National Imaging Associates, Inc.*	
Clinical guidelines **UPPER EXTREMITY CTA/CTV**	**Original Date: July 2008**
CPT Codes: 73206	**Last Revised Date: May 2021**
Guideline Number: NIA_CG_061-2	**Implementation Date: January 2022**

When a separate CTA and CT exam is requested, documentation requires a medical reason that clearly indicates why additional CT imaging of the ~~lower~~ **upper** extremity is needed.

INDICATIONS FOR UPPER EXTREMITY CTA/CTV (Computed Tomography Angiogram/Computed Tomography Venogram)

Hand Ischemia
(Hotchkiss, 2014; Wong, 2016)

- Arterial Doppler not needed with any of these acute symptoms:
  - Ischemic ulceration without segmental temperature change~~.~~
  - Ischemic ulceration with painful ischemia~~.~~
  - Acute sustained loss of perfusion with or without acral ulceration~~.~~
  - Imminent loss of digit~~.~~
- Clinical symptoms with arterial Doppler abnormal and will change management~~.~~
  - Includes Raynaud's (can be associated with scleroderma), Buerger disease, and other vasculopathies (McMahan, 2010)
- Clinical concern for vascular cause of ulcers with abnormal or indeterminate ultrasound (Rosyd, 2017)
- After stenting or surgery with signs of recurrence or indeterminate ultrasound (Pollak, 2012)

Deep Venous Thrombosis or Embolism after abnormal ultrasound
(ACR, 2014; Dill, 2014; Heil, 2017)

- After abnormal ultrasound of arm veins if it will change management, or negative or indeterminate ultrasound to rule out other causes
- For evaluation of central veins
- Clinical suspicion of upper arterial emboli (Bozlar, 201~~4)~~**3a, 2013b)**

Clinical suspicion of vascular disease with abnormal or indeterminate ultrasound
(Bozlar, 2013**a, 2013b**)

* National Imaging Associates, Inc. (NIA) is a subsidiary of Magellan Healthcare, Inc.

- Tumor invasion (Jin, 2018; Kransdorf, 2017)
- Trauma (Wani, 2012)
- Vasculitis (Fonseka, 2017; Hotchkiss, 2014)
- Aneurysm (Verikokos, 2014)
- Stenosis/occlusions (Menke, 2010; Rafailidis, 2018)

Hemodialysis Graft Dysfunction, after Doppler ultrasound not adequate for treatment decisions (Murphy, 2017)

Vascular Malformation ~~(Madani, 2015; Obara, 2019)~~ - If MRA is contraindicated **(Madani, 2015; Obara, 2019)**

- Non-diagnostic doppler ultrasound

Note: CTA useful in delineating high flow lesions such as an arteriovenous malformation.

Traumatic injuries with clinical findings suggestive of arterial injury (Wani, 2012).

Assessment/evaluation of known vascular disease/condition.

Pre-operative/procedural evaluation

- Pre-operative evaluation for a planned surgery or procedure (Ahmed, 2017).

Post-operative/procedural evaluation

- A 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. (Conte, 2019; Cooper, 2018).

Special Circumstances

(Weiss, 2017)

- High suspicion of an acute arterial obstruction - Arteriography preferred (the gold standard).
- Renal impairment
    - Not on dialysis
        - Mild to moderate, GFR 30-89 ml/min MRA can be done
        - Severe, GFR < 30 ml/min MRA without contrast
    - On dialysis
        - CTA with contrast can be done
- Doppler ultrasound can be useful in evaluating bypass grafts

BACKGROUND

Computed tomography angiography (CTA) can visualize blood flow in arterial and venous structures throughout the upper extremity using a computerized analysis of x-ray images. It is enhanced by contrast material that is injected into a peripheral vein to promote visualization. CTA is much less invasive than catheter angiography which involves injecting contrast material into an artery. CTA is less expensive and carries lower risks than catheter angiography.

OVERVIEW

CTA and Raynaud's Syndrome – Raynaud's syndrome is evidenced by episodic waxy pallor or cyanosis of the fingers caused by vasoconstriction of small arteries or arterioles in the fingers. It usually occurs due to a response to cold or to emotional stimuli. CTA may be used in the evaluation of Raynaud's syndrome.

