Cordycepin ameliorates synaptic dysfunction and dendrite morphology impairments induced by cerebral ischemia via A1R in vitro and in vivo

Zhaohui Chen[1], Ying-Jie Shang[1], Si-Yi Zhuang[1], Jun-Ni Huang[1], Bao-Yan Wu[1], Wen-Xiao Liu[1], and Chu-Hua Li[1]

[1]South China Normal University

June 2, 2020

Abstract

Background and Purpose: Cordycepin has been proved to have neuroprotective efficacies and to improve learning and memory in cerebral ischemia. However, the potential mechanisms are unclear so far. Plasticity of synaptic structure and function is considered as the neural mechanisms of learning and memory. Therefore, we investigated the effects of cordycepin on dendritic morphology and synaptic function in cerebral ischemic models. Experimental Approach: The impact of cordycepin was studied using oxygen glucose deprivation (OGD) and global cerebral ischemia (GCI) model. Synaptic transmission and behavioral long-term potentiation (LTP) were investigated with electrophysiological recording. Hippocampal dendritic morphology was assessed by Golgi staining. The density of adenosine A1 and A2A receptors (A1R and A2AR) evaluated with western blot and immunofluorescence. Key Results: Cordycepin alleviated the ischemia-induced damages of dendritic morphology and behavioral LTP in hippocampal CA1 area, improved the learning and memory ability and up-regulated the expression of A1R but not A2AR in hippocampus of GCI rats. Besides, cordycepin pre-perfusion could significantly attenuate the hippocampal slices injury and synaptic transmission impairment induced by OGD, improved adenosine content and reduced the expression level of A1R but did not alter A2AR. Furthermore, the protection of cordycepin on synaptic transmission against ischemic inhibition was eliminated by using the antagonists of A1R instead of A2AR. Conclusion and Implications: These findings indicated that cordycepin alleviated synaptic dysfunction and dendritic injury in vivo and in vitro ischemia models by modulating adenosine A1R, which may be the neural mechanisms of cordycepin to improve learning and memory in cerebral ischemic animals.

Hosted file

`Manuscript.doc` available at https://authorea.com/users/328822/articles/455979-cordycepin-ameliorates-synaptic-dysfunction-and-dendrite-morphology-impairments-induced-by-cerebral-ischemia-via-a1r-in-vitro-and-in-vivo

