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REVIEW ARTICLE

Early Postoperative Venous Hypertension and Failed Maturation of a Brachiobasilic Arteriovenous Fistula: A Case Report and Focused Literature Review

Grisilda Gjana[1]*, Arben Zenelaj[2], Medien Xhaferi[2], Loredana Kapidani[2], Suela Mumajesi[3]

[1] Department of Internal Medicine, University Hospital of Trauma, Tirana, Albania
[2] Vasular Surgery Service, University Hospital of Trauma, Tirana, Albania
[3] Nephrology Service, University Hospital Center, "Mother Teresa" Tirana, Albania.

Corresponding Author: Grisilda Gjana, MD, PhDc
Department of Internal Medicine, University Hospital of Trauma, Tirana, Albania
Email: grisildademiri@yahoo.com

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ABSTRACT

Background: Venous hypertension is a rare complication that occurs following the surgical formation of arteriovenous fistulas (AVFs) for hemodialysis. Clinical signs in its early stage may resemble cellulitis, ischemic steal syndrome, or thrombosis, thus complicate the diagnosis and lead to improper AVF maturation.

Case presentation: A male patient aged 64 years with end-stage chronic kidney disease underwent left brachiobasilic AVF creation. He started developing swelling, edema, pain, digital cyanosis, and intermittent fever shortly after the operation. Although Doppler ultrasonography showed AVF patency without any signs of thrombosis or stenosis, the flow through the fistula was not sufficient for hemodialysis. Neither clinical treatment nor time could solve his symptoms and improve the maturation of the fistula; hence, the use of a temporary central venous catheter became necessary.

Methods: This paper is a focused PubMed literature search aiming at identifying studies that discuss postoperative venous hypertension as well as complications involving AVFs. Present clinical presentation was compared with those discussed in selected articles.

Results: Persistent venous congestion, cyanosis, and poor AVF maturation strongly suggested postoperative venous hypertension despite preserved thrill and Doppler-confirmed patency. Surgical ligation performed eight weeks after AVF creation resulted in rapid resolution of swelling, cyanosis, and pain.

Conclusions: Early postoperative venous hypertension should be suspected in patients with persistent swelling, cyanosis, pain, or failure of AVF maturation, even in the absence of thrombosis or critical stenosis. Prompt recognition may prevent prolonged morbidity and unsuccessful vascular access outcomes.

Keywords: Arteriovenous fistula; venous hypertension; Hemodialysis access; Brachiobasilic fistula;

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INTRODUCTION

Arteriovenous fistula (AVF) is the preferred vascular access for maintenance hemodialysis. It offers better long-term patency, fewer infections, lower thrombotic risk, and improved survival compared to catheters and grafts (1,2). Despite these benefits, AVF maturation failure and postoperative issues are major challenges for dialysis patients (1,3).

AVF maturation relies on vascular remodeling venous dilation, endothelium adaptation, wall thickening, and increased blood flow (4–6). Problems in these processes can cause failed maturation, stenosis, thrombosis, venous congestion, or dysfunction (7–9).

Venous hypertension is an under recognized but significant complication of AVF (10,11). Typically, it arises from sub-optimal venous drainage in the context of arterialized flow. Etiologies include central venous stenosis, outflow obstruction, cephalic arch stenosis, fibrosis, valve hypertrophy, and abnormal remodeling (12–15). Elevated venous pressure may result in arm edema, cyanosis, pain, collateral vessel dilation, prolonged bleeding, dermatologic changes, and access dysfunction (16–17). In severe, untreated cases, risk extends to loss of vascular access, compromised patient survival, or limb jeopardy (18).

This report presents a complex case of early venous hypertension following brachiobasilic AVF creation, marked by progressive edema and cyanosis with preserved AVF patency on Doppler evaluation.

Focused literature review

A focused literature review was conducted using PubMed and Google Scholar through May 2026. We used keywords such as ‘arteriovenous fistula,’ ‘venous hypertension,’ ‘hemodialysis vascular access,’ ‘brachiobasilic fistula,’ ‘postoperative edema,’ and ‘early fistula complications.’ Preference was given to English-language original studies, reviews, and relevant case reports. We also found additional sources by manually reviewing bibliographies.

