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Case Report

Recovery of a broken PICC migrated in cardiac chambersan endovascular approach ☆,☆☆

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ABSTRACT

Complications related to the placement of a peripherally inserted central catheter are a common phenomenon and they can lead to acute complications which must be treated in an emergency regime. The aim of this study was to describe cases in their most practical and technical aspect, especially in complicated conditions.

This was a descriptive case report of a 64 years old female patient who presented with a fractured peripherally inserted central catheter, migrated into the right heart chambers and inferior vena cava, and how the team arranged for its recovery by endovascular technique, in a frail patient who could not undergo to open surgery. The procedure was completed without any complications. The use of the endovascular technique allows a recovery of the foreign body in a short time, essential for a life-saving procedure; the interventional radiological approach allows less invasiveness in fragile patients and shorter hospitalization times.

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Introduction

The implantation of venous catheters for chronic use is a very widespread practice, therefore, the number of correlated complications is proportionally high [1]. Among them, we certainly find the fracture of the catheter with improper migration, with a rate that is around 3% at most [1]. All complications can then

lead to pulmonary thromboembolism, infections, damage to the heart walls, endocarditis, and sepsis [2].

The role of the interventional radiologist is of fundamental importance for a minimally invasive approach [3], precisely because for years now, percutaneous recovery of a foreign body has been the gold standard in these cases [3]. Furthermore, the diversity of foreign bodies found at the vascular level has allowed the development of different techniques

☆ Endovascular recovery of a broken central venous catheter fragment from the right heart chambers.

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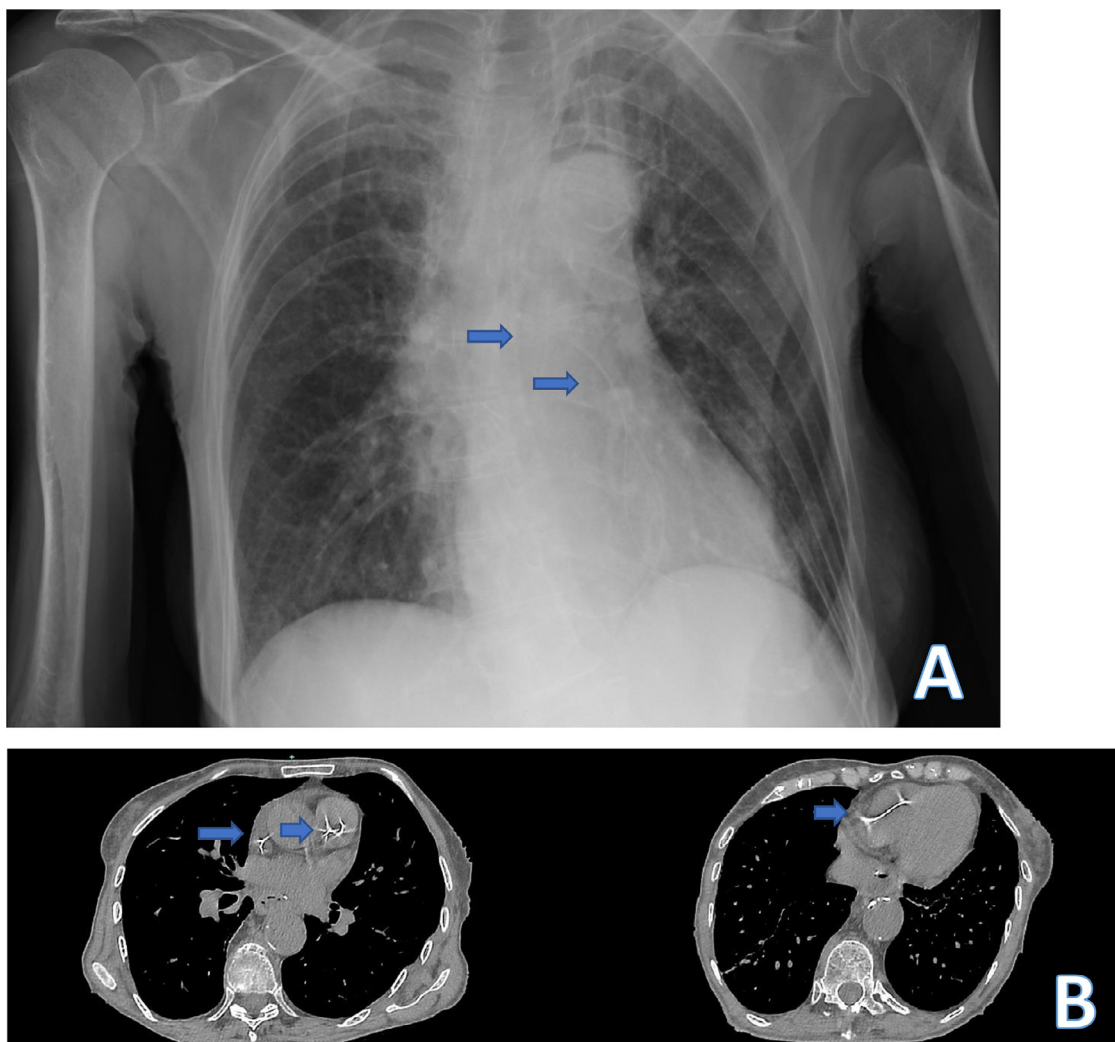


