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Unexpected Anti-depressant Effects Seen with Full Body Pulsed Electromagnetic Treatment when Given for Chronic Back Pain in a Patient with Co-existent Severe Treatment Resistant Depression: A Case Report

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Abstract

Pulsed Electromagnetic Field (PEMF) treatment is a non-invasive modality that uses low-frequency electromagnetic waves to stimulate cells and tissues in the body. When given as full body treatment, it has shown positive results in chronic back pain. Transcranial usage of PEMF has previously been explored for management of treatment resistant depression (TRD).

We report a patient of TRD where full body PEMF was used for chronic back pain. At the end of three weeks treatment, patient showed significant improvement in his symptoms of chronic back pain and surprisingly also reported reduced symptoms of co-existent TRD.

Key clinical message: Full body PEMF maybe administered in patients of TRD with CBP for beneficial effects in both clinical conditions

Keywords: *Pulsed electromagnetic fields; severe depression; treatment resistant depression; TRD; pain; quality of life, PEMF.*

Introduction

Treatment of depression is often complex and challenging. Upto one third of patients with severe major depressive disorder who are non responsive to conventional therapeutic measures are labelled as Treatment resistant depression (TRD). [1, 2] Treatment remains a challenge with various treatment modalities like cognitive behavioral therapy and transcranial pulsating electromagnetic fields therapy (T-PEMF), a form of Pulsed Electromagnetic Field (PEMF). [3,4]

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PEMF therapy is a novel, non-invasive treatment that uses low-frequency electromagnetic currents to stimulate cells and tissues in the body. This treatment is delivered via different types of equipment tailored for different regions and ailments of the body. T-PEMF, in which PEMF is delivered trans cranially is found effective in various neurological conditions including TRD with improvement in about 30% patients. [3] PEMF delivered to local region of body or full body has shown promising results in chronic back pain (CBP). [4]

We discuss a patient of TRD with CBP where PEMF via QRS 101 full body gel mattress treatment was given for CBP, however improved symptoms of TRD were also unexpectedly reported.

Case History: A 47-year-old adult male patient, 168cm in height, 65kgs was referred from the department of Orthopaedics to the Pain Clinic Outpatient Department

(OPD) for CBP secondary to Prolapsed intervertebral disc (PIVD) for 2 years for which he had minimal relief with advised non-steroidal anti-inflammatory drugs (NSAIDS) since last 3 months. He was also a diagnosed patient of TRD on multiple oral medications for 8 years but had stopped treatment for last 3 months owing to no relief in his symptoms. The initial treatment regimen consisted of escitalopram (20 mg), olanzapine (5 mg), and clonazepam (0.5 mg). The patient demonstrated stability for a period until a reduction in olanzapine dosage triggered a resurgence of psychotic symptoms and new secondary depressive symptoms. In response, the olanzapine was adjusted to 10 mg disintegrating tablets, and fluoxetine was introduced at 20 mg. Over the next four years, despite gradual adjustments in medication dosages, including a sustained fluoxetine (80 mg) , duloxetine (40mg) , gabapentin (400 mg) with amitriptyline (20mg) treatment, the patient continued to experience persistent low mood and dysthymia. New secondary depressive symptoms emerged, such as lack of interest in work, agitation, insomnia, and suicidal ideation. Incorporating dialectical behavioral therapy and regular cognitive behavioral therapy (CBT) led to modest improvements; however, the patient experienced recurring depressive symptoms over the subsequent three years. After eight years of treatment, the patient ceased all medications, expressing feelings of stagnation and lack of motivation to engage in life, work, or social interactions.

On examination, pain NRS for CBP was 8. Patient was assessed by psychiatry department in detail where examination revealed Hamilton Depression Rating Scale (HDRS) or HAMD 17 scale score of 26 (severe depression), DSM-5 criteria for Major Depressive Disorder (MDD) (recurrent depressive episode), Mini-International Neuropsychiatric Interview (MINI) score of 3 (moderately severe depression), Beck's Depression Inventory (BDI) score was 44. He was non-responsive to one or more antidepressants, given for at the past 8 years in an adequate dose. However, he discontinued all antidepressants for the past 3 months. The authors communicated with him in vernacular. He displayed compliance and good understanding of the Hindi language (including writing). Written informed consent was taken from the patient for the present report.