Most reported cases of access-related venous hypertension are linked to central venous stenosis. This is often associated with previous tunneled dialysis catheters or pacemaker leads. Repeated central venous catheterization also plays a role (19–21).

Venous hypertension can still occur without clear central venous lesions or excessive AVF flow. This is true for patients with altered venous anatomy, postoperative compression, functional venous outflow issues, or poor collateral adaptation (10,22). Diagnosis in such situations can be challenging. Doppler ultrasonography may show preserved AVF patency, with no clear severe stenosis (23).

Early postoperative venous hypertension is rare and not well described. During maturation, the draining vein must adapt to more arterial inflow. Any outflow disturbance during this time can increase venous pressure. This leads to drainage failure, edema, and failed maturation (10).

Doppler ultrasonography has limits in diagnosing venous hypertension. Outflow problems can exist even without major anatomical stenosis (18). Venography is the gold standard for assessing venous drainage and central stenosis (23). Diagnosis requires careful correlation of clinical findings with imaging results.

Case Presentation

A 64-year-old man with chronic kidney disease from chronic pyelonephritis was referred for permanent hemodialysis access. Hemodialysis began a month earlier with a central venous catheter; two replacements were needed after catheter thrombosis. His history also included low BMI and heart disease with an ejection fraction 40%.

On July 4, 2025, surgeons created a left brachiobasilic latero-lateral AVF. They ligated the basilic vein to reroute outflow to the cephalic system. Distal pulses and AVF thrill were intact immediately after surgery (Figure 1A). Six hours post-surgery, the patient developed a left forearm and hand hematoma with increasing swelling**.** (Figure 1B-C)

We started conservative treatment using compression and analgesics. The hematoma partly resolved over weeks, but forearm edema stayed. Pain and cyanosis were worst in the fourth and fifth digits (Fig. 2 A-B**)**.

Venous congestion and a dilated cephalic vein (5.8 mm) appeared, with pulses and thrill preserved. Intermittent fever led us to suspect cellulitis. Antibiotics partly eased pain and cyanosis, but edema persisted. Labs showed no significant inflammation.

Serial Doppler ultrasound confirmed AVF patency. Thrombosis or critical stenosis was absent. AVF flow was suboptimal (200–300 mL/min), and basilic outflow was limited. Dialysis continued via central catheter.

By October 2025, edema, cyanosis, failed maturation, and persistent congestion continued, despite a patent fistula. These findings pointed to postoperative venous hypertension from poor drainage. We surgically ligated the AVF. One month after fistula closure, swelling, cyanosis, and pain improved.

DISCUSSION

Diagnostic considerations

The clinical presentation in our patient created a significant diagnostic challenge. Persistent edema, erythema, pain, and swelling first suggested cellulitis. This was especially likely after recent surgery and hematoma formation (10,25). The patient also developed intermittent fever, reaching 38.2°C during episodes of

