Brain Stimulation 12 (2019) 1061–1062

Contents lists available at ScienceDirect

Brain Stimulation

journal homepage: http://www.journals.elsevier.com/brain-stimulation

Deep transcranial magnetic stimulation (dTMS) for treatment of major depressive disorder (MDD) status post-surgical removal of medulloblastoma: A case report of safety

Dear Editor:

We are reporting a case with history of surgical removal of medulloblastoma, ventriculosubgaleal shunt in place, history of mild TBI and intake of bupropion for treatment of MDD. This patient tolerated dTMS treatment using H1-coil without incidence of any complications. (see Fig. 1).

Background

Major depressive disorder is one of the most common mental disorders in the United States. In 2017, 7.1% of adults aged 18 or older (17.3 million adults) had at least one Major Depressive Episode (MDE) in the past year, and 4.5% of adults (11.0 million adults) had a MDE with severe impairment in the past year [1]. Depression is the leading cause of disability worldwide, and is a major contributor to the overall global burden of disease. In October 2008 transcranial magnetic stimulation (TMS) was approved by the Food and Drug Administration (FDA) for the treatment of major depressive disorder (MDD) [2]. Induction of seizures is one of the most severe acute adverse effects of TMS therapy. The occurrence of seizures as acute adverse effect of TMS therapy has been extremely rare [3]. Personal history of seizure disorder, history of Traumatic Brain Injury (TBI), brain tumor, brain lesions, congenital brain malformations, sleep deprivation, alcoholism, use of drugs that decrease seizure threshold and recent withdrawal of anticonvulsant drugs, are other risk factors for seizures in patients undergoing TMS [4]. This is a case report of safety of dTMS treatment for Major Depressive Disorder (MDD) in a patient with past history of craniotomy for removal of medulloblastoma, ventriculosubgaleal shunt in place, history of mild TBI and intake of bupropion.

Case report

A 52- year-old Caucasian male with history of Major Depressive Disorder presented with worsening depression symptoms. He started seeking psychiatric services at age 47 after a Major Depressive Episode (MDE). He endorsed sad mood, anhedonia, hopelessness, hypersomnia, lack of motivation, lack of physical activity, weight gain, loss of libido, lack of functioning. These symptoms got worse in fall and winter months. Mood and energy levels improved during summer but never to the remission. He denied suicidal ideations. Screen for bipolar disorder, psychotic disorders, anxiety disorders, eating disorder was negative. There was no previous history of psychiatric hospitalizations, self-injurious behaviors, and suicide attempts. Trials of different medications citalopram, fluoxetine, sertraline, duloxetine, bupropion, aripiprazole, risperidone did not result in remission of MDD symptoms. He attended Cognitive Behavioral Therapy (CBT) and supportive psychotherapy sessions without change in depression symptoms. Patient was taking duloxetine 60mg daily and bupropion XL 300mg daily before starting TMS treatment. His mother has history of Major Depressive Disorder. Patient was average student in school. No history of learning disability. He worked as forklift driver, left work at age 47 due to depression. Patient denied recent or remote history of drug or alcohol use. Medical history is positive for paroxysmal atrial fibrillation, HTN, GERD, Esophageal stricture.

At age 48, he had mild TBI with loss of consciousness, multiple rib fractures, pneumothorax, vertebral compression fracture and pelvic fracture after a motor vehicle accident. He recovered from these injuries without residual symptoms. At age 18, sub occipital craniotomy with excision of fourth ventricular tumor was done. Total tumor was approximately 3.5 cm in diameter and appeared to fill the entire 4th ventricle. Histology reports showed tumor was medulloblastoma. During surgery ventriculosubgaleal shunt was placed. He also finished radiation therapy for tumor. Patient denied any recent complaints related to this surgery.

After critical consideration of risks and benefits of Transcarnial Magnetic Stimulation (TMS), treatment procedure was discussed in details with patient and his mother. He was told that risk of seizure during TMS therapy is rare but he was still at high risk due to previous surgery of brain tumor, ventriculosubgaleal shunt in place, traumatic brain injury and intake of bupropion [5]. Informed consent was obtained for TMS therapy. Medications were not changed before and throughout the TMS therapy, although it is well documented that bupropion can lower seizure threshold [6]. He clinically benefitted from this medication and was not ready to stop this medication. TMS was delivered using the H1-coil (Brainsway Deep TMS) to the left dorsolateral prefrontal cortex according to the FDA-approved protocol [7]: 18- Hz stimulation for 2 second per train with 20 seconds between trains, with 55 trains (1980 pulses) delivered over 20 minutes. The maximum intensity of the stimulation was 120% of Motor Threshold (MT). Initial treatment was delivered daily for 6 weeks and taper was started week 7. Three sessions delivered week 7, 2 sessions week 8 and one session week 9. TMS was discontinued after week 9. Hamilton Rating Scale for Depression (HAM-D) was done one week prior to the first session of TMS treatment and every 2 weeks after start

