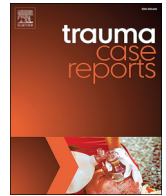


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Trauma Case Reports

journal homepage: www.elsevier.com/locate/tcr

Case Report

An unusual mechanism of hook impalement injury — A case report

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ARTICLE INFO

Keywords:

Impalement
Hook injury
Paediatric trauma
Unusual mechanism
Penetrating injury

ABSTRACT

A six-year-old boy was playing at his home, trying to climb up on a metallic gate which was attached with a hooked chain, and suddenly the child slipped down. The hook of the chain, including its 'U' shape segment got embedded into the posteromedial aspect of his thigh, through a small entry wound. An anteromedial aspect of the thigh carries a neuro-vascular bundle of the lower limb. To remove the hooked part from muscles near to femoral vessels without damaging them requires surgical skill and consideration for vascular emergencies. At the same time, the procedure is an important step. After resuscitation, the patient is taken into the emergency operation theatre, and the hook was safely removed under vision. In the postoperative period, the child recovered well, and the wound was healthy at the time of discharge.

Introduction

The penetrating injuries constitute 10% to 20% of all paediatric trauma cases in the USA [1], overall reports of impalement injuries are relatively uncommon in India [2–4]. At the time of presentation, patients immediately required resuscitation (ATLS® protocol) and further necessitated surgical intervention [5,6]. Surgical interventions become complicated and challenging when an injury in the vicinity to vital organs like the brain, heart, lung, and great vessels. Early diagnosis, the capacity of treating hospitals regarding the availability of specialised trauma surgeons and other super specialty doctors is the main crux of the management of these patients. All penetrating trauma requires specific pre-hospital care; in case of difficult transport, someone can cut the object near to the body if possible but should not be removed from the body [7]. Early transport with least handling of the object with in-transport resuscitation is the key for its management, and it improves overall patient's outcome [3].

Case report

A six-years-male child brought to Trauma Emergency Department with a metallic hook (10 cm) embedded into the right thigh with a chain hanging from the hook. The baby was playing with a thick hooked metallic chain that was attached with the door at his home and was slipped down, and the hooked ('U' shaped) segment of the chain got embedded into his right medial aspect of the thigh. The chain was cut from the door by parents and baby brought to us. At the time of presentation, he was conscious, oriented (GCS-E4V5M6) and vitals were stable; the child does not have any other injuries. The entry wound of the hook was noted in the right medial aspect of thigh 10 cm from ischial tuberosity (Figs. 1 & 2) The femoral artery was feebly palpable against the hook, popliteal, and anterior tibial and posterior tibial arteries were palpable normally. Plain X-rays of the thigh confirmed the location, trajectory and shape & size of the hook (Fig. 3). Arterial blood gas analysis, Complete blood counts and kidney function tests were within normal limits.

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<https://doi.org/10.1016/j.tcr.2020.100332>

Accepted 26 June 2020

Available online 30 June 2020

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Fig. 1. Hook is embedded into right medial aspect of thigh.



Fig. 2. Position of hook in the thigh-intraoperative.

The patient was taken in the emergency operation theatre, considering a vascular injury or accidental vascular injuries while removing the hook, vascular surgery instruments kept ready. The patient was in a supine position with the right thigh, flexed 45° with externally rotated and abducted. The curved end of the hook was palpable just below to femoral pulsation and to the inguinal ligament, all distal pulses were palpable. A vertical incision was given 4 cm above, and 4 cm below the entry site, the trajectory site of the hook was dissected, the hook was found embedded into adductors, gracilis, sartorius and vestus medialis muscle. So, to visualise neurovascular bundle incision extended to the lateral aspect of the thigh and exploration done under vision and hook was removed safely, femoral vessels and femoral nerve were found intact. The wound was cleaned with warm saline and closed with a suction drain. The hook was around 13 cm in length and 7 mm in breadth, 10 cm was inside the thigh, and the hooked segment was 7 cm (Figs. 4 & 5). The patient was discharged on postoperative day fifth, on the 7th-day of follow-up, sutures were removed.

