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Transcranial Magnetic Stimulation An Alternative Treatment for Depression

Transcranial magnetic stimulation (TMS), a noninvasive treatment for depression, provides an alternative treatment for patients who have tried and failed at least 1 antidepressant medication trial. TMS is much less invasive than electroconvulsive therapy (ECT). Unlike patients receiving ECT, TMS patients are awake and alert and do not require anesthesia. Also, patients do not have negative cognitive side effects with TMS treatment.

TMS has been clinically available in Canada and other countries prior to the US Food and Drug Administration (FDA) approval for clinical use in October 2008.

"TMS is a new treatment option for moderately treatment-resistant depressed patients or patients who are intolerant of antidepressant medications," says Shirlene Sampson, MD, a psychiatrist at Mayo Clinic in Rochester, Minnesota.

How TMS Works

TMS uses magnetic fields to stimulate nerve cells to change areas of the brain involved in depression. An electromagnetic coil is placed against the scalp, generally over the dorso-lateral prefrontal

cortex (Figure), and the magnetic field passes undiminished into the underlying cortex to stimulate neurons.

When TMS is effective, symptoms may improve for days or weeks or they may subside completely. Preliminary data suggest that TMS may be less effective for people who are elderly or have psychotic depression.

A common side effect is discomfort at the treatment site during TMS stimulation, as the magnetic field can stimulate nerves under the scalp at the site of stimulation and produce muscle contractions. Some patients also report headaches, light-headedness, or facial twitches during treatment. In rare cases, patients have reported seizures, so individuals at risk for seizures are generally excluded from receiving TMS. The sound of the TMS pulse may shift hearing thresholds. However, this does not occur when earplugs are used.

Success Defined

Simon Kung, MD, a psychiatrist at Mayo Clinic in Rochester, says Mayo Clinic specialists track patient improvement with depression questionnaires administered at the beginning and end of the 6-week treatment period and every 2 weeks during treatment. TMS is generally provided daily, Monday through Friday, for 6 weeks, although some patients may need longer treatment courses. Patients are also monitored daily by physicians and/or nurses who ask detailed questions.

"Although a greater than 50% improvement is considered successful, we aim for remission of depression when possible," says Dr Sampson. Patients are encouraged to continue treatment with their referring health care provider after TMS.

TMS is a newly emerging treatment option. It is in the process of being reviewed by insurance companies for remuneration. At present,

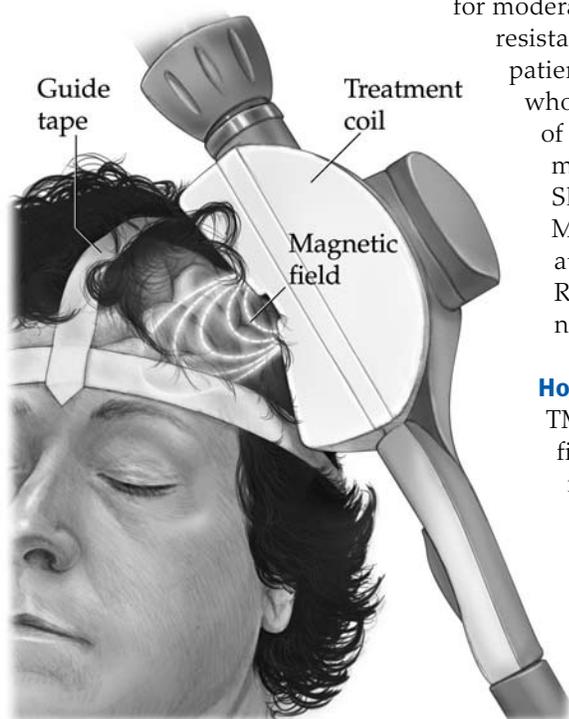


Figure. The TMS treatment coil produces a magnetic field that passes easily through hair, scalp, and skull to stimulate the brain.

coverage of TMS is considered on a case-by-case basis. Few insurance companies currently cover TMS treatments.

Clinical Trials

Mayo Clinic has conducted studies involving TMS for nearly 10 years and participated in the large multicenter trial that collected findings used to gain FDA approval for TMS.

