Original Article

Cognitive Effects in Psychiatric Inpatients Treated with Electroconvulsive Therapy

Nantawat Sitdhiraksa MD, PhD[1], Naratip Sanguanpanich BSc[1],
Phiangbunpa Natithamkul MD[1], Kamonporn Wannarit MD[1],
Nattha Saisavoey MD[1], Woraphat Ratta-apha MD, PhD[1], Pornjira Pariwatcharakul MD, MSc[1]

[1] Department of Psychiatry, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand

Objective: To study cognitive ability in psychiatric inpatients before and after receiving electroconvulsive therapy.

Materials and Methods: The study was a prospective observational cohort. The authors administered Mini-Mental State Examination, Thai version [MMSE-Thai 2002] with patients, who treated with non-maintenance electroconvulsive therapy in the inpatient psychiatric unit, Siriraj Hospital, before ECT, and at 0 to 3 days, 2-week and 2-month after ECT. The data were analyzed by descriptive statistical analysis and one-way repeated measures ANOVA.

Results: 29 subjects participated in the present study. The intention-to-threat analysis showed a statistically significant difference in MMSE scores before ECT and at 0 to 3 days, 2-week, and 2-month after ECT. There was cognitive function decline at 0 to 3 days after treatment but improved at 2-week, and 2-month after ECT. There were significant differences in attention-calculation and recall of cognitive function domains.

Conclusion: The difference of MMSE showed declination in cognitive function in 0 to 3 days after ECT. However, the cognitive function improved significantly at 2-weeks and 2-months after ECT.

Keywords: Electroconvulsive therapy, Cognitive effect, MMSE

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With the advance in Medicine, an outcome of treatment of psychiatric disorder is promising. Psychiatric treatment resulted in full remission, returning to previous occupational and social functioning levels. There are different treatment modalities in Psychiatry including psychopharmacological treatment, psychotherapy, group therapy, and even electroconvulsive therapy [ECT]. ECT is one of the treatment modalities usually used in patients with severe depression, severe manic symptom or catatonic symptoms. The most common limitation is the cognitive impairment side effects of ECT. Most of the cognitive impairment associated acute period after ECT, is usually limited to the first 3 days after ECT[1]. Though memory loss was reported in one-third of the patients treated with ECT, it was concluded that there was no evidence of persistent memory loss associated with ECT[1,2]. The systemic review and meta-analysis showed that cognitive ability usually recovered to pretreatment level or even improved beyond baseline level after 15 days post ECT[1]. No significant cognitive impairment in a long-term also evidenced in adolescence and geriatric population[3,4]. The authors aimed to examine the changes in the cognitive function of the patients before ECT, and 0 to 3 days, 2-week, and 2-month after ECT.

Correspondence to:
Sitdhiraksa N, Department of Psychiatry, Faculty of Medicine Siriraj Hospital, Mahidol University 2 Wanglang Road, Bangkoknoi, Bangkok 10700, Thailand.
Phone: +66-2-4194293
E-mail: nantawat.sit@mahidol.edu

Materials and Methods

In the present study, the authors performed a prospective observational cohort study at the inpatient unit at the University Hospital, Siriraj Hospital, Mahidol University from October 2009 to September 2010. The study was approved by Siriraj Institutional Review

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Board (346/2555 (EC2)). All the patients in the present study received non-maintenance ECT by the DSM-IV-TR diagnoses of major depressive disorder, bipolar I disorder, schizophrenia, or schizoaffective disorder. The authors excluded patients who were diagnosed with delirium and dementia. If the patients had received prior ECT treatments, the last session must be at least 4 months. Written informed consents were obtained from the patients or their guardians. The patients were more than 18 years old, able to read and able to engage in doing the Mini-Mental State Examination: Thai version [MMSE-Thai 2002]. The authors administered the MMSE for 4 times over the period of the trial; before the first ECT session, at 0-3 days, 2 weeks, and 2 months after the last ECT session. The authors used SPSS 18 to analyze data. The authors used *p*-value with Bonferroni correction, one-way repeated measures ANOVA, in testing the significant differences within groups.

Ethical consideration

The present study was conducted with the approval of Siriraj Institutional Review Board [SIRB], Faculty of Medicine, Siriraj Hospital, Mahidol University; Si. 505/2012.

Results

The mean MMSE score at 0-3 days after ECT (24.3) was lower than the mean score before ECT (24.8) (*p*-value = 1.000). At 2-week after ECT, the mean MMSE score was higher than the mean score before ECT (26.1 vs. 24.8, *p*-value = 0.186). However, the mean MMSE score at 2-month after ECT was significantly higher than the score before ECT (26.5 vs. 24.8, *p*-value = 0.001). The mean MMSE score at 2-month was also significantly higher than at 0 to 3 days (26.5 vs. 24.3, *p*-value = 0.001) but not at the 2-week after the ECT (26.5 vs. 26.1, *p*-value = 1.000) (Figure 1).

When looked at the sub-score scales, there were only the sub-scores of attention-calculation (*p*-value = 0.020), and recall (*p*-value = 0.009), were significantly different among the total of 10 different sub-score scales by one-way repeated ANOVA with Bonferroni's correction (Table 2). There was also no significant difference in cognitive level between unilateral and bilateral electrode placement at any intervals of treatments (*p*-value >0.05).

