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Penetrating Trauma to Abdomen with Transfixed Wooden Branch without Intra-Peritoneal Breach: A Close Call

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Abstract

Penetrating trauma to the abdomen secondary to impalement with a wooden branch is rare. Most injuries secondary to impalement are associated with intra-peritoneal breach. Owing to the rare nature of a penetrating trauma without an intra-peritoneal breach our case explores the possibility of considering it in the list of differentials thus shedding light on the possible management of similar injuries. Our case also highlights the significance of improvisation when a surgeon finds himself in unfamiliar territory. We present to you a case of such penetrating injury to the abdomen resulting from fall over a wooden branch that was successfully removed and found to have no intra peritoneal breach.

Keywords: Penetrating Trauma; Injury; Impalement

Case Presentation

As the last rays of the night were fading into the darkness a 24 year old gentleman was rushed into the emergency by an ambulance. The patient was lying in a right lateral position with a moderately thick wooden branch piercing through his clothes. The branch had pierced through his left groin area and emerging out of the left flank area (Figure 1). His facial expression conveyed the suppressed agony. He was unable to move and was lying laterally on the ambulance stretcher. The on-call trauma team was immediately activated to which they responded immediately. A quick AMPLE history was acquired by the awake patient and his attendants. His primary Survey was performed by the trauma and emergency medicine team. His clothes were cut to completely expose him to avoid missing any other injuries beside the one which was obvious. The patient had fell from a 10 feet height while wandering on a wall less roof with his friends. He was on the roof of his house and occasionally used to sit with his friends at night time. His house was a concrete house built in a suburb in Karachi city. The area was crowded with poor living conditions and most people belonging to low socioeconomic strata resided there. He denied any one pushing him or any black out or vertigo neither he was under influence of any liquor. According to him he accidently tripped off from the edge. A wooden branch was transfixed to his abdomen with one end entering through 1 cm above the posterior superior iliac spine and exiting 1 cm above and anterior to the anterior superior iliac spine through the left flank when he fell to the ground. He could not lie flat and he was carefully brought on the ambulance in lateral posture to avoid excessive pain and further damage. He had a Glasgow Coma scale of 15/15, fully oriented to time, place and person and was in excruciating pain.

He was managed in accordance with the ATLS guidelines. Wide bore intravenous access was established in the both median cubital fossae and urinary catheterization was performed. Baseline investigations were performed and blood was sent for grouping and cross-match. He was also administered routine tetanus prophylaxis, antibiotics and pain killers. Chest X ray was done which showed normal lung fields without any rib fractures. Patient remained in severe pain despite of multiple pain medications. He was tachycardia with a heart rate of around 140 with normal blood pressures (120/80mmhg) however his abdominal examination was questionable since he had excruciating pain and tenderness. He was immediately booked for emergency surgery and taken to operating room.

Figure1: Image depicting impaled wooden branch entering through the left groin area near the anterior superior iliac spine and exiting through the left flank area

Exploratory laparotomy was planned due to high suspicion of intra-peritoneal breach. We suspected that with this trajectory he probably had pierced through the sigmoid and possibly could have also caused mesenteric tears, damage to the small bowel and injury to the ureter on the left side. The patient had to be intubated in right lateral position with the head end elevated at 45 degrees due to the awkward trajectory of the branch. An amputation saw was used to cut the wooden branch projecting through the entry and exit wounds to shorten its length in order to avoid worsening of injury to the patient and make room for surgeons and assistants to stand at the same time appropriately position the patient for laparotomy. Exploratory laparotomy surprisingly revealed no intra-peritoneal breach; the wooden branch had traversed between the muscle layers without causing damage to the bowel or bleeding within the abdominal cavity. The peritoneal lining adjacent to the area through with the branch was traversing was bruised. No contamination was observed within the peritoneal cavity and the rectus sheath was closed with loop PDS suture in a continuous manner. After making sure there was no intra- abdominal communication local wound exploration was performed after closing the abdominal wound and applying opsite dressing over the midline. An incision was made connecting the inferior margin of the entry wound and the superior margin of the exit wound and the wooden stick was removed gently. Subsequently the cavity was debrided and thoroughly washed and the detached thorns from the wooden branch were also carefully retrieved from the tissue into which they were embedded. The wound after meticulous hemostasis was left open for healing by secondary intention and a vacuum dressing was applied over it.

Outcome and Follow-Up

The patient was discharged on the second post-operative day on daily dressings. At this time the patient had tolerated normal regular diet and was fully ambulating and was tolerating pain with oral paracetamol. He was kept on daily dressing. At follow up in clinic after a week his wound was granulating well without any evidence of infection. The wound took around a month to completely heal and at his monthly follow up he had a perfectly healed scar without any need to dressing or medicines.

