

# Evolut Clinical Guideline ~~058-12034~~ for Lower Extremity Magnetic Resonance MR-Angiography A/MRV(MRA)

## Ankle, Lower Extremity

<b>Guideline <del>or Policy</del> Number:</b> Evolut_CG_ <del>058-12034</del>	<b><u>Applicable Codes</u></b>	
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## STATEMENT

### General Information

- *It is an expectation that all patients receive care/services from a licensed clinician. All appropriate supporting documentation, including recent pertinent office visit notes, laboratory data, and results of any special testing must be provided. If applicable: All prior relevant imaging results and the reason that alternative imaging cannot be performed must be included in the documentation submitted.*
- *Where a specific clinical indication is not directly addressed in this guideline, medical necessity determination will be made based on widely accepted standard of care criteria. These criteria are supported by evidence-based or peer-reviewed sources such as medical literature, societal guidelines and state/national recommendations.*
- *The guideline criteria in the following sections were developed utilizing evidence-based and peer-reviewed resources from medical publications and societal organization guidelines as well as from widely accepted standard of care, best practice recommendations.*

### Purpose

#### **MRA/MRV**

Magnetic resonance angiography (MRA) ~~and (MRV)~~ generates images of the blood vessels that can be evaluated for evidence of stenosis, occlusion, or aneurysms without use of ionizing radiation. It is used to evaluate the blood vessels of the lower extremities.

**NOTE:** Authorization for MR Angiography (MRA) covers both arterial and venous imaging. The term *angiography* refers to both arteriography and venography.

### Special Notes

#### **Imaging Request**

- When a separate MRA and MRI exam is requested, documentation requires a medical reason that clearly indicates why additional MRI imaging of the lower extremity is needed.
- As there is no CPT code for MRA Aortogram with lower extremity runoff, two separate authorizations are required: Abdomen MRA (CPT 74185) and one Lower Extremity MRA (CPT 73725). This will provide imaging of the abdomen, pelvis and both legs. A separate Pelvis MRA authorization is **NOT** required. Only one Lower Extremity MRA is required (**NOT** two).

## **INDICATIONS FOR LOWER EXTREMITY MAGNETIC RESONANCE ANGIOGRAPHY (MRA)**

### **Lower Extremity Peripheral Vascular Disease <sup>(1,2,3,4)</sup>**

For evaluation of known or suspected lower extremity vascular arterial disease <sup>(1)</sup> when **CTA is contraindicated or cannot be performed:**

- For known or suspected atherosclerotic peripheral arterial disease (such as claudication, or clinical concern for vascular causes of ulcers) when any ONE of the following non-invasive studies (pulse volume recording, ankle brachial index, toe brachial index, segmental pressures, or doppler ultrasound) are abnormal or indeterminate <sup>(2-4)</sup>: **OR**
  - Ankle-brachial index (ABI) (< 0.9 is the cutoff for diagnosis of peripheral arterial disease and >1.4 is considered inconclusive)
  - Toe brachial index (< 0.7 is the cutoff for diagnosis of peripheral arterial disease)
  - Segmental pressure test (a pressure gradient  $\geq$  20 mmHg is considered abnormal)
  - Doppler ultrasound
  - Treadmill test
  - 6-minute walking test
- For acute critical limb ischemia with any ONE of the below clinical signs of peripheral artery vascular disease <sup>(5,6)</sup>: (prior ultrasound is not needed; if done and negative, CTA should still be approved) <sup>(1,2)</sup>
  - Ischemic rest pain
  - Tissue loss
  - Gangrene

**NOTE:** Prior ultrasound is NOT needed <sup>(1,2)</sup>
- For known predisposing conditions (such as Buerger disease, cystic adventitial disease, arterial endofibrosis, fibromuscular dysplasia, segmental arterial mediolysis and/or genetic conditions such as Marfan syndrome, Loeys-Dietz syndrome, or vascular Ehler-Danlos Syndrome) and any ONE of the following <sup>(7)</sup>:
  - Prior imaging suggestive of non-atherosclerotic peripheral vascular disease of the lower extremity
  - Signs or symptoms of lower extremity vascular disease (such as claudication, weak pulses)
- For leg/foot ulcers on exam from known/suspected peripheral vascular disease after prior abnormal or indeterminate ultrasound <sup>(1,2)</sup>

