

Clinical Report

Rare complication of a dialysis catheter insertion

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Abstract

Insertion of a dialysis catheter is a very common procedure in renal medicine, which is associated with one or more complications in ~15% of patients. Central venous catheter vascular erosion is a rare but serious complication, the incidence appears to be between 0.4 and 1% which can be difficult to diagnose, leading to increased morbidity and mortality. We report a case of a persistent left-sided superior vena cava (PLSVC) and a possible central venous catheter vascular erosion following insertion of a left-sided internal jugular dialysis catheter. We discuss the mechanisms, diagnosis and measures to limit vascular erosion and also briefly discuss PLSVC.

Keywords: dangerous complication of dialysis catheter insertion; persistent left-sided superior vena cava; rare complication of central venous catheter insertion; vascular erosion

Case

A 57-year-old gentleman was admitted after he developed acute kidney injury and major upper gastrointestinal bleeding. His urea levels measured 50 mmol/L and creatinine levels 1500 µmol/L. A decision was made to commence haemodialysis. A temporary dialysis catheter was inserted into his right femoral vein initially, but it was then decided to change this to a temporary internal jugular dialysis catheter to minimize the likelihood of catheter-related infection.

The left internal jugular vein was punctured under ultrasound guidance and a temporary dialysis catheter was inserted without difficulty. There was good flow in both arterial and venous lumens of the dialysis catheter. A routine post-line insertion chest X-ray was performed (Figure 1). The chest X-ray showed that the dialysis catheter was following an abnormal course by passing down the left side of the mediastinum rather than crossing the midline via the brachiocephalic vein to enter the superior vena cava on the right side. Aspirated blood gas analysis confirmed that the catheter was in a vein.

A contrast venogram was requested to define the anatomy and ensure that the dialysis catheter remained safe to use. The venogram showed that the patient had a persistent left-sided superior vena cava (PLSVC) or possible double SVC and the dialysis catheter tip was in the distal part of the left-sided SVC. He was started on haemodialysis after the dialysis catheter position was confirmed with the venogram.

After 4 h of haemodialysis in the dialysis unit, he was transferred back to the ward. Approximately 24 h after dialysis, the patient started complaining of breathlessness. An urgent chest X-ray (Figure 1) showed the presence of

cardiomegaly, a new left-sided pleural effusion and subcutaneous emphysema over the left clavicle.

An urgent chest computed tomogram (Figure 2) was performed and showed the presence of bilateral pleural effusions (left more than right) and a 1.2 cm, presumed new, pericardial effusion. There was also left-sided basal atelectasis and surgical emphysema of the neck and left chest wall. No obvious pneumothorax or pneumomediastinum was seen. The tip of the central venous catheter was seen posterior to the left atrium, in the hypertrophied coronary sinus.

Echocardiography confirmed the presence of a modest-sized pericardial effusion but there did not appear to be any echocardiographic or clinical signs of tamponade physiology.

As it was unclear as to why the patient had deteriorated, we felt it best not to use the left internal jugular temporary dialysis catheter. A femoral temporary dialysis catheter was inserted and the patient was dialysed via this without heparin. The patient was transferred to a cardiothoracic centre to have the left internal jugular dialysis catheter removed by cardiothoracic surgeon. He was subsequently transferred back to our care and continued successful temporary haemodialysis during his hospital stay and started peritoneal dialysis prior to discharge.

Discussion

Central venous catheter-related vascular erosion

This case is particularly interesting, partly, because the central venous catheter was placed inadvertently in a

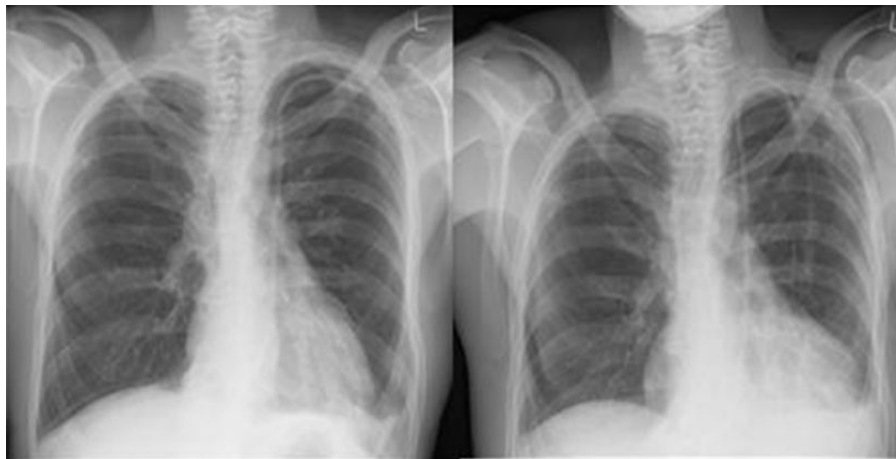


Fig. 1. Chest X-ray postero-anterior view (on the left) demonstrating the dialysis catheter in the left hemithorax and (on the right) demonstrating cardiomegaly, left-sided pleural effusion and left-sided surgical emphysema.