Discussion

Penetrating abdominal trauma presents to civilian trauma centers with a frequency of around 12- 35 percent in the west [1]. Adequate statistics from our region are lacking owing to poor health care facilities and lack of trauma centers and research in this area. Until the 20th century nearly all penetrating traumas were managed conservatively which led to universal fatality [2]. Over the coming years as experience was gained from both the world wars, laparotomy started to be used as a primary treatment for these types of trauma and this was reflected by the increased survival in these patients. Later this was challenged by Shaftan who advised judicious use of laparotomy since a few cases could be managed without undergoing surgery [3]. It is defined as an injury caused by a foreign object piercing the skin, which damages the underlying tissues and results in an open wound. The most common causes of such trauma are gunshots and stab wounds and this pattern also vary according to geography [4,5]. Any gender and age group may be inflicted upon by this type of trauma. Clinical features differ depending on the injured parts of the body and the shape and size of the penetrating object. Diagnosis is established based on history and imaging studies (X-rays, CT/MRI). Management usually involves supportive measures (hemostasis, blood transfusion, respiratory support), and surgical repair of damaged structures and/or removal of foreign bodies. Most of the cases in both young and adults alike suffer hollow viscus injury due to impalement and the most common sited of injury are the great vessels, diaphragm, mesentery, spleen, liver, kidney , pancreas, gallbladder and adrenals [6].

Our patient is an example of stab wound due to impalement with a foreign object, which in this case was a branch of a tree. This type of penetration has a more predictable pattern of organ injury. The management of such cases follows the ATLS principles and the treatment varies based on patient's clinical parameters like hemodynamic stability, peritoneal signs or clear case of impalement or evisceration of bowel from the body wall. It is very important to properly expose the patient by completely removing clothes and examining from top to the bottom. Expectant management is indicated in hemodynamically stable patients and such patients can

undergo local exploration of the foreign objects in a controlled and sterile environment for removal. The importance of history leading to the events of injury and knowledge of anatomy cannot be under emphasized since these can mostly predict the organs and structures likely to be damaged in the trajectory of the foreign object.

Impalement injuries are rare and usually have features of both blunt and penetrating trauma with damage to multiple structures [7,8]. Only a few such cases have been reported in literature most being fatal; this reflects the fact that most surgeons would not experience these in their careers [9-15]. These result from accidental falls or collisions, homicidal attacks or sexually perverted acts [16,17]. Based on the mechanism of injury, these are classified into three types. Our patient had Type I impalement injury [14,18]. Literature suggests that impalement injuries should be very carefully managed. This includes avoiding the manipulation of the impaled object and removal at the site of incident owing to the fact that the release would let go of any Tamponade effect which may exist due to hemorrhage or the risk of breakage which would further complicate the situation [11,19,20]. These impaled objects can be shortened to facilitate transport or positioning. In our case this wasn't done and we had to cut the ends with saw to make the patient supine for surgery. It is important that the object is stabilized during transport to the hospital since excessive movements would lead to further damage. Also the treating emergency and surgical team should not forget that the impaling object is a potential source of infection due to being contaminated. Therefore broad-spectrum antibiotics and tetanus prophylaxis should always be administered in the emergency room at presentation [9]. The surgeons need to improvise when dealing with these patients since their positioning on the operating table may be cumbersome. Therefore modifications and supports and additional tables may be necessary [14,21]. In our case we had to trim the edges of the impaled wooden branch and the patient had to be kept in semi lateral position to be intubated before making him supine for laparotomy. The standard mid line laparotomy was performed to see the peritoneal cavity for any breach of the abdominal wall, contamination, damage to the viscera or hemorrhage. However it is important to understand that sometimes the standard incisions may not be an option available and non-conventional incisions may have to be given [20]. There is enough evidence to support that impaled objects should be removed only after complete exploration and proper vascular control [11]. However in our case the only thing different which we could have done would have been the use of diagnostic laparoscopy which could have avoided a laparotomy. However this raises another important aspect that laparoscopy still hasn't been unconditionally adopted by practicing trauma surgeons and it would still depend upon the surgeons' discretion and resources available to adapt this to treat penetrating abdominal injuries. It is important to remove the foreign impaled object as a single piece which can be facilitated by an incision joining the entry and exit sites which is what we did in our case [8]. Once the wound is debrided after the foreign object is removed a thorough lavage is an absolute essential along the trajectory of the object, this minimizes contamination and debris and the resulting wound could be left to either primary or delayed intention healing [20]. In our case we kept the patients wound open and applied a vacuum dressing for later healing by secondary intention. It is very rare to find patients with impaled objects without any organ injury or hemorrhage. However occasionally there would be a few who escape such consequences one example of such a case was our patient. An average mortality rate for patients who undergo such penetrating injuries is around 5 percent which is based on figures from level one trauma centers. Increased survival is seen in those who don't have associated vascular injuries. Most of the deaths which occur happen within the first 24 hours [22]. The general factors which predict increased mortality in these penetrating trauma cases include; female sex, long interval between injury and operation and presence of shock and coexisting intracranial injury at the time of admission [1]. Injuries such as that encountered by our patient are known to have a very high morbidity and mortality and these injuries pose a challenge to pre hospital care, transport and management [7].

Conclusion

Trans abdominal impalement with foreign bodies such as wooden branch of tree as in our case poses a specific challenge to patient care and treatment. A low threshold for operative intervention is required in all such patients since a few may result in life threatening hemorrhage or visceral injuries. Our patient was lucky enough to escape abdominal penetration and only wound debridement and removal of foreign body was sufficient.

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