Embolized Guidewire into Central Aorta: A Nightmare in the Pediatric Intensive Care Unit

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Abstract

A 4-month-old preterm, critically ill infant weighing 3.8 kg was admitted to our pediatric intensive care unit with congestive cardiac failure due to a large ventricular septal defect and its sequelae. During an attempt to insert a central line into the right subclavian vein at bedside, the guidewire inadvertently entered the subclavian artery and embolized distally. After multiple failed retrieval attempts, including surgical femoral cut-down to retrieve the wire, it was removed finally by fluoroscopic-guided percutaneous catheterization with the help of a cardiac bioprobe and a gooseneck snare utilizing a novel maneuver.

Keywords

- guidewire
- pediatric
- retrieval

Introduction

Central venous catheters are often used in pediatric intensive care units (ICUs) as access for fluids, administration of drugs, and blood sampling. When used properly, they are generally safe, but there are various associated complications such as infection, arrhythmia, guidewire embolization, catheter fracture, and embolization. Guidewire embolization in a low birth weight small infant is not only rare but a very challenging complication for clinicians. Retrieval may be possible by surgical or percutaneous techniques.

Case Report

A 4-month-old preterm male infant weighing 3.8 kg was admitted to the pediatric ICU with a diagnosis of a large ventricular septal defect with congestive heart failure, lower respiratory tract infection, septicemia, hyperbilirubinemia, and generalized tonic clonic seizures. He was managed with intravenous antibiotics, inotropic support, diuretics, digoxin, and mechanical ventilation. During an attempt to cannulate the right subclavian vein for inserting a central line, the patient developed a generalized seizure and the control over the proximal end of guidewire (0.021 inch diameter, 20 cm long) was lost and it inadvertently embolized distally. Vascular access could not be obtained via the ipsilateral subclavian vein despite ultrasonographic guidance. Abdominal radiograph showed dis-

tal end of guidewire near the femoral head region (►Fig. 1). Patient was transferred to a vascular surgeon who attempted retrieval by common femoral venous cut-down, but failed.

Finally, he was transferred to the cardiac catheterization laboratory for attempted removal by percutaneous technique to avert a major surgery. Anteroposterior and angulated fluoroscopic views confirmed the position of the guidewire in the aorta, not in the inferior vena cava. Multiple attempts to puncture left femoral artery failed due to hypotension and absent pulse due to repeated punctures earlier, probably to take arterial blood samples. Finally, access was possible through the right common femoral artery superior to the cut-down site and a 4 Fr pediatric sheath was inserted. Though a short length pediatric sheath was used, because of the superiorly located puncture site, the distal end of the sheath crossed the distal end of the embolized guidewire, obviating direct distal end snaring (►Fig. 2A).

Snaring of the proximal end of the guidewire was attempted with an Amplatz 4 Fr (5 mm) gooseneck snare. The proximal end of the guidewire appeared to be embedded subintimally in the roof of the aortic arch, as it failed to get trapped into the snare despite repeated attempts. A 3 Fr myocardial biopsy forceps (Cook Medical) was introduced and the guidewire was caught at the level of the aortic bifurcation. The wire was then slightly withdrawn distally to free the proximal end of the wire from the subintimal

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Fig. 1 The abdominal X-ray shows distal end of the retained guidewire near right femoral head.

space. This allowed the gooseneck snare to trap the proximal end. But due to the small size of the aorta, the end of the wire being very hard superiorly, it could not be manipulated into

the catheter nor turned upside down to snare it out that end. The only solution was to push the wire into one of the aortic arch branches so that the softer distal end could be snared out. Thus, the wire was caught in the snare and slowly pushed superiorly into the left common carotid (which had straight alignment with the guidewire tip) up to a point below the carotid bifurcation. This brought the softer distal end of the guidewire above the level of the femoral sheath tip. This softer end could be bent to bring it inside the femoral sheath and then it was able to be snared out successfully (→ **Fig. 2B–F**). Controlled fluoroscopy and careful wire inspection were done to ensure that the wire was not broken and totally extracted (→ **Fig. 3**). The femoral sheath was removed and proper hemostasis was achieved. Total procedure time was 95 minutes and total blood loss during the whole procedure was minimal. This critically ill infant, already on ventilatory support with borderline blood pressures, tolerated the procedure well without any added complications.

Discussion

Venous catheters are extremely useful in managing critically ill patients in the pediatric ICU. Reported complications related to catheterization include nosocomial sepsis, vasospasm, thrombosis, vascular perforation, embolism, catheter fracture with

Fig. 2 Stored fluoroscopic images show (A) distal end of sheath crossing the distal end of guidewire obviating direct distal end snaring. (B) Snare unable to grab proximal end of guidewire because it was embedded in subintima. (C) Guidewire was moved distally using biopsy forceps to get free of the proximal end. (D) Proximal end was grabbed with snare. (E) Proximal end of guidewire was pushed into left common carotid artery; thus, distal soft end came above the level of sheath tip. (F) Distal soft end of guidewire was bent into sheath tip and snared out successfully.

Fig. 3 Extracted whole guidewire (0.021 inch diameter, 20 cm long).

embolization, and guidewire embolization.¹ Chow et al reported an incidence of 6.7 embolizations (mainly including catheter fragment) per 1,000 pediatric catheter insertions.² Guidewire fragment embolization has a higher reported incidence of up to 1.4/100 insertions.³ Multiple insertion attempts, technical mistakes during insertion, wire breakage/unraveling during insertion, and low user experience are major reported causes of guidewire embolization.³

The unique complexity of our patient was that the guidewire had embolized into the arterial system and was lodged in the central aorta with its proximal hard end embedded in the roof of the aortic arch—a seriously different situation compared with venous embolization where thrombosis would be less hazardous. The second complexity related to retrieval was the smaller size of the femoral artery compared with the vein—which limits the size of sheath (and thus the hardware used) that can be safely introduced. Moreover, due to the small size of the infant, the 20 cm long guidewire in the aorta reached below femoral bifurcation distally. The manipulation of a guidewire into the left carotid artery can be dangerous as it may lead to serious vascular complications such as perforation, occlusion due to dissection or thrombosis and it should never be attempted routinely. We gently pushed the wire so that the distal end could be snared to the femoral sheath. This is probably the first such case reported in literature where a long guidewire embolized as a whole and lodged in the aorta of a small 4-month-old infant, which was successfully retrieved percutaneously without any complication.

Different techniques have been described for percutaneous intravascular foreign body retrieval, including the loop snare technique, helical baskets use, and the forceps technique.¹ Single loop snare is most commonly used due to its availability in a smaller profile. Helical baskets and triple

loop snares may be more useful in foreign body retrieval from difficult anatomical positions such as the coronary sinus, foreign objects abutted against a wall, or retrieval of an uncoiled guidewire.^{1,4}

Conclusion

Peripherally inserted central venous catheterization is common in the ICU care. Guidewire embolization is an uncommon but serious complication and more so in the arterial system. The present case highlights the importance of meticulous technique during insertion of catheters. Percutaneous endovascular retrieval without complication is possible but depends on availability of appropriate hardware and necessary skill.

Conflict of Interest

None.

References

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