

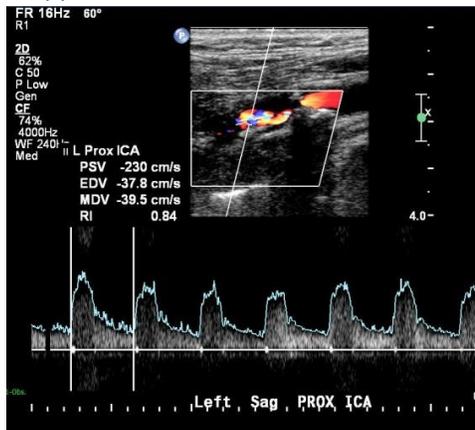
Case Study: Visible Carotid Plaque

Carotid sonography with Doppler analysis is frequently the first line screening examination used to evaluate carotid stenosis and or plaque in symptomatic and asymptomatic patients.¹ However, there are some pitfalls with sonography that can sometimes lead to inaccurate or incomplete results. Arterial wall calcification can cause ultrasound artifacts such as dense shadowing on the gray scale image and impact Doppler velocity, which limits the accuracy of the exam. This case study shows an instance where a significant portion of the plaque exists in a “drop out” zone on the gray scale images. There is clearly visible plaque shown in the Doppler view. The question is: to what extent? Ultrasound standard procedure did not indicated cause for an MRA, *Visualize:Vascular™* 3D Luminal Rendering did indicate that an MRA should be performed. MRA results did indicate that there was a very significant concern. Later the carotid endarterectomy results further confirmed that *Visualize* did correctly change the diagnostic decision from Moderate to Critical, thereby guiding the patient to the best treatment planning and outcome.

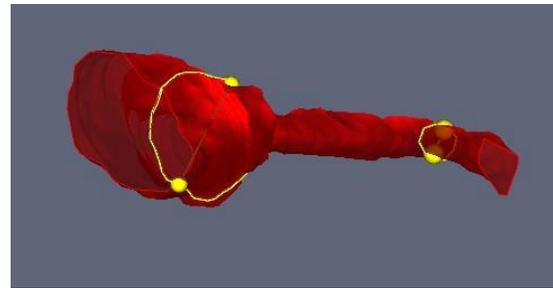
Summary:

	Carotid Duplex		<i>Visualize: Vascular™</i>	MRA	CEA
Left pICA	PSV/EDV	Stenosis	Stenosis	Stenosis	
Results	230/37	50-69%	85%	90%	85%
Category		Moderate	Critical	Occluded	Critical

Doppler:



Visualize 3D view within the shadowed area:



Patient History/Symptoms: 75 year old male with history of hypertension, occasional episodes of feeling faint or light headed. No history of vascular disease.

Carotid Duplex Exam: Carotid Duplex Exam (CDE) was prescribed. Doppler results are shown in Table 1. The left proximal internal carotid artery (pICA) displayed elevated peak systolic velocity (PSV), however, the region of highest diameter reduction was inhibited by the calcific shadow. The PSV is the most important spectral flow measurement as outlined in the North American Symptomatic Carotid Endarterectomy Trial (NASCET) criteria. The NASCET criteria places the relative comparison between velocities measured using Doppler ultrasound and stenosis. A pICA PSV <250 and EDV <130 is placed in the 50-69% stenosis category and PSV <150 and EDV <80 in the 1-49% stenosis category.² The same study

	Right ICA proximal	Left ICA proximal
PSV	93.6	230.0
EDV	29.5	37.8
MDV	28.9	39.5
RI	0.68	0.84
Stenosis	1-49%	50-69%

