Successful endovascular treatment of femoro-popliteal aneurysm and sonographic follow-up with B-Flow™: a case report

Mathias Kaspar[1,2], Suzana Doric[3], André Wyss[4], Jörn F. Dopheide[1,2,5,6*]

1 Vasacura Gefässpraxis am Schlossberg, 3400 Burgdorf, Switzerland
2 Angiologie, Spital STS AG Thun, 3600 Thun, Switzerland
3 Balgrist University Hospital, University of Zurich, Zurich, Switzerland
4 Radiologie, Spital STS AG Thun, 3600 Thun, Switzerland
5 Universität Bern, 3010 Bern, Switzerland
6 Vorarlberg Institute for Vascular Investigation and Treatment (VIVIT), 6900 Feldkirch, Austria

Swiss Journal of Radiology and Nuclear Medicine - SJORANM GmbH - Baar, Switzerland

Abstract

Introduction: Endovascular repair is an option for selected patients with femoro-popliteal aneurysms. Follow-up assesses graft patency, aneurysm size and possible endoleaks. B-Flow™ provides contrast-free blood-flow imaging, but its role in surveillance after peripheral aneurysm repair remains insufficiently validated.

Case report: A 77-year-old man with bilateral femoro-popliteal aneurysms declined further open surgery after early occlusion of a right-leg bypass and postoperative lymphedema. Following endovascular recanalization of the right-leg bypass, the left femoro-popliteal aneurysms were treated with two 10 × 150 mm GORE Viabahn™ endoprostheses. A small endoleak was visible on completion angiography. No endoleak was detected by B-Flow™ or contrast-enhanced ultrasound (CEUS) at 24 hours or at 3, 12 and 24 months. Computed tomography angiography (CTA) at 6 months showed patent endografts without an endoleak. Fontaine stage IIb symptoms improved to stage I. Primary patency was maintained through 24 months.

Discussion: In this patient, B-Flow™ findings were consistent with CEUS findings during follow-up. This observation does not establish diagnostic accuracy, non-inferiority or the ability of B-Flow™ alone to exclude endoleaks. Early postimplantation shadowing limited visualization of intragraft flow.

Conclusion: This case illustrates endovascular repair and multimodal surveillance of femoro-popliteal aneurysms over 24 months. B-Flow™ may offer complementary contrast-free imaging. Further studies are required before recommending it as a replacement for established surveillance methods.

Keywords: endovascular aneurysm repair; peripheral vascular aneurysm; contrast-enhanced ultrasound (CEUS); endoleak detection; B-Flow™; ultrasound surveillance.

*Corresponding author: Jörn F. Dopheide
Received: 06.05.2026 | Published: 30.05.2026

Open Access | CC BY 4.0 | © 2026 The Authors | Published by SJORANM GmbH, Switzerland

Introduction

Femoral and popliteal artery aneurysms are less common than abdominal aortic aneurysms (1-3). Potential complications include thrombosis, distal embolization, acute ischemia and limb loss (4, 5). They predominantly affect older men and may coexist with other aneurysms and cardiovascular risk factors (6, 7).

Open repair using an interposition or bypass graft is an established treatment. Endovascular repair offers an alternative in selected patients (1, 8, 9). The choice depends on anatomy, suitable conduit, operative risk, life expectancy and patient preference. Long-term graft patency and complications require follow-up regardless of the repair strategy.

Surveillance after peripheral aneurysm repair includes clinical assessment and ultrasound evaluation of graft patency, aneurysm size and possible sac perfusion (11, 17). CTA or other imaging may be required when findings are uncertain. CTA provides anatomical detail but entails ionizing radiation and iodinated contrast. CEUS uses intravenously administered microbubbles and can demonstrate flow not visible on conventional B-mode imaging (10). Its use after aortic endovascular repair is better established than after peripheral aneurysm repair (18).

B-Flow™ uses coded-excitation ultrasound to enhance blood-flow signals and suppress tissue echoes without intravenous contrast. This can be useful when vascular access is difficult or contrast avoidance is desirable. Image quality remains dependent on the patient, anatomy, equipment and operator (19). Studies of endoleak detection after aortic repair are encouraging but do not validate diagnostic performance after femoro-popliteal repair (20, 21).