Fig. 1 – X-ray chest showing PICC in cardiac chambers (arrows) (A). CT scan showing (arrows) PICC in cardiac chambers (B).

and different recovery devices, used tailored to the event in progress [4]. Furthermore, the diversity of foreign bodies found at the vascular level has allowed the development of different techniques and different recovery devices, used tailored to the event in progress [4].

Ours is the recovery case of a peripherally inserted central catheter (PICC) device, fractured and migrated to the right cardiac chambers and partially into pulmonary artery, then recovered with Loop Snare device.

Case presentation

The patient (woman, 64 years old), with unspecified advanced stage esophageal cancer, with chronic renal failure and in adjuvant chemotherapy treatment, came to the emergency room because a home care nurse during the cleaning maneuvers, caused a not better specified PICC fracture with the consequent dispersion of the internal fragment in the circle.

The patient then underwent chest X-rays and CT, which showed how the broken PICC was brought with its tip into the pulmonary artery and the body and tail between the atrium and the right ventricle (Figs. 1 and 2). The fragment was XX mm long.

The interventional radiologists were then alerted and decided to proceed with the recovery by endovascular route.

The patient was transported to the angiography room. Local anesthesia was performed in the right groin (Lidocaine, 10 mL); then, an ultrasound-guided puncture was performed in the femoral vein and an introducer was then placed (Avanti+ Introducer, 7F, 11 cm, 0.038", Cordis, USA). Through this, a hydrophilic guide (Merit Laureate, 0.035", 180 cm, Merit Medical, USA) was brought up to the right atrium (Fig. 3). The broken PICC was already visible during the scan (Figs. 3, 4, 5, 6 and 7), so the use of contrast medium was useless, mostly to be avoided in a patient with renal insufficiency. It was therefore decided to attempt the recovery of the venous catheter using a Loop Snare recovery device (En Snare System, 6F, 120 cm, Merit Medical, USA): a soft metal ring welded on the distal end of a guide, carried on its own catheter [4] (Figs. 4, 5, 6, 7).

