Penetrating Abdominal Trauma: Initial Assessment and Diagnostic Challenge: A Case Report

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Abstract

Background: Penetrating abdominopelvic trauma usually stems from stab wounds or gunshots. Workplace impalement by foreign objects is rare and presents a distinct diagnostic and therapeutic challenge. We report an exceptional case of trans-abdominal impalement by a metallic rod with an unusual trajectory yet minimal internal damage.

Case presentation: A 30-year-old male industrial worker was referred after a workplace accident in which a metal rod penetrated his lower back, traversing the posterior lumbar region, retroperitoneum, and peritoneal cavity. Upon arrival, he was hemodynamically stable, fully conscious (GCS 15/15), with a normal FAST. Contrast-enhanced abdominopelvic CT demonstrated the metallic rod's oblique vertical course through paravertebral muscles, psoas, retroperitoneum, and peritoneal cavity anterior to the descending colon, with signs of jejunal perforation (mesenteric air and fat stranding) but no major vascular, visceral, or skeletal injury. The rod was surgically removed; the perforated jejunal segment was resected, and a jejunojejunal anastomosis was performed. Postoperative recovery was uneventful, and the patient was discharged on day 3 in a stable condition.

Conclusions: This case highlights two key points: the first one is that even when a foreign object follows a long, high-risk trajectory, internal damage may be surprisingly limited depending on dynamics and anatomy. The second is that a negative FAST examination in a hemodynamically stable patient does not exclude significant intra-abdominal injury; timely cross-sectional imaging or surgical exploration remains essential. Awareness of atypical impalement injury patterns is crucial for accurate diagnosis and optimal outcomes.

Keywords: Abdominal Trauma; Outcomes; Emergency; Management

Introduction

Penetrating abdomino-pelvic trauma accounts for a significant proportion of emergency surgical admissions. Although most such injuries are due to stab wounds or gunshots, impalement by foreign objects, especially in the workplace, is rare and poses unique diagnostic and therapeutic challenges. These injuries often involve multiple organ systems and require a multidisciplinary approach.

We report a rare case of a transabdominal impalement by a metal rod with an atypical trajectory, resulting in minimal internal damage.

Case Presentation

A 30-year-old male with no medical history was referred to the emergency department by the prehospital team following a workplace accident. The patient had sustained a penetrating abdominal trauma caused by a metal rod that had entered through the lower back (**Figure1).**

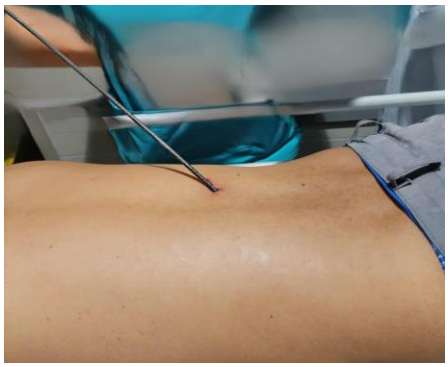

Figure 1: Clinical view demonstrating the in-situ metallic rod

Upon arrival, He was admitted without delay to the resuscitation room. The patient was in the prone position. A systematic ABCDE approach was performed; the airway was patent, with no signs of obstruction. Breathing was regular, with a respiratory rate of 16 breaths per minute. Oxygen saturation (SpO_2) was 98% on room air. Auscultation revealed normal, symmetrical breath sounds without wheezing or crackles. Blood pressure was 120/70 mmHg, and heart rate was 110 beats per minute; capillary refill time was less than 3 seconds; peripheral pulses were present, symmetrical, and there were no signs of peripheral hypoperfusion or shock. Neurologically, he was fully conscious, alert, and cooperative; Glasgow Coma Scale (GCS) was 15/15, with no focal neurological deficits. On rectal examination, anal sphincter tone was preserved, indicating intact sacral neurologic function.

