Repetitive Transcranial Magnetic Stimulation

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Position statement 79

Summary

Repetitive Transcranial Magnetic Stimulation (rTMS) is an effective treatment for major depressive disorders. It involves the focal application of a localised, pulsed magnetic field to the cerebral cortex, inducing small electrical currents which stimulate nerve cells.

Purpose

This position statement seeks to provide information to psychiatric and medical service providers, education and research bodies, and medical and other healthcare professionals about the use of repetitive transcranial magnetic stimulation (rTMS) a treatment in clinical psychiatric practice, highlighting the evidence-base, benefits and side effects, and provides recommendations for quality service delivery.

Key messages

- rTMS is a therapeutic, well tolerated, and safe, medical procedure for the treatment of psychiatric disorders, especially episodes of major depression.
- There is a good evidence base for the therapeutic efficacy of rTMS in major depressive disorder. Those with treatment resistant depression who respond to rTMS treatment (approximately 50% of patients) will subsequently experience a lower burden of disease.
- There is some evidence for the use of rTMS in schizophrenia, but less than that for depression. rTMS has further been investigated for use in a range of other disorders such as post-traumatic stress disorder, obsessive compulsive disorder, autism spectrum disorders, substance dependence and chronic pain conditions. The preliminary evidence of efficacy is encouraging in several of these disorders. However, at this time there is a lack of large scale / multi-site trials supporting the use of rTMS in the treatment of psychiatric disorders other than depression.
- Treatment with rTMS can occur in combination with psychological therapies or medications, but does not generally occur concurrently with electroconvulsive therapy.
- rTMS should be prescribed and supervised by a psychiatrist with appropriate expertise, in a clinical environment where there is access to relevant clinical procedures and quality assurance measures to ensure treatment provision in a safe manner. Monitoring for treatment response, non-response and treatment-related side effects should occur on a regular basis throughout treatment.
- rTMS should be accessible in public and private mental health services and made available in addition to the current spectrum of treatment options. It should be affordable and, where appropriate, offered as a therapeutic option for the treatment of major depression.
- Ongoing research is needed into rTMS utility in different patient groups, and efficacy for other psychiatric conditions.

Background

rTMS involves the focal application of a localised, pulsed magnetic field to the cerebral cortex, inducing small electrical currents which stimulate nerve cells in the region of the brain involved in mood regulation and depression. The precise mechanism of action is not yet fully understood although studies suggest that the nerve cells, when stimulated, cause neurons to fire with the aim of altering brain function for therapeutic purposes (Anderson et al., 2016). Magnetic fields are passed through the skull to the brain using a coil placed on the patient's head. The treatment is non-invasive and does not involve seizure induction or loss of consciousness. The patient[1] is completely alert during the procedure and an anaesthetic is not required. When appropriate procedures are followed for patient selection and treatment, there are minimal risks with rTMS and side effects are usually mild, transient and/or can be easily managed. rTMS can be delivered in a hospital inpatient or outpatient setting. It can also be delivered in non-hospital outpatient settings, such as a medical clinic. Worldwide, the majority of rTMS is conducted on an outpatient basis.

There is a wide range of variables which can be modified in the delivery of rTMS (e.g. stimulation site, stimulation frequency, stimulation intensity, frequency of treatment sessions, number of stimulation pulses or trains applied per session and the total duration of rTMS course). rTMS is administered using established treatment protocols usually multiple times a week (mostly commonly 5 times) for four to six weeks. Maintenance rTMS - further treatments given after the acute course to prevent relapse - may be a useful strategy but the evidence base is less substantive than that for full rTMS courses investigated in acute depressive episodes.

rTMS is prescribed by a psychiatrist with training and expertise in rTMS. The rTMS session is administered by a psychiatrist or an appropriately trained healthcare professional, such as a psychiatric nurse, under the supervision of the psychiatrist. Organisations that provide clinical rTMS treatment need to have a process for ensuring those administering rTMS are properly and thoroughly trained in the theory, technique and safe operation of rTMS, so as to allow for clinical oversight of a patient undergoing a course of rTMS. This includes ongoing assessment of progress, treatment response and the possibility of side effects.

