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Case Report

Percutaneous Retrieval of an Intracardiac Migrated Nitinol Stent with Endovascular Biopsy Forceps

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Keywords

- Percutaneous retrieval
- Stent migration
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Abstract

Intracardiac stent migration is a rare but potentially fatal complication of endovascular stenting. A patient was referred for right brachiocephalic vein stenting for dialysis access venous stenosis. The stent migrated to right atrium upon deployment. Stent extraction was attempted with gooseneck snares but failed. Two endovascular biopsy forceps were then introduced and fractured the stent into two parts for removal. The patient was stable during the procedure and was subsequently discharged. No adverse cardiovascular event occurred. This case report demonstrates the usefulness of the strong gripping capability of endovascular forceps to retrieve a migrated stent that could not be approached by snare technique.

ABBREVIATIONS

SVC: Superior Vena Cava; IJV: Internal Jugular Vein; CFV: Common Femoral Vein; ECG: Electrocardiograms

INTRODUCTION

There is an increasing role of endovascular stenting in maintenance of vascular access patency for chronic hemodialysis. However, such technique is not without risks. Stent migration is one of the reported complications. Snare technique has been widely described as a safe and effective method for percutaneous retrieval of endovascular foreign bodies [1-6]. The use of endovascular forceps as the primary instrument for migrated stent removal was not as commonly reported in literature. We report a case of successful percutaneous extraction of an intracardiac migrated self-expandable nitinol stent with the use of endovascular biopsy forceps. Institutional review board approval and inform consent are not required for case reports at the performing institution. The report was performed according to the World Medical Association Declaration of Helsinki.

CASE PRESENTATION

A 52-year-old female patient was referred for right brachiocephalic vein stenting. She suffered from recurrent stenosis of the vein despite multiple balloon angioplasties. She had been on hemodialysis via right arm arterio venous fistula for 10 years due to chronic renal failure, with underlying systemic lupus erythematosus and membrano-proliferative glomerulonephritis.

Diagnostic right subclavian venogram before the procedure demonstrated a tight occlusion at the junction of superior vena cava (SVC) and right brachiocephalic vein (Figure 1). Attempt to cannulate the obstruction from femoral approach was unsuccessful. Balloon angioplasty with a 10mm balloon was therefore performed via right cephalic vein. The stenotic part measured 9mm in caliber on post-angioplasty angiography. A 12mm x 40mm self-expandable nitinol stent (SMART, Cordis endovascular, Warren, NJ, USA) was deployed through the same approach (Figure 2a). However, the stent jumped forward upon release and migrated to right atrium (Figure 2b). A 0.035-inch angled hydrophilic guide wire (Glidewire, Radifocus, Terumo

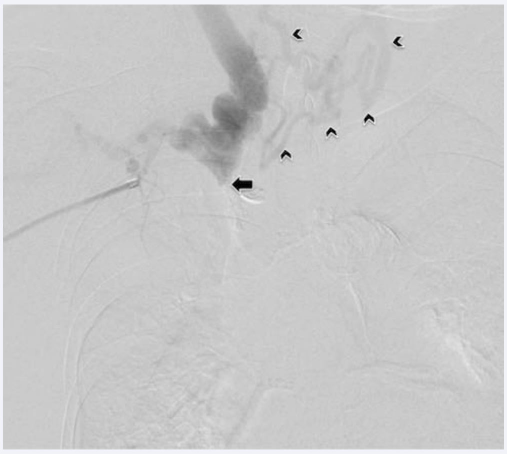

Figure 1 Right sublcavian venogram before balloon angioplasty. Occlusion was noted at the junction of right brachiocephalic vein and superior vena cava (arrow). SVC could not be opacified. There were dilated collaterals (arrowheads).

Medical, Tokyo, Japan) was immediately applied across the stent to prevent further stent migration into right ventricle and pulmonary arterial system (Figure 2c).

16Fr introducer sheaths were inserted to right internal jugular vein (IJV) and right common femoral vein (CFV) respectively. Stent extraction was attempted by using 6Fr 20mm gooseneck snare catheters (Amplatz, EV3 Endovascular, Plymouth, MN, USA), which were introduced from the venous sheaths. However, the snares failed to pass over the ends of the stent because of its large size. Its position was unfavorable, with no free edges available in right atrium. 7Fr standard biopsy forceps (Cordis, Johnson and Johnson, NJ, USA) were then introduced to grasp the ends of the stent through the venous sheaths. Attempts for repositioning of the stent with the forceps were unsuccessful. Therefore, the stent had to be torn into two parts by the two forceps and retrieved through the venous sheaths (Figures 3a,3b). No residual foreign body was detected.

