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CASE REPORT

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Management of a retained knife blade after abdominal stab injury: a case study

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ABSTRACT

Penetrating abdominal trauma poses significant challenges in clinical practice, often resulting from stabbing incidents. Such injuries frequently involve hollow viscus organs, with the intestines being the most commonly affected. While abdominal vena cava (AVC) injuries are rare, they can have severe consequences. We present a case of a 30-year-old woman who sustained a homicidal abdominal stab injury resulting in stomach perforation and the retention of a knife blade. Limited expertise at the peripheral hospital necessitated referral to our tertiary facility. The patient underwent exploratory laparotomy at the peripheral hospital, where the stomach perforation was repaired, but the retained knife blade was initially overlooked. Subsequent imaging revealed its presence, prompting a referral to our center. Upon admission, computed tomography (CT) imaging confirmed the blade locations within the duodenum's lumen and adjacent to the inferior vena cava (IVC). Elective exploration was planned, leading to successful removal of the blade and repair of associated injuries. Penetrating abdominal trauma requires a systematic approach to investigation and management. Collaboration between surgical specialties and advanced imaging techniques is pivotal in achieving optimal outcomes. This case underscores the complexities of managing penetrating abdominal trauma and the crucial role of collaboration and expertise in ensuring successful outcomes.

KEYWORDS

Penetrating abdominal trauma; Stab injury; Retained foreign body; Duodenal perforation; Surgical management; Tertiary care referral

ARTICLE HISTORY

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Introduction

Stabbing is a prevalent method of homicide worldwide, with penetrating abdominal trauma representing a significant challenge in clinical practice [1]. Such injuries occur when a sharp object penetrates the abdominal wall, often resulting in damage to hollow viscus organs, including the intestines, which are most frequently affected [2]. Additionally, injuries may extend to vital structures such as the diaphragm, mesentery, spleen, liver, great vessels, kidneys, pancreas, gallbladder, and adrenal glands [3]. Although injuries to major abdominal vessels are relatively rare, they can lead to life-threatening complications. Among these, abdominal vena cava (AVC) injuries are particularly concerning, with reported incidences ranging from 0.5% to 5% in cases of penetrating abdominal trauma and associated mortality rates between 20% and 66% [4]. Here, we present a compelling case of a 30-year-old woman who suffered a homicidal abdominal stab injury with a kitchen knife, resulting in a stomach perforation. Despite successful initial treatment, the case presented unique challenges, including the retention of a knife blade within the abdomen and subsequent management at a tertiary care center. This case underscores the importance of prompt recognition, appropriate intervention, and collaborative care in optimizing outcomes for patients with penetrating abdominal trauma.

Case Report

A 30-year-old lady was stabbed with a kitchen knife, leading to an emergency exploratory laparotomy at a periphery hospital for penetrating abdominal trauma. The operating surgeon conducted basic blood work and a chest X-ray, which revealed gas under the diaphragm indicative of a peritoneal breach. However, the presence of a retained knife blade was not initially recognized. During the operation, a 1 × 1 cm^2 stomach perforation in the anterior wall proximal to the pylorus was identified. Additionally, a hard object was palpated around the third part of the duodenum, with small blood clots present adjacent to the duodenum's right side. Primary repair of the anterior gastric perforation was performed, followed by peritoneal lavage and placement of intraperitoneal drains. Subsequent post-operative imaging revealed the presence of a retained knife blade foreign body. Despite the patient's stable condition, due to limited expertise at the referring institution, re-exploration was deferred. The patient was gradually transitioned to oral intake and referred to our institution on postoperative day 10 for management of the retained knife blade.

Upon admission to our facility, routine blood investigations were conducted, and contrast-enhanced CT imaging of the abdomen revealed the presence of a knife blade-like foreign body within the lumen of the third part of the duodenum and adjacent to the inferior vena cava (IVC) (Figures 1 and 2). After nutritional optimization, elective exploration was planned in collaboration with a vascular surgeon.

During the subsequent operation, the healed anterior gastric perforation was identified, and the duodenum's third part, adherent to the IVC, was carefully dissected to reveal the blade (Figure 3). A duodenal perforation in the posterolateral

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wall involving approximately 50% of the circumference of the junction between the second and third parts of the duodenum was identified. The blade (Figure 4) was safely removed from the IVC, and the resulting rent was repaired with a prolene 6-0 suture. Hemostasis was confirmed, and the duodenal perforation was repaired with a side-to-side loop duodenojejunostomy. Post-operatively, the patient's recovery was uneventful, with the gradual resumption of oral intake and removal of intraperitoneal drains and feeding jejunostomy tube. Long-term anticoagulation therapy was initiated, and the patient demonstrated complete recovery at the four-week follow-up.

