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Case Report

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Isolated medial rectus hematoma following blunt trauma-a novel case report

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ABSTRACT

This report presents a rare case of isolated medial rectus hematoma following blunt trauma in a 16-year-old male. Typically, traumatic eye injuries lead to orbital fractures or hemorrhages, but isolated rectus muscle injury and hematoma are exceptionally uncommon. Our patient exhibited unilateral total outward gaze limitation, esotropia, and horizontal diplopia without any associated cranial or orbital fractures. Orbital computed tomography and magnetic resonance imaging played pivotal roles in diagnosing the isolated hematoma, which was managed conservatively with oral corticosteroids, leading to complete resolution of symptoms and radiologic findings within a month. This case underscores the importance of thorough clinical examination and careful evaluation of imaging in the differential diagnosis of posttraumatic diplopia, highlighting the diagnostic challenges and the clinical utility of orbital imaging in such rare presentations.

Keywords: Blunt eye trauma, pediatric ocular trauma, post-traumatic diplopia, post-traumatic rectus hematoma.

INTRODUCTION

In the spectrum of trauma affecting the orbit and its proximate structures, occurrences of orbital fracture or hemorrhage are relatively common outcomes. However, the manifestation of isolated rectus muscle injury and hematoma following blunt trauma is an exceptionally rare complication, adding intricacy to the clinical landscape.[1] Within this context, we present the case of a 16-year-old male patient who experienced an isolated medial rectus hematoma subsequent to blunt trauma. While the literature acknowledges spontaneous rectus hematomas, the body of evidence is limited, with only a few documented cases of isolated rectus hematoma.[1-3] Notably, our case report contributes a unique dimension to this rarity, as, to the best of our knowledge, no prior instances of isolated medial rectus hematoma have been documented in the existing literature.

Informed consent form was obtained from the child and his parents.

CASE

A 16-year-old male presented to the emergency department with complaints of a red eye and diplopia following an injury involving a screwdriver to his right eye. The patient reported no loss of consciousness, dizziness, nausea, or vomiting. Notably, visual acuity was 20/20 in both eyes, and intraocular pressure was within normal limits. Clinical examination revealed an absence of edema and ecchymosis in the periocular structures. Anterior and posterior segment examination through biomicroscopy showed no abnormalities, except for a significant subconjunctival hemorrhage in the lower nasal quadrant of the right eye. Light reflexes were normal, and relative afferent pupillary defect was not observed. However, the patient exhibited a-4 limitation in lateral gaze in the right eye, along with esotropia measuring 10 prism diopters at near and 20 prism diopters at a distance. Furthermore, hypertropia of 4 prism diopters on the right was noted, accompanied by horizontal diplopia exacerbated in right gaze (Figure 1).

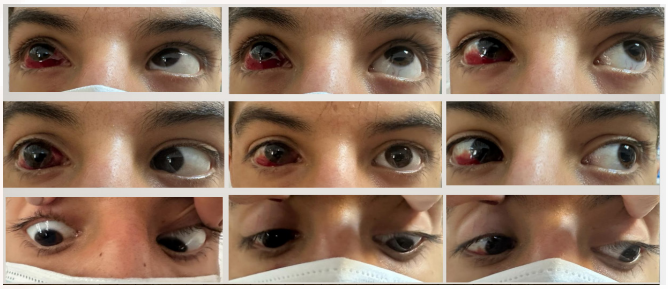

Figure 1. The patient exhibits nine cardinal gaze positions: A notable limitation of -4 in the right gaze accompanied by esotropia, which persists even in the primary position. Other than the identified subconjunctival hemorrhage in the right inferonasal quadrant, the ocular structures and their appendages appear grossly normal upon examination