We describe a patient who underwent endovascular repair of left femoro-popliteal aneurysms after declining further open surgery. B-Flow™ was compared with CEUS at follow-up, with CTA performed at 6 months. The report describes feasibility and concordant findings in one patient rather than a diagnostic accuracy study.

Case report

A 77-year-old man sought a second opinion regarding an occluded right-leg venous bypass. The bypass had been placed for aneurysmal femoro-popliteal disease and had occluded within months of surgery. At presentation, he had severe claudication with a pain-free walking distance of less than 50 m and marked postoperative lymphedema. He declined repeat surgery and preferred an endovascular approach. Following successful endovascular recanalization of the right-leg bypass, he requested treatment of the left femoro-popliteal aneurysms and again declined open repair.

Preprocedural CTA (Fig. 1A) showed an aneurysmal segment with a maximum diameter of 30 mm and a length of approximately 258 mm. The proximal and distal landing-zone diameters were 8 mm and 7 mm, respectively.

The intervention was performed through an 8-French sheath using antegrade access to the left common femoral artery. Following diagnostic angiography (Fig. 1B), two heparin-bonded GORE Viabahn™ endoprostheses, each 10 mm in diameter and 150 mm long, were implanted to cover the aneurysmal segment. After prolonged balloon dilatation, the grafts covered the segment with proximal and distal sealing. A small residual endoleak remained in the proximal treated segment, supplied by a femoral side branch (Fig. 1C, arrow).

On the following day, segmental pulse-wave oscillography showed regular peripheral arterial circulation. No endoleak was detected on B-Flow™ imaging of the proximal treated segment or on CEUS using SonoVue® (Fig. 2). Early postimplantation shadowing limited visualization of intragraft flow.

At 3 months, neither CEUS nor B-Flow™ detected an endoleak (Fig. 3A). CTA at 6 months showed patent endografts without an endoleak (Fig. 3B). At 12 and 24 months, B-Flow™ and CEUS again showed patent endografts without detected sac perfusion (Fig. 4). The aneurysm diameter decreased by approximately 1 mm. Fontaine stage IIb symptoms improved to stage I, with improvement in ankle-brachial index and pulse-wave oscillography. Primary patency was maintained through 24 months.

During follow-up, the patient received apixaban 5 mg twice daily and clopidogrel 75 mg in the context of reintervention on the right femoro-crural bypass, with the aim of maintaining secondary patency. This is the reported patient-specific regimen and should not be interpreted as a general recommendation for aneurysm repair.

Discussion

This case illustrates endovascular treatment in a patient who declined further open repair after an unsatisfactory surgical outcome on the opposite leg. The symptomatic aneurysms and mural thrombus supported consideration of repair. Treatment selection should be individualized rather than based solely on a diameter threshold or a preference for one technique.

The Society for Vascular Surgery guidelines address popliteal artery aneurysms and recommend repair of asymptomatic aneurysms at a diameter of at least 20 mm, subject to clinical circumstances (11). This threshold should not be applied indiscriminately to all femoral aneurysms. Choice of open or endovascular repair also considers anatomy, life expectancy, conduit availability and operative risk. Comparative studies and meta-analyses inform these decisions (8, 12, 13). Studies of alternative bypass conduits (14, 15) concern a different treatment question and do not directly establish the relative efficacy of endografts.

The cause of the early right-leg bypass occlusion in this patient was not established. In particular, the report provides no evidence that the conduit material was inadequate. No causal attribution is made here.

Brendel et al. reported results in 19 patients treated with Viabahn endoprostheses for femoro-popliteal aneurysms (16). Estimated primary patency was 100% at 12 months, 90% at 24 months and 74% at 36-72 months; secondary patency was 100% after reintervention. The present patient's 24-month patency is consistent with a favorable individual outcome. It cannot be compared as a superior result to cohort percentages.

