

The Hidden Cost of a Routine Procedure: Point-of-Care Ultrasound-Guided Retrieval of a Retained Peripheral Intravenous Cannula Fragment: A Case Report

Karupothu Rani^{1*}, Elandevan Gunasekaran², Harish Damu¹, Showry Abraham²

1. Department of Anesthesiology, All India Institute of Medical Sciences (AIIMS), Mangalagiri, Andhra Pradesh, India.

2. Department of Orthopedics, All India Institute of Medical Sciences (AIIMS), Mangalagiri, Andhra Pradesh, India.

ARTICLE INFO	ABSTRACT
Article type: Case Report	Background: Peripheral intravenous (PIV) cannulation is one of the most frequently performed invasive procedures in clinical practice and is generally considered safe. However, catheter fracture with intravascular retention is a rare but potentially serious complication that may result in thrombosis, embolization, vascular injury, infection, and the need for invasive intervention if not promptly recognized. Point-of-care ultrasonography (POCUS) has emerged as a rapid, readily available bedside imaging modality for the localization of retained intravascular foreign bodies and facilitates minimally invasive retrieval.
Article History: Received: 1 Jul 2026 Accepted: 18 Aug 2026	Case Presentation: A 60-year-old man was admitted following a road traffic accident with a fracture of the tibia requiring orthopaedic management. During removal of a peripheral intravenous cannula inserted into the left forearm, resistance was encountered, and inspection of the catheter revealed absence of the distal tip, raising suspicion of catheter fracture with intravascular retention. Immediate bedside POCUS using a high-frequency linear-array transducer accurately localized the retained catheter fragment within a superficial forearm vein. Following ultrasound-guided skin marking, the fragment was successfully retrieved through a small targeted incision under local anaesthesia. The procedure was performed without fluoroscopy, computed tomography, angiography, or extensive surgical exploration.
Keywords: Peripheral intravenous cannula; Retained catheter fragment; Point-of-care ultrasound; Intravascular foreign body; Ultrasound-guided retrieval; Patient safety.	Results: Point-of-care ultrasonography enabled rapid bedside localization and successful minimally invasive retrieval of the retained catheter fragment with minimal tissue dissection. No intraoperative or postoperative complications occurred. The patient recovered uneventfully, with no evidence of thrombosis, infection, neurovascular compromise, or fragment migration during follow-up.

*Corresponding Author:

Department of Anaesthesiology, All India Institute of Medical Sciences (AIIMS), Mangalagiri, Andhra Pradesh, India
E-mail: rani02.k@gmail.com



Copyright©2026 Mashhad University of Medical Sciences. This work is licensed under a Creative Commons Attribution-Noncommercial 4.0 International License <https://creativecommons.org/licenses/by-nc/4.0/deed.en>

Conclusions:

Retained peripheral intravenous catheter fragments represent an uncommon but clinically significant patient safety event. Immediate point-of-care ultrasonography enables rapid diagnosis, precise localization, and minimally invasive bedside retrieval while reducing the need for advanced imaging or extensive surgical exploration. Early recognition combined with multidisciplinary management can prevent migration-related complications, improve patient outcomes, and reduce healthcare costs.

► Please cite this paper as:

Rani K, Eledevan TG, Damu H, Abraham SH. The Hidden Cost of a Routine Procedure: Point-of-Care Ultrasound-Guided Retrieval of a Retained Peripheral Intravenous Cannula Fragment: A Case Report. *Journal of Patient Safety and Quality Improvement*. 2026; 14(4): 235-242. Doi: 10.22038/psj.2026.97037.1540

Introduction

Peripheral intravenous (PIV) cannulation is one of the most frequently performed invasive procedures in modern healthcare. It is indispensable for administering intravenous fluids, medications, and blood products, as well as for emergency resuscitation. Although generally considered a safe and routine procedure, complications may occur, ranging from minor events such as infiltration, phlebitis, and hematoma formation to uncommon but potentially serious complications including catheter fracture, intravascular retention, embolization, vascular injury, thrombosis, infection, and compartment syndrome (1-3).

Catheter fracture with retention of an intravascular fragment is an exceptionally rare complication that may remain unrecognised during routine clinical practice. Failure to identify the retained fragment may permit migration into the central venous circulation, resulting in pulmonary embolization, cardiac complications, vascular perforation, septic complications, or the need for complex endovascular or surgical retrieval procedures (2,3). Early diagnosis and prompt removal are therefore essential to minimise morbidity and prevent potentially life-threatening consequences.

