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Brief report

# Maintenance electroconvulsive therapy up to 12 years

Alby Elias [a,*], Saji J. Chathanchirayil [a], Ravi Bhat [a], Joan Prudic [b]

[a] Rural Health Academic Centre, The University of Melbourne, Goulburn Valley Health Shepparton, Victoria 3630, Australia
[b] New York State Psychiatric Institute, Columbia University, New York, NY, USA

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ABSTRACT

*Background:* Maintenance electroconvulsive therapy (m-ECT) is effective in preventing recurrences of depressive episodes. There is little information on long-term m-ECT extending over several years and its impact on cognitive functions. This study was an attempt to determine the efficacy and side effects of long-term m-ECT.
*Method:* Depressive episodes and admissions before m-ECT for a period equal to the duration of m-ECT and during m-ECT were compared using medical records. Cognitive functions assessed by Mini-Mental State Examination (MMSE) before and after m-ECT were compared along with the review of Neuropsychiatry Unit Cognitive Assessment Tool (NUCOG).
*Results:* 17 patients had m-ECT that extended from 6 to 153 months (mean 39, SD=44.46). The average number of episodes before and during m-ECT was 2.47 (SD=2.23) and 0.88 (SD=1.31) respectively (Wilcoxon ranked test $Z=3.06$, $r=0.55$, two-tailed $p=0.002$). Average number of admissions dropped from 2.05 (SD=1.88) to 0.23 (SD=0.43) during m-ECT ($Z=3.471$, $r=0.71$, $p=0.001$). The average time to recurrence was 24.24 months (SD=25.20) with longest depression free survival of 105 months. There was no significant difference in MMSE score before and after the commencement m-ECT or progressive deterioration in NUCOG score.
*Limitations:* This study was limited by retrospective nature of data collection, small sample size, confounding effects of antidepressants along with m-ECT and absence of a highly sensitive cognitive screening tool that can capture all types of cognitive impairments following m-ECT.
*Conclusions:* In a naturalistic setting the efficacy of m-ECT may extend over several years while cognitive functions remain largely unaffected.



## 1. Introduction

Electroconvulsive Therapy (ECT) is an effective treatment for depressive disorders, but relapse is common after discontinuation despite continued antidepressant treatment (Jelovac et al., 2013; Sackeim et al., 2001). Continuation ECT (c-ECT) refers to treatments in the first 6 months following remission to prevent relapse (American Psychiatric Association, 2001). Maintenance ECT (m-ECT) is the treatment extending beyond 6 months to prevent recurrences, which, unlike c-ECT, has no fixed end point. Several studies support the use of m-ECT in preventing recurrences (Gagné et al., 2000; Navarro et al., 2008; Nordenskjöld et al., 2013; O'Connor et al., 2010; van Schaik et al., 2012). There is little information on efficacy and adverse effects, particularly on cognitive functions with long-term m-ECT. In this study we report the efficacy and cognitive side effects of long-term m-ECT.

## 2. Methods

We identified the participants for this retrospective study from the medical records of Goulburn Valley Health (GV Health), which is a teaching hospital affiliated to The University of Melbourne. The inclusion criteria were: (1) Diagnosis of depressive episode or recurrent depressive disorder based on the International Classification of Diseases, Tenth Edition (ICD-10) criteria. (2) Remission from depression after an acute course of ECT. (3) Treatment with m-ECT. Exclusion criteria were (1) diagnosis of schizophrenia, schizoaffective disorder or substance induced mood disorder as indication for m-ECT and (2) duration of ECT less than 6 months.

Two psychiatrists (AE and SJC) audited the medical records. The end point of acute ECT was clinical symptomatic remission recorded in the clinical notes. Any ECT from the time of remission until 6 months was considered as c-ECT and treatment after six months as m-ECT (American Psychiatric Association 2001, Task-force Report). The duration of m-ECT was calculated as time to recurrence of depression or termination of m-ECT or end of the study. All ECT-related treatment decisions such as re-titration and medication changes such as introduction of new anti-depressants,

* Corresponding author. Tel.: +61 417325223; fax: +61 358236061.
*E-mail address:* alby.elias@unimelb.edu.au (A. Elias).

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dose increments or augmentation treatment were recorded. All ECT-related decisions were made following consensus at weekly ECT team meetings attended by consultant psychiatrists and ECT coordinator nurse. The primary outcome was recurrence, defined as clinical symptoms that met ICD-10 criteria for depression as diagnosed by attending psychiatrists after 6 months of remission of the index episode (Frank et al., 1991). The secondary outcomes were admission to psychiatric in-patient units, time to recurrence and adverse effects. We used Standardised Mini-Mental State Examination (S-MMSE) (Molloy and Standish, 1997) and NUCOG, a tool that assesses cognitive functions in detail including executive functions (Walterfang et al., 2006). For the purpose of this study, for each participant, pre-m-ECT episodes and hospital admissions were limited to those that occurred during a period equal to the duration of m-ECT. Consent for m-ECT was obtained for each treatment according to local state guidelines (Victorian Government Department of Human Services, 2009). The local institutional review board approved this study.

