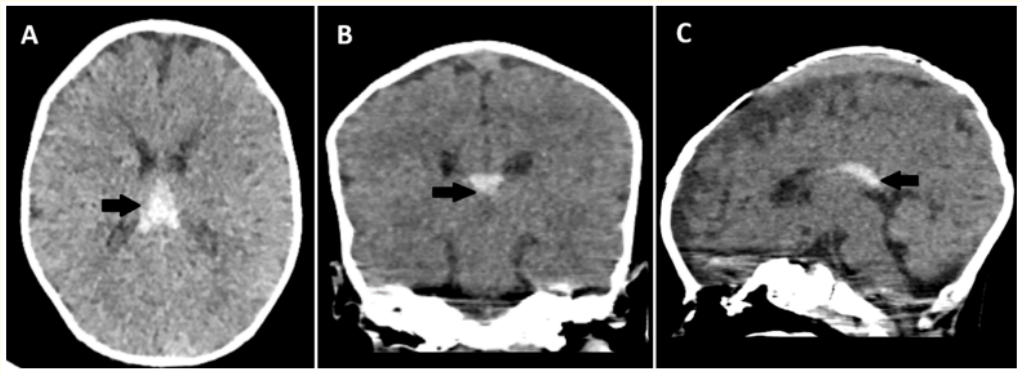

Figure 1: *Isolated traumatic corpus callosum hematoma on non-contrast brain CT.*

Axial (A), coronal (B), and sagittal (C) non-contrast brain CT images demonstrating a well-defined hyperdense intraparenchymal hematoma involving the body of the corpus callosum (arrows). No associated skull fracture, extra-axial hemorrhage, or other intracranial traumatic lesions are identified. These imaging findings are consistent with an isolated traumatic corpus callosum hematoma.

Discussion

Traumatic corpus callosum hematoma is a rare manifestation of traumatic brain injury (TBI), particularly when it occurs as an isolated lesion without associated intracranial injuries. Owing to its deep midline location and dense white matter composition, the corpus callosum is relatively protected from direct impact. However, it is highly susceptible to rotational and acceleration-deceleration forces generated during high-energy trauma. These biomechanical forces produce shearing stress that disrupts the tightly packed commissural fibers, resulting in hemorrhagic injury of the corpus callosum [1,5]. Although callosal lesions are frequently encountered in severe TBI, they are most commonly associated with diffuse axonal injury (DAI) rather than presenting as isolated hematomas.

The pediatric population represents an even more uncommon setting for isolated traumatic corpus callosum hematoma. The rarity of this entity may be explained by the infrequent occurrence of isolated callosal injury and the fact that most patients sustaining severe trauma present with multiple intracranial lesions. Consequently, only a limited number of pediatric and adult cases have been reported in the literature [1,2]. Patnaik., *et al*. described an isolated corpus callosal hematoma following trivial head trauma, emphasizing that even apparently minor injuries may produce characteristic hemorrhagic lesions within the corpus callosum when rotational forces are

involved [1]. Similarly, Du., *et al*. reported delayed enlargement of traumatic corpus callosal hematomas, highlighting the importance of close clinical observation and repeat neuroimaging during the acute phase [5].

Clinical manifestations are variable and largely depend on the severity of the traumatic injury, the extent of callosal involvement, and the presence of associated lesions. Patients may present with transient alteration of consciousness, headache, vomiting, seizures, confusion, or focal neurological deficits, whereas others remain neurologically intact despite conspicuous imaging abnormalities [1,2]. In the present case, the patient developed transient alteration of consciousness associated with repeated vomiting and generalized tonic-clonic seizures following a road traffic accident. Despite these alarming symptoms, neurological examination revealed no focal deficits. This clinical-radiological dissociation has also been described in previous reports and underlines the importance of neuroimaging even in patients with relatively preserved neurological status [1].

