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Case Report

## Transorbital Occult Penetrating Injury with Orbitorrhoea and Cerebral Abscess Complications

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### Abstract

Transorbital penetrating injuries with break in the skull base causing CSF orbitorrhoea is an uncommon mechanism of head injury. These injuries may be unnoticed or undertreated due to CSF may be mistaken as tears from eye. Few patients develop further complications as cerebral abscess and with increased risk of forming abscess if there is associated brain injury.

We present a rare case of 8 years child who had sustained injury while travelling in an autorikshaw crushed when a lorry hit from front. The child had eye injury associated with ipsilateral frontal contusion and multiple long bone fractures involving femur and tibia. He had unnoticed CSF leak from the laceration below the eye which was sutured at primary care centre. One month later he developed pus discharge from the laceration, fever and hemiplegia. CT and MRI brain revealed a huge abscess involving frontal lobe. Abscess tapped and antibiotics given for 6 weeks according to the sensitivity. CSF leak subsided and neurological improvement seen. Serial CT scans revealed subsidence of the abscess. This paper emphasises the importance of good clinical examination, high index of suspicion, orbito-cranial imaging, avoidance of complications, management protocol and follow up of the patients with orbito-cranial injuries.

**Keywords:** Cerebral Abscess; CSF Leak; Orbital roof fractures; Orbitorrhoea; Penetrating Injury; Transcranial Injury

### Introduction

Brain abscess occur with an incidence of 4 cases per million and in the pediatric population they occur commonly between 4 and 7 years age group children [1]. Intracranial parenchymal abscess are mostly due to hematogenous dissemination from a distant infection, the spread of a contagious infection, foreign material from a penetrating traumatic injury or as a postoperative complication.

Transorbital penetrating craniocerebral injuries account for

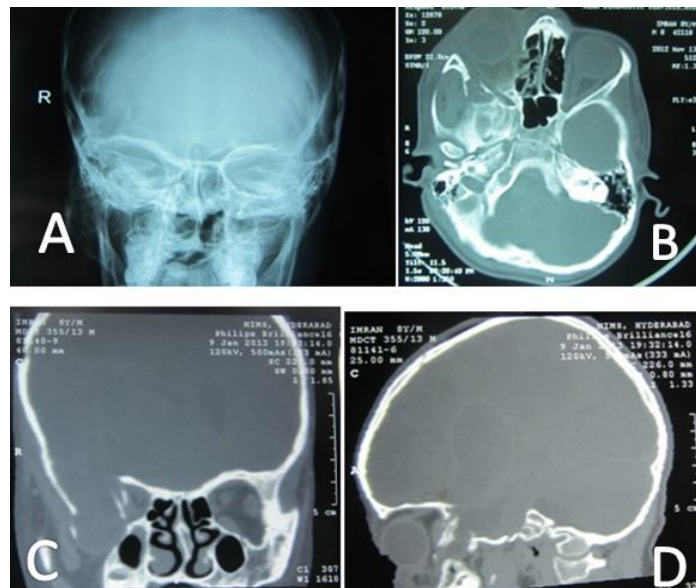
upto 24% of penetrating head injuries in adults and upto 45% in children [2]. There are many penetrating objects reported in the literature as chopstick [3], pencil [4], metals [5], bicycle handle [6], knife [7], gunshot [8], toothbrush [9], arrow [10], and etc. This uncommon injury is associated with complications as orbital cellulitis, orbital emphysema, phthisis bulbi, loss of vision, retinal detachment, intracerebral hematoma, cerebral contusion, intraventricular hemorrhage, pneumocephalus, brainstem injury, cerebrovascular injuries, CSF leak, meningitis, cerebral abscess, neurological impairment and mortality [7,3,11,9].

CSF leak due to dehiscence in the orbital wall and dural tear may lead to ascending infection. Associated parenchymal injury is more prone for acquiring infections compared to normal brain. Cerebral infection is the most common cause of mortality. Occult penetrating injuries can occur without extension upto cranial base with laceration of soft tissue of orbit associated with basal fractures. Different types of foreign bodies with various transorbital routes of entry into cranial cavity have been discussed in the literature[12]. Cerebral abscess is a common complication following transorbital penetrating injury. Chibbaro et al in a review of literature of 18 patients with penetrating injury, 4 of the patients developed cerebral abscess, in which 3 patients had a retained foreign body. Staphylococcus was grown in all the infected cases[13]. We present a case of 8 years boy who sustained multiple injuries with occult penetrating orbital injury led to CSF leak later developed cerebral abscess who was managed with aspiration and antibiotic treatment and on follow up showed resolution of the abscess.

