

DIAGNOSIS OF INTRACRANIAL ARTERY STENOSIS BY TRANSCRANIAL COLOR-CODED SONOGRAPHY

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SUMMARY: Transcranial Doppler (TCD) scenography has been widely used as a diagnostic tool for intracranial hemodynamic alterations and in the last decade transcranial color-coded realtime sonography (TCCS) have been added to conventional TCD sonography in order to improve diagnostic yield. TCCS can reliably assess the 50% and <50% basal artery narrowing, and has proved useful for noninvasive management of patients with symptomatic intracranial stenoses.

Key words: Cerebral arterial diseases, ultrasonography; Cerebral arteries, ultrasonography; Ultrasonography, Doppler transcranial

Since initial demonstration of Doppler signals from the arteries at the skull base by Aaslid et al. in 1982¹, transcranial Doppler (TCD) sonography has been widely used as a diagnostic tool for intracranial hemodynamic alterations. In 1990, Bogdahn et al.² were among the first to use a new method, transcranial color-coded real-time sonography (TCCS). In this method, real-time B-mode imaging and color coding of Doppler signal have been added to conventional TCD sonography.

The advantages of the new method include greater confidence in intracranial vessel identification and measurement of the angle of insonation for determination of flow velocities that are closer to the true values than those obtained by TCD. In addition, rapid advances are being made in the field of new ultrasound contrast agents and ultrasound techniques such as harmonic imaging.

In contrast to the guidelines for quantification of carotid stenoses⁴ and detection of microembolism⁵, there is a lack of guidelines for quantification of intracranial artery stenosis by TCCS. In 1999, Baumgartner et al.⁶ reviewed TCCS, extracranial color-coded duplex sono-

graphy and intra-arterial digital subtraction angiography of 310 patients. These data have shown that TCCS can reliably assess the 50% and <50% basal artery narrowing, and has proved useful for noninvasive management of patients with symptomatic intracranial stenoses. With angiography as a reference standard, Baumgartner et al.⁶ calculated the peak systolic velocity (PSV) cutoffs shown in Table 1. These PSV cutoffs are useful for diagnosing intracranial artery stenoses by TCCS, however, the criteria require prospective testing and consensus recommendations would be welcome.

In case of suspicion of an intracranial artery stenosis, the presence of low-frequency, high-intensity Doppler signals should be evaluated as shown in Fig. 1. An angle

Table 1. Peak systolic velocity cutoffs in intracranial arteries with $\geq 50\%$ and $< 50\%$ stenoses⁶

	Intracranial stenosis	
	$\geq 50\%$	$< 50\%$
Anterior cerebral artery	≥ 155	< 120
Middle cerebral artery	≥ 220	< 155
Posterior cerebral artery	≥ 145	< 100
Basilar artery	≥ 140	< 100
Vertebral artery	≥ 120	< 90

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correction should only be performed when the Doppler sample volume can be located within a straight vessel segment of >20 mm in length⁷.

In conclusion, Baumgartner et al.⁶ have elaborated TCCS criteria for detecting $\geq 50\%$ and $< 50\%$ intracranial stenoses. In addition, consensus recommendations for the quantification of these stenoses would be very useful.

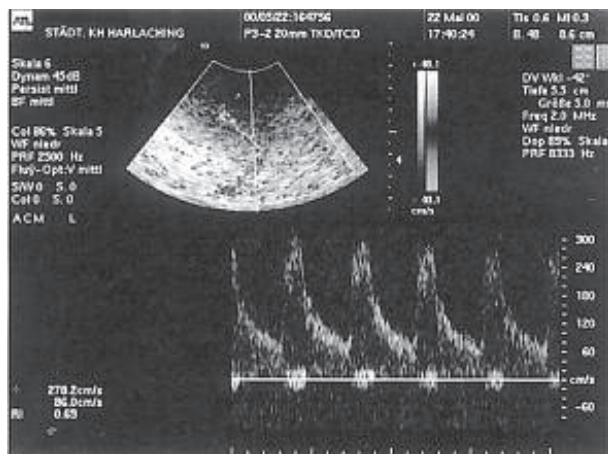


Fig. 1. A 76-year-old patient with a symptomatic middle cerebral artery stenosis with low-frequency high-intensity signals.

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SAŽETAK

DIJAGNOSTIKA STENOZA INTRAKRANIJSKIH ARTERIJA PRIMJENOM TRANSKRANIJSKOG BOJOM KODIRANOG ULTRAZVUKA

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Transkranijski dopler (TCD) upotrebljava se kao dijagnostička metoda za intrakranijske hemodinamske poremećaje, a u zadnjem desetljeću uvođenje transkranijskog bojom kodiranog ultrazvuka (*transcranial color-coded sonography* – TCCS) doprinjelo je poboljšanju dijagnostike. Primjenom TCCS-a moguće je procijeniti suženje arterija na bazi mozga što se pokazalo kao vrijedna neinvazivna metoda kod stenoza intrakranijskih arterija.

Ključne riječi: *Cerebrovaskularna bolest, ultrazvuk; Moždane arterije, ultrazvuk; Ultrazvuk, Transkranijski dopler*