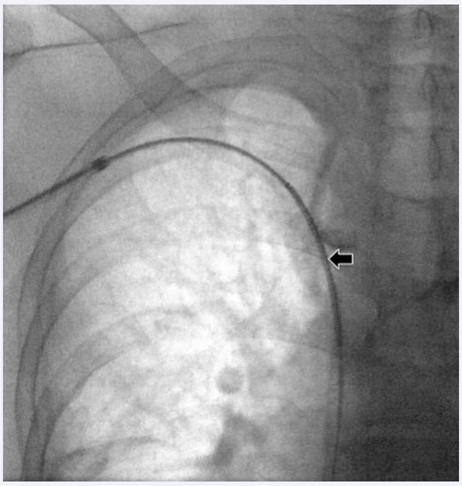

Figure 2a A self-expandable nitinol stent (arrow) was deployed across the stenotic segment.

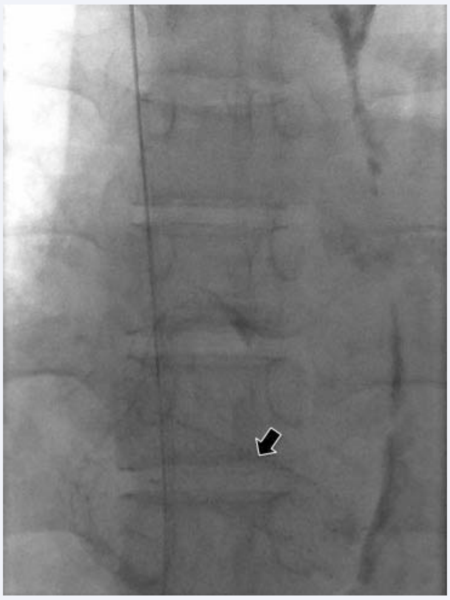

Figure 2b The stent (arrow) jumped forward and migrated to right atrium.

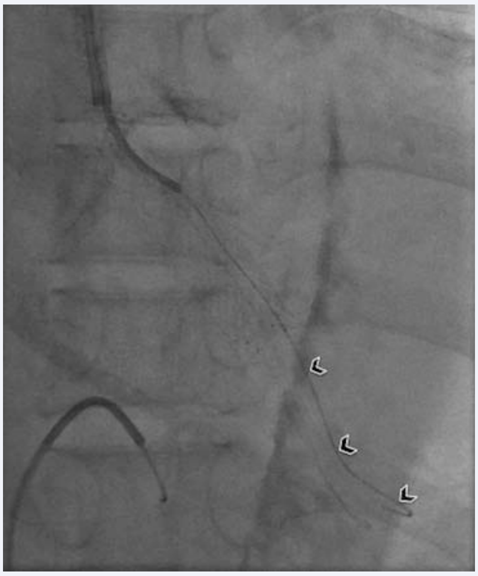

Figure 2c A guide wire (arrowhead) was immediately applied across the stent to prevent further stent migration.

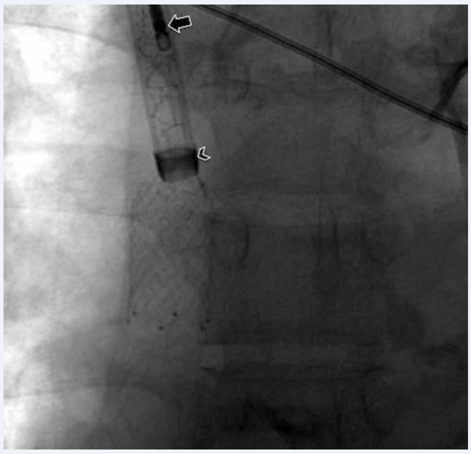

Figure 3a Standard biopsy forceps (arrows) were introduced to grasp the ends of the stent through 16Fr introducer sheaths (arrowheads) from right IJV and right CFV. The stent was torn into two parts and retrieved by the forceps through right IJV (A) and right CFV (the cranial fragment has been removed from right IJV) (B).

Patient remained asymptomatic and stable during the procedure. Serial electrocardiograms (ECG) and troponin I levels were normal. No adverse cardiovascular events occurred. Patient was discharged uneventfully.