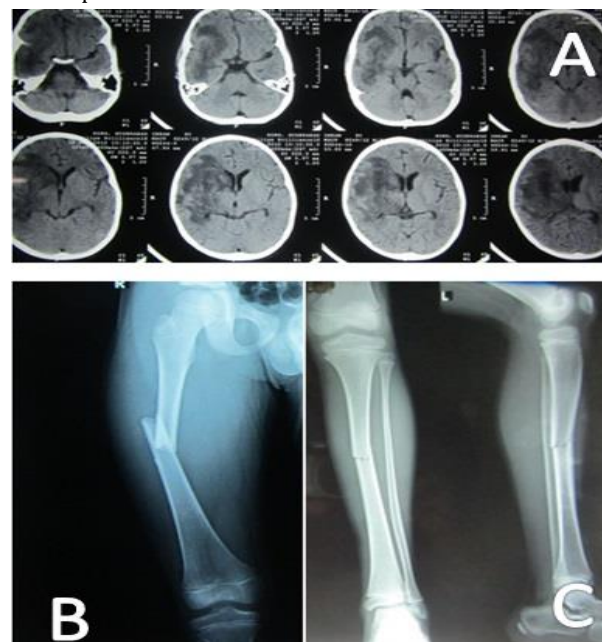
**Case report**

Eight years boy who sustained multiple injuries in a road traffic accident, while he was travelling in an autorikshaw hit by a lorry from front and was crushed in between. He sustained injuries to face, right eye, both lower limbs. History of loss of consciousness for 30 minutes and weakness of left upper and lower extremities present. On examination he had right eye swelling with a sutured laceration of 4 cms below the eyelid and occasional watery discharge from the laceration. Ophthalmological examination revealed eyelid edema, full thickness laceration involving lower eyelid, tears in lower and upper palpebral conjunctiva with hyperemia, sluggish papillary reaction with normal cornea and normal vision. Neurologically he had left hemiplegia. He had closed fractures involving right femur and left tibia. CT head with bone and brain windows showed fractures involving right maxillary sinus, lateral wall and roof of the orbit, traumatic contusion involving right frontotemporal, right thalamic and basal ganglia regions with mass effect with no midline shift and basal cisterns were patent. He was managed conservatively with antiepileptic Phenytoin 7mg/kg/day given during the treatment period and continued after the discharge and antiedema - Mannitol 0.2gm/kg/day given for 3 days. Power in the left side extremities improved in the due course. Antibiotic topical application in the eye and eye hygiene sufficiently reduced eye edema and redness. Hip spica applied for the closed fractures after reducing the fractures. He was discharged in 2 weeks from the hospital and at the time of discharge he had infrequent watering from right eye. After 1 month the patient returned with fever, headache, vomittings and increased weakness of left side extremities after a transient phase of improvement. He had pus discharge from the lower eyelid. CT and MRI brain scans showed a huge lesion with peripheral ring enhancement present in the right frontotemporal region with mass effect and midline shift to the opposite side. The lesion is extending upto the lateral wall of the

