Catheter Pinch off with Foreign Body Retrieval

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Semin Intervent Radiol 2017;34:81–84

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A broken catheter constitutes the most common type of nontraumatic intravascular foreign body. Typically, it is inadvertently broken or cut by a care giver; however, an implanted device may also fracture by normal “wear and tear.” Intravascular foreign body retrieval is an unusual challenge but one that is uniquely suited for interventional radiologists.

Clinical Case

A 55-year-old malpractice attorney presented to the emergency department with complaints of “racing heartbeat.” She had been seen 1 week earlier with similar symptoms which quickly resolved without therapy and she received no imaging during her initial visit. Her past medical history was remarkable for breast cancer which was treated 8 years earlier and was now in remission. She had a surgically placed subcutaneous chest port which had not been used for 6 years. A chest radiograph was obtained revealing catheter fracture with embolization of the fragment into the left pulmonary artery (►Fig. 1). Interventional radiology was then consulted for management options.

Intravascular foreign body retrieval was discussed with the patient and she elected to proceed. The right common femoral vein was catheterized and a 7F vascular sheath was placed. The left main pulmonary artery was selected (►Fig. 1b) using a 6F van Aman catheter (Cook, Bloomington, IN). This was exchanged over a guide wire for an endovascular snare (Ensnare endovascular snare system, Merit Medical, South Jordan, UT) which was then used to capture the catheter fragment (►Fig. 1c, d) under fluoroscopic guidance. The fragment was retracted from the pulmonary artery, pulled through the heart and into the inferior vena cava (►Fig. 1e), and finally into the right femoral vein sheath. The sheath and fragment were then removed as a unit from the groin. The remaining portion of the subcutaneous port was then removed from the right chest. The patient tolerated both procedures well and was discharged that day without further complaints.

Discussion

Catheter pinch-off syndrome typically occurs in long-term venous access devices such as chest ports inserted via the subclavian vein. A medial access site leads to repeated compression on the catheter portion of the device by the costoclavicular ligaments. Over months to years, catheter fatigue, and occasionally fracture, may occur. In some cases, the catheter will fracture but not embolize. In others, it migrates into the heart or pulmonary vasculature as in this case. Catheter fragments may be asymptomatic, but they may also be lethal in rare cases causing cardiac perforation and tamponade. It is important to recognize that catheter pinch-off does not occur when the internal jugular vein is used as the access site because unlike the subclavian vein, this vein is not repeatedly compressed by normal anatomic structures. Increasingly the internal jugular vein is used for central venous access and as expected, catheter pinch-off syndrome is rarely encountered in current practice.

As endovascular procedures have multiplied, so too have the numbers of malpositioned or embolized devices such as coils, filters, stents, guide wires, and catheters. Venous foreign body retrievals are most common, but arterial and nonvascular retrievals are also increasing. There are a variety of devices used for foreign body retrieval. The most common is a simple snare which consists of a fixed loop at the end of a wire. As this is advanced out of a catheter, the loop forms and can be manipulated around a foreign body. By retracting the snare back into the catheter, the loop closes, enabling the foreign body to be captured and removed (►Fig. 2). Other devices which may be used to facilitate foreign body retrieval include intravascular forceps, baskets, reverse curved catheters, angioplasty balloons, and wire and sheath combinations (►Fig. 3). Commonly, devices are used in tandem with a variety of techniques to achieve a desired end-point.

It is important to recognize that while retrieval using minimally invasive techniques is usually the best option, capturing the device is not the only consideration. The ability

Fig. 1 Woman with irregular heartbeat. (a) Fluoroscopic image of the chest shows the subcutaneous port tubing is fractured at the level of the clavicle (solid black arrow) with an embolized fragment in the left main pulmonary artery (dashed black arrow). (b) Fluoroscopic image shows catheterization of the left pulmonary artery. (c) Fluoroscopic image demonstrates positioning of snare device. (d) Fluoroscopic image shows capture of fragment. (e) Fluoroscopic image over the abdomen shows fragment pulled into the inferior vena cava prior to removal.

Fig. 2 Mechanism of intravascular snare. When the wire is retracted, the loop is pulled into the catheter causing it to decrease in diameter and finally capture the foreign body.

Common Devices Used for Foreign Body Retrieval

Fig. 3 Common devices used in foreign body retrieval.

to safely reposition or remove the captured device also must be determined. Management of complications which may ensue during retrieval and repositioning may be limited. For example, removing an embolized stent or caval filter with sharp edges from the pulmonary artery may result in damage to the tricuspid valve leading to acute regurgitation or myocardium causing fatal tamponade. In some instances, it may be desirable to simply reposition the offending object to facilitate surgical removal. For example, larger objects such as a bullet could be captured, retracted to the groin and then removed via a surgical cut down. Each case should be

evaluated individually and in some instances, surgical explantation will remain the best option. Finally, in some patients, the best strategy may be to simply leave the object in place; many foreign bodies are asymptomatic and unlikely to cause untoward effects.

Suggested Reading

- 1 Funaki B. Central venous access: a primer for the diagnostic radiologist. *AJR Am J Roentgenol* 2002;179(2):309–318