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Intraperitoneal injection of graphene oxide nanoparticle accelerates stem cell therapy effects on acute kidney injury

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Stem cell implantation has appeared as a potential therapy for acute kidney injury (AKI), but the poor survival of stem cells implanted has limited the therapeutic efficacy of this approach significantly. The use of mesenchymal stem cells (MSCs) to treat diseases is normally hindered by generation of cell death of implanted cells after the restoration of blood flow. The ability of GO to protect MSCs from cell death was further confirmed by in vitro experiments. This study aimed to assess the effects of intraperitoneal transplantation of suspended 1.5mg/kg GO nanoparticles mixed MSCs (106×cells/kg) derived from bone marrow in cisplatin-induced AKI in a rat model. It was chosen a model of AKI induced by intraperitoneal administration of 5mg/kg cisplatin. Our results showed that several indicators of renal function such as blood urea nitrogen (bun), creatinine (Cr), necrosis, cast hyaline, and intratubular debris levels were all reduced significantly in MSCs mixed GO intraperitoneally injection groups during the first week, indicating that GO has an exceptional capability to protect MSCs transplantation. Also, unexpectedly, when rats received only GO intraperitoneally, biomedical analysis showed successful reduction of bun and Cr blood factors indicating that GO has an exceptional capability alone to repair AKI. It seems that GO can adsorb extracellular matrix proteins and facilitates their transfer to the AKI tissue and increases its repair speed, moreover it also increases the survival rate of MSCs transplanted, GO protects the implanted MSCs and thereby the therapeutic efficacy of the MSCs in AKI improved by the adhesion of MSCs to GO. It could be concluded that GO enhances the rate of success of stem cell transplantation in AKI.

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