

## 2011 Imaging Criteria

Computed Tomographic Angiogram (CTA)/Magnetic Resonance  
Angiogram (MRA), Carotid<sup>(1\*MDR, 2, 3, 4)</sup>

ICD-9-CM: 88.41

CPT: 70498, 70547, 70548, 70549

I/O Setting: Outpatient

## INDICATION(S)

100 Preoperative study, carotid interventional procedure/surgery planned

100 Preoperative study, carotid interventional procedure/surgery planned **[One]**<sup>(5)</sup>110 Asymptomatic carotid stenosis **[Both]**<sup>(6)</sup>111 Carotid angiogram not planned<sup>(7)</sup>112 Carotid duplex US **[One]**-1  $\geq 60\%$  stenosis<sup>(8)</sup>

-2 Technically inadequate/equivocal

120 Symptomatic carotid stenosis **[All]** ♦121 Carotid angiogram not planned<sup>(7)</sup>122 Sx/findings of anterior circulation ischemia **[One]**-1 TIA in carotid distribution by Hx<sup>(9, 10)</sup>-2 Stroke in carotid distribution by PE<sup>(11, 12)</sup>123 Carotid duplex US **[One]**-1  $\geq 70\%$  stenosis<sup>(13)</sup>-2  $> 50\%$  stenosis with ulcerative plaque<sup>(14)</sup>-3 Carotid occlusion<sup>(15)</sup>

-4 Technically inadequate/equivocal

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## Notes

**(1)-MDR:**

If the patient is not a candidate for carotid surgery or a carotid interventional procedure, secondary medical review is required.

**(2)**

MRA is an application of MRI that produces images of blood vessels for noninvasive evaluation of the arterial as well as venous circulation. Unlike a conventional angiogram or CTA, MRA does not involve ionizing radiation or the administration of iodinated IV contrast which is nephrotoxic and can cause an allergic reaction in some patients. MRA is not usually performed in addition to an angiogram, but as a substitute for angiogram.

**(3)**

The following are examples of relative and absolute contraindications to the use of magnetic resonance imaging:

- Implanted devices that are electrically or magnetically activated (e.g., cardiac pacemakers, automatic cardioverter defibrillators, drug infusion pumps, cochlear implants)
- Ferromagnetic metal objects (e.g., cerebral aneurysm clips, intraocular metallic foreign body, prostheses, screws)
- Pregnancy, first trimester
- Renal insufficiency in cases when magnetic resonance imaging is performed with gadolinium-based contrast

**(4)**

Conventional invasive angiography to evaluate carotid disease (e.g., stenosis, ulcerative plaque) is largely being replaced by noninvasive imaging. These methods (e.g., carotid US, MRA, CTA) may be performed in combination or individually (Chappell et al., *Radiology* 2009; 251(2): 493-502; Hendrikse et al., *Cerebrovasc Dis* 2008; 25(5): 430-437). US is generally preferred for screening asymptomatic patients, as it is more cost effective and has been shown to be highly accurate (Jaff et al., *Vasc Med* 2008; 13(4): 281-292). US is the screening modality recommended by the American Society of Neuroimaging and the Society of Vascular and Interventional Neurology guidelines (Qureshi et al., *J Neuroimaging* 2007; 17(1): 19-47). A meta-analysis of published criteria for carotid US demonstrated sensitivity and specificity of 98% and 88%, respectively, for detecting 50% internal carotid artery stenosis and 94% and 90%, respectively, for detecting >70% stenosis (Jahromi et al., *J Vasc Surg* 2005; 41(6): 962-972).

**(5)**

When US is unable to determine the extent of carotid disease or the results are contradictory, MRA or CTA should be considered. MRA does not involve ionizing radiation but is prone to artifact that can affect imaging quality (Raghavan et al., *Top Magn Reson Imaging* 2008; 19(5): 241-249). CTA utilizes ionizing radiation but has better overall spatial resolution than MRA (Jaff et al., *Vasc Med* 2008; 13(4): 281-292).

**(6)**

Carotid artery stenosis is often found in patients during an evaluation of vague episodes of dizziness, generalized subjective weakness, syncope, blurry vision, transient visual abnormalities (e.g., floaters), or near syncopal episodes. These nonspecific symptoms are considered asymptomatic, even in the presence of high-grade carotid artery stenosis (Lanzino et al., *Mayo Clin Proc* 2009; 84(4): 362-387; quiz 367-368).

**(7)**

If preoperative carotid angiogram is planned, then a carotid CTA or MRA is not indicated.

**(8)**

These criteria support surgical or interventional evaluation for asymptomatic carotid stenosis of  $\geq 60\%$  based on the American Heart Association guidelines for carotid stenosis (Sacco et al., *Circulation* 2006; 113(10): e409-449).

**(9)-DEF:**

Transient ischemic attack (TIA) is defined as a transient episode of neurological dysfunction caused by focal brain, spinal cord, or retinal ischemia, without acute brain tissue infarction. Clinical symptoms generally last for less than one hour.

**(10)**

Virtually any transient focal neurologic symptom may reflect a TIA. Some of the more common presentations include weakness of an extremity, localized sensory disturbance, unilateral visual loss, and communication difficulty. Although the acute onset of cognitive dysfunction can occur with a TIA, it is uncommon for patients to present with transient memory loss or confusion without other neurologic symptoms.

**(11)**

The clinical course of symptoms and findings may be waxing and waning, evolving, or stable and complete.

**(12)**

Many patients with the acute onset of persistent CNS findings have had a stroke (LaMonte, Emerg Med Clin North Am 2008; 26(3): 703-713, viii; Adams et al., Stroke 2007; 38(5): 1655-1711). Symptoms may include sensory, motor, or language deficit, cognitive dysfunction, visual impairment, vertigo with headache or central nystagmus, or altered consciousness.

**(13)**

These criteria support surgical evaluation for symptomatic carotid stenosis of  $\geq 70\%$  based on the American Heart Association guidelines (Sacco et al., Circulation 2006; 113(10): e409-449).

**(14)**

Unstable or vulnerable carotid plaque is prone to local thrombosis and distal embolization which can lead to stroke. Ulcerative plaque seen on US may identify a subgroup of patients at high risk for stroke (Chalela, Cerebrovasc Dis 2009; 27 Suppl 1: 19-24; Kwee et al., Neurology 2008; 70(24 Pt 2): 2401-2409). Newer imaging modalities, as well as molecular markers, are being increasingly used to identify vulnerable plaque (Liapis et al., Eur J Vasc Endovasc Surg 2009; 37(4 Suppl): 1-19). In the Northern Manhattan population-based cohort study, carotid plaque with irregular surfaces increased the risk of ischemic stroke 3-fold (Prabhakaran et al., Stroke 2006; 37(11): 2696-2701).

**(15)**

Duplex US may indicate carotid occlusion when, in fact, the patient has a high-grade stenosis. For this reason, symptomatic patients with complete occlusion by duplex US warrant angiographic evaluation of the vessel (e.g., conventional angiogram, MRA, CTA). If the vessel is not completely occluded, the patient may benefit from carotid intervention (Thanvi and Robinson, Postgrad Med J 2007; 83(976): 95-99; Bartlett et al., AJNR Am J Neuroradiol 2006; 27(3): 632-637).