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Combined Subgaleal and Subperiosteal Orbital Hematoma in a Mentally Challenged Child: A Case Report

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Abstract

Special disabled children have a higher risk of trauma. Their management and cooperation could be a challenge for eyecare professionals. We present a case of head trauma following a trivial fall while playing that resulted in a left subgaleal, subperiosteal orbital hematoma and Acute Orbital Compartment Syndrome. We initially elected conservative management, but the hematoma did not decrease; therefore, two days later, the hematoma was drained under general anesthesia. Comprehensive assessment included Radio imaging investigations, ruling out other associated injuries, child abuse, and blood disease as possible etiology of hematoma was also conducted. Timely interventions and monitoring are critical for avoiding sight-threatening complications of Acute Orbital Compartment Syndrome.

Keywords

Acute Orbital Compartment Syndrome, Subperiosteal Orbital Hematoma, Child with Special Needs, Pediatric Trauma

1. Introduction

Orbital hematoma is one common cause of Acute Orbital Compartment Syndrome (AOCS) in children. If prompt detection and timely management are not carried out, it can lead to irreversible visual loss. An orbital hematoma could be classified based on etiology: traumatic or non-traumatic. Based on the location of the hematoma, it can be classified as within the intra-orbital muscle cone, outside muscle cone, or subperiosteal, along with expansion outside the orbit [1]. The periosteum is loosely attached to the surface of the orbital bones except at the

suture lines. The vessels passing through the bones can easily rupture in blunt trauma and bleed into subperiosteal space. If a hematoma occurs following bleeding from a ruptured short ciliary artery or subperiosteal vessels, the blood could accumulate in the retrobulbar muscle cone. Physical assessment is complimented by T1-weighted imaging and hyperintense on T2-weighted imaging. CT and MRI help in diagnosis and planning management strategy [2].

Literature has few cases of subperiosteal orbital hematoma in children following trivial head injuries [3]. A child with special needs often cannot provide a proper history or cooperate for clinical assessment and evaluation. Follow-ups can also be a challenge. However, to the best of our knowledge, such injuries in children with mental retardation not related to the trauma and successful management of hematoma have not been described.

We present a case of combined traumatic subgaleal and subperiosteal orbital hematoma with suspected Acute Orbital Compartment Syndrome in a child with special needs at our tertiary eye care unit that was surgically managed with successful outcomes.

2. Case Report

A five-year-old mentally subnormal boy was brought by his mother to the emergency department with swelling and discoloration of his left eyelid and forehead. The child is known to have a speech delay and is mentally subnormal. The child had fallen from a swinger on the ground at approximately half meter height and had sustained a head injury. There was no history of vomiting, loss of consciousness, or any abnormal movements following the injury. There was no blood or watery discharge from the nose or ears.

The child was asleep when brought for ophthalmic assessment, but all vital signs were within normal range. He was easily awakened; his cooperation was, however, poor in the evaluation. There was swelling and bruising of the left upper lid with protrusion and displacement of the globe and tense, painful upper lid hematoma (**Figure 1(a)**). The child could fixate and follow the light with each eye. The extraocular muscle movements in all cardinal directions in the right eye were normal. The pupils react briskly to light without any afferent pupillary defect. The vertical and horizontal eye movements could not be tested in the left eye due to the lid swelling. Thus, damage or involvement of innervation of the superior rectus and the levator muscles in the left eye could not be determined. The intraocular pressure was measured using the I care (IC200/USA), 14 mmHg in the right eye and 40 mmHg in the left eye. The increased pressure suggested compression of the intact left globe due to the orbital hemorrhage. We examined the anterior segment of the eyes using a portable slit-lamp biomicroscope. (Kowa/SL-17/technology for life science/USA). The posterior segment was evaluated using the indirect binocular ophthalmoscope (Keeler, UK) and a +20 D lens (Volk, Germany). The right eye was normal, while in the left eye, the retina's periphery could not be evaluated. However, the retina around the posterior pole was normal.

Figure 1. The orbital and frontal hematoma in a child after head injury (a) and the post-operative resolution of orbital hematoma and proptosis (b).

An urgent computerized tomography was performed, and the radiologist reported left frontal subgaleal and left periorbital soft tissue swelling and elliptical hyperdense-shaped blood collection in the extra-conal space of the medial superior quadrant of the left orbit. There was no septation within the collection and no intraconal extension. It was consistent with an orbital subperiosteal hematoma. There were no orbital or cranial bone fractures. The intracranial findings of the CT scan did not have any evidence of traumatic brain injury (**Figure 2(a)**).