Regular surveillance remains necessary. Duplex ultrasound can assess graft patency and identify abnormalities requiring further investigation (17). CEUS and CTA provide additional information when endoleak or sac perfusion is suspected. Guidance on aortic aneurysm surveillance (18) offers context but is not direct evidence for the diagnostic performance of B-Flow™ after peripheral aneurysm repair.

Discussion (continued)

B-Flow™ and CEUS showed concordant findings in this patient, with no endoleak detected at the reported follow-up examinations. A series of negative examinations in one patient cannot establish sensitivity, specificity or a reliable exclusion threshold. The initial angiographic endoleak was not detected at 24 hours; the available observations do not determine its exact time of resolution.

B-Flow™ avoids intravenous contrast and ionizing radiation. CEUS also avoids ionizing radiation but requires intravenous contrast. CTA, CEUS and magnetic resonance imaging have different limitations and indications. Not every MRI examination requires contrast, and eligibility with an implanted device depends on the device and scanning conditions. Modality selection should reflect the clinical question and individual patient factors.

In the aortic feasibility study by Hofmann et al., 34 patients underwent 43 follow-up visits (20). B-Flow™ would have missed six endoleaks detected by CEUS and one detected by CTA. The authors described the findings as hypothesis-generating and requiring further validation. A subsequent study investigated complex aortic repair (21). These studies do not establish non-inferiority or diagnostic equivalence in the femoro-popliteal region.

Superficial peripheral vessels may offer favorable acoustic access, but this is a rationale for further research rather than proof of superior accuracy. Early postimplantation shadowing in the present case also limited intragraft flow assessment. CEUS or CTA should remain available when B-Flow™ or conventional ultrasound is inconclusive or clinical findings warrant further investigation.

The approximately 1 mm reduction in aneurysm diameter is reported descriptively. Without a standardized measurement analysis or repeated-measurement uncertainty, it should not be described as a statistically significant change.

This report is limited by its single-patient design, absence of a positive endoleak at the comparative follow-up examinations, absence of reported blinded image assessment and absence of systematic diagnostic performance measures. Examination time and resource use were not quantified. No conclusion about faster examinations, general safety or replacement of established surveillance methods can be drawn.

Conclusions

Endovascular repair provided a favorable 24-month outcome in this selected patient. B-Flow™ offered complementary contrast-free imaging with findings concordant with CEUS at the reported visits. Further studies are required to define its diagnostic performance and appropriate role in surveillance after peripheral aneurysm repair.

