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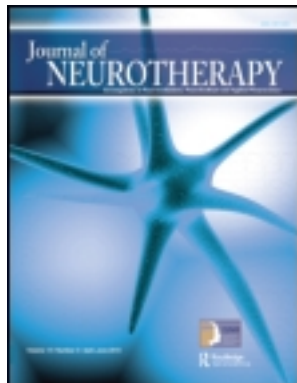
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FP02 BETA TRAINING FOR DRUG-RESISTANT DEPRESSION—A NEW PROTOCOL THAT USUALLY REDUCES DEPRESSION AND KEEPS IT REDUCED

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One hundred eighty-three patients with drug resistant depression were trained with 6 sessions of neurofeedback to reduce 2–7 Hz and increase 15–18 Hz at FP02 (the right fronto-polar orbital location). Remission or significant improvement ($\geq 50\%$) occurred in 84% of subjects, as judged by the Rush Quick Self-Rated Depression Inventory. An additional 9% of patients experienced partial improvement. Improvement was maintained for 1 year or longer in all but 3 patients (1% of the entire group). These results indicate good efficacy in reducing drug-resistant depression and maintenance of the reductions in the majority of patients.

INTRODUCTION

Mayberg (1997) delineated the circuitry of depression. She found that the subgenual cingulate region (Brodmann area 25; BA25) is metabolically overactive in treatment-resistant depression (Mayberg et al., 2005). Subsequently, she found that deep brain stimulation to BA25 could reduce this elevated activity and produce clinical benefit in some clients with refractory depression. Chronic stimulation of white matter tracts adjacent to the subgenual cingulate gyrus was associated with a striking and sustained remission of depression in four out of six patients. Antidepressant effects were associated with a marked reduction in local cerebral blood flow as well as downstream limbic and cortical sites, including the amygdala, as measured using position emission tomography. We reasoned that neurofeedback training to normalize activity in the BA25 area might well decrease depression, without having to resort to deep brain stimulation. We chose to train at “FP02,” a site used by Sebern Fisher to train patients with reactive attachment disorder and

patients with chronic anxiety and fear related to physical and sexual abuse (Fisher, 2009). This site is located just medial to the right eyebrow beneath the ridge of the orbit, between the eyebrow and the bridge of the nose. Fisher found that a protocol designed to inhibit 1–7 Hz and 21–30 Hz and to reward 5–9 Hz at FP02 (“FP02 alpha training”) was found to reduce fear in these individuals, presumably via inhibitory effects on the right amygdala, which has been implicated in major depressive disorder (Farahbod, Cook, Korb, Hunter, & Leuchter, 2010; LeDoux, 1996). She did not specifically evaluate her patients for an effect on depression. In preliminary studies, we found that up-training beta activity (15–18 Hz) was more effective at remediating depression than up-training alpha activity (8–12 Hz). In this article, we report results of FP02 beta training in patients with depression refractory to antidepressant therapy. This approach appears to significantly reduce or eliminate depression in the majority of patients, and the reduction appears to be long-lasting, with infrequent relapses.

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METHODS

One hundred eighty-three subjects with depression who had failed to respond to anti-depressant medication were evaluated in our neurology clinic. Their depression was rated using the Depression Self-Rated Test (Rush, Carmody, & Reivetz, 2000). Their ages ranged from 12 to 70 years. Sixty-six percent (110) were female, and 34% (73) were male. The degree of severity of their depression was rated using the Depression Self-Rated Test. Neurofeedback training was carried out, using BrainMaster equipment, twice weekly. Six (6) sessions of neurofeedback training were done at the FP02 site with eyes closed (audio-reward only). The patients were medication free at baseline and during the study (1 year). The patients gave no other history of medical or neurological disorder. No side effects or complications were noted during the study. Patients completed the Depression Self-Rated Test just prior to their first FP02 beta session, after their sixth session and 1 year later. Reward was given for decreasing 2–7 Hz activity and increasing 15–18 Hz activity. Each session was 20 min in duration.

RESULTS

Table 1 lists the initial average Depression Self-Rated Test Score (first column), the Depression Self-Rated Test score after six sessions of FP02 beta training (second column), and the Depression Self-Rated Test Score at 1 year (column 4). The third column notes the percentage change in the test comparing the postneurofeedback results with the preneurofeedback results. Table 2 indicates that overall, 84% of the subjects achieved a 50% or greater reduction in their depression score ($p < .0001$, Wilcoxon test). An additional 9% of the

TABLE 1. Average Reduction in Depression Scores

| Initial Depression Score | Depression Score Post-FP02 Training | Depression Score After 1 Year |
|--------------------------|-------------------------------------|-------------------------------|
| 11.8 ± 5.0 | 6.6 ± 4.2, $p < .001$ | 5.3 ± 4.3, $p < .001$ |

Note. $N = 186$.

TABLE 2. Response of Depression to FP02 Beta Training (Overall)

| Response of Depression to FP02 Beta Training (183 Subjects) | <i>N</i> | % of Total Subjects |
|---|----------|---------------------|
| Remission (≥50%) improvement | 153 | 84% |
| Partial improvement (20–50%) | 17 | 9% |
| Poor response (0–20%) | 13 | 7% |
| Recurrence | 3 | 1% |

patients experienced clinically significant partial improvement. Seven percent of the subjects experienced poor or no improvement. Three subjects who experienced good improvement initially experienced a partial reversal of clinically significant depression after some months (1% of the entire group).

Table 3 indicates the remission rate in subjects with mild, moderate, severe, or very severe depression prior to neurofeedback training. Table 2 also notes the failure rate in these groups. Remission was less common in the very severe group.

DISCUSSION

Our results indicate that FP02 Beta training is likely to significantly reduce drug resistant depression in most cases. The most severe cases are somewhat less likely to experience significant reduction in depression. These results suggest that FP02 Beta training is more likely to significantly decrease depression in a sustained fashion in such patients than the following treatments: switching medications (Connolly & Thase, 2011), psychotherapy (Trivedi, Nieuwsma, Williams, & Baker, 2009), electroshock therapy (Fink, 2001), transcranial magnetic stimulation (Fitzgerald & Daskalakis,

TABLE 3. Remission Rate with Varying Severity of Depression

| Severity | Self-Rating of Depression | Remission Rate (%) (≥50% Reduction) | Failure Rate (%)< |
|-------------|---------------------------|-------------------------------------|-------------------|
| Mild | 6–10 | 12/14 (86%) | 2/14 (14%) |
| Moderate | 11–15 | 54/58 (93%) | 4/58 (7%) |
| Severe | 16–20 | 44/51 (86%) | 7/51 (14%) |
| Very severe | 21–27 | 26/44 (59%) | 18/44 (41%) |

2011), LENS (Harper & O'Brien, 2011), vagus nerve stimulation (Lanin et al., 2002), deep brain stimulation (Mayberg et al., 2005), or frontal alpha asymmetry training (Hammond, 2005). The training is done relatively quickly (3 weeks or less) and is not associated with any significant side effects or complications.

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