



Abstract

ADIPOSE-DERIVED STROMAL VASCULAR FRACTION SHOWS MARKED BONE-REGENERATIVE POTENTIAL ON A XENOHYBRID BONE SCAFFOLD

G. Perale, I. Roato, D.C. Belisario, M. Compagno, F. Mussano, T. Genova, F. Veneziano, G. Pertici, R. Ferracini

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Intra-articular infusions of adipose tissue-derived stem cells (ASCs) are a promising tool for bone regenerative medicine, thanks to their multilineage differentiating ability. One major limitation of ASCs is represented by the necessity to be isolated and expanded through in vitro culture, thus a strong interest was generated by the adipose stromal vascular fraction (SVF), the non-cultured fraction of ASCs. Besides the easiness of retrieval, handling and good availability, SVF is a heterogeneous population able to differentiate in vitro into osteoblasts, chondrocytes and adipocytes, according to the different stimuli received. We investigated and compared the bone regenerative potential of SVF and ASCs, through their ability to grow on SmartBone[®], a composite xenohybrid bone scaffold. SVF plated on SmartBone[®] showed better osteoinductive capabilities than ASCs. Collagen I, osteocalcin and TGF β markedly stained the new tissue on SmartBone[®]; microCT analysis indicated a progressive increase in mineralised tissue apposition by quantification of newly formed trabeculae ($3391 \pm 270,5$ vs $1825 \pm 133,4$, $p \pm 0,001$); an increased secretion of soluble factors stimulating osteoblasts, as VEGF ($153,5$ to $1278,1$ pg/ml) and endothelin 1 ($0,43$ to $1,47$ pg/ml), was detected over time. In conclusion, the usage of SVF, whose handling doesn't require manipulation in an in vitro culture, could definitively represent a benefit for a larger use in clinical applications. Our data strongly support an innovative idea for a bone regenerative medicine based on resorbable scaffold seeded with SVF, which will improve the precision of stem cells implant and the quality of new bone formation.

We recommend

Cell therapy in orthopaedics

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Stem cells and orthopaedic surgery

M. Khan, *Bone & Joint* 360, 2013

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Biodistribution of locally or systemically transplanted osteoblast-like cells

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Harnessing extracellular vesicles to direct endochondral repair of large bone defects

E. Ferreira, *Bone & Joint Research*, 2018

Comment on "Multipotency and secretome: the mechanisms behind the regenerative potential of adipose-derived stem cells"

Young-Joon Jun, *Plastic and Aesthetic Research*, 2017

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