Figures

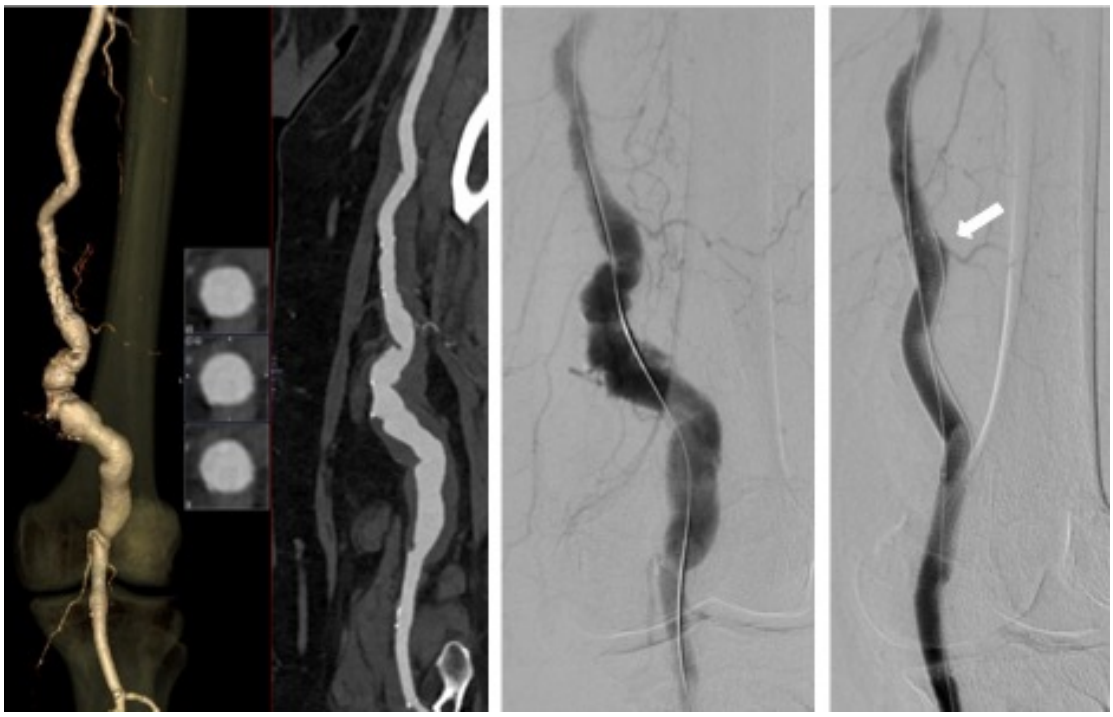


Figure 1. From left to right: A, preprocedural CTA; B, angiography before repair; C, completion angiography after Viabahn™ implantation, showing a small residual endoleak (arrow).

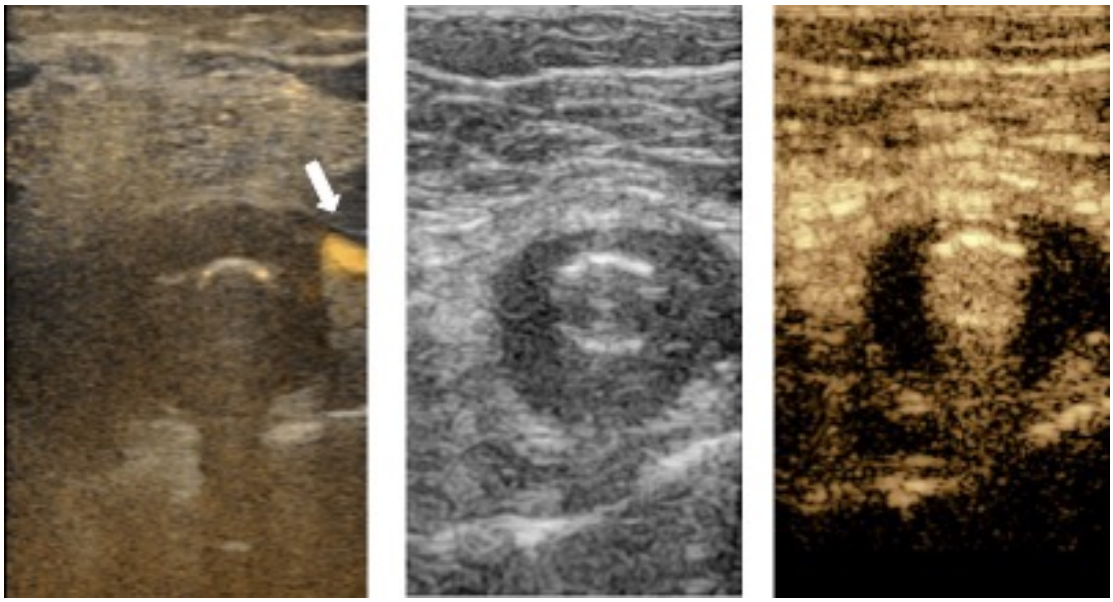


Figure 2. Ultrasound at 24 hours. Left: B-Flow™ image showing the collateral (arrow). Centre: corresponding grayscale image. Right: CEUS. No endoleak was detected in these examinations. Postimplantation shadowing limited intragraft flow visualization; the negative B-Flow™ finding alone does not prove exclusion of an endoleak.

