Adverse effects of electroconvulsive therapy on cognitive performance

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Electroconvulsive therapy (ECT) has historically been shown to be a highly effective method of treating major depression and catatonic state otherwise resistant to psychopharmacotherapy.[1-5] However, ECT has also been associated with a variety of transient impairments in cognitive performance during and following the treatment.[6-10] The side effects, often subjectively reported by the patients, include deficits in orientation, short term memory function, attention, speech fluency, and executive functions lasting from hours to perhaps months in a number of cases.[6-10] These reported attributes often lead to limited use of ECT as an acute treatment of treatment-resistant depression and other conditions where it can potentially produce positive overturning effects. There appears to be a lack of clarity and consensus in the literature regarding ECT-related adverse effects on cognitive performance. While some studies have reported absence of any effects on memory and implicit learning,[6] several others have shown diverse negative impacts across various domains of cognition including greatest global decline associated with bitemporal ECT, major deterioration of verbal memory attributed to bifrontal ECT, and largest decline in visual memory related to right unilateral ECT, as measured by tests such as Mini Mental State exam,[7] Trail-Making,[11,12] Rey Auditory Verbal Learning,[11,12] autobiographical memory, visual memory, and verbal fluency.[11,13] Therefore, this topic remains much debatable, and can still benefit from investigations that would add to the body of evidence to further elucidate and clarify different aspects and extent of these adverse effects in terms of factors such as distinction between immediate versus delayed impacts, different electrode placement methods and dosing, as well as the appropriate measurement methods sensitive to particular cognitive domains.

Authors of this study[14] investigated the potential immediate short-term adverse effect of right unilateral ECT on cognitive function using digital ascending number tapping test (DANTT) as a novel psychometric measurement modality. Using DANNT, the authors specifically studied speed of processing, executive function, and visual search before and after treatment in patients of both genders between the ages of 36 to 76 years. They concluded that ECT does not significantly alter cognitive performance in those domains up to 2 hours after receiving therapy, which is in stark contrast to the results of previous investigations.[14] Results of this study revealed no measurable impairment of concentration resulting from single or multiple ECT treatments. In addition, patients with a longer seizure duration elicited by ECT did not exhibit greater concentration impairment as evidenced by absence of any significant difference in performance times.[14]

Adverse effects of ECT on cognitive function has been the subject of investigation in several studies. However, current literature does not provide sufficient and specific data in order to draw reliable conclusions as to the degree and extent of potential impairments in various particular domains of cognitive performance.[1-13] In contrast to previous studies, this study did not reveal any significant post-ECT deficit in select cognitive domains, namely speed of processing, executive function, and visual search as measured by DANNT.[14] This finding raises the possibility that perhaps some elements of cognition may be immune to ECT, whereas other domains, shown to have exhibited deficits in other studies, might be more susceptible. This demands further subtyping of cognitive domains and deficits, as well as designing measurement tools tailored to more accurately and specifically target those areas. Use of DANTT introduced in this study in lieu of tests used in previous studies such as trail-making and MMSE, which provide only an overall score without localizing function to particular cognitive domains, is an example of this approach. This novel modality for measuring visual search and speed of processing in particular allows for higher precision and accuracy by eliminating problems associated with trail-making test such as memorization biases and line drawing which can hinder identification of numbers, and can be employed in future trials to reproduce the findings of this study.

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References

1. Kellner CH, Greenberg RM, Murrough JW, et al. ECT in treatment-resistant depression. Am J Psychiatry 2012;169:1238-44.
2. Bschor T, Bauer M, Adli M. Chronic and treatment resistant depression: diagnosis and stepwise therapy. Dtsch Arztebl Int 2014;111:766-75.
3. Bschor T. Therapy-resistant depression. Expert Rev Neurother 2010;10:77-86.
4. Pagnin D, de Queiroz V, Pini S, et al. Efficacy of ECT in depression: a meta-analytic review. J ECT 2004;20:13-20.
5. Gábor G, László T. [The efficacy of ECT treatment in depression: a meta-analysis]. Psychiatr Hung 2005;20:195-200. [Article in Hungarian].
6. Andrade C, Arumugham SS, Thirthalli J. Adverse effects of electroconvulsive therapy. Psychiatr Clin N Am 2016;39:513-30.
7. Dunne RA, McLoughlin DM. Systematic review and meta-analysis of bifrontal electroconvulsive therapy versus bilateral and unilateral electroconvulsive therapy in depression. World J Biol Psychiatry 2012;13:248-58.
8. Prudic J. Strategies to minimize cognitive side effects with ECT: aspects of ECT technique. J ECT 2008;24:46-51.
9. Datka W, Siwek M, Dudek D, et al. [Working memory disturbances in patients with major depression after ECT treatment]. Psychiatr Pol 2007;41:339-49. [Article in Polish].
10. Maric NP, Stojanovic Z, Andric S, et al. The acute and medium-term effects of treatment with electroconvulsive therapy on memory in patients with major depressive disorder. Psychol Med 2016;46:797-806.
11. Kellner CH, Knapp R, Husain MM, et al. 2010. Bifrontal, bitemporal and right unilateral electrode placement in ECT: randomised trial. Br J Psychiatry

196:226-234.
12. Sienaert P, Vansteelandt K, Demyttenaere K, et al. Randomized comparison of ultra-brief bifrontal and unilateral electroconvulsive therapy for major depression: cognitive side-effects. J Affect Disord 2010;122:60-7.
13. Eschweiler GW, Vonthein R, Bode R, et al. Clinical efficacy and cognitive side effects of bifrontal versus right unilateral electroconvulsive therapy (ECT): a short-term randomised controlled trial in pharmaco-resistant major depression. J Affect Disord 2007;101:149-57.
14. Müller HH, Reike M, Grosse-Holz S, et al. Electroconvulsive therapy does not have negative effects on short-term memory function, as assessed using a bedside hand-held device. Ment Illn 2017;9:7093.