Evolent Clinical Guideline 2041 for Neck Magnetic Resonance Angiography (MRA)

Guideline Number: Evolent_CG_2041	**Applicable Codes**	
"Evolent" refers to Evolent Health LLC and Evolent Specialty Services, Inc. 		
Original Date: September 1997	**Last Revised Date:** July 2025	**Implementation Date:** January 2026

TABLE OF CONTENTS

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

Indications for performing Magnetic Resonance Angiography (MRA) in the neck/cervical region.

Special Note

If there is a combination request for an overlapping body part, either requested at the same time or sequentially (within the past 3 months) the results of the prior study should show one or more of the following:

- Inconclusive or show a need for additional or follow up imaging evaluation
- The office notes should clearly document an indication why overlapping imaging is needed and how it will change management for the patient.

(See **Combination Studies** section for indicated combinations below)

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

INDICATIONS FOR NECK MR ANGIOGRAPHY

Cerebrovascular Disease

- Recent ischemic stroke or transient ischemic attack [1–3]
  - **Note:** For remote strokes with no prior vascular imaging, imaging can be considered based on location/type of stroke and documented potential to change management
- Known or suspected vertebrobasilar insufficiency (VBI) in patients with symptoms such as dizziness, vertigo, headaches, diplopia, blindness, vomiting, ataxia, weakness in both

sides of the body, or abnormal speech [4,5]

- Asymptomatic patients with an abnormal ultrasound of the neck or carotid duplex imaging (e.g., carotid stenosis ≥ 70%, technically limited study, aberrant direction of flow in the carotid or vertebral arteries) [1,2]
- Symptomatic patients with an abnormal ultrasound of the neck or carotid duplex imaging (e.g., carotid stenosis ≥ 50%, technically limited study, aberrant direction of flow in the carotid or vertebral arteries) [1,2]

Tumor/Pulsatile Mass

- Pulsatile mass on exam [6]
- Known carotid body tumors, or other masses such as a paraganglioma, arteriovenous fistula, pseudoaneurysm, atypical lymphovascular malformation [6,7]

Note: Ultrasound (US) may be used to identify a mass overlying or next to an artery in initial work up of a pulsatile mass.

Vasculitis and Other Extracranial Vascular Diseases

- Large vessel vasculitis [8]
  - Giant cell with suspected extracranial involvement [9]
  - Takayasu's Arteritis [10]
    - At initial diagnosis
    - Every 6 months for the first 2 years while on therapy
    - Annually after the first 2 years
- For patients with fibromuscular dysplasia (FMD) [11,12]:
  - One-time vascular study from brain to pelvis
- Spontaneous coronary arteries dissection (SCAD) [13]
  - One-time vascular study from brain to pelvis
- Subclavian steal syndrome when ultrasound is positive or indeterminate OR for planning an intervention [14,15]
- Suspected carotid or vertebral artery dissection (secondary to trauma or spontaneous) [1,16,17]
- Follow-up of known carotid or vertebral artery dissection with any **ONE** of the following [18,19]:
  - At 3-6 months post dissection (for evaluation of recanalization or to guide anticoagulation treatment)
  - When documentation is provided that the results will be used to guide anticoagulation treatment
  - When there is recurrent pain, headache or new neurologic deficits that suggest

progression

- To identify an arterial source of bleeding in patients with hemorrhage of the head and neck [7]
- Non-Central Horner's Syndrome (Secondary/preganglionic or tertiary/post-ganglionic) to evaluate for a vascular source (Such as dissection, aneurysm, arteritis) with any **ONE** of the following [20,21]:
  - For evaluation of a possible underlying vascular issue
  - Associated ipsilateral orbital, face, and/or neck pain that could indicate a possible contributing carotid artery dissection

  NOTE: Vascular imaging of the brain and chest may also be indicated
- Pulsatile tinnitus to identify a suspected arterial vascular etiology [7,22]
- For further evaluation of a congenital vascular malformation of the head and neck [7]
- Known extracranial vascular disease that needs follow-up or further evaluation [7]

PREOPERATIVE OR POSTOPERATIVE ASSESSMENT

When not otherwise specified in the guideline:

Preoperative Evaluation:

