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Case Report

A Terrifying Pediatric Impalement Injury of the Hand

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Abstract

Impalement injuries are rare injuries which may result from penetration of any foreign object into an individual. Manly two modes of injuries are reported. We report a case resulting from a child falling on an immobile object, the fence over the wall penetrating the left hand. Such injuries require careful inspection gentle handling and immediate transfer to an expert in emergency centre. In our case the injury was successfully managed with uneventful recovery.

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Introduction

Impalement injuries are rare wounds resulting from a foreign object which penetrates an individual[(1)]. Foreign objects enter the body creating a puncture wound and then can penetrate upto any depth. These injuries can be categorized into two groups; penetration of an immobile object or penetration of a mobile object (1,2). This impaled body may either completely embed into the body of may remain visible on examination. Regardless of type, these impaled bodies always need prompt management to remove the object, tract revision and wound management (3). Hence, such patients should receive surgical care without any undue delay in pre-operative examination which may not give any decision making findings (3).

Due to rare presentation of such cases, there are no definitive management guidelines (1,3). Careful observation and inspection of the affected part along with the surrounding environment is essential with minimal handling, and prompt transfer to an equipped emergency unit, tetanus prophylaxis, IV antibiotics and surgical removal and debridement are crucial for fruitful results (2,4). Pain, unconsciousness or poor cooperation by patients may mask the Neuro vascular deficits which may ultimately compromise the outcomes (5). This manuscript reports a successful incident of management of impalement injury in a pediatric patient.

Case report

A9-year-old boy presented with a history of accidental slip while trying to catch a ball on the wall of the public playground and sustained a penetrating injury over the right hand by iron fence, the entrapped iron fence was detached from the remaining fence by cutting it and he presented within an hour of the injury (Fig 1).

Figure 1: *Preoperative view, showing impaled spike railing (volar view).*

On arrival to the emergency department, patient was managed as per the ATLS protocol; tetanus prophylaxis and broad-spectrum antibiotic were administered.

The spike railing penetrated through and through from the volar aspect of the right distal forearm and exited from the 2nd web space on the volar aspect of the palm in the region of flexor zone II. Middle finger appeared dusky and congested, along with restricted movement (fig 2)

Figure 2: *Preoperative view, showing impaled spike railing (dorsal view).*

Table 1: *Showing preoperative and postoperative hand examination.*

Examination	Preoperative finding	Post operative finding
Capillary Refill	Absent on middle finger	Present
Pin prick	Bright red in all digits, Middle finger appeared dusky	Bright red in all digits
Finger movements	Restricted	Restricted initially, full range on 6 months follow up

The patient was immediately taken for exploration under general anesthesia. Wound was washed, avoiding excessive movements to avoid injury to the underlying structures. The spike railing was removed by carefully extending and connecting the railing track, wound was explored and spiked iron was withdrawn under fluoroscopic image guidance (fig 3, 4) taking utmost care without injuring surrounding structures (video 1).After removing the spike rail, middle finger vascularity was restored (video 2).On exploration, luckily all the structures were found to be intact median nerve was found compressed above the rail spike, nerve appeared healthy after removal of the spike, and there was no skeletal injury (fig 3).

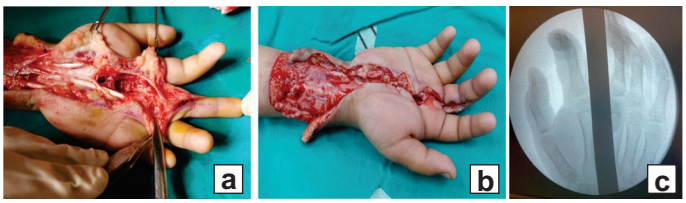

Figure 3: *The per-operative images after removal of the rail spike, showing,* ***a)*** *intact structures including the tendons and the median nerve,* ***b)*** *Vascularity of middle finger was restored,* ***c)*** *Fluoroscopic image showing rails pike and no skeletal injury.*

Figure 4: *The railing after removal*

The wound was washed thoroughly with saline. The wound was then closed with 4/0prolene suture. Postoperatively, the patient was monitored overnight for vascularity. On the 1st post operative day, the wound was healthy, middle finger was well perfused and there were decreased sensations on the radial aspect of middle finger (fig 4). Patient was discharged with follow up advised in outpatient department. Stitches were removed on the 10th post operative day and the patient was actively moving his hand. Sensations were later improved and were fully restored on 30th postoperative day. The key to success during the planning & execution of the case was sound knowledge of anatomy of hand, careful & meticulous dissection, and tissue respect. Another point of consideration is to bring awareness in the society regarding such type of injuries.

Figure 5: *Post operative picture showing well vascularised fingers also the medial skin flap edge is poorly perfused (this healed well with dressings)*

Discussion

The distal edgs of metal railing used in fences or gates may either end sharply or terminate in decorative designs[6]. In certain cases, these edges are ate fashioned into pointed spear-shaped ends serving as a deterrent to unauthorized entry. Literature in impalement injuries consistently advises that the penetrating objects should remain in-situ, and if necessary, shortened externally to facilitate safe transport to medical facility. This practice aims to prevent catastrophic hemorrhage that could result from prematurely removing the object, which might be tamponading a vessel or stabilizing nearby tissues.

Several case reports have documented successful management of similar injuries [7]. The treatment of such impalement injuries demands extreme caution- the removal of foreign objects should only occur in a controlled surgical sitting, ideally with in an operating room and under expert supervision. Prompt transfer to a tertiary care centre and coordinated surgical intervention are crucial, as theses injuries often present complex challenges during prehospital care, transportation and operative management. Therefore, all all healthcare facilities should maintain awareness of this rare but critical clinical scenario and its associated complications [6].

Comprehensive trauma assessment and resuscitation should precede any focus on the local wound. Minimal handling of the foreign body, removal under direct vision in operation theatre, meticulous debridement and administration of prophylactic antibiotics to prevent the infection remain the core principle of management [7].

In the presented case, the patient fortunately sustained no major structural or vascular damage-an uncommon outcome in hand impalement injuries. They achieved complete recovery and were found to be in good health during subsequent follow up visits to the department.

Conclusion:

Such injuries generally cause severe structural damage, but our patient presented with minimal internal damage which was treated accordingly with no residual functional loss.

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Author's Contribution:

Dr. Muhammad Imran Khan: Data Analysis, Conception and design and final approval of the study.

Dr. Asma Sarfaraz: critical revision, data analysis and final approval of the study

Dr. Hassan Tahir: Interpretation and data analysis, Data Collection, agreement to be accountable for all aspects of the work and final approval of the version to be published

Dr. Namia cho: Conception and design of the study, Data analysis, and final approval of the study.

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