Areas of focus for TMS research at Mayo Clinic include chronic pain and treatment-resistant depression in adolescents. Future studies are being designed to help understand how TMS may be used to improve chronic pain.

During studies of TMS treatment for depression, adult patients and adolescents who also experience chronic pain have shown improvement in their pain. “We know that the neural pathways for pain and depression



Simon Kung, MD, Christopher A. Wall, MD, Donald E. McAlpine, MD, and Shirlene Sampson, MD

overlap. We hope that future TMS research will help us better understand the pathophysiology of chronic pain,” says Dr Sampson.

Pediatric Pain Rehabilitation Program Restores Functionality Treatment Helps Families Resume Normal Activities

An innovative pediatric pain rehabilitation program at Mayo Clinic in Rochester, Minnesota, provides treatment for adolescents with chronic pain. This 3-week, hospital-based outpatient program works to restore the child’s ability to function, despite persistent pain and symptoms often associated with chronic pain such as nausea, fatigue, and dizziness. The program also teaches family members coping skills and shows parents

how to support the child’s return to normal activities and move out of the sick role.

Studies indicate 15% to 20% of children and adolescents experience chronic pain. Up to 5% can be so debilitated by pain that they are unable to attend school, maintain social relationships, or participate in daily exercise or activities.

Children and adolescents with chronic pain benefit from rehabilitation programs that achieve important functional outcomes (see sidebar on page 3). Unlike adult programs, however, successful pediatric pain management programs require parental involvement.

Table. Pretreatment to Posttreatment Reduction in Medications in 47 Patients

Medication	On Medication at	
	Admission	Dismissal
Opioids	25.5%	4.3%
Sedative hypnotics	17.0%	4.3%
Muscle relaxants	14.9%	2.1%
Benzodiazepines	10.6%	4.3%

Clinically Effective and Cost-effective

Medical care for children with chronic pain is often interventional or pharmacologic, focusing on pain management medications (Table). It often does not address coping, and it may not acknowledge the impact a child with chronic pain has on family life. “Our data suggest that an interdisciplinary pain rehabilitation approach with considerable family involvement is both clinically effective

Patient and Parent Satisfaction

- 82% of teens said they agreed or strongly agreed with the statement “The pain rehabilitation program has been beneficial in helping me to learn how I can live well in spite of chronic pain.”
- 82% of teens said they agreed or strongly agreed with the statement “I feel my quality of life has improved using the tools I have learned and practiced in the pain rehabilitation program.”
- 76% of teens said they agreed or strongly agreed with the statement “I feel better prepared to plan for and handle ‘difficult pain days.’ ”
- 79% of parents said they would definitely recommend the pain rehabilitation program to family members or friends with chronic pain.

and cost-effective,” says Tracy E. Harrison, MD, a pediatric anesthesiologist and medical director of the pediatric pain rehabilitation program at Mayo Clinic.

Programs that focus on pediatric rehabilitation are few, despite extensive literature on the effectiveness of comprehensive pain rehabilitation in adults. “This program is designed to address children’s particular barriers and to allow them to do so along with their peers, who experience some of the same difficulties. We continually evaluate how the program affects each patient,” says Dr Harrison.

Each patient is seen by members of the

interdisciplinary treatment team, including child psychologists, pediatric anesthesiologists, advanced-practice nurses, physical therapists, occupational therapists, recreational therapists, biofeedback therapists, and other specialists, who then collaborate to determine their recommendations. “We let children and parents know that many tools are available to them to help manage pain, even if medications have not been effective. And if medications aren’t effective, we may consider discontinuation to minimize side effects,” says Dr Harrison.

Life with a child who is experiencing chronic pain often spirals into serious family stress. “As the child withdraws from normal routines, the focus of both parents and siblings becomes the affected child. Home schooling is common,” says Dr Harrison. “Often the child and parents begin a seemingly endless series of visits to new doctors, seeking a cure for the pain.”

