Research report

Randomized comparison of ultra-brief bifrontal and unilateral electroconvulsive therapy for major depression: Clinical efficacy

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Abstract

Background: It has been suggested that electroconvulsive therapy (ECT) with an ultra-brief pulse width in combination with a bilateral electrode placement has diminished antidepressive efficacy, as compared to unilateral ultra-brief pulse ECT.

Objective: The antidepressive efficacy of bifrontal and right unilateral ultra-brief pulse (0.3 ms) ECT were compared.

Method: Eighty-one patients with a medication refractory depressive episode were treated with a course of bifrontal ultra-brief pulse ECT at 1.5 times seizure threshold or unilateral ultra-brief pulse ECT at 6 times seizure threshold by random assignment. The 17-item Hamilton Rating Scale for Depression (HRSD), Beck Depression Inventory, Clinical Global Impression and Patient Global Impression were administered at baseline and repeated weekly during and 1 and 6 weeks after the course, by a blinded rater.

Results: 64/81 patients (79%) completed the study, half of which were treated with bifrontal ECT. At the end of the course, 78.1% of the BF group and 78.1% of the UL group responded, whereas, 34.38% (N = 11) of the BF group and 43.75% (N = 14) of the UL group achieved strict remission criteria (HRSD-score ≤ 7). There were no significant differences between the patients given bifrontal ECT and those given unilateral ECT, although patients receiving unilateral ECT achieved response/remission-criteria after a smaller number of treatments.

Limitations: Relatively small number of subjects.

Conclusions: Using an ultra-brief pulse width, both BF and UL-ECT are efficacious, although patients receiving UL-ECT achieve response/remission-criteria after a smaller number of treatments.

Trial registry: http://www.controlled-trials.com/
Registration number: ISRCTN56570426

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1. Introduction

Electroconvulsive therapy (ECT) is a powerful acute treatment for severe and resistant depression (UK ECT Review Group, 2003). Since its introduction in 1938, the technique of ECT has changed considerably (Loo et al., 2006). In an ongoing attempt to improve efficacy while minimizing side-effects, both different electrode placements and stimulus parameters have been studied.

The traditional bitemporal electrode placement is very efficacious, but can induce problematic cognitive side-effects (Sackeim et al., 1993). Unilateral (UL) ECT produces less cognitive side-effects, but is also less efficacious, when used with the same stimulus dose as bitemporal ECT. Thus, with UL ECT, a
higher stimulus dose is required (Sackeim et al., 2000). Bifrontal (BF) ECT has been proposed as a potential candidate to become the placement of first choice (Abrams, 2002), in view of the fact that it exhibits an equal antidepressant efficacy than bitemporal ECT (Bailine et al., 2000), and has few cognitive side-effects (Ranjkesh et al., 2005). Therefore, BF ECT has been adopted by clinicians striving to optimize the efficacy/side-effect profile of ECT (Loo et al., 2006).

Modern ECT-devices no longer deliver a sine wave but a square wave brief pulse stimulus. An unresolved issue in the use of brief pulse stimulation concerns the optimal pulse width (American Psychiatric Association, 2001). From neurophysiologic observations, a pulse width of 0.1–0.2 ms is optimal for neuronal depolarization (Ranck, 1975). It has been suggested that the use of a stimulus with an ultra brief (UB) pulse width, i.e. 0.3 ms, is substantially more efficient in seizure induction, thus needing less energy (Hyman, 1999; Sackeim et al., 1994). Therefore it is supposed to produce less cognitive side-effects than standard pulse width (i.e. 0.5–2 ms) stimulation (Kim et al., 2007; Sackeim, 2004; Sackeim et al., 2008). Early research showed less retrograde amnesia with UB ECT as compared to brief pulse or sine wave ECT (Cronholm and Ottosson, 1963a; Valentine et al., 1964). In a recent retrospective study, UB UL ECT incurred less cognitive side effects than standard pulse UL ECT (Loo et al., 2007). In contrast, Pisvejc et al. (1998), in patients with schizophrenia, reported therapeutic and cognitive results of UB ECT similar to those obtained with standard pulse width ECT.

