

Persistent Left Superior Vena Cava in a Hemodialysis Patient

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Abstract

We report a case of end-stage renal disease with a persistent left superior vena cava (PLSVC) after placement of hemodialysis (HD) catheter through the left internal jugular vein as revealed on routine post-procedure chest X-ray. The diagnosis of PLSVC was confirmed by echocardiography and thorax computed tomography. This anomaly is rather rare, and few studies have evaluated the safety of PLSVC for HD. The catheter was used for 2 months under careful continuous monitoring with no complications. Physicians who place HD catheters in the left jugular/subclavian vein should be aware of the possibility of PLSVC.

Keywords: Hemodialysis; Hemodialysis Catheter; Persistent Left Superior Vena Cava.

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Introduction

Inserting a non-cuffed dialysis catheter is the most common clinical procedure a nephrologist performs, which is done to have vascular access for immediate hemodialysis (HD) (1). HD vascular catheters are very important for maintaining HD, especially when there is an immediate need for a vascular access. They are increasingly used in patients with end-stage renal disease (ESRD). Right internal jugular vein (IJV) is the preferred initial access site for catheter placement because of a relative direct path to the superior vena cava (SVC) and right atrium and a relatively low incidence of central vein stenosis (1). The second choice for placement of a catheter is not clear. The left internal jugular vein is not a preferred access site. The subclavian site allows excellent function but it is associated with a high rate of central vein stenosis and should therefore be avoided (1). For single use or in bedridden patients, placing a temporary dialysis catheter in the femoral vein provides a convenient vascular access for a short time.

However, they are reported to be prone to higher infection rates and loss of ambulation. This is a report of patient with successful placement and use of HD catheter into the persistent left superior vena cava (PLSVC).

Case report

A 6-year-old boy with ESRD due to VUR and PUV and reflux nephropathy as well as a positive history of vesicostomy at 5 months of age presented to the hospital because of weakness and vomiting. He suffered from nausea and vomiting since 2 months ago, which had intensified in the last 2 weeks. He had a history of CKD and frequent UTI. He was diagnosed with chronic kidney disease (CKD) two years ago with a serum creatinine base 2 mg/dl. The patient was noncompliant regarding periodic follow-up and treatment from 18 months ago. Upon admission, the patient was pale and lethargic. Routine blood investigations revealed the following findings: Hemoglobin: 4.7 mg/dl, serum creatinine:

8.8 mg/dl, blood urea: 417mg/dl, sodium: 134 mg/dl, potassium: 4.4 mg/dl, calcium: 4.9 mg/dl, phosphor: 9.9 mg/dl, uric acid: 10.8 mg/dl.

VBG: pH=7.19, PCO₂: 29.2 mmHg, HCO₃: 11.3

Ultrasound examination of the kidney, ureter, and bladder showed bilateral small kidneys. He was diagnosed with CKD stage V (estimated glomerular filtration rate: 6 ml/min/1.73 m² (CKD-EPI)) and renal replacement therapy was planned.

According to medical history and lab data, an acute hemodialysis catheter was implanted and hemodialysis was started as the first procedure. After two weeks, because of femoral catheter malfunction, it was decided to implant a permanent central venous catheter.

A double-lumen cuffed dialysis catheter was attempted through the right IJV, but the needle could not be negotiated down into the IJV. The subsequent neck vessel Doppler revealed a thrombus in the right IJV; therefore, the procedure was planned through the left IJV.

A dual-lumen cuffed dialysis catheter was inserted into the left IJV without complication except for a mild initial resistance during guide wire insertion. A dark red blood return with a non-pulsatile flow was noted immediately before insertion of the guide wire. There was also brisk dark (venous) blood return on aspiration of both catheter ports. However, routine post-procedure chest X-ray (Figure 1) showed that the dialysis catheter followed a left paramediastinal course from the left neck and repeated gentle aspiration of both ports resulted in brisk dark red blood return, which was sent for blood gas analysis.



