Fullerenol nanoparticles decrease ischaemia-induced brain injury and oedema through inhibition of oxidative damage and aquaporin-1 expression in ischaemic stroke

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Abstract:

Background: We examined the possible protective effects of fullerenol nanoparticles on brain injuries and oedema in experimental model of ischaemic stroke through inhibition of oxidative damage and aquaporin-1 (AQP-1) expression. Methods: Experiment was done in three groups of rats (N = 66): sham, control ischaemia and ischaemic treatment. Ischaemia was induced by 90-minutes middle cerebral artery occlusion (MCAO) followed by 24 hours of reperfusion. Rats received a dose of 10 mg/kg of fullerenol 30 minutes before MCAO. Infarction, brain oedema, malondialdehyde (MDA) and nitrate contents as well as mRNA level of AQP-1 were determined 24 hours after termination of MCAO. Results: Administration of fullerenol before MCAO significantly reduced the infarction of cortex and striatum by 72 and 77%, respectively. MCAO induced brain oedema in control ischaemic rats (3.83 ± 0.53%), whereas, fullerenol significantly reduced it (0.91 ± 0.55%). The contents of MDA and nitrate increased in ischaemic hemispheres by 86 and 41%, respectively. Fullerenol considerably reduced the MDA and nitrate contents by 83 and 48%, respectively. Moreover, MCAO noticeably increased the mRNA level of AQP-1 in ischaemic hemispheres by 22%, whereas fullerenol significantly decreased it by 29%. Discussion: Fullerenol is able to reduce ischaemia-induced brain injuries and oedema possibly through inhibition of oxidative damage and AQP-1 expression in ischaemic stroke.

Keywords:

aquaporin-1; brain oedema; fullerenol; Ischaemic stroke; oxidative damage

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