

An Unusual Transorbital Penetrating Injury by House-key (lock): A Case Report with a Small Review of Literature

SANTANU SARKAR¹, SANDEEP MODI², ARUP KUMAR SETH³, SOUMYAJYOTI PANJA⁴

ABSTRACT

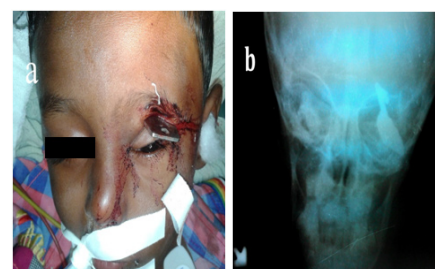
Penetrating injuries of the brain are quite uncommon, comprising approximately 0.4% of all head injuries. In our case, a four-year-old boy who fell forward on a house-key (lock) accidentally while playing with some other children sustained a left sided penetrating transorbital brain injury. After hospital admission, the patient had a Glasgow Coma Scale (GCS) score of 15/15, no visual loss but restriction of upward gaze (left eye) and profuse bleeding from the wound site. Firstly, the metallic key was removed in emergency operation theatre and haemostasis secured. Next day we did a combined surgical approach with neurosurgeons, Eye-surgeons and general surgeons after having CT scan report. We report this case because penetrating head injury is rare and transorbital penetrating head injury is even rarer and a predicament in emergency surgical practice with controversial management.

Keywords: Cranio-cerebral injury, CT scan, GCS score, Orbital roof fracture

CASE REPORT

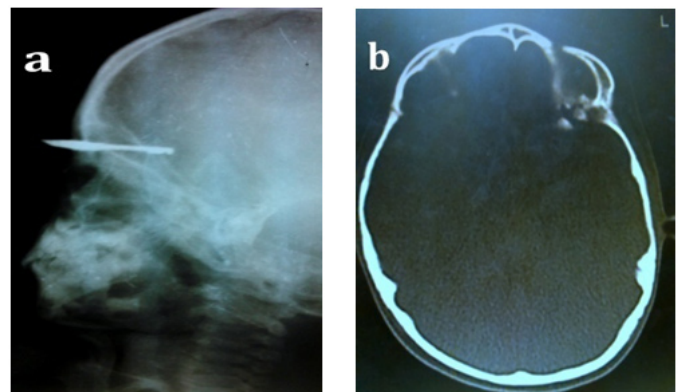
A four-year-old boy fell from the bed on his face while playing in home resulting in a penetrating transorbital injury by house key which was kept on the floor inadvertently. While taking admission in casualty ward at midnight, the patient was conscious and completely responsive with GCS score of 15 points. Physical examination revealed a left supraorbital (superolateral aspect) wound [Table/Fig-1a]; but no bony defects were palpated over the superior orbital rim. The eyeball was intact with normal visual acuity but restriction of movement of his left eye was noticed especially in upward gaze. There was no history of vomiting or loss of consciousness.

X-ray of skull was done immediately (both antero-posterior and lateral view), which revealed a metallic house key impacted into the left orbit [Table/Fig-1b,2a]. The child was immediately shifted into the operation theatre as there was profuse bleeding from wound site. Wound site was explored to remove the key under general anaesthesia. Next day morning CT scan of brain and orbit was done which revealed a fracture of the supero-lateral orbital roof (left) with displacement of the fracture fragments into the anterior cranial fossa [Table/Fig- 2b] but surprisingly there was



[Table/Fig-1a,b]: (a) House-key impacted into the superolateral aspect of left orbit (b) Antero-posterior x-ray of face and cranium showing metallic key in left orbit

no further clinical deterioration. Considering the consequences of impacted foreign bodies in brain, the patient was shifted to nearest neurosurgical centre where with the help of multidisciplinary team approach including general surgeons, neurosurgeons and eye surgeons an extradural frontal craniotomy was done to explore the bony defect of left orbital roof and to remove bone fragments. Pericranium was then placed over the bony defect for stabilization of the orbital roof and the tear of the left superior rectus muscle was repaired by ophthalmologist. There was a small dural tear which was also repaired. Postoperative period was uneventful where the patient was treated with intravenous 3rd generation cephalosporin, dexamethasone and regular dressing. The patient was discharged home on 10th Postoperative day on prophylaxis for seizure for one



[Table/Fig-2a,b]: (a) lateral x-ray of face and skull showing intracranial extension of foreign body; (b) Axial CT scan brain showing left orbital roof fracture fragments

month and tapering dose of oral steroids. He is under follow-up for last two months without any neurological or ocular complications.