- Imaging of the area requested is needed to develop a surgical plan

Postoperative Evaluation:

- Known or suspected complications
- A clinical reason is provided how imaging may change management

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

FURTHER EVALUATION OF INDETERMINANT FINDINGS

Unless follow up is otherwise specified within the guideline:

- For initial evaluation of an inconclusive finding on a prior imaging report 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

- Loeys-Dietz [23]:
  - Every two years (including at diagnosis) **OR**
  - More frequently if abnormalities are found
- Vascular Ehlers-Danlos syndrome (vEDS) [24]:
  - Every 18 months (including at diagnosis) **OR**
  - As clinically indicated to follow known vascular abnormalities

Combination Studies for Known Genetic Conditions

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)

Brain/Neck/Chest/Abdomen/Pelvis MRA

- Loeys-Dietz [23]:
  - Every two years (including at diagnosis) **OR**
  - More frequently if abnormalities are found
- Vascular Ehlers-Danlos syndrome (vEDS) [24]:
  - Every 18 months (including at diagnosis) **OR**
  - As clinically indicated to follow known vascular abnormalities

OTHER COMBINATION STUDIES WITH NECK 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)

Brain MRI and Brain/Neck MRA [1,3]

- Recent ischemic stroke or transient ischemic attack (TIA) [1,25]
- History of stroke and **ONE** of the following:
  - No prior workup
  - New neurologic signs or symptoms
- Suspected or known carotid or vertebral artery dissection with focal or lateralizing neurological deficits
- Pulsatile tinnitus with concern for a suspected arterial vascular and/or intracranial etiology [22,26,27]

- **NOTE**: For the indication of pulsatile tinnitus the Brain MRI of the combination should include the Internal Auditory Canal (IAC)

- Giant cell arteritis with suspected intracranial and extracranial involvement [9]

Note: CTA and MRA are generally comparable noninvasive imaging alternatives each with their own advantages and disadvantages. Brain MRI can be combined with Brain CTA/Neck CTA.

Brain/Neck MRA

- Recent ischemic stroke or transient ischemic attack (TIA) [1,25]
  - **Note:** For remote strokes with no prior vascular imaging, imaging can be considered based on location/type of stroke and documented potential to change management
- Known or suspected vertebrobasilar insufficiency (VBI) in patients with symptoms such as dizziness, vertigo, headaches, diplopia, blindness, vomiting, ataxia, weakness in both sides of the body, or abnormal speech [4,28,29]
- Suspected carotid [30] or vertebral [31] artery dissection (secondary to trauma [32] or spontaneous) [1,16,17]
- Follow-up of known carotid or vertebral artery dissection with any **ONE** of the following [1,18,19]:
  - At 3-6 months post dissection (for evaluation of recanalization or to guide anticoagulation treatment)
  - When documentation is provided that the results will be used to guide anticoagulation treatment
  - When there is recurrent pain, headache or new neurologic deficits that suggest progression
- Giant cell arteritis with suspected intracranial and extracranial involvement [9]
- Asymptomatic patients with an abnormal ultrasound of the neck or carotid duplex imaging (e.g., internal carotid stenosis > 70%, technically limited study, aberrant direction of flow in the carotid or vertebral arteries) and patient is surgery or angioplasty candidate [1,2]
- Symptomatic patients with an abnormal ultrasound of the neck or carotid duplex imaging (e.g., internal carotid stenosis ≥ 50%, technically limited study, aberrant direction of flow in the carotid or vertebral arteries) and patient is surgery or angioplasty candidate [1,2]
- Pulsatile tinnitus to identify a suspected arterial vascular etiology [7,22]

Brain/Neck/Chest MRA

- Non central Horner's syndrome (secondary/preganglionic or tertiary/post-ganglionic) for evaluation of underlying vascular source (such as dissection, aneurysm, arteritis) [20,21]

Brain/Neck/Chest/Abdomen/Pelvis MRA

- For patients with fibromuscular dysplasia (FMD), a one-time vascular study from brain to

pelvis is indicated [11,12]