- ~~After stenting or surgery with signs of recurrent symptoms, abnormal ankle/brachial index, abnormal or indeterminate arterial Doppler, or abnormal or indeterminate pulse volume recording~~ After prior stenting or surgery (arterial and/or venous) -with any ONE -of the following <sup>(8,9)</sup>:
  - ~~R~~ recurrent symptoms
  - ~~S~~ signs of recurrent disease on examination
  - ~~A~~ abnormal / indeterminate prior non-invasive testing or imaging (such as ankle/brachial index, ultrasound)

## Popliteal Artery Entrapment Syndrome

- For known/suspected popliteal artery entrapment syndrome with ALL the following <sup>(10)</sup>:
  - Prior ultrasound is abnormal or inconclusive
  - Advanced ~~after abnormal arterial ultrasound and when~~ imaging study results will potentially change management

## Deep Venous Thrombosis (DVT)

~~Clinical suspicion of lower extremity DVT (when ultrasound is abnormal or inconclusive and a positive study would change management)~~ <sup>(8,9,10)</sup>

- For known/suspected DVT with ALL the following <sup>(11,12)</sup>:
  - Prior ultrasound is abnormal or inconclusive ~~and~~
  - Advanced imaging ~~ss positive study results would~~ will potentially change management <sup>(5,6,7)</sup>
  - CTA is contraindicated or not available

## Arterial Thromboembolism

- Clinical findings (such as pulselessness, acute limb ischemia) and/or prior imaging suggestive of lower extremity arterial thromboembolism <sup>(9)</sup>
- NOTE: Echocardiogram and advanced vascular imaging of the chest, abdomen, and/or pelvis may also be indicated to identify the source of the emboli.

~~Clinical Suspicion of Vascular Disease~~

~~Abnormal or indeterminate ultrasound or other imaging:~~

~~Tumor invasion~~ <sup>(11,12)</sup>

Trauma<sup>(13)</sup>

Vasculitis<sup>(14)</sup>

Aneurysm<sup>(14)</sup>

Stenosis/occlusions<sup>(2)</sup>

## Clinical Suspicion of Aneurysm

- With prior abnormal or indeterminate ultrasound or other imaging when CTA is contraindicated or not available <sup>(13)</sup>

## Clinical Suspicion of Vasculitis

- With prior abnormal or indeterminate ultrasound or other imaging when CTA is contraindicated or not available <sup>(13)</sup>

## **Hemodialysis Graft Dysfunction**

- After Doppler ultrasound, if findings were not adequate for treatment decisions If Doppler prior ultrasound was completed and not adequate sufficient for required treatment decisions <sup>(14)</sup>

## **Vascular Malformation (VM)** <sup>(15,16)</sup>

- ~~After initial evaluation with ultrasound if:~~
  - ~~Results will change management~~
  - ~~Results are inconclusive ultrasound~~
  - ~~If a known or suspected high flow lesion~~
- ~~For preoperative planning~~
  - MRI is also approvable for initial evaluation For known / suspected lower extremity VM with ALL the following:
    - Prior abnormal or indeterminate ultrasound
    -
  - Advanced imaging study results will potentially change management After initial evaluation with ultrasound if:
    - Results will change management
- Results are inconclusive on ultrasound
  - If a known or suspected high flow lesion
  - A concurrent MRI is also approvable for initial evaluation/preoperative planning or by surgeon preference.

