

Intravenous fracture of a peripheral cannula at the dorsum of the hand; in a patient who used walking aids after surgery

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Case Report

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Abstract

In orthopedic patients peripheral intra venous (IV) cannulation is a common procedure for various clinical purposes. After the surgery most of the patient uses walking aids (walking frame, crutches) for mobilization. The dorsum of the hand or wrist is one of the most common place for the peripheral IV cannulation. When patients holding weight bearing devices, there is a potential of bending the catheter part of the cannula. Repeated bending can result in fatigue fracture of the cannula. To avoid these, it is advisable to place the peripheral venous cannulas at places away from wrist joint which will prevent the catheter bending and fracture of it. This is an very important point to be consider when placing cannulas in orthopedic surgical patients.

Background

In orthopedic patients peripheral intravenous (IV) cannulation is a common easiest procedure used for obtaining intra venous access.

Peripheral intravenous cannulation is essential for intravenous medications, fluid and other intravascular replacements . It is usually performed by doctors , nurses and paramedical staff. Most of the orthopedic patients it is placed in the emergency department, ward or in the operation theatre. Most preferred placed for IV canula is the dorsal venous arch of the hand. IV canulation is associated with complications. Common complications documented are damage to the veins, arteries, nerves, hematoma formation, phlebitis (mechanical, chemical, septic), cannula related infections and extravasation of medications.

Intravenous fracture of a canula is rare but it can happen and result for a serious consequences like distal embolization.

Most of the orthopedic patients need walking aids (e.g. walking frames, crutches) for their mobilization after surgery to share the body weight or keep off weight on an operated leg. When using a walking aid, the wrist get bend to hold the grip of the walking aid and to share the body weight. Most of the orthopedic patients cannulas are place in the dorsum of the hand or wrist since the dorsal venous arch is the most comfortable place to site a cannula. In an orthopedic patient, when a IV canula is placed at the dorsum of the hand or wrist, when the wrist bends the cannula has a potential of bending at the neck of cannula.(Fig 1) Because of the frequent bending at the canula neck , it can get a fracture. The fractured part can get distally embolize and result in hazardous consequences.

In this case report we discuss a case of an intravenous fracture of an IV cannula which was placed at the cephalic vein of the dorsal venous arch of the hand. Patient underwent a total knee replacement surgery. Post operatively patient was mobilized with a walker and during the mobilization procedure cannula was bended and fractured. It act as a vascular foreign body in the cephalic vein and which has migrated proximally.

Case Report

A 65 yrs old patient admitted to the University Hospital of the General Sir John Kotelawala Defense university for bilateral knee replacement. She admitted after all preoperative preparations for right knee replacement. She had stable vitals and all preoperative blood investigations were normal. She follows the routine procedure for knee replacement surgery. On the day of surgery in the operation theatre consultant anesthetist had placed a 17 G cannula in the basilic vein of the dorsal venous arch of the left hand(Fig.1).

She underwent a successful right total knee replacement. As routine procedure she was given intravenous antibiotics for 3 days and routine intravenous fluid replacements. On post-operative day 2 she was transfused with one pint of blood for low Hemoglobin level (9.1g/dl). She was started on physiotherapy on post op day one as protocol. She was started supported weight bearing and mobilization on post op day one with a walking frame.(Fig 1).

She recovered during these three days without any uncomplicated events. On post op day 4 she was discharged from the ward. On post op day three evening it was noticed her IV cannula is not functioning. Since there was no requirement of further IV antibiotics and fluids it was decided to complete the rest of the antibiotic dose with oral antibiotics.

As the discharged was planned on day 4 , the ward nurse had removed the cannula and it was immediately recognized that the intravenous cannula portion was missing. It was noticed the IV cannula was broken at the neck of the cannula. Nurse was unable to remove the stem of the cannula. (fig 2) .

