

# A Novel Approach to Percutaneous Retrieval of Intravascular Foreign Body: Pusher Technique

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## ABSTRACT

Complications are known to occur in hospitals where interventions are performed. Intravascular foreign body (IFB) embolisation is encountered in tertiary care settings. These include fragments and parts of catheters, wires, dislodged stents, coils, and intravascular glue. IFBs must be removed as early as possible due to the risk of infection, thrombosis, and flow limitation in vessels. We present a case of a 63-year male patient who came to the Interventional Radiology (IR) department with a large IFB in the right atrium and inferior vena cava, which was the dislodged fragment of Permcath. It was removed percutaneously without any surgical intervention. The frequently used method of snaring free-end of IFB was failed. The combination of the through and through wire technique and the new pusher technique helped in removing the foreign body, in its entirety, as a day case procedure.

**Key Words:** *Intravascular foreign body, Interventional Radiology, Internal Jugular vein.*

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## INTRODUCTION

Intravascular catheter embolisation is a rare, yet known complication.<sup>1</sup> Permcath inserted for long-term dialysis needs to be removed with care. It can dislodge if the component distal to the cuff is cut without holding it. This can lead to embolisation of distal fragment into the right atrium, inferior vena cava, or pulmonary arteries and lead to complications.<sup>2</sup> Percutaneous removal of these foreign bodies reduces patients' morbidity and hospital stay and is almost always performed under local anaesthesia.<sup>3</sup> These procedures are expensive due to the single use of inventory items. We present a case of a long fragment of Permcath that got dislodged during removal.

## CASE REPORT

A 63 year old male presented to Interventional Radiology (IR) for percutaneous endovascular removal of the intravascular foreign body (IFB), which was a large tubular fragment of 14.5 Fr Permcath. This got embolised during the removal of the right internal jugular vein (IJV) Permcath. Pre-procedure x-ray and CT demonstrated the proximal end in the right atrium and the distal end in the inferior vena cava (IVC) (Figure 1A).

Available inventory and patient affordability were the limitations. The patient recently had a renal transplant and the graft was present in the right iliac fossa. The operators were trained interventional radiologists, having experience of more than five years.

The right IJV was accessed with an 8 Fr vascular sheath (Terumo Medical). The primary operator tried to snare the upper part of the foreign body with 6 Fr En-Snare (Merit Medical) but small snare loops, variations in heart rate during attempts, and continuous atrial contractions led to failure from the right internal jugular access. Only En-Snare was available in the current inventory. Operators decided to use the common femoral vein as the access point from the groin. The left common femoral vein was punctured under ultrasound guidance and was accessed with an 8 Fr sheath (Terumo Medical). The lower end of IFB was tried with En-Snare. The primary operator attempted multiple times but failed to grasp the lower end of IFB due to small clover loops of the snare. The lumen of IFB was accessed with a Hydrophilic 0.35 (Terumo Medical) wire. Through and through access was secured (Figure 1B). A 4 Fr vertebral catheter was advanced over the wire and, after multiple attempts, the wire along with the 4 Fr catheter was parked in the right brachiocephalic vein. Hydrophilic Terumo wire was exchanged with Amplatz Superstiff 0.35 wire, which straightened the IFB. The upper end of the wire was snared from the right IJV access sheath. One loop of En-snare was advanced over Amplatz wire (co-axial wire technique, Figure 2A) and tried to grasp the upper end of IFB. This did not help much. A 6 Fr sheath (90 cm Flexor sheath, Cook Medical) was introduced from the left femoral sheath. It was advanced over the Amplatz wire. The IFB was pushed with it. Sheath got engaged in the lower part of IFB. After efforts, the IFB was pushed up to the right IJV (Figure 2B). The 8 Fr right IJV sheath was removed and the entry site was dissected with surgical blade and artery forceps. The 6 Fr sheath was pushed further from below until IFB was seen with the naked eye (Figure

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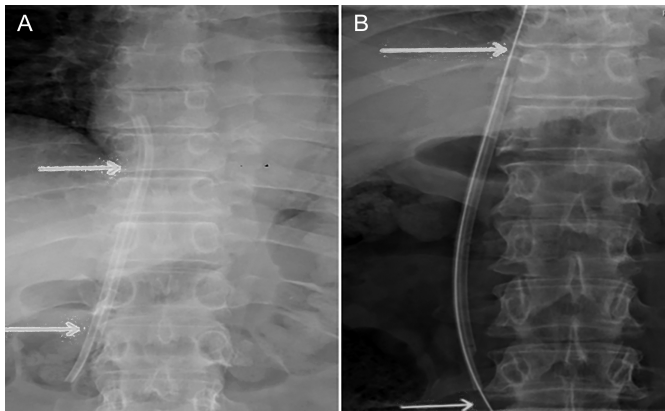
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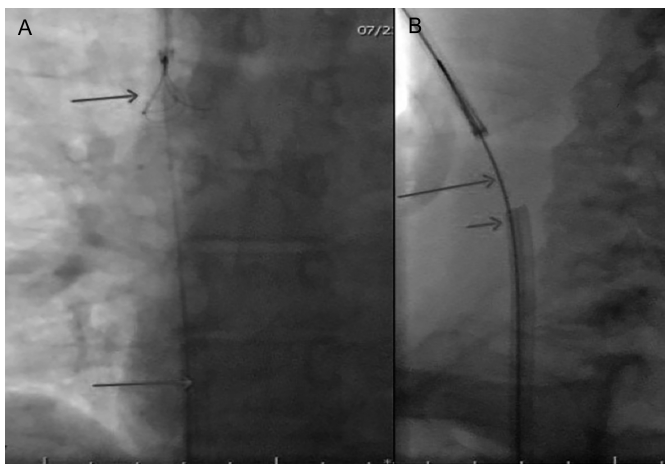
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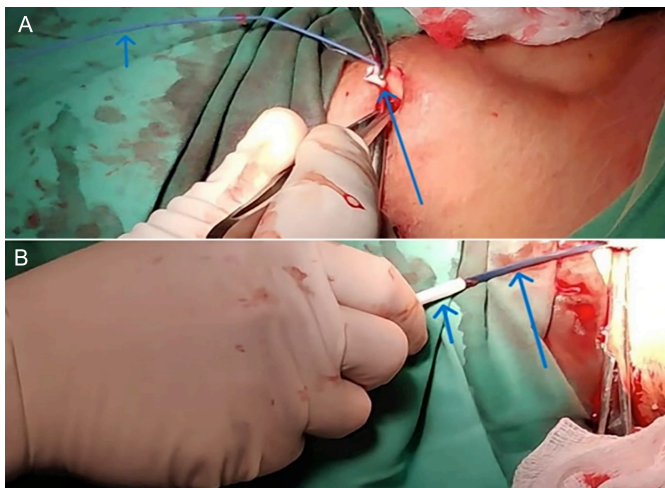
3A). The upper end was grasped with the artery forceps and removed in a single piece (Figure 3B). Check venogram demonstrated no contrast extravasation and the right IJV and superior vena cava were patent.



