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Editorial

Regenerative plastic surgery

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Regenerative plastic surgery is a new branch of plastic surgery finalized to obtain damaged tissue regeneration using autologous or allogeneic cells and tissues.

Regenerating damaged organs and tissues, an act that once was considered magic, is currently entrusted to the surgical scientists who, using the laboratory simulated in the operating room, have allowed us to move from replacement and reconstructive plastic surgery to "regenerative plastic surgery" through autologous and allogeneic cell-based therapies and growth factors.

The enthusiasm for regenerative plastic surgery and for the treatment of some pa-thologies addressed by it, such as breast reconstruction, hemifacial atrophy, outcomes of burns and outcomes of scars, and also for aesthetic improvements such as breast and buttock augmentation, face rejuvenation and hair regrowth, has led over years, the author and publisher Prof. Pietro Gentile to better investigate, through rigorous scientific studies, the possible new minimally invasive strategies, particularly based on adipose-derived mesenchymal stem cells (AD-MSCs), human follicle mesenchymal stem cells (HF-MSCs) and growth factors contained in platelet-rich plasma (PRP).

The visionary idea of Prof. Gentile is therefore to introduce and definitively establish this interesting new field of plastic surgery, called regenerative plastic surgery.

AD-MSCs, cell-based therapies and biomaterials are interrelated terms that often go hand in hand when discussing strategies to improve tissue regeneration. Stem cells, biotechnology, bioactive molecules (PRP and micrografts) and biomaterials (mesh, scaffolds and hydrogels) may be helpful to researchers in this field.

Considering current knowledge of mesenchymal stem cells (MSCs), AD-MSCs, HF-MSCs, and biomaterials such as dermal substitute and titanium/polypropylene mesh, many scientists have developed different techniques to improve the effects of these re-generative strategies.

Regenerative plastic surgery has changed traditional reconstructive surgical pro-cedures in regenerative surgical procedures, increasing the use of less invasive strategies based on autologous fat grafting (AFG) and related AD-MSCs [1].

This last technique, based on the procedures of fibrin gel (FG) enrichment with AD-MSCs, has been used with effective outcomes in several fields of plastic surgery, such as breast soft tissue defects [2]. A recent study compared the breast augmentation results obtained in patients suffering from breast hypoplasia and treated with an implant with those obtained in patients treated with FG enriched with AD-MSCs [2]. The research confirms the safety and effectiveness of prostheses and AD-MSCs-enhanced FG, showing that FG allows for decreased scar burden with natural aesthetic results [2].

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The main limits of FG are the resorption and the controversial breast cancer rela-tionship in obese patients [2]. The techniques based on FG (FG not enriched or enriched with AD-MSCs) do not represent a significant risk factor for tumor recurrence as confirmed in recent research [2-4]. Additionally, a recent innovative strategy during conservative mastectomies and pre-pectoral breast reconstruction, based on titanium mesh, that could be also used in combination with FG, has been described, confirming its oncological safety [3].

As reported, the beneficial effects of FG during breast reconstruction have been amplified by the enrichment with human AD-MSCs. The major concern about the AD-MSC enrichment on breast cancer during breast reconstruction depends on their potential to release growth factors and hormones that can promote the proliferation of residual or quiescent cancer cells, with the risk of triggering cancer recurrence or new cancer development. The recent description that adult stem cells primed in vitro may be the vehicle for anti-cancer drug delivery offers a new vision concerning the role of AD-MSCs in breast reconstruction after cancer removal [4].

The clinical improvements obtained by FG are related to AD-MSCs, contained in the stromal vascular fraction (SVF) [2, 4], consisting of a mixture of pericytes, leukocytes, endothelial and smooth muscle cells. Additionally, FG contains several cells (AD-MSCs and adipocytes), extracellular matrix (ECM), nerves and vessels [5]. For the reasons mentioned above, FG may be considered a kind of biologically active tissue with re-generative properties when it is directly injected into skin wounds, soft tissue defects and malformations [5, 6] and a scaffold when it is enriched with AD-MSCs [5].

FG may act as a scaffold for AD-MSCs, representing a biological matrix (cellular and extracellular) in which these cells can be incorporated and transported, resulting in im-proved healing time and scar signs and symptoms, via an autologous regenerative ap-proach. The percentage of AD-MSCs contained in the SVF varies depending on the ex-traction procedure (enzymatic digestion vs mechanical manipulation based on centrif-ugation and filtration) but is greater than that in a classic FG [7].

Additionally, many other fields of plastic surgery may benefit using regenerative strategies, such as malformations [6, 7], symptomatic scars [8], hair loss [9], wound healing [10] and photoaging [1].

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Conflicts of Interest

The author declares no conflict of interest.

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