CTA and Dialysis Graft – The management of the hemodialysis access is important for patients undergoing dialysis. With evaluation and interventions, the patency of hemodialysis fistulas may be prolonged. In selected cases, CTA is useful in the evaluation of hemodialysis graft dysfunction due to its speed and high resolution. Rapid data acquisition during the arterial phase, improved visualization of small vessels and lengthened anatomic coverage increase the usefulness of CTA.

CTA and Stenosis or Occlusion – CTA of the central veins of the chest is used for the detection of central venous stenoses and occlusions. High-spatial resolution CTA characterizes the general morphology and degree of stenosis. Enlarged and well-developed collateral veins in combination with the non-visualization of a central vein may be indicative of chronic occlusion, whereas less-developed or absent collateral veins are suggestive of acute occlusions. A hemodynamically significant stenosis may be indicated by the presence of luminal narrowing with local collaterals.

POLICY HISTORY

Date	Summary
May 2021	~~Reviewed literature for updates~~No changes
May 2020	• Added CT Venography to the title • Clarified that CTA does not include a baseline CT exam • Expanded section about vascular malformation to include initial testing • Added information about renal function and contrast agents • Added acute arterial obstruction and renal impairment • Simplified language • Updated references
May 2019	• Reformatted/modified indications to include hand ischemia; deep venous thrombosis or embolism and clinical suspicion of vascular disease • Updated background information and references

~~May 2019~~

- ~~Reformatted/modified indications to include hand ischemia; deep venous thrombosis or embolism and clinical suspicion of vascular disease~~
- ~~Updated background information and references~~

~~May 2020~~

- ~~Added CT Venography to the title~~
- ~~Clarified that CTA does not include a baseline CT exam~~
- ~~Expanded section about vascular malformation to include initial testing~~
- ~~Added information about renal function and contrast agents~~
- ~~Added acute arterial obstruction and renal impairment~~
- ~~Simplified language~~
- ~~Updated references~~

REFERENCES

Ahmed O, Hanley M, Bennett SJ, et al. ACR Appropriateness Criteria® - Vascular Claudication: Assessment for Revascularization. *J Am Coll Radiol*. May 2017; 14(5 Suppl):S372-S379. https://acsearch.acr.org/docs/69411/Narrative/.

Bae M, Chung SW, Lee CW, et al. Upper limb ischemia: Clinical experiences of acute and chronic upper limb ischemia in a single Center. *Korean J Thorac Cardiovasc Surg*. 2015; 48(4):246–251. doi:10.5090/kjtcs.2015.48.4.246.

Bozlar U, Ogur T, Norton P, et al. CT angiography of the upper extremity arterial system: Part 1-anatomy, technique, and use in trauma patients. *AJR Am J Roentgenol*. 2013a; 201(4):745-752

Bozlar U, Ogur T, Norton P, et al. CT angiography of the upper extremity arterial system: Part 2-clinical applications beyond trauma patients. *AJR Am J Roentgenol*. 2013b; 201(4):753-763.

Conte MS, Bradbury AW, Kolh P, et al. Global vascular guidelines on the management of chronic limb=threatening ischemia. J Vasc Surg. 2019 Jun; 69(6S):3S-1255.e40. Epub 2019 May 28.

Cooper K, Majdalany BS, Kalva SP, et al. ACR Appropriateness Criteria lower extremity arterial revascularization – post-therapy. *J Am Coll Radiol*. 2018 May; 15(5Suppl):S104-S115.

Dill KE, Bennett SJ, Hanley M, et al. American College of Radiology ACR Appropriateness Criteria® - Upper Extremity Swelling. https://acsearch.acr.org/docs/69417/Narrative/. Published 2014.

Fonseka CL, Galappaththi SR, Abeyaratne D, et al. A case of polyarteritis nodosa presenting as rapidly progressing intermittent claudication of right leg. Case Reports in Medicine. 2017; 2017: Article ID 4219718.

