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Integra® dermal matrix bioengineered with platelet rich plasma (PRP) and mesenchymal stromal cells to serve as niche for skin regeneration

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Regenerative medicine strategies represent one of the main challenges to improve tissue healing and repair after damage or chronic pathologies. In this perspective, the setting of bioengineered scaffolds, namely synthetic matrices enriched with growth factors and stem cells, is considered a hot issue by numerous research groups.

In a previous "in vitro" study we have demonstrated that rat bone marrow-derived mesenchymal stem cells (MSCs) seeded on an artificial dermal matrix Integra®, enriched with platelet-rich plasma (PRP) displayed enhanced proliferative attitude as compared with those cultured in the presence of PRP or on the scaffold alone.

To this purpose, in this study we wanted to extend the experimentation by evaluating the efficacy of the bioengineered Integra® in an in vivo model of skin damage in rats. In particular, we used MSC derived from genetically modified rats overexpressing green fluorescent protein (GFP).

Rats were divided into different groups: those receiving Integra® or PRP alone, Integra® plus PRP, Integra® plus PRP and MSC, and injured and untreated rats. Skin biopsies, obtained at different times from the injury and the implant, were examined to evaluate the regeneration process and neovascularization pattern of the substrate at light an confocal immunofluorescence microscopy. In parallel experiments we evaluated the ability of MSC to release growth factors, namely VEGF and FGF, and immunomodulatory cytokines, to underscore the paracrine effects of these cells on the surrounding host tissue.

Keywords: regenerative medicine, skin