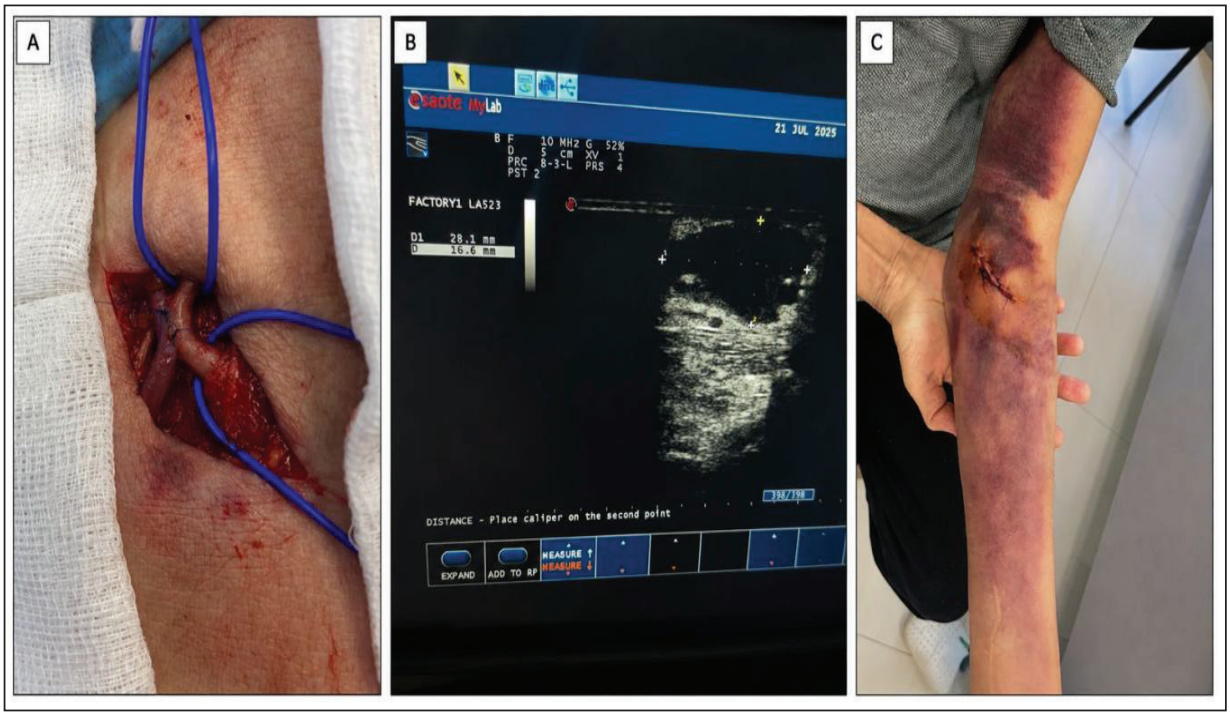

Figure 1A. Intraoperative view of the left brachiobasilic AVF with basilic vein ligated and preserved thrill.
Figure 1B. Doppler shows a postoperative hematoma measuring 28 × 16.6 mm.
Figure 1C. Extensive swelling and ecchymosis of the forearm and hand developed within hours after AVF creation.