Table 1: Comparing Left pICA Results

Case Study: Visible Carotid Plaque

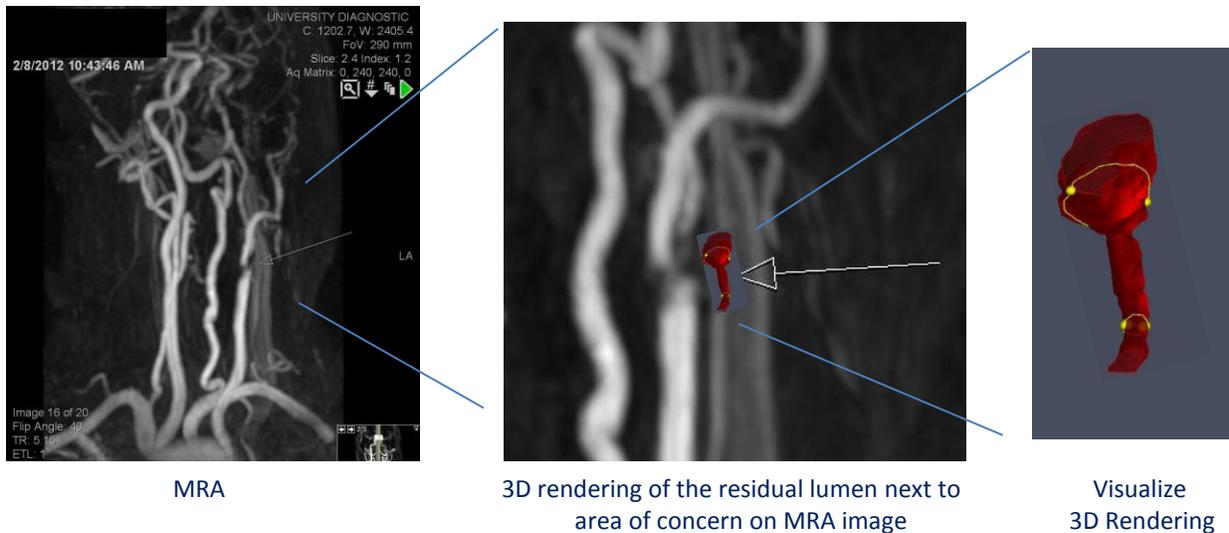
recommends that a patient with >70% stenosis is referred to angiography either using Computed Tomography (CTA) or Magnetic Resonance (MRA) for a more direct calculation of luminal reduction. The NACSET guideline is that stenosis measuring above 70% should be considered for a carotid endarterectomy (CEA). Many surgeons would argue that in an asymptomatic individual with stenosis in the high end of the 50-69% bracket “watchful waiting” is in order given the inherent risks of surgery.¹ The results of this CDE exam do not indicate that further imaging or a CEA were indicated.

Visualize:Vascular Exam: The 3D rendering procedure requires an additional scan and is a separate procedure from the CDE. Luminal reduction is calculated similar to the NASCET method. The results show a luminal reduction of >80% which is remarkably different than the CDE results.

	Right ICA proximal	Left ICA proximal
Visualize:Vascular™	24%	85%
MRA	Not significant	90%

Table 2: Concordance with MRA

MRA Exam: MRA confirmed the results demonstrated using *Visualize:Vascular* 3D Luminal Rendering.



CEA: A Carotid Endarterectomy (CEA) was performed on the patient. The pathology report confirms that the patient had heterogeneous plaque which significantly obstructed the pICA. The Stenosis was estimated in the 85 to 95% range.

CONCLUSION: This study evidences that *Visualize* 3D rendering is proven to be an effective procedure through its high correlation with angiographic imaging. The MRA from this case study above shows good concordance with the 3D luminal rendering from ultrasound. 3D rendering provides a complete perspective making luminal measurements possible on ultrasound images. 3D rendering gives a much more detailed image in the area where the obstruction is present. 3D luminal rendering as provided by *Visualize:Vascular* is a very useful secondary diagnostic procedure with vascular Duplex Ultrasound.

About the Case Study: The case study is from University Diagnostic Medical Imaging, P.C., New York, New York. The practice is owned and operated by radiologists who care about their patients and work collaboratively with doctors of many varied specialties to achieve the best outcome for all patients.

¹ Yao-Jen Chang, BA; Alexandra J. Golby, BS; Gregory W. Albers, MD, “Detection of Carotid Stenosis From NASCET Results to Clinical Practice” *Stroke*. 1995;26:1325-1328

² NASCET (North American Symptomatic Carotid Endarterectomy triad collaborators. Beneficial effect of carotid endarterectomy in symptomatic patients with high-grade carotid stenosis. *NEJM*1991; 325:445-4533