Immediately this was notified and instruction were given to apply a tourniquet in proximal fore arm near the elbow. Patient was taken to the operation theater and bed side ultra sound scan was performed using the bed side scanner(Fig 3). It was noted the broken piece of cannula is in the dorsal veins just 3 cm away from the point of insertion. New tourniquet tube was applied closer to the proximal end of the broken cannula part.

The fore arm was cleaned and draped, vein was explored under local anesthesia and transverse venotomy was done and the broken cannula part removed with a curved mosquito forceps, without any hazardous out comes(Fig 4). Both the proximal and distal ends of the vein was milked to remove the formed blood clots. The vein was ligated. Skin was sutured with 3.0 Ethylone. The patient made an uneventful recovery and was discharged with follow-up plan for post total knee arthroplasty.

Patient was reviewed in post-operative day 12 for arthroplasty follow up and at that time skin sutures of the venotomy side removed. Skin healed nicely and there were no evidence of thrombophlebitis of the veins and no local inflammations.

Discussion

Peripheral IV cannulation is a common procedure. Approximately 60% of all patients treated by a healthcare system will have an IV cannula inserted for varying purposes,[1]. Intra venous access required for sampling of blood as well as administration of fluids, medications, nutrition and blood products It can

be associated with complications such as infiltration to nearby nerves, tendons and blood vessels, thrombophlebitis, venous spasm, hematoma, air embolism and cannula associated blood stream infections. Among the complications of peripheral venous cannulation, intravascular fracture of the cannula stem is an uncommon complication. Its exact incidence is unknown and not much literature is available.

Peripheral venous canula has several components. Out of the parts of a cannula, catheter part is the intravenous part and liable for damage or fracture. The broken off piece of a cannula within a vein will act as an intravascular foreign body which can embolize. Embolism of broken cannula segments may result in sepsis, endocarditis, cardiac perforations and arrhythmias,[2].

Intravenous cannula can fracture due to various reasons. Repeated attempts at insertion, repeated insertion of the introducer needle, poor quality cannulas and keeping the cannula in situ for prolonged periods have been cited as reasons for breakage of these devices,[3]. Reinsertion of the introducer needle into the cannula during repeated attempts at cannulation can damage the catheter part of the device. This can lead to complete fracture or partial damage to the tip. A partially damaged cannula can completely transect at the time of its removal,[4].

In majority of orthopedic patients uses assistive walking devices (walking frame, crutches)to walk. Most of these patients , peripheral intravenous canula lines are placed at the dorsum of the hand or wrist, either in the cephalic vein or basilic vein.

Even though the outer part of the canula placed distal to the wrist, the catheter part stay intravenous across the wrist. When the patient mobilizes with a walking aid, patient's wrist get bended to hold the walking aid. When the wrist bend , the catheter portion of the IV cannula also get bended(Fig1). Due to the inherent nature of the flexibility of catheter part, canula get bended at the neck of the canula. Repeated bending of plastic catheter can result in failure of it integrity and facture of the catheter part of the canula. (Fig 2) In our patient obviously the canula was placed at the cephalic vein near the wrist. When the patient holding the walking frame, wrist is getting bended and body weight loads at wrist. It is very obvious , catheter of the canula is bended at the neck of the cannula. The frequent bending with loaded weight might have resulted in a fatigue fracture of the canula.

Most of the time intravenous fracture of a cannula can be detected at the time of the removal of it. Otherwise nonfunctioning canula, local swelling and pain at the place of a canula or symptoms attributable to distal embolization,[3]may suspect for it. Or it may be totally asymptomatic and will get noted at the time of the removal,[6] . Distal symptoms caused by catheter embolization included cardiac palpitations , dyspnea, cough, or chest pain,[6]. Sometimes it might give rise to distal septic complications.

When a cannula fracture is diagnosed the major issue is to trace the broken part. Attempt on tracing along the vein by palpation may dislodge the broken part and facilitate the embolization. Applying a

tourniquet band proximal to the site can reduce the risk of embolization. But application of tourniquet should be for a shorter period to prevent tourniquet complications.

Since these devices are made out of plastic material they are radiolucent in plain Xray imaging. Ultrasound scan of the location will help to localize it. Deep seated places like chest wall and neck CT scan will help to localize it,[5].