**Figure 1: (A) X-ray demonstrating dislodged fragment of Permcath. (B) Through and through wire across the intravascular foreign body (IFB).**



**Figure 2: (A) En-snare over the wire, co-axial technique (short arrow), upper-end of intravascular foreign body (IFB) (Long blue arrow). (B) Intravascular foreign body (IFB) (short arrow) pushed over the wire (long arrow) towards the exit site in the right internal jugular vein.**



**Figure 3: (A) Demonstrating the proximal end of intravascular foreign body (IFB) (long arrow) delivered over the wire. (B) Demonstrating in-toto removal of intravascular foreign body (IFB) (lower-end, short-blue arrow), pusher is 6 Fr long sheath (long-blue arrow).**

## DISCUSSION

Small IFBs, especially lost wire fragments and small lumen catheter fragments, are easily retrieved with the help of snares.<sup>1</sup> In some cases, entire percutaneous endovascular removal of IFB may not be possible, and partial or complete surgical intervention may be required.<sup>2</sup> A foreign body can be grasped and pulled near the jugular or femoral veins where surgical intervention may be needed in the complete retrieval of the lost object. This is particularly important in large-size IFBs. Complete surgical intervention is required when the endovascular approach fails.

There are many techniques as described by Woodhouse and Uberoi.<sup>3</sup> Loop snare is usually the first approach. Other techniques are the proximal grab technique, distal wire grab technique, co-axial snare technique, lateral grasp technique, hairpin technique, and intravascular retrieval forceps.

Percutaneous retrieval of IFB is nowadays considered as the primary option.<sup>4,6</sup> It is less traumatic to the patient with a shorter hospital stay, and almost all cases are done with local anaesthesia. Kim *et al.* have reported endovascular removal of large IFB through a 16 Fr sheath and laparoscopic grasper.<sup>5</sup> These are not standards but can be used. Its operator preference depends on location and type of IFB.

Unattended IFBs can cause serious complications including venous thrombosis and embolism, stroke, and limb ischaemia.<sup>7</sup> Chronic irritations can lead to perforation of the vessel wall. Schechter *et al.* have reported many symptoms associated with IFB.<sup>8</sup> At presentation, the patient had arm swelling, pulmonary embolism, claudication, cardiac tamponade, ventricular tachycardia, shortness of breath, and limb ischaemia.<sup>8</sup> Therefore, IFB needs to be retrieved as soon as possible. An asymptomatic foreign body can be left only if patient has limited life expectancy and the risks associated with removal outweigh the benefits. Many devices are used to retrieve IFBs. These include snares (Gooseneck, Clover-loop En-snare), stone baskets, forceps, and long sheaths with diameters more than the IFBs.<sup>8</sup>

Endovascular removal of IFB is performed under local anaesthesia. Complete blood count, serum creatinine, and PT / INR are checked before the procedure. Usually, a CT scan is performed before the procedure. This is vital in planning and accessing the IFB. Associated complications include vascular perforation, cardiac arrhythmias, and rupture of the heart.<sup>1</sup> Therefore IFBs should be removed with care. Most of these cases are done as day case and usually, no follow-up is required.

In conclusion, the IFB was retrieved without any assistance from the surgical team. This is a unique case as the through and through wire technique was used in combination with a 6 FR long sheath as a Pusher. The technique can be used in the retrieval of long tubular and luminal foreign bodies where inventory is limited, and the snare technique fails. This case report introduces the Pusher technique as an additional method of IFB removal. This will help interventional radiologists in complicated cases of long-tunnelled IFBs.

## PATIENT'S CONSENT:

Written consent was obtained from the patient for the purpose of research and publication.

## COMPETING INTEREST:

The authors declared no conflict of interest.

## AUTHORS' CONTRIBUTION:

WF: Manuscript writing, literature review, and drafting.

MKK: Manuscript writing, acquiring images, and critical review.

ANK: Design and formatting, critical review, and drafting.

All authors approved the final version of the manuscript to be published.

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