DISCUSSION

The role of metallic stent in maintaining patent hemodialysis access has been increasing. The occurrence of related complications such as stent migration is likely to rise consequently. Although intracardiac migration of endovascular stent is uncommon, potentially catastrophic complications

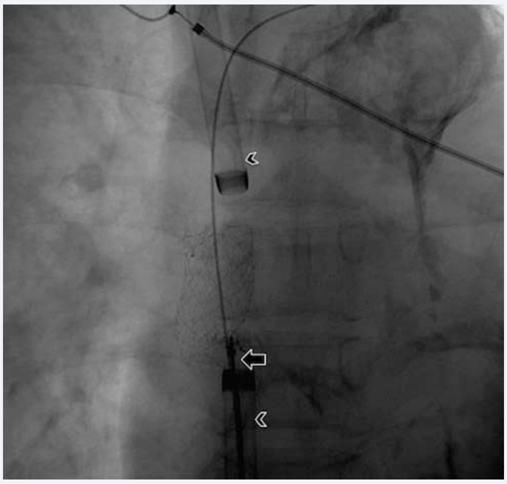

Figure 3b Standard biopsy forceps (arrows) were introduced to grasp the ends of the stent through 16Fr introducer sheaths (arrowheads) from right IJV and right CFV. The stent was torn into two parts and retrieved by the forceps through right IJV (A) and right CFV (the cranial fragment has been removed from right IJV) (B).

such as thromboembolic complications and cardiovascular perforation can occur [1]. The latter can result in pericardial tamponade, which can be fatal. Prompt management is therefore essential. Various studies suggested percutaneous retrieval to be the primary method of choice for extraction of endovascular foreign bodies as it is effective with low morbidity [2,3]. Tools that have been reported to retrieve endovascular objects included snares, grasping forceps, retrieval baskets and tip-deflecting wires, pincher device, oversize sheath or catheter and balloon catheter [1,2]. Among these tools, snare technique was the most commonly described. It was reported to be safe and with high success rate [1-6].

The advantages of gooseneck snare include its flexibility and ability to follow the endovascular curvature [3], thus it is less traumatic to vascular wall. However, a snare does not possess gripping ability. It can be difficult for the loop to pass over an object in an unfavorable position, particularly if the object is adherent to vascular wall or without an obvious free edge [2,3]. In such circumstances, the grasping capability of endovascular forceps can be helpful, as demonstrated in this case report. The migrated stent was engaged from jugular and femoral approaches simultaneously, hoping to align it vertically for easier extraction by snares through the 16Fr vascular sheaths. However, it failed to be repositioned within the right atrium because of its large size. The stent was therefore fragmented into two parts and retrieved by forceps. Fortunately no free tiny fragments were produced and no residual foreign body was detected after the procedure.

Stent fragmentation during its retrieval with gooseneck snares has previously been reported. It was explained by the intrinsic weakness of the stent, relating to its open-cell structure [7]. SMART stent is of open-cell structure and is susceptible to this weakness as well. Repositioning of nitinol stent is problematic due to its high degree of self-expandability [6,7]. It is therefore difficult to be compressed and retrieved percutaneously. Destroying and fragmenting the stent was probably the only way to remove it in our case.

There are several learning points in our case. The guide wire should have been maintained from SVC to IVC all the time during the stent deployment. This could prevent the intracardiac migration of the stent. The importance of this "pull-through" wire system was highlighted in literature [4,5]. The migrated stent should also be secured by extending the guide wire across it. This can prevent further stent migration into right ventricle and pulmonary arteries. In addition, the use of large size introducer sheaths would facilitate the removal of large-sized stent fragments by the endovascular forceps. Another learning point is about the delivery route of the stent. Common femoral approach is preferable as the course for the stent delivery system would be straight. Force can be stored at the stent delivery system when it encounters acute turn, such as at the junction of subclavian vein and brachiocephalic vein in this case. The force might push the stent into the right atrium during deployment. Therefore, femoral approach, which is relatively straight, would be safer and more stable for the delivery system. Also, with femoral approach, the direction of forward jumping would be away from right atrium [5].

In summary, a case of successful percutaneous extraction of an intracardiac migrated nitinol stent by endovascular biopsy forceps was reported. The grasping ability of endovascular forceps made it useful in retrieving an object that gooseneck snares failed to extract.

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