OsteoBiol® by Tecnoss

Biofunctionalized scaffold in bone tissue repair

LABORATORY TESTS

132

ABSTRACT

The aim of bone tissue engineering is to provide the right microenvironments to promote cell differentiation together with optimal scaffold development. In order to favour bone regeneration, the scaffolds need to be biocompatible, to lead the progenitor cells to commit to an osteogenic lineage and to avoid the possible host tissue inflammation or reaction. Moreover, they should provide an optimal microenvironment to support bone growth and development, the vascular network formation and cell recruitment. Different materials are used for the creation of the scaffolds. They can be tissue-derived materials, components of extracellular matrix (ECM), hydrogels or synthetic polymers. In this study, the Authors investigated the effect of human periodontal ligament stem cells (hPDLSCs) and their conditioned medium (CM) on bone regeneration using a commercially available collagen membrane scaffold OsteoBiol® *Evolution* (EVO) (Tecnoss®, Giaveno, Italy) with a high consistency dense collagen fiber derived from equine mesenchymal tissue. Collagen fibers constitute one of the main components of bone matrix and collagen-based scaffolds have been used and seem promising in bone tissue regeneration. Collagenous membranes were reported to induce osteogenesis *in situ* and collagenized porcine bone xenografts were demonstrated to be biocompatible, bioabsorbable, and osteoconductive in animal models. EVO alone or EVO + hPDLSCs with or without CM were implanted in Wistar male rats subjected to calvarial defects. *In vivo* bone regeneration in the grafted sites was evaluated after 6 weeks of implantation using fuchsine acid and methylene blue stained sections. The *in vivo* results revealed that EVO membrane enriched with hPDLSCs and CM showed a better osteogenic ability to repair the calvarial defect. These results were confirmed by acquired micro-computed tomography (CT) images and the increased osteopontin levels.

CONCLUSIONS

The results of this study revealed that EVO enriched with hPDLSCs and CM was able to almost completely repair the rat calvarial defect, showing a higher osteogenic ability compared with the other complexes. Moreover, the group EVO + CM + hPDLSCs showed the best regenerative capacity, indicating a synergistic effect of CM and hPDLSCs. In particular, CM played a key role and could have a very high potential for the induction of bone regeneration. These results suggest a promising potential application of CM from hPDLSCs and scaffolds for bone defect restoration and in particular for calvarial repair in case of trauma. Nevertheless, further investigations will be necessary to explain how the CM enhances the bone regeneration process.

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