Complex endovascular retrieval of an intravascular foreign body

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ABSTRACT

We report a case of a 54-year-old man who developed bilateral multifocal pneumonia as a result of septic thromboembolization from an ingested ballpoint pen that migrated through the gastrointestinal system and lodged in the inferior vena cava. The ballpoint pen was removed from the inferior vena cava with a complex endovascular approach using internal jugular and common femoral vein access with the combination of a snare device and atrumatic laparoscopic grasper. Consent for publication was obtained, and all identifying information has been omitted.

The removal of intravascular foreign bodies are an uncommon occurrence, although it is well-described in the literature. These cases typically involved the use of a snare device for migrated or fractured medical devices, and reports involving other strategies are rare. We describe the case of successful endovascular removal of a foreign body from the inferior vena cava (IVC) with a novel technique using the combination of a multilobe snare device and laparoscopic grasper. Consent for publication was obtained, and all identifying information has been omitted.

CASE REPORT

A 54-year-old man with a history of developmental delay presented to the hospital with a 1-day history of fever and shortness of breath. The patient could not provide any relevant history and was found to be in septic shock requiring fluid resuscitation, vasopressors, and broad spectrum antibiotics. His initial work-up with chest radiograph showed bilateral cavitary lung lesions, and a computed tomography scan of his chest, abdomen, and pelvis demonstrated bilateral cavitary lung lesions, concerning for septic emboli. Imaging also revealed a linear foreign body within the IVC, which seemed to extend extraluminally into the retroperitoneum (Fig 1).

He was subsequently transferred to a tertiary care hospital. After a period of medical stabilization, he was taken to the operating room for endovascular removal of the foreign body from the IVC. Endovascular retrieval was considered given his clinical status and ongoing sepsis, with the plan for open retrieval and repair if an endovascular approach was unsuccessful. Cardiac surgery was also available and on standby with cardiopulmonary bypass due to proximity of the foreign body to the right atrial wall. General anesthesia was induced, and a transesophageal echocardiogram was performed throughout the procedure with real time monitoring of the atrial septum. Percutaneous access was obtained in the right internal jugular vein, and a 16F 44-cm Gore DrySeal (W. L. Gore & Associates, Flagstaff, Ariz) sheath was placed. Percutaneous access was also obtained in the right common femoral vein, and an additional 8F 55-cm sheath was placed (Fig 2). A venogram demonstrated the foreign body within the suprarenal IVC, which seemed to penetrate through the vessel wall into the retroperitoneum.

Intravascular ultrasound imaging was placed through the right common femoral vein access and demonstrated the foreign body as well as intraluminal thrombus in the IVC. An initial attempt with a multilobe snare device was made from the right internal jugular approach, but was unable to effectively capture and direct the foreign object off the IVC into the sheath. The snare was then introduced from the common femoral vein access, and an atrumatic laparoscopic grasper was introduced from the internal jugular access. With simultaneous traction using the snare from the femoral access and the laparoscopic grasper from the right internal jugular, the foreign body was directed into the 16F sheath. The foreign body was then pulled through the sheath and removed from the patient (Fig 3). A completion venogram did not demonstrate significant residual thrombus within the IVC or evidence of extravasation. An intravascular ultrasound catheter was also placed in the IVC and did not show any evidence of vessel wall injury. The 16 F sheath was removed from the internal jugular vein and primarily repaired with polypropylene suture. The patient remained...
hemodynamically stable throughout the procedure and was extubated upon completion of the case.

Postoperatively, a swallow study was performed and demonstrated contained extravasation from the duodenum into retroperitoneum. The patient was subsequently taken for an exploratory laparotomy with general surgery. The duodenum was mobilized; the defect in the posterolateral wall was debrided to healthy tissue and repaired with interrupted sutures in two layers. No bleeding from the retroperitoneum or evidence of fistulization was encountered during the procedure. His blood cultures did not demonstrate growth of any organisms, and he was continued on vancomycin and piperacillin-tazobactam for 14 days for his cavitary pneumonia. Given the residual thrombus within the IVC, he was maintained on enoxaparin and transitioned to apixaban before discharge. The duodenal repair was evaluated with a Gastrografin swallow study that was negative for an intestinal leak. He was able to tolerate a regular diet and discharged to a rehabilitation center on hospital day 10.

DISCUSSION

This case demonstrates complex endovascular retrieval of a ballpoint pen that caused multifocal pneumonia and sepsis after remote ingestion. We speculate that after ingestion the foreign body traveled through the gastrointestinal tract and eroded through the duodenum and IVC and lodged against the right atrial septal wall. Traditional approaches to foreign body retrieval in this location would include a median sternotomy and cardiopulmonary bypass. However, in the settings of sepsis and bilateral multifocal pneumonia, this procedure would be associated with prohibitive mortality. We describe the successful endovascular removal of a foreign body with a novel technique using the combination of a multilobe snare device and laparoscopic grasper.

The ingestion of foreign bodies leading to perforation or fistulous connection between the vasculature and gastrointestinal tract are rare but well-described in the
Foreign body ingestion with involvement of the venous system is even more unusual, but has been observed with sharp objects such as a toothpick or fishbone. As observed in this case, foreign bodies may be thrombogenic and associated with sepsis and embolism. Thus, a high degree of suspicion to investigate unusual causes of pulmonary emboli should be observed.

The majority of reports describing the removal of foreign bodies from the venous system involve the removal of medical devices including IVC filters, catheters, and wires. Carroll et al described their experience with removal of 27 intravascular devices, which largely involved fractured and embolized wires and catheters, and were able to use snares in the majority of cases to remove the devices. More unusual cases including the retrieval of nonmedical foreign bodies are rare. Schroeder et al described the endovascular removal of a bullet fragment within the internal iliac vein using a biliary retrieval set. Kim et al described the case of septic thrombosis of the IVC caused by a foreign body. Sultan Qaboos Univ Med J 2010;10:266-8.

We observed a toothpick perforation of the external iliac vein using a biliary retrieval set. Kim et al described the case of septic thrombosis of the IVC caused by a foreign body. Sultan Qaboos Univ Med J 2010;10:266-8. We proposed management of a foreign body-case reports of 3 patients and literature review. Medicine (Baltimore) 2020;99:e20849.

Additionally, precautions including intraoperative transesophageal echocardiogram and the presence of cardiac surgery were used to avoid any untoward outcomes.

CONCLUSIONS

The effective retrieval of foreign objects is feasible with minimally invasive technology and should be considered after initial resuscitation and optimization. Although uncommon, this method can be used as an alternative approach for the complex removal of foreign objects from the vascular system.

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