

NEW TECHNOLOGIES

Open Access



# Ultrasound-guided percutaneous retrieval of non-radiopaque radial line using a microsnares

Hasan Alaeddin<sup>1\*</sup> , Amr Elsaadany<sup>2</sup> and Mohammad Rashid Akhtar<sup>2</sup>

## Abstract

Radial arterial lines are inserted in critically ill patients admitted to hospital intensive care units for continuous monitoring of their blood pressure. On removal the line can rarely become transected, potentially leading to thrombosis of the radial artery. Retrieval of the broken fragment can be achieved by open surgery, however other retrieval methods using ultrasound-guidance have been performed as they are considered safer and less invasive. We describe our technique of ultrasound-guided percutaneous retrieval of a broken non-radiopaque radial line in one patient, which involved the use of a microsnares. Under local anaesthesia and ultrasound guidance, a 6 Fr 5.5 cm short brite tip sheath was introduced into the radial artery, followed by a microsnares which was used to capture the arterial line, track the line back into the sheath and remove it uneventfully. The use of a microsnares under ultrasound-guidance is only one method to retrieve transected radial lines, with other interventional methods described in the literature. It enables a minimally invasive and safer approach to this potentially critical challenge and can help affected patients avoid open surgery to achieve the same management outcome.

**Keywords** Radial artery, Retained catheter, Ultrasound, Minimally invasive techniques, Microsnares

## Background

Radial artery catheterization, also commonly known as ‘radial arterial line’ insertion, is usually performed in critically ill patients who are admitted to intensive care units (ICU) for continuous real-time monitoring of their blood pressure and sampling of their arterial blood. Alternatively, they are also inserted in patients who are undergoing major procedures or surgeries [1]. As with any invasive procedure, complications can occur with radial artery catheterization (although it is generally viewed as a safe procedure). This procedure is predominantly performed by trained anaesthetists without ultrasound guidance.

Common complications include haematoma formation and temporary arterial occlusion [2]. A rare but serious complication is inadvertent transection of the catheter on its removal, which can cause thrombosis of the radial artery if not retrieved, and in patients who have an occluded ulnar artery or incomplete palmar arch it can lead to critical hand ischaemia [2]. There are a limited number of cases found in the medical literature detailing cases of retained radial artery catheter fragments caused by accidental catheter transection during removal [2–4].

Surgical removal of the retained catheter fragment is a relatively low-risk procedure but remains significantly invasive with questionable benefit in an otherwise asymptomatic patient. An alternative method of removal involves the use of ultrasound and local anaesthetic for an interventional procedure. The ultrasound-guided retrieval is minimally invasive, reducing the need for open surgery whilst also reducing patient discomfort and recovery time. The procedure is monitored

\*Correspondence:

Hasan Alaeddin  
hfalaeddin@gmail.com

<sup>1</sup> Royal Derby Hospital, 14 Prothero Gardens, London NW4 3SL, UK

<sup>2</sup> Royal London Hospital, London, UK

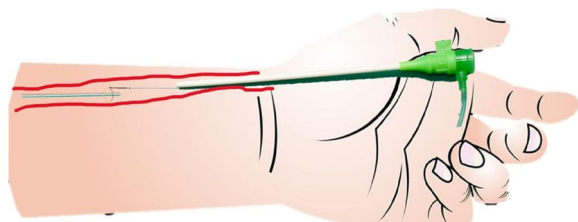
in real-time, enhancing precision and minimising the risk of complications. In addition, ultrasound-guidance can be applied in various clinical settings, making it a versatile tool for broken radial line retrieval.

We describe the successful and uncomplicated ultrasound-guided percutaneous radial line fragment retrieval technique using a microsnares (Fig. 1).

