

Commentary

ROLE OF HIPPOCAMPUS AND AMYGDALA IN MAJOR DEPRESSION

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Description

The amygdala and hippocampus have been associated with social interactions. Memory is thought to be dependent on the hippocampal system. The amygdala is prominently involved in producing emotional responses and memories. However, our emotional state seems to considerably affect the way and accuracy with which we retain information. The amygdala and hippocampus work synergistically to form long-term memories of robust emotional events. These brain structures are activated after emotional events and communicate with each other during memory consolidation, which are related to neuropsychiatric diseases [1].

Major Depression (MD) is one of the most common psychiatric disorders, with a total lifetime prevalence of approximately 15%-18%. MD has a significant impact on the patient's quality of life, social interaction, and occupational achievement [2].

A report on the findings of the ENIGMA study, a comprehensive investigation conducted using Magnetic Resonance Imaging (MRI) to assess brain structure, function, and disease, reported a statistically significant reduction in hippocampal and amygdala volumes in patients with MD compared with that in Healthy Controls (HC) [3]. While chronic stress conditions are known to cause an increase in cortisol levels, previous studies have suggested that elevated cortisol levels can contribute to hippocampal and amygdala atrophy [4].

In our study, we reported no difference in total hippocampal volume between patients with MD and HC. However, the volumes of the Hippocampal-Amygdala-Transitional Area (HATA) in the left hemisphere and the Para hippocampal, anterior cerebellar and limbic structures in the right hemisphere were significantly smaller in the MD group than in the HC group. Furthermore, the right

hippocampal fissure volume was significantly smaller in the HC group than in the MD group. Additionally, we established a positive linear correlation between hippocampal volume in the left CA4 region and plasma levels of the Brain-Derived Neurotrophic Factor (BDNF) in the MD group. BDNF is a neurotrophic factor involved in neuroplasticity and is associated with neurogenesis and synaptic plasticity in the hippocampus [5]. In other words, several subfields of the hippocampus were correlated with plasma BDNF levels, and an association was established between the right parafoveal cerebellar volumes in the MD and HC groups with respect to plasma BDNF levels [6]. With regards to the amygdala volume, no difference in amygdala subregion volume was observed between the HC and MD groups. However, when we examined the relationship between the amygdala subregional volume and depression severity in the MD group, we found that the more severe the core symptoms of MD, the smaller the volumes of the lateral nucleus and anterior amygdala region of the right amygdala, and the more severe the anxiety or agitation, the smaller the volumes of lateral nucleus, anterior amygdala region, transition, and total amygdala. Furthermore, the volumes of lateral nucleus and anterior amygdala regions were strongly associated with the total Hamilton rating scale for depression scores for clinical symptoms of MD [7].

Taking these findings into account, volume changes in sub regions of the hippocampus and amygdala in MD patients could be complicated, which might be reflected by impairments in the connections between the hippocampus and amygdala.

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