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The therapeutic effects of catechol-functionalized hyaluronic acid patch combined with mesenchymal stem cells in diabetic wound

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Chronic inflammation and impaired neovascularization are a critical factor contributing to delayed wound healing in diabetic patients. To overcome the therapeutic limitations of diabetic wounds (DBW), we investigated the effects of catechol-functionalized hyaluronic acid (HA-CA) patch combined with adipose-derived mesenchymal stem cells (ADSCs) in diabetic wound mouse models. The diabetic mice (DB, C57BL/6) were induced with streptozotocin (50 mg/kg, < 250 mg/dL) and divided into 4 groups; control (DBW), DBW+ADSCs, DBW+HA-CA, DBW+HA-CA+ADSCs (n=10 each). The ADSCs were labeled with fluorescent cell tracer PKH26 to detect the mesenchymal stem cells (MSCs) migration. The wound area was evaluated by ImageJ and was assessed for collagen content, thickness and vascularity of granulation tissue, apoptosis, re-epithelialization. The angiogenesis was evaluated by immunohistochemistry (von Willebrand Factor and CD31) and real-time PCR. The DBW healings were improved in all groups compared with control, especially in DBW+HA-CA+ADSCs group. In histopathologic scoring about edema, inflammation and congestion, the score significantly decreased in DBW+HA-CA+ADSCs group. PKH26-labeled ADSCs were observed in the subcutaneous tissue and muscle layer of the wounds. Apoptotic cells by TUNEL staining were decreased in all groups compared with control. In angiogenesis assay, the expressions of vWF and CD31 were significantly increased in DBW+HA-CA+ADSCs group. The HA-CA combined with ADSCs represents a promising approach to improve DBW healing by re-epithelialization and promoting angiogenesis. HA-CA combined with ADSCs will be a new strategy for clinical treatment.

Recent Publications

1. Lee J, Kang H J, Jang H, Lee Y J, Lee Y S, Ali B A, Al-Khedhairy A A and Kim S (2015) Simultaneous imaging of two different cancer biomarkers using aptamer-conjugated quantum dots. Sensors 15(4):8595-604.
2. Lee J, Kang H J, Lee Y S, Heo H, Gu H N, Cho S and Kim S (2015) A self-assembling magnetic resonance beacon for the detection of microRNA-1. Chem Commun. 51(33):7199-202.
3. Kang H J, Moon M J, Lee H Y and Han S W (2014) Testosterone alters testis function through regulation of piRNA expression in rats. Mol Biol Rep. 41(10):6729-35.
4. Kim S W, Im Y J, Choi H C, Kang H J, Kim J Y and Kim J H (2014) Urinary nerve growth factor correlates with the severity of urgency and pain. Int Urogynecol J. 25(11):1561-7.

Biography

Hyo Jin Kang has his professional experiences in the Department of Neurosurgery, Seoul National University Hospital Clinical Research Institute (~2007), Department of Urology, Yonsei University Medical Center Research Center (~2015), Department of Biological Sciences, Yonsei University College of Medicine (~2017) and Department of Plastic and Reconstructive Surgery, Seoul National University Bundang Hospital (~2018). He has his teaching experiences in the Department of Life Science, Gachon University (2012 ~ 2014).

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