

# Role of Repetitive Transcranial Magnetic Stimulation (rTMS) in Patients with Depression in Developing Countries



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## Background

- In developing countries, depression is one of the most important causes of morbidity and disability. <sup>(4)</sup>
- In these countries, the high cost of treatment may mean that patients cannot afford treatment even if diagnosed.

## Aims

- To assess the potential of repetitive transcranial magnetic stimulation (rTMS) as a technology for use in depression in developing countries compared to electroconvulsive therapy (ECT).

**P**OPULATION: Depressed patients in developing countries

**I**NTervention: Applying rTMS on the dorsolateral prefrontal cortex (DLPFC)

**C**ONTROL: ECT

**O**UTCOME: Safety, effectiveness, cost

## Technology

- First developed by Dr A. Barker at University of Sheffield (UK) in 1985. <sup>(5)</sup>
- Electrical activity in the brain may be influenced by a pulsed magnetic field using a rTMS coil. (See Figure 1).

**Figure 1.** Example of rTMS application. Doctor demonstrates a rTMS figure-8 coil applied over the DLPFC of a subject. Note that the subject is awake, alert and wearing earplugs for safety. The electromyography machine (B) is used to determine the motor threshold for dosing of stimulation intensity. Several TMS devices and coils are provided. A. Medtronic Stim: Quadragen; Demtek; C. Cadwell; Kernerick; Wash with water-cooled figure 8 coil; D. Resonance; Uferan; Gao and E. Magstim (Chesham, England) (Picture reproduced from [1])



- rTMS can be used to treat depression by inducing a current in the dorsolateral prefrontal cortex (DLPFC).
- There are different type of coil types including the original round coil, figure-eight and double cone coils.
- Commercially used in Canada, Israel and Germany among others; with 7 different manufacturers or more.

## Fast Facts: Global Landscape of Depression

- Depression is the leading cause of disability worldwide and the fourth-leading cause of the global disease burden. <sup>(1)</sup>
- 154 million people globally suffer from depression. <sup>(2)</sup>
- Cost-effective interventions are available, but do not often reach those who need them because of a number of overwhelming challenges in low-resource settings:<sup>(3)</sup>
  - lack of facilities and trained mental health personnel,
  - questions about effective population-based screening,
  - general stigma surrounding mental disorders

## Methodology

- Databases: Centre for Reviews & Dissemination, Cochrane, Medline and National Guidelines Clearinghouse
- Search terms: rTMS, ECT, safety, efficacy, cost-effectiveness

## Cost & Cost Impact

- Currently, lack of trained personnel and scarce resources make practice of evidence-based medicine difficult and expensive in developing countries. <sup>(11)</sup>
- Cost of training rTMS personnel is relatively inexpensive.
- Although cost-effectiveness for treatment is lower for rTMS compared to ECT <sup>(10)</sup>, it may still be practical due to for its reduced set-up cost and low risk. <sup>(12)</sup>

## Research & Evidence

- 17% of depressed patients received traditional treatment (eg ECT) in developing countries compared to 34% to 49% in developed ones. <sup>(6)</sup>
- Unlike ECT, there are no limits as to the number of treatment sessions that rTMS can be given to a patient. <sup>(7)</sup>
- Safety profile is good with incidence of seizure (most significant side-effect) at 0.1% with rTMS. <sup>(8)</sup>
- Commonest side-effect of rTMS is that of headache.
- rTMS is superior over sham and certain antidepressant drug treatment. <sup>(9)</sup>
- rTMS and ECT have similar efficacy (~45%). <sup>(10)</sup>
- But rTMS may have better risk profile including less anaesthesia risk and does not require inpatient stay.

## Conclusion

- Depressed patients in resource poor countries face challenges, as the usual modes of treating depression in developed countries using ECT may be both costly and risky if conducted by inexperienced healthcare workers working in the austere conditions of some developing countries.
- Further exploration should be encouraged to assess potential application of rTMS in developing countries.

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