Human acellular amniotic membrane incorporating exosomes from adipose-derived mesenchymal stem cells promotes diabetic wound healing

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Research

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Abstract

Background: Diabetic wounds threaten the health and quality of life of patients and their treatment remains challenging. ADSC-derived exosomes have shown encouraging results in enhancing diabetic wound healing. However, the common method of exosome administration is subcutaneous injection at several sites around the wound, causing further damage and preventing direct contact between the exosomes and the injury site.

Methods: A diabetic mouse skin wound model was established. ADSC-derived exosomes (ADSC-Exos) were isolated and in vitro application of exosomes was evaluated using human umbilical vein endothelial cells (HUVECs) and human dermal fibroblasts (HDFs). After preparation and characterization of a scaffold of human acellular amniotic membrane (hAAM) loaded with ADSC-Exos in vitro, they were transplanted into wounds in vivo and wound healing phenomena were observed by histological and immunohistochemical analyses to identify the wound healing mechanism of the exosome-hAAM composites.

Results: The hAAM scaffold dressing was very suitable for the delivery of exosomes. ADSC-Exos enhanced the proliferation and migration of HDFs and promoted proliferation and tube formation of HUVECs in vitro. In vivo results from a diabetic skin wound model showed that the hAAM-Exos dressing accelerated wound healing by regulating inflammation, stimulating vascularization and promoting the production of extracellular matrix.

Conclusion: Exosome-incorporated hAAM scaffolds showed great potential in promoting diabetic skin wound healing, while also providing strong evidence for the future clinical applications of ADSC-derived exosomes.

Full Text

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