

Trauma and reconstruction

Needle in a haystack: Robotic removal of a retroperitoneal wire

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ABSTRACT

Retroperitoneal foreign bodies are rare indications for exploratory surgery. We present a case of a 19-year-old male with abdominal pain after a fall who was found to have a linear metallic object adjacent to the right ureter and inferior vena cava. Given the patient's pain and discomfort, he elected for robotic exploration of the retroperitoneum, which was carried out successfully with the Da Vinci Si® robot. This case demonstrates the feasibility of robotic retroperitoneal exploration and foreign body retrieval for a very small object.

Introduction

Robotic-assisted surgery has become commonplace in urology.¹ The use of a surgical robot allows for excellent visualization of the surgical field and enables fine instrument movements.² Though oncologic management of retroperitoneal renal and adrenal masses with robotic surgery has been thoroughly described, few cases of robotic retroperitoneal exploratory surgery have been reported.³ We present a case of a patient who underwent successful retroperitoneal retrieval of a foreign body using the Da Vinci Si® robot.

Case presentation

A healthy 19-year-old male with no past medical history presented to the emergency department with one day of chills, loose stools, and worsening, sharp lower quadrant abdominal pain exacerbated by movement and relieved by rest. The patient denied any history of musculoskeletal trauma to the back or abdomen. The patient was afebrile and hemodynamically stable. His physical exam was significant for right lower quadrant tenderness and positive McBurney's sign. Given the suspicion for acute appendicitis, a computed tomography (CT) scan of the abdomen and pelvis was performed, which was unremarkable except for a small linear hyperdensity posterior to the liver that was felt to be radiographic artifact (Fig. 1a). Laboratory studies, including basic metabolic panel, blood cell counts, hepatic function panel, serum lipase, and urinalysis were normal. The patient was discharged from the emergency department with oral analgesics for symptomatic

management of presumed musculoskeletal pain. Five days later, he returned to the emergency department with continued abdominal pain and non-bloody diarrhea. Again, thorough examination and laboratory evaluations were negative for acute abdominal pathology, and the patient was discharged.

Approximately one month after initial presentation, the patient returned to the emergency department with significant abdominal pain. Laboratory studies were again normal. A repeat CT scan of the abdomen and pelvis revealed a 15 mm linear metallic object lateral to the right ureter and gonadal vein at the level of the lower renal pole (Fig. 1b). There was inflammatory stranding surrounding the object and mild hydroureter proximal to the object. Retrospective assessment of prior CT images revealed the same metallic object inferior to the tip of the right lobe of the liver and deep to the rectus musculature (Fig. 1a). Up to this point, physical examination of the back had not been performed. A complete physical examination revealed a 10cm area of healing scab ('road-rash') overlying the right flank and iliac crest. Further questioning revealed that the healing external injury was from a skateboarding accident (fall) while on an asphalt tennis court three months prior to initial presentation.

The patient elected to have the object removed through a robotic approach. The patient was placed in the left modified lateral position (Fig. 2). After safely establishing pneumoperitoneum, a periumbilical 12mm camera trocar was placed (Fig. 2, C), followed by two Da Vinci Si® robotic trocars (Fig. 2, L = left, R = right), and a 5 mm AirSeal® assistant trocar (Fig. 2, A). After docking the Da Vinci Si® robot, the ascending colon was medialized and duodenum Kocherized to expose

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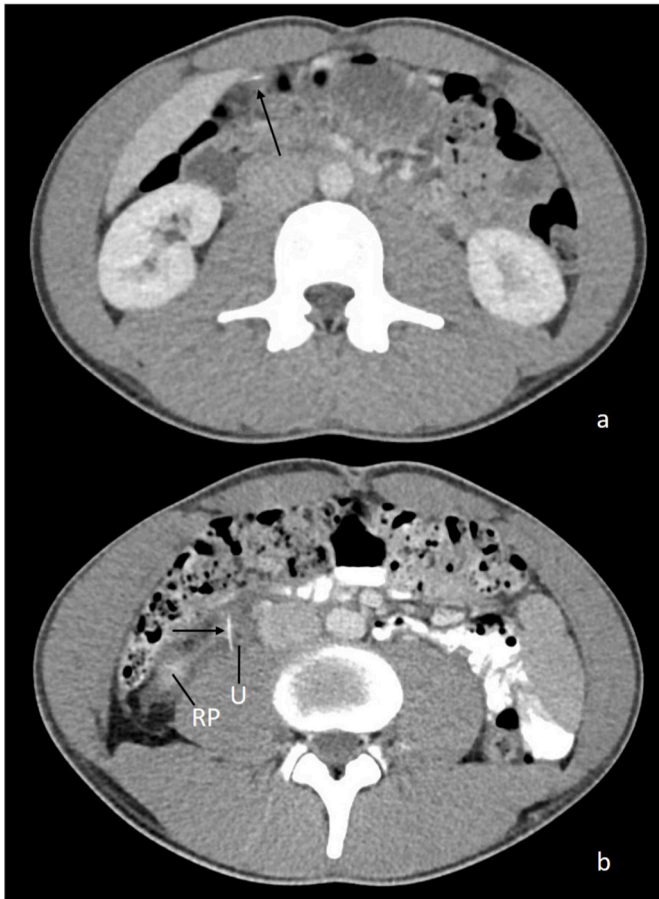


Fig. 1. a. Initial axial CT image of the abdomen showing the metallic object (arrow) medial to the right lobe of the liver and posterior to the rectus musculature, and b. Subsequent axial CT image of the abdomen showing migration of the object (arrow) to be adjacent to the right ureter (U), inferior vena cava, and right lower renal pole (RP).



