Laparoscopic exploration of the retroperitoneum in a gunshot victim: A case report

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ABSTRACT

INTRODUCTION: Non-operative management and minimally invasive surgery reduce the burden of negative laparotomies in patients with penetrating gunshot wounds (GSW). Careful patient selection is key. Although challenging, in experienced hands laparoscopic exploration of the retroperitoneal space can be carried out.

CASE PRESENTATION: A 38-year-old man was brought to the emergency room after sustaining a GSW to his right groin. Due to evidence of intoxication, clinical picture was unreliable, although the patient was hemodynamically stable and there were no signs of peritonitis. Furthermore, the presence of retained bullet fragments created significant artifact on imaging. Clinical and radiological uncertainty urged us to proceed with laparoscopic exploration. Following mobilization, the ascending colon wall was fully inspected and no injury was identified. The pelvic fracture was managed non-operatively. After an uneventful hospital course, the patient was discharged home in stable condition and outpatient follow up was re-assuring.

DISCUSSION: Avoiding morbidity from missed colonic injury is important, particularly in patients with unclear clinical and radiological findings, that were present in our case. Non-operative management by serial examination and minimally invasive surgical techniques are considered an alternative to the classical exploratory laparotomy approach. Furthermore, utilization of laparoscopy in retroperitoneal injury has gained much attention in the recent years particularly in well-established centers.

CONCLUSION: Laparoscopic exploration is a safe and effective surgical approach in patients who have sustained GSW to the abdomen and to the retroperitoneal space. However, it requires careful patient selection and surgical expertise.

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1. Introduction & importance

Historically, penetrating abdominal trauma, including anterior abdomen, flank and back, were treated similarly by operative exploration [1]. Advancements in diagnostic modalities, better understanding of anatomy and high negative laparotomy rates lead to development of guidelines for non-operative management for victims of penetrating abdominal injury [2]. Nonetheless, the classical approach to high velocity penetrating injuries is operative exploration through laparotomy, while low velocity mechanism including stab wounds or gunshot wounds (GSW) can be approached laparoscopically guided by the patient's condition and hemodynamic stability, as well as location and extent of injury. Laparoscopic exploration has gained attention in the recent years as an approach to penetrating anterior abdominal injuries, while it's use in cases of retroperitoneal injury remains controversial [3]. Although challenging, laparoscopic exploration of the retroperitoneal space has been reported [4,5]. We report a case of laparoscopic exploration of a retroperitoneal hematoma secondary to GSW to the retroperitoneum, in the absence of solid organ or hollow viscus injury. This work has been reported in line with the SCARE criteria [6].

2. Case presentation

A 38-year-old Saudi man was brought to the emergency room of a major trauma center by ambulance after sustaining a GSW to his right groin. Although difficult to obtain, the patient had no pre-
vious medical or surgical history and denied any drug history or previous allergies. His family history was unremarkable. His initial assessment showed an alert but intoxicated patient with intact airway and breathing. Although he was initially tachycardic with a heart rate of 128 beats per minute, his blood pressure was maintained at 118/63. Physical examination revealed a GSW in the right groin few centimeters below the level of the inguinal ligament with no active bleeding, with an exit wound in the right flank near the iliac crest (Fig. 1). Abdominal examination was unremarkable for any distention, ecchymosis or tenderness. The patient was able to move his limb and pulses were intact and palpable throughout the entire limb including femoral, popliteal and distal pulses.

Pelvic x-ray showed right iliac bone fracture with multiple metallic radio-opaque bullet fragments. Further imaging by computed tomography (CT) confirmed the presence of a comminuted fracture of the iliac crest associated with intra-muscular hematoma of the gluteus medius and iliacus muscles without any active contrast extravasation or evidence of active bleeding. Numerous metallic foreign bodies were scattered throughout the right gluteal region, right retroperitoneal area as well as the right iliac fossa with the largest lying in close proximity to the ascending colon (Fig. 2). Trace amount of free fluid and air foci were noted in the retroperitoneum. Although clear evidence of colonic injury was not appreciated, it’s absence could not be entirely ruled out. Intra-abdominal solid organs, urinary bladder and small bowel loops were unremarkable.