Getting Children Back to School

Participants attend the program every day, 8 AM to 5 PM, Monday through Friday, for 3 weeks. Parents are in classes approximately 20 hours a week as well. “Our No. 1 goal is to get children back to school full-time. If they can attend school, everything else starts to fall into place,” says Barbara K. Bruce, PhD, LP, a psychologist and clinical director of the pain rehabilitation program. Sessions in the 3-week program focus on physical reconditioning, relaxation training and biofeedback, stress management, pain management training, such as activity moderation and the elimination of pain behaviors, and occupational therapy and recreational therapy for school, leisure, and home activities.



Tracy E. Harrison, MD



Barbara K. Bruce, PhD, LP

Behavioral Medicine Clinic Solves Conundrums

Mayo Clinic's Department of Psychiatry and Psychology developed its Behavioral Medicine Program to address the needs of people affected by physical symptoms that are not easily explained or understood. The program also benefits patients with medical conditions who also have depression, anxiety, or other psychological problems that complicate medical treatment outcomes.

Jeffrey P. Staab, MD, a Mayo Clinic psychiatrist, wishes to dispel the negative connotations associated with his area of expertise and to help patients understand that treatment is available. "Behavioral medicine focuses on the problems that lie at the interface of medicine, surgery, and behavior," says Dr. Staab. "The idea of a body-brain disconnect is a misperception. We want to treat the baffling cases, the medical and behavioral conundrums, in patients who don't have an explanation for their physical symptoms."



Jeffrey P. Staab, MD

Teamwork Drives Success

Initiated in 2007 as the Psychiatry and Psychology Assessment Service and renamed in 2009, the Behavioral Medicine Clinic explores medical, behavioral, family, and lifestyle elements and their impact on the patient and his or her medical problem. Patients entering Mayo's Behavioral Medicine Program often have seen several doctors and are still looking for answers. "The real benefit Mayo Clinic offers is the opportunity to be examined by various specialists who then work together to evaluate their findings," says Dr. Staab.

An example of a patient seen in this program is one with stubborn dizziness. Patients with dizziness generally see several specialists during the same visit at Mayo Clinic. Within the Behavioral Medicine Program, psychologists, psychiatrists, psychiatric nurses, and therapists apply their expertise to an array of clinical problems. Medical and surgical specialists are also available when needed. Using all available history and results, these specialists, working as a team, reach consensus regarding their findings, report to the patient's referring physician, and recommend

interventions.

"The team approach ensures that many minds contribute to the determination of what's really happening. As a result, patient satisfaction is high, as shown in the accompanying Figure," says James R. Rundell, MD, a Mayo Clinic psychiatrist. "Treatment becomes more consistent from patient to patient as the team identifies approaches that work well and modifies or discontinues ineffective practices."

Dr. Rundell notes that the program provides patients with an understanding of why they have what they have, which allows them to reduce the impact of their illness. Treatment is considered a success if there are reductions in psychological morbidity, reduced health care expenses, and improved quality of life.

A Sample of What's Possible

A patient with a 6-year history of persistent dizziness and imbalance following an inner ear infection was referred to the program. She had received diagnoses ranging from multiple sclerosis to Meniere disease in the 3 years

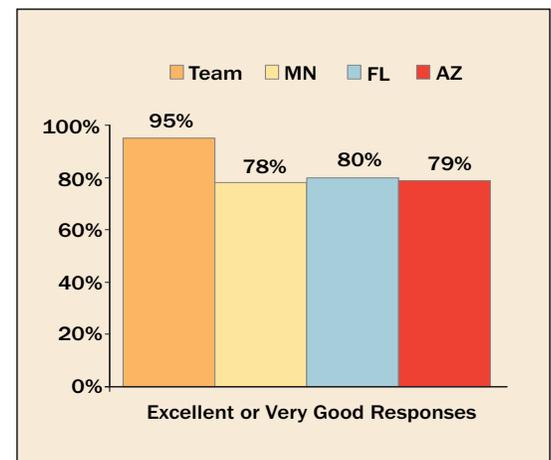


Figure. Combined patient satisfaction ratings. A June 2008 study, "Team Mental Health Integrative and Collaborative Care Model," was conducted at all 3 Mayo Clinic sites (Rochester, Minnesota, Jacksonville, Florida, and Scottsdale/Phoenix, Arizona). The results indicated that the team consultation approach (evaluation by all appropriate specialists who then reach consensus and make recommendations) results in greater patient satisfaction than the traditional, single psychiatrist or psychologist consultation. The majority of patients who responded rated the care they received to be excellent or very good at each site, and the team approach received the highest overall percentage of excellent or very good ratings.