Proper training and technique can prevent potential complications associated with peripheral cannulation. Reintroduction of the needle into a partially inserted cannula should be avoided. Once inserted, the cannula insertion site should be regularly monitored. At removal the cannula should be checked for its completeness. If a piece of the cannula is missing some recommend an immediate proximal tourniquet to prevent migration of the missing segment until it is localized and removed,[5,6]. Tourniquet application should be handle with caution to prevent complications.

Conclusions

In day to day clinical practice peripheral IV cannulation is a common procedure. Most of the inward orthopedic patient get cannulated for various clinical purposes. Most of them have to use a walking aid when they mobilize after a surgery. The most common place for the distal canulation is the dorsum of the hand or wrist. As we discussed when patients are holding weight bearing devices, there is a potential of bending the catheter part of the cannula and which can result in fatigue fracture of the cannula. To avoid these, it is advisable to place the peripheral venous cannulas at places away from wrist joint which will prevent the catheter bending and fracture of it. This is an very important point to be consider when placing cannulas in orthopedic surgical patients , especially when they have to use walking aids after surgery. I addition to above proper technique in cannula insertion, canula placement, proper cannula care and correct technique of removal are important factors to consider.

LEARNING POINTS:

1. When patients has to use walking aids, not to place peripheral venous cannulas at the dorsum of the hand or near the wrist joint.

Declarations

Consent:

Written consent was obtained from the patient to participate and publish their clinical data and images.

Data Availability Statement (DAS):

Can access the study data on a request to the corresponding author's Email:
chandana375@hotmail.co.uk

Code Availability:

Code is not available since it is a case report

Funding Statement:

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Figures



Figure 1

Cannula at the dorsum of the hand



Figure 1

Cannula at the dorsum of the hand

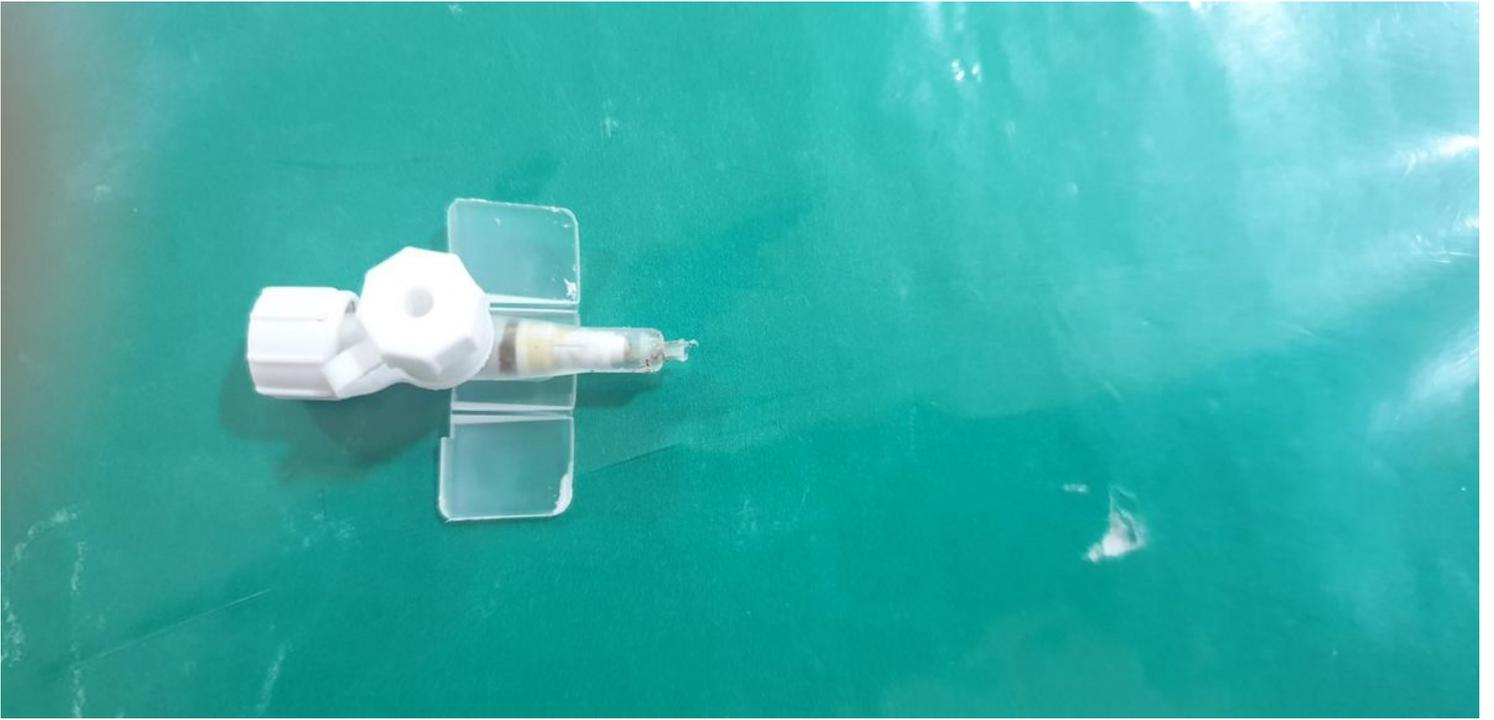


Figure 2