DISCUSSION

Penetrating brain injuries (PBI) are usually caused by relatively high-velocity metal objects i.e. missile, stab knife etc. and also can occur in explosions (splinters), motor vehicle collisions (metallic rod), occupational (screw drivers, nails, pins etc) or household accidents by scissors, glass, sharp-nails etc. Although less prevalent, PBI carries a worse prognosis than closed head trauma [1]. There are different routes for penetrating intracranial injury through the orbit among which the commonest route of entry is through superior orbital roof. The orbital roof is made up of the orbital plate of the frontal bone and the lesser wing of the sphenoid bone. It is very thin than other parts of the cranium and is therefore at particular risk of injury specially in children, because of the lack of a pneumatized frontal sinus [2]. There are certain other areas within the orbit that may provide direct access to the cranial cavity, such as the superior orbital fissure, inferior orbital fissure and the optic canal. Turbin et al., reported the pattern of transorbital intracranial injury and divided the orbital surface into four different zones [3]. The complications of transorbital penetrating cranio-cerebral injury include consequences of extra-ocular muscle injury, Intra-parenchymal brain lesions like cerebral oedema, cerebral contusions, intra-cerebral haematoma, subdural and epidural haematoma, subarachnoid haemorrhage, pneumocephalus, cerebrospinal (CSF) fluid fistulas, etc. Infective

complications including brain abscess, encephalitis, meningitis, osteomyelitis and scalp wound sepsis & vascular complications like pseudo-aneurysm, post-traumatic carotico-cavernous fistula rarely also can occur [4]. The risk of postoperative seizure is as high as 30 to 50%, of which 10% appear within first week of trauma [5]. Initially there may be no apparent neurological deficit on examination and therefore a lack of neurological signs does not exclude an associated brain injury [6]. Chibbaro et al., reported 18 cases of orbito-cranial injuries caused by penetrating non-missile foreign bodies where GCS of 14-15 was noticed in 50% of subjects without obvious evidence of intracranial injury [7]. Therefore, even in the presence of a trivial orbital wound, a thorough ophthalmological examination and neurological evaluation is recommended supplemented by imaging studies (CT Scan) whenever necessary. Non-displaced or minimally displaced orbital roof fractures are usually managed by observation [8]. Early surgical exploration is recommended to reduce the morbidity in cases of retained foreign body and displaced fracture. A search of English medical databases, using key words transorbital penetrating injury and brain injury, revealed some interesting case reports, which were compiled in [Table/Fig-3] [9-17].

Author	Journal	Year of Publication	±Age & Sex	Penetrating objects	Outcome
O'Neill OR et al., [9]	Surg Neurol	1994	---	Hunting arrow	Uneventful recovery
Paucic-Kirincic E et al., [10]	Pediatr Rehabil	1997	9(M)	Toy-arrow	Enucleation of lt. eye ball, Latent rt. Sided haemiparesis & Cognitive disturbances
Cackett P et al., [11]	Emerg Med J	2005	20(M)	Short bladed knife	Uneventful recovery
Lin HL et al., [12]	J Chin Med Assoc	2007	83(F)	Iron bar	Blindness in the rt. eye; lt. haemiparesis
Satyarthee GD et al., [13]	Neurol India	2009	28(M)	Ceramic stone	Enucleation of the eyeball
Paiva et al., [14]	International Journal of Emergency Medicine	2010	10(M)	Bamboo stick	Uneventful recovery
Huiszoon et al., [15]	Case Reports in Ophthalmological Medicine (Hindawi)	2012	45(F)	Bicycle hand brake	Death
Abdulbaki A et al., [16]	The Indian Journal of Neurotrauma	2012	5(F)	Pen	Brain abscess
Ramdurg SRet et al., [1]	The Indian Journal of Neurotrauma	2014	20(M)	Branch of a tree	Seizure
Gupta OP et al., [17]	The Indian Journal of Neurotrauma	2014	47(F)	Valve of pressure cooker	Uneventful recovery
Present case	J clin & diag research (jcd)	2015	4(M)	House-key	Uneventful recovery

[Table/Fig-3]: Published case reports of unusual transorbital penetrating brain injury
±Age in years; Sex: M=male, F= female; rt=right, lt=left

The principles of treatment for transorbital penetrating injury are removal of bone fragments and foreign body, control of persistent bleeding and intracranial hypertension, prevention of infection through debridement of all contaminated and necrotic tissues and at

the same time preservation of as much nervous tissue as possible, and restoration of anatomic structures through accurate closure of the dura and lastly reconstruction of orbital roof. Jin Woo Kim et al., reported successful use of titanium micromesh and micro-screw system for large displaced fracture. These meshes do not interfere with postoperative imaging [18].

CONCLUSION

In a case of transorbital penetrating injury, high index of suspicion for underlying brain injury even in absence of any neurological symptoms is mandatory and appropriate radiological imaging should be considered. Outcome depends upon the type of object, site of entry into the eye globe, its trajectory, involvement of paranasal sinuses, extent of brain parenchymal injury and the septic complications. Furthermore, we also emphasize the importance of a combined team approach involving general surgeons, neurosurgeons and ophthalmologists for surgical intervention in such cases.

