International Journal of Advanced Biomedicine

http://dx.doi.org/10.18576/ab/090203

Iron Foreign Body Penetrating Thigh: Case Study

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Received: 2 Dec. 2024, Revised: 17 Feb. 2025, Accepted: 9 Mar. 2025.
Published online: 1 May 2025.

Abstract: Foreign body penetrating injuries are a relatively common type of injury that has a wide variety of clinical presentations and fates according to the site of injury, depth of penetration, involvement of neurovascular structures, and nature of the foreign body. Hemorrhage is the most common warning sign or complication that may be fatal if it involves large vessels. Penetrating foreign body sequences are not related to their size as related to the site; a small penetrating foreign body in the eye with significance may be more destructive than a large one that does not involve vital structures. A 10-year-old boy was presented to the hospital ER with Rt knee frontal side injury by a retained, penetrating metallic rusty foreign body. Clinical assessment, investigations, extraction, and follow-up were done. Before treating localized injuries, a thorough trauma examination is needed after resuscitation. Treatment includes extended wound exposure, little manipulation, impaled item extraction in the operating room under direct view, sufficient debridement, and antibiotics. Clinicians and radiologists must rule out neurovascular injuries while assessing limbs.

Keywords: Foreign body penetration, Joint injury, X Ray, Surgical extraction.

1 Introduction

Foreign body penetration is a relatively common injury in different age groups. It mostly occurs by sharp or pointed objects, either metallic or non-metallic as (glasses, woods, or hard plastic) (Fig 1).

2 Case Report:

A 10-year-old boy was presented with a long rusty iron rod to the ER in Muli Regional Hospital, Meemu Atoll, Maldives. While he was playing and running, he fell on it, and it penetrated his thigh on the frontal side just above the knee joint. As the rod was fixed in the ground, the boy was not able to move. The police men saw him, and rapidly they cut the rod base and transported the patient to the hospital. The clinical assessment of the case revealed that the vital signs were stable, no signs of vasovagal shock, and the boy presented with the injury and tolerable pain with a blood-soaked dressing over it, with no associated other injuries (Fig.1).

Fig. 1: A 10-year-old boy presented with a penetrating rusty iron rod to the frontal medial lower aspect of the right thigh.

After a rapid full clinical assessment, X-ray Knee AP and lateral views were done and revealed a long radiopaque metallic rod penetrating the anterior aspect of the Rt knee joint. Lab investigations (complete blood count, bleeding time) were normal. CT is not available in the hospital, and X-ray showed no bone abnormality, so it was not indicated (Fig 2).

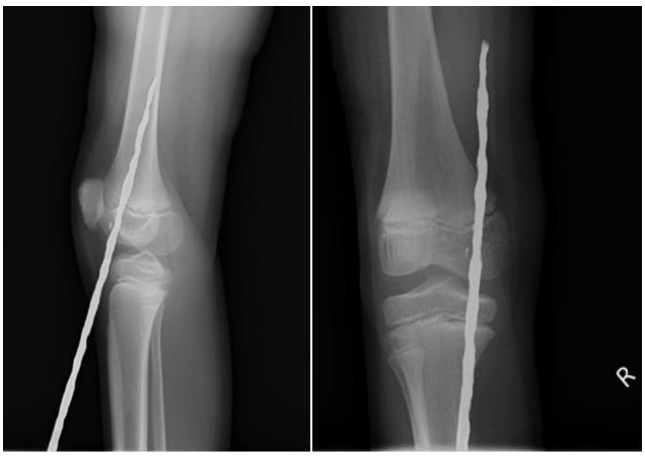

Fig. 2: X-ray of Rt knee joint, AP and lateral views. A Large, irregular metallic rod is seen penetrating the anterior aspect of the joint.

Clinical examination of the patient revealed a visible puncture hole on the right thigh, resulting from an injury caused by a 10 cm-long, 0.5 cm-wide iron rod that penetrated the soft tissue. During the initial physical examination, the patient exhibited a good overall condition with stable vital signs, including normal blood pressure, heart rate, respiratory rate, and oxygen saturation levels.

