Use of Human Mesenchymal Cells to Improve Vascularization in a Mouse Model for Scaffold-BasedDermal Regeneration

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Abstract

All engineered bioartificial structures developed for tissue regeneration require oxygen and nutrients to establish proper physiological functions. Aiming to improve vascularization during dermal regeneration, we combined the use of a bioartificial collagen scaffold and a defined human mesenchymal cell (MC) line. This cell line, termed V54/2, exhibits typical morphologic and immunohistochemical characteristics of MC. V54/2 cells seeded in the scaffold were able to survive, proliferate, and secrete significant amounts of vascular endothelial growth factor (VEGF) and basic fibroblast growth factor (bFGF) during 2 weeks in vitro. To induce dermal regeneration, scaffolds with or without cells were transplanted in a nude mice full skin defect model. After 2 weeks of transplantation, scaffolds seeded with V54/2 cells showed more vascularization during the dermal regeneration process than controls, and the presence of human cells in the regenerating tissue was detected by immunohistochemistry. To confirm if local presence of angiogenic growth factors is sufficient to induce neovascularization, scaffolds were loaded with VEGF and bFGF and used to induce dermal regeneration in vivo. Results showed that scaffolds supplemented with growth factors were significantly more vascularized than control scaffolds (scaffolds without growth factors). The present work suggests that combined use of MC and bioartificial scaffolds induces therapeutic angiogenesis during the scaffold-based dermal regeneration process.

Palabras clave

KeyWords Plus: IN-VITRO; ALLOGENEIC FIBROBLASTS; GROWTH-FACTORS; STEM-CELLS; ANGIOGENESIS; MATRICES; RELEASE; TRANSPLANTATION; INFLAMMATION; SUBSTITUTES

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