



All India Institute of Medical Sciences, Rajkot



Department of Physiology

All India Institute of Medical Sciences (AIIMS),

Repetitive Transcranial Magnetic Stimulation

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When medication-based approaches to treating depression aren't working, doctors may prescribe other treatment options, such as repetitive transcranial magnetic stimulation (rTMS).

This therapy involves using magnetic pulses to target specific areas of the brain. People have been using it since 1985 to relieve the intense sadness and feelings of hopelessness that can come with depression.

If you or a loved one has tried several approaches for depression treatment without success, rTMS may be an option.

Why is rTMS used?

The FDA approved rTMS to treat severe depression and Obsessive Compulsive Disorder when other treatments (like medications and psychotherapy) haven't achieved enough effect.

Sometimes, doctors may combine rTMS with traditional treatments, including antidepressants.

You may benefit the most from rTMS if you meet the following criteria:

- You've tried other depression treatment methods, such as at least one antidepressant, without success.
 - You're not in good enough health for procedures like electroconvulsive therapy (ECT). This is true if you have a history of seizures or can't tolerate anesthesia well for the procedure.
 - You aren't currently struggling with substance or alcohol use issues.
- If these sound like you, you may wish to talk to your doctor about rTMS. It's important to note that rTMS isn't a first line treatment, so you'll have to try other things first.

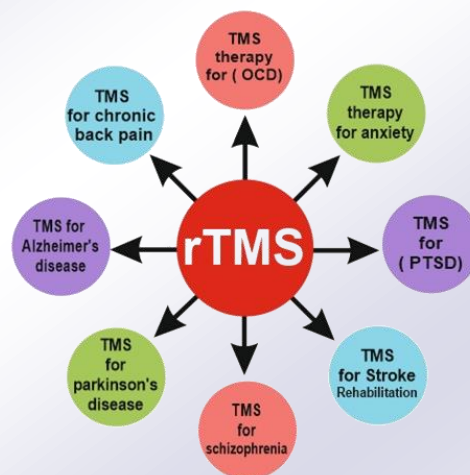
How does rTMS work?

This is a noninvasive procedure that usually takes between 30 and 60 minutes to perform.

Here's what you can expect at a typical rTMS treatment session:

- You'll sit or recline while a doctor places a special electromagnetic coil near your head, specifically a brain area that regulates mood.
 - The coil generates magnetic pulses to your brain. The sensation isn't painful, but it may feel like knocking or tapping on the head.
 - These pulses produce electrical currents in your nerve cells.
 - You can resume your regular activities (including driving) after rTMS.
- It's thought that these electrical currents stimulate brain cells in a complex way that can reduce depression. Some doctors may place the coil in different areas of the brain.

Potential Benefits of rTMS Therapy



Timeline : Evolution Of rTMS

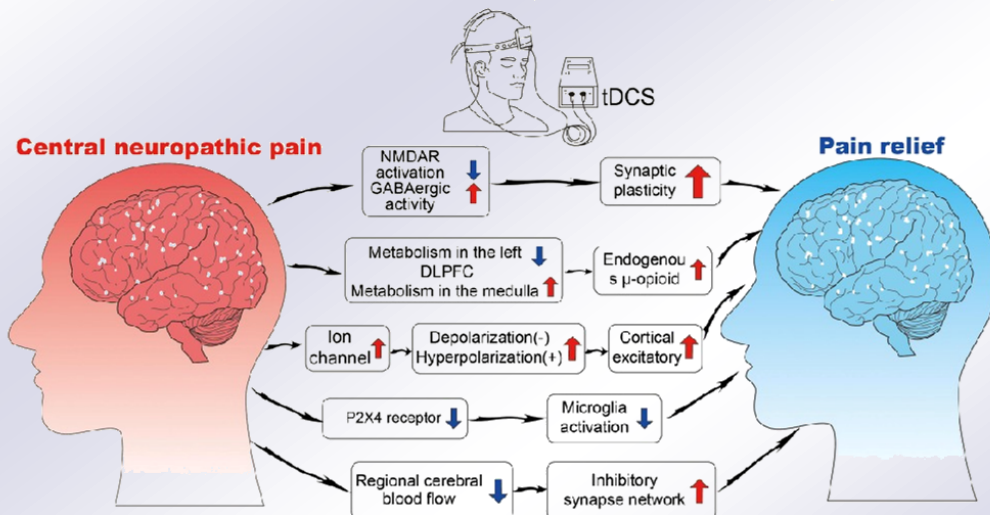
1800	Scientists first discovered that our nerve cells carry electrical activity	1800	Michael Faraday discovered that a changing magnetic field can generate an electrical current (known as magnetic induction)
1830		1830	
1985	The first modern rTMS device was developed by Anthony Barker in Sheffield, England	1985	Used to study the function of different brain areas and causes of neurological and psychiatric illness and as a therapeutic too
1990		1990-2000	
2000	Canada approved the use of rTMS therapy for depression	2003	
2003	NICE in the UK approved the use of rTMS for treatment resistant depression	2008	The FDA in the United States gave its approval for rTMS to be used for treatment-resistant depression
2008		2015	
2015		2020	Clinical trial for chronic low backache started at Department of Physiology AIIMS Bhopal
2020	the FDA approved rTMS treatment for OCD in the United States	2023	