## Traumatic Injuries

~~—Clinical findings (such as bruit, hemorrhage, hematoma, pulselessness) and/or abnormal prior imaging suggestive of lower extremity vascular injury when CTA is contraindicated or not available<sup>(17)</sup>~~

- ~~• Clinical findings suggestive of arterial injury (CTA preferred if emergent)~~

## Evaluation of Tumor

- ~~• When needed for clarification of vascular involvement ~~invasion~~ from tumor after prior imaging (may be approved in combination with CT or MRI of tumor)~~

## **PRE-OPERATIVE ~~OR POSTOPERATIVE ASSESSMENT~~**

~~When not otherwise specified in the guideline/Procedure Evaluation~~

~~Preoperative Evaluation:~~

- ~~• Imaging of the area requested is needed to develop aPre-operative evaluation for a planned surgical eryplan or procedure~~

## **Post-operative/~~Procedure Evaluation~~**

~~Postoperative Evaluation:~~

- ~~• Known or suspected complications~~
- ~~• A clinical reason is provided how imaging may change management Follow-up study may be needed to help evaluate a patient's progress after treatment, procedure, intervention, or surgery. Documentation requires a medical reason that clearly indicates why additional imaging is needed for the type and area(s) requested.~~

~~**NOTE:** This section applies only within the first few months following surgery~~

## **FURTHER EVALUATION OF INDETERMINATE FINDINGS ~~ON PRIOR IMAGING~~**

Unless follow-up is otherwise specified within the guideline:

- For initial evaluation of an inconclusive finding on a prior imaging report (i.e., x-ray, ultrasound or CT) that requires further clarification
- One follow-up exam of a prior indeterminate MR/CT finding to ensure no suspicious interval change has occurred. (No further surveillance unless specified as highly suspicious or change was found on last follow-up exam.)

## IMAGING IN KNOWN GENETIC CONDITIONS SYNDROMES AND RARE DISEASES

- ~~Known vascular EDS (vEDS) with acute extremity pain and concern for dissection/rupture (18,19)~~
- Vascular Ehlers-Danlos Syndrome (vEDS) ~~surveillance imaging~~: With inconclusive ultrasound or ultrasound suggestive of vascular pathology OR acute extremity pain and concern for dissection/rupture (18,19)
- ~~Known~~ Williams Syndrome: ~~when there is concern for vascular disease based on~~ Abnormal vascular exam or imaging findings (such as diminished pulses, bruits or signs of diffuse thoracic aortic stenosis) (20)
- For other syndromes and rare diseases not otherwise addressed in the guideline, coverage is based on a case-by-case basis using societal guidance
- For known predisposing conditions (such as Buerger disease, cystic adventitial disease, arterial endofibrosis, fibromuscular dysplasia, segmental arterial mediolysis and/or genetic conditions such as Marfan syndrome, Loeys-Dietz syndrome, or vascular Ehler-Danlos Syndrome) and any ONE of the following (7):
  - Prior imaging suggestive of non-atherosclerotic peripheral vascular disease of the lower extremity
  - Signs or symptoms of lower extremity vascular disease (such as claudication, weak pulses)

## OTHER COMBINATION STUDIES WITH LOWER EXTREMITY MRA

**NOTE:** When medical necessity is met for an individual study **AND** conscious sedation is required (such as for young pediatric patients or patients with significant developmental delay), the entire combination is indicated)

### **Chest/Abdomen ~~MRA/Pelvis/~~ and/or Lower Extremity MRA**

- To evaluate for an embolic source of lower extremity thromboembolic vascular disease.
  - **NOTE:** Echocardiography is also ~~indicated often needed, since as~~ the heart is the most commonly reported source of lower extremity emboli, ~~accounting for 55 to 87 percent of events~~

## **CODING AND STANDARDS**

## Coding

CPT Codes

73725

### Applicable Lines of Business

<input checked="" type="checkbox"/>	CHIP (Children’s Health Insurance Program)
<input checked="" type="checkbox"/>	Commercial
<input checked="" type="checkbox"/>	Exchange/Marketplace
<input checked="" type="checkbox"/>	Medicaid
<input checked="" type="checkbox"/> <input type="checkbox"/>	Medicare Advantage