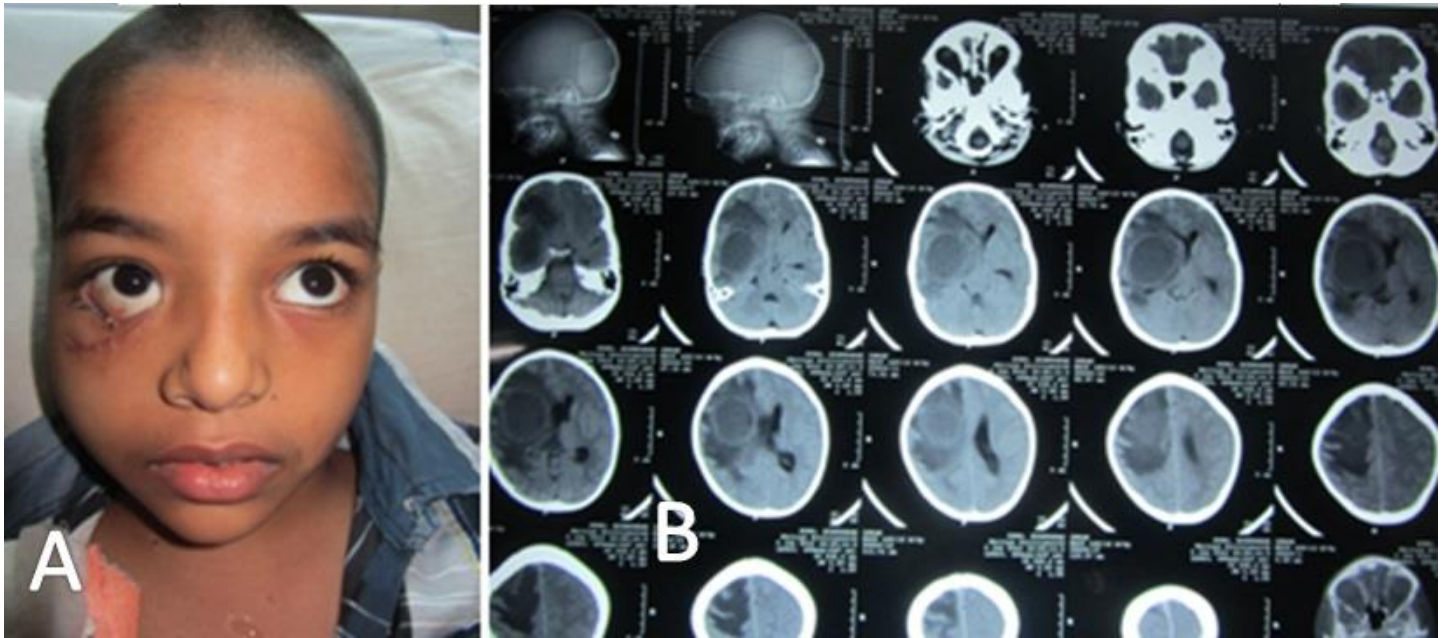
orbit. Tapping of the abscess done with placement of a single burr hole and pus of 125 ml aspirated. Cultures were obtained at the time of drainage with direct needle aspiration of the pus into a syringe which was immediately sealed. The specimen was transported to the bacteriology laboratory and inoculated within 30 minutes of collection.



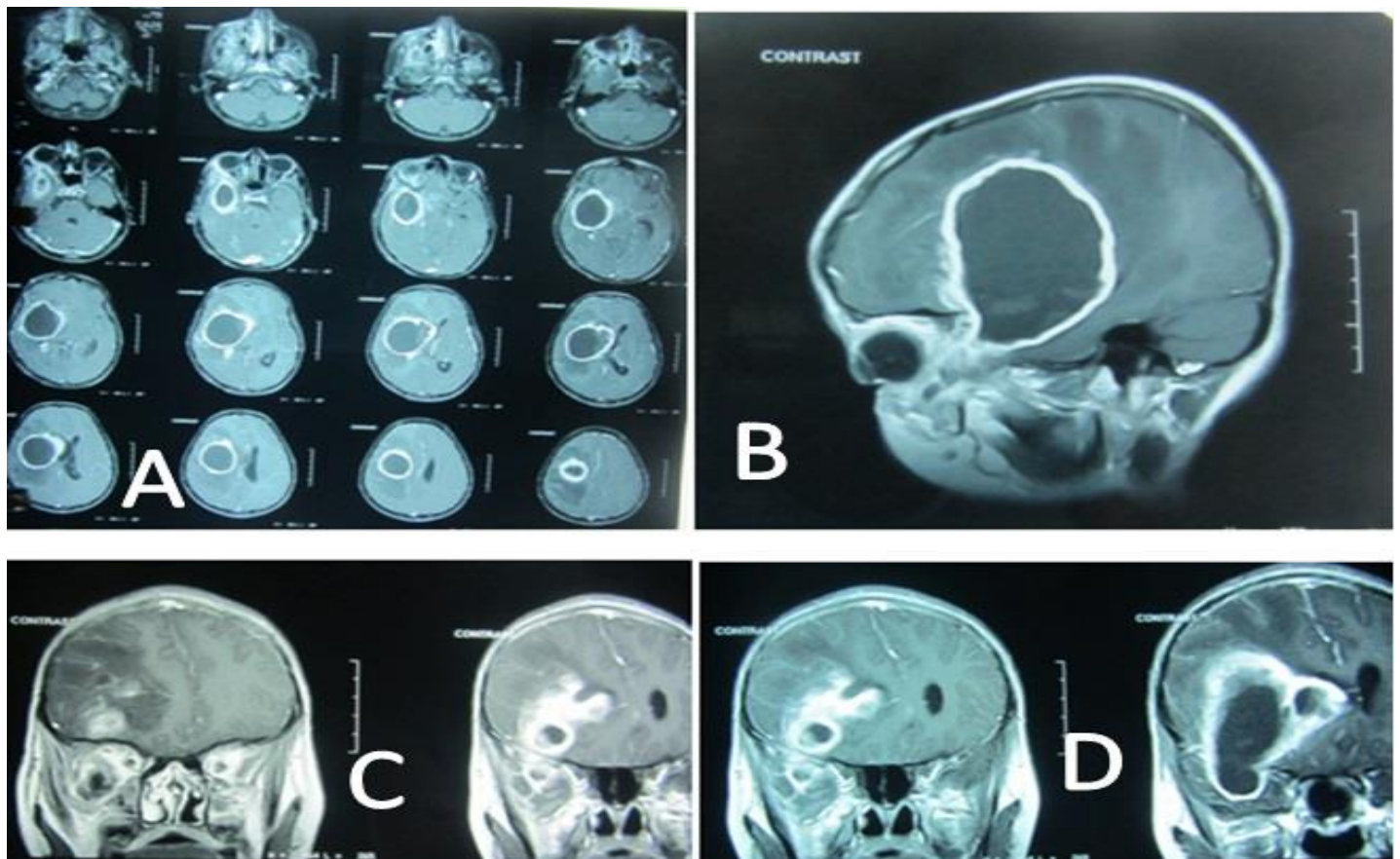
**Figure 1.**  
 A: X – Ray skull showing fracture of lateral wall and roof of the right orbit with zygoma fracture  
 B, C and D : Axial, coronal and sagittal sections showing fractures involving lateral wall and roof of the orbit with a small fragment piercing into the periorbital