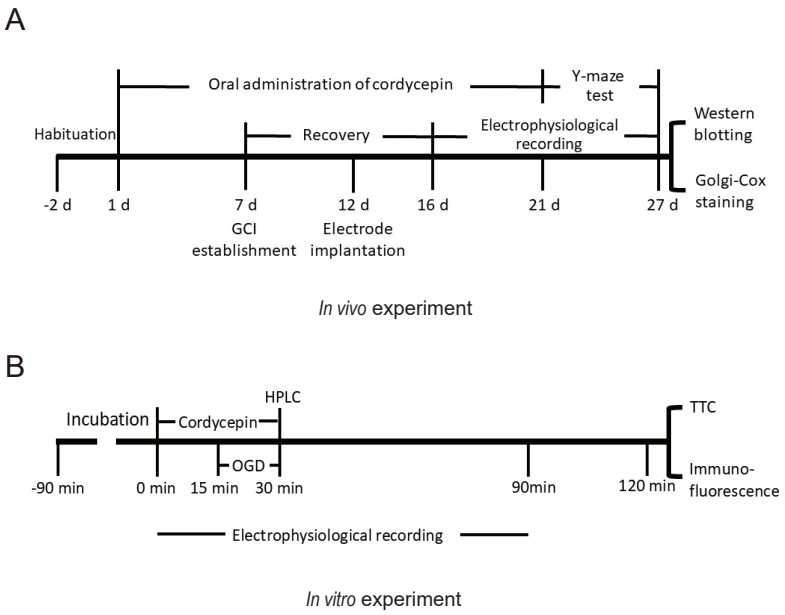

Figure 1

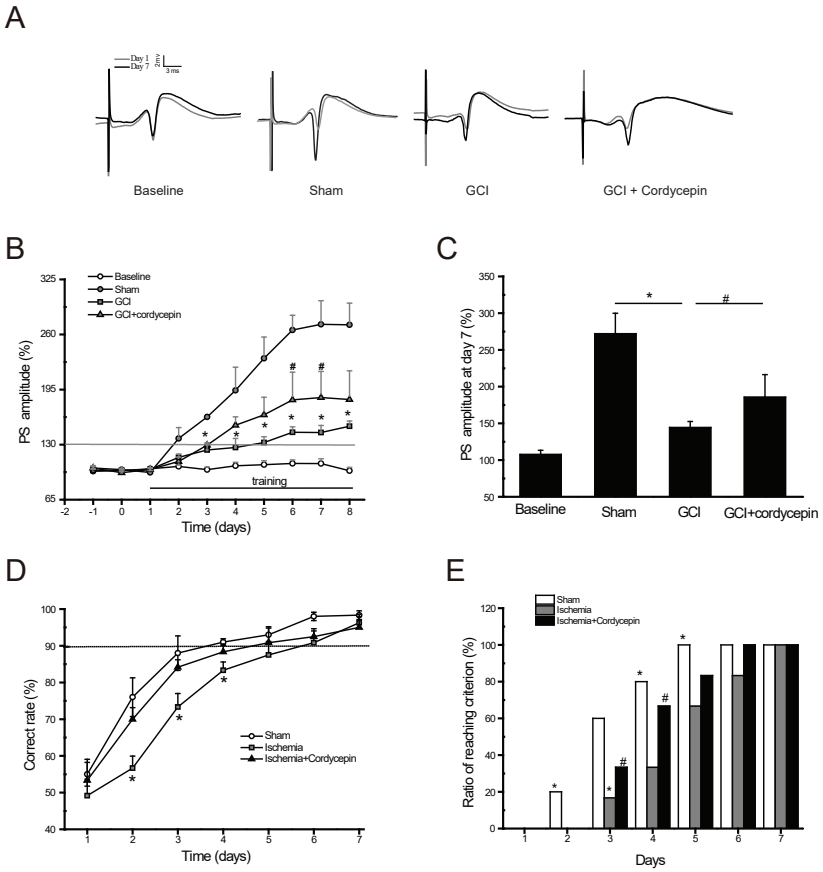

Figure 2