Case Presentation

A 60-year-old man presented to the emergency department following a road traffic accident and was diagnosed with a fracture of the tibia requiring admission for

Several imaging modalities have been described for localisation of retained intravascular foreign bodies, including plain radiography, fluoroscopy, computed tomography, and angiography. However, these techniques may expose patients to ionising radiation, increase healthcare costs, delay definitive treatment, and may not be readily available in emergency or resource-limited settings. Point-of-care ultrasonography (POCUS) provides a rapid, portable, radiation-free bedside imaging modality that allows accurate localisation of superficially retained catheter fragments and facilitates minimally invasive retrieval (4).

Here, we report a rare case of fracture of a peripheral intravenous cannula with intravascular retention of the distal catheter fragment that was successfully localised and retrieved using immediate bedside point-of-care ultrasonography through a multidisciplinary collaboration between the Departments of Anaesthesiology and Orthopaedics. This case highlights the important role of POCUS in improving patient safety while avoiding unnecessary advanced imaging and extensive surgical exploration.

definitive orthopaedic management. As part of routine resuscitative care, a peripheral intravenous cannula was inserted into a superficial vein of the left forearm distal to

the cubital fossa for administration of intravenous fluids and medications. Shortly after cannulation, the patient complained of localised pain at the insertion site associated with minimal bleeding.

During attempted removal of the peripheral intravenous cannula, unusual resistance was encountered. Inspection of the removed

cannula demonstrated absence of the distal catheter tip (Figure 1), raising immediate suspicion of catheter fracture with intravascular retention. Considering the potential risk of proximal migration and embolisation, urgent localisation of the retained fragment was undertaken.



Figure 1. Retrieved distal fragment of the fractured peripheral intravenous cannula following ultrasound-guided bedside retrieval.

On physical examination, the patient was hemodynamically stable with normal distal perfusion of the affected limb. Local examination revealed mild tenderness and minimal bleeding at the cannulation site without significant swelling, hematoma, or a palpable foreign body. Distal neurovascular examination demonstrated intact radial and ulnar pulses, normal capillary refill, preserved motor and sensory function, and no evidence of compartment syndrome. Bedside point-of-care ultrasonography was performed

immediately using a high-frequency linear-array transducer (6–13 MHz). Initial transverse scanning identified the superficial forearm vein, followed by longitudinal scanning, which demonstrated a linear hyperechoic structure within the venous lumen consistent with the retained catheter fragment (Figure 2). The fragment was located approximately 4–6 mm beneath the skin surface without evidence of proximal migration. The overlying skin was marked under real-time ultrasound guidance to facilitate targeted retrieval.

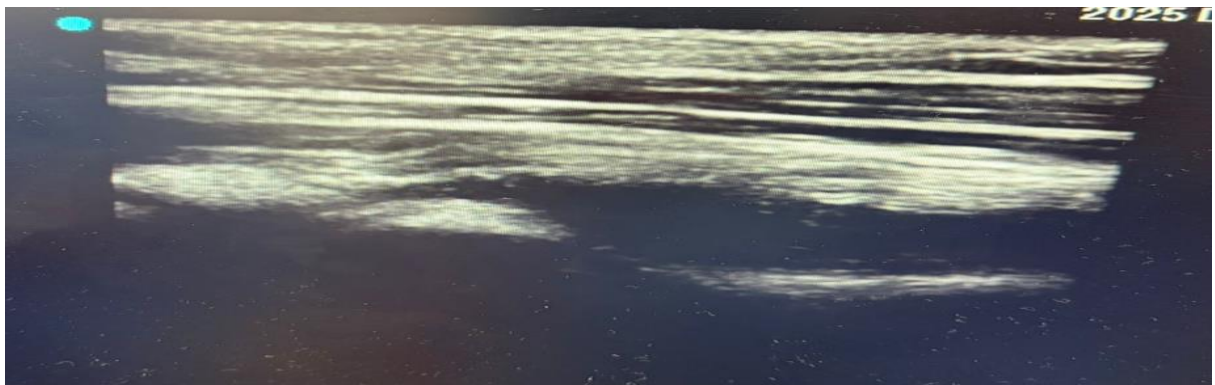


Figure 2. Longitudinal point-of-care ultrasound image obtained using a high-frequency linear transducer demonstrating the retained peripheral intravenous catheter fragment within a superficial forearm vein.

