An iatrogenic arterial foreign body

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Summary
The creation, possible complications and retrieval of an unusual, perhaps unique, arterial foreign body are described. (Br. J. Anaesth. 1996;77:430–431)

Key words

Case report
The patient was a right-handed, 72-yr-old woman undergoing internal fixation of a pathological fracture of the left femur by interlocking nail. Ten months before operation she had undergone a total left knee replacement under spinal and light general anaesthesia without incident. Three months before operation she had a left pneumonectomy for lung cancer: her early postoperative course was stormy as within hours of surgery she developed respiratory failure and atrial fibrillation, and required ventilation. Tracheotomy was performed and she was weaned from ventilatory support over the next 2 weeks. She was discharged with a prescription for domiciliary oxygen, and digoxin, verapamil andbumetanide. While walking at home she sustained a mid-shaft fracture of her left femur and was admitted for surgical fixation. She was in hospital for 1 week before operation during which time diclofenac and sustained-release morphine were added to her drug regimen.

At the preoperative visit she was sitting upright breathing oxygen from a face mask with her left leg in traction. She was dyspnoeic on slight exertion (moving herself in bed, eating lunch) and spoke in short sentences. She was orthopnoeic at about 45° and physically weak with a thoracolumbar kyphoscoliosis and sacral sores. Her haemoglobin concentration was 9.9 g dl⁻¹ and serum albumin concentration 24 g litre⁻¹, but all other haematological and biochemical variables were normal.

The planned operation was estimated to take 2 h and required a supine patient. General anaesthesia was used with lumbar extradural block for intra- and postoperative pain management. The procedure took 3 h and involved transfusion of 4 u. of blood after which her lungs were ventilated electively overnight and her trachea extubated without difficulty the next morning.

A left subclavian central venous catheter and left radial arterial cannula were inserted to facilitate monitoring and management. The arterial cannula was a 20-gauge Ohmeda arterial catheter with Flo Switch (1 mm in diameter by 45 mm in length). The device is designed to be sewn to the skin by means of a fenestrated plate, with holes for two sutures, which is integral with the hub of the cannula. Insertion of a third suture to hold the cannula firmly at the junction of the hub and catheter sections led to a jet of blood from the cannula wound indicating some damage to the device. A 0.5-mm by 20-cm guidewire was inserted through the hub of the arterial cannula with the intention of withdrawing the device while maintaining vascular access, but the wire emerged from the cannula 2 mm from the hub which was then seen to have been completely severed from the catheter section (fig. 1). As a pulsatile jet of arterial blood continued to issue from the cannula wound, it seemed possible that the detached fragment might be protruding from the vessel wall. However, a cut-down showed the bleeding came from the arteriotomy wound indicating the catheter section of the cannula was wholly within the arterial lumen. Firm pressure was applied to the wound and a right radial arterial cannula was inserted. A vascular surgical opinion was sought.

While the left hand appeared pink and warm and had a good pulse oximeter signal, with saturation readings from the index finger identical to those from the right hand, it was felt that the risk of digital ischaemia from embolization by a large foreign body, and possible later infection, was unacceptable. The arteriotomy site was re-explored and the palmar arch searched using a Fogarty embolectomy catheter without result. The detached fragment of the cannula was finally delivered from the radial artery proximal to the point of its insertion by means of the Fogarty catheter. The surgical arteriotomy was closed with 6/0 Prolene sutures.

Figure 1  Ohmeda arterial cannula with Flo Switch showing fenestrated plate for suturing (A) and point of severance by cutting needle (B).
The patient made a rapid and uneventful recovery from both operations with normal hand function when assessed 2 and 5 weeks after operation.

Discussion
Continuous display of arterial pressure\(^1\) by cannulation of an accessible artery is a valuable adjunct in the management of complex and difficult surgical cases, and during respiratory support in intensive care. It is usual to cannulate the radial artery on the non-dominant side and, although minor complications are common, ischaemic injury is almost unknown.\(^2\) The procedure appears to be safe when, in the absence of peripheral vascular disease, Allen’s test\(^3\) does not demonstrate adequate collateral circulation or when failed radial cannulation is followed by cannulation of the ipsilateral ulnar artery.\(^7\)

The complications of arterial cannulation have been classified and comprehensively reviewed recently.\(^8\) Immediate local complications are extravasation and haematoma formation: delayed local complications are reduced or absent flow, sensory impairment, infection, skin necrosis and false aneurysm. Distal complications include embolization of the deep palmar arch by thrombus from the wall of a partially occluded vessel, from the external surface of the cannula or flushed from the lumen of the device. The extensive interconnections between the palmar arterial arches and their many branches appear to be highly protective of circulation to the digits: minor embolic events are not clinically obvious and their incidence is unknown. Partial or complete radial artery occlusion, which occurs in approximately 25% of cannulations and is more common in women and after haematoma formation, is almost invariably devoid of clinical signs.

Foreign bodies in peripheral arteries are rare and result from missile injuries\(^8\) to\(^10\), radiological interventions\(^11\) or complications of surgery\(^12\) -\(^13\). There has been one report of palmar arch embolization from a penetrating injury of the forearm\(^14\) and none from arterial catheter fragments. The concern in the last case quoted, as in this, was that distal embolization might lead to digital ischaemia or later infection with the attendant risk of secondary haemorrhage or mycotic aneurysm formation.

Management of foreign body emboli which have been investigated fully and are causing no problems, or which are difficult to deliver, may be conservative\(^14\) -\(^15\) but most agree that the foreign body should be localized by radiological and angiographic studies and retrieved if possible.

Small peripheral arteries are presently beyond the reach of interventional radiology\(^16\) and therefore retrieval implies surgery. In our case there was no immediate circulatory compromise, a limited and accessible field for exploration (even under local anaesthesia) and surgical skills and equipment were available. Somewhat surprisingly exploration of the deep palmar arch by embolectomy catheter was fruitless and the 43-mm long fragment was delivered subsequently from the arterial lumen proximal to the arteriotomy. Without radiological studies the reasons for its immobilization are conjectural: impaction in the vessel wall and local spasm\(^11\) may have contributed, as may the length and relative rigidity of the fragment in what was probably a small and tortuous artery.

The lessons of the episode are clear: first, when fixing arterial cannulae, suture needles should be kept well clear of the devices; second, when distal exploration for an arterial foreign body is fruitless, proximal exploration may be worthwhile before resorting to imaging studies.

References