A blood investigation was performed to review the coagulation parameters. Prothrombin time was 14.5, the International normalized ratio was 1.1, and activated partial thromboplastin time was 33. The platelet count was 370, Mean corpuscular volume (MCV) was 11.6, RDW was 16.7, and PDW was 13.0. These three parameters were mildly higher than the normal range in a healthy child.

In the absence of signs of intracranial involvement and intact left globe, as evident based on the clinical assessment and CT scan report, we treated the child conservatively. We administered a single dose of IV dexamethasone 50 mg at the pediatric ER. Amoxicillin/clavulanic acid syrup was administered orally every 8 hours. Ofloxacin eye drops were instilled in the left eye four times daily, as well as topical dorzolamide 2%. Cold compressors were applied to the left eye. The child was advised to revisit for a follow-up after two days. However, upon clinical assessment, no improvement was seen. He was complaining of increasing eye discomfort and was tender to touch. Therefore, he was admitted for further investigation and intervention if needed.

Magnetic Resonance Imaging (MRI) was performed (**Figure 2(b)**). A large left subperiosteal hematoma superiorly measuring 26 × 31 × 10 mm was noted, causing a mass effect, and depressing the extraocular muscle and globe, resulting in proptosis. Subtle signal changes within the optic nerve were noted. The left globe was intact.

Based on MRI findings, acute orbital compartment syndrome (ACS) was diagnosed, and after an ophthalmology assessment, decompression of the subgaleal and subperiosteal hemorrhage was recommended.

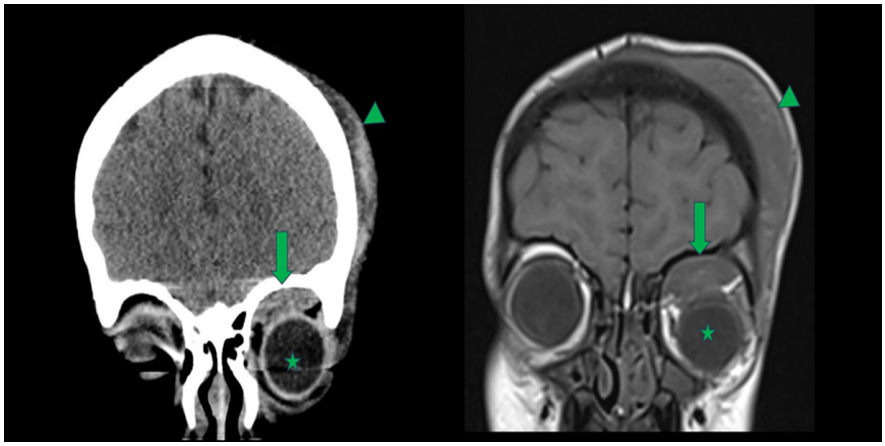

Figure 2. (a) Coronal CT shows a Hyperdense left frontotemporal subgaleal hematoma (arrowheads) and an elliptical hyperdense shaped collection in extraconal space of the superior aspect of the left orbit (arrows) depressing the globe(stars). No fracture of the adjacent bones; (b) A follow-up Coronal T1-weighted MR image shows an interval increase in the size of the subgaleal hematoma and the orbital hematoma, causing a more significant mass effect on the globe(stars), resulting in proptosis. Subtle signal changes within the optic nerve were noted (not shown).

After consenting to the child's guardians, he was operated upon under general anesthesia. The lid crease on the affected eye was marked with a marking pen. Then two cc of local anesthetic was injected into the upper lid (2% lidocaine with epinephrine). An incision was made with no 15 blades, and dissection was carried down with Westcott scissors and forceps, aiming at the orbital rim superiorly. Once the periosteum was opened with a freer elevator, a gush of dark clotted bluish blood came out. In that area, suctioning was performed with pressure over the forehead to allow all remaining blood to drain. It was noticed that the proptosis resolved instantaneously on the operation table, and the globe felt freely moving with no retribution or resistance; the upper lid skin closed with a 6/0 Vicryl suture (**Figure 1(b)**).

One week after surgery, the child's incision healed; no proptosis was seen. Ophthalmic assessment, including visual acuity and intraocular pressure. A repeat MRI was performed and the report came back as normal. All medications were discontinued.

Written informed consent was obtained from the patient's father for the use of clinical photographs for research and publication [4].

3. Discussion

Children with head injuries should be carefully assessed for possible intracranial or orbital injuries. Trivial falls while playing are common in children but are more worrisome in children with special needs. The team in emergency units should be aware of the protocol to be followed in cases of minor head injuries [5]. In an orbital hematoma, the caregiver team should include a pediatrician, neurologist, ophthalmologist, orthopedic, and ENT specialist.