For further details about how to use of rTMS in practice, please refer to the RANZCP rTMS Professional Practice Guideline.

[1] The term patient is used through this document for clarity and consistency although it is recognised that individuals may prefer alternative terms, for example person, consumer, client or service user.

Evidence

rTMS is an effective and evidence-based treatment for depression. This is reflected in multiple clinical practice guidelines, such as the RANZCP Clinical Practice Guidelines of Mood Disorders (Malhi et al., 2015). Real world studies featuring patients with treatment-resistant depression place response rates in the order of 50% (Fitzgerald et al., 2016; Slotema et al., 2010) and such patients experience a reduced burden of disease as a result (Brunoni et al., 2017). Over recent years, the evidence for efficacy has improved for this population group, with a shift towards consistently positive therapeutic outcomes. Some efficacy trials included subsets of patients with bipolar depression, demonstrating similar response rates in these patients, although few studies have targeted this group in stand-alone trials. The efficacy of TMS in treating psychotic depression is unclear. For patients with depression that is very severe, associated with psychotic features, highly treatment resistant, or requires a rapid response due to acute risk, clinicians will consider whether treatment with ECT is required instead.

The evidence base for the use of rTMS in schizophrenia is less than that for depression. Clinical trials have examined the use of rTMS to treat symptoms of schizophrenia, and have found rTMS to have beneficial effects in reducing the severity and/or frequency of auditory hallucinations (Matheson et al., 2010) but further research is needed. There is slowly accumulating evidence for the use of rTMS in obsessive–compulsive disorder (OCD) supported by several recent positive meta-analyses (Zhou et al., 2017; Rehn et al., 2018) but rTMS is not yet considered an established treatment for this disorder.

rTMS has also been investigated for use in a range of other disorders such as post-traumatic stress disorder, autism spectrum disorders, substance dependence and chronic pain conditions.

The preliminary therapeutic evidence in these other disorders varies but in no area have large scale multi-site trials or meta-analyses to date established efficacy.

Who can recieve rTMS treatment?

rTMS is a treatment of major depressive disorder. It is suitable for treatment of a depressive episode that has not responded to adequate medication trials and/or psychotherapeutic approaches. Patients experiencing a major depressive episode as part of bipolar affective disorder have demonstrated similar antidepressant response rates as patients experiencing unipolar depression. The use of rTMS to treat auditory hallucinations in schizophrenia is emerging and may be offered in specialist centres, where treatment and outcome data are collected for further analysis. The use of rTMS for patients with other disorders should only be undertaken as part of research or clinical trials.

Psychiatrists should consider and discuss the risks and benefits of rTMS with the patient before recommending a treatment course. There is little safety data on the use of rTMS in pregnant women and this requires careful assessment of the individual patient's situation, along with discussion of known and potential risks of rTMS compared to alternative forms of treatment. There is also little safety and efficacy data on the use of rTMS in children and adolescents. rTMS should only be given to those aged under 18 within an approved research protocol or under circumstances where there are limited other treatment options and potential clinical benefit is considered to outweigh the risks of treatment in this group. The use of rTMS in adolescents requires a careful assessment of the patient's circumstances, family situation, developmental stage and maturity, capacity to provide informed consent and discussion of known and potential risks.

Sufficient information and time should be provided to patients considering rTMS before informed consent is sought. The consent process must be undertaken by a psychiatrist with knowledge and expertise in rTMS therapy, and should detail alternative treatment considerations, along with the possible benefits and adverse effects of rTMS. Patients should understand that the results of rTMS cannot be guaranteed.

Benefits and side effects

Research to date indicates that rTMS is well tolerated and safe when patients are carefully screened and treatment is given within recommended safety parameters and evidence-based guidelines. With appropriate screening, the overall risks are very low. Clinical trials have found no cognitive impairment when rTMS is given within recommended parameters. On the contrary, improvement in cognitive function may be expected in patients whose depression respond to rTMS, particularly if cognitive impairment is a feature of their depressive syndrome.