- For assessment in patients with spontaneous coronary artery dissection (SCAD) (SCAD is a common initial diagnostic event for underlying fibromuscular dysplasia (FMD)) [33]
  - **NOTE**: Body vascular imaging for SCAD can be done at time of coronary angiography
- Takayasu's Arteritis [10]:
  - At initial diagnosis
  - Every 6 months for the first 2 years while on therapy
  - Annually after the first 2 years

CODING AND STANDARDS

Codes

70547, 70548, 70549

Applicable Lines of Business

☒	CHIP (Children's Health Insurance Program)
☒	Commercial
☒	Exchange/Marketplace
☒	Medicaid
☒	Medicare Advantage

BACKGROUND

MRA and Dissection

Craniocervical dissections can be spontaneous or traumatic. Spontaneous dissection presents with headache, neck pain with neurological signs or symptoms. There is often minor trauma or precipitating factor (e.g., exercise, neck manipulation). Dissection of the extracranial vessels can extend intracranially and/or lead to thrombus, which can migrate into the intracranial circulation causing ischemia. Therefore, MRA of the head and neck is warranted. [17,34]

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

Society for Vascular Surgery clinical practice guidelines for management of extracranial cerebrovascular disease [2]

Study Design: This document presents clinical practice guidelines for the management of extracranial cerebrovascular disease, specifically carotid bifurcation stenosis in stroke prevention. The guidelines are based on extensive investigations, including multiple randomized controlled trials (RCTs) and systematic reviews.

Target Population: The guidelines focus on patients with carotid bifurcation disease, including both symptomatic and asymptomatic patients with varying degrees of carotid artery stenosis.

Key Factors:

- **Carotid Endarterectomy (CEA) vs. Medical Therapy**: CEA is recommended over maximal medical therapy for low-risk patients with asymptomatic carotid bifurcation atherosclerosis and stenosis of >70%.
- **CEA vs. Transfemoral Carotid Artery Stenting (TF-CAS)**: CEA is recommended over TF-CAS for low surgical risk patients with symptomatic carotid artery stenosis of >50%.
- **Timing of Carotid Intervention**: Carotid revascularization is recommended for symptomatic patients with >50% stenosis to be performed as soon as the patient is neurologically stable after 48 hours but definitely before 14 days after symptom onset.
- **Screening for Carotid Artery Stenosis**: Routine screening for asymptomatic carotid artery stenosis in individuals without cerebrovascular symptoms or significant risk factors is not recommended.
- **Optimal Sequence for Intervention**: For patients with symptomatic carotid stenosis of 50% to 99% who require both CEA and coronary artery bypass grafting (CABG), CEA before or concomitant with CABG is suggested.

ACR–ASNR–SNIS–SPR Practice Parameter for the Performance of Cervicocerebral Magnetic Resonance Angiography (MRA) [7]

Study Design: This document outlines the practice parameters for the performance of cervicocerebral magnetic resonance angiography (MRA) by the American College of Radiology (ACR), the American Society of Neuroradiology (ASNR), the Society of NeuroInterventional Surgery (SNIS), and the Society for Pediatric Radiology (SPR).

Target Population: The guidelines are intended for practitioners performing MRA on patients with various vascular diseases of the brain, head, and neck, including both adult and pediatric populations.

Key Factors:

- **Indications for MRA**: Detection and evaluation of atherosclerotic or nonatherosclerotic steno-occlusive disease, traumatic injury, aneurysms, arteriovenous malformations, vasculitis, tumor vascular supply, and other vascular anomalies.
- **Safety Guidelines**: The document emphasizes the importance of adhering to safety guidelines and possible contraindications, including the use of contrast agents and sedation.
- **Examination Technique**: Various MRA techniques are described, including noncontrast TOF MRA, contrast-enhanced MRA, phase-contrast MRA, arterial spin-labeling MRA, and MR vessel wall imaging.
- **Documentation**: Proper documentation of the examination and findings is crucial for effective communication and patient care.

ACR Appropriateness Criteria Cerebrovascular Diseases-Stroke and Stroke-Related Condition [(1)]

Study Design: This document provides the ACR Appropriateness Criteria for cerebrovascular diseases, stroke, and stroke-related conditions. The guidelines are evidence-based and reviewed annually by a multidisciplinary expert panel.