Fig. 2. Robotic trocar placement for the procedure, including 5 mm left arm port for Maryland bipolar grasper (L), 12 mm camera port (C), 5 mm AirSeal® assistant port (A), and 5 mm right arm port for monopolar scissors (R).

the vena cava and right renal and gonadal veins. The plane between the right gonadal vein/psoas and right ureter was bluntly developed, though there was some edematous and fibrotic tissue near the right renal lower

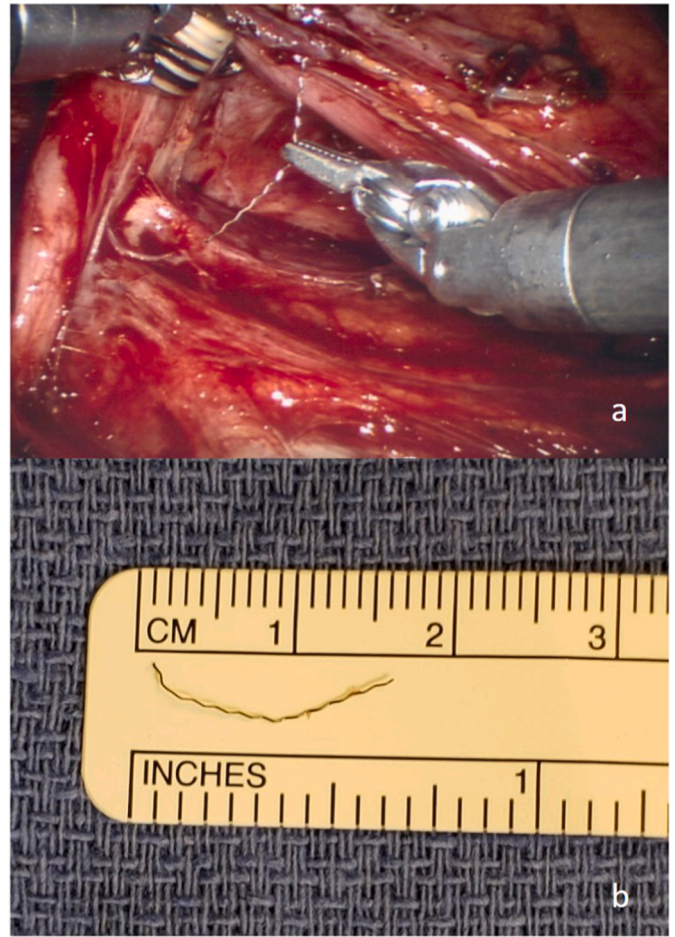


Fig. 3. a. Intraoperative image showing retrieval of the foreign body, and b. Foreign body with ruler to scale, demonstrating length consistent with estimates from pre-operative imaging.

pole. The foreign body was visualized within the inferior cone of Gerota’s fat adjacent to the right ureter (Fig. 3a). This was removed in its entirety with laparoscopic graspers (Fig. 3b). There was no evidence of ureteral injury. The patient had an uneventful postoperative course and was discharged on postoperative day 1. Although the patient did not attend any of his urology clinic follow-up appointments, renal ultrasonography at 4 weeks after surgery was unremarkable, and at a clinical evaluation for an unrelated orthopedic issue, he was free of abdominal pain.

Discussion

This case demonstrates the feasibility of robotic retroperitoneal exploration for foreign bodies. Though the urology team was not consulted until just prior to surgery, urologic consultation was appropriate due to the specialty’s familiarity with retroperitoneal surgery.¹

This is a case in which we feel the robotic approach added value to the case as compared to pure laparoscopic or open surgery because the foreign body was quite small and actually very difficult to find. A pre-operative concern was that manipulation of the tissues might displace the foreign body into a place that might make finding it impossible. Compared to the pure laparoscopic or open approach, a robotic technique facilitated higher resolution visualization of the surgical field in three dimensions and arguably facilitated parsimonious tissue manipulation to prevent unrecognized displacement of the foreign body into a deeper hidden location.^{2,4}

Before all cases such as this, it is essential to counsel the patient that

exploration may not result in successful foreign body removal, and that foreign body removal may not resolve the presenting symptoms. Fortunately, in this case, an ideal outcome was achieved.

To our knowledge, there has been one report of a robotic retroperitoneal exploration in the literature. This was a case of a scalpel blade removed from the aortic bifurcation of a patient who underwent lumbar discectomy complicated by blade migration to the abdomen.³ The precision and resolution of the surgical robot was beneficial to the surgical team due to the close proximity of the sharp object to delicate retroperitoneal structures.³ There has also been a prior reported case of metallic wire causing abdominal pain secondary to bowel perforation, a situation in which the foreign body was removed laparoscopically.⁵

The question remains: what was the foreign body and how did it get there? We suspect that the foreign body was a filament derived from the braided metallic wires that are used to tension tennis court nets, given the location of the prior skateboarding accident.

Conclusion

We present a case of a 19-year-old male with abdominal pain secondary to a retroperitoneal foreign body. Robotic exploratory surgery was used to successfully retrieve the object. To our knowledge, this is only the second reported case of robotic retroperitoneal exploration and appears to be a viable method of treatment.

Consent

Consent was obtained from the patient to present this case.

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Declaration of competing interest

The authors declare no conflicts of interest.

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