There has been a concern, however, of lower antidepressant efficacy of UB ECT, with patients needing additional treatment sessions (Cronholm and Ottosson, 1963b; Loo et al., 2007; Robin and De Tissera, 1982). Moreover, it has been suggested that the diminished antidepressive efficacy is encountered solely with the combination of an ultra-brief pulse width and bilateral, i.e. bitemporal, electrode placement, as compared to unilateral UB ECT or standard pulse ECT (Kim et al., 2007; Sackeim et al., 2008). These intriguing findings call for further study (Coffey, 2008; Lerer and Isserles, 2008). This study was set up to compare the efficacy of BF-ECT and UL-ECT in patients with a major depressive episode, using an ultra brief pulse width.

2. Methods

2.1. Study population

Patients with DSM-IV-defined major depressive disorder, either bipolar or unipolar, with or without psychotic symptoms, with an age of 18 years or older, who were referred for ECT and who had a minimum baseline score of 18 on the 17-item Hamilton Rating Scale for Depression (HRSD) (Hamilton, 1960) were eligible for study inclusion. Exclusion criteria included schizophrenia, neurological illness, cognitive disorder, substance abuse or dependence within the previous year, or ECT within the past 6 months. Patients provided written informed consent, and the study was approved by the Ethical Committee of the Catholic University of Leuven.

2.2. Treatment

Patients were withdrawn from antidepressants at least 3 days before starting ECT. Lorazepam up to 4 mg/day or clozadipine up to 40 mg/day was allowed if needed for agitation or anxiety. The patients received BF or UL ECT by random assignment. Anesthetic medications consisted of glycopyrrolate (0.2 mg), methohexital (1.0 mg/kg) or etomidate (0.2 mg/kg), and succinylcholine (1.0 mg/kg), all given intravenously. For BF placement, each electrode was placed 5 cm above the outer angle of the orbit on a line parallel to the sagittal plane (Letermendia et al., 1993). The d’Elia placement was used in UL-ECT (D’Elia, 1970). Treatment was given two times a week with a square–wave, brief-pulse, constant-current device (MECTA SR1 5000Q; Lake Oswego, OR, U.S.A.). At the first treatment, the subject’s seizure threshold (ST) was established by empirical titration. Subsequent treatments were given at 1.5 times the ST for BF placements, and 6 times the ST for UL placements. Stimulus train duration was the longest, stimulus frequency the lowest allowed for the dose selected. Motor seizure duration was monitored with the cuff technique, and two channels of EEG (frontal–mastoid) were recorded. Patients not achieving response or remitter-criteria after study completion were further treated at the discretion of the treating psychiatrist.

2.3. Evaluation of outcome

HRSD-scores and Clinical Global Impression (CGI)-scores were obtained at baseline and once every week, until response/remission, and at 1 and 6 weeks after finishing the course, by a blinded rater. Self-rated questionnaires were Beck Depression Inventory (BDI) and Patient Global Impression (PGI). No minimum or maximum number of treatments was imposed on patients who showed substantial clinical improvement. ECT was continued until patients achieved remission or had a plateau in improvement over at least two consecutive evaluations. Remission was defined according to both moderate and strict criteria. The moderate criteria (remitter 10), required a HRSD-score of ≤10. The strict criteria (remitter 7) required a HRSD-score of ≤7, which corresponds to full remission (Thase and Ninan, 2002). Response was defined as a decrease in HRSD-score of ≥50%. As part of a larger cognitive test battery, described elsewhere (Sienaert et al., 2008), Mini Mental State scores (MMSE) were obtained at baseline and at 1 and 6 weeks after finishing the course.

2.4. Statistical analysis

Baseline comparisons between patients given BF and UL ECT were analyzed with standard descriptive tests: chi-square tests (or exact tests) for categorical variables and t tests (or Wilcoxon two-sample test) for continuous variables. To examine the difference between BF and UL ECT in outcome (response, remission 10 and 7), chi-square tests were used. To examine differences between BF and UL-ECT in HRSD, BDI, CGI, and PGI scores at baseline, the last treatment, and 1 and 6 weeks after the course of the treatment, repeated measures analysis were performed with mixed effect models (Gueorgueva and Krystal, 2004). For these models, an unstructured form for the within subject-variance structure was chosen on the basis of likelihood ratio tests and information criteria (AIC). In addition, the mean number of sessions needed to meet response and remission criteria were compared between BF and UL ECT by t-tests. The latter analysis, however, is necessarily restricted to the group of patients who met these criteria. Therefore, also discrete time
3. Results

3.1. Participant flow

Eighty-one patients were randomized into a BF (N = 40) and a UL (N = 41) group. A total of 17 patients did not complete the study protocol. Nine patients (11.1%) refused further treatment before achieving remission: in the BF group 5 patients refused further treatment after a 18–67% change in their HRSD-score; in the UL group 3 patients stopped prematurely after a 16–38% decrease of the HRSD-score. In 3 patients electrode placement (BF: N = 2; UL: N = 1) was changed to bitemporal placement after 6-8 sessions because of sustained suicidality. In one patient right-unilateral placement was changed to left-unilateral placement because of sustained disorientation. In 3 patients the course was interrupted due to medical problems (bradycardia, pulmonary embolism) or complications (delirium). One patient dropped out because the anesthetic regimen was changed to propofol because of recurrent postictal agitation (Fig. 1).

