

Transcranial Magnetic Stimulation

Tabitha Block, M.S. and Jonathann Kuo, M.D.

OVERVIEW

Depression is a psychiatric condition that can severely impact quality of life. Depression rates are highest among 25- to 44-year olds and depression often presents with characteristic symptoms including a loss of interest in previously pleasurable activities, sadness, hopelessness, feelings of worthlessness, guilt, anxiety, and irritability (1). As at least 17 million US adults struggle with depression, understanding the pathophysiology of this disease is of utmost importance to the discovery of novel treatment options for this patient population (2). Conventional treatments for depression include myriad psychological therapy methods and pharmacological antidepressant medications such as selective serotonin reuptake inhibitors (SSRIs), serotonin and noradrenaline reuptake inhibitors (SNRIs), tricyclic antidepressants (TCAs), and electroconvulsive therapy (ECT) (3). Many of these pharmacological therapies have significant drawbacks because they can cause the development of severe side effects such as anxiety, insomnia, nausea, sleepiness, dizziness, sexual difficulties, and weight gain (4). In addition to the extensive drawbacks associated with traditional depression treatments, these treatments may fail to provide adequate symptom relief for a population of patients struggling with depression. In the search to address this failure of conventional depression treatments, researchers have discovered IV Ketamine Therapy and TMS Therapy as novel treatment options for depression that provide profound and lasting symptom relief.

TMS FOR DEPRESSION

Transcranial magnetic stimulation (TMS) is a noninvasive brain stimulation therapy used to treat psychiatric disorders like depression, migraines, and obsessive compulsive disorder (5, 6). In order to understand how TMS can provide significant and lasting depression symptom relief, it is essential to discuss how brain function is altered in patients with depression.

Although the exact mechanisms of depression pathophysiology are not completely understood, several significant structural alterations have been identified in brain regions of depressive patients involved in mood regulation including the frontal lobe, hippocampus, temporal lobe, thalamus, striatum and amygdala (7). In patients with depression, these brain areas show reduced activity and may even become inactive (8). Further, research suggests that the pathology of depression may be caused by changes to neuronal circuits involved in the interaction of multiple brain regions (7). As both the structural connections between neurons and between brain regions are formed and fine-tuned by the activity of neurotransmitter at neuronal synapses, alterations in neurotransmitter concentrations have been widely accepted to play a role in depression pathology (9). As such, many conventional pharmacological treatments for depression aim to restore neurotransmitter concentrations to compensate for depression-associated reductions in neurotransmitter concentrations. These medications have broad mechanisms of action and are thus imprecise in addressing areas of the brain that are underactive in patients with depression (8). Additionally, antidepressant medications can have

limitations. Clinical trials have demonstrated that with every subsequent medication attempt, a patient's chance for remission decreases due to treatment resistance (10, 11, 12). Further, studies have shown that the discontinuation of antidepressant medication due to side effects increases with each medication attempt (10, 11, 12). As traditional pharmacological depression treatments can have significant drawbacks, TMS Therapy offers a safe and effective alternative treatment option for patients struggling with depression.

TMS involves the application of targeted magnetic pulses to the superficial layers of the cerebral cortex. This magnetic field is able to locally induce small electrical currents that stimulate nerve cells in mood-controlling areas of the brain (7, 8, 9, 13, 14). These small electrical currents are powerful enough and precise enough to elicit an action potential in neurons to release more neurotransmitters into the synapse. TMS is able to address the neurotransmitter imbalance associated with depression by stimulating targeted neurotransmitter release in areas of the brain that control mood (8). By eliciting increased neurotransmitter release in mood-controlling areas, TMS Therapy can restore neuronal circuit activity in patients with depression and can result in a statistically and clinically significant improvement of depressive symptoms.

NEUROSTAR TMS SYSTEM

At Hudson Medical, we use the NeuroStar TMS system because it is a noninvasive treatment option for patients with depression that has extensive clinical trial data demonstrating its strong safety and effectiveness profiles. The NeuroStar TMS system is an FDA-cleared cutting-edge therapy designed to target multiple pathologies associated with depression. In addition to directly stimulating superficial brain regions involved in mood regulation, the magnetic pulses delivered through the NeuroStar TMS system are able to activate deeper brain regions that lie outside the direct action of the applied magnetic fields. By stimulating these deeper brain regions, NeuroStar TMS Therapy causes secondary activation of brainstem neurotransmitter centers that elicits activation of other brain regions involved in controlling mood.

During the NeuroStar TMS Therapy treatment sessions, a small magnetic coil is placed lightly on the patient's head as they sit in a comfortable lounge chair. As treatment begins, a clicking sound and tapping sensation will occur. Treatment sessions generally last between 20 and 40 minutes, and as there are no sedatives involved in the NeuroStar TMS Therapy treatments, patients do not experience alterations to alertness and are free to resume daily activities as soon as the session concludes. NeuroStar TMS Therapy is typically delivered over a course of 4 to 6 weeks, but patients often report symptom improvement as soon as 2 weeks (18).

NeuroStar TMS Therapy provides a statistically and clinically meaningful and long-lasting benefit for patients with depression (14, 15, 16, 17). Symptom improvement in mood, days of experiencing depression and engagement in socializing have been reported as early as 2 weeks following NeuroStar TMS Therapy (18). The effectiveness of NeuroStar TMS Therapy as a treatment for depression has been demonstrated in over 65 clinical studies (13).

These studies have shown that 83% of patients treated with NeuroStar TMS Therapy showed significant improvements of depressive symptoms, and 62% of patients reported symptom relief lasting through 12 months (15, 17). NeuroStar TMS Therapy is not an antidepressant medication, so it does not have any of the side effects associated with traditional pharmacological treatments (9, 19). The most common side effect associated with NeuroStar TMS Therapy is mild to moderate pain or discomfort that typically subsides within the first week of treatment (15). TMS Therapy is a safe and powerful treatment option for individuals with depression who do not achieve adequate symptom relief from conventional antidepressant medications or for individuals with depression who are interested in trying a noninvasive treatment option.

CONCLUSION

Transcranial Magnetic Stimulation Therapy technology offers remarkable and lasting symptom relief for patients with depression through multiple short noninvasive sessions. As NeuroStar TMS Therapy is FDA-cleared and demonstrates a strong safety and efficacy profile, it poses many potential benefits and few drawbacks for patients struggling to find symptom relief with conventional treatments. Extensive clinical trial data supports the use of TMS Therapy for treatment of depression and provides evidence for the powerful impact this therapy can have in improving symptoms for patients struggling with depression.

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