## BACKGROUND

Testing

### ~~NONINVASIVE TESTING~~

~~“Noninvasive testing (NIVT), both before and after intervention, has been used as a first-line investigatory tool in the diagnosis and categorization of PAD, and post procedure follow-up. It is widely available, provides a large amount of information, and is a low cost without the use of ionizing radiation.”<sup>(22)</sup>~~

~~NIVT can consist of one or more of the following components:<sup>(22)</sup>~~

- ~~● ABI~~

~~Ankle-brachial index (ABI)~~

- ~~● Segmental pressure measurements (SPMs)~~
- ~~● Pulse-volume recordings (PVRs)~~
- ~~● Photoplethysmography (PPG)~~
- ~~● Transcutaneous oxygen pressure measurement (TcPO<sub>2</sub>)~~

### ~~Noninvasive Hemodynamic Testing~~

The ankle-brachial index (ABI) is the ratio of systolic blood pressure at the ankle divided by the systolic pressure of the upper arm. The normal range lies between 0.9-1.4. An ABI of <0.9 is a reliable indicator of the presence of lower extremity PAD, indicating athero-occlusive arterial disease. The upper limit of normal ABI should not exceed 1.40. An ABI >1.40 is suggestive of arterial stiffening (i.e., medial arterial calcification) and is also associated with a higher risk of cardiovascular events and is seen in elderly patients, typically in those with diabetes or chronic kidney disease (CKD).

## Contraindications and Preferred Studies

- Contraindications and reasons why a CT/CTA cannot be performed may include: impaired renal function, significant allergy to IV contrast, pregnancy (depending on trimester)
- Contraindications and reasons why an MRI/MRA cannot be performed may include: impaired renal function, claustrophobia, non-MRI compatible devices (such as non-compatible defibrillator or pacemaker), metallic fragments in a high-risk location, patient exceeds weight limit/dimensions of MRI machine

## SUMMARY OF EVIDENCE

### ACR Appropriateness Criteria Nonatherosclerotic Peripheral Arterial Disease <sup>(7)</sup>

**Study Design:** This study provides evidence-based guidelines for the diagnosis and treatment of nonatherosclerotic peripheral arterial diseases. The guidelines were developed by the American College of Radiology (ACR) and reviewed annually by a multidisciplinary expert panel.

**Target Population:** The guidelines are intended for radiologists, radiation oncologists, and referring physicians dealing with patients suspected of having nonatherosclerotic peripheral arterial diseases.

**Key Factors:** The study discusses various nonatherosclerotic diseases affecting peripheral arteries, including popliteal entrapment syndrome, external iliac artery endofibrosis, lower-extremity inflammatory vasculitides, and vascular trauma. It emphasizes the importance of accurate vascular imaging and provides recommendations for appropriate initial diagnostic imaging studies based on clinical presentation and suspicion of disease

### 2024 ACC/AHA/AACVPR/APMA/ABC/SCAI/SVM/SVN/SVS/SIR/VESSE Guideline for the Management of Lower Extremity Peripheral Artery Disease <sup>(9)</sup>

**Study Design:** This guideline provides recommendations for the management of lower extremity peripheral artery disease (PAD) and was developed by the American College of Cardiology (ACC) and the American Heart Association (AHA).

**Target Population:** The guidelines are aimed at clinicians treating patients with lower extremity PAD across various clinical presentation subsets, including asymptomatic, chronic symptomatic, chronic limb-threatening ischemia, and acute limb ischemia.

**Key Factors:** The study includes a comprehensive literature review, covering studies, reviews, and other evidence conducted on human subjects. It provides updated recommendations for the diagnosis, medical therapy, exercise therapy, and revascularization for PAD. The guidelines also address special considerations such as risk amplifiers, health disparities, and management of PAD in older patients.