d'Arsonval (1896/1911)

Thompson, 1910

Magnusson & Stevens, 1911

MECHANISM OF PAIN MODULATION BY NIBS



PROCEDURE OF TMS

0-6 days Step 1: Recruit and screen patients

20-30 mins Step 2: Treatment Process

20 mins Step 3: Measurement of Resting motor threshold

10 mins Step 3: Record the treatment process

c

50 μ v

20ms

Motor-Evoked Potential

A Coil current

B Coil current

C **D** **E** **F** **G** **H** **I** **J**

❖ What are the possible side effects and complications of rTMS?

Pain isn't usually a side effect of rTMS, but some people report mild discomfort with the procedure. The electromagnetic pulses can cause muscles in the face to tighten or tingle.

The procedure is associated with mild to moderate side effects, including:

- Feelings of light-headedness
- Temporary hearing problems due to the sometimes-loud magnet noise
- Mild headaches
- Tingling in the face, jaw, or scalp

Though rare, rTMS does come with a small risk of seizures.

- **How does rTMS compare to ECT?**

Doctors can offer several brain stimulation therapies that may help treat depression. While rTMS is one, another is [electroconvulsive therapy \(ECT\)](#).

ECT involves placing electrodes on strategic areas of the brain and generating an electric current that essentially causes a seizure to occur in the brain.

Doctors perform the procedure under general anesthesia, which means you're asleep and unaware of your surroundings. Doctors also give you a muscle relaxant, which keeps you from shaking during the stimulation portion of the treatment.

This differs from rTMS because people receiving rTMS don't have to receive sedation medications, which can reduce the risks for potential side effects.

One of the other key differences between the two is the ability to target certain areas of the brain.

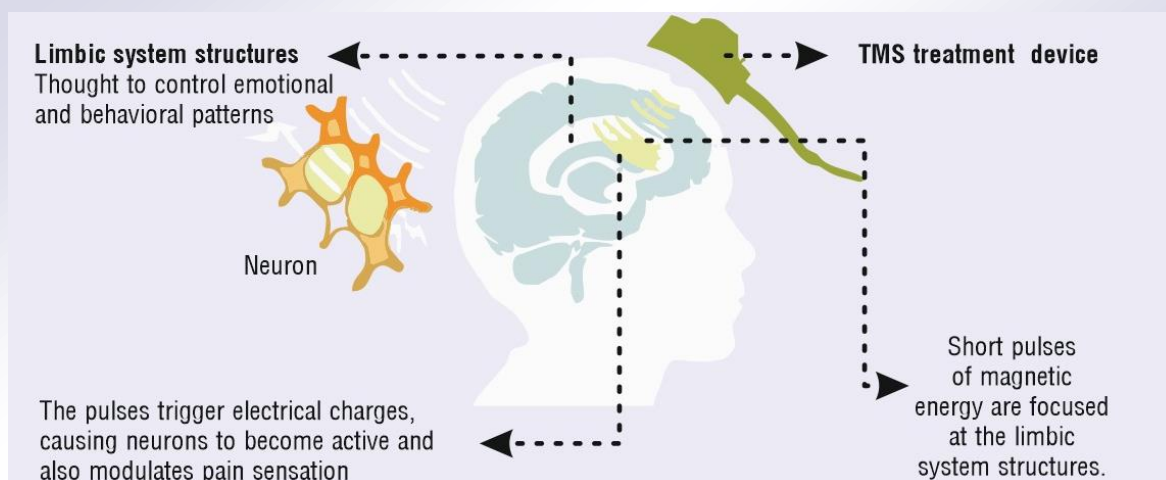
When the rTMS coil is held over a certain area of the brain, the impulses travel only to that part of the brain. ECT doesn't target specific areas.

