

Diagnostic Imaging Pathways - Peripheral Stent Follow-Up

Population Covered By The Guidance

This pathway provides diagnostic imaging guidance for follow-up of patients with peripheral arterial stents.

Date reviewed: January 2018

Date of next review: January 2021






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Quick User Guide

Move the mouse cursor over the PINK text boxes inside the flow chart to bring up a pop up box with salient points.

Clicking on the PINK text box will bring up the full text.

The relative radiation level of each imaging investigation is displayed in the pop up box.

SYMBOL	RRL	EFFECTIVE DOSE RANGE
	None	0
	Minimal	< 1 millisieverts
	Low	1-5 mSv
	Medium	5-10 mSv
	High	>10 mSv

Pathway Diagram

Date reviewed: January 2018
Please note that this pathway is subject to review and revision

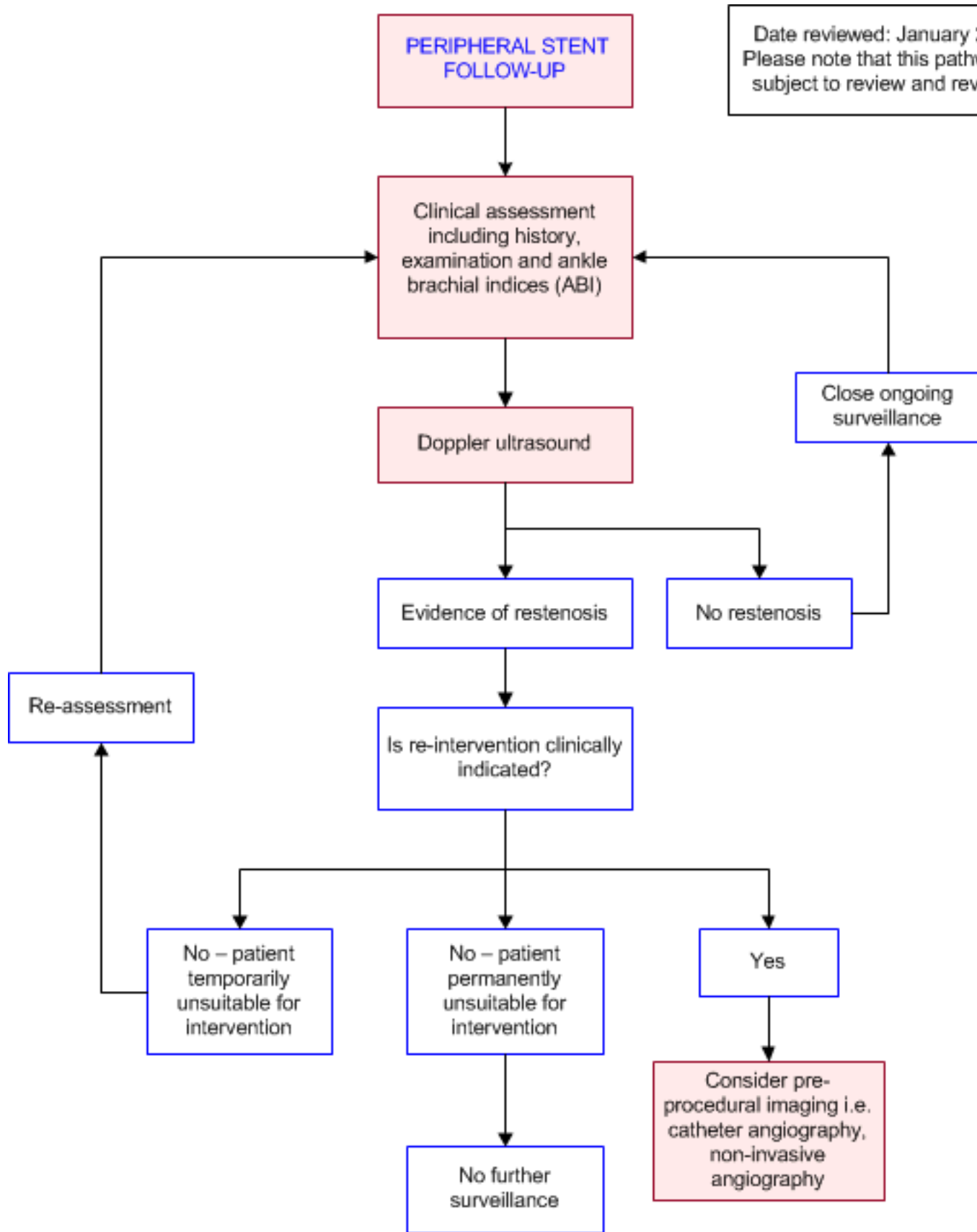


Image Gallery

Note: Images coming soon.

