

Spontaneous arterial catheter fracture and embolisation: Unpredicted complication

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ABSTRACT

Arterial cannulation is a common procedure in the care and management of critically ill patients. Blood pressure measurement, arterial blood sampling and cardiac output determinations are a few primary reasons for arterial cannulation. This invasive catheter placement also imposes certain risks and clinical management problems like bleeding, thrombosis and hematoma formation. Fracture and embolisation of arterial catheters placed in the femoral region is a rare and serious complication that may result in arterial occlusion and thrombosis. Percutaneous retrieval of the foreign body is frequently reported to be the technique of choice, leaving the surgical option to a small group. We report two consecutive cases of catheter fracture that was successfully retrieved by a combination of surgery and balloon tip retrieval device.

Key words: Arterial-catheter, complications, embolisation, fracture

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INTRODUCTION

Arterial cannulation is commonly practiced while managing critically ill patients. Blood pressure measurement, arterial blood sampling, cardiac output determinations and a site for rapid blood withdrawal are the primary reasons for arterial cannulation. In the era of rapidly advancing technology, there is an increase in the number of catheter-based procedures and therefore the incidence of catheter based complications. One of the potential complications is the fracture and dislodgement of a femoral artery catheter used for routine perioperative monitoring. Catheters used in cardiac theaters are sheath-less, small in size and are removed prior to ambulating the patient and hence catheter fracture and embolisation, though a well-known complication for central venous catheters, is rarely seen. Catheter quality and manufacturing defects though rare are seen frequently in current cost saving era when catheters are subjected to unconventional use.

CASE REPORTS

First case

A 54 year old male patient with critical two vessel coronary artery disease and poor ventricular function

underwent successful bypass surgery with right common femoral artery and left radial artery cannulation for blood pressure measurement and possible placement of intra-aortic balloon pump. A single lumen Unicath™ dialysis catheter [Newtech Medical Devices, New Delhi, India] was used via the femoral route to measure the arterial pressure. The patient was shifted to the Intensive Care Unit and extubated the next morning. Bleeding was noticed in the right groin and on examination the femoral catheter was found fractured at its junction with the hub [Figure 1]. The proximal segment of the catheter was not palpable. The distal pedal pulses were normally felt. The catheter had embolised and it was not clear in what direction. After control of the common, superficial and profunda vessels, the patient was heparinised and common femoral artery opened along the puncture site. The re-exploration of the right groin was done at the

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Figure 1: Catheter showing fracture at its junction with the port

bedside with sterile technique. A number 4F Fogarty catheter [Edward Lifesciences LLC, CA, USA] was passed along the distal arterial route and on multiple passages, the embolised segment was retrieved. The common femoral artery was repaired and the right groin closed in layers. The patient was discharged with good right femoral and right pedal pulse.

Second case

A 65 year old male with triple vessel coronary artery disease and borderline ventricular function was induced for bypass surgery and the right femoral artery catheter was cannulated for arterial pressure measurement. Whilst positioning the patient for painting and draping, the femoral catheter fractured at its junction with the hub with resultant bleeding from the fracture site. The proximal catheter had migrated distally and required a groin cut down to the level of common femoral artery for retrieval of the fractured end and repair of the artery. The fractured end was still in the puncture site and could be retrieved with an artery forceps. The artery was repaired and the groin wound suture closed.

DISCUSSION

Arterial cannulation is a common procedure in the care and management of critically ill patients and most commonly placed in the radial and femoral arteries.^[1] Invasive catheter placement can impose certain risks and clinical management problems. Femoral artery is cannulated by various catheters varying in texture, length and caliber with or without guidewire assistance. In 1967, Mortensen^[2] reported complications from 3193 arterial needle punctures, cannulations and incisions. The overall complication rate was 13%, including 66 major and 321 minor complications. Catheter fracture was evidently not reported in this series.

Catheter fracture with subsequent embolisation is rare and sometimes a late complication of central venous catheter placement, reported to occur in 0.5% to 3% of patients, either spontaneously and at times with port removal.^[1,3] It is commonly reported with subclavian approach and postulated to be preceded by the pinch-off sign.^[4] The complication could not be eliminated with internal jugular approach as well.^[5,6] The fracture was attributed to repeated compression of the catheter against the clavicle and regular wear and tear. Spontaneous catheter fractures are underestimated as some vascular access devices are not assessed after completion of scheduled treatment and may never be identified as damaged. Majority are asymptomatic.^[1] Although there are various signs reported to be classical for a central venous catheter fracture,^[1,3,6] no such signs are reported for a femoral approach. Ideally catheter material needs to be sufficiently stiff to maintain structural integrity and flexible to minimise discomfort or injury. Teflon and polyethylene are the two most common materials used in arterial catheters. A bent or kinked catheter is a common observation and may be a precursor for fracture. Catheter length has not been studied as a factor related to fracture and one article recommended a 3.2 to 5.1 centimeter catheter for radial and brachial artery cannulation and a 16 centimeter catheter for femoral artery cannulation.^[7] Literature review of complications of femoral arterial cannulation found no incidence of catheter fracture, making it a rare complication.^[1] A defective catheter escaping quality control checks in the production line might also be a reason for it to fracture under mechanical strain. Relevant to our assumption is a report by Panuccio *et al.*^[8] of 5 episodes in 4 patients of epidemic spontaneous catheter rupture. They suspected a problem with defective silicone catheters during the manufacturing process because no definite cause for the fractures could be found and most ruptures occurred at similar sites shortly after initiation of peritoneal dialysis. Alternatively, damage to the catheter at the time of insertion, such as an accidental needle-stick injury or use of a hemostat to clamp the catheter, might also contribute to an internal break. A thorough inspection and careful manipulation of the catheter before implantation is therefore required to avoid this unusual complication and the resultant patient morbidity. In our case the new catheter transection occurred spontaneously at the junction of the catheter with its hub which is its weakest part. We have since then discontinued the use of dialysis catheters for routine femoral artery cannulations

and switched over to small guide-wire based shorter catheters and have not found any untoward incident.

Percutaneous retrieval of intravascular foreign bodies is a safe technique that is effective, accessible and standardised.^[9] Many retrieval devices have been designed^[10,11] and their success rate has varied from 50%^[12] to nearly 100%.^[13] Fluoroscopic identification of fractured catheter can be difficult and ultrasound examination of the vascular tree may help locate the embolised segment and assist in planning surgical course. Surgical retrieval is the best intervention^[11] in cases where catheter fragment lacks a free end, is entrapped in deep peripheral branches, is endothelialised or has escaped outside the vessel walls. We have successfully used a combination of both surgery and retrieval balloons to extract the embolised segment, making it an innovative technique.

CONCLUSION

Low-maintenance systems must be researched and developed to avoid the complications of indwelling arterial lines. Simple and reproducible techniques are to be practised to avoid serious complications in critically ill patients.

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Conflicts of interest

There are no conflicts of interest.

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