Target Population: The criteria focus on patients with stroke-related conditions, including carotid stenosis, carotid dissection, intracranial large vessel occlusion, cerebral venous sinus thrombosis, intraparenchymal hemorrhage, and completed ischemic strokes.

Key Factors:

- **Imaging Recommendations**: The document outlines imaging recommendations for various clinical scenarios, including initial imaging for transient ischemic attack (TIA), acute ischemic stroke, recent ischemic infarct, and surveillance imaging for prior ischemic infarct.
- **Variants**: The criteria include specific variants for different clinical presentations, such as TIA, acute ischemic stroke, recent ischemic infarct, and known intraparenchymal hemorrhage.
- **Relative Radiation Levels**: The document provides relative radiation levels for different imaging procedures to help guide the selection of appropriate imaging techniques.
- **Summary of Literature Review**: The guidelines are based on a systematic analysis of the medical literature from peer-reviewed journals and expert opinions

ANALYSIS OF EVIDENCE

Shared Findings [1,2,7]:

- **Non-Invasive Nature**: All three articles emphasize the non-invasive nature of MRA, which makes it a safer alternative to traditional catheter-based angiography. This is particularly important for patients who may be at risk for complications from invasive procedures.
- **Diagnostic Utility**: MRA is consistently highlighted as a valuable diagnostic tool for assessing vascular diseases, including carotid stenosis, intracranial aneurysms, and arteriovenous malformations. The articles agree that MRA provides detailed imaging that can help in the diagnosis and management of these conditions.
- **Limitations**: All three articles acknowledge the limitations of MRA, such as lower spatial resolution compared to CT angiography (CTA) and susceptibility to artifacts from patient movement or turbulent blood flow

Conclusion [1,2,7]

In summary, while all three articles agree on the non-invasive nature and diagnostic utility of MRA, they differ in their specific indications, technical aspects, and clinical recommendations. AbuRahma et al 2022 focuses on extracranial cerebrovascular disease, ACR–ASNR–SNIS–SPR MRA provides a comprehensive overview of MRA techniques and indications, and Pannell et al 2024 offers detailed guidelines for the use of MRA in cerebrovascular diseases and stroke management. These differences highlight the versatility of MRA in various clinical contexts and the importance of tailored guidelines for its use.

POLICY HISTORY

Date	Summary
July 2025	• Fixed a spelling typo in the Vasculitis and Other Extracranial Vascular Disease ○ Changed “identity” to “identify” • Edited the policy history for June 2025 to better reflect the changes that were presented at committee. No clinical changes
June 2025	• Guideline name changed from Neck MRA_MRV to Neck Magnetic Resonance Angiography (MRA) • Guideline number changed from 012-2 to 2041 • Added new bullet-point to the General Statement section • Updated references • Updated background section

Date	Summary
	• Updated and rearranged the genetic section • Added Vasculitis and Other Extracranial Vascular Diseases section • Added intervals for imaging of Takayasu arteritis • Clarified follow-up of known carotid or vertebral artery • Clarified central Horner's Syndrome to evaluate for a vascular source • Added history of stroke and no prior workup or new neurologic signs or symptoms • Added a Summary of Evidence and Analysis of Evidence

June 2024	• Updated references
	• Updated background section
	• Updated combination section
	• Clarified
	  ○ Frequency of screening in genetic syndromes
	• Added
	  ○ Follow-up of known carotid or vertebral artery dissection within 3-6 months for evaluation of recanalization and/or to guide anticoagulation treatment (already in combo)
	  ○ Horner's syndrome, non-central (miosis, ptosis, and anhidrosis) - also in combo section
	  ○ Genetic syndromes and rare disease section
	  ○ Giant cell arteritis with suspected intracranial and extracranial involvement (combos)
	  ○ Large vessel vasculitis (Giant cell or Takayasu arteritis) with suspected intracranial and extracranial involvement (combos)
	• Deleted
	  ○ Aneurysm screening section
	  ○ MRI Brain with IAC/MRA Head/MRA Neck section