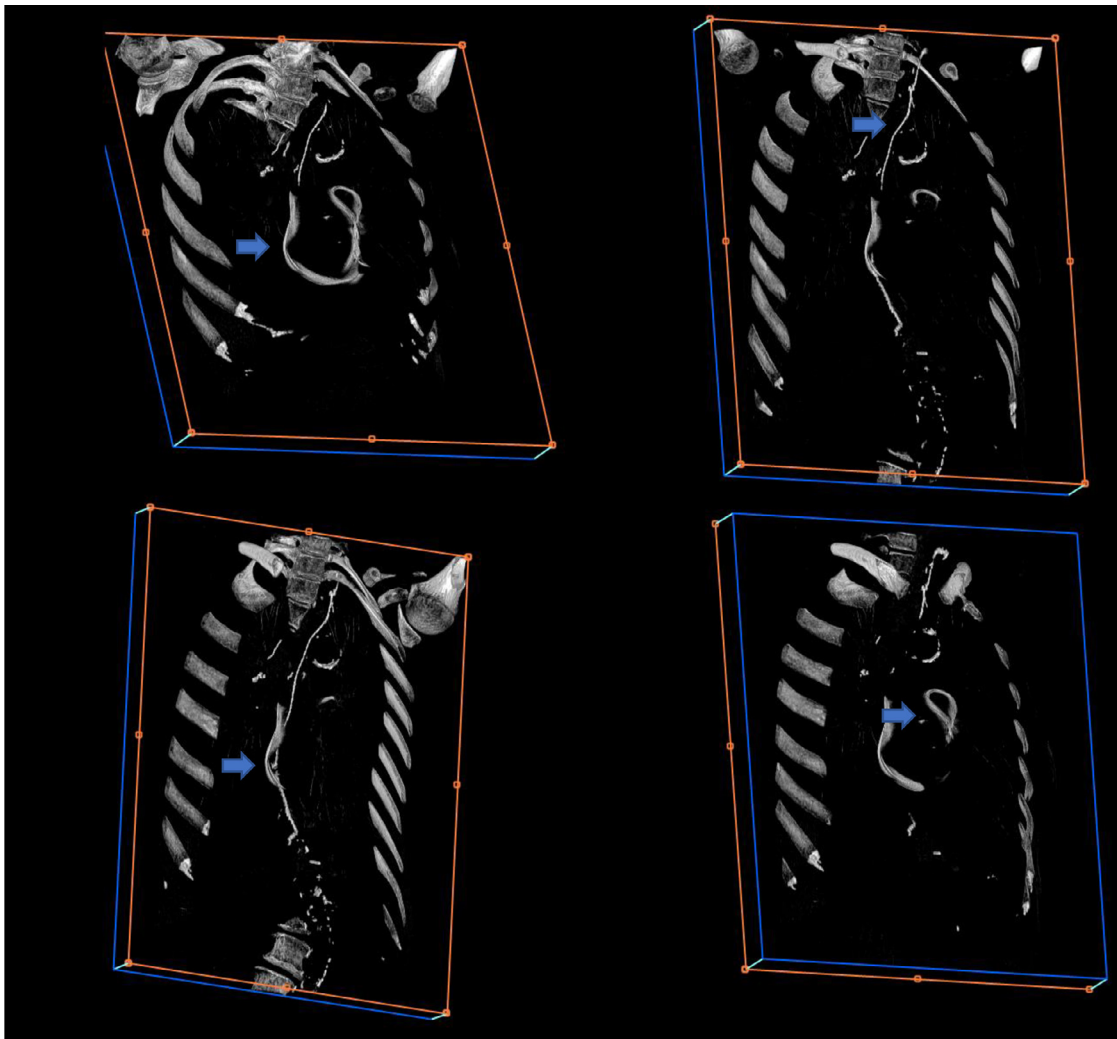


Fig. 2 – CT 3D reconstructions showing (arrows) PICC in cardiac chambers and inferior cava vein.

The portion of the PICC located in the right atrium was hooked into the catheter of the Loop Snare device and then taken out (Figs. 7 and 8). A mild venous compression was then performed in the right inguinal area.

At the postoperative X-ray chest check, the absence of further fragments or foreign bodies was demonstrated.

Discussion

The procedure for the recovery of vascular foreign bodies is certainly a procedure to be done in the shortest possible time, since the literature speaks of 71% of adverse reactions over time, even serious [4]. Precisely for this reason, we opted for a quick and nondelayable intervention for an already fragile patient.

Furthermore, for years, the use of central venous catheters has been an ever-increasing practice, with an absolute increase in related complications [1]. Not as common, however, is the migration of broken fragments to the

level of the right atrium, an event that makes the procedure more similar [1]. The peculiarity of the case in question was the arrangement of the PICC starting from the right heart chambers up to the pulmonary artery, with a possible transition from venous to arterial circulation and with acute and fatal complications. In literature, several complications related to the recovery procedure have also been demonstrated (temporary tachycardia, iatrogenic valve insufficiency, other arrhythmias) [1], but they did not occur in our single event. Among them, there is also the hematoma in the site of the femoral puncture [1], averted in our case by the use of the ultrasound guide and by effective compression at the end of the operation. On the other hand, standard multidisciplinary consulting was not necessary [3], since the endovascular approach represents the gold standard approach [1,4] and because an open intervention would not have been possible in the conditions of our patient.

As regards the choice of the recovery technique, several are described in the literature.

