

■ Sonothrombolysis

Eggers et al. studied patients with acute middle cerebral artery occlusion and contraindications for thrombolytic therapy. Transcranial ultrasound accelerated arterial recanalization even without use of a thrombolytic drug.

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■ Therapeutic effects of ultrasound

Commentary by Charles Francis, MD

Ultrasound is expanding from diagnostic to therapeutic applications. Sound consists of pressure waves that exert bioeffects through several mechanisms. For example, it promotes local fluid motion (microstreaming), which can alter drug transport. Heating results from tissue absorption of ultrasound, and it can also induce cavitation, which refers to the local action of small gas bodies that oscillate or implode with local release of high energy. Therapeutic effects of ultrasound are widely used in physical therapy; it is also used in lithotripsy in which focused high intensity ultrasound is used to disrupt renal calculi. High intensity focused ultrasound is being investigated in cancer treatment and as a way to stop bleeding from severed vessels on the battlefield. Preclinical studies indicate that ultrasound can regulate drug delivery and improve cell transfection.

Small clinical trials have demonstrated the value of ultrasound in treating thrombotic disease. Specially designed ultrasound

catheters operating at high power can be guided to the site of arterial obstruction to mechanically fragment thrombus. Low intensity ultrasound can accelerate fibrinolysis, and a recent clinical study demonstrated its potential as a therapeutic adjunct to fibrinolytic therapy in patients with stroke.¹ Mechanistically, ultrasound acts through altering fibrin structure and by improving transport of fibrinolytic drugs into the clot. Also, recent studies demonstrate that low intensity ultrasound stimulates vasodilation in ischemic tissue through a nitric oxide dependent mechanism, independent of thrombolysis.²

The Eggers et al. report in this issue of *Neurology* suggests that prolonged insonation of an acutely occluded middle cerebral artery improves reperfusion and outcome. The unique aspect of the study is that no thrombolytic agent was used. Also remarkable was the use of a standard high frequency, low intensity transducer that would deliver very low intensity ultrasound to the site of

thrombosis when applied through the temporal bone.

The results will need to be confirmed in larger studies; Eggers et al. also raise several questions. Would other ultrasound frequencies or intensities be more effective? Could the addition of micro-bubble ultrasound contrast agents, which can augment cavitation, improve the results? Would the addition of potent antiplatelet or anticoagulant therapy be beneficial? Is the effect due to the enhancement of local fibrinolysis or to nitric oxide dependent vasodilation? Evidence is building that therapeutic ultrasound may offer new modality for stroke treatment.

References

1. Alexandrov AV, Molina CA, Grotta JC, et al. Ultrasound-enhanced systemic thrombolysis for acute ischemic stroke. *N Engl J Med* 2004;351:2170–2178.
2. Suchkova VN, Baggs RB, Sahni SK, Francis CW. Ultrasound improves tissue perfusion in ischemic tissue through a nitric oxide dependent mechanism. *Thromb Haemost* 2002; 88:865–870.

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