Proximal part of the fractured cannula

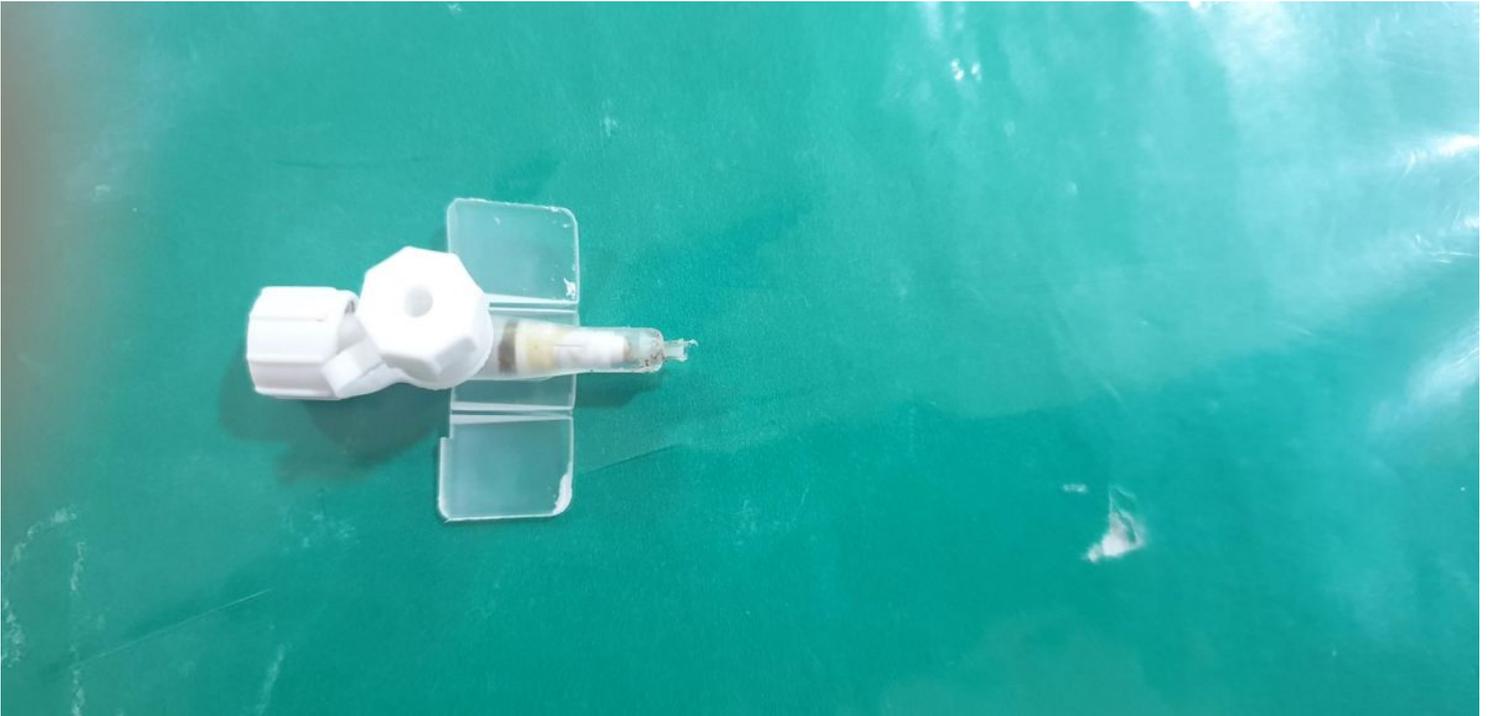


Figure 2

Proximal part of the fractured cannula

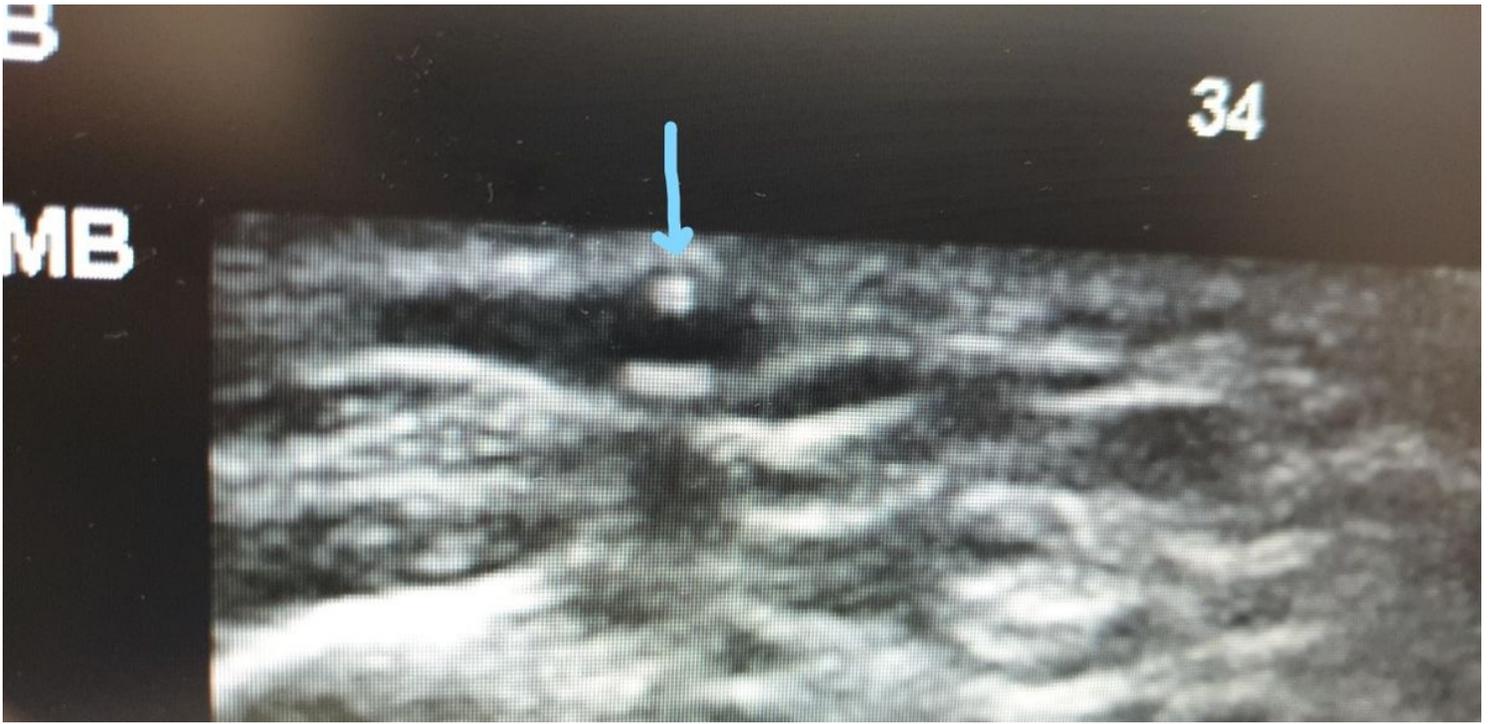


Figure 3