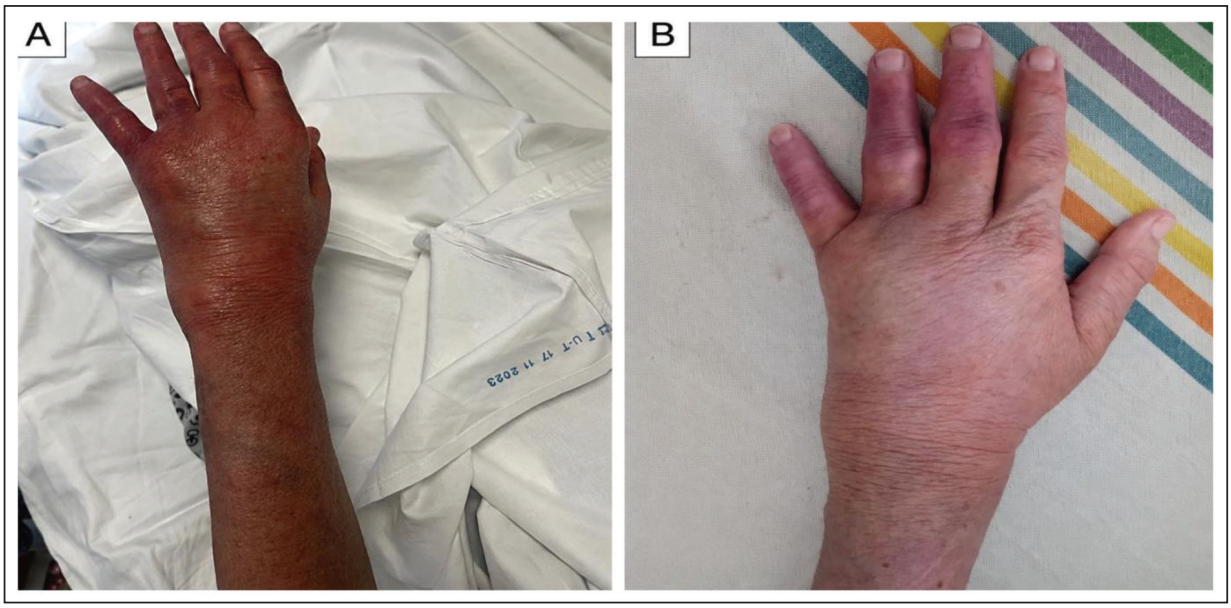

Figure 2 A-B. Persistent forearm edema and progressive cyanotic discoloration of the distal fingers despite preserved distal pulses and maintained AVF thrill.

upper-limb edema. This further supported an infectious complication. Antibiotics decreased the fever, but edema, cyanosis, and pain remained. This made cellulitis less likely as the main cause.

The clinical course overtime gave important diagnostic clues. The time evolution of symptoms in Figure 4 further supported venous hypertension as the main mechanism. Edema and cyanosis persisted despite improved fever after antibiotics.

Ischemic steal syndrome was also considered. Brachial artery–based AVFs can cause distal ischemia and digital discoloration (16,24). However, preserved distal pulses and maintained AVF thrill were noted. There was no tissue necrosis, and diffuse venous congestion was most notable. These findings favored venous hypertension over arterial hypoperfusion (10,16).

Figure 3. Marked resolution of forearm edema and digital cyanosis one month after AVF ligation.

Compartment syndrome was unlikely, as there were no progressive neurological deficits or severely tense compartments.

Hemodynamic considerations

The latero-lateral brachiobasilic fistula with selective basilic vein ligation may have contributed to impaired venous drainage. Despite preserved patency, the fistula did not mature for hemodialysis use, and flow stayed low. Studies have shown that abnormal venous remodeling and poor outflow adaptation during AVF maturation can lead to venous hypertension and access dysfunction, even without severe stenosis (4,10,22).

Although venography remains the gold standard for evaluation of venous drainage abnormalities and central venous stenosis, the combination of serial Doppler findings, failed AVF maturation, progressive venous congestion, and marked clinical improvement following AVF ligation strongly supported postoperative venous hypertension secondary to impaired venous drainage as the predominant mechanism in our patient. Therefore, additional invasive imaging was not pursued (26,27).

Clinical implications

Marked clinical improvement after AVF ligation strongly supported venous hypertension secondary to impaired venous drainage as the predominant underlying mechanism (10,21). Resolution of edema, digital cyanosis, and pain after fistula closure further supported the diagnosis. This case demonstrates that postoperative venous hypertension can occur even free of overt thrombosis or critical stenosis and may mimic other postoperative complications. Careful clinical follow-up and correlation between Doppler findings and clinical evolution are essential for timely diagnosis and management.

CONCLUSION

Early postoperative venous hypertension should be considered in patients presenting with persistent edema, cyanosis, and failed AVF maturation, even in the absence of thrombosis or critical stenosis. Careful correlation between clinical evolution and Doppler findings is necessary for timely diagnosis and proper management.