James R. Rundell, MD

before coming to Mayo Clinic. Assuming herself disabled, she quit her job and was using a wheelchair.

A review of existing records plus detailed balance tests, neurologic and psychiatric examinations, and physiotherapy evaluations resulted in medical-psychiatric explanation: The vestibular neuritis was the initial trigger, but then the patient developed a high level of vigilance about her balance, and the resulting anxiety caused the dizziness to worsen.

Giving the patient full understanding of her situation by knitting together the medical and behavioral factors involved—and prov-

ing to her that she could trust her balance—resulted in successful treatment. The patient's dizziness was neither entirely medical nor fully psychiatric. Only the combination made sense.

Follow-up Options

Mayo Clinic specialists work with the patient's physician to determine the most appropriate approach to follow-up care. Normally, the patient returns to the referring physician for follow-up, and Mayo provides consultation as requested. Some patients are best served if their physician provides daily management of their Mayo-recommended treatment plan and Mayo recommendations can be incorporated into routine health care. Some patients do not need follow-up treatment. A few require ongoing care at Mayo.

Recognition

NARSAD Recipients of 2009 Young Investigator Grants for Research on Psychiatric Disorders

Susannah J Tye, PhD:

Mechanism of Action of Deep Brain Stimulation in Neuropsychiatric Conditions:
Neural Circuitry, Neurotransmission and Synaptic Plasticity

Heidi A Edmonson, PhD:

Lithium Magnetic Resonance Brain Imaging for Bipolar Disorder

After reviewing more than 800 proposals from researchers worldwide who are studying the causes, disease mechanisms, treatment, and prevention of mental illnesses, NARSAD has selected 201 researchers to receive its 2009 Young Investigator awards. These early-career scientists, based at universities and medical centers in the United States and 10 other countries, each receive \$30,000 annually in support of 1 or 2 years of research.

NARSAD's Young Investigator program plays a seminal role in attracting talented scientists to the field of neuropsychiatric research and in helping launch their research programs. Young Investigator grants allow early-career researchers, typically assistant professors or postdoctoral fellows, to gather the pilot data necessary to secure additional research funding from government agencies such as the National Institutes of Health and other, private funding sources.



Research Highlights

Recent Mayo Clinic Psychiatry and Psychology Research Publications

Assessment of genotype imputation methods

Biernacka JM, Tang R, Li J, McDonnell SK, Rabe KG, Sinnwell JP, Rider DN, de Andrade M, Goode EL, Fridley BL. *BMC Proceedings* 2009, in press.

Sequence variations of the human MPDZ gene and association with alcoholism in subjects with European ancestry

Karpyak VM, Kim J-H, Biernacka JM, Wieben ED, Mrazek DA, Black JL, Choi D-S. *Alcohol Clin Exp Res* 2009;33:712-21.

Serotonin transporter gene status and ECT outcomes

Rasmussen KG, Black JL. *J Clin Psychiatry* 2009;70:92-4.

Depressive relapse during lithium treatment associated with increased serum thyroid-stimulating hormone: results from two placebo-controlled bipolar I maintenance studies

Frye MA, Yatham L, Ketter TA, Goldberg J, Suppes T, Calabrese JR, Bowden CL, Bourne E, Bahn RS, Adams B. *Acta Psychiatr Scand* 2009;120:10-3.

RM.SLC6A4 variation and citalopram response

Mrazek DA, Rush AJ, Biernacka JM, O'Kane DJ, Cunningham JM, Wieben ED, Schaid DJ, Drews MS, Courson VL, Snyder KA, Black JL 3rd, Weinshilboum RM. *Am J Med Genet B Neuropsychiatr Genet* 2009;1570B:341-51.

Correlates of treatment-emergent mania associated with antidepressant treatment in bipolar depression

Frye MA, Helleman G, McElroy SL, Altshuler LL, Black DO, Keck PE Jr, Nolen WA, Kupka R, Leverich GS, Grunze H, Mintz J, Post RM, Suppes T. *Am J Psychiatry* 2009;166:164-72.