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. Pannell JS, Corey AS, Shih RY, et al. ACR Appropriateness Criteria® Cerebrovascular Diseases-Stroke and Stroke-Related Conditions. *Journal of the American College of Radiology*. 2024;21(6):S21-S64. doi:10.1016/j.jacr.2024.02.015
2. AbuRahma AF, Avgerinos ED, Chang RW, et al. Society for Vascular Surgery clinical practice guidelines for management of extracranial cerebrovascular disease. *J Vasc Surg*. 2022;75(1):4S-22S. doi:10.1016/j.jvs.2021.04.073
3. Robertson RL, Palasis S, Rivkin MJ, et al. ACR Appropriateness Criteria® Cerebrovascular Disease-Child. *Journal of the American College of Radiology*. 2020;17(5):S36-S54. doi:10.1016/j.jacr.2020.01.036
4. Lima Neto A, Bittar R, Gattas G, et al. Pathophysiology and Diagnosis of Vertebrobasilar Insufficiency: A Review of the Literature. *Int Arch Otorhinolaryngol*. 2017;21(03):302-307. doi:10.1055/s-0036-1593448
5. Yang CW, Carr JC, Futterer SF, et al. Contrast-enhanced MR angiography of the carotid and vertebrobasilar circulations. *AJNR Am J Neuroradiol*. 2005;26(8):2095-2101.
6. Aulino JM, Kirsch CFE, Burns J, et al. ACR Appropriateness Criteria® Neck Mass-Adenopathy. *Journal of the American College of Radiology*. 2019;16(5):S150-S160. doi:10.1016/j.jacr.2019.02.025
7. ACR-ASNR-SNIS-SPR. *ACR-ASNR-SNIS-SPR PRACTICE PARAMETER FOR THE PERFORMANCE OF CERVICOCEREBRAL MAGNETIC RESONANCE ANGIOGRAPHY (MRA)*. https://gravitas.acr.org/PPTS/GetDocumentView?docId=73
8. Aghayev A, Steigner ML, Azene EM, et al. ACR Appropriateness Criteria® Noncerebral Vasculitis. *J Am Coll Radiol*. 2021;18(11S):S380-S393. doi:10.1016/j.jacr.2021.08.005
9. Maz M, Chung SA, Abril A, et al. 2021 American College of Rheumatology/Vasculitis Foundation Guideline for the Management of Giant Cell Arteritis and Takayasu Arteritis. *Arthritis & Rheumatology*. 2021;73(8):1349-1365. doi:10.1002/art.41774
10. Joseph G, Goel R, Thomson VS, Joseph E, Danda D. Takayasu Arteritis. *J Am Coll Cardiol*. 2023;81(2):172-186. doi:10.1016/j.jacc.2022.09.051
11. Gornik HL, Persu A, Adlam D, et al. First International Consensus on the diagnosis and management of fibromuscular dysplasia. *Vascular Medicine*. 2019;24(2):164-189. doi:10.1177/1358863X18821816
12. Kesav P, Manesh Raj D, John S. Cerebrovascular Fibromuscular Dysplasia – A Practical Review. *Vasc Health Risk Manag*. 2023;Volume 19:543-556. doi:10.2147/VHRM.S388257
13. Hayes SN, Kim ESH, Saw J, et al. Spontaneous Coronary Artery Dissection: Current State of the Science: A Scientific Statement From the American Heart Association. *Circulation*. 2018;137(19):523-557. doi:10.1161/CIR.0000000000000564
14. 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

15. Rafailidis V, Li X, Chryssogonidis I, et al. Multimodality Imaging and Endovascular Treatment Options of Subclavian Steal Syndrome. *Can Assoc Radiol J*. 2018;69(4):493-507. doi:10.1016/j.carj.2018.08.003

16. Shih RY, Burns J, Ajam AA, et al. ACR Appropriateness Criteria® Head Trauma: 2021 Update. *J Am Coll Radiol*. 2021;18(5S):S13-S36. doi:10.1016/j.jacr.2021.01.006

17. Shakir HJ, Davies JM, Shallwani H, Siddiqui AH, Levy EI. Carotid and Vertebral Dissection Imaging. *Curr Pain Headache Rep*. 2016;20(12):68. doi:10.1007/s11916-016-0593-5

