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Case Report

ANESTHESIA AND CRITICAL CARE

ISSN: 2687-7996



Endovascular Retrieval of a Retained Femoral Arterial Catheter Fragment in an Infant: A Case Report

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Abstract

Femoral arterial catheter fracture with intravascular retention is a rare complication that may lead to serious vascular events. This report describes the successful endovascular retrieval of a retained femoral arterial catheter fragment in an infant. A 22-gauge femoral arterial catheter fractured during removal after eight days of postoperative use in a 1-year-old male patient with congenital heart disease. Plain radiography and Doppler ultrasonography were performed to identify and localize the retained fragment. After an unsuccessful attempt at surgical retrieval, the fragment was successfully removed using an endovascular snare under fluoroscopic guidance. No procedural complications occurred, and distal limb perfusion remained intact. At six-month follow-up, the patient was asymptomatic, with no evidence of vascular complications or limb ischemia. Early recognition of catheter fracture and prompt imaging are essential for appropriate management. Endovascular snare retrieval may represent a minimally invasive treatment option for retained femoral arterial catheter fragments in infants.

Keywords: Femoral Artery; Catheter Fracture; Intravascular Foreign Body; Endovascular Retrieval; Device Removal; Infant

Introduction

Femoral arterial catheterization is a commonly used invasive procedure for perioperative hemodynamic monitoring and arterial blood sampling in selected pediatric patients undergoing surgery for congenital heart disease (1). Although rare, intravascular catheter fracture with retention of a catheter fragment may result in serious complications, particularly in the arterial system, including distal embolization, thrombosis, vascular occlusion, and acute limb ischemia (2-4). Pediatric patients may be particularly vulnerable because of their small vessel caliber. Therefore, early recognition and timely intervention are essential to minimize the risk of significant morbidity. Although catheter fracture has been reported more frequently in central venous catheters, arterial catheter fracture remains exceptionally rare, and the available literature consists primarily of isolated case reports (2-5). Percutaneous endovascular retrieval is an established minimally invasive approach for the removal of selected intravascular foreign bodies, potentially avoiding more extensive surgical exploration (3-5). However, reports of successful endovascular retrieval of retained femoral arterial catheter fragments in infants remain limited (2-7). Here, we report the successful endovascular snare retrieval of a retained femoral arterial catheter fragment following catheter fracture during removal in an infant after congenital cardiac surgery. This case highlights the diagnostic and therapeutic considerations involved in managing this uncommon complication.

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Citation: Ergun Gunduz, Ilkay Akkaya, Shiraslan Bakhshaliyev, Ergin Aslanoglu, Omer Ozyigit, Seza Apiliogullari. Endovascular Retrieval of a Retained Femoral Arterial Catheter Fragment in an Infant: A Case Report. Anesthesia and Critical care 8 (2026): 180-183.

Received: November 08, 2026
Accepted: November 18, 2026
Published: November 21, 2026

Gunduz E, et al., Anesth Crit Care 2026
DOI:10.26502/acc.0115

Case Presentation

A 1-year-old male patient with transposition of the great arteries associated with a ventricular septal defect underwent pulmonary artery banding. For continuous invasive blood pressure monitoring and perioperative arterial blood sampling, a 22-gauge arterial catheter (Arrow®, Teleflex Inc., Wayne, PA, USA) was inserted into the left common femoral artery under ultrasound guidance using sterile technique. The catheterization procedure and surgery were uneventful, and the patient was subsequently transferred to the pediatric cardiovascular intensive care unit for postoperative monitoring. The arterial catheter remained in situ for eight days without catheter-related complications, including bleeding, infection, thrombosis, or impaired distal perfusion. Prior to transfer to the pediatric cardiovascular surgery ward, the catheter was removed by an experienced intensive care nurse with more than five years of clinical experience. Manual compression was applied proximal to the insertion site during catheter removal to reduce the risk of bleeding. Immediately after catheter removal, inspection of the catheter revealed that the distal portion was missing, raising suspicion of catheter fracture with intravascular retention. A plain radiograph demonstrated a linear radiopaque structure consistent with a retained catheter fragment along the course of the left femoral artery (Figure 1). Doppler ultrasonography subsequently confirmed the intravascular location of the retained catheter fragment within the femoral arterial system without evidence of distal embolization (Figure 2).



Figure 1: Plain radiograph showing the retained femoral arterial catheter fragment along the course of the left femoral artery.

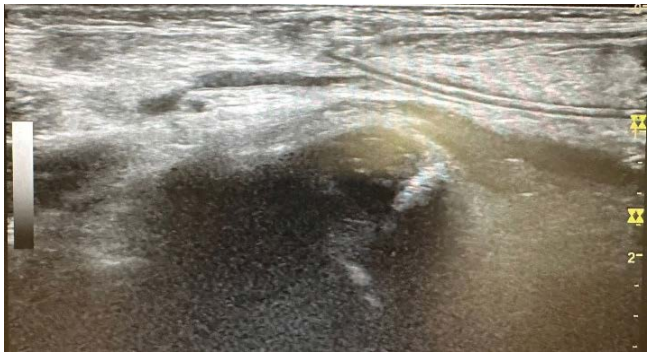


Figure 2: Doppler ultrasonographic image demonstrating the retained catheter fragment within the left femoral artery.

Following imaging confirmation, limited local surgical exploration at the arterial puncture site was undertaken in an attempt to retrieve the retained fragment. As the fragment could not be safely retrieved, further surgical exploration was avoided to minimize the risk of arterial injury, and the patient was subsequently referred for endovascular retrieval. The patient was subsequently transferred to the operating room for endovascular retrieval under general anesthesia using a laryngeal mask airway. Under fluoroscopic guidance, vascular access was obtained, and a snare retrieval system was advanced beyond the retained catheter fragment. The snare was then opened and carefully withdrawn to capture the fragment. The retained catheter fragment, measuring approximately 5 cm in length, was successfully retrieved without procedural complications (Figure 3).

