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Case report: Iatrogenic brachial artery dissection with complete anterograde occlusion during elective arterial line placement

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ABSTRACT

INTRODUCTION: Brachial arterial catheters provide a more accurate reflection of central aortic arterial pressure compared to their radial counterparts. Although brachial arterial line complications are uncommon, we report a case of a rare iatrogenic brachial artery dissection with complete anterograde occlusion from elective arterial line placement.

PRESENTATION OF CASE: A 41-year-old female presented for a right upper and middle lobe resection of a large neuroendocrine lung cancer. A brachial arterial line was inserted for continuous blood pressure monitoring using clinical landmarks. Six hours postoperatively the left hand was noted to be pale, cool and pulseless with complete paraesthesia. Thrombus was initially suspected on computed tomography angiography. Upon return to theatre, extensive dissection of the posterior brachial arterial wall was identified.

CONCLUSION: We review our diagnostic pathway and treatment of this rare complication. Recommendations to minimise the risks of complications from brachial arterial line insertion are also overviewed. We recommend the routine utilization of ultrasound-guided technique and regular post-insertion neurovascular monitoring for the prevention and early recognition of complications from brachial artery catheter insertion.

1. Background

Several studies have concluded that brachial arterial catheters provide a more accurate reflection of central aortic arterial pressure compared to their radial counterparts [1–5]. Although use of brachial artery catheters for continuous haemodynamic monitoring is becoming more common in cardiac and vascular anaesthesia settings, particularly for complex patients, complications of line insertion are relatively uncommon [6–8]. We report a case of a rare iatrogenic brachial artery dissection with complete anterograde occlusion from elective arterial line placement in an academic tertiary referral hospital. We review our diagnostic pathway and treatment of this rare complication. Recommendations to minimise the risks of complications from brachial arterial line insertion are also overviewed.

2. Case presentation

A 41-year-old female caucasian presented for a right upper and middle lobe resection of a neuroendocrine lung cancer. She had no other relevant past medical or family history, and took no medications. The procedure was planned via a hemi-sternotomy surgical incision likely requiring cardiopulmonary bypass (CPB) due to tumour compression of the brachiocephalic and azygos veins, superior vena cava, pulmonary artery and heart (Fig. 1). On arrival to the operating room, a brachial arterial line was inserted by an experienced cardiac anaesthetist for continuous blood pressure monitoring. A 5 mL syringe attached to a 19Gx5.6 cm thin wall short bevel needle with a clear flashback Luer Hub (Argon Medical Devices, Texas, USA) was advanced into the brachial artery using clinical landmarks. Two access passes were required. A 0.028Gx40 cm metal guidewire was then advanced through the needle. There was minor resistance on initial insertion and the wire was withdrawn and reinserted through the needle without further complication. The needle was removed and an 18Gx15 cm Fluoropolymer catheter (Argon Medical Devices, Texas, USA) fed over the guidewire into the artery; the guidewire was removed and the

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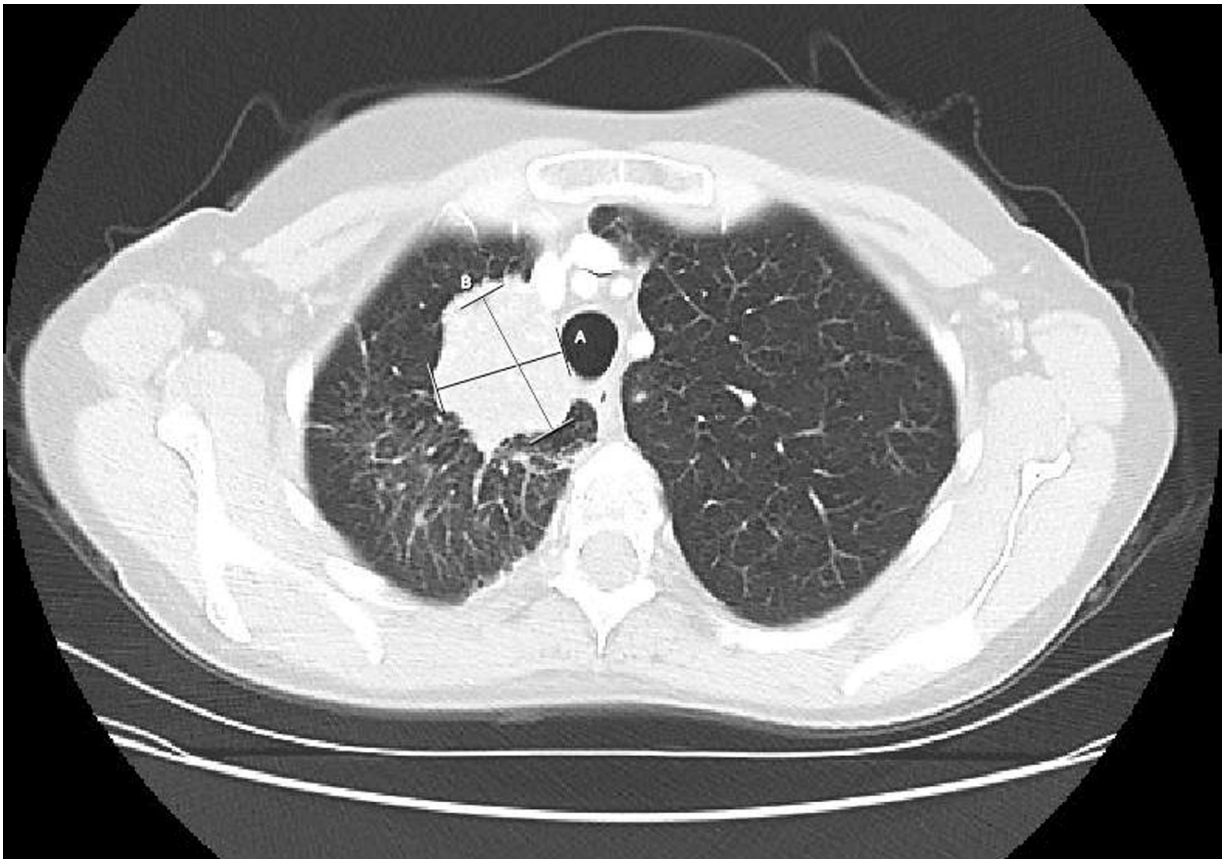