Common side effects with rTMS include local scalp pain or discomfort, headache and facial muscle twitching during stimulation. Although common, these side effects are typically mild with fewer than 2% of patients in clinical trials discontinuing treatment due to stimulation-related discomfort (Rossi et al., 2009). In general, tolerability of rTMS improves over the course of treatment and may be eased with simple analgesia such as paracetamol (Loo et al., 2008).

More serious side effects are rare and these risks diminish when safety precautions are followed (Taylor et al., 2018). The incidence of induction of a generalised seizure has not been fully quantified but appears to be extremely low when patients are adequately screened for risk factors and treatment applied carefully. An increase risk seems likely in patients with pre-existing neurological conditions, alcohol or substance use and possibly during changes in medications (particularly those that lower seizure threshold) during the rTMS course. All services offering rTMS are required to have protocols to manage seizure induction. Prompt cessation of rTMS is indicated in these instances. There is no evidence to suggest rTMS increases an individual's risk to experience a seizure in the future.

The other rare, but potentially serious adverse effect is that of inducing a manic or hypomanic episode. These episodes can occur, most commonly in patients with a pre-existing diagnosis of bipolar affective disorder. In clinical experience they appear less common / quite rare in patients receiving mood stabilising medication whilst undertaking rTMS.

During stimulation sessions, rTMS produces a loud clicking noise which can cause discomfort or affect hearing. Hearing protection, such as the use of ear plugs, is therefore advised. rTMS can present a problem for those with metal implants or electronic devices, for example cochlear implants or pacemakers and its use in this population should be carefully assessed.

rTMS use with other treatments

rTMS should be considered as part of the spectrum of treatment options currently available for the treatment of depression. Treatment with rTMS can occur in combination with psychological therapies or medications. This depends on the care needs and symptom profile of the individual patient.

There is minimal evidence supporting the concurrent use of rTMS and ECT. The current state of understanding of these two treatment modalities suggest distinct mechanisms of action and side effect profile, and therefore best considered distinct therapeutic modalities in their own right. Patients whose depression has not responded to one modality may well respond to the other.

Recommendations

The RANCZP recommends that:

- In treating major depression, rTMS should be offered in clinical settings with appropriate stimulation protocols, staff training and TGA-approved equipment. Assessment of appropriateness for patients to undergo rTMS should reflect evidence-based guidelines, such as the RANZCP Clinical Practice Guidelines for Mood Disorders (Malhi et al., 2015)
- rTMS may be offered on a restricted basis to carefully selected patients with schizophrenia who have auditory hallucinations that have not improved with adequate trials of antipsychotic medications. This should only be performed in tertiary referral or specialist centres with expertise and experience with this indication for rTMS.
- Until the establishment of further empirical evidence, rTMS as a treatment of other neuropsychiatric disorders should only be within a research protocol which has had formal review and approval by a relevant clinical research ethics committee.
- Ongoing research into rTMS should be undertaken, including a focus on further optimisation of treatment protocols, utility in different patient groups, and efficacy for other psychiatric conditions. Treatment outcomes and adverse events in specialty patient groups, e.g. pregnant populations, should be closely monitored and where possible employed to inform scientific understanding and evidence base.
- Clinical trials investigating outcomes in bipolar depression should be undertaken to increase the evidence base for the applicability of rTMS in this population group.
- Where rTMS is conducted, the outpatient or hospital based rTMS clinic should be suitably accredited by an accepted accreditation agency such as International Standards Organisation (ISO) or Australian Council of Healthcare Standards (ACHS).
- Psychiatrists supervising rTMS should have appropriate expertise and be credentialed by their institution for the delivery of rTMS treatment, and undertake continuing professional education to ensure they remain up to date on treatment advances.
- rTMS should be accessible in private and public mental health services and made available in addition to the current spectrum of treatment options. It should be affordable and, where appropriate, offered as a therapeutic option for the treatment of major depression.

Further reading

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Responsible committee: Section of Electroconvulsive Therapy and Neurostimulation

References ›