Table 1.
Quantitative parameters of Back Pain NRS and Treatment resistance depression (TRD) at different time intervals

	Pre PEMF treatment	Post PEMF treatment after 15 sessions (% improvement)	Follow up Post 3 months. (% improvement)	Follow up post 6 months. (% improvement)
CBP Pain NRS	8	4 (50%)	3.5 (60%)	4 (50%)
Hamilton Depression Rating Scale (HDRS) / HAM-D -17	26	7 (73%)	4 (84%)	4 (84%)
Beck's Depression Inventory (BDI)	44	10 (77%)	10 (77%)	10 (77%)
Inventory of Depressive Symptomatology Self-Report (IDS-SR)	52	18 (65%)	16 (69%)	16 (69%)
Beck Anxiety Index (BAI)	16	7 (56%)	6 (62%)	9 (43%)
Maudsley Staging Method (MSM)	8	3 (62%)	2 (75%)	3 (62%)
Mini-Mental Status Examination (MMSE)	28	30 (7%)	30 (7%)	30 (7%)
Mini International Neuropsychiatric Interview (MINI)	3	0 (50%)	0 (50%)	0 (50%)

Numeric Pain Rating Scale (NPRS, range 0-10); Hamilton Rating Scale for Depression (HDRS / HAM-D-17 , range 0-52); Beck's Depression Inventory (BDI , range 0-63) ; Inventory of Depressive Symptomatology Self Report (IDS – SR , range 0-84); Beck Anxiety Inventory (BAI, range 0-63); Maudsley Staging Method (MSM , range 0-15); Mini-Mental Status Examination (MMSE , range 0-30); Mini International Neuropsychiatric Interview (MINI , range 0-6)

Methods

Patient was apprehensive about invasive epidural steroids for his CBP; thus, PEMF was offered to him as an option to which he consented. According to the protocol of the pain clinic at our hospital, a total of 15 sessions of 30 minutes duration for five times a week using a full body mattress applicator of PEMF via QRS 101 system (Quantum Resonance System) at intensity of 40 micro Tesla were given over the course of three weeks.

After treatment sessions, patient reported pain NRS of 2-3 for his CBP. Patient in particular reported an improvement in his overall mood, sleep, appetite, not experience irritability with people around him, no low mood or suicidal symptoms and an increased interest in activities. Patient reported better energy and enthusiasm to work along with improved sleep and psychological effects. On further evaluation by psychiatry physician, HDRS was reduced from 26 to 7; BDI from 44 to 10 with significant improvements in other depression assessment parameters. (Table 1) Follow-up assessments conducted at three- and six-months post-treatment showed sustained improvement in depression assessment. (Table 1)

Discussion

TRD presents a significant challenge in clinical practice, with current treatment guidelines often lacking evidence-based support. Consequently, better-quality research is essential to inform more effective management strategies. As existing treatments for resistant depression remain largely empirical, the absence of benchmark antidepressants hinders standardized approaches.[1,2] Psychopharmacological interventions continue to be the mainstay for TRD treatment. Alternative therapies like neuromodulation, psychotherapy and T-PEMF have shown promising results.[3,5 -7]

PEMF is a form of treatment that uses low-frequency electromagnetic waves to stimulate cells and tissues in the body. It has been shown to have potential anti-depressant effects by promoting neuronal activity and neuroplasticity. 8 In depression, T-PEMF therapy can be used to target the prefrontal cortex, which is a key area of the brain involved in mood regulation and cognitive function. It can also help improve mood, reduce anxiety and improve cognitive function in individuals with depression. [8] This may be particularly beneficial for patients with TRD who have failed to respond to traditional pharmacotherapy and psychotherapy.[6,7] T- PEMF is applied via headsets or helmets that uses a magnetic field to induce electric currents in the brain. 8 Daily 20-30 minute sessions of T-PEMF in TRD patients showed significantly greater reduction in depressive symptoms than the sham group. 3 A meta-analysis evaluated the efficacy of repetitive transcranial magnetic stimulation (rTMS) and T-PEMF therapy for depression and concluded T-PEMF may have an effect on brain metabolism, neuronal connectivity, brain plasticity, and the immune system. In a study, patients on active T-PEMF showed a clinically and statistically significant better outcome in depression than patients treated with sham T-PEMF, with an onset of action within the first weeks of therapy. [9] In contrast, in another study treatment with active tPEMF was seen not superior to sham in patients with TRD which the authors attributed to using a magnetic field of 0.1 mT measured at a distance of 1 cm from the coil; which was deemed too low to induce a clinical effect. [10] The antidepressant effect of T-PEMF may be specifically attributable to its effects on local brain activity and connectivity. [8] T-PEMF was also shown effective in depression and anxiety in patients with Parkinson's disease. 11

