Unusual Dialysis Catheter Location in a Transplant Patient

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Case Description
A 56-year-old woman, the recipient of a kidney transplant 8 years ago, was admitted to the nephrology intensive care unit with septic shock secondary to disseminated shingles after immunosuppressive therapy for acute cellular rejection. The patient developed AKI requiring RRT. Due to history of right internal jugular vein thrombosis related to previous vascular access, the left internal jugular vein was catheterized with a nontunneled double lumen hemodialysis catheter (12 French, 20 cm) without any complications. Routine postprocedure chest radiograph (Figure 1A) showed that the catheter was descending straight into the left border of the mediastinum. A transthoracic echocardiogram then showed enlarged coronary sinus with normal size cardiac chambers and no septal defects.

Computed tomography angiography (CTA) of the neck and thorax with three-dimensional reconstruction was performed and it revealed the existence of the persistent left superior vena cava, and the absence of the left brachiocephalic vein (Figure 1B). The tip of the catheter was placed on the distal part of the vein that drained blood into the right atrium through a dilated coronary sinus (Figure 1C).

The patient was placed on hemodialysis through this vascular access for 3 weeks, with blood flow around 250 ml/min barring any complications. The catheter was removed due to routine access rotation and a right femoral catheter was inserted. One week later, because of a low-flow catheter malfunction, another short-term double lumen catheter was inserted in the persistent left superior vena cava. The patient continued hemodialysis uneventfully throughout the hospitalization period.

Persistent left superior vena cava is a congenital malformation reported in 0.4%-0.5% of the general population, with an incidence of 4%-10% in congenital heart defects (1). The left superior vena cava originates in the third week of gestation. Between the fourth and the eighth week, it is obliterrated by the compression of the left atrium and the hilum of the left lung, forming the ligament of Marshall. If this compressive force does not occur, the vein stays open (2,3).

Patients with a persistent left superior vena cava are mostly asymptomatic and it is frequently missed or only noticed incidentally during imaging studies or an invasive vascular procedure (1,2). Some patients can present with bradycardia, abnormal atrial rhythm (caused by an enlarged coronary sinus) such as atrial fibrillation, and sudden death (caused by multiple anatomic and electrical communication malfunctions between the persistent left superior vena cava and the atrium) (1,4,5).

Screening diagnostic tests include chest radiograph and echocardiography, confirmed by transesophageal echocardiography, CTA, and magnetic resonance imaging showing indirect and direct signs of persistent left superior vena cava, although cardiac catheterization is the gold standard (4,5).

The possibility of catheterization of persistent left superior vena cava with a hemodialysis catheter is uncertain. Some authors argue that this vessel is too thin to retain a long-term catheter, but others suggest that if an accurate assessment of inner diameter of the persistent left superior vena cava can be performed before catheterization, the vein could be used as a site for conventional dialysis access (1). However, there are reports of serious complications during catheterization such as pneumothorax, hemothorax, arrhythmias, and cardiac arrest (2).

Teaching Points
- Persistent left superior vena cava is the most common thoracic venous malformation, despite its low incidence.
- Persistent left superior vena cava is generally discovered fortuitously without clinical signs. Advanced imaging studies such as CTA confirm the existence of the persistent left superior vena cava.
- Serious hemodynamic complications may occur during the implantation and the permanency of a hemodialysis vascular access on this vessel.

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Figure 1. | Imaging studies exposing the persistent left superior vena cava. (A) Chest radiograph showing dialysis catheter descending straight to the left border of the mediastinum. (B) Anteroposterior three-dimensional computed tomography angiography (CTA) reconstruction revealing the catheter placed on the persistent left superior vena cava and the absence of the left brachiocephalic vein. (C) Left anterior incidence of three-dimensional CTA reconstruction displaying the tip of the catheter draining through the dilated coronary sinus into the right atrium.
References


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