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## Case Report

# Retrieving embolized peripherally inserted central catheter – A novel two step technique ☆☆☆

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## ABSTRACT

We report a novel two-step percutaneous endovascular technique for retrieval of peripherally inserted central catheter, free ends of which were inaccessible, that had embolized to the segmental branch of left pulmonary artery using SIM 1 catheter and a loop snare, in a 17 year old female patient diagnosed with osteosarcoma right femur. Step one involved, inserting SIM 1 catheter through the heart to hook the embolized peripherally inserted central catheter and bring it down to the lower segment of inferior vena cava. In the second step, a loop snare was used to grasp the free end of peripherally inserted central catheter, and the whole assembly was withdrawn via right common femoral vein access. Patient was monitored for 24 hours and discharged as there were no complications. SIM 1 catheter followed by the use of loop snare as a retrieval system is safe and efficacious and can be considered by an intervention radiologist for retrieval of embolized vascular access device, in which none of the free ends are available to catch hold with a loop snare.

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PICC is a vascular access device (VAD), inserted via a peripheral arm vein and terminates at the cavoatrial junction. The common indications for PICC line insertion include administering long-term medication including chemotherapies, total parenteral nutrition, infusion of blood products, frequent blood withdrawals and limited peripheral access [1]. PICC can be kept in situ for weeks to months with low rate of complications, which include occlusion (8.9%), accidental withdrawal (8.9%), infections (6.3%), venous thrombosis (1.6%) and hematoma (1%) [2].

The risk of catheter embolization as its complication is rare and is seen in less than 1%; however, if it happens, it is associated with significant mortality varying from 24%–60%. Therefore, removal of intravascular foreign body (IFB) is always recommended because of the risk of cardiac arrhythmias, bacterial endocarditis, sepsis and fracture [3–7]. Percutaneous retrieval is the preferred method to extract the embolized VAD and surgery is kept as a standby mode only [8].

Although much hardware exists for endovascular removal of IFB through percutaneous access which includes balloons,

PICC, Peripherally inserted central catheter; VAD, Vascular access device; IFB, Intravascular foreign body; IR, Intervention radiology; IVC, Inferior vena cava; SIM, Simmons; Fr, French.