Differentiating suicide from life-ending acts in end-of-life decision: a model based on chronic kidney disease and dialysis

Bostwick JM, Cohen LM. *Psychosomatics* 2009;50:1-7.

Serotonin transporter gene status and electroconvulsive therapy outcomes: a retrospective analysis of 83 patients

Rasmussen KG, Black JL. *J Clin Psychiatry* 2009;70:92-4.

Sham electroconvulsive therapy studies in depressive illness: a review of the literature and consideration of the placebo phenomenon in electroconvulsive therapy practice

Rasmussen KG. *J ECT* 2009;25:54-9.

The effects of smoking status on opioid tapering among patients with chronic pain

Hooten WM, Townsend CO, Bruce BK, Warner DO. *Anesth Analg* 2009;108:308-15.



Age, family history, and memory and future risk for cognitive impairment

Locke DE, Ivnik RJ, Cha RH, Knopman DS, Tangalos EG, Boeve BF, Petersen RC, Smith GE. *J Clin Exp Neuropsychol* 2009;31:111-6.

Representative Mayo Clinic Presentations at the 2009 American Psychiatry Association Annual Meeting

Specialty Care Costs Higher for Patients With Bipolar Disorder Than Diabetes and Other Chronic Diseases

Mayo Clinic researchers have found that bipolar disorder (BPD) is a more costly chronic condition than diabetes, depression, asthma, and coronary heart disease, based on a review of health care claim costs. Specialty care costs (the costs of seeing any specialist and all tests ordered) were especially higher for bipolar patients.

A data review of health care claims, over a 4-year period, showed patients with BPD had significantly higher total per-member, per-month costs when compared with the other groups. Only patients with both coronary heart disease and diabetes had higher costs than patients with BPD. Total costs, specialty care visits, specialty care costs, outpatient psychiatric costs, and outpatient psychiatric visits were compared.

The next steps to improve the care of patients with BPD are to look into details of utilization (the types of care these patients are receiving), look for ways to associate costs with outcomes, and translate into practice the effective models of care for BPD already identified in the literature.

Mayo Clinic Researchers Examine the Psychological Impact of Child Abuse

According to a new Mayo Clinic study, a history of child abuse significantly impacts the wide range of challenges facing depressed inpatients. Included are an increase in suicide attempts, prevalence of substance use disorder, and a higher incidence rate of personality disorder. Additionally, these patients had an earlier onset of mental illness and an increase in psychiatric hospitalizations for psychiatric issues.

The impact of child abuse already is known to increase the risk of suicide; however, the literature about other characteristics of depressed victims of child abuse is scarce. Although the findings of the Mayo study do not confirm causality, the information stresses the importance of more aggressive public health approaches to prevent child abuse.

Plans are under way to further examine the association between child abuse and mental illness in a larger study of patients.



To read more about Mayo Clinic psychiatry research and patient care, visit www.mayoclinic.org.

Mayo Clinic PsychUpdate

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CME Opportunities

Biological Frontiers of Addiction

October 2, 2009, Rochester, Minnesota

This course offers a new biological model for the treatment of addiction. Topics incorporate new research on the biological basis for genomic subtypes of addiction. Emphasis is on the rapid translation of basic science to the clinic, strategies for pharmacotherapy, and individualized approaches to the treatment of addictions with comorbid psychiatric diagnoses. Outcomes-based research using clinical electronic databases to enhance follow-up also is discussed, as well as the bioethics and history of the concept of addiction as an illness.

Acute Care Psychiatry Clinical Review

October 22-24, 2009, Chicago, Illinois

This course focuses on assessment and management of acute psychiatric problems in all groups across all acute care settings. The course is designed to provide both a framework for board certification/recertification/maintenance of certification for the busy clinician and state-of-the-art assessment and management of common psychiatric emergencies. Topics include acute assessment and management of suicide risk, anxiety, mania, eating disorders, depression, substance abuse, and psychosis.

To Register

For more information about psychiatry- and psychology-related educational opportunities, including registration details, visit www.mayo.edu/cme/psychiatry-psychology-social-services.html.



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