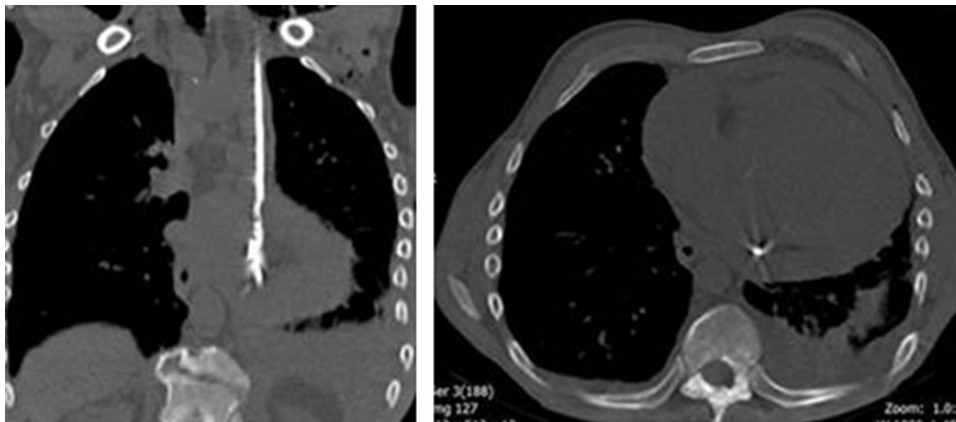


Fig. 2. Computerised tomography chest demonstrating dialysis catheter position, pericardial and pleural effusion.

PLSVC but more so because of the patient's subsequent deterioration in the absence of an obvious explanation.

Central venous catheter insertion, despite being commonly performed, is not necessarily safe in inexperienced hands. In one review, it was noted that up to 15% of central venous catheter (CVC) insertions can be associated with one or more complication. Commonly encountered complications include arterial puncture, catheter-related infection, pneumothorax, venous thrombosis, catheter malposition, venous air embolism and precipitation of dysrhythmias. In our case, however, we were confident that the catheter was in a vein, and given the time frame of events it was unlikely that his deterioration had been caused by infection. No pneumothorax was found and it is unlikely that a venous air embolism would present in this way. After a comprehensive literature search, we believe that the most likely cause of the patient's deterioration was vascular erosion caused by the central venous catheter.

Central venous catheter vascular erosion is a rare but serious complication; the incidence appears to be between 0.4 and 1% [1] and can be difficult to diagnose, leading to increased morbidity and mortality.

The possible mechanism of erosions following CVC insertion is that the catheter tip is abutting the vessel wall resulting in endothelial damage and subsequent vascular

erosion. The internal jugular catheters may migrate up to 3 cm with neck flexion [2] which can result in the catheter migrating to a more acute angle abutting the vessel wall causing erosion.

In a published study, all patients had sudden onset of symptoms, the most common of which was shortness of breath. Other symptoms include chest pain, cough or asymptomatic. A literature search showed that the mean time interval between the time of insertion of CVC and the onset of symptoms was 60.2 h and no symptoms occurred within 24 h of CVC insertion [1]. Vascular erosion must be considered if a CVC is in place but the patient develops sudden onset of breathing difficulty or chest pain. Chest X-ray findings include unilateral or bilateral pleural effusion (not apparent in the previous X-rays) and widening of mediastinum. The findings could be confirmed by performing a computerised tomography of the thorax. The CVC catheter should be removed if there is any evidence of erosion. The decision of whether the patient needs thoracocentesis or pericardiocentesis depends on the clinical situation.

Early diagnosis, discontinuation of the central venous catheter and therapeutic thoracocentesis when indicated by the degree of respiratory distress was associated with a good outcome.

A literature search confirms the importance of left-sided catheter placement as a risk factor for vascular

erosion [3, 4]. The left-sided catheters are at a high risk of erosion compared with right-sided catheters because of the anatomy from the angle at which left-sided catheters curve into the SVC resulting in higher risk of impaction against vessel wall.

Persistent left-sided superior vena cava

A PLSVC [5, 6] is seen in 0.3–0.5% of the normal population and in 3–5% of those with congenital heart disease. Isolated PLSVC is seen in only 10% of cases as almost 90% of PLSVC is accompanied by a normal right-sided SVC. A PLSVC drains into either a coronary sinus (92%) or into the left atrium (8%). Technical difficulties associated with PLSVC may lead to misplacement of the catheter and injury to the vessel wall [7].

Measures to limit CVC-related erosions

- (i) Aspiration of central venous catheter should yield free flow in all of the lumens. If free flow is not obtained either the catheter may be kinked or the tip may be adjacent to the vessel wall. Inability to aspirate blood from the lumens supports the possibility of erosion or perforation [8], however, free flow in the lumens does not exclude the diagnosis [9].
- (ii) Chest X-ray should be done to confirm the line position and the tip should overlie the shadow of the SVC and should not lie in close proximity to the vessel wall.
- (iii) Blood flow from the lumen should not be positional as the catheter tip position may change with patient's position and motion increasing the risk of erosion.
- (iv) CVC catheter should preferably be inserted from the right side to prevent or minimize erosions [10]. If a left-sided CVC needs to be inserted; only 20 cm sized CVC should be used in adults, as insufficient length

catheters tend to abut the catheter tip against the right SVC wall within 45° of perpendicular [3].

Conflict of interest statement. None declared.

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