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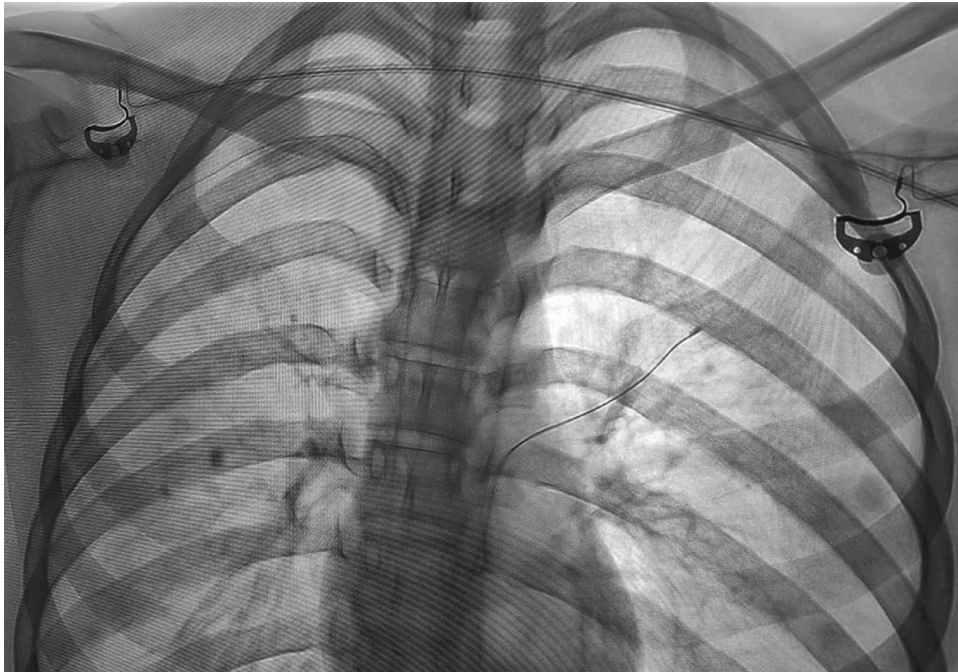
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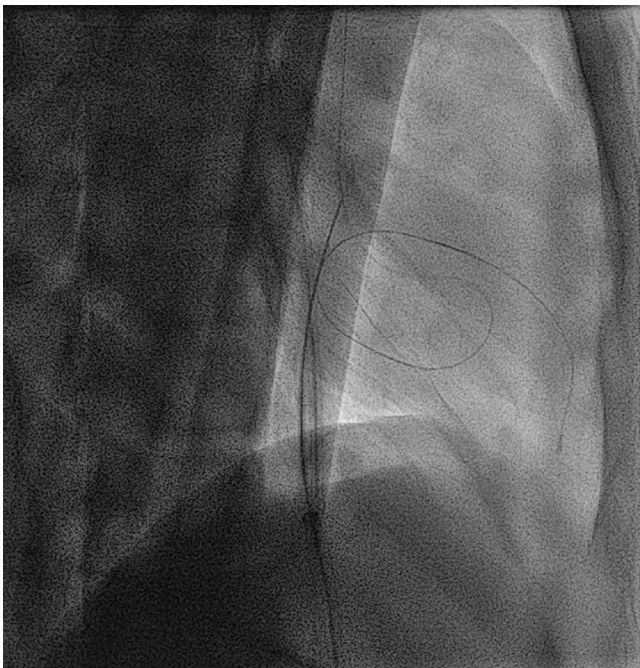
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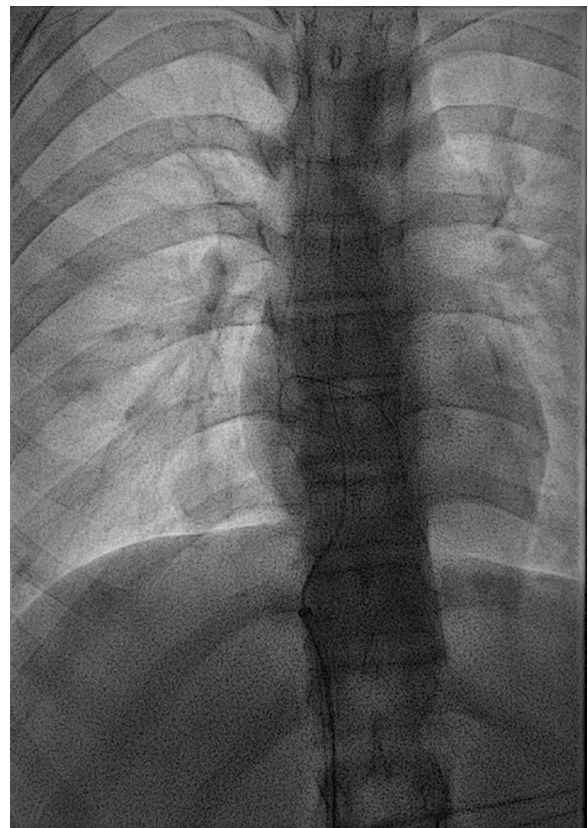
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**Fig. 1 – Embolized PICC with distal end in segmental branch of left upper lobe pulmonary artery on the day of retrieval**



**Fig. 2 – Shows embolized PICC hooked by SIM 1 catheter and pulled into lower segment of IVC**



**Fig. 2 – Continued**

filters, dormia basket, forceps etc, but the loop snare is frequently the first choice. Snare are mostly atraumatic and have a good safety profile [9,10]. The loop snare needs a free end of IFB to grasp it.



**Fig. 3 – Loop snare being deployed distal to free end of PICC, with distal end of PICC being grasped by loop snare and being pulled into vascular access sheath**

Removing embolized PICC line from pulmonary artery or its branches can be challenging as manoeuvrability of the snare and its loop is limited, making a successful grasp of IFB technically difficult and also heightening the possibility of complications [11]. In this report we describe a novel two-step approach for successful removal of embolized PICC line from the segmental branch of the left pulmonary artery using SIM 1 catheter and a loop snare.