Ultrasound scan picture (arrow indicates intravascular part of the fractured cannula)

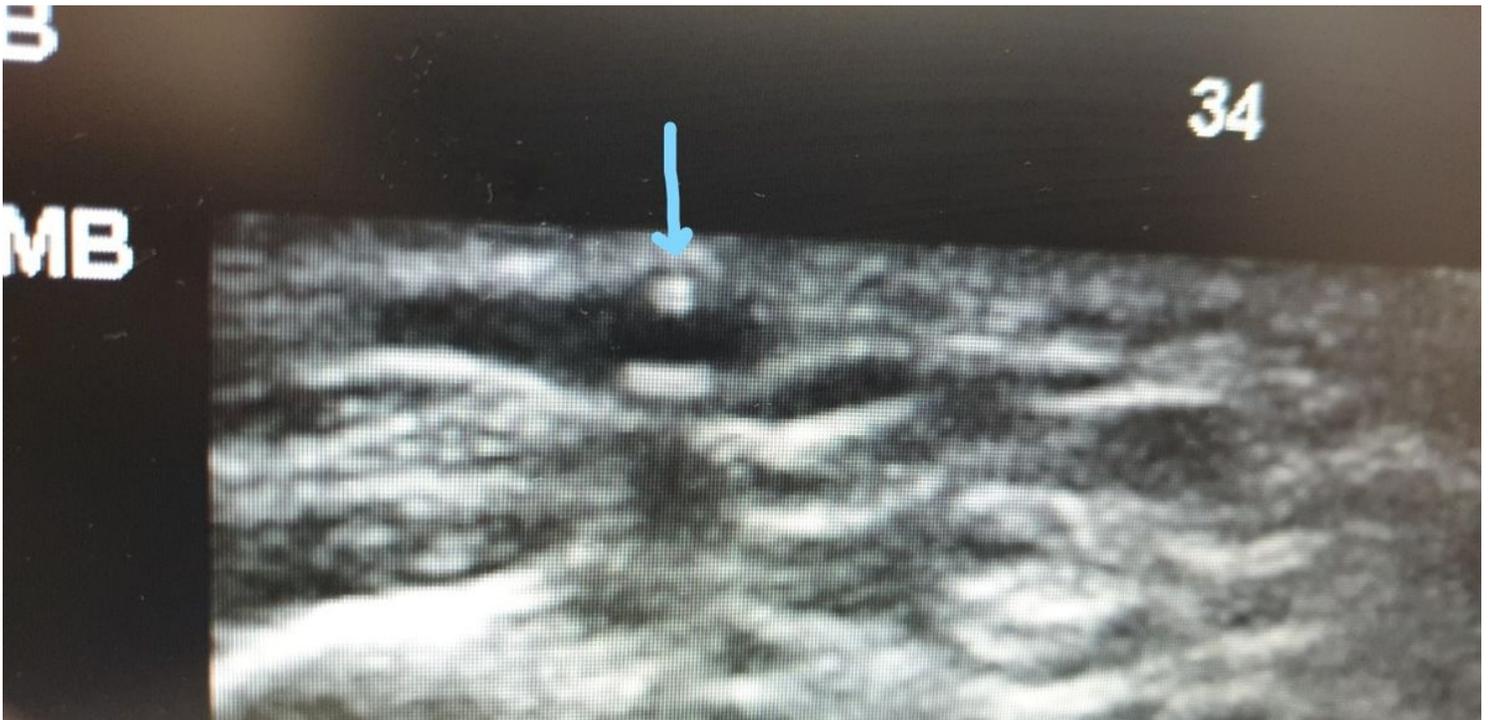


Figure 3

Ultrasound scan picture (arrow indicates intravascular part of the fractured cannula)