Sixty-four patients completed the study. Of the completers, 32 (50%) patients received BF ECT, and 32 (50%) received UL ECT. Table 1 lists demographic and clinical characteristics of participants. The BF and UL groups did not differ in age, or the distributions of gender, history of past ECT, number of previous hospitalizations and number of days free of antidepressants, but differed in the presence of psychotic (delusional) symptoms (Fisher's exact test, p = 0.02). Methohexital was used more often in the BF group (χ²(1) = 4.27; p = 0.04). In addition, patients given BF and UL ECT did not differ in baseline HRSD (t(62) = 0.83; p = 0.41), BDI (t(62) = 1.09, p = 28), CGI (t(61) = 0.57, p = 0.57), and PGI-scores, (t (62) = 0.15, p = 0.88).

3.2. Efficacy: response and remission

Response criteria were met by 25 patients in the BF group (78.13%) and 25 patients in the UL group (78.13%). Remitter 10-criteria were met by 19 patients (59.38%) in the BF group and 23 patients (71.88%) in the UL group (χ²(1) = 1.11; p = 0.29). Remitter 7-criteria were met by 11 patients (34.38%) in the BF group and 14 patients (43.75%) in the UL group (χ²(1) = 0.59; p = 0.44). There was no difference in response/remission rates for patients with or without psychotic symptoms (Response: OR: 0.36, 95% CI: 0.066–1.914, p = 23; Remitter-10: OR: 0.57, 95% CI: 0.159–2.071, p = 0.40; Remitter-7: OR: 3.4, 95% CI: 0.931–12.787, p = 0.064). Patients using methohexital, however, had a higher chance of achieving remitter-7-criteria (Response: OR: 0.03).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Bifrontal</th>
<th>Unilateral</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (%)</td>
<td>N (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>19 (59.38)</td>
<td>23 (71.77)</td>
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<tr>
<td>Unipolar depression</td>
<td>26 (81.25)</td>
<td>25 (78.13)</td>
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</tr>
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<td>Bipolar depression</td>
<td>6 (18.75)</td>
<td>7 (21.88)</td>
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<tr>
<td>Psychotic depression</td>
<td>13 (40.63)</td>
<td>4 (12.50)</td>
<td>0.01</td>
</tr>
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<td>Unipolar, non-psychotic</td>
<td>17 (53.13)</td>
<td>21 (65.63)</td>
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<tr>
<td>Unipolar, psychotic</td>
<td>9 (28.13)</td>
<td>4 (12.50)</td>
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<tr>
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<td>7 (21.88)</td>
<td></td>
</tr>
<tr>
<td>Bipolar, psychotic</td>
<td>4 (12.50)</td>
<td>0 (0.00)</td>
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<td>Axis II disorder</td>
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<td>13 (40.63)</td>
<td>0.03</td>
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<td>8 (25.00)</td>
<td>4 (12.50)</td>
<td>0.34</td>
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<td>Age (years)</td>
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<td>54.40 (13.11)</td>
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<td>Previous hospitalizations (no.)</td>
<td>3.67 (2.70)</td>
<td>3.65 (3.12)</td>
<td>0.50</td>
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<td>Age of first hospitalization (year)</td>
<td>43.82 (14.33)</td>
<td>43.30 (15.18)</td>
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<tr>
<td>Days free of antidepressants</td>
<td>8.83 (4.35)</td>
<td>7.06 (4.40)</td>
<td>0.06</td>
</tr>
</tbody>
</table>

Fig. 1. Participant flow.
1.06, 95% CI: 0.289–3.876, \( p = .93 \); Remitter-10: OR: 1.24, 95% CI: 0.398–3.878, \( p = .71 \); Remitter-7: OR: 3.8, 95% CI: 1.124–12.999, \( p = .032 \).

