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

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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 populations 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 TGFβ markedly stained the new tissue on SmartBone®; microCT analysis indicated a progressive increase in mineralised tissue apposition by quantification of newly formed trabeculae (3391 ± 270,5 vs 1825 ± 133,4, $p < 0{,}001$); 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.