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LETTER TO THE EDITOR

Transoral fractureless penetrating injury to brainstem in a child: a rare presentation

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Dear Editor,

Low-velocity penetrating injuries to the brain stem caused by sharp objects due to falls are rarely reported in children. Most of them cause diffuse brainstem damage and are fatal injuries. Penetrating brainstem injuries [pBSI] can occur either as transcranial, transorbital or transoral injuries. Transcranial and transorbital injuries are more common than the transoral mode. They cause significant parenchymal and vascular injuries along with vision loss in case of transorbital injuries. Transoral injuries are rare especially when there are no associated bony fractures. We report a case of transoral mode of pBSI in a child along with the surgical management and the overall functional outcome. A careful literature search returned only two other cases of surgically treated transoral pBSI in children.

An 18-month-old child presented to emergency room with an accidental transoral penetration of a metallic shank screw (Fig. 1A). The parents of the child were migrant labourers staying in makeshift tents near a construction site where the child wandered off playing with another child and tripped and fell face down crying on a loose screw. On examination, the child was consciously alert having spastic weakness of the right-side limbs. The kid was not cooperative for a detailed examination. An X-ray lateral radiograph showed a screw penetrating the skull base intracranially (Fig. 1B). Further imaging revealed about 8.5-cm nail passing transorally through posterior pharyngeal wall penetrating the anterior atlantoaxial ligament and entering the posterior fossa (Fig. 1C). An angiogram of the brain revealed the screw was skirting on the vertebral artery on the left side penetrating the lower medulla. The flow of vertebral artery remained patent (Fig. 1D).

The child underwent surgical extraction of the nail. The surgery was planned in stages first securing the airway by a tracheostomy. This was done to avoid manipulating the nail during attempted intubation. This is followed by microscopic transoral exploration with the use of oral retractors used for tonsillar excision. The incision on the nasopharynx was extended above and below the point of penetration. The shank screw was unscrewed and removed gradually. There was a leak of cerebrospinal fluid through the wound. The wound was repaired using fat graft and glue, and graft was secured in place with absorbable sutures on the mucosa. A feeding tube was placed under vision. Immediate post op, the child underwent imaging to rule out a hematoma. Postoperatively the child had mild weakness on the left side of the body. The rest of the neurological examination was intact.

Penetrating brain injury (PBI) accounts for approximately 0.4% of all traumatic brain injuries and can occur transcranially, transorbitally, transnasally or transorally [1]. Despite the rarity of transoral PBIs, prompt timely management and preop planning are the key factors that determine outcome. Transoral injuries causing penetrating injury to the brainstem are rare because of the thick clivus protecting the brainstem. Hence, pBSI through this route occurs mainly through natural foramens like jugular foramen [2]. The anterior midline ligaments in the craniovertebral junction like the anterior longitudinal/atlantooccipital, apical ligaments and the tectorial membrane are the path of least resistance for low velocity penetrating injuries through this route. At this level, there are less midline vascular structures owing to laterally positioned vertebral arteries. Management and treatment should be tailored to each individual patient owing to the rarity of the mode of injury. Table 1 shows a summary

