



# ASSESSMENT OF TRANSCRANIAL DOPPLER ULTRASONOGRAPHY

This is a summary of the AAN's guideline for the use of Transcranial Doppler Ultrasonography (TCD) and Transcranial Color-Coded Sonography (TCCS) for clinical diagnosis. This summary is based on a complete and critical analysis of the published studies to date. It is designed to be a clinical decision-making support tool.

Please refer to the full guideline for more information at: [www.aan.com/professionals/practice/index.cfm](http://www.aan.com/professionals/practice/index.cfm).

## TCD IS ABLE TO PROVIDE INFORMATION AND CLINICAL UTILITY IS ESTABLISHED

		Sensitivity (%)	Specificity (%)
Sickle Cell Disease	Screening of children aged 2-16 years with sickle cell disease for assessing stroke risk ( <b>Type* A, Class** I</b> ), although the optimal frequency of testing is unknown ( <b>Type U</b> ).	86	91
Angiographic Vasospasm	Detection and monitoring of angiographic vasospasm after spontaneous subarachnoid hemorrhage ( <b>Type A, Class I-II</b> ). More data are needed to show if its use affects clinical outcomes ( <b>Type U</b> ).  <ul style="list-style-type: none"> <li>• Intracranial ICA</li> <li>• MCA</li> <li>• ACA</li> <li>• VA</li> <li>• BA</li> <li>• PCA</li> </ul>	25-30	83-91
		39-94	70-100
		13-71	65-100
		44-100	82-88
		77-100	42-79
		48-60	78-87

## TCD IS ABLE TO PROVIDE INFORMATION BUT CLINICAL UTILITY COMPARED TO OTHER DIAGNOSTIC TOOLS REMAINS TO BE DETERMINED

		Sensitivity (%)	Specificity (%)
Intracranial Steno-Occlusive Disease	TCD is probably useful ( <b>Type B, Class II-III</b> ) for the evaluation of occlusive lesions of intracranial arteries in the basal cisterns (especially the ICA siphon and MCA). The relative value of TCD compared with MR Angiography or CT Angiography remains to be determined ( <b>Type U</b> ). Data are insufficient to recommend replacement of conventional angiography with TCD ( <b>Type U</b> ).  <ul style="list-style-type: none"> <li>• Anterior Circulation</li> <li>• Posterior Circulation Occlusion</li> <li>• MCA</li> <li>• ICA, VA, BA</li> </ul>	70-90	90-95
		50-80	80-96
		85-95	90-98
		55-81	96
Cerebral Circulatory Arrest (Adjunctive test in the Determination of Brain Death)	If needed, TCD can be used as a confirmatory test, in support of a clinical diagnosis of brain death ( <b>Type A, Class II</b> ).	91-100	97-100

## TCD IS ABLE TO PROVIDE INFORMATION BUT CLINICAL UTILITY REMAINS TO BE DETERMINED

		Sensitivity (%)	Specificity (%)
Cerebral Thrombolysis	TCD is probably useful for monitoring thrombolysis of acute MCA occlusions ( <b>Type B, Class II-III</b> ). More data are needed to assess the frequency of monitoring for clot dissolution and enhanced recanalization and to influence therapy ( <b>Type U</b> ).  <ul style="list-style-type: none"> <li>• Complete Occlusion</li> <li>• Partial Occlusion</li> <li>• Recanalization</li> </ul>	50	100
		100	76
		91	93
Cerebral Microembolism Detection	TCD monitoring is probably useful for the detection of cerebral microembolic signals in a variety of cardiovascular/cerebrovascular disorders/procedures ( <b>Type B, Class II-IV</b> ). Data do not support the use of this TCD technique for diagnosis or monitoring response to antithrombotic therapy in ischemic cerebrovascular disease ( <b>Type U</b> ).		