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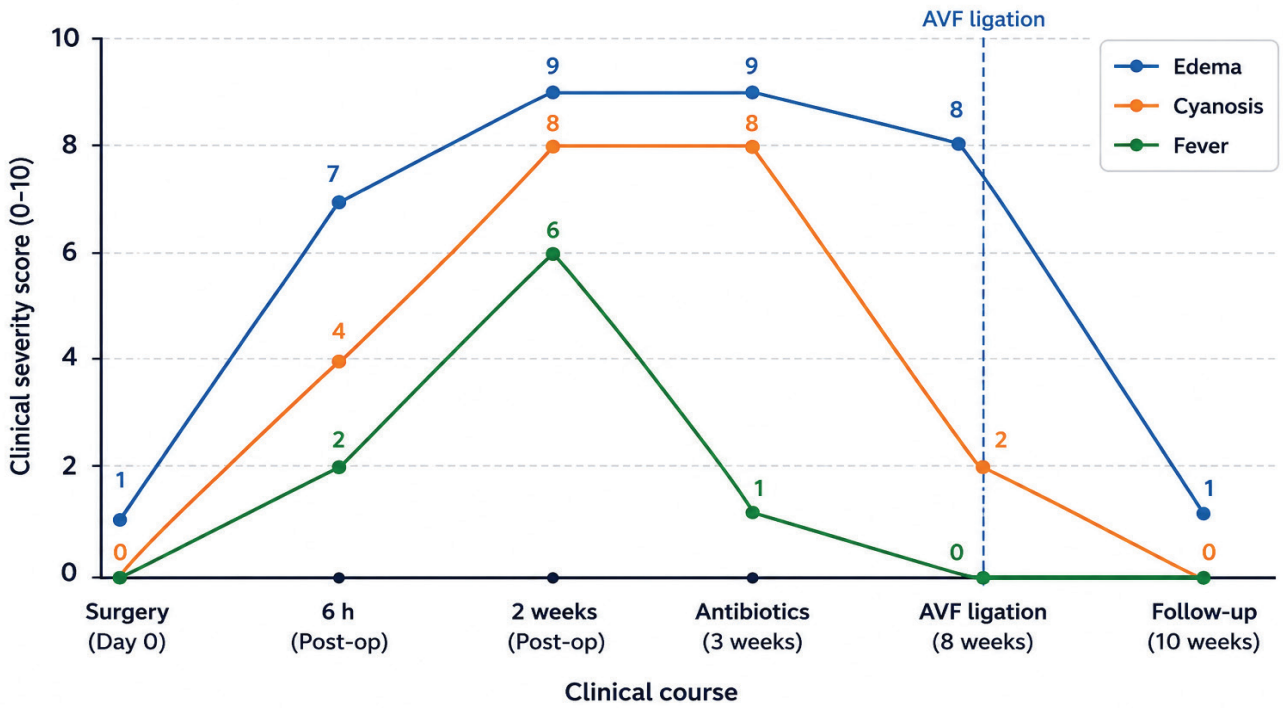

Figure 4. Progressive postoperative edema and digital cyanosis developed despite preserved AVF patency. The fever showed partial, brief improvement with antibiotics. However, edema and cyanosis remained during follow-up. After AVF ligation at 8 weeks, rapid clinical improvement supported venous hypertension as the main cause.

Clinical Feature	Venous Hypertension	Ischemic Steal Syndrome	Compartment Syndrome	Cellulitis	Present Case
Diffuse upper limb edema	Common and prominent	Uncommon	Possible	Common	Present
Hand/finger cyanosis	Characteristic	Possible in severe ischemia	Rare	Rare	Present
Venous congestion/dilated veins	Characteristic	Absent	Absent	Absent	Present
Distal arterial pulses	Usually preserved	Frequently diminished	May decrease late	Preserved	Preserved
AVF thrill/bruit	Usually preserved	Preserved	Variable	Preserved	Preserved
Severe pain	Common	Common	Severe and disproportionate	Mild–moderate	Present
Cold hand	Usually absent	Characteristic	Variable	Absent	Absent
Tissue ischemia/necrosis	Rare	Possible in advanced cases	Possible	Absent	Absent
Doppler findings	Patent AVF ± impaired venous outflow	Reduced distal perfusion	Non-specific	Soft tissue edema	Patent AVF without major stenosis
Response to antibiotics	No improvement	No improvement	No improvement	Usually improves	No improvement
Response after AVF ligation	Marked improvement	Possible improvement	Variable	Unrelated	Marked improvement

Adapted and synthesized from previous studies by Mittal et al., Schillinger et al., Remuzzi et al., and other published literature describing the differential diagnosis, clinical presentation, and hemodynamic mechanisms of AVF-related venous hypertension and other postoperative vascular access complications.