### **2024 ESC Guidelines for the management of peripheral arterial and aortic diseases** <sup>(1)</sup>

**Study Design:** This guideline was developed by the European Society of Cardiology (ESC) and provides recommendations for the management of peripheral arterial and aortic diseases.

**Target Population:** The guidelines are intended for healthcare professionals managing patients with peripheral arterial and aortic diseases, including those with atherosclerotic and non-atherosclerotic conditions.

**Key Factors:** The study covers a wide range of topics, including epidemiology, risk factors, clinical assessment, diagnostic tests, medical therapy, and interventional treatment. It emphasizes a comprehensive approach to managing the entirety of the arterial circulation and highlights the importance of a multidisciplinary approach in expert and high-volume centers.

## **ANALYSIS OF EVIDENCE**

### **Shared Findings** <sup>(1,7,9)</sup>

- Importance of Imaging Modalities: All three articles emphasize the significance of imaging modalities in diagnosing and managing peripheral arterial diseases. They highlight the use of techniques such as Duplex Ultrasound (DUS), Computed Tomography Angiography (CTA), and Magnetic Resonance Angiography (MRA) for accurate visualization of vascular abnormalities and guiding treatment decisions.
- Role of Non-invasive Imaging: The articles agree on the value of non-invasive imaging techniques like DUS and MRA for initial assessment and follow-up of patients with peripheral arterial diseases. These methods are preferred due to their ability to provide detailed information without the risks associated with invasive procedures.
- Use of CTA: CTA is recognized across the articles for its high spatial resolution and ability to visualize calcifications, making it a valuable tool for assessing the severity of arterial stenosis and planning revascularization.

### **Conclusion** <sup>(1,7,9)</sup>

The evidence across these articles reiterates the critical role of imaging in diagnosing and managing peripheral arterial diseases. Non-invasive imaging techniques like DUS and MRA are preferred for initial assessment and follow-up due to their safety and detailed visualization capabilities. CTA is valuable for its high spatial resolution and ability to visualize calcifications, making it essential for planning revascularization.

While the articles share common conclusions on the importance of imaging modalities, they differ in their specific recommendations, target populations, and key factors. Francois et al 2019 provides detailed appropriateness criteria for various imaging modalities based on specific

clinical scenarios, while Gornik et al 2024 focuses on comprehensive management of lower extremity PAD and Mazzolai et al 2024 offers a holistic approach to peripheral arterial and aortic diseases, including genetic conditions.

Overall, the shared and differing conclusions highlight the multifaceted nature of extremity imaging and the need for tailored approaches based on the patient's specific condition and clinical scenario.

## POLICY HISTORY

Date	Summary
<a href="#"><u>June 2025</u></a>	<ul style="list-style-type: none"> <li>● <u>This guideline number changed from <del>replaces Evolent Clinical Guideline 058-1 for Lower Extremity MRA/MRV</del> to 2034</u></li> <li>● <u>Guideline name changed from Lower Extremity MRA/MRV to Lower Extremity Magnetic Resonance Angiography (MRA)</u> <ul style="list-style-type: none"> <li>○ <u>Added a subtitle: Ankle, Lower Extremity</u></li> </ul> </li> <li>● <u>Added in general information statement regarding guideline criteria development by reputable sources, standard of care, and best practices</u></li> <li>● <u>Added non-invasive studies and non-atherosclerotic PVD to Peripheral Vascular Disease section</u></li> <li>● <u>Broke down clinical suspicion of vascular disease section for clarity</u></li> <li>● <u>Added non-atherosclerotic PVD to Genetics Syndromes and Rare Diseases section</u></li> <li>● <u>Standardized preoperative and postoperative assessment and Imaging in Known Genetic Conditions sections</u></li> <li>● <u>Adjusted applicable lines of business – Medicare Advantage checked</u></li> <li>● <u>Reduced Background section</u></li> <li>● <u>Edited text for clarity and consistency</u></li> <li>● <u>Updated references</u></li> <li>● <u>Added a Summary of Evidence and Analysis of Evidence</u></li> </ul>
June 2024	<ul style="list-style-type: none"> <li>● Content clarified without change to clinical indications</li> <li>● Added Genetics Syndrome and Rare Diseases section</li> <li>● Added Contraindications and Preferred Studies section in</li> </ul>