The neurological examination conducted in the emergency department yielded unremarkable findings. In response to a

suspected traumatic sixth nerve palsy, an urgent cranial computed tomography (CT) scan was conducted, revealing no discernible pathology. Subsequently, orbital magnetic resonance imaging (MRI), prompted by the suspicion of an orbital hematoma, identified an area situated slightly lateral to the proximal 1/3 of the optic nerve, positioned 13 mm posterior to the disc level in the right orbit. However, the accurate assessment of its size and intensity was hindered by a magnetic susceptibility artifact, as illustrated in Figure 2A. Following the suspicion of a potential metallic foreign body, radiology was asked to carefully re-evaluate the patient's orbital CT, which was performed 1 day before under emergency conditions. Contrary to expectations, the CT scan elucidated "asymmetric thickening and coarse densities in the central part of the right medial rectus muscle." The findings were subsequently interpreted as indicative of an isolated medial rectus hematoma, as illustrated in Figure 2B.

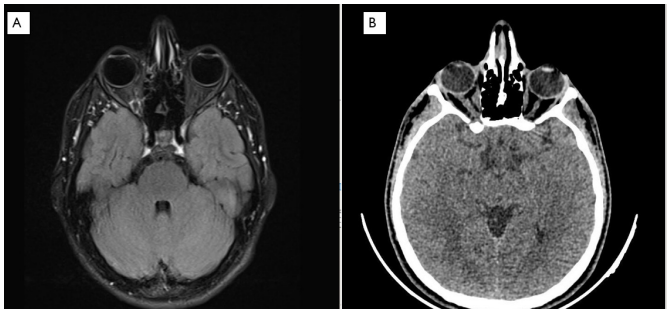

Figure 2A. Contrast-enhanced orbital MRI, axial T1-weighted with fat suppression. The image reveals an anomalous region situated slightly lateral to the proximal 1/3 of the optic nerve, positioned 13 mm posterior to the disc level in the right orbit. Unfortunately, the precise assessment of its size and intensity is impeded by a magnetic susceptibility artifact, as indicated in the description
Figure 2B. Axial CT scan: asymmetric thickening and coarse densities in the central right medial rectus

Oral methylprednisolone at a dosage of 30 mg/day was administered to the and regular weekly follow-ups were conducted. The corticosteroid dose was systematically tapered and eventually discontinued after three weeks of treatment. Notably, at the first-month follow-up, a remarkable restoration of ocular movements was evident, accompanied by a complete reversal of the previously observed findings on radiologic images, as depicted in Figure 3.

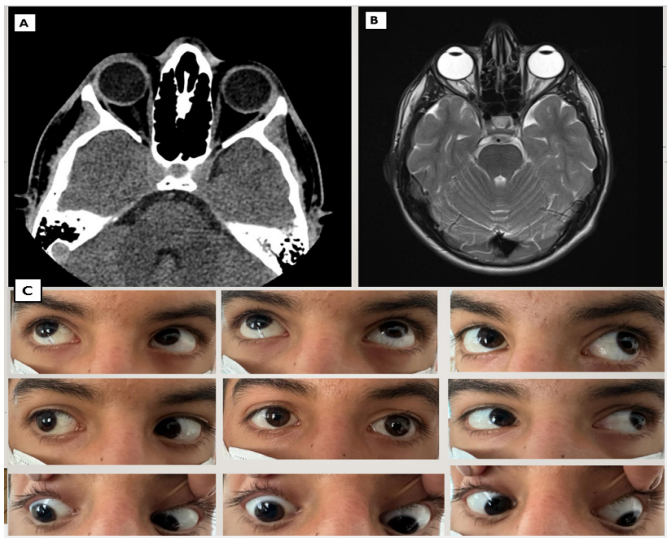

Figure 3A. Axial CT scan
Figure 3B. Contrast-enhanced MRI axial T2 weighted. In this follow-up radiologic assessment conducted one month after the trauma, both images exhibit the complete resolution of the medial rectus hematoma without any lingering sequelae
Figure 3C. One month after trauma, as seen in nine cardinal gaze positions, unimpeded ocular movements in all directions, and orthophoria was achieved

DISCUSSION

Traumatic eye injuries cover a wide variety of conditions and can adversely affect the appearance and function of the eyeball and orbit. Additionally, orbital hemorrhages and subperiosteal hematomas are prevalent complications.[4] The rigid nature of orbital walls renders them susceptible to substantial soft tissue damage, even with minor injuries.[5] Orbital fractures and hemorrhages are common sequelae of blunt trauma and the clinical presentation is almost never limited to an isolated single muscle. While medial rectus injuries themselves are not exceedingly rare, the specific presentation of an isolated medial rectus hematoma without associated orbital fractures or other structural injuries is particularly unusual.