### Case Report

A 17-year-old patient diagnosed with osteosarcoma right femur with lung metastasis undergoing chemotherapy was referred to intervention radiology (IR) as there was inadvertent breakage of the catheter hub and subsequent embolization of the PICC, while undergoing a check-up CT. Fluoroscopic imaging demonstrated the distal tip of embolized PICC line at the cavoatrial junction and proximal end in the distal basilic vein. The patient was asymptomatic. Endovascular retrieval using a loop snare was planned. Written consent was obtained. Next day on the day of retrieval, fluoroscopic imaging showed that



**Fig. 3 – Continued**

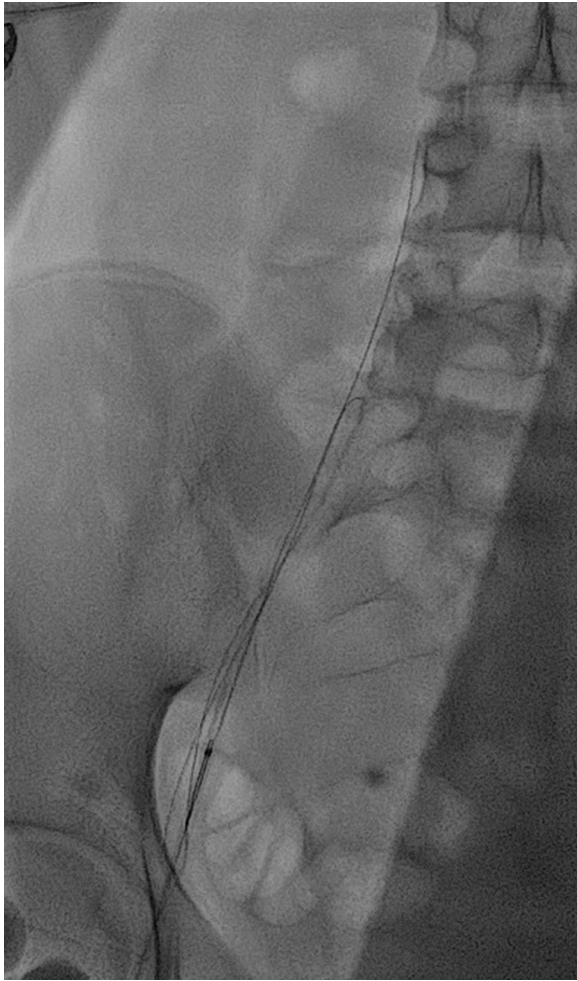
the PICC line had embolized further with its distal end now in the segmental branch of the left upper lobe pulmonary artery (Fig. 1). Now none of the free ends were available to grasp with the snare. Hence, a two-step approach was planned.

SIM1 catheter, supported with 10Fr access sheath was advanced from right heart into the pulmonary artery and the PICC was grasped. It was dragged down and brought to the IVC (Fig. 2) and further upto the external iliac vein where the grip was lost. Now there was no landing zone left for the snare to be opened to catch hold of the proximal end, hence snare was taken distal to the distal end of the IFB where it was opened and the PICC was caught hold of (Fig. 3) and the whole assembly was withdrawn. There was no fracture of the catheter and the PICC was extracted en bloc (Fig. 4).

The procedure was performed with continuous cardiac monitoring and in presence of an intensivist. Patient was monitored in intensive care unit for 24 hours post procedure, and no electrocardiogram alterations noted. Hence, she was discharged.

### Discussion

Insertion of vascular assisted devices for permanent venous access is a routine practice in oncology centers around the world. Although embolization is rare, significant associated mortality necessitates the need for prompt removal, particularly in patients with cardiopulmonary embolization [12]. Although there is a possibility of atrial fibrillation, fracture of de-



**Fig. 3 – Continued**

vice, hematoma formation and possible iatrogenic vessel wall damage or perforation during the process of endovascular removal, the benefits of removing intravascular foreign body still outweighs the risks of leaving one in situ [13].

