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TMS treatment in a patient with seizures and refractory depression

Dear Editor:

We are reporting on a 69 year old white female with a history of complex partial seizures, resistant depression, generalized anxiety disorder, and panic disorder. The patient reported a 30 year history of Temporal Lobe Seizures and had three Generalized Seizures in the past too. She also had a history of two head injuries occurring in 2011 and 2017. She was on Felbatol 600 mg 1 ½ pills per day to control her seizures. She was referred to our clinic by her primary psychiatrist due to the refractory nature of her depression. She had previously tried Prozac, Buspar, Pristiq, Zoloft, Effexor, Adderall, Vyvanse, a Fisher Wallace Stimulator, Bright Light Therapy, and psychotherapy. She was on Fluoxetine 60 mg q day, Vyvanse 30 mg q day, and Buspar 10 mg BID at intake with continued symptoms of increased sleep, increased appetite, decreased energy, decreased concentration, decreased memory, decreased interests, decreased motivation, and indecisiveness. She also reported "bad seasonal depression". The risks/benefits of TMS treatment were discussed with both the patient and her husband, specifically with respect to seizures. This patient had other issues that may have contributed to an increased risk of seizures beyond just epilepsy, such as the history of a head injury and stimulant use. Both were agreeable to beginning treatment. She continued her Felbatol at her previous dose throughout treatment. At the start of TMS her Beck Depression Inventory [1] was elevated at 33 and her PHQ-9 [2] was 23. She received 31 treatments using the *Brainsway* dTMS at 120% MT over the left DLPFC without having a seizure. Her mood improved subjectively along with her Beck Depression Inventory which decreased to a level of 9 and her PHQ-9 decreased to a level of 6. By the end of treatment, she was off of Prozac.

Overall the risk of seizures with TMS in the general population is low, with only a marginal increase in seizures rates in patients with epilepsy. The general risks of seizure with TMS has been reported to be < 1/30,000 (<0.003%) per treatment exposure and <0.1% per acute treatment course by Carpenter et al., 2012 [3]. A recent report by Lerner et al., 2019 [4] reviewed TMS seizures from the years 2012–2016 by obtaining surveys from 174 health care respondents including a total of 318,560 TMS sessions with 24 reported seizures. 303,183 sessions were completed with Fig. 8 coils and 7577 with the H-coil. Lerner et al. reported the seizure risk ranged from 0.08/1000 for conventional figure-8 coils, 0.12/1000 for double cone coils, and 0.43/1000 in H-coils. There were only three seizures reported with the H-1 coil, but with the lower sample size of 7577 sessions out of the total 318,560 sessions, these numbers may have appeared higher. Tendler et al., 2018 [5] reported the seizure rate with the Brainsway H1 coil as 0.087%. This study used a PubMed review and all of the cases that were reported to the dTMS manufacturer. The numbers were assessed based on the number of head caps purchased between May 2010 and August 2018. Tendler et al. reported on 32 seizures and 35,443 caps purchased. The risk of seizures with Theta Burst is estimated at 0.02% by Oberman et al., 2011 [6]. Bae et al., 2007 [7] reported the seizure risk with TMS in patients who have epilepsy is less than 2% (4 of 280 patients). Vernet et al., 2012 [8] indicated that usually TMS related seizures in epilepsy patients are clinically similar to their own typical seizures and the risk of a seizure in temporal association with TMS is less than 2%. Pereira et al., 2016 [9] recounted 12/410 patients that had a history of epilepsy developed a seizure during TMS suggesting a crude rate of seizures per subject of 2.9%. Also, antiepileptic medications in the epilepsy patient may be a protective force in preventing seizures. Of course epilepsy in the presence of other risk factors may increase the likelihood of having a seizure such as sleep deprivation, substance abuse/withdrawal, a history of a head injury, excessive caffeine use, family history of seizures, electrolyte disturbance, eating disorders, and medications that lower the seizure threshold.

In summary, the risk of TMS treatment in the seizure patient must be weighed against that of untreated refractory depression. As the risk of seizures appears to be low and if present the seizure is similar to those already experienced by the patient, transcranial magnetic stimulation may provide a valuable treatment alternative for resistant depression in a patient with known seizure disorder.

Conflicts of interest

There are no conflicts of interest to report by any of the authors.

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