Resuscitative measures were initiated and the patient was shifted to the operating room (OR) for emergency diagnostic laparoscopy by a surgical team consistent of surgical trainees and a specialized trauma and acute care surgery consultant. The patient received intra-venous fluids, tetanus toxoid, prophylactic antibiotics and analgesia, and was kept nil per os (NPO) prior to surgery. Cefazolin 2 grams was administered intra-venously as well as analgesia by morphine 5 milligrams and fentanyl 100 micrograms. After shifting to the OR, the patient was placed in supine position and general anesthesia was induced. The abdomen, from the nipple line to the groin, was prepped using chlorhexidine and laparoscopic access gained safely by open Hasson technique. Intra-operatively, there was a large retroperitoneal hematoma extending between the right iliac fossa up to the hepatic flexure (Fig. 3). The peritoneum was not violated and no intra-abdominal free fluid or blood was found. Retroperitoneal exploration was carried out after full mobilization of the right colon. Bullet fragment was retrieved and no retroperitoneal injuries or active bleeding were identified (Fig. 4). The colon wall was fully inspected and appeared intact. Post-operatively, the patient had an uneventful hospital course. He was discharged home in stable condition, on post-operative day 5, after initiation of diet and physical rehabilitation. For prophylaxis against venous thromboembolism, the patient received heparin 5,000 units three times a day during his hospital stay and was switched to low molecular weight heparin 40 mg daily for 30 days at discharge. His pelvic fracture was managed non-operatively. Upon follow up in the clinic two weeks following discharge, the patient was in good condition. He was tolerating regular diet, mobilizing with assistance and did not have any complaints. No complications had occurred. Physical examination findings and laboratory results were re-assuring. Due to eligibility issues long-term follow up was not feasible at our center.

3. Clinical discussion

Negative laparotomies represent a significant healthcare burden owing to high complication rate, and prolonged hospital stay. Measures to reduce this burden include non-operative management by serial examination, or laparoscopic exploration, both of which can be considered in patients with low velocity penetrating injury who remain hemodynamically stable. The role for laparoscopic approach in retroperitoneal injury is poorly established but gaining much attention in the recent years. However, this approach requires expertise and careful patient selection.

Retroperitoneal injury from GSWs may range from musculoskeletal, duodenum, pancreas, kidneys, ureters, bladder, ascending and descending colon, major abdominal vessels with the most commonly organ involved being the colon [5]. Diagnosis of these injuries may be misguided by clinical picture as patients commonly remain asymptomatic [7,8]. Furthermore, as in our case, patients who are under the influence of alcohol or drugs have unreliable clinical findings. In GSWs, the bullet trajectory, bullet type and gunshot velocity may influence the extent and pattern of injuries [9]. High velocity GSWs can cause thermal injury that will not manifest until later in the clinical course. The ability to detect violation of peritoneum or presence of colonic injury may be radiologically challenging. Sensitivity of radiological tests may be masked by artifacts created by retained bullet fragments [5]. Thus missed injury can occur, resulting in significant morbidity and mortality.
rule out hollow viscus injury. The patient’s clinical picture as well as radiological findings encouraged us to explore the injury. Although there was no peritonitis and the patient remained hemodynamically stable, evidence of intoxication may be misleading. Another point to consider was the suboptimal sensitivity of CT scan for detection of colonic injury especially in the presence of artifact related to the retained bullet fragments.

Declaration of Competing Interest

The authors report no declarations of interest.

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Ethical approval

Case reports do not require ethical approval by our institution.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal upon request.

Author contribution

All authors contributed to the manuscript preparation including data acquisition, literature review and writing.

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