Figure 3

A: 3-month follow-up (left) | B: 6-month CTA (right)

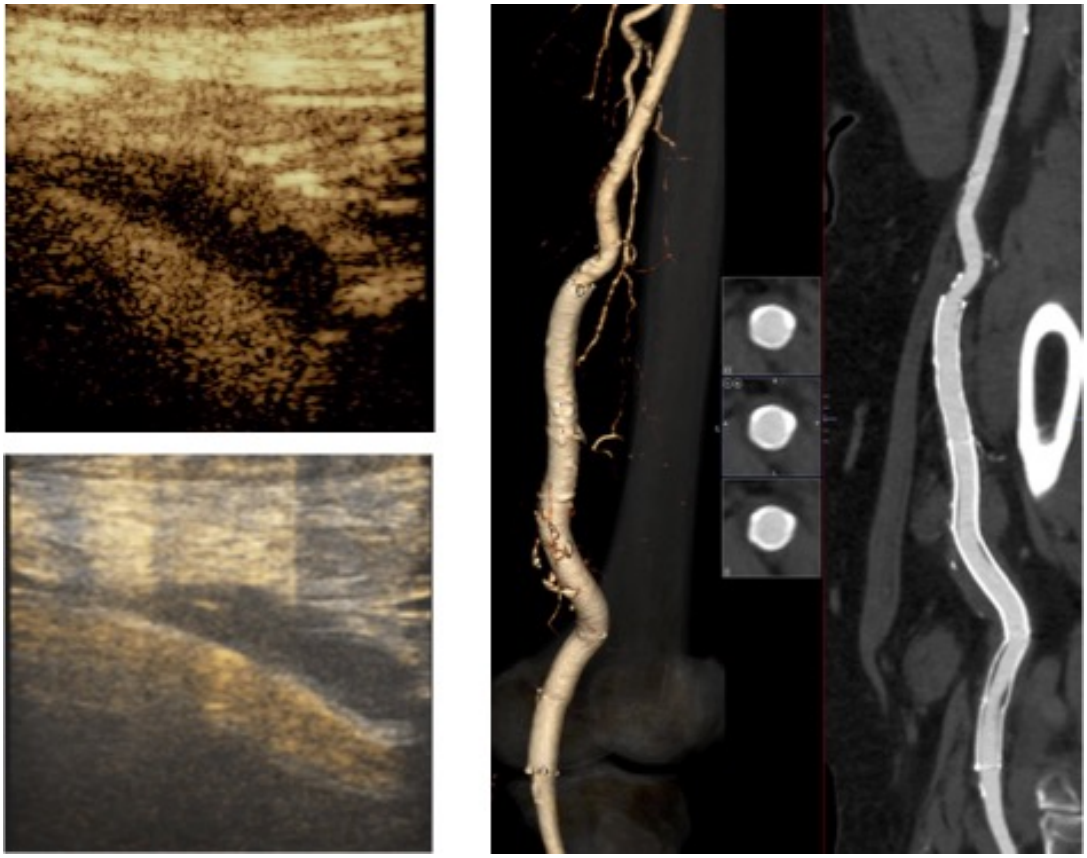


Figure 3. A: CEUS (upper image) and B-Flow™ (lower image) at 3 months, without a detected endoleak. B: CTA at 6 months showing patent endografts without a detected endoleak.