Table 1. Summary of Differential Diagnostic Features

REFERENCES

1. Al-Jaishi, A.A.; Oliver, M.J.; Thomas, S.M.; Lok, C.E.; Zhang, J.C.; Garg, A.X.; Kosa, S.D.; Quinn, R.R.; Moist, L.M. Patency rates of the arteriovenous fistula for hemodialysis: a systematic review and meta-analysis. *Am J Kidney Dis* **2014**, *63*, 464–478, doi:10.1053/j.ajkd.2013.08.023.
2. Bartolomeo, K.; Vachharajani, T.J.; Shingarev, R. The Sisyphean Task of Getting the Arteriovenous Fistula to Mature. *Kidney360* **2021**, *2*, 1873–1875, doi:10.34067/kid. 0007452021.
3. Roy-Chaudhury, P.; Sukhatme, V.P.; Cheung, A.K. Hemodialysis vascular access dysfunction: a cellular and molecular viewpoint. *J Am Soc Nephrol* **2006**, *17*, 1112–1127, doi:10.1681/asn. 2005050615.
4. Li, B.; Eisenberg, N.; Beaton, D.; Lee, D.S.; Al-Omran, L.; Wijeysundera, D.N.; Hussain, M.A.; Rotstein, O.D.; Greco, E.; de Mestral, C.; et al. Predicting 1-year successful clinical use of an arteriovenous access for hemodialysis using machine learning. *NPJ Digit Med* **2025**, *9*, 15, doi:10.1038/ s41746-025-02187-9.
5. Wong, V.; Ward, R.; Taylor, J.; Selvakumar, S.; How, T.V.; Bakran, A. Factors associated with early failure of arteriovenous fistulae for hemodialysis access. *Eur J Vasc Endovasc Surg* **1996**, *12*, 207–213, doi:10.1016/s1078-5884(96)80108-0.
6. Lee, T.; Roy-Chaudhury, P. Advances and new frontiers in the pathophysiology of venous neointimal hyperplasia and dialysis access stenosis. *Adv Chronic Kidney Dis* **2009**, *16*, 329–338, doi:10.1053/j.ackd.2009.06.009.
7. Schild, A.F. Maintaining vascular access: the management of hemodialysis arteriovenous grafts. *J Vasc Access* **2010**, *11*, 92–99, doi:10.1177/112972981001100202.
8. Allon, M.; Robbin, M.L. Increasing arteriovenous fistulas in hemodialysis patients: problems and solutions. *Kidney Int* **2002**, *62*, 1109–1124, doi:10.1111/j.1523-1755.2002. kid551.x.
9. Konner, K. Primary vascular access in diabetic patients: an audit. *Nephrol Dial Transplant* **2000**, *15*, 1317–1325, doi:10.1093/ndt/15.9.1317.
10. Mittal, V.; Srivastava, A.; Kapoor, R.; Lal, H.; Javali, T.; Sureka, S.; Patidar, N.; Arora, S.; Kumar, M. Management of venous hypertension following arteriovenous fistula creation for hemodialysis access. *Indian J Urol* **2016**, *32*, 141–148, doi:10.4103/0970-1591.174779.
11. Mickley, V. Central vein obstruction in vascular access. *Eur J Vasc Endovasc Surg* **2006**, *32*, 439–444, doi:10.1016/j. ejvs.2006.04.011.
12. Echefu, G.; Stowe, I.; Lukan, A.; Sharma, G.; Basu-Ray, I.; Guidry, L.; Schellack, J.; Kumbala, D. Central vein stenosis in hemodialysis vascular access: clinical manifestations and contemporary management strategies. *Front Nephrol* **2023**, *3*,1280666, doi:10.3389/fneph. 2023.1280666.
13. Jones, R.G.; Willis, A.P.; Jones, C.; McCafferty, I.J.; Riley, P.L. Long-term results of stent-graft placement to treat central venous stenosis and occlusion in hemodialysis patients with arteriovenous fistulas. *J Vasc Interv Radiol* **2011**, *22*, 1240–1245, doi:10.1016/j.jvir.2011.06.002.
