**Case Report**

**Delayed presentation of unusual arterial injury during femoral vein catheterization for haemodialysis access**

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**Introduction**

The placement of central venous catheters (CVC) has well-recognized complications many of which tend to be more frequent in chronic dialysis patients. The reasons for this include the large calibre of catheters required and the higher number of catheter placements needed [2,3]. In view of the increased risk, various precautionary measures are recommended.

We report an unusual type of femoral artery injury that was caused by CVC placement despite adherence to recommended precautions. The case illustrates important learning points.

**Case**

A 78-year-old lady of Chinese origin had been maintained on a regular 3 times weekly haemodialysis therapy for 3 years 8 months. She had presented with bilaterally small kidneys and end stage renal disease. Her co-morbid illnesses were hypertension and ischaemic heart disease. Temporary internal jugular (IJ) catheter placement was needed on a number of occasions at the start of haemodialysis, as her left radiocephalic arteriovenous fistula (AVF) was slow to achieve adequate development. Her small stature and correspondingly small blood vessel calibre made placement of CVCs difficult.

On arrival for a regular dialysis session her AVF appeared thrombosed, emergency salvage was not possible, and placement of a CVC was attempted. No identifiable right IJ was visualized on ultrasound scanning, the left IJ was tiny and inaccessible. The femoral vessels bilaterally were also of small calibre.

Under direct ultrasound guidance and using a 21-gauge needle the right femoral vein was cannulated. The vein was noted on ultrasound visualization to lie deep to the artery, and avoiding arterial puncture while achieving venous puncture was difficult. After several attempts venous blood was aspirated. There was no distress or apparent complication during or immediately after the procedure. Low molecular weight heparin (20 mg enoxaparin s/c once daily) was prescribed to prevent femoral vein thrombosis. The patient received uneventful haemodialysis via the femoral catheter directly after the placement procedure, and on two further occasions while awaiting attempted CVC placement under radiographic guidance.

Three days after CVC insertion, the patient complained of discomfort in the region of the right groin. Initially, there was no visible abnormality on clinical examination or haemodynamic instability, but there was a 2.5 g/dl fall in haemoglobin and a retroperitoneal haematoma was suspected. A subsequent computed tomography (CT) scan showed no evidence of retroperitoneal blood but instead extensive haematoma approximately 10 cm in diameter, from the point of insertion of the femoral catheter to the lower thigh. Vascular surgical advice was sought, and although the thigh was now visibly swollen, there was no evidence of arterial compromise. In view of this, and the now critical situation regarding vascular access, the surgical recommendation was to leave the catheter in place, discontinue heparin therapy and transfuse packed cells, deferring removal of the femoral catheter until line placement was achieved by an interventional radiologist.

The following day the patient died suddenly during her haemodialysis session. No anticoagulation had been given. Pre-dialysis haemoglobin concentration was 6.7 g/dl, and serum potassium level 5.7 mmol/l. Dialysis had been uneventful and the last vital signs...
recorded at 15 min prior to death were heart rate 66 beats/min, blood pressure 107/52 mmHg, and oxygen saturation 96%. This blood pressure reflected systemic hypotension in this normally hypertensive patient, with relative bradycardia due to maintenance beta-blocker therapy.

At postmortem examination the femoral artery was noted to lie in an anatomically anomalous position directly on top of, rather than lateral to, the femoral vein. The dialysis catheter was correctly positioned in the femoral vein but had transected the femoral artery on the path from skin to vein (Figure 1). There was extensive organized and fresh blood in the right thigh. There was no indication of acute myocardial infarction or pulmonary embolism, and death was attributed to exsanguination from femoral arterial injury.

Discussion

The management of patients with renal failure frequently requires placement of large bore dual lumen venous catheters. Recognized risks of this procedure include localized haematoma, arterial puncture, pneumothorax, haemothorax, arteriovenous fistula formation and pericardial injury. Subsequent complications include venous thrombosis and infection [1–3]. Central venous stenoses remain a significant long-term issue [4,5].

The procedural risks are increased by abnormal coagulation, pre-existing anomalies of the vascular anatomy and acquired venous stenoses [3–6]. The calibre of the catheters required to provide adequate blood flows (typically 11.5–15.5 F), and the increasing age and co-morbidity of maintenance dialysis patients are additional risk factors.

Femoral vein catheterization is generally regarded as posing less risk than thoracic CVC placement. Use of 2-D ultrasound guidance in placement has been shown to reduce the number of attempts required and to lessen, but not eliminate, the risk of femoral and external iliac artery puncture [2,7].

This case illustrates that the usual diagnostic clues to femoral artery injury at the time of the procedure can be concealed when the catheter completely traverses the artery and enters a femoral vein that lies in a posterior position to the artery. This is the first fatality from femoral artery injury in our institution in 23 years of CVC placement; an incident rate of approximately 1 in 10,000. A key factor was aberrant vascular anatomy that resulted in an unusual type of arterial injury, leading to delayed diagnosis and contributing to the fatal outcome. This occurred despite direct ultrasound guided catheter placement and use of a small gauge puncture kit.

Arterial injury is usually immediately obvious from visible swelling at the puncture site together with aspiration of bright red arterial blood from the introducing needle. When however, as here, the artery is completely traversed by the needle which then enters a vein lying posteriorly, venous blood will be aspirated, and evidence of arterial injury will be masked – a unique feature of this case. The later development of thigh pain with a concomitant fall in haemoglobin, and CT scan demonstration of thigh haematoma was highly suggestive of major vessel trauma. However, even at this point the diagnosis of arterial transection was not made, as CT scan imaging
is of insufficient resolution to determine the source of bleeding precisely. In retrospect, the optimal management would have been earlier discontinuation of subcutaneous heparin, and catheter removal followed by local compression.

The provision of haemodialysis to an increasingly elderly population, in whom the absence of good upper limb blood vessels limits the successful creation of AVFs, will result in increased reliance on CVC placement. This case illustrates that this ‘routine procedure’, even in experienced hands, employing all precautionary measures and using the femoral site, is not without risk. Special care should be taken when ultrasound scanning identifies the femoral vein in an anomalous position posterior to the artery.

References


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