Discussion

In the present study, subjects who received ECT had a non-significant decrease in cognitive function determined by MMSE-Thai 2002. There were significant improvements in cognitive function at 2-month after ECT when compared to pre-ECT, and 0 to 3 days after treatment. Only the sub-scale of attention-calculation and recall of the cognitive function determined by MMSE-Thai 2002 were significantly

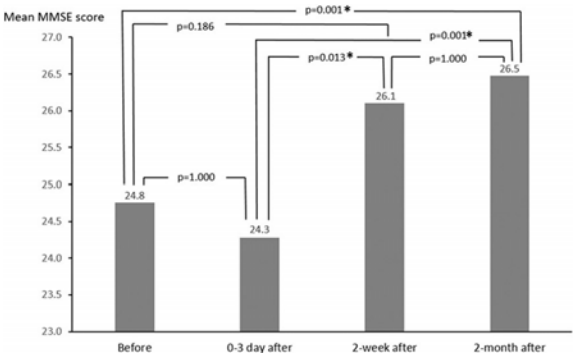

Figure 1. Mean MMSE-Thai 2002 score before and after ECT, intention to treat analysis (*p<0.05).

Table 1. Demographic data

Variables	n (%)
Age (years): mean (SD)	44 (15.5)
Sex	
Male	16 (55.2)
Female	13 (44.8)
Marital status	
Single	17 (58.6)
Married	11 (37.9)
Divorced	1 (3.5)
Education	
0 to 12 years	12 (41.4)
13 years or more	17 (58.6)
Psychiatric diagnosis	
Schizophrenia	13 (44.8)
Schizoaffective disorder	1 (3.5)
Bipolar disorder	10 (34.5)
Major depressive disorder	5 (17.2)
Amphetamine induced psychotic disorder	1 (3.4)
Number of subjects with no previous ECT	19 (65.4)
Number of ECT: mean (SD)	8.5 (2.6)
ECT modality	
Unilateral	21 (72.5)
Bilateral	8 (27.5)
Indication for treatment	
Non-response to medication	24 (82.8)
Severe clinical symptom	6 (20.7)
Previous history of good response to ECT	7 (24.1)
Intolerance to medication side effect	6 (20.7)

Table 2. Sub-score of MMSE-Thai 2002 (intention to treat analysis)

Sub-score	Score range	Mean (min, max)				*p*-value
		Before	0-3 days after	2-week after	2-month after	
Orientation	0 to 10	8.41 (4, 10)	8.10 (2, 10)	8.62 (5, 10)	8.86 (5, 10)	0.058
Registration	0 to 3	3 (3, 3)	3 (3, 3)	3 (3, 3)	3 (3, 3)	N/A
Attention&Calculation	0 to 5	3.24 (0, 5)	3.10 (0, 5)	3.69 (0, 5)	3.69 (0, 5)	0.020
Recall	0 to 3	2.03 (0, 3)	2.07 (0, 3)	2.41 (0, 3)	2.45 (1, 3)	0.009
Naming	0 to 2	1.93 (1, 2)	1.97 (1, 2)	1.97 (1, 2)	2 (2, 2)	0.572
Repetition, n (%)	0 to 1	15 (52%)	17 (59%)	20 (69%)	18 (62%)	0.272
3-stage command	0 to 3	2.86 (2, 3)	2.83 (1, 3)	2.90 (2, 3)	3 (3, 3)	0.160
Reading and perform, n (%)	0 to 1	28 (97%)	29 (100%)	29 (100%)	29 (100%)	0.392
Writing a sentence, n (%)	0 to 1	26 (90%)	25 (86%)	26 (90%)	28 (97%)	0.516
Copying, n (%)	0 to 1	26 (90%)	22 (76%)	27 (93%)	26 (90%)	0.087

N/A = not available to analyze

affected and improved at 2-month after ECT.

There were some limitations in the study: small sample size of only 29 subjects, and only 20 records of the patients who completed the MMSE all 4 times. The time restriction of one year period influenced the recruitment process of this study. In addition, drop-offs, due to loss to follow-up and relapse and transferred to maintenance ECT, were treated with last observation carried forward [LOCF]. In the present study, the authors used MMSE-Thai 2002 as the only cognitive parameter.

Brus reported 26% of subjective memory worsening within 1 week after ECT[5]. Semkovska and McLoughlin's 2010 meta-analysis reported significant cognitive deficit at 0 to 3 days after the ECT course, and there was significant improvement in cognitive function after 15 days of ECT course[1] which was similar to the present study that at 2-month after the ECT, the cognitive function was significant improved compared to before ECT. In Mohn C and Rund BR reported significant improvement in speed of processing, attention/vigilance, and visual learning 6 weeks after ECT[6]. In the present study, only subscales of attention-calculation and recall significantly improved at both at 2-week and 2-month after ECT. Most of the study in the cognitive effect of ECT used MMSE as a cognitive parameter[1]. Most of the study found unilateral ECT has less impact on global cognition[7]. However, in the present study, there was no significant difference in the cognitive deficit between unilateral and bilateral ECT at any intervals of treatments, possibly due to small sample size.

The findings from the present study confirmed the benefit in cognitive function improvement with ECT, though with the minor decline of cognitive function in the first 0 to 3 days after the ECT.

Conclusion

There were some non-significant declines in cognitive function at 0 to 3 days after ECT. However, the cognitive function improved significantly at 2 weeks and 2 months after ECT. Only the subscales of attention-calculation and recall were significantly improved at both at 2 weeks and 2 months after ECT. There was no significant difference in the cognitive deficit between unilateral and bilateral ECT.

What is already known on this topic?

Cognitive decline is a common reported side effect of ECT.

What this study adds?

The side effect of cognitive decline from ECT improved significantly at 2-weeks and 2-months follow-up of ECT and also improved better than the cognitive baseline of the subjects before ECT.

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Potential conflicts of interest

None.

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