Discussion

Impalement injuries are relatively uncommon [2,3]. Most of the impalement object is straight with different trajectories. We searched PubMed by using ‘impalement injuries, penetrating injuries’ keywords, on a customised search for < 18years of < 10years English articles, we found total 29 articles, 23 out of 29, were case reports or case series, 2 were review article, and 3 were original articles, and one was image case report. Among 23 case reports, all were having a straight penetrating object. A few Case reports are tabulated, on penetrating injury to the abdominal or abdominothoracic region, and thigh (Table 1). The energy transferred to the body, which results in impalement and causes massive tissue damage and severe haemorrhage, which leads to death at the scene site [3,6]. Such patients often present with extensive damage comprising both blunt and penetrating injuries and a complete assessment



Fig. 3. Skiagram showing hook in the thigh.



Fig. 4. Hook after removal.

of the entire patient is mandatory to recognise the primary and associated life-threatening injuries [3].

Impalement injuries are associated with severe haemorrhage, deep wound contamination, severe internal damage – which further leads to organ dysfunction, infections, and further may lead to death [7]. The outcome of such patients depends on the control of bleeding and infection as soon as possible.

The common causes of impalement injuries as reported in the literature are the fall of an object over the victim, sexual activity, mistakenly sitting over the object, playing and road traffic crash [5]. In impalement injuries, removal of the foreign body is less important than haemorrhage control and preventing further tissue damage [4]. Uncontrolled, unsupervised, scene site removal of the object may kill the victim because the object might be controlling the bleeding from the injury site [7]. Overall management of such patients requires meticulous planning (e.g. clinical assessment with an appropriate investigation, a specialised expert surgeon in call) and decisions (based on clinical and radiological judgement) before exploring and removing the object [3].

When foreign body removed at the scene, manually or in case of animal horn injuries, it is challenging to manage the patients if injury involving large vessels in the body. These cases have a worse prognosis than those who have impaling objects remains in the body. The prognosis in such patient depends on the object (size, surface, material, and cleanness), site of impalement (in the vicinity of great vessels or vital organ like heart, lung, brain, eyes), trajectory (passing through vital organs), associated blunt trauma in case



Fig. 5. Whole chain with attached hook.

Table 1
Review of articles on impalement injuries [2,3,5,6,8].

S. no.	Authors	Title	Summary
1.	Ketterhagen JP, Wassermann DH.	Impalement injuries: The preferred approach. 1983	Reported two case- one thigh impalement by tree branch another is thoraco-abdominal impalement in road accident
2.	Horowitz MD, Dove DB, Eismont FJ, et al.	Impalement injuries. 1985	Presented successful management of trunk impalement by iron rod
3.	Bajaj HN, Rao PS, Kumar B.	Impalement injuries. 1989	Presented a series of four cases stressing the need to individualize management in every case.
4.	Santosh Nagnath Banshelkikar, Binoti A Sheth, et al.	Impalement injury to thigh: A case report with review of literature. 2017	Presented management of a crusted iron rod impalement into thigh.
5.	IA Udo, O Eta, C Sokwa, E Etuknwa	Impalement injury to the abdomen: Report of a case 2017	Presented a management of lower abdominal tree branch impalement injury

of fall or road traffic crash and extraction of foreign body (at scene site have poor prognosis).

All such patients should be managed like all other trauma patients, as per ATLS guidelines first to secure the airway, then breathing and circulation before to proceed on local examination and management [8]. The main objective of managing impalement injuries is to prevent further damage and maintain the physiological stability of the patient. Attempt to remove impaling objects in the field or without the proper backup of the operation theatre may be lethal [7]. Even in the operation theatre multi-disciplinary team is required for proper management [9,10].

Conclusion

Penetrating or impalement injuries, the external appearance may not be a good predictor of the severity of an injury or vital organ damage. Early resuscitation, considering co-morbidities, preplanning, and multi-disciplinary team involvement always give better outcomes. Always expect more damage than visible from outside.

Learning points

1. Do not remove the foreign body at the scene site.
2. Always consider vascular injury in the vicinity of vessels.
3. Plan before exploration.
4. Avoid pulling or pushing of the foreign body while removing, may lead to further damage.
5. Consider broad-spectrum antibiotics in case of contamination.

Acknowledgement

I would like to thank my nurses specially Sinoj (SNO) who helped in surgery. Thanks to Radiology Department, AIIMS Rishikesh for helping in preplanning for surgery. Finally, I am very thankful to Dr. Ajay Kumar (Assistant Professor, Trauma Surgery) for his surgical expert.

We are very thankful to his parents for their patience and understanding & believing on us.

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