

Case Report

Successful placement of a tunnelled hemodialysis catheter in persistent left superior vena cava: a case report and literature review

Maulik Patel*, Akash Dholakia

Department of Nephrology, Shankus Hospital, Mehsana, Gujarat, India

Received: 04 June 2026

Accepted: 06 July 2026

***Correspondence:**

Dr. Maulik Patel,

E-mail: maulikpatel88.md@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Persistent left superior vena cava (PLSVC) is the most common congenital thoracic venous anomaly and is often detected incidentally during central venous procedures. Its presence may complicate hemodialysis catheter placement because of the unusual venous anatomy and potential risk of catheter malposition or arrhythmia. We report the case of a 56-year-old man with end-stage renal disease secondary to diabetes mellitus and hypertension who required urgent hemodialysis. Ultrasound examination revealed thrombosis of the right internal jugular vein, necessitating left-sided vascular access. During tunneled hemodialysis catheter insertion, fluoroscopy demonstrated an unexpected guidewire course along the left mediastinal border. Contrast venography confirmed a PLSVC draining into a dilated coronary sinus and subsequently into the right atrium. Given the favorable drainage pattern, a cuffed dual-lumen tunneled hemodialysis catheter was successfully inserted under fluoroscopic guidance without procedural complications. The catheter achieved blood flow rates of 250–300 ml/min with satisfactory dialysis adequacy ($Kt/V > 1.2$). No arrhythmia, catheter dysfunction, thrombosis, infection, or hemodynamic instability occurred during the procedure or throughout 3 months of follow-up. This case highlights the importance of recognizing an unexpected left-sided guidewire trajectory during venous access procedures and promptly confirming the anatomy before catheter advancement. When right atrial drainage is established, tunneled hemodialysis catheter placement through a PLSVC can provide safe and effective dialysis access in patients with limited vascular options.

Keywords: Persistent left superior vena cava, Tunneled hemodialysis, Ultrasound

INTRODUCTION

Persistent left superior vena cava (PLSVC) is the most common thoracic venous anomaly and is usually an incidental finding. It is present in roughly 0.3%–0.5% of the general population and most often drains into the coronary sinus and right atrium, where it may remain clinically silent. However, it becomes important during central venous catheterization, pacemaker implantation, and other invasive procedures because an unrecognized PLSVC can cause malposition, difficult catheter passage, arrhythmia, or ineffective access. In hemodialysis patients, this matters even more because vascular access options are often limited, and catheter preservation is crucial within a patient-centered access plan.^{1,2}

CASE REPORT

A 56-year-old man with long-standing type 2 diabetes mellitus and hypertension presented with progressive renal failure, generalized weakness, anorexia, nausea, and features of volume overload. Laboratory investigations were consistent with end-stage renal disease requiring urgent initiation of hemodialysis.

Pre-procedural ultrasonography demonstrated thrombosis of the right internal jugular vein, necessitating the use of the left internal jugular vein for vascular access. Under ultrasound guidance and strict aseptic precautions, venous cannulation was achieved without difficulty. However, fluoroscopy revealed an unusual vertical course of the

guidewire along the left mediastinal border rather than the expected right-sided trajectory toward the superior vena cava and right atrium. This finding raised suspicion of an underlying venous anomaly.

Subsequent contrast venography confirmed the presence of a PLSVC draining into a dilated coronary sinus and then into the right atrium. Given the favorable venous drainage pattern and the urgent need for dialysis, the procedure was continued. A cuffed dual-lumen tunneled hemodialysis catheter was successfully inserted under fluoroscopic guidance, with satisfactory tip positioning and no procedural complications.

Hemodialysis was initiated immediately after catheter placement. The catheter provided adequate blood flow rates of 250–300 ml/min, achieving satisfactory dialysis adequacy ($Kt/V > 1.2$). The patient remained hemodynamically stable throughout the procedure and follow-up period. No arrhythmia, catheter dysfunction, thrombosis, infection, or other catheter-related complications were observed during 3 months of follow-up.