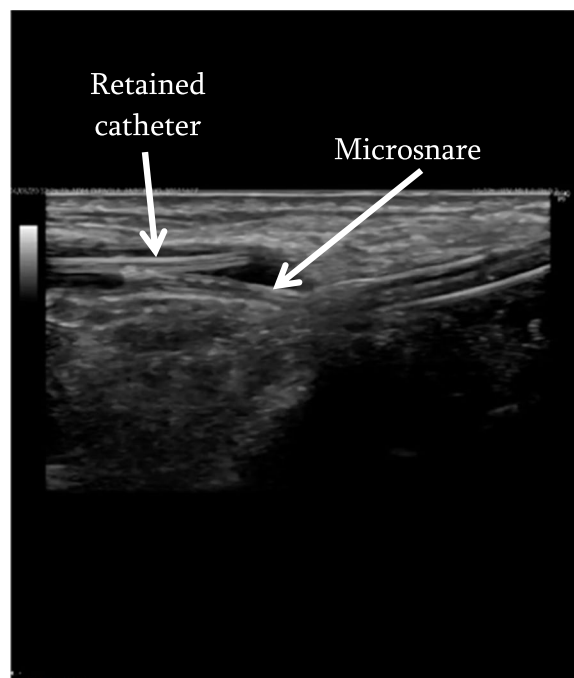
**Case description**

A patient was hospitalized in the intensive care unit at the Royal London Hospital after sustaining a renal injury from a road traffic accident that required embolisation. On admission they had a 20-gauge radial arterial line inserted in both arms for dynamic blood pressure monitoring. A few days later the patient was discharged from ICU and their arterial lines were all removed. However, after removal of the left radial line it was noted by the nursing staff that the proximal fragment of the line was missing. An ultrasound scan was then used to visualise the left radial artery and this demonstrated the missing catheter fragment along with some intimal defects/flaps within the radial artery which were not flow-limiting.

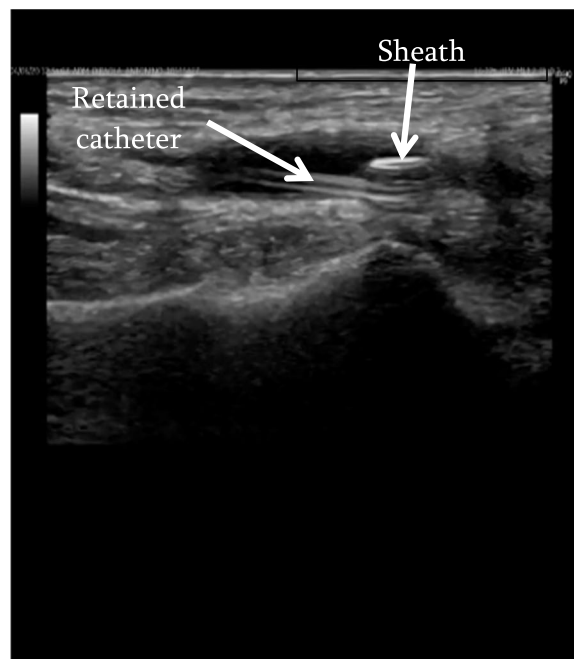
For the retrieval procedure, 1% lidocaine local anaesthetic was applied to the subcutaneous tissues of the left wrist, overlying the left radial artery above the radial styloid. A 4 French (Fr) micropuncture sheath (S-MAK, Merit medical, South Jordan, UT, USA) was inserted into the radial artery at this site under ultrasound guidance. The 4 Fr micropuncture sheath was exchanged under ultrasound guidance for a 6 Fr 5.5 cm short brite tip sheath (Cordis, Miami Lakes, FL, USA). This was followed by the insertion of a microsnares (3 Fr Amplatz Goose Neck, ev3 Inc., MN, USA) into the sheath. Under continuous ultrasound visualisation, the opened microsnares was used to capture the arterial line fragment (Fig. 2) (video 1). The fragment was then tracked back into the sheath and removed (Fig. 3) (video 2). After confirmation of removal of the entire fragment, the 6 Fr sheath was removed and a transradial band (TR Band,



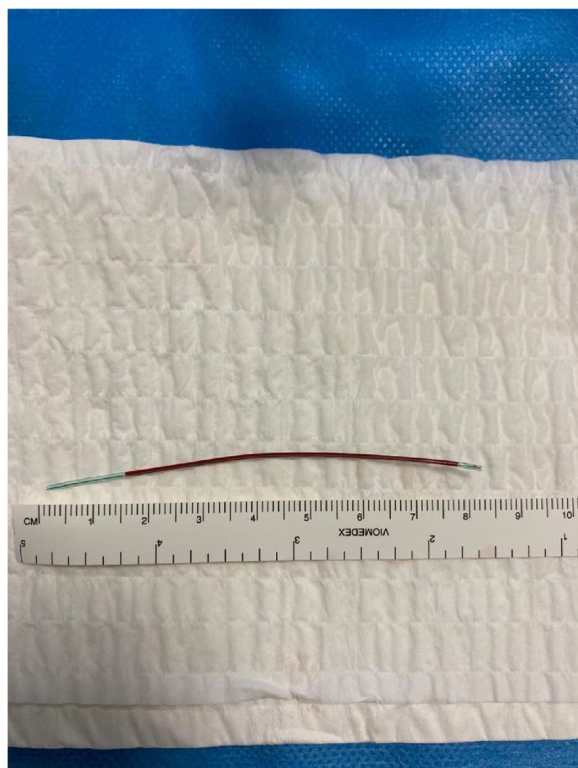
**Fig. 1** Illustration of percutaneous retrieval of retained radial line using microsnares technique