Orbital injuries frequently implicate the medial and inferior rectus muscles as the most commonly affected extraocular muscles. Extraocular muscle injuries often manifest as traumatic ruptures of the rectus muscles and are commonly associated with orbital fractures, hemorrhages, or globe injuries. While the literature commonly reports spontaneous rectus muscle hematomas, particularly in the inferior rectus muscle, the occurrence of an isolated muscle injury or hematoma following trauma without concurrent structural damage in the orbit is exceptionally rare.[3]

Our report highlights a case of unilateral total outward gaze limitation and esotropia resulting from an isolated medial rectus hematoma following trauma, accompanied by horizontal diplopia in the affected patient. When confronted with a similar clinical presentation, it is imperative to rule out cranial pathologies in the differential diagnosis. Key considerations encompass intracranial hemorrhage, potential brain stem injury, skull base fractures, traumatic cavernous sinus or orbital apex injuries, as well as peripheral abducens (6th) nerve injuries. It is crucial to differentiate our case from trapdoor fracture or orbital retrobulbar hemorrhage, because in these cases conservative treatment may lead to irreversible visual loss. Therefore, a meticulous diagnostic approach is essential to guide appropriate therapeutic interventions and safeguard visual function in affected individuals.[5-7]

The 6th cranial nerve is vulnerable to trauma due to its long intracranial path. Trauma-related 6th nerve palsy, which manifests as limitations in eye abduction, esotropia, and horizontal diplopia.[6] In case of any suspected head trauma, the 6th nerve may be injured anywhere from the dorsal pons to the lateral rectus muscle.[5]

Increased intracranial pressure from intracranial hemorrhage often leads to papilledema and usually bilateral 6th nerve palsy.[7] In 6th nerve palsies, as a characteristic of paralytic incomitant strabismus, the forced duction test is negative, and is therefore one of the leading differential diagnoses in our case, and it should be kept in mind that it can occur in the absence of cranial or orbital fracture. Trauma is the most common cause of isolated 6th nerve palsy in children, with skull base fractures being the most frequent pathology.[8] In our case, skull base or caudal fractures and intracranial hemorrhage were ruled out by neurological examination and cranial imaging upon presentation to the emergency department.

The most common cause of posttraumatic diplopia is mechanical entrapment of the soft tissues due to a blow-out fracture.[5] The medial wall of the orbit, delineated by the fragile lamina papyracea, is particularly vulnerable to trauma from both external injuries and functional endoscopic sinus surgery. This area's susceptibility often results in complications such as diplopia and movement restriction due to muscle compression or damage to its vascular or neural supply.. The medial rectus muscle, adjacent to the thin lamina papyracea, is most often affected during endoscopic sinus surgery due to these anatomical vulnerabilities.[9] Hemorrhage and edema of the orbital fat that causes the tension of the septae may also restrict ocular movement. In both of these conditions, the forced duction test is positive. However, in cases of injury to the ocular muscles, the forced duction test may be negative and the diagnosis may be confused with< paralysis.[2]

Trapdoor fractures in children result from a sudden increase in intraorbital pressure, causing a bone flap to temporarily displace and then return to its original position. Children's bones, with more osteocytes and less calcified tissue, are more flexible and less prone to fragility, contributing to the distinct characteristics of trapdoor fractures in this age group.[7] The weaker bony adhesions of the periosteum in children also make them susceptible to subperiosteal hematoma after trauma, regardless of an orbital fracture.[4,10] In our case, the absence of a positive forced duction test and no orbital fractures on CT ruled out a trapdoor fracture or soft tissue entrapment.[3] Prompt surgical intervention is crucial for entrapment of extraocular muscles or soft tissue in an orbital bone fracture due to the risk of severe complications, including bradycardia, persistent diplopia, and mortality, making it a top priority in differential diagnosis.[7] Subperiosteal orbital hematomas pose a management challenge, as they may require conservative treatment or urgent surgery if there's a risk of compartment syndrome and optic nerve damage. Typically located in the upper orbital wall, these hematomas present with proptosis, hypoglobus, limited upward gaze, and reduced visual acuity. Orbital CT is crucial for accurate diagnosis, guiding treatment, and timely intervention to prevent complications.[10]