Following retrieval, distal arterial pulsations remained palpable, and no evidence of vascular compromise or limb ischemia was observed. The postoperative course was uneventful, and the patient was discharged home in good clinical condition. At the 6-month clinical follow-up, the patient remained asymptomatic, with no evidence of vascular complications or limb ischemia.

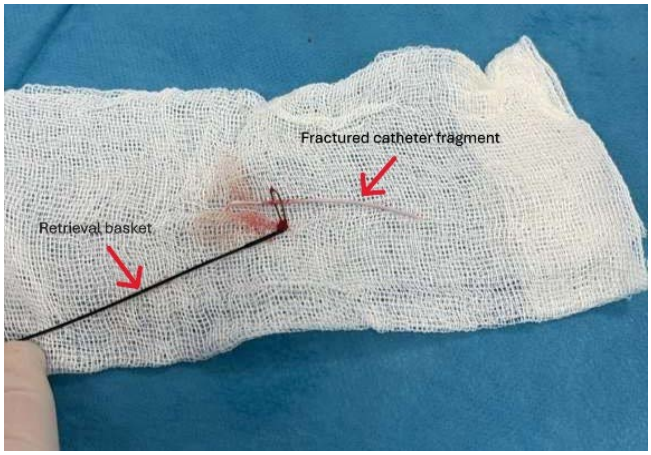


Figure 3: Retrieved femoral arterial catheter fragment following successful endovascular snare retrieval. The fragment measured approximately 5 cm in length.

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Discussion

Peripheral arterial catheter fracture is an uncommon but potentially serious complication, particularly in pediatric patients. Although catheter-related complications such as thrombosis, infection, bleeding, and arterial occlusion are well recognized, catheter fracture with retention of an intravascular fragment has been reported far less frequently than other catheter-related complications (1-4), and most reported cases involve central venous catheters, with embolized fragments typically migrating to the right heart or pulmonary circulation (3). In contrast, arterial catheter fracture has been reported only rarely, and the available evidence is largely limited to isolated case reports (2-4). Because of the small caliber of pediatric vessels, pediatric patients may be particularly vulnerable, emphasizing the importance of prompt recognition and timely management (2-4). Although arterial catheter fracture has previously been described, reports describing successful endovascular retrieval of retained femoral arterial catheter fragments in infants remain exceedingly limited (2,4,6,7). In the present case, successful endovascular retrieval using a snare system enabled minimally invasive removal of the retained femoral arterial catheter fragment. This case adds to the limited literature supporting endovascular management of this rare complication in pediatric patients. The exact mechanism of catheter fracture in the present case remains uncertain. Several mechanisms have been proposed in previous reports, including excessive traction during catheter removal, mechanical stress related to the angle of withdrawal, localized compression during removal, prolonged catheterization, and device-related material failure (2-4). In the present case, the catheter fractured during removal while proximal manual compression was being applied. Although localized mechanical stress may have contributed, the precise cause could not be determined, and no mechanical or material analysis of the fractured catheter was performed. Therefore, a manufacturing defect or material weakness cannot be confirmed and should be regarded only as a possible contributing factor rather than a demonstrated cause. Early recognition of catheter fracture is essential to prevent complications such as distal embolization, thrombosis, vascular occlusion, and limb ischemia (2-4). Once catheter fracture is suspected, imaging plays a crucial role in confirming the diagnosis, localizing the retained fragment, and planning the most appropriate retrieval strategy. Following recognition of the retained fragment, plain radiography and Doppler ultrasonography confirmed its location before definitive intervention. These imaging modalities provided sufficient anatomical information for treatment planning while excluding distal migration. Fluoroscopy subsequently enabled accurate localization and safe endovascular retrieval during the intervention. This sequential imaging approach facilitated timely endovascular management of the retained catheter fragment. Percutaneous endovascular techniques are established minimally invasive approaches for retrieving selected intravascular foreign bodies (3-5). Among the available devices, snare systems are commonly used retrieval tools because of their versatility and effectiveness (3-5). This case highlights several practical considerations for the prevention and management of arterial catheter fracture. Catheter removal should be performed using gentle, steady traction while avoiding excessive force. If unexpected resistance is encountered, catheter withdrawal should be stopped until the underlying cause has been assessed (7). In addition, the removed catheter should always be inspected carefully to confirm its integrity immediately after removal. Prompt recognition of catheter fracture, followed by appropriate imaging and timely endovascular intervention when indicated, may reduce the risk of vascular complications and facilitate minimally invasive management (3-5). This report has several limitations. As a single case report, the findings cannot be generalized. In addition, the exact mechanism of catheter fracture could not be established because no mechanical or material analysis of the fractured catheter was performed. Nevertheless, the favorable clinical outcome, including the absence of vascular complications at the 6-month follow-up, provides additional support for prompt endovascular management in similar cases.

Conclusion

Peripheral arterial catheter fracture is a rare but potentially serious complication that requires prompt recognition and appropriate management. Sequential imaging with radiography, Doppler ultrasonography, and fluoroscopic guidance can facilitate accurate localization and treatment planning. Endovascular snare retrieval may represent a minimally invasive treatment option for retained femoral arterial catheter fragments. Careful inspection of the catheter after removal may facilitate early diagnosis and help prevent delayed complications.

Funding: No financial support was received for the preparation or publication of this case report. No external funding, equipment, medications, or other material support was provided.

Conflict of Interest: The authors declare that they have no conflicts of interest related to this study.

Consent for Publication: Written informed consent for publication of the clinical details and accompanying images was obtained from the patient's legal guardians.

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