www.directivepublications.org

Advances in Plastic Surgery

DIRECTIVE PUBLICATIONS

Editorial

Biomaterials, Cell-Based Therapies, and Adipose-Derived Mesenchymal Stem Cells as Novel Regenerative Techniques in Plastic Surgery.

Pileto Gentiole.

INTRODUCTION

The terms "biomaterials," "cell-based therapies," and "adipose-derived mesenchymal stem cells" (AD-MSCs) are frequently used interchangeably when addressing methods to enhance tissue regeneration or fix tissue abnormalities. For these kinds of uses, mesenchymal and follicular stem cells, biotechnologies, blood products like platelet-rich plasma (PRP), and biomaterials including mesh, scaffolds, and hydrogels might be useful.

Given the current understanding of human follicle mesenchymal stem cells (HF-MSCs), mesenchymal stem cells (MSCs), AD-MSCs, epithelial and dermal cells, and biomaterials like titanium/polypropylene mesh, a number of researchers have devised various approaches to enhance the outcomes of these diverse biotechnology applications.

The goal of this Special Issue was to compile original, multidisciplinary research articles that illustrated the fundamental studies and practical applications of MSCs, AD-MSCs, PRP, micrografts, and biomaterials in tissue healing.

The current issue has taken into consideration a number of research areas, such as neurogenesis [1], dental implant surfaces [2], pancreatic pain [3], neurogenic differentiation [4], polyurethane–fibrin scaffolds [5], chondrogenesis [6], osteoarthritis [7], adipose-derived stem cells [8], and skin photoaging [9].

It has been noted that fatty tissue and AD-MSCs play a major role.Indeed, surgical techniques in regenerative domains have seen significant change in recent years, with a slow transition towards less invasive approaches based on autologous fat grafting (FG) and associated with AD-MSCs. This final tactic, which is based on FG enrichment with AD-MSCs, has been applied and has produced positive outcomes for both breast soft tissue abnormalities and plastic surgery. These processes use centrifugation, filtration, or enzymatic digestion with human collagenases to minimally manipulate fatty tissue. In a recent study, the outcomes of breast augmentation in patients with breast hypoplasia treated with prosthetics and those in patients treated with FG enhanced with AD-MSCs were compared.

In the treated case series, the investigation validated the safety and efficacy of both the prosthesis and AD-MSC-enhanced FG; yet, the group treated with FG showed less scarring and more natural-looking outcomes [10].

FG's primary drawbacks are its resorption and its contentious link to breast cancer in obese individuals [10]. Recent studies have established that FG-based techniques (non-enriched FG or FG enriched with AD-MSCs) did not constitute a major risk factor for tumor recurrence [10]. Its oncological safety has also been confirmed by the description of a novel titanium mesh-based technique utilized during conservative mastectomies and pre-pectoral breast reconstruction, which can also be employed in conjunction with FG [11].

The AD-MSCs found in the stromal vascular fraction (SVF), which included a combination of pericytes, leukocytes, endothelium, and smooth muscle cells, were linked to the clinical benefits that FG achieved [10,12]. FG also includes extracellular matrices (ECMs), nerves, arteries, and a variety of cells, including adipocytes and AD-MSCs [12].

For the reasons outlined above, FG may be regarded as a scaffold when enriched with AD-MSCs and as a biologically active tissue with healing qualities when injected directly into soft tissue defects and skin wounds [12].

When employing an autologous regenerative method, FGs may serve as scaffolds for AD-MSCs, acting as a biological matrix (cellular and extracellular) in which these cells can be inserted to increase healing time as well as scar indications and symptoms. The extraction method (enzymatic digestion

***Corresponding Author:** Pileto Gentiole, University of North Carolina, Hill, NC.
Received: 05-Jan-2025, **; Editor Assigned:** 06-Jan-2025 **; Reviewed:** 25-Jan-2025, **; Published:** 06-Feb-2025,
Citation: Pileto Gentiole. Biomaterials, Cell-Based Therapies, and Adipose-Derived Mesenchymal Stem Cells as Novel Regenerative Techniques in Plastic Surgery. Advances in Plastic Surgery. 2025 February; 1(1).

vs.mechanical manipulation based on centrifugation and filtration) affects the proportion of AD-MSCs in SVF. Nevertheless, it is higher than the proportion seen in traditional FG [10,12].