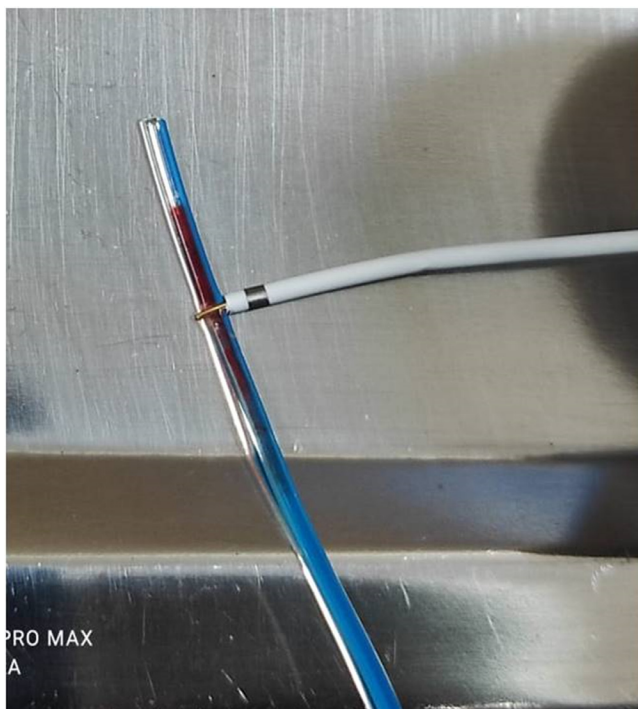
Several percutaneous transcatheter retrieval techniques are available for removal of cardiovascular catheter fragments and other foreign bodies. The loop snare method, due to its reliability and good safety profile, is widely used. However, when lodged in the pulmonary artery, the utility of the loop snare alone becomes limited, as the free end is not available easily to be grasped, and it is difficult to manoeuvre the loop in such a confined space. Hence, there was a need for improvisation in our case.

The primary aim was to create a free end, to facilitate removal of IFB using snare loop. This could have been achieved by using a pig tail catheter as used by Juan Peng et al in his 5 cases [14], reverse curve catheter or a tip deflecting wire to double the foreign body on itself or dislodge it to a more favorable position. Flexible grasping forceps as used by Ando k et al in his 3 cases [15] was not considered in our case as the orientation of PICC line was parallel rather than perpendicular to the vessel wall, and there is a risk of grasping the vessel wall next to IFB [16].



**Fig. 4 – En bloc retrieved PICC line grasped by loop snare**

We inserted SIM 1 catheter in the heart to hook and pull the embolized PICC line into the lower segment of IVC. The reverse curve grants it pushability, control and fineness, in comparison to pigtail catheters which have a tendency to curl inside and can become difficult to manoeuvre and require more time in manipulation. Considering the fact that longer time spent manipulating catheters in the cardiac chamber is associated with arrhythmia [17] – both transient and life-threatening – SIM 1 catheter is ideal for a quick retrieval. The soft tip and ability to use the contralateral wall for support makes SIM 1 catheter a very useful device to hook IFB. Optimal steerability without compromising flexibility is another advantage of



**Fig. 4 – Continued**

SIMS 1 catheter, which enables it to pull down IFB's to a desired location while reducing mechanical complications. The SIM 1 catheter proved to be an easy and fast method to hook and pull the embolized PICC which had no accessible ends. Also after grasping an IFB with SIM 1, the SIM 1 catheter can be twisted to entangle the IFB, in order to reduce chances of it becoming inaccessible again before or during the snaring manoeuvre.

Several techniques have been envisioned earlier in the world over for removal of IFB in the heart or pulmonary artery. Teragawa et al. reported a successful retrieval of a broken migrated PICC using endovascular technique using a snare with a suture in a patient on chemotherapy [18]. Kawata et al. reported three cases of retrieval of silicone port catheters migrating into the cardiac ventricle or pulmonary artery. A combination of devices, such as a snare wire, a basket catheter, and an ablation catheter, in combination with an interventional guiding catheter were utilized to retrieve them [19].

SIM 1 catheter followed by the use of loop snare as a retrieval system is safe and efficacious and can be considered by an intervention radiologist for retrieval of embolized VAD in which none of the free ends are available to catch hold with a loop snare.

### Patient consent

Ethical Approval Committee, Indira Gandhi Medical College (IGMC), Shimla, File No. EC/20/0001. Government of India Di-

rectorate General of Health Services Central Drugs Standard Control Organization Ethics Committee Registration Division.

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