REFERENCES

- [1] Ramdurg SR, et al. An Unusual Case of Trans-orbital Penetrating Brain Injury due to Fall on Branch of a Tree. *The Indian Journal of Neurotrauma* 2014. <http://dx.doi.org/10.1016/j.ijnt.2014.12.007>
- [2] Fulcher TP, Sullivan TJ. Orbital roof fractures: management of ophthalmic complications. *Ophthalm Plast Reconstr Surg*. 2003;19:359-63.
- [3] Turbin RE, Maxwell DN, Langer PD, et al. Patterns of transorbital intracranial injury: a review and comparison of occult and non-occult cases. *Survey of Ophthalmology*. 2006;51(5):449-60.
- [4] Bard LA, Jarrett WH. Intracranial complications of penetrating orbital injuries. *Archives of Ophthalmology*. 1964;71:332-43.
- [5] Salazar AM, Jabbari B, Vance SC, Grafman J, Amin D, Dillon JD. Epilepsy after penetrating head injury, I. Clinical correlates: a report of the Vietnam Head Injury Study. *Neurology*. 1985;35:1406-14.
- [6] Solomon KD, Pearson PA, Tetz MR, et al. Cranial injury from unsuspected penetrating orbital trauma: a review of five cases. *J Trauma*. 1993;34:285-89.
- [7] Chibbaro S, Tacconi L. Orbito-cranial injuries caused by penetrating non-missile foreign bodies. Experience with eighteen patients. *Acta Neurochir(Wien)*. 2006;148:937-42.
- [8] Bolling J.P, Wesley R.E. Conservative treatment of orbital roof blow-in fracture. *Ann Ophthalmol* 1987;19:75-76.
- [9] O'Neill OR, Gilliland G, Delashaw JB, Purtzer TJ. Transorbital penetrating head injury with a hunting arrow: case report. *Surg Neurol*. 1994;42:494-97.
- [10] Paucic-Kirincic E, Prpic I, Gazdik M, Kriz M, Vojnikovic B, Golubovic V. Transorbital penetrating brain injury caused by a toy arrow: a case report. *Pediatr Rehabil*. 1997;1(3):191-93.
- [11] Cackett P, Stebbing J. Transorbital brain injuries. *Emerg Med J*. 2005;22:299. doi: 10.1136/emj.2003.007427.
- [12] Lin HL, Lee HC, Cho DY. Management of transorbital brain injury. *J Chin Med Assoc*. 2007;70(1):36-38.
- [13] Satyarthee GD, Borkar S, Tripathi A, Sharma BS. Transorbital penetrating cerebral injury with a ceramic stone: report of an interesting case. *Neurol India*. 2009;57:331.
- [14] Paiva WS, Monaco B, Prudente M, Soares MS, De Amorim RLO, De Andrade AF, Teixeira MJ. Surgical treatment of a transorbital penetrating brain injury. *Clinical Ophthalmology*. 2010;4:1103-05.
- [15] Huiszoon WB, Noe PN, Manten A. Fatal transorbital penetrating intracranial injury caused by a bicycle hand brake. *International Journal of Emergency Medicine*. 2012;5:34.
- [16] Abdulbaki A, Otaibi FA, Almalki A, Alohaly N, Baeesa S. Transorbital Craniocerebral Occult Penetrating Injury with Cerebral Abscess Complication. *Case Reports in Ophthalmological Medicine*. 2012;2012:742186. 6 pages, 2012. doi:10.1155/2012/742186.
- [17] Gupta OP, Roy K, Ghosh S, Tripathy P. An unusual penetrating transorbital craniocerebral Injury. *The Indian journal of neurotrauma*. 2014;11:53-56.
- [18] Kim JW, Bae TH, Kim WS, Kim HK. Early Reconstruction of Orbital Roof Fractures: Clinical Features and Treatment Outcomes. *Archives of Plastic Surgery*. 2012;39(1):31-35.

PARTICULARS OF CONTRIBUTORS:

1. Clinical Tutor, Department of General Surgery, Burdwan Medical College & Hospital, West Bengal, India.
2. PG Resident, Department of General Surgery, Burdwan Medical College & Hospital, West Bengal, India.
3. PG Resident, Department of General Surgery, Burdwan Medical College & Hospital, West Bengal, India.
4. PG Resident, Department of General Surgery, Burdwan Medical College & Hospital, West Bengal, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Santanu Sarkar,
1/3/1 C Ramlal agarwala Lane; Sinthee; Kolkata- 700050, India.
E-mail : drsantanu.surg@gmail.com

FINANCIAL OR OTHER COMPETING INTERESTS: None.

Date of Submission: **Mar 31, 2015**

Date of Peer Review: **Jul 03, 2015**

Date of Acceptance: **Jul 25, 2015**

Date of Publishing: **Sep 01, 2015**