In the BF group, mean HRSD-scores decreased from 30.25 ± 6.46 at baseline to 11.22 ± 6.00, 11.60 ± 7.70 and 8.10 ± 5.67, at the end of the treatment course and 1 and 6 weeks after the treatment course, respectively. In the UL group, mean HRSD scores decreased from 29.03 ± 5.18 to 11.03 ± 7.25 and 9.55 ± 6.30, at the end of the treatment course and 1 and 6 weeks after the treatment course, respectively. HRSD-scores decreased significantly over time in both BF and UL ECT groups (main effect time: \( F(3,62)=145.54, p<.0001 \)). There were no significant differences between the two treatment groups (group, \( F(1,62)=.21, p = .65 \); group×time, \( F(3,62)=.44, p = .72 \)).

In the BF group, mean BDI-scores decreased significantly from 39.28 ± 10.64 at baseline to 14.58 ± 9.98, 14.52 ± 11.78 and 11.40 ± 10.65, at the end of the treatment course and 1 and 6 weeks after the treatment course, respectively, and from 36.50 ± 9.84 at baseline to 13.59 ± 12.43, 15.17 ± 12.33 and 12.65 ± 10.93, at the end of the treatment course and 1 and 6 weeks after the treatment course, respectively, in the UL group (main effect time: \( F(3,62)=75.39, p<.0001 \)). Again, there were no significant differences between the two treatment groups (group, \( F(1,62)=.03, p = .87 \); group×time, \( F(3,62)=.35, p = .79 \)).

In the BF group, mean CGI-scores decreased significantly from 5.77 ± 0.80 at baseline to 2.10 ± 0.87, 2.97 ± 1.33 and 2.15 ± 1.23, at the end of the treatment course and 1 and 6 weeks after the treatment course, respectively, and from 5.66 ± 0.83 at baseline to 2.07 ± 1.10, 2.87 ± 1.28 and 2.40 ± 1.27, at the end of the treatment course and 1 and 6 weeks after the treatment course, respectively, in the UL group (main effect time: \( F(3,62)=181.27, p<.0001 \)). There were no significant differences between the two treatment groups (group, \( F(1,62)=1.75, p = .16 \); group×time, \( F(3,62)=.87, p = .76 \)).

In the BF group, mean PGI-scores decreased from 6.31 ± 0.82 at baseline to 2.52 ± 1.12, 3.47 ± 1.59 and 2.55 ± 1.70, at the end of the treatment course and 1 and 6 weeks after the treatment course, respectively, and from 6.28 ± 0.85 at baseline to 2.52 ± 1.21, 3.47 ± 1.83 and 2.65 ± 1.76, at the end of the treatment course and 1 and 6 weeks after the treatment course, respectively, in the UL group (main effect time: \( F(3,62)=145.95, p<.0001 \)). Again, there were no significant differences between the two treatment groups (group, \( F(1,62)=.03, p = .87 \); group×time, \( F(3,62)=.03, p = .99 \)).

### 3.3. Speed of response

Patients in the UL group met response criteria after a mean of 7.76 ± 2.57 treatment sessions, which is significantly less than the number of treatment sessions in the BF group (10.08 ± 4.49; \( t(38.2)=2.24; p = .03 \)) (Fig. 2). There were no significant differences in the number of treatment sessions needed to meet

![Fig. 3. a–b–c Estimated hazard and survivor functions for respectively (a) remission 10, (b) remission 7, and (c) response in two groups with bifrontal and unilateral electrode position.](image-url)
The estimated hazard and survivor functions of these models for response, remission 10, and remission 7 are depicted in Fig. 3.

In addition, discrete time hazard models were estimated to compare both groups, adjusted for psychotic symptoms and the anesthetic used, two potentially confounding variables.

For response, the estimated odds of meeting response criteria are 1.5 times higher for each additional clinical evaluation, i.e. after 2 additional treatment sessions ($p < .0001$; 95% CI: 1.294–1.840). Moreover, the estimated odds of meeting response criteria are 2.06 times higher for the UL group in comparison with the BF group at each evaluation, which is marginally significant ($p = .06$; 95% CI: 0.973–4.370).

For remission 10, the estimated odds of meeting remitter-10 criteria are 1.5 times higher for each additional clinical evaluation ($p < .0001$; 95% CI: 1.251–1.715). The estimated odds of meeting remitter-10 criteria are 2.3 times higher in the UL group in comparison with the BF group ($p = .03$; 95% CI: 1.090–4.980) at each evaluation.

