



Is Advancing of Circadian Rhythm a Reason for the Rapid Treatment Effect of Electroconvulsive Therapy?

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Although the pathophysiological mechanisms of mood disorders have not been elucidated yet, a significant amount of research has suggested an important role of the circadian rhythm. The mechanism behind the effects of antidepressant treatment is also not fully known. Antidepressant treatment is successful only in about 60% of cases, and even if the same antidepressant is administered to a specific patient, the therapeutic response is not always consistent with previous depressive episodes, raising questions about the therapeutic mechanism of such treatments. In addition, the increase of monoamine in the brain synapses, which has been considered to be a mechanism of antidepressant treatment, occurs within a few hours after administration of the antidepressant drugs, but it takes up to 2 weeks for these drugs to exert their antidepressant effect.¹ Therefore, the mechanism of antidepressant treatment is not fully explained by the increase in neurotransmission alone.

In contrast to the delayed treatment response of antidepressant medication, three rapidly acting antidepressant treatments: ketamine, sleep deprivation, and electroconvulsive therapy (ECT), work within a few hours to days, strongly reducing depressive symptoms in a subgroup of patients with depressive disorders. Several studies suggest that the effects of these antidepressant treatments occurs through the normalization of a delayed circadian rhythm.² There is growing evidence that a common therapeutic mechanism of sleep deprivation and ketamine is related to the circadian rhythm.³ ECT is also one of the fastest-acting antidepressant treatments. However, the effect of ECT on the circadian rhythm has not been well-studied so far.

In this issue, Kim et al.⁴ have demonstrated that electroconvulsive seizure (ECS) alters the expression and daily oscillation of circadian genes in the frontal cortex of rats. Their results showed that the transcription and translation of circadian genes were changed by ECS, and their circadian rhythms of

expression were generally advanced after repeated ECS.

Previously, a study reported that ECT in depressed patients normalizes body temperature and advances circadian rhythm. Szuba et al.⁵ found that the 24-hour profile of temperature was significantly delayed in patients pre-ECT than in patients post-ECT or in controls. They found that ECT restores a disrupted circadian temperature rhythm in depressed patients as well. Therefore, circadian rhythm normalization has been regarded as a possible mechanism for the antidepressant effect of ECT.

Kim et al.⁴ reported that ECS advances the circadian rhythm at the gene expression level in animal studies. However, their study was conducted in normal animals, not in depressive animal models showing disturbances in the circadian rhythm. Therefore, it is difficult to confirm that the delay of the circadian rhythm in depression is advanced by ECS. Further studies are needed to determine whether the mechanism of the fast effect of ECT in depression treatment is related to the advancing of the circadian rhythm.

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