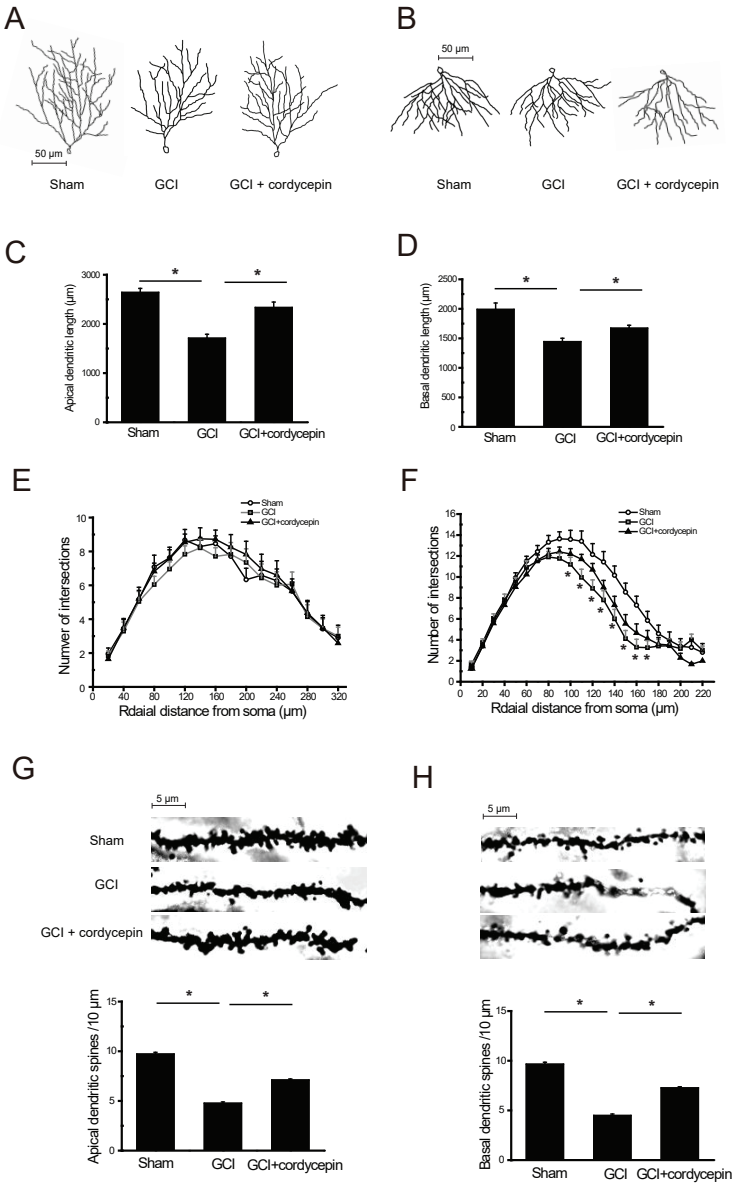

Figure 3

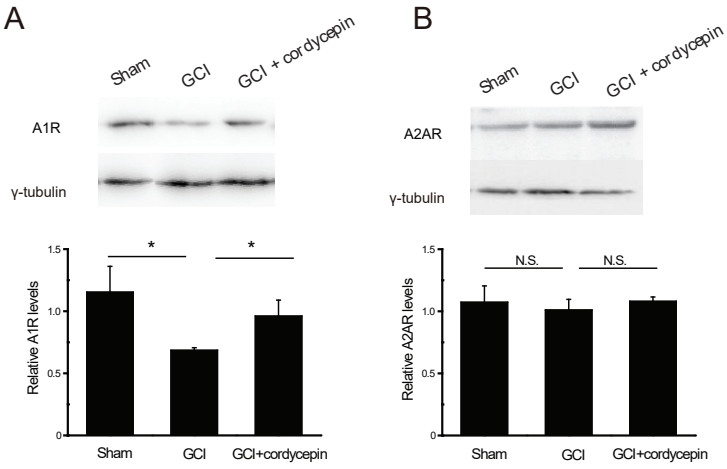

Figure 4

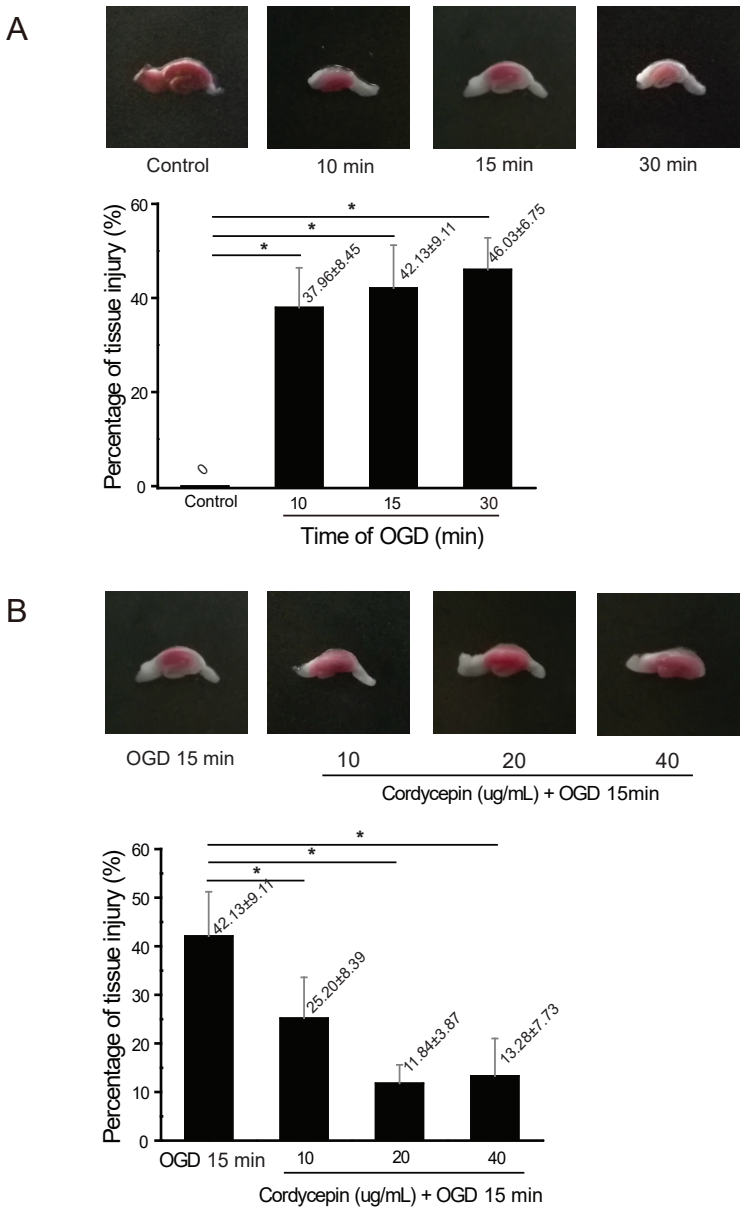