Heil J, Miesbach W, Vogl T, et al. Deep vein thrombosis of the upper extremity. *Dtsch Arztebl Int*. 2017; 114(14):244–249.

Hotchkiss R, Marks T. Management of acute and chronic vascular conditions of the hand. *Curr Rev Musculoskelet Med*. 2014; 7(1):47–52.

Jin T, Wu G, Li X, et. al. Evaluation of vascular invasion in patients with musculoskeletal tumors of lower extremities: Use of time-resolved 3D MR angiography at 3-T. *Acta Radiol.* 2018 May; 59(5):586-592.

Kransdorf MJ, Murphey MD, Wessell DE, et al. ACR Appropriateness Criteria® - Soft-Tissue Masses. *J Am Coll Radiol*. 2018; 15:S189-S97.

Lebowitz C, Matzon JL. Arterial injury in the upper extremity evaluation, strategies, and anticoagulation management. *Hand Clin*. 2018; 34(1):85-95.

Madani H, Farrant J, Chhaya N, et al. Peripheral limb vascular malformations: An update of appropriate imaging and treatment options of a challenging condition. *Br J Radiol*. 2015; 88(1047):20140406.

McMahan ZH, Wigley FM. Raynaud's phenomenon and digital ischemia: A practical approach to risk stratification, diagnosis and management. *Int J Clin Rheumtol*. 2010; 5(3):355-70.

Menke J, Larsen J. Meta-analysis: Accuracy of contrast-enhanced magnetic resonance angiography for assessing steno-occlusions in peripheral arterial disease. *Ann Intern Med*. 2010; 153(5):325-334. doi: 10.7326/0003-4819-153-5-201009070-00007.

Murphy EA, Ross RA, Jones RG, et al. Imaging in Vascular Access. Cardiovasc Eng Technol. 2017; 8(3):255–272.

Nguyen N, Sharma A, West JK, et al. Presentation, clinical features, and results of intervention in upper extremity fibromuscular dysplasia. *J Vasc Surg.* 2017 Aug; 66(2):554-563.

Obara P, McCool J, Kalva SP, et al. ACR Appropriateness Criteria clinically suspected vascular malformation of the extremities. *J Am Coll Radiol.* 2019 Nov; 16(11S):S340-S347.

Pollak AW, Norton P, Kramer CM. Multimodality imaging of lower extremity peripheral arterial disease: Current role and future directions. *Circ Cardiovasc Imaging*. 2012 Nov 1; 5(6):797–807.

Rafailidis V, Li X, Chryssogonidis I, et al. Multimodality imaging and endovascular treatment options of subclavian steal syndrome. Can Assoc Radiol J. 2018 Nov; 69(4):493-507. Epub 2018 Oct 11.

Rosyd FN. Etiology, pathophysiology, diagnosis and management of diabetics' foot ulcer. *Int J Res Med Sci*. 2017 Oct; 5(10):4206-4213.

Sharma AM, Norton PT, Zhu D. Conditions presenting with symptoms of peripheral arterial disease. *Semin Intervent Radiol*. 2014; 31(4):281-291. http://doi.org/10.1055/s-0034-1393963.

Verikokos C, Karaolanis G, Doulaptsis M, et al. Giant popliteal artery aneurysm: case report and review of the literature. *Case Rep Vasc Med*. 2014; 2014:780561.

Wani ML, Ahangar AG, Ganie FA, et al. Vascular injuries:Trends in management. *Trauma Mon*. 2012; 17(2):266–269.

Weiss C, Azene ER, Azene EM, et al. American College of Radiology (ACR). ACR Appropriateness Criteria® - Sudden Onset of Cold, Painful Leg. J Am Coll Radiol. 2017 May; 14(5Suppl):S307-S313.

Wong VW, Major MR, Higgins JP. Nonoperative management of acute upper limb ischemia. *Hand (NY).* 2016; 11(2):131–143. doi:10.1177/1558944716628499.

Reviewed / Approved by M. Atif Khalid MD M. Atif Khalid, M.D., Medical Director, Radiology

Reviewed / Approved by **ee**

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.