Figure 1. Chest radiograph showing hemodialysis catheter passing through a persistent left superior vena cava

A two-dimensional transthoracic echocardiogram showed that the dialysis catheter was in the PLSVC with the tip lying above the coronary sinus draining to the right atrium.

Computed tomography (CT) of the chest revealed the presence of a PLSVC with patent left innominate vein (Figure 2). The catheter was used successfully for HD treatment. HD sessions were performed with a blood flow rate of 100 ml/minute without any difficulties. We decided to leave the catheter in place for HD due to nonavailability of other access sites. During the first HD session, his vital signs were maintained and an electrocardiogram (ECG) revealed no evidence of any arrhythmia/ischemia. Subsequently, the catheter was used for HD uneventfully for the next two months with careful and continuous monitoring.

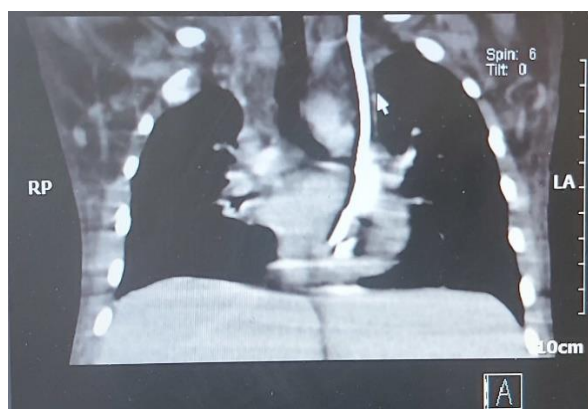


Figure 2. Spiral CT scan of thorax with IV contrast showing persistent left superior vena cava.

Discussion

PLSVC is the most common congenital anomaly of the thoracic venous circulation with an incidence of 0.3% in healthy individuals and 4.5% in patients with congenital heart disease (2,3). PLSVC is rarely reported because most dialysis catheters are inserted through the right IJV and PLSVC co-exists with the right SVC in more than 80% of the patients (4,5). PLSVC should be suspected, especially when catheterization of the central vein through the left subclavian/IJV is difficult and an aberrant left-sided course for the catheter is suspected on fluoroscopy or chest X-ray. It is usually symptom-free and is not significant hemodynamically (6-8). PLSVC is usually an incidental finding during procedures such as HD catheter insertion and may be associated with serious consequences like systemic embolization, arrhythmia, vascular thrombosis,

shock, angina, and cardiac arrest (2,5,6,9,10). Placement of a catheter into PLSVC can be mistaken for placement into subclavian or carotid artery, descending aorta, internal thoracic vein, superior intercostal vein, pericardiophrenic vein, mediastinum, pericardium, or pleural space. Furthermore, cardiac arrhythmias including ventricular fibrillation and atrial septal defects have been associated with PLSVC (11). Echocardiography can accurately diagnose PLSVC non-invasively (2). A lateral chest X-ray provides additional aid for an accurate diagnosis to rule out cannulation of the superior intercostal vein or the accessory hemiazygos vein, which are similar to a cannulated PLSVC on antero-posterior CXR. PLSVC is recommended to be used safely for HD if echocardiography confirms right atrial drainage, CT scan shows a patent left innominate vein, ECG reveals no provocation of any arrhythmia, and blood gas analysis confirms venous blood (2,5). The dialysis catheter was uneventfully used for HD for two months with careful and continuous monitoring as reported by others (2,5,6,9). The catheter may cause coronary sinus thrombosis, which may result in devastating consequences. Prospective trials should be carried out to determine the superiority of clopidogrel to prevent coronary sinus thrombosis,

especially when a catheter is required for a long time.

Conclusion

PLSVC can be used safely for short-term HD with careful and continuous monitoring. Physicians who place HD catheters in the left jugular or subclavian vein should be aware of the possibility, diagnosis, and complications of PLSVC to prevent misinterpretation of routine post-procedure chest X-ray and unnecessary removal of dialysis catheters.

Conflict of Interest

The authors declare no conflicts of interest.

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