The metal rod had penetrated dorsally near the lumbar spine and followed an oblique intra-abdominal course, ending at the level of the left iliac crest **(Figure2).**

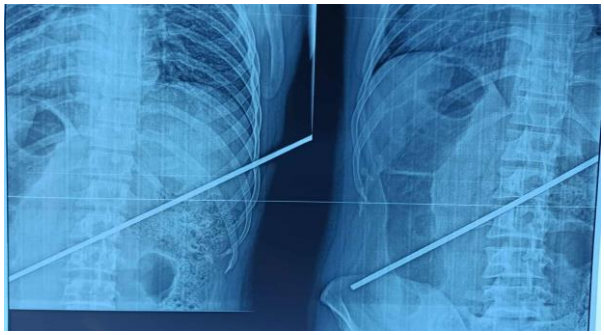

Figure 2: Plain abdominal X-Ray showing the trajectory of the metallic rod.

We performed a focused abdominal sonography for trauma (FAST), which was negative.

Laboratory tests showed normal coagulation (PT 87 %), platelets 280,000/mm³, hemoglobin 14.5 g/dL, creatinine 71 µmol/L, and mild hypokalemia (K^+ 3.2 mmol/L).

Given the patient's hemodynamic stability, we decided to perform a contrast-enhanced abdominopelvic CT scan. It revealed a posterior penetrating injury caused by a linear metallic object. The entry point was in the left paravertebral lumbar zone. The trajectory followed an oblique vertical course, traversing the paravertebral muscles adjacent to the left transverse process of L3, passing through the psoas muscle, into the retroperitoneal space along the outer border of the psoas, and finally breaching into the peritoneal cavity anterior to the descending colon and superior to the sigmoid colon. (**Figure3)**

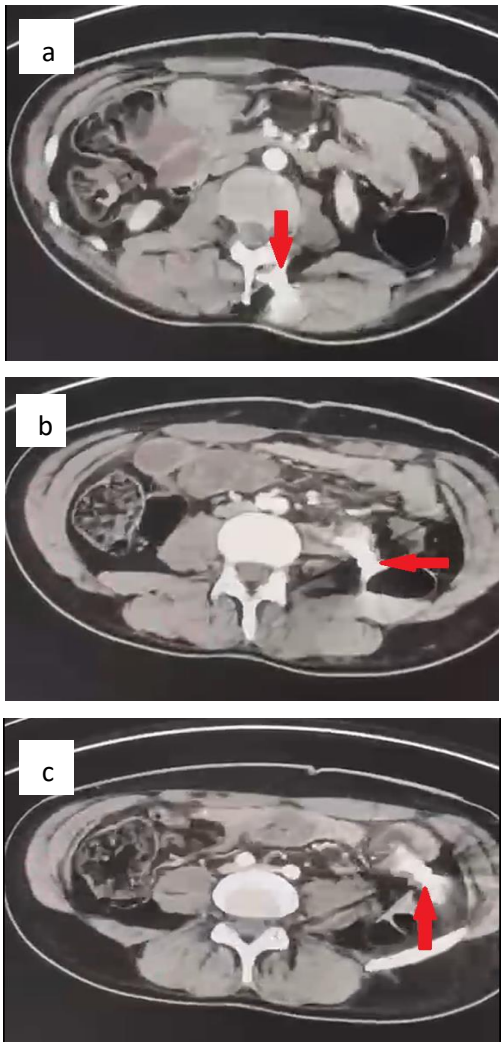

Figure 3(a) (b) (c): Trajectory of the metallic rod on the abdominopelvic CT sections

At the site of intraperitoneal entry, the object lay in proximity to the distal mesenteric vessels of small dimension and loops of the jejunum. Air bubbles were observed within the mesenteric fat, strongly suggesting perforation of a hollow viscus—most likely jejunal, given the extent of pneumoperitoneum. In addition, mesenteric fat stranding was noted in the left iliac fossa, with a thin layer of free intra-peritoneal fluid.

Antibiotics were administered, and the surgery was decided. The perforated intestinal segment was resected, the peritoneal cavity was irrigated, and a jejunojejunal anastomosis was performed. The patient was then transferred to the surgical intensive care unit. The postoperative course was uneventful, and the patient was discharged on postoperative day 3 in stable condition.