Our choice to use the "loop snare proximal grab" technique [4] was based on the fact that we were facing a cylindrical

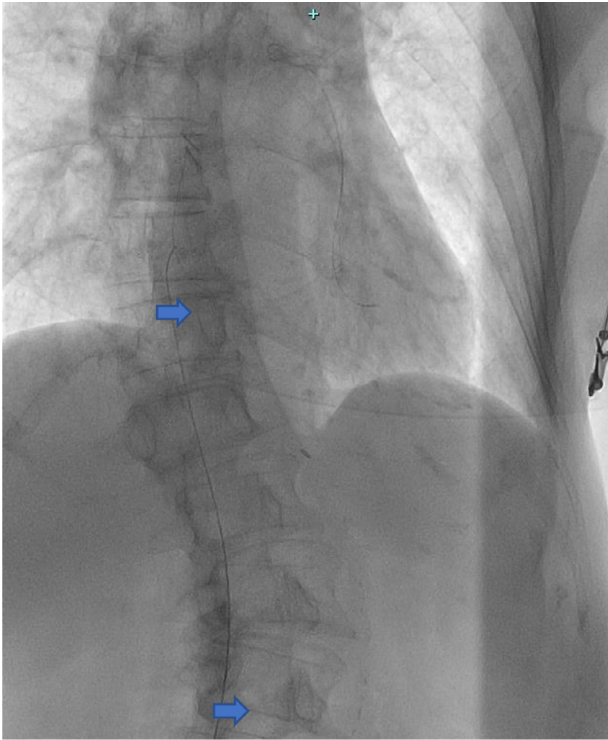


Fig. 3 – Catheter from inferior cava vein to right atrium (arrows).

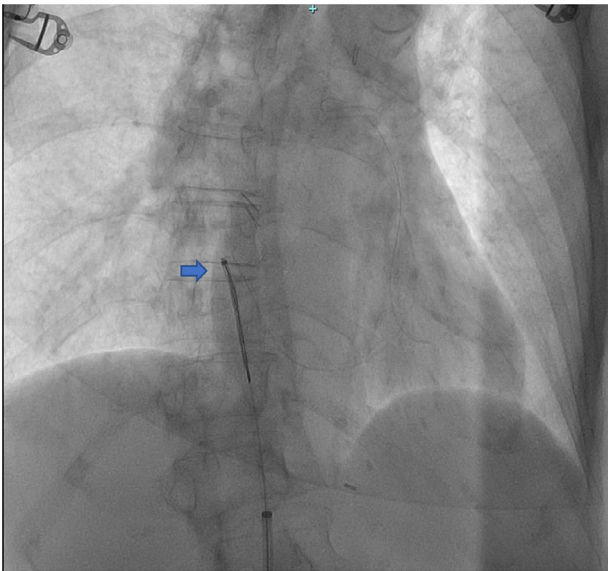


Fig. 4 – Loop Snare introduction (arrows).

foreign body, with a prevalence of longitudinal diameter over the transverse one, moreover with a small lumen, so the loop snare was the safest and most complication-free device.

Other techniques would have involved the use of an angiographic balloon or a Dormia basket [4].

The angiographic balloon technique involves the entry of the deflated balloon inserted into the foreign body (hollow);

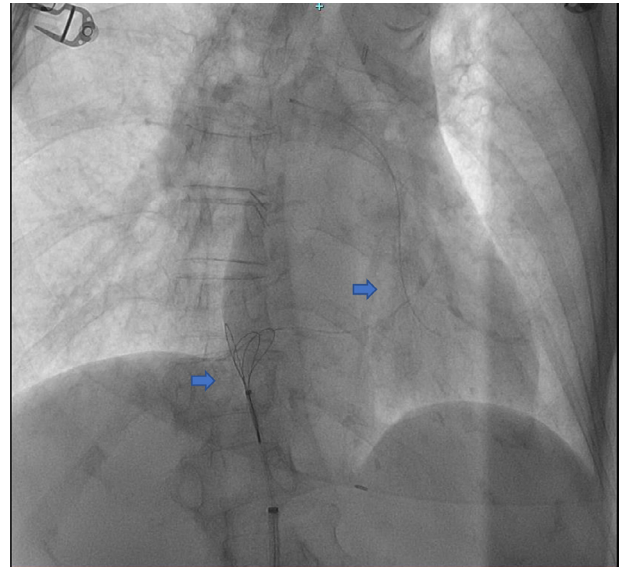


Fig. 5 – Opened Loop Snare hooking PICC (arrows).