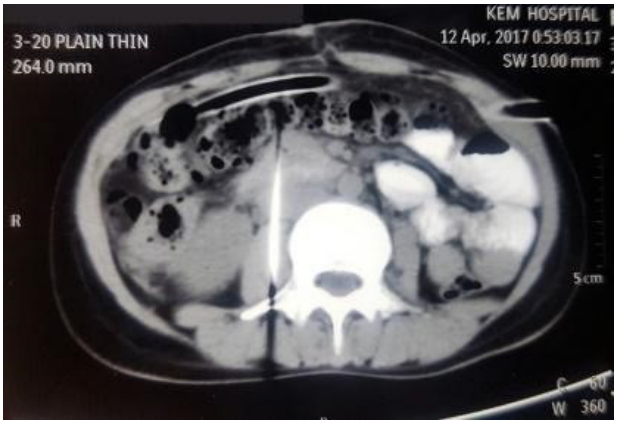

Figure 1. Contrast enhanced CT imaging of the abdomen showing presence of knife blade like foreign body within the lumen of third part of duodenum and IVC.

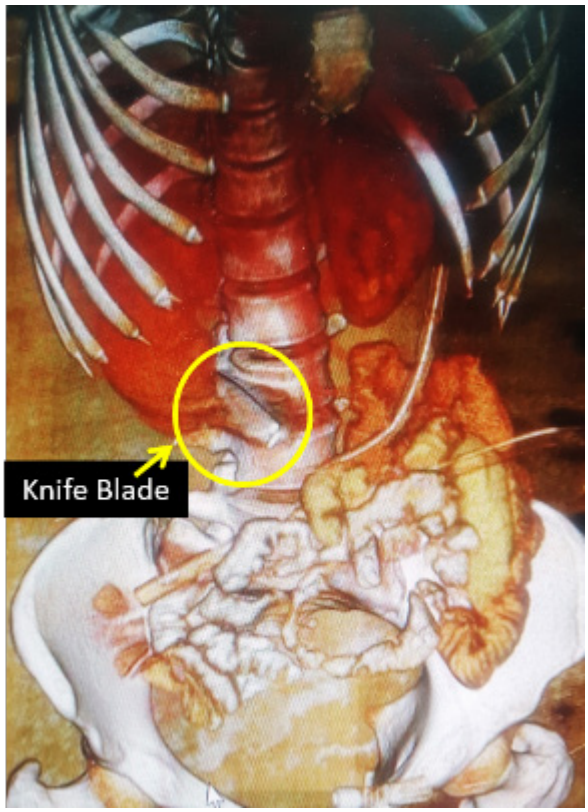

Figure 2. 3D-reconstruction image of abdomen shows knife blade lodged to the right of the spine.

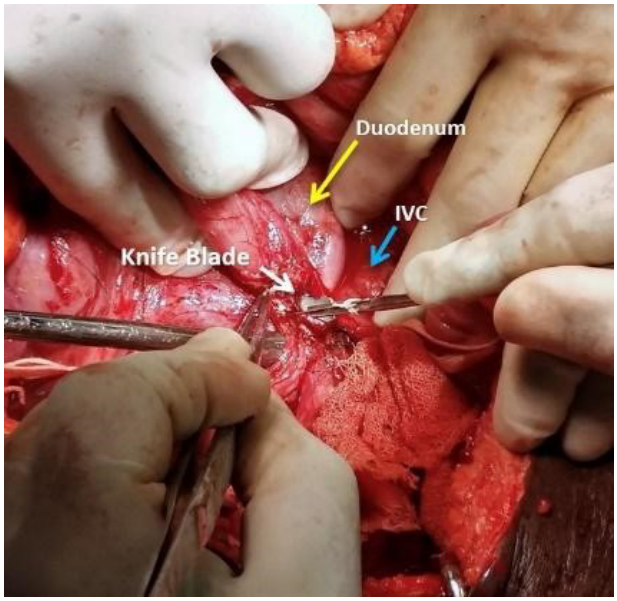

Figure 3. Duodenal third part adherent to the IVC; Duodenum was dissected off the IVC sharply, revealing the blade.

Figure 4. The Knife blade that was retained.

Discussion

Penetrating abdominal trauma presents a significant challenge to clinicians due to the potential for severe internal injuries and associated complications. This case highlights the complexity of managing such injuries, particularly when foreign bodies are retained within the abdomen. In this section, we discuss the approach to investigating and managing penetrating abdominal trauma, as well as strategies for dealing with retained foreign bodies.

Investigating and managing penetrating abdominal trauma

When confronted with a patient presenting with penetrating abdominal trauma, a systematic approach is essential to accurately assess the extent of the injury and plan appropriate management [5]. Initial assessment includes a thorough history, physical examination, and diagnostic imaging studies such as ultrasound, computed tomography (CT) scans, or diagnostic peritoneal lavage (DPL) [6]. These investigations aid in identifying the injured structures and determining the need for surgical intervention.