In guiding our differential diagnosis, the patient's trauma history and clinical observations are crucial. An isolated rectus muscle hematoma, unlike acute diffuse orbital hemorrhage, suggests a mechanism linked to direct injury to the rectus muscle area rather than changes in intra-orbital pressure seen in blow-out fractures. This type of hematoma is less likely to cause compartment syndrome affecting the optic nerve than high-pressure arterial hemorrhage. Acute orbital hemorrhage typically leads to rapid, painful proptosis, significant eye movement restriction, and optic nerve damage.[11] In our case, the fact that visual acuity and optic nerve functions were not affected, proptosis was not observed and the relatively mild clinical progression leads us away from this diagnosis. However, differentiating isolated rectus hematoma from other posttraumatic diplopia causes is challenging due to the lack of distinct clinical features. Notably, evidence of hemorrhage becomes discernible when the hematoma extends along the muscle sheath, reaching its insertion on the globe.[2] In our case, a subconjunctival hemorrhage was evident along the course of the muscle.

Orbital CT is particularly diagnostic in the diagnosis of isolated rectus hematoma and sections should be carefully examined according to the suspected muscle. Coronal sections for vertical rectus hematomas and axial sections horizontal rectus should be especially evaluated.[1,8] The CT scan revealed distinctly demarcated, irregular coarse densities within the medial rectus muscle, with no pathological findings observed in the adjacent orbital tissues. In patients with isolated rectus muscle hematoma treated conservatively, gradual symptom improvement may confirm the diagnosis, while rapid worsening may necessitate reevaluation.[1] In our case, we initiated oral steroid therapy at a moderate dosage, gradually tapering the dose over time. Existing literature supports the use of oral corticosteroids as a primary medical intervention for managing orbital hematomas and hemorrhages, though conservative approaches have also been proposed. Oral steorides play a crucial role in alleviating edema and spasm within the microcirculation, contributing to a reduction in intra-orbital pressure.[11]

In our case, concerns regarding a potentially metallic foreign body, raised during the orbital MRI examination, were effectively addressed through the use of orbital CT. While MRI is generally superior, particularly in visualizing soft tissues, it can be susceptible to focal field inhomogeneity artifacts. These artifacts, also known as magnetic susceptibility artifacts, arise from localized distortions in the magnetic field. Magnetic susceptibility, indicating a tissue's magnetization capacity, plays a role in these artifacts. Both metallic fragments and blood breakdown products have been identified as culprits for these artifacts. On MRI, these artifacts typically manifest as signal gap areas or concentric patterns of bright and dark circles.[12] The suspicion of a metallic foreign body mentioned on MRI was probably a magnetic susceptibility artifact due to hemorrhage and was eliminated on CT.

CONCLUSION

This report presents a rare instance of an isolated medial rectus muscle hematoma following blunt trauma, a condition not previously documented in the literature. It underscores the importance of a thorough examination of trauma history and clinical presentation in diagnosing this challenging entity. The crucial role of orbital CT in identifying and differentiating this condition from other cranial and orbital causes is highlighted, demonstrating its clinical utility. Our case emphasizes the need for careful evaluation of imaging in emergency conditions and revisiting radiologic images when the clinical picture is unclear, to avoid unnecessary tests and time wastage. Additionally, it reinforces that a negative forced duction test does not rule out muscular pathology in cases of isolated gaze limitation following blunt trauma.

ETHICAL DECLARATIONS

Informed Consent

Informed consent form was obtained from the child and his parents.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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