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The injury site exhibited mild edema and ecchymosis, suggesting bruising surrounding the puncture region. Despite the severity of the injury, there were no indications of ongoing hemorrhaging, and the patient's distal extremities' pulses were robust and palpable, indicating sufficient blood circulation. The injured leg exhibited intact sensation and motor function, as the patient could perceive light touch and move the leg effortlessly. After examining the patient's medical history about tetanus vaccinations, it was concluded that a tetanus booster would be provided due to the characteristics of the puncture wound and the risk of infection. The patient was thereafter taken to the operating room for the scheduled procedure. Before the procedure, a spinal anesthetic was administered to guarantee the patient's comfort and analgesia. The rod's inlet wound was extended, and soft tissue dissection was performed to release the rod from the adjacent structures (**Fig.3**). The iron rod was carefully extracted, and the procedure proceeded without noticeable complications. There was careful management of slight bleeding when the rod was removed. We carefully irrigated the wound with sterile saline to eliminate debris and prevent infection. A thorough assessment of the nearby blood vessels and nerves was done to rule out further damage. The incision was sutured in anatomical layers to promote maximum healing and minimize scarring (**Fig.4**). A **Redivac** drain was inserted to aid in the evacuation of excess fluid and reduce the risk of hematoma formation. A sterile dressing was used to protect the wound (**Fig. 5**).

Fig. 3: (A) Wound exploration after rod extraction. (B)-Wound closure over suction drain.

Fig. 4: The Length of the rod is more than 20 Cm.

Soft tissue US was done two days later and showed that there was no soft tissue abnormality, collections, or hematomas with the drain in place. (Fig. 6A). The drain was removed on the third postoperative day. Post-operatively, the patient was closely monitored for signs of infection, such as erythema, warmth, edema, or discharge from the site, as well as for indicators of bleeding or the onset of compartment syndrome, ensuring a safe recovery process. Follow-up US was done after drain extraction, and no abnormality was detected (Fig. 6 B)

Fig. 5: Crepe bandage of the wound.

Fig. 6: A&B – Follow-up US of the injury, pre- and post-suction drainage removal. No US abnormality was detected.

3 Discussion

Penetration injuries are a common form of injury in different age groups. Impalement injuries, due to their specific traumatic nature, present significant challenges in pre-hospital, medical imaging, emergency room, and operating room care. Pre-hospital transportation and operating room removal are determined by the nature of the foreign object and its anatomical location. Impalement injuries are characterized by high-energy trauma that causes injuries via blunt, penetrating, and lacerating mechanisms. Penetrating foreign body is a relatively common pattern of injury; it occurs in different age and sex groups, especially children or those in occupation-related related. The clinical presentation of the case may be quite variable according to the type of trauma, site, depth of penetration, and the injured tissue or organ. Such trauma must be managed in accordance with ATLS principles, prioritizing the assessment and maintenance of airway, breathing, and hemodynamic stability, which encompasses limb vascular evaluation due to the potential presence of major vessel laceration. Following the stabilization of the patient's vital signs, the subsequent priority should be the evaluation of limb soft tissue and bone. Supplementary radiographs are necessary to ascertain the path and precise position of the foreign object. Impaled item extraction in the operating room is generally accepted. The foreign body may be avoiding severe hemorrhage by tamponing a large artery laceration. However, cutting foreign object extremities simplifies transit, placement, and removal. In our clinical scenario, an impaled foreign body was removed in the operating room. Due to the anteromedial positioning of the foreign body, a supine decubitus position was employed. To avoid spreading of infection, sterile drapes were changed after foreign body extraction. *Some* documented impalement cases; either limb impalements, forearm impalement, or thigh impalements, without neurovascular injuries, treated with entry and exit holes foreign body removal, without complications (12-20). *Banshelkikar et al.*. reported a thigh impalement with an iron bar without neurovascular damage; the impaled object was removed using the entry and exit holes without problems (21). One of the most significant therapeutic strategies in these injuries is infection prevention, with wound debridement and cleaning with saline and prophylactic antibiotics. Anti-tetanus immunization should always be considered because the majority of these clinical cases occur with iron bars. The clinical status of the patient can also make the outcome of the same injury vary; individuals with lower immunity, such as diabetics, are more prone to complications. Rusty or contaminated foreign bodies need more caution against infection. The radiological diagnosis of the case is a critical tool. X-ray is the primary modality for detecting radiopaque foreign bodies, assessing the depth of penetration, and evaluating associated bone injuries. Ultrasound is utilized for the identification of small foreign bodies, particularly those of a non-metallic composition that are typically not visible on X-rays. CT is typically indicated only when X-ray results are insufficient for evaluation or when there is a suspected associated injury requiring CT assessment.

4 Conclusion

Impalement injuries necessitate a multidisciplinary approach. Following initial resuscitation, a comprehensive trauma evaluation must be conducted before addressing localized injuries. Management involves extensive wound exposure, minimal manipulation, extraction of the impaled object in the operating theater under direct vision, adequate debridement, and antibiotic coverage. The initial assessment of the limbs must consistently involve the exclusion of neurovascular injuries through clinical evaluation and radiological imaging.

Abbreviations

ATLS Advanced Trauma Life Support

CT Computed Tomography

US Ultrasound

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