Discussion

Penetrating abdominopelvic trauma can be a complex challenge for the clinician. It commonly requires concurrent resuscitation and urgent decision-making. Although trauma is the leading cause of death worldwide, penetrating trauma is less frequent than blunt trauma and represents less than 15% of all trauma presentations (1). Studies report that penetrating abdominal trauma disproportionately affects young adult males (2).

Penetrating abdominal trauma most commonly arises from stab wounds or gunshot injuries, typically in the context of interpersonal violence. Most series report that gunshot wounds account for a substantial portion of penetrating abdominal trauma (≈ 64%), and stab wounds make up around 31% (3).

Accidental penetrating abdominal injuries (for example, work-related incidents or falls) remain rare compared with violent causes (2).

The most frequently affected sites in intra-abdominal stab wounds are the great vessels, the diaphragm, the mesentery, the spleen, the liver, the kidneys, the pancreas, the gallbladder, and the adrenal glands. The left upper quadrant is the most common location of the wounds, followed by the left iliac fossa, the right iliac fossa, and the right iliac fossa. Stab wounds to the posterior abdomen and the flank carry an increased risk of injury to retroperitoneal structures (4). Stab wounds are penetrating in only 45–76 % of cases, and among those, just 35–61 % are perforating (5).

The severity of presentation from penetrating abdominal trauma ranges from the stable patient with pain to the hemodynamically compromised patient with active hemorrhage. Upper abdominal wounds pose a specific threat as they can cross the diaphragm into the chest (6). Penetrating injuries to the anterior abdomen can damage solid organs and/ or cause peritonitis from hollow viscus injuries. Back and flank injuries pose a risk of injury to the retroperitoneal organs without peritonitis (7). The severity is mainly related to initial bleeding and to the high risk of infection due to associated lesions, which occur more frequently than in blunt trauma. The mortality of PPT exceeds 30% (8).

Emergency management of abdomino-pelvic trauma should be performed in a level 1 trauma center. The initial clinical presentation is often dominated by hemorrhagic shock in a hemodynamically unstable patient. Management must quickly obtain hemostasis by either surgical or radiological means.

Unstable patients with evidence of active hemorrhage should be explored surgically before time-consuming investigations are undertaken. However, simple blood tests, including cross-matching, should be undertaken for all patients regardless of status (9).

Meanwhile, Focused Abdominal Sonography For Trauma (FAST) may serve as a rapid bedside tool to detect free fluid or air within the peritoneal or pericardial cavities; nevertheless, its operator-dependence and limited sensitivity mean that a negative eFAST does not reliably exclude intra-abdominal injuries (5).

In hemodynamically stable patients presenting to the emergency department, the gold standard imaging is the contrast-enhanced CT scan. Its diagnostic accuracy in detecting significant intra-abdominal injury is high, with a sensitivity up to approximately 96% and a specificity exceeding 94 % (10) (11).

According to Kyle et al. The management of penetrating abdominal trauma can be divided into: damage control surgery, definitive surgical management, and selective non-operative management(9). In our case, despite the long and high-risk trajectory of the metallic rod, the patient had a single jejunal perforation without significant vascular, visceral, or skeletal injury. The lumbar entry point in our patient, along with the oblique intraperitoneal trajectory, exposed several critical structures, including the left

kidney, ureter, descending colon, and iliac vessels. The absence of injury to these organs is therefore unexpected and noteworthy.

Such cases highlight the unpredictable nature of impalement trauma, in which even extensive penetration may cause limited tissue disruption depending on the velocity, direction, and rotational stability of the foreign body.

Conclusion

In penetrating abdominal trauma, hemodynamic stability and negative findings on FAST do not rule out serious intra-abdominal injury. Integrating mechanism, wound trajectory, and contrast CT imaging, with vigilant reassessment, is essential to timely diagnosis and intervention. This case illustrates that prompt surgical action, guided by imaging despite a stable presentation, can lead to a good outcome.

Consent

Oral consent for publication was obtained from the patient. All information has been anonymized to protect patient privacy.

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