Figure 5

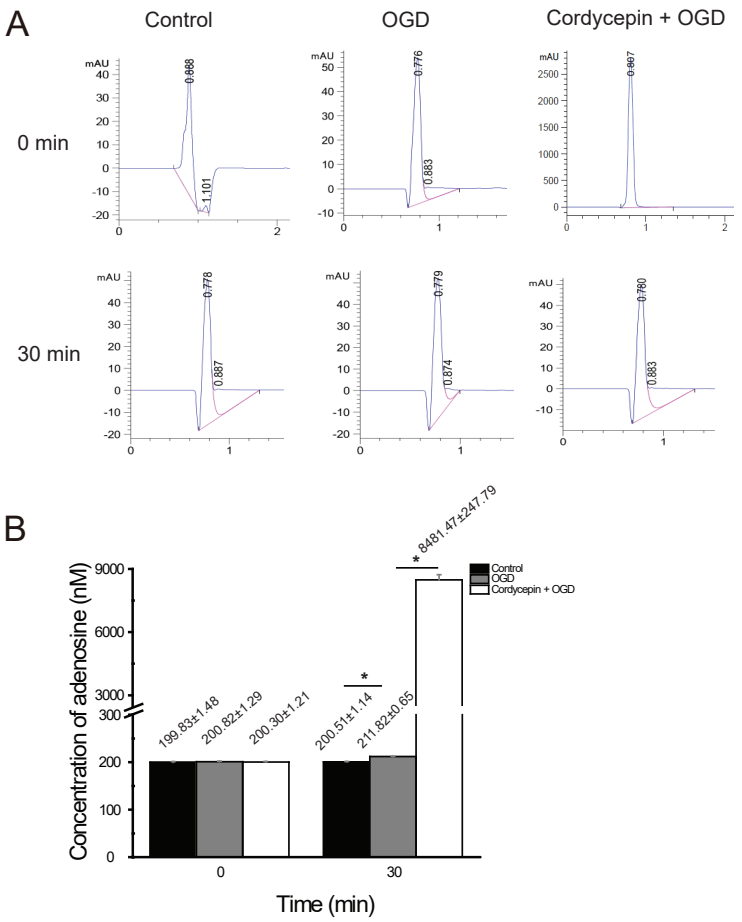

Figure 6

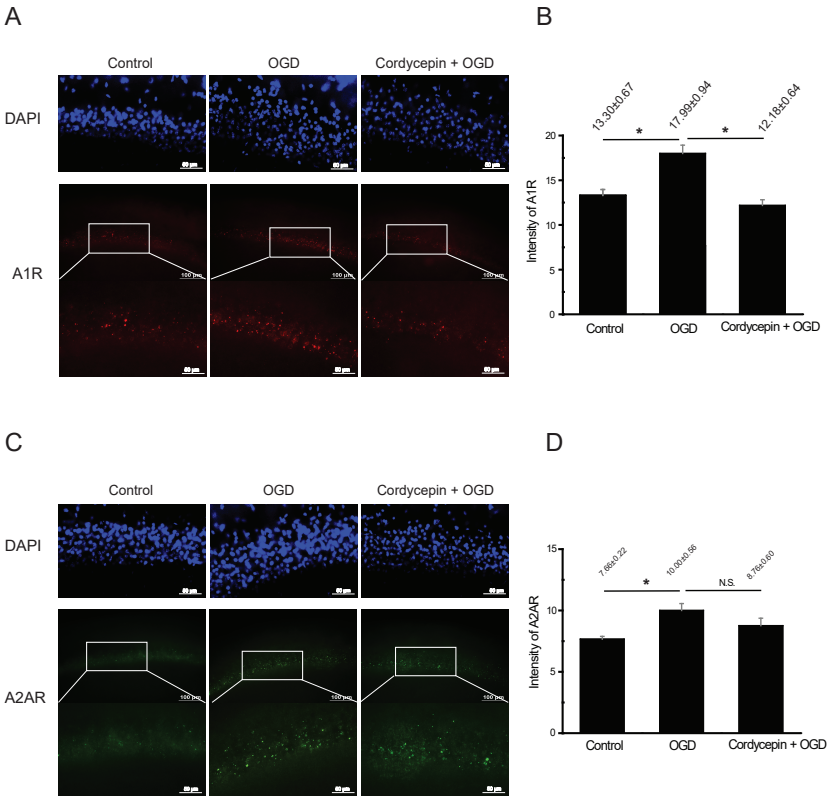