Teaching Points

- Doppler ultrasound following clinical assessment is the imaging modality of choice to follow-up patients with endovascular peripheral stents
- Non-invasive angiography such as MRA and CTA has an increasing role in the assessment of lower limb peripheral arterial disease and pre procedural planning

Follow-up of Peripheral Stent

- The risk of restenosis depends on multiple factors: drug eluting stents may reduce the risk of restenosis, infra-inguinal stents have an increased risk of restenosis; longer segments and complex disease also carry a higher risk [1](#)
- Patient risk factors and co-morbidities should also be considered [2](#)
- Not all restenosis is symptomatic [3](#)
- There is no consensus on the optimal timing for monitoring patients after percutaneous therapy for peripheral vascular disease [2, 4, 5](#)
- Early detection of restenosis is preferred as restenosis is easier to treat than complete occlusion [5](#)
- The risk of restenosis is highest in the first 12 months, but can occur at any time [6](#)
- Close follow-up is suggested in the first year, e.g. at 6 weeks, 3 months, 6 months and 12 months post-procedure, then annually thereafter
- Follow-up assessment should include taking a history to identify recurrent symptoms, physical examination and ABIs [2, 5, 7, 8](#)
- Duplex ultrasound is the preferred imaging modality for follow-up [2, 7](#), though there have been no randomised trials performed
- Duplex ultrasound is reasonable for routine surveillance after endovascular procedures [2](#)
- Although many clinicians add duplex ultrasound to routine surveillance, [9](#) the Appropriate Use Criteria panel felt that surveillance more than annually was inappropriate or uncertain for asymptomatic patients [10](#)
- Ongoing imaging is only indicated if further intervention is being considered; other co-morbidities and functional status should be taken into account

Duplex Colour Doppler Ultrasound

- Lowest cost cross-sectional imaging modality [7](#)
- Recommended imaging modality for routine surveillance and in the setting of recurrent symptoms following surgical or percutaneous intervention [2, 7](#)
- Able to localise lesion site and assess its haemodynamic significance [4, 11](#)
- Sensitive and specific for detecting in-stent stenosis by measuring peak systolic velocity (PSV) or velocity ratio (Vr) [3, 12](#)
- Limitation: Unable to provide information on loss of luminal volume or extent of stenosis (e.g. a focal stenosis compared to diffuse) [9](#)

Catheter Angiography

- 'Gold standard' for peripheral arterial imaging [7, 13, 14](#)
- Allows for intervention at the time of diagnosis

Non-invasive Angiography

- Advancing technology has increased the use of CT Angiography (CTA) and magnetic resonance angiography (MRA) for evaluating vascular disease, particularly prior to intervention [7, 13, 15](#)
- When compared to catheter angiography, CTA provides better evaluation of all collateral vessels and surrounding tissues [15](#)
- MRA may also have a role in pre procedural planning and for follow-up assessment after revascularisation [4, 15, 16](#)
- MRA is more sensitive and specific than CTA or ultrasonography for detection of lower-limb PAD [16](#)

References

Date of literature search: January 2018

References are graded from Level I to V according to the Oxford Centre for Evidence-Based Medicine, Levels of Evidence. [Download the document](#)