Following confirmation of the retained intravascular fragment, the patient underwent bedside retrieval under strict aseptic precautions. After temporary proximal venous compression and infiltration with 1% lignocaine, a small longitudinal skin incision measuring approximately 1–1.5 cm was made directly over the sonographically marked site. Blunt

dissection exposed the superficial vein containing the retained catheter fragment, which was carefully removed (Figure 3) using fine forceps through the existing puncture tract. Haemostasis was achieved, the wound was irrigated with normal saline, and the skin was closed with interrupted nylon sutures followed by sterile dressing application.



Figure 3. Peripheral intravenous cannula after removal demonstrating absence of the distal catheter tip, confirming catheter fracture.

The postoperative course was uneventful. The patient remained hemodynamically stable without evidence of thrombosis, infection, bleeding, neurovascular compromise, or migration of the retained fragment. At follow-up, satisfactory wound healing was observed with complete preservation of distal limb function, and no additional intervention was required.

Discussion

Peripheral intravenous cannulation is one of the most frequently performed invasive procedures in clinical practice and is generally regarded as a low-risk procedure. Nevertheless, rare complications such as catheter fracture with intravascular retention may lead to significant morbidity if diagnosis is delayed. Retained catheter fragments may migrate through the venous circulation, resulting in thrombosis,

pulmonary embolisation, cardiac arrhythmias, infective complications, vascular perforation, or the need for complex endovascular or surgical retrieval procedures (2,3).

Several mechanisms have been implicated in peripheral intravenous catheter fracture, including reinsertion of the introducer needle into a partially advanced catheter, repeated cannulation attempts, difficult venous access, excessive manipulation, manufacturing defects, prolonged catheter dwell time, and forceful catheter removal (1,3). Careful inspection of catheter integrity after removal remains an essential patient safety practice and allows early recognition of this uncommon complication.

Various imaging modalities have been reported for localisation of retained intravascular catheter fragments, including

plain radiography, computed tomography, fluoroscopy, and angiography. Although these investigations are useful when central migration is suspected, they may delay definitive treatment, increase healthcare costs, expose patients to ionising radiation, and may not be immediately available in emergency departments or resource-limited settings (3).

Previous reports have described retained peripheral intravenous catheter fragments requiring surgical or endovascular retrieval. Dell'Amore et al. reported migration of a fractured peripheral venous catheter into the pulmonary artery requiring thoracic surgical intervention following delayed diagnosis (12). Surov et al. demonstrated that delayed retrieval of embolized intravascular catheters was associated with increased morbidity and frequently required invasive procedures (2). Nyamuryekung'e et al. described successful ultrasonographic localisation before surgical removal of a retained peripheral intravenous catheter fragment (14). More recently, Ouatab et al. emphasised the importance of early diagnosis and prompt intervention to prevent migration-related complications (16).

Unlike many previously published reports, immediate bedside point-of-care ultrasonography was performed immediately after recognition of catheter fracture in the present case. Ultrasonography not only confirmed the diagnosis but also enabled real-time localisation, skin marking, and procedural guidance, allowing successful retrieval through a small targeted incision under local anaesthesia. This approach avoided fluoroscopy, computed tomography, angiography, transfer to the operating room, and extensive surgical exploration.

Point-of-care ultrasonography offers several practical advantages for superficially

retained catheter fragments. It is portable, inexpensive, radiation-free, readily available at the bedside, and provides dynamic visualisation of both the retained foreign body and adjacent vascular structures. In addition, ultrasound-guided skin marking minimises tissue dissection and facilitates precise surgical planning. These characteristics make POCUS particularly valuable in emergency departments, operating theatres, intensive care units, and resource-limited healthcare settings.

This case also highlights the importance of multidisciplinary collaboration between Anaesthesiology and Orthopaedics. Immediate recognition of the complication by the anaesthesia team, followed by prompt ultrasound-guided localisation and definitive retrieval by the orthopaedic team, resulted in successful management without procedure-related complications. Such collaborative practice may reduce delays in treatment, minimise healthcare costs, and improve overall patient safety. To our knowledge, only a limited number of published reports have described immediate bedside point-of-care ultrasound-guided localisation followed by targeted minimally invasive retrieval of a retained peripheral intravenous cannula fragment through multidisciplinary collaboration between Anaesthesiology and Orthopaedics. This case demonstrates that readily available bedside ultrasonography can serve as both a diagnostic and procedural guidance tool, thereby avoiding unnecessary radiation exposure, advanced imaging, extensive surgical exploration, and delays in definitive management. The present report reinforces the importance of integrating point-of-care ultrasonography into the management algorithm for retained peripheral intravenous catheter fragments as a practical patient safety intervention, particularly in emergency and resource-limited settings.