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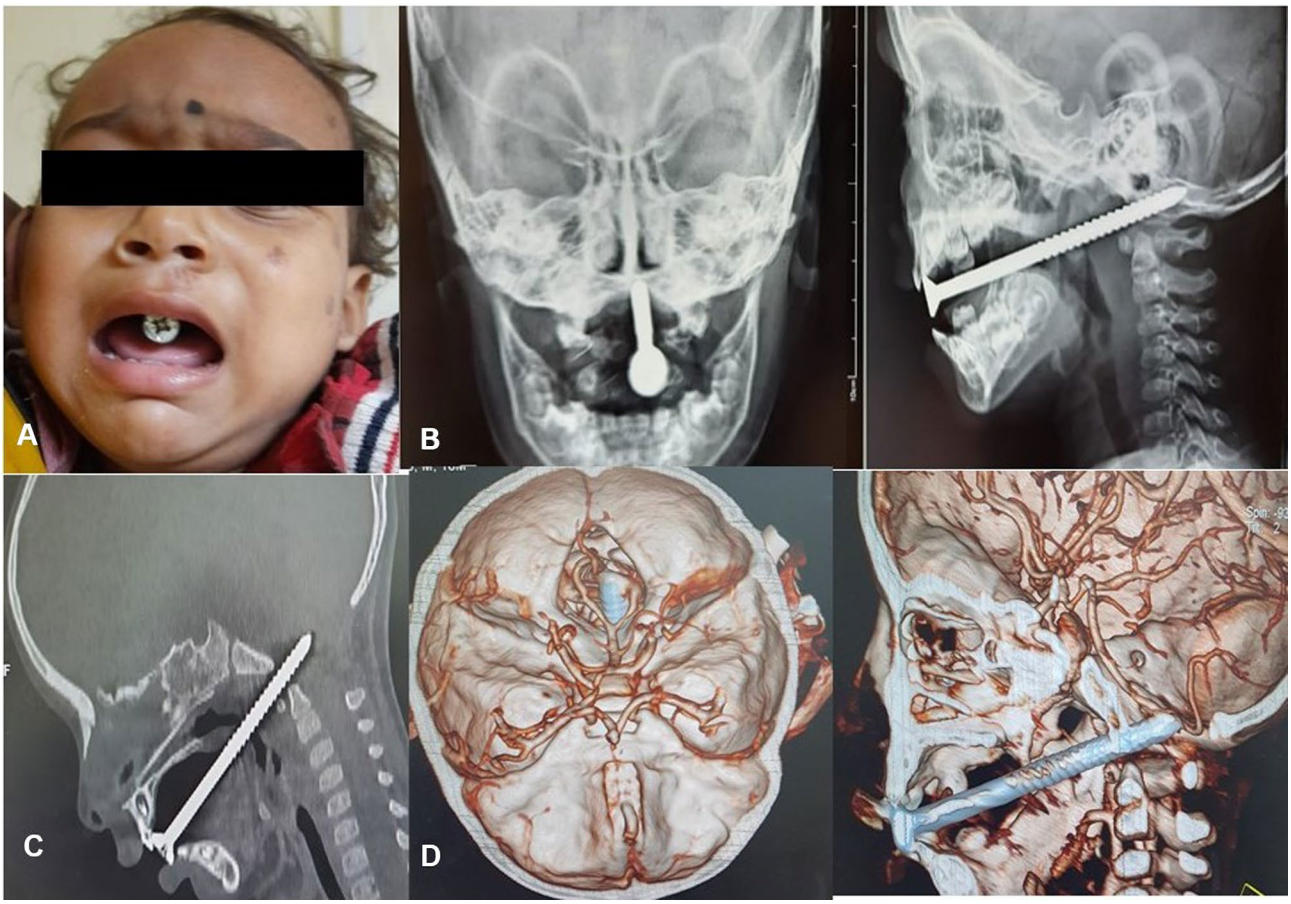

Fig. 1 **A-** Clinical image of shank screw stuck in the oral cavity. **B**- X-ray skull AP and lateral view showing the skull entering the posterior fossa. **C**- Mid sagittal computer tomography image showing shank screw between the basion and atlas. **D**- Angiography picture showing the tip of the screw in close proximity to the vertebral artery without any vascular discontinuity

of similar reported cases with penetrating brain injury along with the current report [1, 3]. The current report was managed through the transoral route because the screw fortunately was adjacent to the vertebral artery without any vascular cutoff. In order to avoid major manipulation of neural structures, a transoral route was adopted which provided a favourable outcome. The child recovered without any infection. He was initially fed through a feeding tube and gradually initiated oral feeds by 5 days post-surgery. He improved in the weakness with regular rehabilitation.

Table 1 Review of previous cases with penetrating brain stem injury

SL no	Age/sex	Type of foreign body	Moi	Entry site	Clinical presentation	Involved structures and route	Extraction approach	Complications
1 [3]	6/F	Wooden chopsticks	Fall	Transoral	No deficit	Basion and atlas	Transoral extraction	No
2 [1]	2/F	Wooden chopsticks	Fall	Trans oral	Low GCS	Basion and atlas	Suboccipital retrosigmoid (far lateral) craniotomy	Pneumonia
3	1.5/M (current case)	Metallic screw	Fall	Trans oral	Mild weakness of right upper limb and lower limb	Basion and atlas	Microscopic transoral extraction	No

Declarations

Conflict of interest The authors declare no competing interests.

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