Full body PEMF, to the best of our knowledge, has not been investigated for TRD. In the present patient, full body PEMF QRS was used for CBP. However, patient reported significant improvement in both CBP and TRD symptoms. The decrease in pain NRS of CBP could have resulted in general well-being of patient contributing to decrease of depressive parameters. However present patient was a diagnosed case of TRD and had defaulted on treatment for past 3 months, thus the improvement in symptoms cannot be explained alone by the above. Thus, contributory role of PEMF QRS on both CBP and TRD is proposed. The authors feel that as full-body PEMF increases circulation in the entire body, promoting systemic effects it can potentially address multiple issues simultaneously, such as pain relief, inflammation reduction, improved circulation, and enhanced cellular function throughout the body. It may enhance cellular function in all tissues of the body with full-body PEMF optimizing their function and promoting better overall health leading to improved energy levels, enhanced metabolism, and better tissue repair. Thus, full body PEMF may result in systemic benefits and potentially benefit various systems in the body extrapolating to beneficial effects in TRD. [12]

Further research is warranted to study the effect of full body PEMF on TRD especially as T-PEMF also carries potential risks of seizures, interference with medical devices such as pacemakers, cochlear implants, or deep brain stimulators, headache and discomfort which is unsuitable for certain conditions like active tumors or brain injuries and thus requires hospital monitored administration.

To conclude, full body PEMF via QRS may lead to successful remission of TRD, however further randomized controlled trials are needed to come to a definitive conclusion and maybe worthwhile to investigate considering its translational potential and morbidity of TRD.

Ethical Clearance: Taken

Conflict of Interest: Nil

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References

1. Gaynes BN, Lux L, Gartlehner G, Asher G, Forman-Hoffman V, Green J, Boland E, Weber RP, Randolph C, Bann C, Coker-Schwimmer E, Viswanathan M, Lohr KN. Defining treatment-resistant depression. Depress Anxiety. 2020 ;37(2):134-145.
2. Pandarakalam JP. Challenges of Treatment-resistant Depression. Psychiatr Danub. 2018 Sep;30(3):273-284. doi: 10.24869/psyd.2018.273. PMID: 30267518.
3. Larsen ER, Licht RW, Nielsen RE, Lolk A, Borck B, Sørensen C, Christensen EM, Bizik G, Ravn J, Martiny K, Vinberg M, Jankuviené O, Jørgensen PB, Videbech P, Bech P. Transcranial pulsed electromagnetic fields for treatment-resistant depression: A multicenter 8-week single-arm cohort study. Eur Psychiatry. 2020:18;63(1):e18.
4. Andrade R, Duarte H, Pereira R, Lopes I, Pereira H, Rocha R, Espregueira-Mendes J. Pulsed electromagnetic field therapy effectiveness in low back pain: A systematic review of randomized controlled trials. Porto Biomed J. 2016 Nov-Dec;1(5):156-163.
5. Kverno KS, Mangano E. Treatment-Resistant Depression: Approaches to Treatment. J Psychosoc Nurs Ment Health Serv. 2021 Sep;59(9):7-11.
6. Iglesias C, Alonso M. Residual symptoms in depression. Actas Esp Psiquiatr. 2009 Mar-Apr;37(2):101-5.
7. Figee M, Riva-Posse P, Choi KS, Bederson L, Mayberg HS, Kopell BH. Deep Brain Stimulation for Depression. Neurotherapeutics. 2022 ;19(4):1229-1245.
8. Martiny K, Lunde M, Bech P. Transcranial low voltage pulsed electromagnetic fields in patients with treatment-resistant depression. Biol Psychiatry. 2010;15;68(2):163-9. Van Belkum SM, Bosker FJ, Kortekaas R, Beersma DG, Schoevers RA. Treatment of depression with low-strength transcranial pulsed electromagnetic fields: A mechanistic point of view. Prog Neuropsychopharmacol Biol Psychiatry. 2016 Nov 3;71:137-43.
9. Pol F, Salehinejad MA, Baharlouei H, Nitsche MA. The effects of transcranial direct current stimulation on gait in patients with Parkinson's disease: a systematic review. Transl Neurodegener. 2021 Jun 29;10(1):22.
10. Hu H, Yang W, Zeng Q, Chen W, Zhu Y, Liu W, Wang S, Wang B, Shao Z, Zhang Y. Promising application of Pulsed Electromagnetic Fields (PEMFs) in musculoskeletal disorders. Biomed Pharmacother. 2020;131:110767.