Figure 4

Intravascular part of the broken piece of the cannula

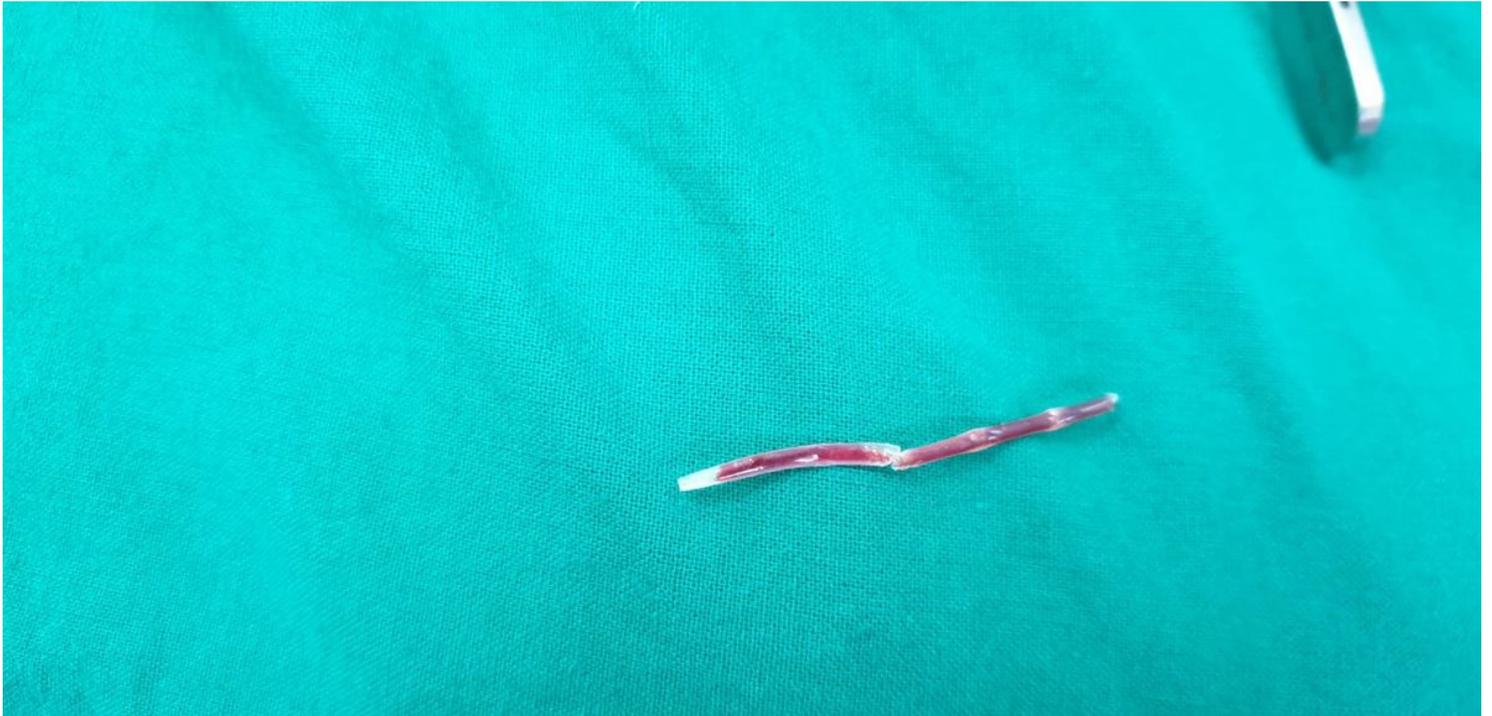


Figure 4

Intravascular part of the broken piece of the cannula