For remission 7, the estimate odds of meeting remitter-7 criteria are 1.3 times higher for each additional evaluation ($p = .0008$; 95% CI: 1.134–1.612). The estimated odds of meeting remitter-7 criteria are 2.7 times higher in the UL group in comparison with the BF group ($p = .04$; 95% CI: 1.065–8.893) at each evaluation.

Speed of response/remission did not differ significantly in patients with psychotic depression and patients with non-psychotic depression.

### 3.4. Cognitive side-effects

MMSE-scores at baseline and at 1 and 6 weeks after the course are reported in Table 2. The two groups did not differ in baseline standardized Mini-Mental State-scores. In both groups the scores increased significantly over time ($F(2,59) = 14.07$, $p < .0001$); there was no significant interaction between group and time ($F(1.56) = .76$, $p = .4733$).

### 3.5. Prediction of response

Using logistic regression, none of the demographic or clinical variables listed in Table 1 could predict response or remission. Next, an ordinary regression model was used to predict differences in HRSD scores between baseline and endpoint on the basis of GAF, CGI, PGI, the presence of psychotic symptoms and bipolar disorder at baseline. Forward, backward and stepwise selection procedures all indicated that the presence of psychotic symptoms (regression weight = 4.28, $t(1) = 2.06$, $p = .04$) and higher CGI-scores (regression weight = 3.65, $t(1) = 3.25$, $p = .002$) at baseline predict a larger decrease in HDSR-scores. In this model 24% of the variance in differences in HRSD scores was explained by differences in the presence of psychotic symptoms and CGI-scores at baseline.

### 3.6. Stimulus and treatment parameters

According to the protocol, pulse frequency was kept as low as possible, with the longest train duration allowed for the dose selected. In the BF group a mean frequency of 46.90 Hz was used, while in the UL group mean frequency was 65.76 Hz ($p = .0015$). Train duration in the BF group was 7.60 s, while in the UL group it was 7.98 s ($p = .0005$). Patients in the BF group had a mean seizure threshold of 89.35 ± 70.44 mC; patients in the UL group had a mean seizure threshold of 38.40 ± 24.92 mC ($p < .0001$). In the BF group, the number of stimulations to reach the threshold was significantly higher than in the UL group (1.87 versus 1.28; $p = .0052$). Mean stimulus dose in the BF group was 183.96 mC. In the UL group the mean dose was 278.40 mC ($p = .0025$). The mean stimulus dose at the last treatment session was 213.71 ± 155.31 mC and 311.55 ± 206.74 mC for the BF group and UL group respectively ($p = .01$). There were no significant differences between the BF group and the UL group in motor seizure duration or EEG seizure duration during the first or the last treatment session (Table 2).

### 4. Discussion

Sackeim et al. (2008) found ultra-brief bitemporal ECT to have markedly inferior antidepressant efficacy than ultra-brief unilateral ECT. Our results show that this observation does not apply to ultra-brief bifrontal ECT, as the response/remission rates after ultra-brief BF ECT and ultra-brief UL ECT are comparable. There is, however, an advantage of ultra-brief UL ECT, when speed of response is concerned. Patients treated with UL ECT met response criteria after a significantly lower number of treatment sessions. Moreover, at each point in time, the estimated odds of achieving response and remission criteria are higher for patients receiving UL ECT, as compared to patients receiving BF ECT. Whether or not this advantage relates to the use of a

Table 2

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Bifrontal (50%)</th>
<th>Unilateral (50%)</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$N = 32 (50%)$</td>
<td>$N = 32 (50%)$</td>
<td></td>
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<tr>
<td>Methohexital dose</td>
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<td>75.00</td>
<td>16</td>
</tr>
<tr>
<td>Etomidate</td>
<td>8</td>
<td>25.00</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Succinylcholine dose</td>
<td>63.5</td>
<td>11.82</td>
<td>64.06</td>
</tr>
<tr>
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<td>66.13</td>
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<td>65.25</td>
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<tr>
<td>Etomidate dose</td>
<td>12.75</td>
<td>1.83</td>
<td>13.37</td>
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<td>Seizure threshold (mC)</td>
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<td>70.44</td>
<td>38.40</td>
</tr>
<tr>
<td>Number tirations</td>
<td>1.87</td>
<td>0.95</td>
<td>1.28</td>
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<tr>
<td>Frequency (Hz)</td>
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<td>65.77</td>
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<td>Final treatment dose (mC)</td>
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<td>155.31</td>
<td>311.55</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Motor seizure duration</td>
<td>58.74</td>
<td>19.82</td>
<td>62.19</td>
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<td></td>
<td>Motor seizure duration – first treatment</td>
<td>41.17</td>
<td>12.56</td>
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<td></td>
<td>Motor seizure duration – last treatment</td>
<td>91.52</td>
<td>45.16</td>
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<tr>
<td></td>
<td>EEG seizure duration – first treatment</td>
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</tr>
<tr>
<td></td>
<td>MMSE post 1</td>
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<td>2.60</td>
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<td></td>
<td>MMSE post 6</td>
<td>28.63</td>
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</tr>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
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</table>
stimulus with an ultra-brief pulse width is not known. In one other study, high dose standard pulse width (1 ms) UL ECT also yielded a faster antidepressant effect than low dose BF ECT (Heikman et al., 2002).