Date	Summary
	background <ul style="list-style-type: none"> <li>● Combination Studies updated</li> <li>● Updated References</li> </ul>
April 2023	<ul style="list-style-type: none"> <li>● Updated references</li> <li>● Modified background section</li> <li>● Added vascular malformations</li> <li>● Added graft evaluation</li> <li>● General Information moved to beginning of guideline with added statement on clinical indications not addressed in this guideline</li> <li>● Added indeterminate prior imaging findings</li> </ul>

## LEGAL AND COMPLIANCE

### Guideline Approval

#### Committee

Reviewed / Approved by Evolent Specialty Services Clinical Guideline Review Committee

#### Disclaimer

*Evolent Clinical Guidelines do not constitute medical advice. Treating health care professionals are solely responsible for diagnosis, treatment, and medical advice. Evolent uses Clinical Guidelines in accordance with its contractual obligations to provide utilization management. Coverage for services varies for individual members according to the terms of their health care coverage or government program. Individual members' health care coverage may not utilize some Evolent Clinical Guidelines. Evolent clinical guidelines contain guidance that requires prior authorization and service limitations. A list of procedure codes, services or drugs may not be all inclusive and does not imply that a service or drug is a covered or non-covered service or drug. Evolent reserves the right to review and update this Clinical Guideline in its sole discretion. Notice of any changes shall be provided as required by applicable provider agreements and laws or regulations. Members should contact their Plan customer service representative for specific coverage information.*

*Evolent Clinical Guidelines are comprehensive and inclusive of various procedural applications for each service type. Our guidelines may be used to supplement Medicare criteria when such criteria is not fully established. When Medicare criteria is determined to not be fully established, we only reference the relevant portion of the corresponding Evolent Clinical Guideline that is applicable to the specific service or item requested in order to determine medical necessity.*

## REFERENCES

1. Mazzolai L, Teixido-Tura G, Lanzi S, et al. 2024 ESC Guidelines for the management of peripheral arterial and aortic diseases. *Eur Heart J*. 2024;45(36):3538-3700. doi:10.1093/eurheartj/ehae179
2. Rochon PJ, Reghunathan A, Kapoor BS, et al. ACR Appropriateness Criteria® Lower Extremity Chronic Venous Disease. *Journal of the American College of Radiology*. 2023;20(11):S481-S500. doi:10.1016/j.jacr.2023.08.011
3. Azene EM, Steigner ML, Aghayev A, et al. ACR Appropriateness Criteria® Lower Extremity Arterial Claudication-Imaging Assessment for Revascularization: 2022 Update. *Journal of the American College of Radiology*. 2022;19(11):S364-S373. doi:10.1016/j.jacr.2022.09.002
4. Nordanstig J, Behrendt CA, Baumgartner I, et al. Editor's Choice -- European Society for Vascular Surgery (ESVS) 2024 Clinical Practice Guidelines on the Management of Asymptomatic Lower Limb Peripheral Arterial Disease and Intermittent Claudication. *European Journal of Vascular and Endovascular Surgery*. 2024;67(1):9-96. doi:10.1016/j.ejvs.2023.08.067
5. Shishehbor MH, White CJ, Gray BH, et al. Critical Limb Ischemia. *J Am Coll Cardiol*. 2016;68(18):2002-2015. doi:10.1016/j.jacc.2016.04.071
6. Browne WF, Sung J, Majdalany BS, et al. ACR Appropriateness Criteria® Sudden Onset of Cold, Painful Leg: 2023 Update. *Journal of the American College of Radiology*. 2023;20(11):S565-S573. doi:10.1016/j.jacr.2023.08.012
7. Francois CJ, Skulborstad EP, Kalva SP, et al. ACR Appropriateness Criteria® Nonatherosclerotic Peripheral Arterial Disease. *Journal of the American College of Radiology*. 2019;16(5):S174-S183. doi:10.1016/j.jacr.2019.02.026
8. Cooper K, Majdalany BS, Kalva SP, et al. ACR Appropriateness Criteria® Lower Extremity Arterial Revascularization—Post-Therapy Imaging. *Journal of the American College of Radiology*. 2018;15(5):S104-S115. doi:10.1016/j.jacr.2018.03.011
9. Gornik HL, Aronow HD, Goodney PP, et al. 2024 ACC/AHA/AACVPR/APMA/ABC/SCAI/SVM/SVN/SVS/SIR/VES Guideline for the Management of Lower Extremity Peripheral Artery Disease. *J Am Coll Cardiol*. 2024;83(24):2497-2604. doi:10.1016/j.jacc.2024.02.013
10. Neubauer TM, Chin JJ, Hill RD, Hu YWE. Popliteal Artery Entrapment Syndrome: Updates for Evaluation, Diagnosis, and Treatment. *Curr Sports Med Rep*. 2024;23(9):310-315. doi:10.1249/JSR.0000000000001194
11. Hanley M, Steigner ML, Ahmed O, et al. ACR Appropriateness Criteria® Suspected Lower Extremity Deep Vein Thrombosis. *Journal of the American College of Radiology*. 2018;15(11):S413-S417. doi:10.1016/j.jacr.2018.09.028
12. Kakkos SK, Gohel M, Baekgaard N, et al. Editor's Choice – European Society for Vascular Surgery (ESVS) 2021 Clinical Practice Guidelines on the Management of Venous Thrombosis. *European Journal of Vascular and Endovascular Surgery*. 2021;61(1):9-82. doi:10.1016/j.ejvs.2020.09.023