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In cases of suspected visceral injury, prompt surgical exploration is often necessary to identify and repair damaged organs [7]. The principles of damage control surgery may be applied, involving temporary measures to control bleeding and contamination followed by definitive repair once the patient's condition has stabilized [8].

In this case, the patient underwent exploratory laparotomy, during which the stomach perforation was repaired, and the retained knife blade was not immediately suspected. The decision made by the surgeon at the peripheral hospital to perform immediate necessary intervention and then refer the patient to a tertiary care center underscores the importance of acknowledging one's limitations in managing complex cases due to a lack of expertise and resources. In situations where specialized surgical expertise or advanced medical facilities are unavailable, such decisions become imperative to achieve the best possible patient outcomes. This decision was likely influenced by several factors, including the need for specialized surgical expertise to address the retained foreign body, potential associated injuries such as vascular damage, and the necessity for advanced imaging modalities to guide further management. This collaborative approach ensures that patients receive comprehensive care from multidisciplinary teams with the requisite expertise and resources to optimize their outcomes.

Management of retained foreign bodies

Retained foreign bodies in the abdomen pose unique challenges and require careful consideration during surgical exploration. These objects can lead to ongoing inflammation, infection, and even vascular injury if left untreated [9]. Thus, prompt identification and removal are essential to prevent further complications.

Various imaging modalities, including plain radiographs, CT scans, and ultrasound, can aid in localizing and characterizing retained foreign bodies [10]. In our case, post-operative abdominal X-ray imaging revealed the presence of a retained knife blade, prompting further intervention.

Surgical retrieval of retained foreign bodies may necessitate meticulous dissection to avoid further injury to surrounding structures. In cases where the foreign body is embedded in vital organs or major vessels, collaboration with subspecialty surgeons, such as cardiovascular or gastrointestinal surgeons, may be required [11]. Additionally, intraoperative imaging techniques, such as fluoroscopy or intraoperative ultrasound, can assist in guiding the removal process [12].

Following removal of the foreign body, thorough irrigation and debridement of the affected area are essential to minimize the risk of infection. In cases where associated injuries are identified, appropriate repair or reconstruction should be performed [13].

Management of duodenal perforation

The selection of a specific surgical procedure for a duodenal perforation depends on various factors, including the location and size of the perforation, the presence of associated injuries, and the patient's overall condition. Several algorithms have been proposed to guide surgeons in making these decisions. One commonly used algorithm is based on the classification of duodenal injuries according to the American Association for the Surgery of Trauma (AAST) grading system, which categorizes injuries from grades I to V based on severity [5].

Grade I and II injuries, which involve superficial or partial thickness perforations without significant tissue loss, treatment typically involves nasogastric tube decompression and a diet as tolerated. For moderate hematomas, a jejunal feeding tube may be placed, and total parenteral nutrition (TPN) may be considered. For large hematomas or lacerations, laparotomy may be necessary to evacuate the clot or repair the laceration.

In contrast, grade III to V injuries, which include full-thickness perforations with increasing degrees of tissue loss and associated vascular injuries, typically require surgical intervention. For grade III injuries, which are more severe, treatment options include primary repair, Roux-en-Y duodenojejunostomy reconstruction, or resection with end-to-end duodenoduodenostomy. The best option depends on the location and extent of the injury. For grade IV and V injuries, which are the most severe, treatment options include primary repair, Roux-en-Y duodenojejunostomy reconstruction, or pancreaticoduodenectomy. In some cases, repair may not be possible, and damage control surgery or pyloric exclusion may be necessary [14].

Ultimately, the selection of the most appropriate surgical approach should be individualized based on the patient's clinical presentation, intraoperative findings, and the surgeon's expertise.

In our case, the management of the duodenal perforation involved performing a side-to-side loop duodenojejunostomy. Additionally, the associated vascular injury was addressed through primary repair of the anterior wall of IVC. Both of these procedures are standard interventions commonly employed in the surgical management of duodenal perforations and vascular injuries. Their successful outcomes in our case highlight the importance of timely and appropriate surgical intervention in addressing complex abdominal injuries.

Conclusions

Penetrating abdominal trauma remains a significant cause of morbidity and mortality, requiring prompt recognition and intervention. The decision to perform minimum interventions and refer the patient to a tertiary care center highlights the importance of recognizing and respecting the limitations of local medical facilities. It also underscores the importance of a systematic approach to investigating and managing such injuries, including the prompt identification and removal of retained foreign bodies. Collaboration between surgical specialties and the utilization of advanced imaging techniques play crucial roles in achieving successful outcomes for patients with penetrating abdominal trauma.

Disclosure statement

No potential conflict of interest was reported by the author.

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