Unusual venous anomaly leading to malposition of dialysis catheter into the accessory hemiazygos vein

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DESCRIPTION

A 47-year-old African American woman with a history of chronic kidney disease stage IV presented with anaemia and acute kidney injury secondary to bleeding uterine fibroids. Haemoglobin on admission was 5.1 g/dL and creatinine 4.52 mg/dL. Her renal indices continued to worsen during admission; she became oliguric with estimated glomerular filtration rate declining to (8 mL/min/1.73 m²). Decision was made to initiate haemodialysis. A 16 cm temporary haemodialysis catheter was placed via the left internal jugular vein for venous access. Non-pulsatile dark blood was aspirated, and wire placement was confirmed by real-time ultrasound prior to proceeding with dilation. The haemodialysis catheter was placed without difficulty using the Seldinger technique. After line placement, chest radiograph was obtained to confirm the position. Chest X-ray revealed that the line was positioned on the left side of the mediastinum, following an abnormal course inferiorly, not crossing midline (figure 1A). CT chest was obtained to further characterise placement prior to initiating haemodialysis. CT revealed an enlarged hemiazygos system, with collateral vessels identified within the mediastinum (figure 2A,B). The dialysis catheter was visualised on the left side, with the tip projecting into the accessory hemiazygos vein. Under fluoroscopy guidance (figure 1B), the catheter was exchanged, and the tip placed into the cavoatrial junction so it could be accessed for haemodialysis.

Malposition of central venous catheters into the accessory hemiazygos vein is a rare complication. Knowledge of normal and abnormal venous anatomy is needed when interpreting line position, so complications can quickly be recognised when they arise. Typically, the accessory hemiazygos vein drains into the left brachiocephalic via anastomosis with the superior intercostal vein. Our patient had

a venous anomaly consisting of a large hemiazygos system which was dominant. This anomaly caused the catheter to flow from the left internal jugular vein, into the superior intercostal vein and then directly into her accessory hemiazygos vein, instead of into the desired position at the cavoatrial junction (figure 2C–F).

Potential clinical consequences of catheter placement into the azygos vein system include pleural effusion, pulmonary oedema, chest pain, back pain and cardiac tamponade.¹ Patients can also experience venous perforation, thrombosis and occlusion leading to increased morbidity and mortality if not recognised in a timely manner.² Management typically includes repositioning the catheter under radiological guidance.

Figure 1 (A) Chest radiograph depicting left internal jugular central venous catheter following an abnormal course inferiorly, not crossing midline. (B) Superior vena cava venogram via temporary haemodialysis catheter showing the tip of haemodialysis catheter in a large left accessory hemiazygos vein (red arrow).

Figure 2 (A) CT chest with left-sided central venous catheter identified with the tip projecting in the accessory hemiazygos vein just below the aortic arch (red arrow). (B) CT angiography showing enlarged azygos system, with collateral vessels identified within the mediastinum (red arrow). (C, D) Sagittal view depicting the path of the central venous catheter by anastomosis of the superior intercostal vein into the dominant left accessory hemiazygos vein. (E, F) Axial images depicting the path of the central venous catheter through the superior intercostal vein into the accessory hemiazygos vein.

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Images in...

Our top differential diagnoses for left-sided catheter location included carotid artery cannulation and persistent left-sided superior vena cava. To rule out artery cannulation, a venous blood gas was performed which showed the blood was venous in nature. CT chest was able to further reveal the exact location of the catheter. The vein was not draining directly into the right atrium and we were able to rule out persistent left-sided superior

vena cava. Other potential differentials include extravascular placement, for example, into the mediastinum or pleural space. Congenital anomalies such as partial anomalous pulmonary venous return can also reveal a left-sided catheter not crossing midline. Fortunately, in our patient case, the line was adjusted promptly, and she did not experience any adverse outcomes.

Learning points

- ▶ The preferred position for the central venous catheter tip is the junction of the superior vena cava and right atrium.
- ▶ Although central venous catheter placement is a relatively safe procedure, patients with abnormal venous anatomy are predisposed to line malposition during insertion. Malposition of central catheters into the azygos vein system is a rare but potentially dangerous complication.
- ▶ Contrast-enhanced CT, MRI studies and venography are all suitable imaging options to further determine central venous catheter location. Management typically includes repositioning the catheter under radiological guidance.

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