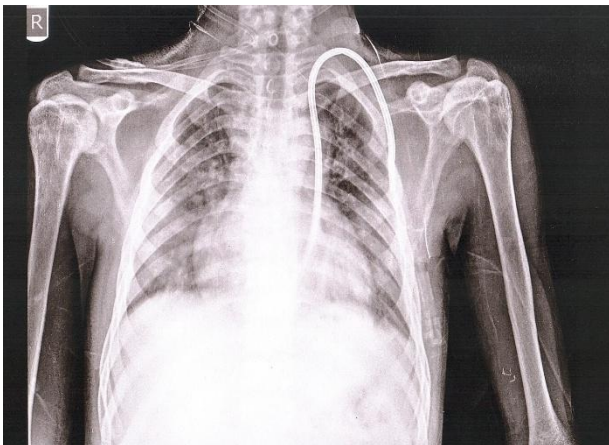


Figure 1: Post-procedural chest radiograph demonstrating the tunneled hemodialysis catheter coursing vertically along the left mediastinal border through a PLSVC. The catheter tip projects over the coronary sinus–right atrial junction, confirming successful placement via the anomalous venous pathway.

A post-procedural chest radiograph demonstrated the tunneled hemodialysis catheter coursing along the left mediastinal border, consistent with the presence of a PLSVC (Figure 1).

DISCUSSION

The embryologic basis of PLSVC is persistence of the left anterior cardinal vein. Cross-sectional and fluoroscopic imaging reviews emphasize that the diagnosis is often suggested by an unusual left mediastinal venous course or a dilated coronary sinus, and that contrast venography

remains useful when the anatomy is uncertain. In our case, the abrupt vertical descent of the guidewire along the left mediastinal border was the key clue, and prompt venographic confirmation prevented unnecessary forceful manipulation.^{3,4}

Recent hemodialysis access literature supports ultrasound-guided puncture with fluoroscopic confirmation when anatomy is uncertain. A randomized study in 2024 found no clear additional reduction in mechanical, infective, or thrombotic complications with fluoroscopic assistance in experienced hands, but fluoroscopy remains valuable when anatomic variation is suspected. This aligns with the present case, in which fluoroscopy was not merely confirmatory but diagnostic.⁵

Earlier reports also highlight the procedural relevance of PLSVC. Pahwa et al described PLSVC as an important thoracic venous anomaly detected during catheter-related procedures, while Goyal et al emphasized that it may be encountered unexpectedly and must be recognized to avoid misinterpretation of chest radiographs and procedural difficulty. Together, these observations support the practical lesson that an unexpected left-sided catheter track should trigger a search for congenital venous anomaly rather than assumption of technical error alone.^{6,7}

The clinical significance of PLSVC depends on its drainage pattern. When the vessel drains into the coronary sinus and then the right atrium, catheter placement can be feasible, but care is needed because deep tip positioning may irritate the coronary sinus or provoke arrhythmia. Kurtoglu et al noted that a dilated coronary sinus is a frequent indirect sign of PLSVC and that right atrial drainage generally permits conservative management, whereas left atrial drainage carries risk of hypoxemia and systemic embolization and is usually inappropriate for routine catheter use.⁸

For dialysis access specifically, Kuppusamy et al reported that PLSVC may first be recognized on a routine chest radiograph after left internal jugular catheter placement. This is highly relevant because left-sided dialysis catheters can appear alarming unless the anomaly is recognized. More recent catheter-focused reviews by Sharma and colleagues underscore that tunneled dialysis catheter placement should be individualized, with attention to access preservation, tip position, and nonconventional routes when standard sites are limited.^{9,10}

In the present patient, preserved right atrial drainage allowed safe continuation of the procedure, and the catheter functioned well with adequate blood flow and dialysis adequacy during follow-up. The case illustrates two practical points: first, a left mediastinal guidewire course during left internal jugular access should prompt immediate anatomic clarification; second, if venography confirms drainage to the right atrium, tunneled hemodialysis catheter placement through PLSVC can be an effective access-preserving option.^{3-5,8-10}

Table 1: Recent published case reports of PLSVC and their procedural implications.

Years	Citation	Clinical setting	Key message
2025	Kasarla et al ¹¹	PICC/central venous catheter placement	PLSVC was identified during venous access; recognition of the abnormal left-sided catheter course prevented procedural complications and unnecessary catheter repositioning.
2025	Shubietah et al ¹²	Permanent pacemaker implantation	PLSVC created technical challenges during transvenous pacemaker implantation, necessitating procedural modifications for successful lead placement.
2025	Müller-Kühnle et al ¹³	Tunneled hemodialysis catheter	Isolated PLSVC can cause tunneled hemodialysis catheter dysfunction. Recognition of the anomalous venous anatomy and appropriate imaging are essential for accurate diagnosis and successful vascular access management.
2024	Idrees et al ¹⁴	ESRD patient requiring hemodialysis access	PLSVC draining into the left atrium emphasized the need to define the drainage pattern before catheter placement because of the risk of systemic embolization.
2024	Hentges et al ¹⁵	Temporary dialysis catheter placement	An unusual left mediastinal catheter course on chest radiography led to the diagnosis of PLSVC and appropriate management.