13. Seitz L, Seitz P, Pop R, Lötscher F. Spectrum of Large and Medium Vessel Vasculitis in Adults: Primary Vasculitides, Arthritides, Connective Tissue, and Fibroinflammatory Diseases. *Curr Rheumatol Rep*. 2022;24(11):352-370. doi:10.1007/s11926-022-01086-2
14. Richarz S, Isaak A, Aschwanden M, Partovi S, Staub D. Pre-procedure imaging planning for dialysis access in patients with end-stage renal disease using ultrasound and upper extremity computed tomography angiography: a narrative review. *Cardiovasc Diagn Ther*. 2023;13(1):122-132. doi:10.21037/cdt-21-797
15. Obara P, McCool J, Kalva SP, et al. ACR Appropriateness Criteria® Clinically Suspected Vascular Malformation of the Extremities. *Journal of the American College of Radiology*. 2019;16(11):S340-S347. doi:10.1016/j.jacr.2019.05.013
16. Schmidt VF, Masthoff M, Czihal M, et al. Imaging of peripheral vascular malformations — current concepts and future perspectives. *Mol Cell Pediatr*. 2021;8(1):19. doi:10.1186/s40348-021-00132-w
17. Fox N, Rajani RR, Bokhari F, et al. Evaluation and management of penetrating lower extremity arterial trauma. *Journal of Trauma and Acute Care Surgery*. 2012;73(5):S315-S320. doi:10.1097/TA.0b013e31827018e4
18. Byers PH. Vascular Ehlers-Danlos Syndrome. *GeneReviews*®. Published online April 10, 2025. <https://www.ncbi.nlm.nih.gov/books/NBK1494/>
19. Bowen JM, Hernandez M, Johnson DS, et al. Diagnosis and management of vascular Ehlers-Danlos syndrome: Experience of the UK national diagnostic service, Sheffield. *European Journal of Human Genetics*. 2023;31(7):749-760. doi:10.1038/s41431-023-01343-7
20. Morris CA. Williams Syndrome. *GeneReviews*®. Published online April 13, 2023. <https://www.ncbi.nlm.nih.gov/books/NBK1249/>