The Placenta-choriodecidual Derived MSC (pcMSCs) Improve the Function of High Glucose Impaired Endothelial Cells and Salvage the Hind Limb in Diabetic Ischemic Model

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Background

Diabetes mellitus is the fifth leading cause of death worldwide. Globally, an estimated 422 million adults were living with diabetes in 2014, compared to 108 million in 1980. Indicating there is a dramatic increase in the population of diabetes. In generally, there were usually 15-25% of diabetic patients develop diabetic foot ulcer (DFU) during their lifetime. DFU is considered to be the major issue of morbidity and the leading cause of hospitalization for DM patients. To date, a significant number of DM patients required amputations due to a complex result of impaired angiogenesis. Therefore, DFU is not only a patient problem but also a major health care concern throughout the world. In recent studies, mesenchymal stem cells (MSCs) have been reported to be an ideal cell source for regenerative therapy with no ethical issues, played an important role in DFU. Growing evidence has demonstrated that MSCs transplantation could accelerate wound closure, ameliorate clinical parameters, and avoid amputation.

Methods

To investigate the therapeutic effects of cell therapy in diabetes, we use HUVEC cultured in high glucose condition (30mM) and STZ-induced ischemic murine model to mimic the abnormal blood glucose concentration, then treated with placenta-choriodecidual derived mesenchymal stem cells (pcMSCs) to ameliorate the damage from high glucose in endothelial cells.

Results

In our studies, we have successfully isolated a type of MSCs from human placenta decidual membranes, named pcMSCs. By using a co-culture system consisting of pcMSCs and human umbilical vein endothelial cells (HUVECs), we found that pcMSCs improved the ability of tube formation and seemed to reduce the ROS production in HUVECs. Furthermore, the administration of pcMSCs could retard the necrosis of hind limb and reduce the rate of limb amputation in STZ-induced ischemic murine model.

Conclusions

Our study showed the potential therapeutic effects of cell therapy in DFU animal model and the pro-angiogenesis ability of pcMSCs. The application of pcMSCs provided an effective treatment and an accessible cell source for the application in cell-based therapies.