## 3. Results

There were 17 patients who had m-ECT (Table 1).

### 3.1. The treatment

All patients received ECT using Thymatron system as per the local dose titration protocol: first treatment with Right Unilateral ECT (RUL-ECT) was 10% (50.4 mC) for males and 5% (25.2 mC) for females, increasing by 5% until threshold was achieved. Supra-threshold treatment was given at three to six times threshold. Dose titration was similar for both bitemporal (BT-ECT) and bifrontal (BF-ECT) placements but supra-threshold treatments were given at 1.5 to 2 times threshold. For Right Unilateral Ultrabrief ECT (RUL-UB-ECT) first treatment was at 2% (9.9 mC) with threshold determined by successive 2 times increments and suprathreshold dose 6 times threshold.

10 patients had RUL-ECT, 8 had BT-ECT and two had BF-ECT. Some patients had more than one type of placement. Seven patients received standard RUL-ECT (pulse width $>0.5$ ms). The remaining three patients were switched to RUL-UB-ECT (0.3 ms) when they developed cognitive impairment on RUL-ECT. Two of these patients continued to receive m-ECT without recurrence for a year until studied. One patient had a recurrence after 6 months of switching to RUL-UB-ECT, but this patient had history of three recurrences in 12 years of RUL m-ECT, with the first of three recurrences occurring within 6 months of starting m-ECT.

**Table 1**
Patients' and illness characteristics.

| Variables | | Number | Standard deviation |
|---|---|---|---|
| Gender | Females | 13 | |
| | Males | 4 | |
| Age range | | 39–79 years | ± 8.93 |
| Average Age | | 66.29 years | |
| Duration of illness | | 3–39 years | ± 11.52 |
| Average duration of illness | | 17.29 years | |
| Average age at first ECT | | 49.88 years | ± 14.83 |
| Range of duration of m-ECT | | 6 months to 153 months | |
| Average duration of m-ECT | | 39.00 months | ± 44.46 |

The frequency of m-ECT varied for every patient over the course of m-ECT. At the start 13 patients received weekly, two received biweekly and another two received three-weekly m-ECT. The frequency was reduced over time with the mean frequency for the whole cohort being 2.11 treatments in a month. Changes to treatment intervals were made as clinically indicated, typically in response to early signs of recurrence. In all, treatment intervals were reduced for six patients during m-ECT; three had recurrences requiring new acute course of ECT and in the other three, early signs remitted with increased frequency. Once the treatment dose was established at the beginning of m-ECT the same dose was continued until re-titration was attempted. Seven patients needed re-titration for changes in electrode placement and clinical presentation accompanied by poor EEG parameters.

Two common indications for m-ECT were failure to respond to pharmacological treatments and previous positive response to ECT. Evidence of its effectiveness was the most common reason for ongoing m-ECT. All patients received antidepressants throughout the course of m-ECT. In 7 patients new anti-depressants were started and in another three patients existing anti-depressant doses were increased before m-ECT.

### 3.2. Duration of m-ECT

It extended from 6 months to 153 months (Table 1). Five patients had m-ECT in more than one phase because of discontinuation of m-ECT; in two, it was because they were doing well and in another three because of recurrence of depression requiring an acute course of ECT. In such cases the duration of all phases were added to obtain the total duration of m-ECT. The remaining patients received m-ECT without a break since commencement (Fig. 1).

### 3.3. Recurrence and survival time

During m-ECT 10 patients (58.8%) remained free from recurrence of depression. The average number of depressive episodes for the whole cohort before m-ECT was 2.47 (SD=2.23) compared to 0.88 (SD=1.31) during m-ECT. On Wilcoxon ranked sign test this was a significant difference at 95% confidence interval with a large effect size (two tailed $p=0.002$, $Z=3.06$, and $r=0.55$). There was a significant decrease in the number of admissions during m-ECT (2.05 (SD=1.88) versus 0.23 (SD=0.43) two tailed $p=0.001$, $Z=3.471$, and $r=0.71$). Mean depression-free survival time was 24.24 months (SD=25.20) with the longest period of 105 months (Fig. 2). During recurrence free period all patients, except one, functioned at their pre-morbid level of functioning. One patient had co-morbid Alzheimer's dementia, which progressively worsened.

### 3.4. Cognitive functions and other adverse effects

Pre-m-ECT and post-m-ECT S-MMSE scores were available in all patients except one. The pre-m-ECT S-MMSE score varied from 17/30 to 30/30 (mean 26.64, SD=5.1) and post-m-ECT S-MMSE score from 22/30 to 30/30 (mean 26.71, SD=4.42) with no

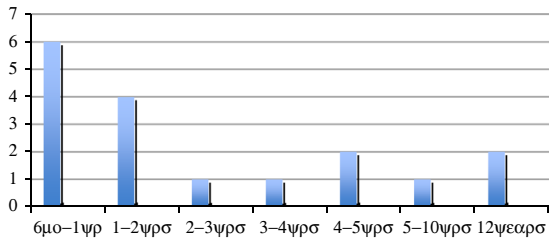


**Fig. 1.** Frequency distribution of duration of m-ECT.