Intravenous recombinant tissue plasminogen activator (rtPA) is thought to benefit patients with acute ischemic stroke by producing early reperfusion. Transcranial Doppler (TCD) is a noninvasive method that can monitor the recanalization process in real time when occlusion occurs in the proximal intracranial vessels.

We present our findings during rtPA infusion in a 56-year-old man with acute ischemic stroke to illustrate the time course of changes that occur in a middle cerebral artery (MCA) stem occlusion treated by intravenous thrombolysis. We used a 2-MHz portable unit (Multigon 500 mol/L) with a pulse-wave transducer mounted on a head frame (Marc 500, Spencer Technologies) to insonate the MCA at a constant angle through the temporal bone. At the initiation of rtPA treatment, only minimal antegrade flow was visualized (Figure, frame 1), indicating MCA main-stem near-occlusion. The MCA flow signals started to improve 30 minutes later (frames 2 and 3). Microembolic signals were heard as chirping sounds with unidirectional appearance on screen (white arrow, frame 2), consistent with the beginning of clot breakdown and washout. A brief period of a stenotic signal was seen (frame 4), representing early partial recanalization. This was rapidly followed by the appearance of a hyperemic low-resistance flow (frames 5 and 6), indicating complete reperfusion of the MCA stem. Thus, a complete recanalization was achieved within 36 minutes of initiation of rtPA infusion. Once the residual blood flow signals around the clot started to improve, only a few additional minutes were necessary to achieve complete recanalization.

This case demonstrates rapid recanalization of a presumed embolic clot occluding the MCA stem. TCD can detect residual blood flow around the clot, which may play a role in the process of intracranial clot dissolution similar to myocardial infarction. TCD can noninvasively monitor recanalization and has a potential to identify patients who may not require additional thrombolysis or other clot disruption therapies.

References
TCD recordings were obtained via transtemporal approach at a depth of 53 mm with an 11.8-mm gate of insonation. Graphic below spectra frames shows presumed clot location in MCA main stem. Frame 1, Minimal flow signal in proximal MCA at time of IV rtPA bolus (13:02). After 30 minutes of continuous IV rtPA infusion: frames 2 and 3, early restoration of flow signals with increasing frequencies and microembolic signals (arrow); frame 4, turbulent stenotic signal with audible chirping components, suggesting clot dissolution; frame 5, hyperemic flow with velocities elevated above age-expected values and relatively low pulsatility (Gosling pulsatility index 0.73), indicating distal vasodilation; frame 6, hyperemic flow with velocities elevated above age-expected values and normal pulsatility (Gosling pulsatility index 0.93), showing proximal MCA reperfusion with distal vasomotor response.
Evolution of Rapid Middle Cerebral Artery Recanalization During Intravenous Thrombolysis for Acute Ischemic Stroke
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Circulation. 1999;100:2282-2283
doi: 10.1161/01.CIR.100.22.2282

Circulation is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
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Print ISSN: 0009-7322. Online ISSN: 1524-4539

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://circ.ahajournals.org/content/100/22/2282

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