While doctors use both rTMS and ECT to treat depression, ECT is usually reserved for treating severe and potentially life-threatening depression.

Other conditions and symptoms doctors may use ECT to treat include:

- [Bipolar disorder](#)
- [Schizophrenia](#)
- [Suicidal thoughts](#)
- [Catatonia](#)

- **Transcranial Magnetic Stimulation is a non-invasive procedure, it uses a magnetic pulse to stimulate brain cells to Modulate Brain Function**



• Who should avoid rTMS?

While rTMS doesn't have a lot of side effects, there are still some people who shouldn't get it. You aren't a candidate if you have metal implanted or embedded somewhere in your head or neck.

Examples of people who shouldn't get rTMS include those with:

- Aneurysm clips or coils
- Bullet fragments or shrapnel near the head
- Cardiac pacemakers or implantable cardioverter defibrillators (ICD)
- Facial tattoos that have magnetic ink or ink that's sensitive to magnets
- Implanted stimulators
- Metal implants in the ears or eyes
- Stents in the neck or brain

A doctor should conduct a thorough examination and take a medical history before using the therapy. It's really important to disclose any of these potential risk factors to keep you safe.



- **What's the duration of rTMS?**

Doctors will create an individual prescription for a person when it comes to treatment. However, most people will go to treatment sessions that last anywhere from 30 to 60 minutes about 5 times a week.

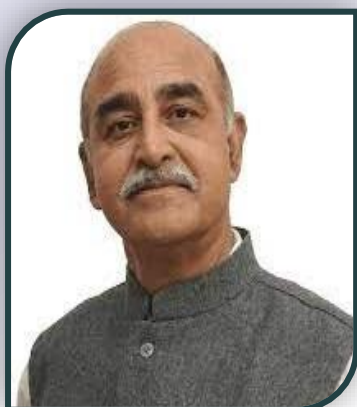
The treatment duration usually lasts between 4 and 6 weeks. This number of weeks could be shorter or longer depending on the individual's response.

- **What do the experts say about rTMS?**

A number of research trials and clinical reviews have been written on rTMS. Some of the results include:

- A 2018 study found that people who responded to rTMS by increasing their theta and alpha brainwave activity were more likely to improve their mood. This small human study could help to predict who may respond most to rTMS.
- A 2019 consensus recommendation Trusted Source found the treatment is appropriate for those whose depression is medication resistant and who also have significant anxiety.
- A 2015 critical review Trusted Source found rTMS in combination with ECT could minimize the number of needed ECT sessions and allow a person to get maintenance treatments with rTMS after an initial round of ECT treatment. This combination approach could help to reduce the adverse effects of ECT.
- A 2019 literature review Trusted Source found rTMS is effective for treatment after one medication trial has worked well in treating major depressive disorder.

Many studies now in progress have researchers examining the long-term effects of rTMS and finding out what types of symptoms best respond to the treatment.



Message from the Executive Director:

I heartily congratulate the Department of Physiology for bringing this informative newsletter on " Repetitive Transcranial Magnetic Stimulation".
 My best wishes to the entire team.

Prof. Dr. (Col) CDS Katoch, Executive Director,

Team Physiology, AIIMS Rajkot



Message from Head of Department

This is an effort to bring forward important information on Repetitive Transcranial Magnetic Stimulation. This initiative will definitely be useful for medical students, practitioners and all readers. We hope that this e-bulletin will increase your knowledge on Repetitive Transcranial Magnetic Stimulation.

- Dr. Vivek Kumar Sharma
 (Professor and HOD, Department of Physiology)

Dr. Rajesh Kathrotia	Additional Professor
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