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## **Therapeutic applications of adipose-derived mesenchymal stem cells in combination with autologous fat graft as fillers in plastic and reconstructive surgery**

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Stem cell based therapies for the repair and regeneration of various tissues and organs offer a paradigm shift that may provide alternative therapeutic solutions for a number of diseases. The emerging field of regenerative medicine will require a reliable source of stem cells and adipose tissue represents an abundant and accessible source of adult stem cells with neither ethical nor immunoreactive considerations, as long as they are of autologous tissue origin.

Plastic surgeons are keenly aware of the principle “replace like with like.” This principle underlies much of the rationale behind the clinical use of autologous fat transplantation, despite the procedure’s drawbacks. Autologous fat transplantation is frequently used for a variety of cosmetic and reconstructive indications. However, the limitations of fat transplantation are well known, particularly the long-term unpredictability of volume maintenance. Resorption rates ranging from 25% to 80% have been reported. Therefore, methods to increase graft viability are needed. A recent study, reports the results of a triple-blind, placebo-controlled trial to compare the survival of fat grafts enriched with autologous adipose-derived stem cells (ADSC) versus non-enriched fat grafts. Compared with the control grafts, the mesenchymal stem cells enriched fat grafts had significantly higher residual volumes: 23,00 (95% CI 20,57-25,43) cm<sup>3</sup> versus 4,66 (3,16-6,16) cm<sup>3</sup> for the controls, corresponding to 80,9% (76,6-85,2) versus 16,3% (11,1-21,4) of the initial volumes, respectively. The difference between the groups was 18,34 (95% CI 15,70-20,98) cm<sup>3</sup>, equivalent to 64,6% (57,1-72,1). These promising results indicate that mesenchymal stem cells graft enrichment could render lipofilling a reliable alternative to major tissue augmentation with allogeneic material or major flap surgery.

These impressive results were possible thanks the passing of the limits of the actual protocols for cells amplification, through the optimization of the condition of cells culture. In particular, the use of platelet lysate was the key of success of this result. The adipose-derived stem cells, that were cultured in platelet lysate, exhibited a significantly shorter population doubling time (PDT) of 29.6 h (95% confidence interval, 22.3 - 41.9 h) compared with those cultured in fetal bovine serum (FBS), for which the PDT was 123.9 h (95% confidence interval, 95.6 - 176.2 h). Comparative genomic hybridization analyses revealed no chromosomal aberrations. Cell differentiation, capillary structure formation and cell-surface marker expression were generally unaffected by the type of medium supplement that was used or by the addition of vascular endothelial growth factor. The use of platelet lysate as a growth supplement for ADSC facilitated a significantly higher proliferation rate compared with FBS without compromising genomic stability or differentiation capacity and, in general, the well demonstrated safety of adipose-derived stem cells, for clinical use, grown with FBS.

In conclusion, clearly adipose tissue enriched with adipose-derived stem cells offer the possibility of finally fulfilling the key principle of replacing like with like as an aesthetic filler, without the drawbacks of current technology.

### **Biography**

Matteo Vigo is an accomplished surgeon offering over 10 years of experience in performing challenging surgical operations encompassing plastic and reconstructive surgeries. Outstanding in performing fat grafting and breast surgeries (both aesthetic than reconstructive) as well as possessing impressive skills in facial cosmetic and body recontouring surgeries. Exceptional and hands-on experience in Liposuction procedures. Skilled initiator of innovative procedures and strategies while evaluating and managing clinical practices ensuring exceptional customer services and quality patient care. Established cosmetic surgery expert with exposure to global locations and sound knowledge of standard practices and ethics in medicine; conversant with legislation and standards ensuring patient care, vigilance and safety during interventions while achieving clinical excellence.

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