14. Cristino, D.; Neves, J.R.; Melo, R.; D'Oria, M.; Oliveira-Pinto, J. Patency and maturation rates after forearm arteriovenous fistulas: systematic review with meta-analysis. *J Nephrol* **2025**, *38*, 2111–2127, doi:10.1007/s40620-025-02346-x.
15. Luo, C.M.; Lien, C.W.; Hsieh, M.Y.; Dai, L.P.; Wu, C.C. Disability predicts maturation failure of hemodialysis arteriovenous fistulas. *Vasc Med* **2025**, *30*, 696–702, doi:10.1177/1358863x251386408.
16. Scheltinga, M.R.; Bruijninckx, C.M. Haemodialysis access-induced distal ischaemia (HAIDI) is caused by loco-regional hypotension but not by steal. *Eur J Vasc Endovasc Surg* **2012**, *43*, 218–223, doi:10.1016/j.ejvs.2011.10.018.
17. Morosetti, M.; Meloni, C.; Gandini, R.; Galderisi, C.; Pampana, E.; Nicoletti, M.; Gallucci, M.T.; Simonetti, G.; Casciani, C.U. Late symptomatic venous stenosis in three hemodialysis patients without previous central venous catheters. *Artif Organs* **2000**, *24*, 929–931, doi:10.1046/ j.1525-1594.2000.06658.x.
18. Lumsden, A.B.; MacDonald, M.J.; Isiklar, H.; Martin, L.G.; Kikeri, D.; Harker, L.A.; Allen, R.C. Central venous stenosis in the hemodialysis patient: incidence and efficacy of endovascular treatment. *Cardiovasc Surg* **1997**, *5*, 504–509, doi:10.1177/096721099700500514.
19. Oguzkurt, L.; Tercan, F.; Yildirim, S.; Torun, D. Central venous stenosis in haemodialysis patients without a previous history of catheter placement. *Eur J Radiol* **2005**, *55*, 237–242, doi:10.1016/j.ejrad.2004.11.006.
20. Trerotola, S.O.; Johnson, M.S.; Harris, V.J.; Shah, H.; Ambrosius, W.T.; McKusky, M.A.; Kraus, M.A. Outcome of tunneled hemodialysis catheters placed via the right internal jugular vein by interventional radiologists. *Radiology* **1997**,*203*,489–495,doi:10.1148/radiology. 203.2.9114110.
21. Dammers, R.; de Haan, M.W.; Planken, N.R.; van der Sande, F.M.; Tordoir, J.H. Central vein obstruction in hemodialysis patients: results of radiological and surgical intervention. *Eur J Vasc Endovasc Surg* **2003**, *26*, 317–321, doi:10.1053/ejvs. 2002.1943.
22. Quencer, K.B.; Arici, M. Arteriovenous Fistulas and Their Characteristic Sites of Stenosis. *AJR Am J Roentgenol* **2015**, *205*, 726–734, doi:10.2214/ajr. 15.14650.
23. Asif, A.; Gadalean, F.N.; Merrill, D.; Cherla, G.; Cipleu, C.D.; Epstein, D.L.; Roth, D. Inflow stenosis in arteriovenous fistulas and grafts: a multicenter, prospective study. *Kidney Int* **2005**, *67*, 1986–1992, doi:10.1111/j.1523-1755.2005.00299.x.
24. Jennings, W.C.; Sideman, M.J.; Taubman, K.E.; Broughan, T.A. Brachial vein transposition arteriovenous fistulas for hemodialysis access. *J Vasc Surg* **2009**, *50*, 1121–1125; discussion 1125–1126, doi:10.1016/j.jvs.2009.07.077.
25. Remuzzi, A.; Ene-Iordache, B. Novel paradigms for dialysis vascular access: upstream hemodynamics and vascular remodeling in dialysis access stenosis. *Clin J Am Soc Nephrol* **2013**, *8*, 2186–2193, doi:10.2215/cjn. 03450413.
26. Mario, M.; Ibeas, J.; Malik, J. Current role of ultrasound in hemodialysis access evaluation. *J Vasc Access* **2021**, *22*, 56–62, doi:10.1177/11297298211034638.
27. Mehta, H.J. Central Venous Stenosis: What Should a Nephrologist Know? *Indian J Nephrol* **2017**, *27*, 427–429, doi:10.4103/0971-4065.202825.