REPETITIVE TRANSCRANIAL MAGNETIC STIMULATION AND PHYSICAL THERAPY

Promoting hand recovery in adults after a stroke
Repetitive transcranial magnetic stimulation (rTMS), combined with hand therapy, is currently a research-based treatment intended to help people with stroke achieve greater recovery of hand function. The hand weakness following stroke stems not only from brain neurons destroyed by the stroke but also from surviving neurons that become dormant through inactivity and suppression from the non-stroke hemisphere. In some patients, rTMS can help remaining dormant neurons to become excitable once again and thereby improve voluntary hand function.

Unlike deep brain stimulation, rTMS is noninvasive and does not involve surgery. Patients receive painless magnetic pulses to the head through a device held by the clinician and, soon after, perform hand exercises while the effects of the rTMS are active. Although the magnetic energy can be applied to produce involuntary muscle contractions, rTMS uses repeated, low-intensity magnetic pulses to change brain synapses so that people can more easily produce muscle contractions on their own.

How to refer patients
We require that patients have a physician's referral for rTMS. This referral can come from the family physician, neurologist or psychiatrist. Patients without a physician can also receive a referral from a University of Minnesota Health physician. Medical records pertaining to the stroke will also be needed. Our call-in coordinator can assist with referrals and medical records.

Cost
Medicare and insurance companies do not yet cover rTMS for stroke recovery. Generally, our approach is to give 10 treatments. The cost is $280 for the first day and payment is due at the beginning of the first day. The cost of the remaining 9 treatments is $235 per day (total = $2,115) and payment for this series is due at the beginning of the second day.

Clinic location
Physical Medicine and Rehabilitation Clinic
University of Minnesota Health Clinics and Surgery Center
909 Fulton St. SE
Minneapolis, MN 55454
612-672-7000 for referrals
612-626-6688 for appointments

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Two therapeutic approaches
The rTMS can be given at a low rate to the non-stroke hemisphere to block suppressive signals from that hemisphere that go across the brain and hinder excitability of neurons in the stroke hemisphere. Alternatively, rTMS can be given at a slightly higher rate to the stroke hemisphere and produce a facilitating effect of that hemisphere. In both approaches, the goal is to improve the excitability, i.e. the ease of activating neurons voluntarily, in the stroke hemisphere.

To help the effects last longer it is important for people to use their weak hand in challenging tasks immediately after the rTMS. For this, we will use a variety of exercises, including a computer program where patients will move their hand to guide movements in a virtual hand shown on the computer screen. A variety of tasks can be created, like picking petals from a flower or stacking blocks. To make the effects permanent, individuals are urged to use their stroke hand ambitiously in all daily activities.

How does rTMS feel?
During the 10 to 20 minutes of rTMS, individuals will feel a light tapping sensation on the scalp. Also, the rTMS involves a clicking sound, which we diminish with earplugs. After the treatment, most people report no problems. Some people report a tiredness after the first treatment but not subsequent treatments. Some have reported feeling a vague lightheadedness for a few minutes. Rarely, a few people have reported a mild short-lasting headache. Individuals are free to resume their normal activities after leaving the clinic, including driving a car.

Risks
The most important risk with rTMS is a seizure. The occurrence is quite rare and we use protocols that minimize this risk. Other risks reported in the literature across a wide variety of patient conditions include headache, hearing loss, impaired concentration, and mood change.

Participation criteria
In order to promote the best possible outcomes, patients should meet the following criteria:

- Individuals should have at least a little voluntary motion in the stroke hand. Individuals can decide to participate even if they do not have any motion, but the chances of a beneficial outcome are much reduced.

- Individuals should have a muscle response when a single magnetic pulse is applied to the stroke hemisphere. Individuals can decide to participate even if they do not have such a response but the chances of a beneficial outcome are much reduced.

- No seizure within the past two years.

- No major psychiatric disorder.

- No metal in head, except dental metal.

- No pacemakers or other in-dwelling medical devices.

- Individuals should not be pregnant.

- Individuals should have a referral from a physician.

Visit mhealth.org/rTMS for more information.