1. Katsanos K, Tepe G, Tsetis D, Fanelli F. **Standards of practice for superficial femoral and popliteal artery angioplasty and stenting.** *Cardiovasc Intervent Radiol.* 2014;37(3):592-603. (Review article). [View the reference](#)
2. Gerhard-Herman MD, Gornik HL, Barrett C, Barshes NR, Corriere MA, Drachman DE, et al. **2016 AHA/ACC guideline on the management of patients with lower extremity peripheral artery disease: a report of the American college of cardiology/American heart association task force on clinical practice guidelines.** *Circulation.* 2017;135(12):e726-e79. (Guideline). [View the reference](#)
3. Baril DT, Rhee RY, Kim J, Makaroun MS, Chaer RA, Marone LK. **Duplex criteria for determination of in-stent stenosis after angioplasty and stenting of the superficial femoral artery.** *J Vasc Surg.* 2009;49(1):133-9. (Level II evidence). [View the reference](#)
4. Hirsch AT, Haskal ZJ, Hertzner NR, Bakal CW, Creager MA, Halperin JL, et al. **ACC/AHA 2005 practice guidelines for the management of patients with peripheral arterial disease (lower extremity, renal, mesenteric, and abdominal aortic): a collaborative report.** *Circulation.* 2006;113(11):463-654. (Guideline). [View the reference](#)
5. Sobieszczyk P, Eisenhauer A. **Management of patients after endovascular interventions for peripheral artery disease.** *Circulation.* 2013;128(7):749-57. (Review article). [View the reference](#)
6. Vroegindeweij D, Tielbeek AV, Buth J, Vos LD, van den Bosch HC. **Patterns of recurrent disease after recanalization of femoropopliteal artery occlusions.** *Cardiovasc Intervent Radiol.* 1997;20(4):257-62. (Level II evidence). [View the reference](#)
7. Rybicki FJ, Nallamshetty L, Yucel EK, Holtzman SR, Baum RA, Foley WD, et al. **ACR appropriateness criteria on recurrent symptoms following lower-extremity angioplasty.** *J Am Coll Radiol.* 2008;5(12):1176-80. (Level II evidence). [View the reference](#)
8. Conte MS, Pomposelli FB, Clair DG, Geraghty PJ, McKinsey JF, Mills JL, et al. **Society for vascular surgery practice guidelines for atherosclerotic occlusive disease of the lower**



- extremities: management of asymptomatic disease and claudication.** J Vasc Surg. 2015;61(3 Suppl):2s-41s. (Guideline). [View the reference](#)
9. Ho KJ, Owens CD. **Diagnosis, classification, and treatment of femoropopliteal artery in-stent restenosis.** J Vasc Surg. 2017;65(2):545-57. (Review article). [View the reference](#)
 10. Mohler ER, Gornik HL, Gerhard-Herman M, Misra S, Olin JW, Zierler RE. **ACCF/ACR/AIUM/ASE/ASN/ICAVL/SCAI/SCCT/SIR/SVM/SVS 2012 appropriate use criteria for peripheral vascular ultrasound and physiological testing part I: arterial ultrasound and physiological testing.** J Vasc Surg. 2012;56(1):e17-51. (Guideline). [View the reference](#)
 11. Leiner T, Kessels AG, Nelemans PJ, Vasbinder GB, de Haan MW, Kitslaar PE, et al. **Peripheral arterial disease: comparison of color duplex US and contrast-enhanced MR angiography for diagnosis.** Radiology. 2005;235(2):699-708. (Level III evidence). [View the reference](#)
 12. Kawarada O, Higashimori A, Noguchi M, Waratani N, Yoshida M, Fujihara M, et al. **Duplex criteria for in-stent restenosis in the superficial femoral artery.** Catheter Cardiovasc Interv. 2013;81(4):E199-205. (Level III evidence). [View the reference](#)
 13. Kumamaru KK, Hoppel BE, Mather RT, Rybicki FJ. **CT angiography: current technology and clinical use.** Radiol Clin North Am. 2010;48(2):213-35. (Review article). [View the reference](#)
 14. Kock MC, Adriaensen ME, Pattynama PM, van Sambeek MR, van Urk H, Stijnen T, et al. **DSA versus multi-detector row CT angiography in peripheral arterial disease: randomized controlled trial.** Radiology. 2005;237(2):727-37. (Level I evidence). [View the reference](#)
 15. Kasapis C, Gurm HS. **Current approach to the diagnosis and treatment of femoral-popliteal arterial disease. A systematic review.** Current cardiology reviews. 2009;5(4):296-311. (Level II evidence). [View the reference](#)
 16. Collins R, Burch J, Cranny G, Aguiar-Ibanez R, Craig D, Wright K, et al. **Duplex ultrasonography, magnetic resonance angiography, and computed tomography angiography for diagnosis and assessment of symptomatic, lower limb peripheral arterial disease: systematic review.** BMJ. 2007;334(7606):1257. (Level I evidence). [View the reference](#)

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