Figure 4A - 12-month follow-up

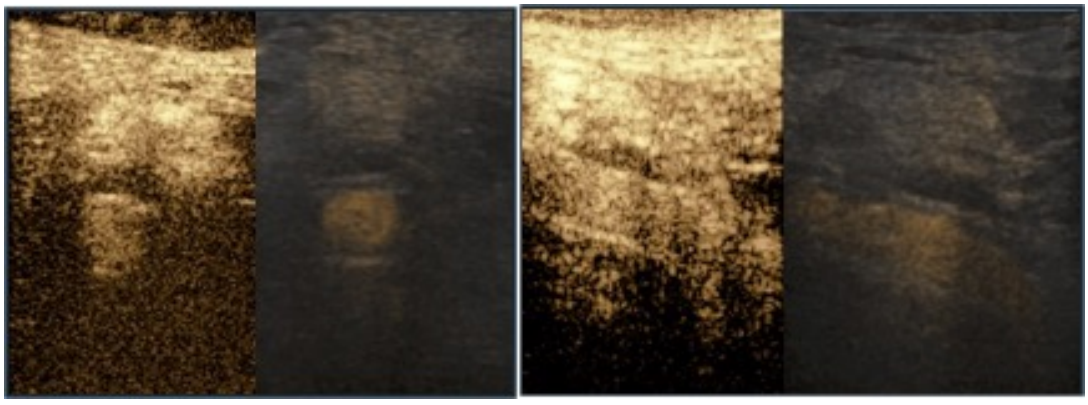


Figure 4A. At 12 months, CEUS is on the left and B-Flow™ on the right in the paired cross-sectional and longitudinal views. No endoleak was detected.

Figure 4B - 24-month follow-up

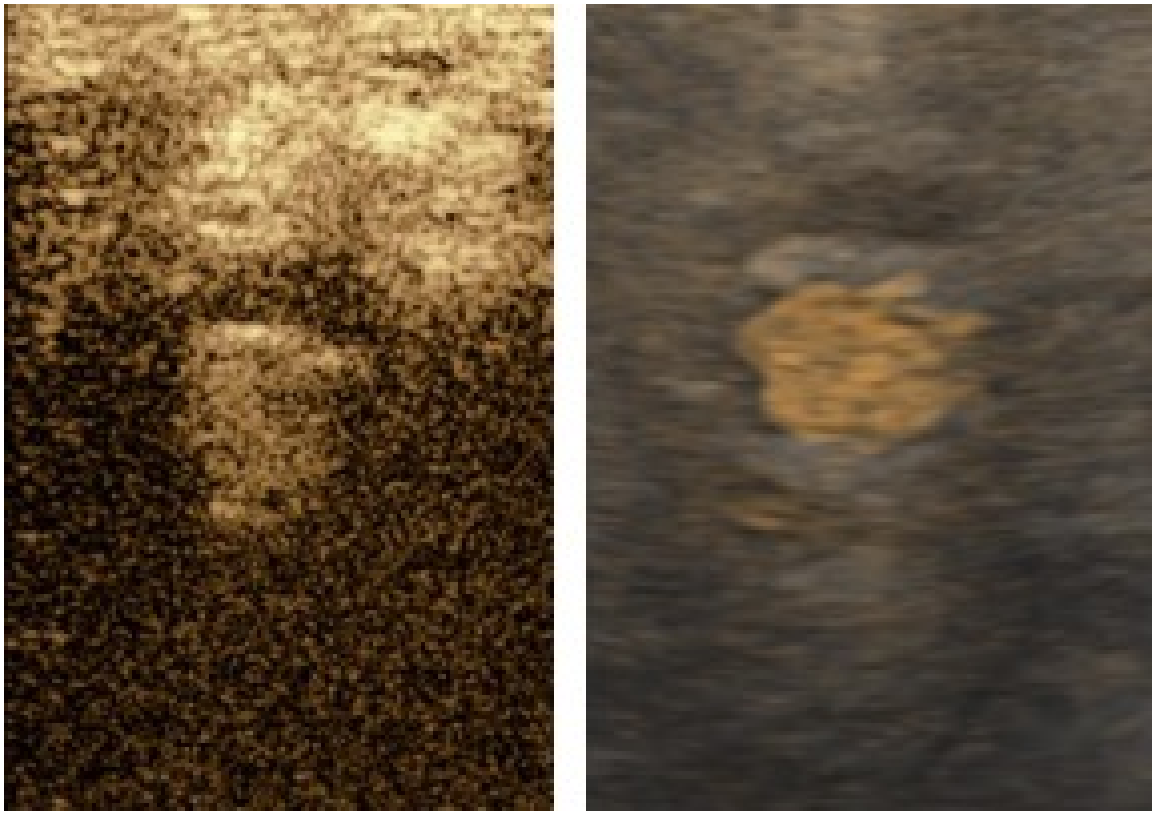


Figure 4B. At 24 months, CEUS (left) and B-Flow™ (right) showed no detected endoleak. Aneurysm diameter decreased by approximately 1 mm over follow-up; this is a descriptive observation.