Results

Bedside point-of-care ultrasonography accurately localised the retained peripheral intravenous catheter fragment within a superficial forearm vein and facilitated successful ultrasound-guided retrieval through a small targeted incision under local anaesthesia. Complete removal of the retained fragment was achieved without fluoroscopy, computed tomography, angiography, or formal operative

exploration. The patient experienced no perioperative complications, including bleeding, thrombosis, infection, neurovascular injury, or fragment migration. At follow-up, wound healing was satisfactory, distal limb function was preserved, and no further intervention was required. Here we present the algorithm below (Figure 4) for management of suspected retained peripheral intravenous catheter fragments:

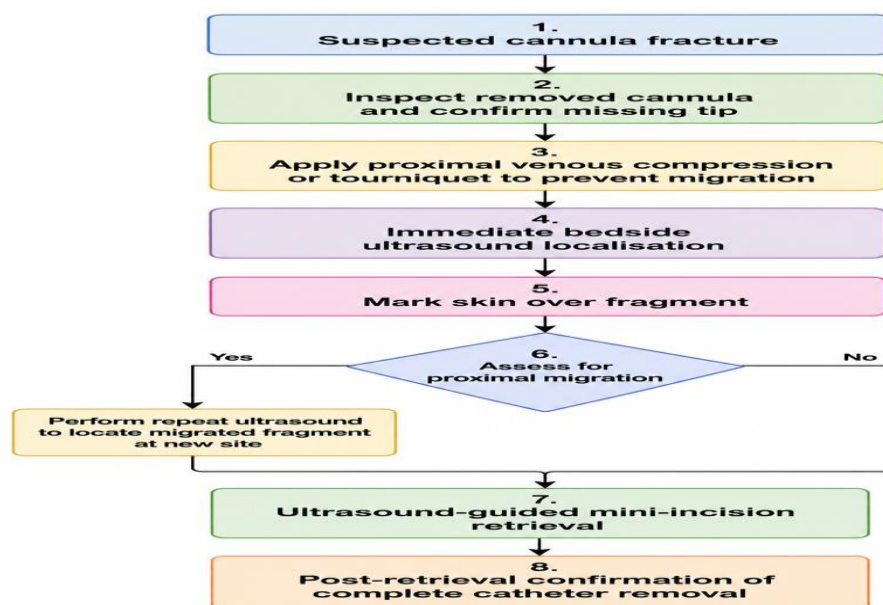


Figure 4. Proposed algorithm for ultrasound-guided management of suspected retained peripheral intravenous catheter fragments.

Conclusion

Peripheral intravenous cannulation is a routine clinical procedure; however, catheter fracture with intravascular retention represents a rare but clinically important patient safety event that requires prompt recognition and intervention. Delayed diagnosis may result in migration of the retained fragment with potentially serious vascular and embolic complications. This case demonstrates that immediate point-of-care ultrasonography provides a rapid, inexpensive, radiation-free, and readily available method for localisation of

retained peripheral intravenous catheter fragments. Ultrasound-guided bedside retrieval through a small targeted incision can facilitate minimally invasive management while avoiding advanced imaging, extensive surgical exploration, and unnecessary healthcare costs. Increased awareness of this uncommon complication and close collaboration between Anaesthesiology and Orthopaedics may improve patient outcomes and enhance patient safety.

Ethical Considerations

This case report was conducted in accordance with the ethical standards of the participating institution and the principles of the Declaration of Helsinki. Institutional

Written Informed Consent

Written informed consent was obtained from the patient for publication of this case report and the accompanying clinical photographs and ultrasound images. Patient confidentiality has been maintained throughout the manuscript.

Conflict of Interest

The authors declare that they have no conflicts of interest related to this publication.

Funding

The authors received no financial support for the preparation, authorship, or publication of this manuscript.

