

# REPETITIVE TRANSCRANIAL MAGNETIC STIMULATION-

## A REVOLUTIONARY TREATMENT FOR DEPRESSION AND OTHER DISORDERS

**R**epetitive Transcranial Magnetic Stimulation (rTMS) is a safe, painless, effective and natural evidence-based treatment for people suffering from severe unipolar affective/depressive disorder and other neurological/psychological illnesses. Used successfully in renowned centres such as the Mayo clinic, Johns Hopkins and the Nottingham Neuromodulation Unit,<sup>1,2</sup> rTMS is now available locally. This non-invasive FDA<sup>3-5</sup> and NICE<sup>6</sup> approved electromagnetic therapy is ideal for depressed patients who are either resistant or intolerant to other treatments. rTMS has no side-effects associated with drugs (e.g. weight gain, sexual dysfunction, sedation). Besides, no anaesthetic is involved and there is no memory loss or impaired learning as may happen with electroconvulsive therapy (ECT), which has long been considered the gold standard for treating such patients. rTMS is claimed to be more effective than medication,<sup>7,8</sup> psychotherapy or ECT<sup>9-12</sup> in treatment-resistant patients. Thankfully, rTMS has a synergistic effect when used with other treatments.

WHO states that there are 350 million depressed people worldwide. Depression is the leading cause of disability globally. When coupled with other co-morbid illnesses, it has a lifetime prevalence of 23%.<sup>13</sup>

The hidden psychological and social burden inherent to depression causes many to suffer in silence, potentially leading to suicide. Furthermore, for every person who commits suicide there are at least 20 others who try.<sup>14</sup> rTMS can give relief to these people, prevent deaths and offer hope to those suffering from e.g. migraine, ADHD, altered body image, OCD.

rTMS is the brainchild of Baker and his colleagues who began experimenting in the 1980s. Inspired by Galvani and Aldini's eighteenth century experiments on electrically stimulating the peripheral muscles of dead animals and corpses respectively, the UK team pioneered the stimulation of the human brain's motor homunculus electromagnetically. Their objective at the time was to elicit a corresponding motor stimulation of peripheral muscles.<sup>15</sup>

In 1987, Bickford extended the domain of TMS research into neuropsychiatry. He described transient mood elevation in healthy subjects receiving single-pulse stimulations to the motor cortex.<sup>16</sup> This was the turning point for the scientific investigation of the effects of depolarising magnetic fields in a variety of neuropsychiatric disorders.

Technological developments produced repetitive-pulse TMS which was shown to have long lasting effects on the cortex that persisted beyond the stimulus delivery.<sup>17-19</sup> Once it was ascertained that rTMS technology could stimulate the brain in a focal way, the search was on to use this technique to treat neuropsychiatric disorders, with the earliest studies attempting to treat depression.<sup>20-22</sup>

This novel treatment is based on the discoveries of British nineteenth century physicist Michael Faraday, whose Law of Electromagnetic Induction predicts how a changing magnetic field will interact with an electric circuit to produce an electromotive force - a phenomenon called electromagnetic induction.



The painless electromagnetic therapy coil is applied to the patient who sits comfortably in a chair

In essence, exposing a conductor to a rapidly changing magnetic field will induce a current in the conductor. rTMS works by inducing a rapidly changing magnetic field in a “depression sensitive” brain/cortical area, which is populated by neurons and is located just under the skull. This rapidly changing field induces a current in the neurons (the conductor). Hence, the area is stimulated to be more electrically active.

In biophysiological terms, several studies show that the left dorso-lateral pre-frontal cortex (LDLPFC), along with deeper cortical structures such as the limbic system, is associated with mood regulation and hence is a lynchpin in the pathogenesis of depressive illness. Overall, a depressed brain is less active than a healthy brain, as evidenced by several neuroimaging studies. It also has fewer brain receptors, less circulating neurotransmitters (e.g. serotonin) and fewer healthy nerve contacts (synaptic connections between neurons).<sup>23</sup>

rTMS addresses this neuronal “apathy” by progressively re-stimulating a current in the LDLPFC neurons (i.e. a wave of depolarisation down the neuron membranes) so as to eventually restore the balance of neurotransmitters and healthy nerve contacts. The positive behavioural effects of this technology persist after a course of rTMS treatment.<sup>24,25</sup>

NICE “noted consistently positive outcomes in many studies” and explained that rTMS has “a good safety profile”. Besides, “commentary from patients was positive and described significant benefits to their quality of life, including the advantages, for some patients, of being able to stop the use of oral antidepressant medications”<sup>6</sup>

In essence, the patient is seated in a comfortable chair as an electromagnetic field is applied over the LDLPFC for up to 37 minutes. Patients remain fully alert throughout: no anaesthetic, medicine or invasive procedure is required. During the session, the person can talk, read or watch TV. He can even undergo psychotherapy. Once done, the patient simply hops off the chair and carries on with his day.

If your patients feel life is not worth living, please reassure them that it is! However, they may be going through a crisis. We can help. . Call us on our 24/7 crisis line (99339966), email us (crisismalta@gmail.com) or get help from our *Crisis Resolution Malta* FaceBook page. 📞