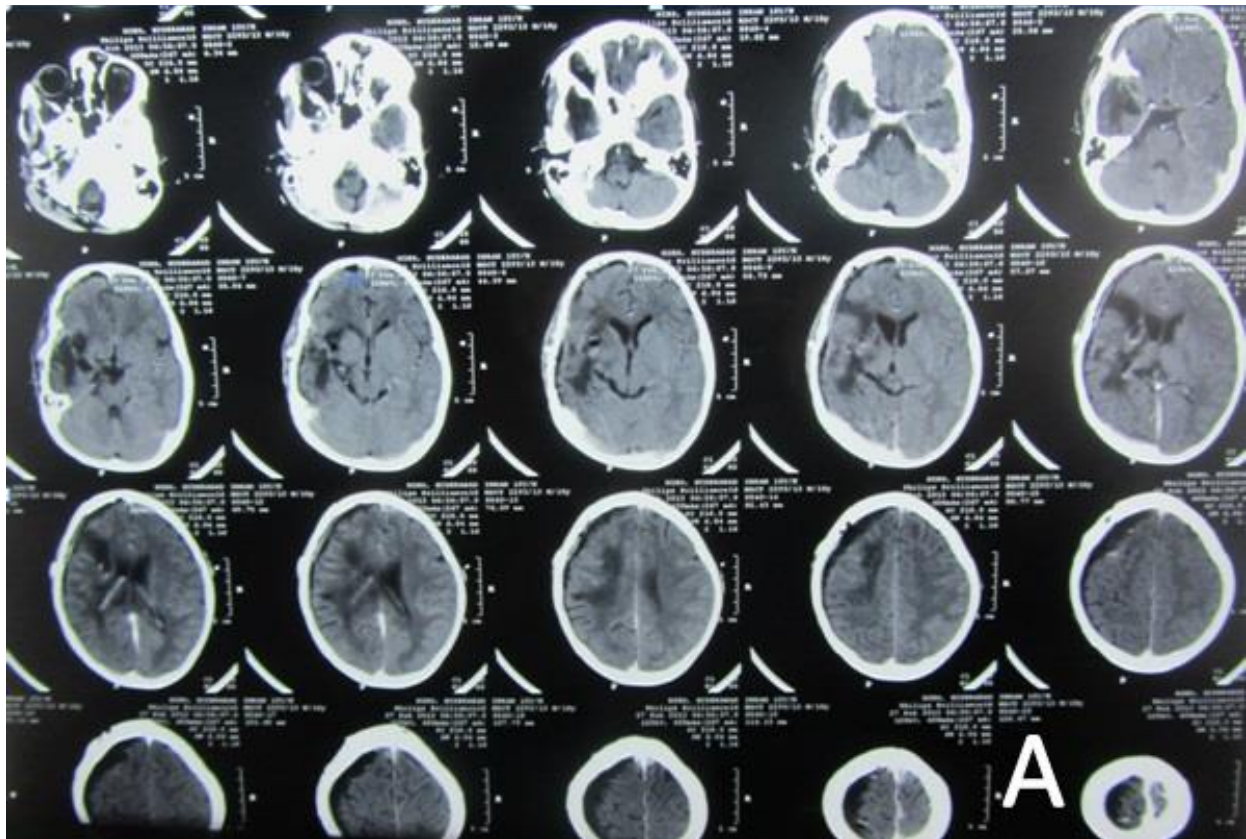
**Figure 2.**  
 A: CT scan of brain showing right fronto temporal contusion with involvement of capsuloganglionic and thalamic regions with mass effect and no midline shift.  
 B and C : Fractures involving femur and tibia