**TCD IS ABLE TO PROVIDE INFORMATION BUT CLINICAL UTILITY REMAINS TO BE DETERMINED (Continued)**

Carotid Endarterectomy (CEA)	TCD monitoring is probably useful to detect hemodynamic and embolic events that may result in perioperative stroke during and after CEA in settings where monitoring is felt to be necessary ( <b>Type B, Class II-III</b> ).
Coronary Artery Bypass Graft (CABG) Surgery	TCD monitoring is probably useful ( <b>Type B, Class II-III</b> ) during CABG for detection of cerebral microemboli. TCD is possibly useful to document changes in flow velocities and CO <sub>2</sub> reactivity during CABG surgery ( <b>Type C, Class III</b> ). Data are insufficient regarding the clinical impact of this information ( <b>Type U</b> ).
Vasomotor Reactivity Testing	TCD is probably useful ( <b>Type B, Class II-III</b> ) for the detection of impaired cerebral hemodynamics in patients with severe (>70%) asymptomatic extracranial ICA stenosis, symptomatic or asymptomatic extracranial ICA occlusion and cerebral small-artery disease. Whether these techniques should be used to influence therapy and improve patient outcomes remains to be determined ( <b>Type U</b> ).
Vasospasm (VSP) after Traumatic Subarachnoid Hemorrhage (SAH)	TCD is probably useful for the detection of VSP following traumatic SAH ( <b>Type B, Class III</b> ), but data are needed to show its accuracy and clinical impact in this setting ( <b>Type U</b> ).
TCCS	TCCS is possibly useful ( <b>Type C, Class III</b> ) for the evaluation and monitoring of space-occupying ischemic MCA infarctions. More data are needed to show if it has value vs. CT and MRI scanning and if its use affects clinical outcomes ( <b>Type U</b> ).

**TCD IS ABLE TO PROVIDE INFORMATION BUT OTHER DIAGNOSTIC TESTS ARE TYPICALLY PREFERABLE**

		Sensitivity (%)	Specificity (%)
Right-to-Left Cardiac Shunts	While TCD is useful for detection of right-to-left cardiac and extracardiac shunts ( <b>Type A, Class II</b> ), transesophageal eschocardiography (TEE) is superior, as it can provide direct information regarding the anatomic site and nature of the shunt.	70-100	>95
Extracranial ICA Stenosis	TCD is possibly useful for the evaluation of severe extracranial ICA stenosis or occlusion ( <b>Type C, Class II-III</b> ), but, in general, carotid duplex and MR Angiography are the diagnostic tests of choice. <ul style="list-style-type: none"> <li>• Single TCD variable</li> <li>• TCD Battery</li> <li>• TCD Battery and Carotid Duplex</li> </ul>	3-78	60-100
		49-95	42-100
		89	100
Contrast-Enhanced TCCS	(CE)-TCCS may provide information in patients with ischemic cerebrovascular disease and aneurysmal SAH ( <b>Type B, Class II-IV</b> ). Its clinical utility vs. CT scanning, conventional angiography, or non-imaging TCD is unclear ( <b>Type U</b> ).		

\*"Type" refers to the strength of the practice recommendation based on the reviewed literature. **Type A:** Established as useful/ predictive or not useful/ predictive for the given condition in the specified population.; **Type B:** Probably useful/ predictive or not useful/ predictive for the given condition in the specified populations; **Type C:** possibly useful/ predictive or not useful/ predictive for the given condition in the specified population; **Type U:** Data inadequate or conflicting. Given current knowledge, test/predictor unproven. **\*\*"Class"** refers to the quality of research methods employed in the reviewed literature. **Class I:** Evidence provided by prospective study in broad spectrum of persons with suspected condition, using a "gold standard" to define cases, where test is applied in blinded evaluation, and enabling assessment of appropriate tests of diagnostic accuracy; **Class II:** Evidence provided by prospective study in narrow spectrum of persons with suspected condition or well designed retrospective study of broad spectrum of persons with suspected condition (by "gold standard") compared to broad spectrum of controls where test is applied in blinded evaluation and enabling assessment of appropriate tests of diagnostic accuracy; **Class III:** Evidence provided by retrospective study where either persons with established condition or controls are of narrow spectrum, and where test is applied in blinded evaluation; **Class IV:** Any design where test is not applied in blinded fashion OR evidence provided by expert opinion or descriptive case series.

This is an educational service of the American Academy of Neurology. It is designed to provide members with evidence-based guideline recommendations to assist with decision-making in patient care. It is based on an assessment of current scientific and clinical information, and is not intended to exclude any reasonable alternative methodologies. The AAN recognizes that specific patient care decisions are the prerogative of the patient and the physician caring for the patient, based on the circumstances involved. Physicians are encouraged to carefully review the full AAN guidelines so they understand all recommendations associated with care of these patients.

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1080 Montreal Avenue • St. Paul, MN 55116  
[www.aan.com](http://www.aan.com) • [www.thebrainmatters.org](http://www.thebrainmatters.org)  
 (651) 695-1940