Computed tomography remains the imaging modality of choice in the emergency evaluation of head trauma because of its widespread availability, rapid acquisition, and excellent sensitivity for detecting acute intracranial hemorrhage. In our patient, non-contrast CT readily demonstrated a well-defined hyperdense hematoma confined to the corpus callosum without associated skull fracture or other traumatic intracranial lesions. These findings established the diagnosis of an isolated traumatic corpus callosum hematoma. Nevertheless, MRI remains the most sensitive technique for evaluating corpus callosal injuries and detecting associated diffuse axonal injury that may not be visible on CT. Conventional MRI sequences, particularly T2-weighted, FLAIR, susceptibility-weighted imaging (SWI), and diffusion-weighted imaging (DWI), provide superior characterization of hemorrhagic lesions and associated white matter abnormalities [3]. Furthermore, advanced techniques such as diffusion tensor imaging (DTI) and tractography may demonstrate disruption of callosal fibers and contribute to long-term prognostic assessment by evaluating white matter integrity [3].

The differential diagnosis of corpus callosal lesions includes diffuse axonal injury, cytotoxic lesions of the corpus callosum (CLOCCs), ischemic lesions, vascular malformations, hemorrhagic neoplasms, and metabolic or inflammatory disorders [4]. Cytotoxic lesions, in particular, have gained increasing attention because they may mimic traumatic lesions on MRI. However, CLOCCs are usually associated with infectious, metabolic, epileptic, or drug-related conditions and demonstrate distinctive imaging characteristics together with an appropriate clinical context [4]. Therefore, correlation between imaging findings and the mechanism of injury remains essential to establish the correct diagnosis in traumatic patients.

The therapeutic approach is primarily determined by the patient's neurological status rather than by the radiological appearance alone. In the absence of significant mass effect, hydrocephalus, or neurological deterioration, conservative treatment is generally recommended. This approach includes close neurological monitoring, symptomatic management, seizure control when indicated, and follow-up neuroimaging to assess hematoma evolution [2,5]. Neurosurgical intervention remains exceptional and is reserved for patients with progressive neurological deterioration or associated intracranial lesions requiring surgical treatment. In the present case, conservative management resulted in a favorable clinical evolution without the need for surgical intervention, in agreement with previous reports.

Overall, the prognosis of isolated traumatic corpus callosum hematoma appears to be more favorable than that of corpus callosal injuries associated with diffuse axonal injury, which are generally markers of severe traumatic brain injury and poorer neurological outcomes [3]. Early diagnosis through prompt neuroimaging, careful neurological assessment, and appropriate follow-up are therefore essential to optimize patient management and prevent delayed complications. Our case adds to the limited number of reported pediatric cases and further emphasizes that isolated traumatic corpus callosum hematoma, although rare, should be considered in children presenting with post-traumatic neurological symptoms, particularly seizures and transient impairment of consciousness. Recognition of this uncommon entity is important because appropriate imaging evaluation and conservative management can result in an excellent clinical outcome.

Conclusion

Isolated traumatic corpus callosum hematoma is an exceptionally rare consequence of traumatic brain injury, particularly in the pediatric population. Because its clinical manifestations may be nonspecific, ranging from transient alteration of consciousness and seizures to vomiting or mild neurological symptoms, early diagnosis can be challenging. Neuroimaging plays a pivotal role in the diagnostic workup, with non-contrast computed tomography serving as the first-line modality in the acute setting, while magnetic resonance imaging provides a more comprehensive assessment of associated white matter injuries when clinically indicated. Although corpus callosal injuries are commonly associated with diffuse axonal injury, isolated hematomas generally have a more favorable prognosis when promptly recognized and appropriately managed. Conservative treatment with close neurological and radiological follow-up is often sufficient in clinically stable patients. This case contributes to the limited literature on isolated traumatic corpus callosum hematoma in children and emphasizes the importance of recognizing this uncommon entity to ensure timely diagnosis, appropriate management, and favorable clinical outcomes.

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Conflict of Interest

The authors declare no conflict of interest.

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