Biocellular Regenerative Medicine

Use of Adipose-Derived Stem/Stromal Cells and It's Native Bioactive Matrix

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KEYWORDS

• Stem cells • Stromal cells • PRP • Regenerative medicine • Nanofat
• Mesenchymal cells • Fat grafts • SVF

KEY POINTS

- Autologous Stem/Stromal Cells and Platelet Concentrates Guided to Targets.
- Combination of Cells & PRP concentrates work better than either alone.
- Biocellular Combination Is Believed To Facilitate Patient's Own Wound Healing/ Regeneration.

EVOLUTION OF CELL-BASED THERAPIES

Over the past decade, great strides have been made in the understanding and potential of targeted cell-based therapies. Starting decades ago, use of an irritant solution to stimulate inflammatory reactions has been replaced in the past few years with transition to injecting various platelet-rich plasma (PRP) concentrates for supporting an effective inflammatory reaction at damaged or degenerative sites. Use of the contained growth factors and signal proteins became recognized as offering a significant improvement in tissue healing responses but seemed limited by incomplete repair while requiring a series (often 4–6) to achieve long-term clinical improvement. Current evolution of combining these trophic growth factors and signal proteins with concentrated undifferentiated cellular/stromal populations seemed like a logical and effective modality, moving into the forefront since 2000. Aesthetic and reconstructive applications led the way, because constant challenges of injury, loss of circulatory capabilities, degenerative, repair, and so forth demanded an optimal approach to regenerative needs. In-depth examination of how the body maintains itself revealed that undesignated cells were integrally important to replacing aging cells (such as

There are no conflicts of interest reported in this article or its content.
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Phys Med Rehabil Clin N Am 27 (2016) 871–891
http://dx.doi.org/10.1016/j.pmr.2016.06.005
1047-9651/16/

skin, hair, bowel lining, and so forth). Early on, fat was not thought of as undergoing such homeostatic mechanisms, because typical mitotic activities were not observed. Now it is recognized that rather than a static number of cells varying only in size, mature adipocytes actually undergo total replacement at a rate of 10% to 20% per year but do so in a different form of cell division known as asymmetric cell division. The ability to have resident precursor cells that are capable of responding to local site signals and the ability of providing a replacement cell of the needed type result in potential replacement cell differentiation, while retaining a single precursor cell type. Without that mechanism eventually there would be an uncontrollable stem/stromal cell population.[1]

With the advent of Food and Drug Administration (FDA)–approved tabletop devices for high platelet concentrations via a closed system, use of a simple blood draw yielded more than 4 to 6 times a patient's own circulating baselines levels. It has been well shown that the higher the achieved concentrations, the proportionally higher delivery of important factors intrinsically involved in all wound healing and repair.

It has become clear that certain tissue characteristics are most favorable for use in cell-based therapies, including easy and safe access and plentiful autologous stores of a group of cells possessing multipotent potential. Multipotency is important in that such cells have the capability of responding to local signals and possess the ability to transform or replenish signals needed at damaged or diseased sites for repair or regeneration.

Research has confirmed that a vast majority of such undesignated cells are associated and stored in proximity to the microvascular capillary system (**Fig. 1**). Essentially all tissues (with blood supply) have some of these multipotent cells available to deal with local and isolated demands. The body retains the ability to chemotactically attract and mobilize cells from local and remote storage points in response to chemical and physical signaling in the body. Approximately 15 years ago, an important scientific advance was made by researchers in finding that adipose tissue (fat) contained high numbers of such cells.[2,3] This is not totally surprising considering that fat also represents the largest microvascular organ in the body.

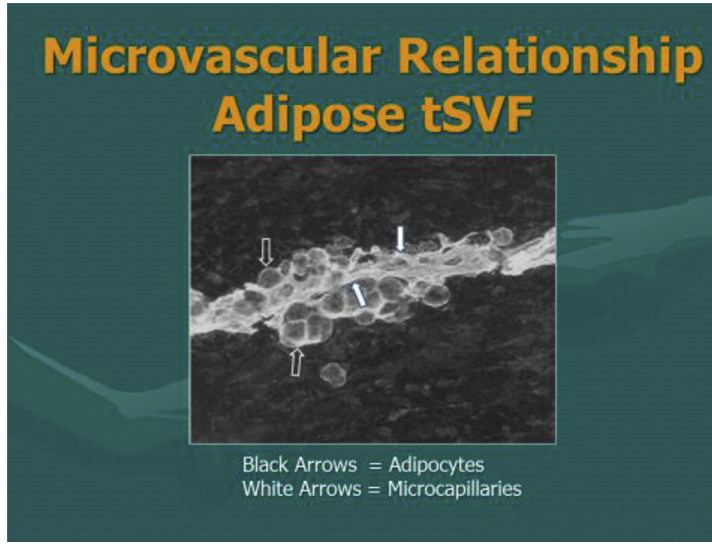

Fig. 1. Microvascular relationships in fetal pig.