Acknowledgment

The authors sincerely thank the Departments of Anaesthesiology and Orthopaedics, All India Institute of Medical Sciences (AIIMS), Mangalagiri, for their clinical support and multidisciplinary collaboration in the successful management of this patient. The authors also thank the patient for providing written informed consent for publication of this case report and accompanying images.

References

1. McGee DC, Gould MK. Preventing complications of central venous catheterization. *N Engl J Med*. 2003;348(12):1123-33. doi:10.1056/NEJMra011883.
2. Surov A, Buerke M, John E, Kösling S, Spielmann RP, Behrmann C. Intravenous port catheter embolization: mechanisms, clinical features and management. *Angiology*. 2008;59(1):90-7.
3. Venkatesan AM, Kundu S, Sacks D, Wallace MJ, Wojak JC, Rose SC, et al.

ethical committee approval was not required for publication of a single anonymised case report according to institutional policy.

- Practice guideline for the retrieval of intravascular foreign bodies and misplaced intravascular devices. *J Vasc Interv Radiol*. 2009;20(7 Suppl):S191-6.
4. Stone MB, Moon C, Sutijono D, Blaivas M. Needle and foreign body localization by bedside ultrasound. *J Emerg Med*. 2010;39(4):462-6.
5. Osti C, Khadka M, Wosti D, Gurung G, Zhao Q. Knowledge and practice towards care and maintenance of peripheral intravenous cannulation among nurses in Chitwan Medical College Teaching Hospital, Nepal. *Nurs Open*. 2019;6(3):1006-12.
6. Chopra V, Flanders SA, Saint S, Woller SC, O'Grady NP, Safdar N, et al. The Michigan Appropriateness Guide for Intravenous Catheters (MAGIC): results from a multispecialty panel using the RAND/UCLA appropriateness method. *Ann Intern Med*. 2015;163(6 Suppl):S1-40.
7. Marsh N, Webster J, Larsen E, Mihala G, Rickard CM. Observational study of peripheral intravenous catheter outcomes in adult hospitalised patients. *BMJ Open*. 2018;8(2):e019076.
8. Alexandrou E, Ray-Barruel G, Carr PJ, Frost SA, Inwood S, Higgins N, et al. International prevalence of the use of peripheral intravenous catheters. *BMJ Open*. 2015;5(7):e008462.
9. Fields JM, Dean AJ, Todman RW, Au AK, Anderson KL, Ku BS, et al. The accuracy of ultrasound-guided localization of soft tissue foreign bodies. *J Emerg Med*. 2015;48(4):448-53.
10. Merrer J, De Jonghe B, Golliot F, Lefrant JY, Raffy B, Barre E, et al. Complications of femoral and subclavian venous catheterization in critically ill patients: a randomized controlled trial. *JAMA*. 2001;286(6):700-7.
11. Kornbau C, Lee KC, Hughes GD, Firstenberg MS. Central line complications. *Int J Crit Illn Inj Sci*. 2015;5(3):170-8.
12. Dell'Amore A, Ammari C, Campisi A, D'Andrea R. Peripheral venous catheter fracture with embolism into the

- pulmonary artery. *J Thorac Dis.* 2016;8(12):E1581-4.
13. 13. Sohrabi C, Mathew G, Maria N, Kerwan A, Franchi T, Agha RA, et al. The SCARE 2023 guideline: updating consensus Surgical CAse REport (SCARE) guidelines. *Int J Surg.* 2023;109(5):1136-40. doi:10.1097/JS9.0000000000000373.
 14. 14. Nyamuryekung'e MK, Mmari EE, Patel MR. A missing piece: fracture of peripheral intravenous cannula, a case report. *Int J Surg Case Rep.* 2021;78:296-9. doi:10.1016/j.ijscr.2020.12.030.
 15. 15. Adeosun PO, Abdulazeez AT, Okeke UI, Ehinmosan OE, Eze EG. CT-guided retrieval of a fractured intravenous cannula in a toddler: a case report. *Afr J Emerg Med.* 2020;10(4):277-80. doi:10.1016/j.afjem.2020.06.010.
 16. 16. Ouatab Y, Jidal M, Halhoul Y, Kraitiss H, Bensghir M. Peripheral intravenous cannula fracture with intravascular retention: early diagnosis and management in a case report and literature review. *Cureus.* 2026 Apr 7;18(4):e106602. doi:10.7759/cureus.10660.