Fig. 1. Principal diagnosis.
Axial computed tomography showing large right sided upper lobe lung tumour with compression of the brachiocephalic and azygos veins, superior vena cava, pulmonary artery and heart.

catheter secured. Surgery and anaesthesia proceeded uneventfully. Immediately postoperatively, the patient was transferred to the intensive care unit for routine monitoring. She was alert and comfortable, with stable haemodynamics. Six hours postoperatively and post intervention, the patient complained of complete paraesthesia of the left hand. On examination, the hand was noted to be pale, cool and pulseless. There was no motor weakness. The arterial catheter was removed, and sensation and warmth returned, but only transiently.

An urgent computed tomography angiogram was performed; arterial phase imaging of the angiogram displayed a thrombus occluding the proximal left brachial artery immediately distal to the profunda brachii branch (Fig. 2). There was opacification of the radial and ulnar arteries on delayed phase imaging indicating collateral flow. The patient was immediately returned to theatre and, under general anaesthesia, the brachial artery was explored at the puncture site and found to be pulseless. Heparin (7000IU) was administered intravenously and a vertical arteriotomy made, revealing a thrombus extending proximally and occluding anterograde flow. Clot embolectomy was unsuccessful. Exploration revealed a small puncture site over the anterior wall of the artery, and large intimal tear of the posterior wall of the brachial artery with extensive dissection. Primary repair of the intimal tear was attempted but failed due to its large size. The artery was then repaired with a cephalic vein interposition graft. Flow was restored with an excellent radial pulse with complete restoration of colour to the hand. Full and open disclosure was provided to the patient. The patient made an uneventful recovery and was followed at 3,6, and 12 months with no further neurology.

3. Discussion

For this case, we chose the brachial artery as the preferred site for continuous haemodynamic monitoring. In the setting of complex surgery and CPB, central-peripheral arterial pressure gradients are well described with unpredictable variances in arterial catheter blood pressure measurements reported [1–4]. Stern et al. reported aortic-radial systolic pressure gradients as great as 32 mmHg post CPB, questioning the reliability of radial artery catheterisation measurements as an accurate source of haemodynamic information [5]. While brachial artery measurements are subject to some pressure gradient, there is less variability, prompting several studies to conclude that brachial arterial catheters provide a more accurate reflection of central aortic arterial pressure compared to their radial counterparts [1]. Although brachial arterial lines are widely used in cardiac and vascular anaesthesia, complications relating to brachial artery catheterisation are fortunately uncommon [3,8–10]. In the largest series to date, the records of 21,597 patients receiving brachial arterial catheters in a university hospital were evaluated [6]. Direct brachial artery catheter related complications were reported in only 41 patients, with an incidence of complications of 0.19% (95% confidence interval 0.14 to 0.26%). The majority of these complications were vascular and no consequent neurologic complications were reported. In another large series of 6185 patients, by Okeson et al., the incidence rate of brachial line complications was 2.0% [7]. Neither of these large series reported dissection, which were findings confirmed in other smaller series of arterial line complications [8,9]. Brachial artery dissection is rare with very few reported cases. In a single case report, Rusza et al. reported brachial