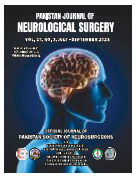

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Case Report

A Rare Presentation of Triplegia Resulting from Penetrating Brain Trauma by a Hand-Held Dagger

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ABSTRACT

Penetrating brain trauma is a devastating injury mode mostly seen in military settings. Its low-velocity counterpart resulting from objects such as knives, drills, daggers, etc. is relatively less common & rarely seen present mostly in isolated case reports. The neuropathological outcome can be disproportionately morbid in these cases with a varied clinical spectrum ranging from occult deficits to grave debilities reported. It is an anatomical insult whose course is free of clinical constraints & determined by the trajectory & velocity of the object. In this case report, an 18-year-old male who suffered the injury from a hand-held dagger that involved both parietal cortices via midline traversing is reported. GCS on presentation was 15/15 but the patient had triplegia in the form of paraplegia & contralateral upper limb monoplegia. The object was retrieved via craniectomy & cortectomy although no clinical recovery was seen post-up or on follow-up. It is a case intriguing & indicative of the unpredictable course of such injuries.

Keywords: Penetrating-Brain Trauma, Triplegia, Craniectomy.

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INTRODUCTION

Penetrating brain trauma (pTBI) is a major cause of neurological disability, debility & death worldwide, and is currently the fourth leading cause of mortality in the population aged 1-44 overall.[1] While blunt neurosurgical injuries outnumbered the aforementioned, with advanced warfare & sophisticated ballistics, the dynamic is shifting, moreover, it carries a significantly worse prognosis with a mortality rate of up to 92% reported.[2] While its low-velocity subtype with sharp objects such as knives & drills remains relatively rare reported mostly in case reports & small series of patients only, the neurological outcome is varied & runs the spectrum of neuropathology from disability i.e., hydrocephalus, epilepsy, mono paresis, etc. to immediate mortality.[3] The pathophysiology is led

by the kinetic & disruptive energy imparted to the brain & the location of the impact. Trilpegia is a neurological deficit mostly seen with medical causes i.e. stroke, cerebral palsy & in cases of trauma, after post-traumatic hydrocephalus. Occurrence after a low-velocity brain injury with a knife is most unlikely & never before been reported. In this case report an intriguing case of a 25-year-old male is being reported as a patient & sheds light on a rare clinical picture.

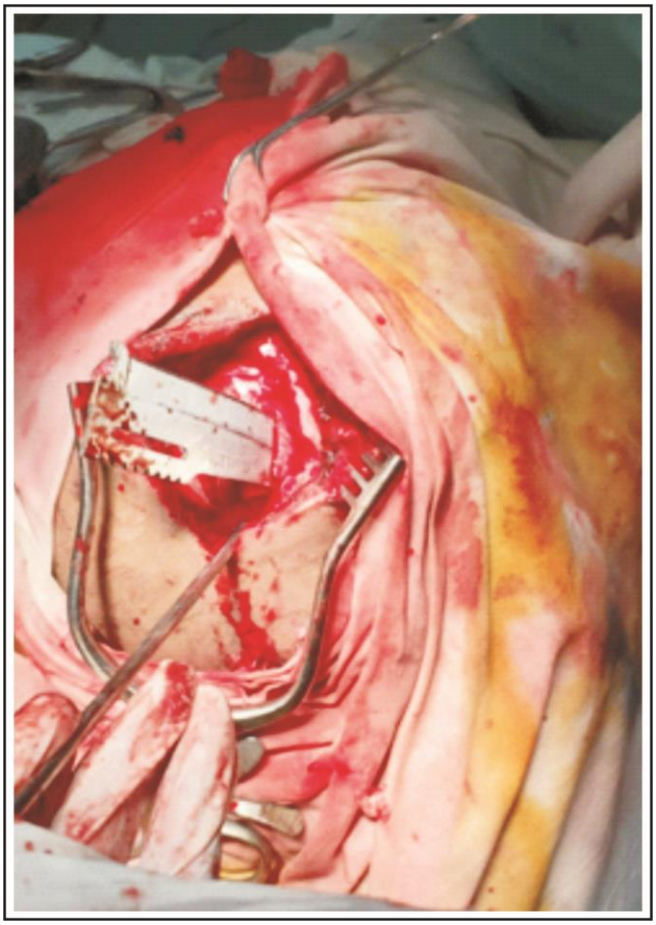

Figure 1: A dagger was stabbed into the left parietal region of the skull. – Picture added with consent from the patient.

Case Presentation

A 25-year-old male patient presented to ED with a history of penetrating injury to his head two hours back via a dagger in a homicidal attempt. On presentation, he was hemodynamically stable and recorded vitals within normal range, he had a GCS of 14/15 on initial evaluation.

The dagger was embedded in the left parietal region of his skull & he had triplegia in the form of paraplegia & monoplegia of the contralateral upper limb on admission. No other neurological abnormalities were present.

Imaging via CT showed a penetrating dagger lodged in the brain through the skull involving the Left parietal lobe traversing the midline and affecting the contralateral parietal lobe.

Figure 2: Post-Operative Scan showing the trajectory of the dagger from the left parietal lobe traversing through the midline and affecting the medial side of the right motor strip. Picture added with consent from patient.