The information examined in this Special Issue shows that AD-MSCs have beneficial impacts in a variety of domains, including plastic surgery.

REFERENCES

1. Soni, N.; Gupta, S.; Rawat, S.; Krishnakumar, V.; Mohanty, S.; Banerjee, A. MicroRNA-Enriched Exosomes from Different Sources of Mesenchymal Stem Cells Can Differentially Modulate Functions of Immune Cells and Neurogenesis. Biomedicines 2021, 10, 69.[CrossRef] [PubMed]

2. Marconi, G.D.; Fonticoli, L.; Della Rocca, Y.; Oliva, S.; Rajan, T.S.; Trubiani, O.; Murmura, G.; Diomede, F.; Pizzicannella, J.Enhanced Extracellular Matrix Deposition on Titanium Implant Surfaces: Cellular and Molecular Evidences. Biomedicines 2021,9, 1710. [CrossRef] [PubMed]

3. Chow, R.P.; Nguyen, K.; Gou, W.; Green, E.; Morgan, K.; Lancaster, W.; Helke, K.; Strange, C.; Wang, H. A Novel Cellular Therapy to Treat Pancreatic Pain in Experimental Chronic Pancreatitis Using Human Alpha-1 Antitrypsin Overexpressing Mesenchymal Stromal Cells. Biomedicines 2021, 9, 1695. [CrossRef] [PubMed]

4. Wu, S.-H.; Liao, Y.-T.; Huang, C.-H.; Chen, Y.-C.; Chiang, E.-R.; Wang, J.-P. Comparison of the Confluence-Initiated Neurogenic Differentiation Tendency of Adipose-Derived and Bone Marrow-Derived Mesenchymal Stem Cells. Biomedicines 2021, 9, 1503.[CrossRef] [PubMed]

5. Radeloff, K.; Weiss, D.; Hagen, R.; Kleinsasser, N.; Radeloff, A. Differentiation behaviour of adipose-derived stromal cells (ASCs) seeded on polyurethane-fibrin scaffolds in vitro and in vivo. Biomedicines 2021, 9, 982. [CrossRef]

6. Wu, S.-C.; Chang, C.-H.; Chang, L.-H.; Wu, C.-W.; Chen, J.-W.; Chen, C.-H.; Lin, Y.-S.; Chang, J.-K.; Ho, M.L. Simvastatin Enhances the Chondrogenesis But Not the Osteogenesis of Adipose-Derived Stem Cells in a Hyaluronan Microenvironment. Biomedicines 2021, 9, 559. [CrossRef] [PubMed]

7. Peláez, P.; Damiá, E.; Torres-Torrillas, M.; Chicharro, D.; Cuervo, B.; Miguel, L.; del Romero, A.; Carrillo, J.M.; Sopena, J.J.; Rubio,M. Cell and Cell Free Therapies in Osteoarthritis. Biomedicines 2021, 9, 1726. [CrossRef] [PubMed]

8. Airuddin, S.S.; Halim, A.S.; Sulaiman, W.A.W.; Kadir, R.; Nasir, N.A.M. Adipose-Derived Stem Cell: "Treat or Trick". Biomedicines 2021, 9, 1624. [CrossRef]

9. Gentile, P.; Garcovich, S. Adipose-Derived Mesenchymal Stem Cells (AD-MSCs) against Ultraviolet (UV) Radiation Effects and the Skin Photoaging. Biomedicines 2021, 9, 532. [CrossRef] [PubMed]

10. Gentile, P. Breast Silicone Gel Implants versus Autologous Fat Grafting: Biomaterials and Bioactive Materials in Comparison. J.Clin. Med. 2021, 10, 3310. [CrossRef] [PubMed]

11. Gentile, P.; Bernini, M.; Orzalesi, L.; Sordi, S.; Meattini, I.; Lessi, F.; Kothari, A.; Calabrese, C. Titanium-coated polypropylene mesh as the innovative bioactive material in conservatives mastectomies and pre-pectoral breast reconstruction. Bioact. Mater.2021, 6, 4640–4653. [CrossRef] [PubMed]

12. Gentile, P.; Garcovich, S. Systematic Review: Adipose-Derived Mesenchymal Stem Cells, Platelet-Rich Plasma and Biomaterials as New Regenerative Strategies in Chronic Skin Wounds and Soft Tissue Defects. Int. J. Mol. Sci. 2021, 22, 1538. [CrossRef][PubMed]