Although the response rates in this study are higher than response rates reported with high dose standard pulse UL ECT (Sackeim et al., 2000), large randomized trials using standard pulse bitemporal ECT yielded higher remission rates (>80%) (Petrides et al., 2001). Moreover, these high remission rates are generally achieved after a smaller number of treatments (8) (Husain et al., 2004). A slower speed of response of ultra-brief UL ECT, as compared to standard pulse UL ECT, was also reported in a retrospective comparison (Loo et al., 2007). Thus, patients treated with ultra-brief ECT may require more treatments to achieve remission.

Although it was shown that increasing the frequency of the stimulus does not improve efficacy (Devanand et al., 1998; Swartz and Manly, 2000), Abrams (2002) argued that the weak efficacy of ultra-brief bitemporal ECT, might be accounted for by the low stimulus frequency, and suggests that efficacy can be augmented by employing higher stimulus frequencies, perhaps in the 75–150 Hz range. In our study, pulse frequency was kept as low as possible (mean total group 56.5 Hz), with the longest train duration allowed for the dose selected (mean total group 7.8 s), and response rates were in the normal range. Nevertheless, it cannot be ruled out that the use of higher frequencies, in combination with ultra-brief pulse width, could have yielded higher clinical efficacy.

Studies using pulse waveforms have generally observed a lower seizure threshold with UL placements (Sackeim et al., 1987; Weiner, 1980). As expected, patients in the UL group had a significantly lower seizure threshold than patients in the BF group. Seizure thresholds observed in this study are comparable to those reported by Sackeim (2004) and Loo et al. (2007) and are lower than ST reported with standard pulse width ECT (Bailine et al., 2000; Heikman et al., 2003), thus confirming the superior electrical efficiency of ultra-brief pulse ECT.

In this study, the presence of psychotic symptoms and a higher CGI-score predicted a larger decrease in HDSR-scores, corroborating the notion that ECT works better in more severe depressive conditions. This is in accordance with previous studies showing higher response rates in patients with psychotic depression (Petrides et al., 2001). Although the presence of psychotic symptoms predicted a larger decrease of depressive symptoms, it did not predict response/remission per se, nor did it account for the faster response/remission, observed in patients receiving UL-ECT.

It is unsure whether the finding that patients using methohexitol had a higher chance of achieving remitter-7 criteria is clinically meaningful, since there was no difference in the chance of achieving response and remitter-10 criteria, and since, to the best of our knowledge, it has never been shown that methohexitol has an influence on the outcome of ECT (Hooten and Rasmussen, 2008).

MMSE-scores, as part of a more thorough cognitive evaluation (Sienaert et al., 2008), showed an improvement in global cognitive status both during and after the treatment course, in both treatment groups, confirming the cognitive safety of ultra-brief ECT (Loo et al., 2007).

5. Conclusion

The combination of a BF electrode placement and an ultra-brief pulse width has antidepressant efficacy. Moderate dose ultra-brief BF ECT yielded equal response/remission rates as high dose ultra-brief UL ECT, and neither of the treatment techniques impair global cognitive function, as measured with the MMSE. Patients do respond faster, however, when treated with ultra-brief UL ECT.

Further study with ultra-brief pulse widths, manipulating other critical features of the stimulus configuration, such as pulse frequency and duration, are warranted, since ultra-brief ECT may be associated with substantially lesser cognitive impairment. More research into this promising approach is needed to clarify these issues before it is adopted into general clinical practice.

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Conflict of interest

The authors declare no conflicts of interest.

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