References

1. Piffaretti G, Mariscalco G, Tozzi M, Rivolta N, Annoni M, Castelli P. Twenty-year experience of femoral artery aneurysms. Journal of vascular surgery. 2011;53(5):1230-6. https://doi.org/10.1016/j.jvs.2010.10.130

2. Trickett JP, Scott RAP, Tilney HS. Screening and management of asymptomatic popliteal aneurysms. Journal of Medical Screening. 2002;9(2):92-3. https://doi.org/10.1136/jms.9.2.92

3. Dawson I, Sie RB, van Bockel JH. Atherosclerotic popliteal aneurysm. Br J Surg. 1997;84(3):293-9. https://doi.org/10.1046/j.1365-2168.1997.02731.x

4. Cervin A, Acosta S, Hultgren R, Grip O, Björck M, Falkenberg M. Results After Open and Endovascular Repair of Popliteal Aneurysm: A Matched Comparison Within a Population Based Cohort. European Journal of Vascular and Endovascular Surgery. 2021;61(6):988-97. https://doi.org/10.1016/j.ejvs.2021.02.007

5. Whitehouse WM, Jr., Wakefield TW, Graham LM, Kazmers A, Zelenock GB, Cronenwett JL, et al. Limb-threatening potential of arteriosclerotic popliteal artery aneurysms. Surgery. 1983;93(5):694-9. https://pubmed.ncbi.nlm.nih.gov/6845176/

References (continued)

6. Tsilimparis N, Dayama A, Ricotta JJ. Open and Endovascular Repair of Popliteal Artery Aneurysms: Tabular Review of the Literature. Annals of Vascular Surgery. 2013;27(2):259-65. https://doi.org/10.1016/j.avsg.2012.01.007

7. Diwan A, Sarkar R, Stanley JC, Zelenock GB, Wakefield TW. Incidence of femoral and popliteal artery aneurysms in patients with abdominal aortic aneurysms. Journal of vascular surgery. 2000;31(5):863-9. https://doi.org/10.1067/mva.2000.105955

8. Leake AE, Segal MA, Chaer RA, Eslami MH, Al-Khoury G, Makaroun MS, et al. Metaanalysis of open and endovascular repair of popliteal artery aneurysms. Journal of vascular surgery. 2017;65(1):246-56.e2. https://doi.org/10.1016/j.jvs.2016.09.029

9. Shahin Y, Barakat H, Shrivastava V. Endovascular versus Open Repair of Asymptomatic Popliteal Artery Aneurysms: A Systematic Review and Meta-Analysis. Journal of Vascular and Interventional Radiology. 2016;27(5):715-22. https://doi.org/10.1016/j.jvir.2016.02.026

10. Feinstein SB, Coll B, Staub D, Adam D, Schinkel AFL, ten Cate FJ, et al. Contrast enhanced ultrasound imaging. Journal of Nuclear Cardiology. 2010;17(1):106-15. https://doi.org/10.1007/s12350-009-9165-y

11. Farber A, Angle N, Avgerinos E, Dubois L, Eslami M, Geraghty P, et al. The Society for Vascular Surgery clinical practice guidelines on popliteal artery aneurysms. Journal of vascular surgery. 2022;75(1):109S-20S. https://doi.org/10.1016/j.jvs.2021.04.040

12. Serrano Hernando FJ, Martínez López I, Hernández Mateo MM, Hernando Rydings M, Sánchez Hervás L, Rial Horcajo R, et al. Comparison of popliteal artery aneurysm therapies. Journal of vascular surgery. 2015;61(3):655-61. https://doi.org/10.1016/j.jvs.2014.10.007

13. Antonello M, Frigatti P, Battocchio P, Lepidi S, Cognolato D, Dall'Antonia A, et al. Open repair versus endovascular treatment for asymptomatic popliteal artery aneurysm: Results of a prospective randomized study. Journal of vascular surgery. 2005;42(2):185-93. https://doi.org/10.1016/j.jvs.2005.04.049