18. Patel SD, Haynes R, Staff I, Tunguturi A, Elmoursi S, Nouh A. Recanalization of cervicocephalic artery dissection. *Brain Circ*. 2020;6(3):175-180. doi:10.4103/bc.bc_19_20

19. Larsson SC, King A, Madigan J, Levi C, Norris JW, Markus HS. Prognosis of carotid dissecting aneurysms. *Neurology*. 2017;88(7):646-652. doi:10.1212/WNL.0000000000003617

20. Maamouri R, Ferchichi M, Houmane Y, Gharbi Z, Cheour M. Neuro-Ophthalmological Manifestations of Horner's Syndrome: Current Perspectives. *Eye Brain*. 2023;Volume 15:91-100. doi:10.2147/EB.S389630

21. Davagnanam I, Fraser CL, Miszkiel K, Daniel CS, Plant GT. Adult Horner's syndrome: a combined clinical, pharmacological, and imaging algorithm. *Eye*. 2013;27(3):291-298. doi:10.1038/eye.2012.281

22. Pegge SAH, Steens SCA, Kunst HPM, Meijer FJA. Pulsatile Tinnitus: Differential Diagnosis and Radiological Work-Up. *Curr Radiol Rep*. 2017;5(1):5. doi:10.1007/s40134-017-0199-7

23. Loeys BL, Dietz HC. Loeys-Dietz Syndrome. *GeneReviews*®. Published online September 12, 2024. https://www.ncbi.nlm.nih.gov/books/NBK1133/

24. Byers PH. Vascular Ehlers-Danlos Syndrome. *GeneReviews*®. Published online April 10, 2025. https://www.ncbi.nlm.nih.gov/books/NBK1494/

25. Kleindorfer DO, Towfighi A, Chaturvedi S, et al. 2021 Guideline for the Prevention of Stroke in Patients With Stroke and Transient Ischemic Attack: A Guideline From the American Heart Association/American Stroke Association. *Stroke*. 2021;52(7):e364-e467. doi:10.1161/STR.0000000000000375

26. Hofmann E, Behr R, Neumann-Haefelin T, Schwager K. Pulsatile Tinnitus: imaging and differential diagnosis. *Dtsch Arztebl Int*. 2013;110(26):451-458. doi:10.3238/arztebl.2013.0451

27. Jain V, Policeni B, Juliano AF, et al. ACR Appropriateness Criteria® Tinnitus: 2023 Update. *Journal of the American College of Radiology*. 2023;20(11):S574-S591. doi:10.1016/j.jacr.2023.08.017

28. Searls DE, Pazdera L, Korbel E, Vysata O, Caplan LR. Symptoms and Signs of Posterior Circulation Ischemia in the New England Medical Center Posterior Circulation Registry. *Arch Neurol*. 2012;69(3):346-351. doi:10.1001/archneurol.2011.2083

29. Wang LL, Thompson TA, Shih RY, et al. ACR Appropriateness Criteria® Dizziness and Ataxia: 2023 Update. *Journal of the American College of Radiology*. 2024;21(6):S100-S125. doi:10.1016/j.jacr.2024.02.018

30. Goodfriend SD, Tadi P, Koury R. Carotid Artery Dissection. *StatPearls*. Published online December 19, 2022. https://www.ncbi.nlm.nih.gov/books/NBK430835/

31. Britt TB, Agarwal S. Vertebral Artery Dissection. *StatPearls*. Published online March 20, 2023. https://www.ncbi.nlm.nih.gov/books/NBK441827/

32. Harrigan MR. Ischemic Stroke due to Blunt Traumatic Cerebrovascular Injury. *Stroke*. 2020;51(1):353-360. doi:10.1161/STROKEAHA.119.026810

33. Teruzzi G, Santagostino Baldi G, Gili S, Guarnieri G, Montorsi P, Trabattoni D. Spontaneous Coronary Artery Dissections: A Systematic Review. *J Clin Med*. 2021;10(24):5925. doi:10.3390/jcm10245925

34. Clark M, Unnam S, Ghosh S. A review of carotid and vertebral artery dissection. *Br J Hosp Med (Lond)*. 2022;83(4):1-11. doi:10.12968/hmed.2021.0421