A review of recently published case reports demonstrates that PLSVC continues to pose important procedural challenges during central venous access, pacemaker implantation, and hemodialysis catheter placement, while successful outcomes are achievable when the anomaly is recognized and the drainage pattern is carefully evaluated (Table 1).

CONCLUSION

PLSVC is an uncommon but clinically important venous anomaly that may be discovered during tunneled hemodialysis catheter insertion. Recognition of an unexpected left-sided guidewire trajectory, prompt venographic confirmation, and careful fluoroscopic placement are essential. When drainage into the right atrium is confirmed, tunneled catheterization through PLSVC can be safe and effective and may preserve limited dialysis access options.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: Not required

REFERENCES

- Azizova A, Onder O, Arslan S, Ardali S, Hazirolan T. Persistent left superior vena cava: clinical importance and differential diagnoses. *Insights Imaging*. 2020;11(1):110.
- Lok CE, Huber TS, Lee T, Shenoy S, Yevzlin AS, Abreo K, et al. KDOQI Clinical Practice Guideline for Vascular Access: 2019 Update. *Am J Kidney Dis*. 2020;75(4 Suppl 2):S1-S164.
- Sonavane SK, Milner DM, Singh SP, Abdel Aal AK, Shahir KS, Chaturvedi A. Comprehensive imaging review of the superior vena cava. *Radiographics*. 2015;35(7):1873-92.
- Yaxley J. Tunneled hemodialysis catheter insertion: technical and clinical considerations. *Indian J Radiol Imaging*. 2023;33(1):76-9.
- Konnepati S, Sethi J, Lal A, Ramachandran R, Rathi M. Comparison of dialysis catheter insertion and complications under ultrasound guidance with or without fluoroscopic assistance: a randomized study. *Indian J Nephrol*. 2024;34(4):363-8.
- Pahwa R, Kumar A. Persistent left superior vena cava: an intensivist's experience and review of the literature. *South Med J*. 2003;96(5):528-9.
- Goyal SK, Punnam SR, Verma G, Ruberg FL. Persistent left superior vena cava: a case report and review of literature. *Cardiovasc Ultrasound*. 2008;6:50.
- Kurtoglu E, Cakin O, Akcay S, Akturk E, Korkmaz H. Persistent left superior vena cava draining into the coronary sinus: a case report. *Cardiol Res*. 2011;2(5):249-52.
- Kuppusamy TS, Balogun RA. Unusual placement of a dialysis catheter: persistent left superior vena cava. *Am J Kidney Dis*. 2004;43(2):365-7.
- Sharma M, Tong WL, Thompson D, Vachharajani TJ. Placing an appropriate tunneled dialysis catheter in an appropriate patient including the nonconventional sites. *Cardiovasc Diagn Ther*. 2023;13(1):281-90.
- Kasarla R, Ditchek J, Elias M, Tadepalli PS, Shojia MM. Persistent left superior vena cava: clinical and procedural challenges. *Cureus*. 2025;17(4):e81931.
- Shubietah A, Doudein A, Al-Khawaldeh M, Al-Hadidi H, Al-Khatib M. Persistent left superior vena cava in pacemaker implantation for digoxin-induced complete heart block: clinical considerations and challenges. *Clin Case Rep*. 2025;13:e70227.
- Müller-Kühnle J, Stäbler C, Mandel S, Sauer J, Gruber M, Maßmann A, et al. Isolated Persistent Left Superior Vena Cava Causing Hemodialysis Catheter Dysfunction: An Uncommon Challenge in Vascular Access. *Cureus*. 2025;17(11):e97013.

14. Idrees M, Tariq W, Asghar R, Tahir MJ, Mohamed Ahmed KAH, Yousaf Z. Left superior vena cava's unconventional path to left atrium drainage: a case report. Radiology Case Reports. 2024;19(10):4297-301.
15. Hentges M, Schroeder K, Somani A. Persistent left-sided superior vena cava: a case report. Cureus. 2024;16(8):e67935.

Cite this article as: Patel M, Dholakia A. Successful placement of a tunneled hemodialysis catheter in persistent left superior vena cava: a case report and literature review. Int J Res Med Sci 2026;14:3638-41.