**Figure 3** A: Child with right eye lower lid laceration and ectropion with minimal pus discharge from the suture site  
 B: CT scan of brain after 1 month showing large 6 x 8 cms rim enhancing lesion in right fronto temporal region with mass effect and midline shift to the opposite side



**Figure 4:** A: MRI Brain with contrast showing peripheral rim enhancing lesion in right fronto temporal region which is extending upto orbit.  
 B, C and D : MRI Brain in sagittal, and coronal sections showing the lesion extending upto the orbit. The tract can be visualised clearly



**Figure 5.** Postoperative CT scan brain showing significant reduction in the abscess size

Culture of the pus showed MRSA and antibiotics Levofloxacin and Linezolid were given intravenously for 6 weeks according to the sensitivity report and weight of the patient. Standard precautions for MRSA infected patients as isolation, barrier nursing, strict hand wash of health care workers with alcohol preparations and limited staff were maintained. Patient improved power in the limbs, fever subsided, vomittings subsided and pus discharge from the eyelid subsided. No evidence of CSF leak later. He was discharged in 2 weeks with an advice of continuing intravenous antibiotics for further 4 weeks. Follow up for every 2 weeks done strictly with serial CT scans to check for resolution. Significant resolution of the abscess seen in serial CT scans after 6 months.

## Discussion

Penetrating head injuries also make children susceptible to intracerebral abscess formation, because retained debris or bone fragments can serve as nidus of infection. Incidence of brain abscesses in children as a result of penetrating cranial injuries range from 4.8 to 16% [1].

Mechanism of CSF leak is somewhat unclear in orbitorrhoea and there are several theories proposed for the same [11].

There should be conjunctival tear with orbital fractures with dural tear to produce CSF leak. But penetrating injuries into the periorbita can also cause CSF leak from the wound with intact conjunctiva. Treatment for CSF leaks from orbit is tailored according to the significance of amount of leak and defect causing defect causing the leak. Most of the times there is less pronounced CSF leak which may be mistaken as watering from the eye and prompt investigation is required. Discharge from the eye or penetrating wound around the eye should be analysed biochemically and cytologically with amounts of glucose, proteins, chloride,  $\beta_2$  transferrin, WBC count with DLC and RBC count. If confirmed as CSF then CT metrizamide cisternogram should be obtained to trace the tract and defect [11]. Most of the cases with dural fistulas will spontaneously close over a period of few days with antibiotics. Few with significant leaks require surgical repair of the defect. Use of lumbar drain in CSF orbitorrhoea is not studied well.

Non occult transorbital penetrating injury occurs when the part of the foreign body still attached to the proximal wound, and the occult injury is the one in which the trivial superficial proximal penetration tract does not draw medical attention to the presence of a foreign body [4]. In our case the penetrating object is not clearly made out as the child was retrieved from

the crushed autorikshaw. Possibility of penetrating injury with breach in periorbita and fracture roof of orbit causing dural tear leading to CSF leak is there.

Brain abscess secondary to traumatic head injuries needs surgical excision due to possibility of retained foreign bodies or bone fragments [1]. But in our case there was no foreign but small bone fragment from the orbital wall present which was not causing significant damage or compression.

Turbin and colleagues analysed the pattern of trans orbital intracranial injury and divided the orbital surface into different zones [14]. Our case fitting into zone 4 of the proposed classification.

Balasuramanian and colleagues classified transorbital penetrating injury based on orbital bone's anatomy and the associated injury [12].

In few cases of orbital penetration injury, the foreign body might be missed and go undiagnosed. Eyelid laceration is sutured without further investigation. Therefore, high index of suspicion should be there and all penetrating orbital injuries should be evaluated thoroughly with imaging including thin sections of CT of base of skull and orbit. MRI skull base and brain required to assess metal or non metal foreign bodies and trajectory and depth of penetration.

## Conclusion

Occult transorbital penetrating injury with associated CSF leak and traumatic brain injury complicated by cerebral abscess is an unusual form of trauma associated with significant morbidity. High index of suspicion and thorough evaluation with imaging modalities is required. Early identification of the underlying pathology and subsequent complications modify the treatment protocols.

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