**Fig. 2** Ultrasound image demonstrating microsnares capturing the retained arterial line fragment



**Fig. 3** Ultrasound image demonstrating tracking back of retained fragment into sheath



**Fig. 4** Retained catheter fragment post-removal

Terumo, Tokyo, Japan) was then applied to the puncture site to help stem bleeding and assist haemostasis. There were no complications reported post-procedure (Fig. 4).

## Discussion

This case involved the use of a microsnare under ultrasound-guidance to retrieve a radial arterial line fragment that had been transected during line removal. This percutaneous approach enabled the minimally invasive retrieval of the line fragment without the need for open surgery. Such an approach requires high-quality ultrasound imaging and familiarity with ultrasound-guided endovascular procedures. To our knowledge, this is the first case in the literature detailing the use of a microsnare in such a technique for retrieval of a radial artery catheter fragment under ultrasound guidance. A previous case report in the literature describes the ultrasound-guided retrieval of broken radial lines in two patients, with one case using a Fogarty arterial embolectomy catheter to retrieve the line, and in the second the retrieval was achieved by cannulating the fragment with a non-hydrophilic catheter [5].

## Conclusion

Ultrasound-guided retrieval of broken radial lines can be a valuable technique in interventional radiology and vascular procedures. The use of a microsnare under ultrasound-guidance offers a minimally invasive, precise, and versatile approach to address this potentially critical medical challenge, and can help avoid the need for open surgical procedures to achieve the same management outcome for affected patients.

## Abbreviations

ICU Intensive care unit  
Fr French

## Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s42155-023-00407-5>.

**Additional file 1.**

**Additional file 2.**

## Acknowledgements

Not applicable.

## Authors' contributions

HA drafted the manuscript and researched the medical literature for previous cases detailing the use of interventional methods to retrieve transected radial lines. AE and MR both carried out the interventional procedure – using microsnare under ultrasound-guidance to retrieve a broken left radial-line fragment from an ICU patient, provided ultrasound images and videos from the procedure, and were contributors in writing the manuscript. All authors read and approved the final manuscript.

## Authors' information

Not applicable.

## Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

## Availability of data and materials

Not applicable.

## Declarations

### Ethics approval and consent to participate

Not applicable.

### Consent for publication

Not applicable.

### Competing interests

The authors declare that they have no competing interests.

Received: 24 October 2023 Accepted: 19 November 2023  
Published online: 29 November 2023

## References

1. Wallace MW, Solano JJ. Radial Artery Cannulation. In: StatPearls. Treasure Island: StatPearls Publishing; 2023. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK539796/>. Updated 2023 Jun 26.
2. Nielsen JH, Thomsen AB, Thomsen NO. An unnoticed retained cannula fragment in the radial artery: should ultrasound investigation be included in guidelines? *Eur J Anaesthesiol*. 2014;31(2):118–20. <https://doi.org/10.1097/EJA.0b013e328361a5a6>. PMID: 23635995.
3. Moon SK, Gong JC, Kim JH, Lee KC, Kim HY, Choi EK, Lee MJ. A retained catheter fragment in radial artery caused by accidental catheter transection during arterial catheter removal. *J Anesth*. 2012;26(4):625–6. <https://doi.org/10.1007/s00540-012-13884>. Epub 2012 Apr 7 PMID: 22484914.
4. Tollinche L, Jackson J, La M, Desiderio D, Yeoh C. Case report: transection of radial arterial catheter requiring surgical intervention. *J Intensive Crit Care*. 2018;4(1):3 Epub 2018 Feb 1. PMID: 29780973; PMCID: PMC5954833.
5. Derycke L, Mallios A. Ultrasound-guided percutaneous retrieval of transected radial artery catheter. *J Vasc Access*. 2021;22(1):151–3. <https://doi.org/10.1177/1129729819899807>.

## Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Submit your manuscript to a SpringerOpen<sup>®</sup> journal and benefit from:

- ▶ Convenient online submission
- ▶ Rigorous peer review
- ▶ Open access: articles freely available online
- ▶ High visibility within the field
- ▶ Retaining the copyright to your article

---

Submit your next manuscript at ▶ [springeropen.com](https://www.springeropen.com)

---