https://doi.org/10.1016/j.brs.2019.03.010

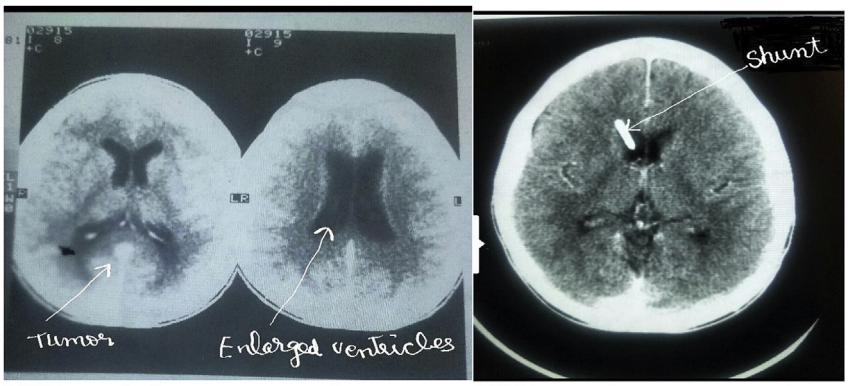

Fig. 1. MRI images before and after tumor removal.

of the treatment. HAM-D score was 22 prior to the first session of TMS and the score decreased from 22 to 5 after 4 weeks of the treatment. HAM-D score was 1 after 8 weeks of the treatment. Patient denied any side effects of TMS therapy. There were no episodes of incidental seizures throughout the treatment.

Discussion

Carefully weighing the balance of benefits versus potential harm is always important in the practice of medicine. Strictly adhering to the warning about increased seizure risk and depriving patients like this of a treatment that can improve their quality of life so dramatically is unjust. A meta-analysis estimated the risk of a seizure from repetitive TMS in subjects with previous history of epilepsy is 1.4% [8] and no cases of status-epilepticus. The deep TMS induced seizure rate is 0.087% overall and 0.028% per instructions for use rate (3). Therefore, in carefully selected cases, if depression is severe, treatment resistant, if alternative treatments have failed or are unavailable and person's functioning is impaired, benefits of TMS therapy can outweigh the potential harm from an induced seizure. This case report is to provide some reassurance about safety to trying this modality of treatment even in patients with several risk factors for seizures.

Declaration of interest

None.

Conflicts of interest

None.

Funding

2Authors of this case report did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Acknowledgements

We offer our special thanks to Dr. Khatuna Gurgenashvili, Susan Goetz, RN and Brianna Fielding, LPN. Dr. Gurgenashvili provided valuable neurology consultation. Susan and Brianna are clinical service members of TMS team.

References

[1] Substance Abuse and Mental Health Services Administration. Key substance use and mental health indicators in the United States: results from the 2017 national survey on drug use and health. Rockville,MD: Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration; 2018. HHS Publication No. SMA 18-5068, NSDUH Series H-53, https://www.samhsa.gov/data.

[2] O'Reardon JP, Solvason HB, Janicak PG, et al. Efficacy and safety of transcranial magnetic stimulation in the acute treatment of major depression: a multisite randomized controlled trial. Biol Psychiatry 2007;62:1208–16.

[3] Tendler A, Roth Y, Zangen A. Rate of inadvertently induced seizures with deep repetitive transcranial magnetic stimulation: brain Stimulation 2018;11(6):1410–4. Nov-Dec.

[4] Rossi S, Hallett M, Rossini PM, et al. Safety, ethical considerations, and application guidelines for the use of transcranial magnetic stimulation in clinical practice and research. Clin Neurophysiol 2009;120:2008–39.

[5] McClintock S, Reti I, Carpenter L, et al. Consensus recommendation for the clinical application of repetitive transcranial magnetic stimulation (TMS) in the treatment of depression. J Clin Psychiatry 2018;79(1):35–48. Jan- Feb.

[6] Mufti MA, Holtzheimer PE, Epstein CM, et al. Bupropion decreases resting motor threshold: a case report. Brain Stimul 2010;3:177–80.

[7] Brainsway deep TMS 510(k)K122288. http://www.accessdata.fda.gov/cdrh_docs/pdf12/k122288.pdf; 2013.

[8] Bae EH, Schrader LM, Machii K, et al. Safety and tolerability of repetitive transcranial magnetic stimulation in patients with epilepsy: a review of the literature. Epilepsy Behav 2007;10:521–8.

Jagdeep Kaur*, Irakli Mania
Keystone Rural Health Center, Keystone Behavioral Health, 110 Chambers Hill Dr, Chambersburg, PA, 17201, United States

* Corresponding author.
E-mail addresses: drjbenipal@gmail.com (J. Kaur).

15 February 2019
Available online 12 March 2019