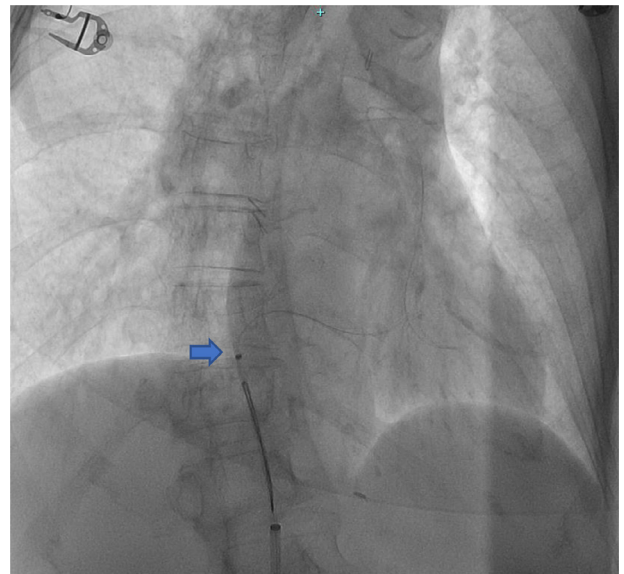


Fig. 6 – Loop Snare and hooked PICC (arrows).

the subsequent inflation of the balloon inside the hollow foreign body allows, then through friction, its extraction up to the supporting catheter [4]. In the course of our procedure, we could not have easily and quickly inserted an angiographic balloon inside the PICC, since the same lumen of the PICC was not easily identifiable.

The Dormia basket technique, on the other hand, involves grasping the foreign body and dragging it through the basket into the supporting catheter [4]. Also in this case we would have had a contraindication, that is a foreign body too long to be captured by the Dormia basket, which is more suitable for short objects [4] also due to the description of our single experience.

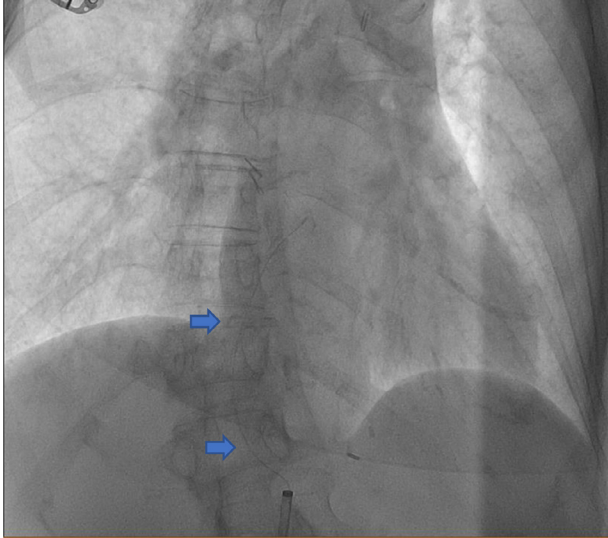


Fig. 7 – PICC carrying out (arrows).



Fig. 8 – PICC extracted, with a length about 14 cm.

Conclusions

About 50 years have passed since the birth of vascular radiology [3], and the literature is clear on how the recovery of foreign bodies sees its gold standard in endovascular techniques [1,4].

Even just a single experience like ours demonstrates how the minimally invasive approach is primarily a life-saving procedure – a patient in this state would never have been a candidate for open surgery, given the comorbidities.

Furthermore, a traditional surgery would have given less certainty about the recovery of the foreign body, which can still migrate to locations that are difficult to approach for an operation that does not make use of micro-invasiveness [1].

Finally, given the proportional increase in complications related to venous catheters, the increase in endovascular procedures for the recovery of foreign bodies is equally linear. The endovascular approach is definitely less invasive and cheaper – the overall effects of savings become even more significant as the number of cases increases.

Patient consent statement

The patient was informed in a clear and comprehensive way of the three types of treatments and other possible surgical and conservative alternatives. In the surgical consent was reported that clinical data can be used for scientific studies but remain anonymous. The manuscript contains no individual patient's information, nor identifiable images.

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