14. Moreira CC, Leung AD, Farber A, Rybin D, Doros G, Siracuse JJ, et al. Alternative conduit for infrageniculate bypass in patients with critical limb ischemia. Journal of vascular surgery. 2016;64(1):131-9.e1. https://doi.org/10.1016/j.jvs.2016.01.042

15. Avgerinos ED, Sachdev U, Naddaf A, Doucet DR, Mohapatra A, Leers SA, et al. Autologous alternative veins may not provide better outcomes than prosthetic conduits for below-knee bypass when great saphenous vein is unavailable. Journal of vascular surgery. 2015;62(2):385-91. https://doi.org/10.1016/j.jvs.2015.03.025

16. Brendel JM, Mangold T, Pfändler M, Stenzl B, Andic M, Mück J, et al. Viabahn endoprosthesis for femoropopliteal aneurysm repair: safety, success rates, and long-term patency. CVIR Endovascular. 2024;7(1):53. https://doi.org/10.1186/s42155-024-00465-3

17. Stone PA, Armstrong PA, Bandyk DF, Keeling WB, Flaherty SK, Shames ML, et al. The value of duplex surveillance after open and endovascular popliteal aneurysm repair. Journal of vascular surgery. 2005;41(6):936-41. https://doi.org/10.1016/j.jvs.2005.03.021

18. Wanhainen A, Van Herzeele I, Bastos Goncalves F, Bellmunt Montoya S, Berard X, Boyle JR, et al. Editor's Choice - European Society for Vascular Surgery (ESVS) 2024 Clinical Practice Guidelines on the Management of Abdominal Aorto-Iliac Artery Aneurysms. Eur J Vasc Endovasc Surg. 2024;67(2):192-331. https://doi.org/10.1016/j.ejvs.2023.11.002

19. Hofmann AG, Mlekusch I, Wickenhauser G, Assadian A, Taher F. Clinical Applications of B-Flow Ultrasound: A Scoping Review of the Literature. Diagnostics (Basel). 2023;13(3):397. https://doi.org/10.3390/diagnostics13030397

20. Hofmann AG, Klosz FR, Mlekusch I, Wickenhauser G, Walter C, Assadian A, et al. Endoleak Detection after Endovascular Aortic Repair via Coded-Excitation Ultrasound-A Feasibility Study. J Clin Med. 2023;12(11):3775. https://doi.org/10.3390/jcm12113775

21. Hofmann A, Mlekusch I, Wickenhauser G, Walter C, Falkensammer J, Assadian A, et al. Ultrasound Coded-Excitation Imaging for Endoleak Detection After Complex Endovascular Aortic Repair. J Ultrasound Med. 2024;43(3):429-37. https://doi.org/10.1002/jum.16374

Correspondence

Jörn F. Dopheide
Spital STS AG Thun
Krankenhausstrasse 12
CH-3600 Thun, Switzerland
Phone: +41 (0) 58 636 2842
E-mail: joern.dopheide@spitalstsag.ch

Declarations

Consent for publication: The authors state that written informed consent was obtained and patient anonymity was ensured. The work was conducted in accordance with the Declaration of Helsinki and applicable local and international standards.

Author contributions: All authors contributed to the conception and design of the manuscript, participated in drafting and critically revising the content, and approved the final version for publication. Each author agrees to be accountable for the accuracy and integrity of the work.

Conflict of interest: The authors declare that there were no conflicts of interest within the meaning of the recommendations of the International Committee of Medical Journal Editors when the article was written.

Funding: No funding was received for this work.

Data availability: The data may be requested from the corresponding author, subject to applicable consent and privacy requirements.

Publisher's note: The statements, opinions and data in this publication are those of the authors and contributors. The publisher and editors disclaim responsibility for injury to people or property resulting from ideas, methods, instructions or products referred to in the content.

License: This work is licensed under a Creative Commons Attribution 4.0 International License. Reuse, redistribution and adaptation, including commercial use, are permitted with appropriate credit.

SJORANM on LinkedIn