He was operated on with the removal of the foreign body via a craniectomy. Debridement of wound track was done. Durotomy & a cortectomy was done to remove the object. Per-op foreign body (knife) of approximate size 4*5 cm was retrieved. Devitalized brain tissue was evacuated & hemostasis was secured. Devitalized dura was excised & watertight closure was achieved. The object penetrated the left parietal lobe, extended across the midline & damaged the opposite medial side of the motor strip. Postoperatively the

patient remained stable with no complications observed however, no neurological recovery was observed. At follow-up at 3 months, the clinical picture remains the same & he is being treated with physiotherapy & anti-epileptics.

DISCUSSION

Traumatic brain injuries remain the most devastating of injuries, given the looming morbid outcome in most cases& the possible debility that punctuates its long-term course. Of these, the penetrating subtype accounts for a mere 0.4% & is mostly seen in non-civilian settings.[4] These are less common but carry a notably worse prognostic profile. When the patients do survive, a lifelong disability & dependency often follows which incurs significant psychosocial & economic strain.

Penetrating brain trauma (PBT) can be further classified into high velocity (missile, speed >100m/s) & low velocity (non-missile).[2,4] Firearm injuries are synonymous with the former & outnumber the latter staggeringly but low-velocity injuries such as in our case are the subject of rare case reports & series. A drill bit, bike key, screwdriver& even a toothbrush[5-8] have all been incriminated & depict the potential of these seemingly trivial objects to cause major neurological insults.[4]

The extent of the injury is determined by the primary & ensuing secondary injury, which is most pertinent in blunt and missile trauma cases. For low-velocity injuries, these factors differ & the pathophysiological outcome is unpredictable given the varied & at times highly localized area of the brain that is affected. Generally, it is the intracranial path & location, size & type of the object & other associated circumstances & injuries that all dictate the course. Relevant to our case, objects that cross the midline, involve the ventricles & lie in the posterior fossa carry the worse outcome.[2,8]

In our experience, we observed a most unusual outcome of triplegia. We have found no similar account in the extensive literature review. The penetrating object involved the right parietal lobe and possibly this clinical picture can be explained by the penetration of the whole left motor cortex and breaching of the medial aspect of the right motor cortex which is the cause of left lower limb paresis, the Current clinical picture of the patient can be explained by the anatomical representation of different parts of the body on the motor cortex which is anatomically explained as homunculus on the motor cortex. In a similar case, the patient had suffered penetrating trauma via an iron rod that had breached the right parietal bone. CT showed the right temporal, parietal lobe, and right cavernous sinus involvement. The patient was left contralaterally hemiplegic. The object was retrieved under direct visualization via a craniotomy. Sonmez et al report likewise.[9]

Appropriate imaging is decisive in operative decision-making with the operative approach dependent on the appreciation of the foreign body location, trajectory & relation with critical brain structures. 3D CT is accepted as a standard however its efficacy is often obscured by the artefactual effect of a metallic foreign body. Vascular injury is the most daunting aspect of operative control and where suspected should be delineated by a CT-Angio although a DSA is reported as a better choice when available.[4,9,10]

Due to the scarcity of pTBI, treatment protocols are ambiguous and derived from various literature reviews.[10] The question of Craniotomy vs. craniectomy is unanswered & both are utilized. Aggressive antibiotic therapy rather than operative manipulation is the current focus however early surgical removal is the only definitive treatment.[11] A craniotomy is indicted for NMPBI where the object is protruding outside the brain. Deep-seated objects, need not be removed & can be left as such. Decompressive craniectomy has been argued for in case of increased inceptive cranial pressure. Minimally invasive procedures

are also being explored & role of the stereotactic navigation system in guiding removal via mini-craniectomy has been reported.[4,11] Overall following principles are developed for optimum results. i) evacuation of the hematoma, ii) Debridement of necrotic tissue, and debris. iii) removal of the object, and iv) Watertight closure of the Dura.[12]

Neurocritical care is mandatory to avert post-op complications ranging from meningitis to CSF leaks & epilepsy. Prophylactic antibiotics and anti-epileptic medications are indispensable & reported to significantly decrease infective sequelae & improve overall outcomes.[9 -11]

Overall, prevention of secondary brain injury, timely pre-op imaging & selection of correct operative approach are all constitutive of the surgical outcome & when met with such cases, a surgeon must be open in his cognition & comfortable with novel approaches.

CONCLUSION

Unlike solid organ injuries whose extent can be graded & quantified, Penetrating brain injuries of the low-velocity subtype defy such constraints. The clinical picture can be unpredictable & novel surgical decision-making & handling is required to achieve the desired outcome. Standardized protocols need to be developed for such cases.

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Additional Information

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Human Subjects: Consent was obtained by all patients/participants in this study.
Conflicts of Interest:
In compliance with the ICMJE uniform disclosure form, all authors declare the following:
Financial Relationships: All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.
Other Relationships: All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

AUTHOR CONTRIBUTIONS

Sr.#	Author's Full Name	Intellectual Contribution to Paper in Terms of:
1.	Ali Tassadaq	Study design and methodology.
2.	Muhammad Motsim Shah	Paper writing, data collection and analysis, and interpretations of results.
3.	Soban Sarwar & Rana Mohsin	Literature review and referencing.
4.	Munema Khan & Nadeem Akhtar	Editing and quality insurer.