Figure 7

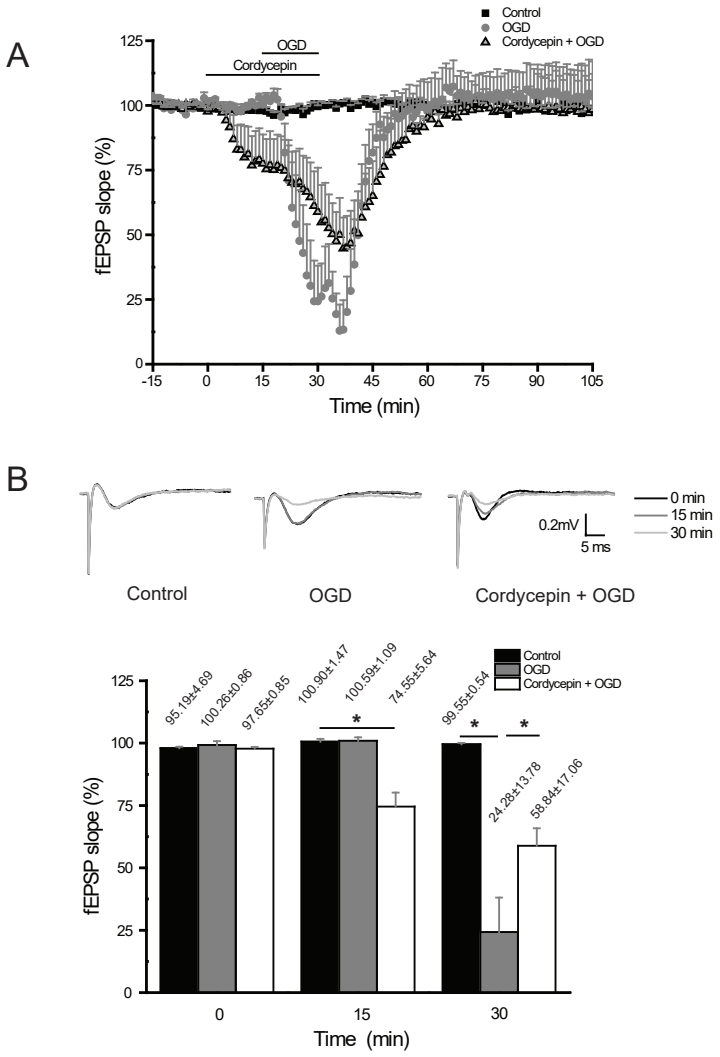

Figure 8

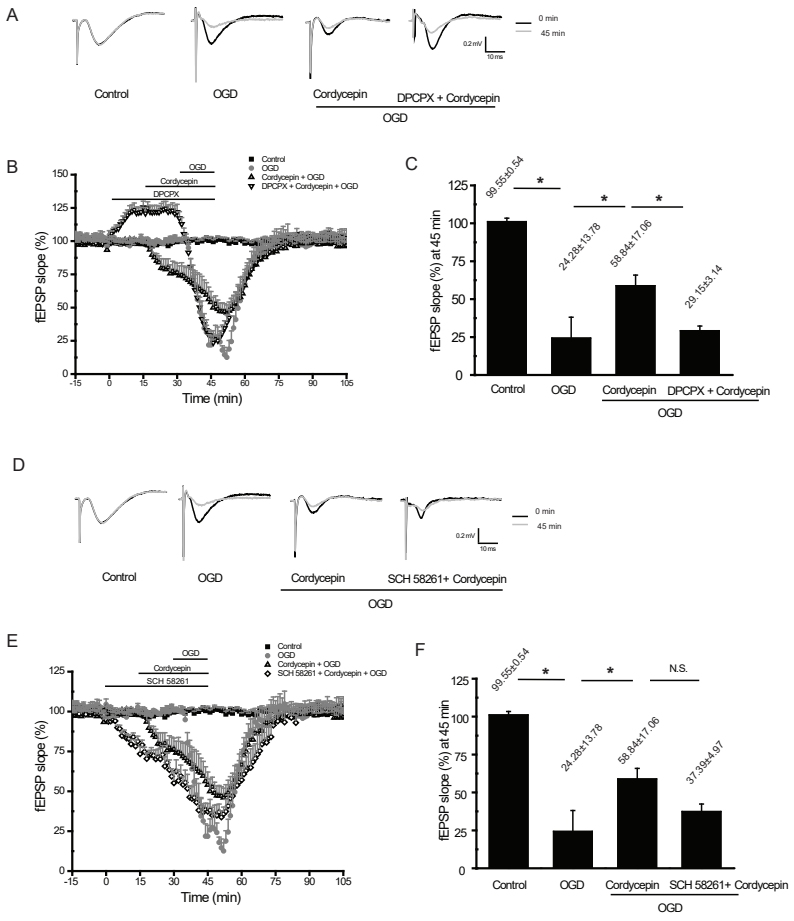

Figure 9