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The renoprotective effects of endothelial progenitor cells on renal ischemia/reperfusion injury

Ruipeng Jia, Yuzheng Ge, Hao Liu, Ran Wu, Liuhua Zhou, Jianping Wu and Jiageng Zhu Nanjing Medical University, China

Tt is difficult to avoid ischemia reperfusion injury in kidney transplantation, renal cell carcinoma surgery and nephrolithotomy, specially in Nephron Sparing Surgery (NSS). NSS has been recommended as the standard surgical option for localized small renal cancers instead of radical nephrectomy. However, the Renal Hilar needs to be temporarily clamped during NSS, which can increase the incidence of renal ischemia/reperfusion injury (IRI). The protective role of endothelial progenitor cells (EPCs) on IRI has been demonstrated; however, the potential role and underlying mechanism of EPC on NSS-induced IRI is still elusive to investigate the potential renoprotective role of exogenous endothelial progenitor cells (EPCs) on renal IRI in NSS rats. EPCs were collected by in vitro culture of mononuclear cells derived from rat bone marrow, labeled with CM-Dil and Fe2O3-poly-L-lysine before transplantation. Ninety male SD rats were randomly divided into three groups. At 1, 3, 6, 12, 24 and 72 hours after reperfusion, we detected the homing of EPCs by MRI, before harvesting the peripheral blood, lungs, spleens and kidneys, and confirmed the EPCs mobilization by a fluorescence microscope. Furthermore, we evaluated renal injury both functionally and morphologically, apoptosis and neovascularization markers such as MVD, endothelial cell proliferation and angiogenic growth factor expression. EPCs-treated NSS rats exhibited significant improvements in renal morphology and function as confirmed by the markedly decreased histological score, blood urea nitrogen and serum creatinine, especially at 12 and 24 hours (P<0.05). MRI images represented the exact homing process of EPCs into injured kidneys and accumulation in lungs and spleens, which was confirmed by fluorescence microscopic analysis. MVD, endothelial cell proliferation and expression of VEGF, SDF-1a was markedly increased in kidneys treated with EPCs, while apoptosis of tubular epithelial cells was substantially reduced. EPCs may exert renoprotective roles by promoting endothelial cell proliferation and angiogenesis, thus maintaining the integrity of peritubular capillaries after NSS-induced IRI.

uro_rpjia@hotmail.com