In this case, the subperiosteal orbital hematoma was associated with subgeleal frontal hematoma (SGH). The radio imaging confirmed the existence of these two entities together. It is difficult to know if the two injuries are separate or if blood from the frontal area spreads to the orbit. Therefore, Sanada et al. recommended ruling out extradural hematoma in all cases of acute orbital hematoma [6]. If SGH progresses, it can cause compression of brain tissues and must be monitored in infants as the fontanels are not closed yet.

In our case, there was no injury to other parts of the body or evidence of child abuse. In a child with special needs, such possibilities are always to be ruled out [7]. Head injuries are common, but orbital trauma in child abuse without periorbital and facial injury marks is less likely. It is essential to identify abuse and neglect in such children as they are more vulnerable, it is difficult to communicate with them, and there is potential for future victimization.

In line with the protocol in a case of head injury after ruling out bleeding disorders and infection from an open wound, oral or systemic steroid is given to address edema that could affect both intracranial and intra-orbital tissues. High doses of steroids are given as conservative treatment as well as postoperatively to reduce edema and compression of vital structures and speed recovery time in superior orbital fissure syndrome or retrobulbar hematoma. However, the role of steroids in orbital injuries is still debatable, and the benefits are inconclusive [8].

The decision for surgical intervention in this case after conservative treatment is logical. The conservative treatment did not resolve the swelling. The intraocular pressure in the left eye was high. Given the mental status of the child, cooperation in eliciting signs of progression in the left eye was a challenge. Immediate orbital decompression with lateral orbital canthotomy and cantholysis (LOCC) is urgently recommended for management. The steps and success in achieving orbit decompression in AOCS and avoiding visual impairment complications are described in detail [9]. However, the availability of neurosurgeons and ENT surgeons will be an asset in such cases so that joint surgical intervention can be taken whenever needed instead of exposing the child to multiple general anesthesia sessions.

The subgaleal space is large and includes all the cranial convexities, but shearing forces to the scalp violate the venous channels crossing the space. Subperiosteal spaces in the orbit are unique. The frontal bone provides the largest concave surface without sutures. Sutures are where the periosteum is firmly attached to the deep structures; therefore, the spread of hematoma stops at the suture site. The periosteum at the roof of the orbit is loosely attached to the frontal bone; hematoma can, therefore, accumulate and push the eyeball and intraconal structures of the orbit down and forward. This causes proptosis, downward eyeball shift, and optic nerve stretching, which could threaten vision. Therefore, promoting diagnosis with radio imaging will help in deciding intervention. The occurrence of this complication in the reported case justified surgical evacuation.

Subgaleal hematoma is a complication that could be related to instrumentation in the newborn. It was reported in adults and older children post-trauma; alt-

hough not life-threatening at this age group, it could impose a significant risk to vision if not properly managed. The risk is higher if the patient exhibits a bleeding disorder, which was ruled out in our patient. Subgaleal hematoma was reported in children after minor head trauma, hair pulling, or braiding. The combination of subgaleal and subperiosteal hematoma is rare as the subperiosteal space is largely avascular, and this combined occurrence is secondary to leakage from high-pressure subgaleal bleeding to the sub-periosteal space.

Potential complications following traumatic subgaleal hematoma may include any of the following: airway compression was reported once. Infection was due to scalp laceration secondary to soiling of the skin. Our patient was treated with both local and systemic antibiotics immediately following the trauma to prevent such occurrence and orbital compartment syndrome.

In this case, AOCS was highly suspected based on the MRI findings and is known to happen secondary to the extension of the bleeding to the subperiosteal region. This has prompted us to perform the drainage to prevent serious compromise to the vision related to increased intraocular pressure and impending blindness with favorable outcomes.

There is no uniform approach to evacuating subperiosteal orbital hematoma. If vision is closely monitored and found not to be affected, a conservative approach is suggested. Still, resorption of hematoma may take a long time, resulting in sustained symptoms of diplopia and proptosis. In cooperative patients, such hematoma can be drained by office-based needle aspiration. Operating on the child under anesthesia through a frontal approach to reach the hematoma, irrigate, and evacuate the hematoma is the best but most challenging option for a child with poor cooperation and anesthesia-related risk in the present case. This approach enables the complete evacuation of hematoma, placing a drain, and repairing orbital fractures, if any.

While rare, subgaleal hematoma can occur in children beyond the neonatal age group. It could impose a risk on life and vision. Physicians caring for this age group should be aware of the potential complications that this injury could eventually lead to and be on alert to address timely intervention and prevent severe ocular complications.

More and more focuses are given to measures promoting the safety of children with disabilities. Our case of head trauma and combined sugaleal and subperiosteal hematoma would once again alert the caregivers about the need for prevention, prompt intervention, and lifelong following of such children to ensure no long-term compromise on their quality of life [10].

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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