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VIEWPOINT

Research

Diet (Fat-free) Fat Grafting: The Truth behind the Mechanical Stromal Cell Transfers

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Regenerative medicine is one of the most promising and important subjects in plastic surgery. Recently, many studies and new protocols have been described, especially regarding stromal cell applications. The most popular application is obtaining stromal cells from adipose tissue by mechanical means. The starting point in mechanical methods is the nanofat, as defined by Tonnard et al.[1] The basic principle of nanofat collection is to pass the fat tissue between two syringes through a connector, break up the parenchymal elements, and expose the stromal elements. Each tissue consists of two main structures—first, parenchymal cells responsible for the main function of the tissue, and second, stromal cells that support the parenchymal cells. Stromal cells are the principal source of regenerative cells, and the body's best source, both qualitatively and quantitatively, for stromal cell population is adipose tissue.[2] Although devices and methods designed to obtain mechanical stromal cells have been described recently, unfortunately very few products have been certified by such agencies as the FDA, EMA, and TGA, and few protocols have been accepted. In addition, there is still no consensus on the nomenclature and what fraction should be used after the procedure. Recently, all the attention has focused on extracellular matrix (ECM).[3] Therefore, in many mechanical methods, using the area where cell aggregates are found and where the ECM is concentrated has been recommended. The study by Copcu and Oztan[4] reported 46 different definitions related to mechanical methods, and it has been shown that the final product can be used in liquid, semi-solid, and solid formats. Regardless of the device or protocol chosen, there are two types of products obtained from mechanical methods (Fig. 1):

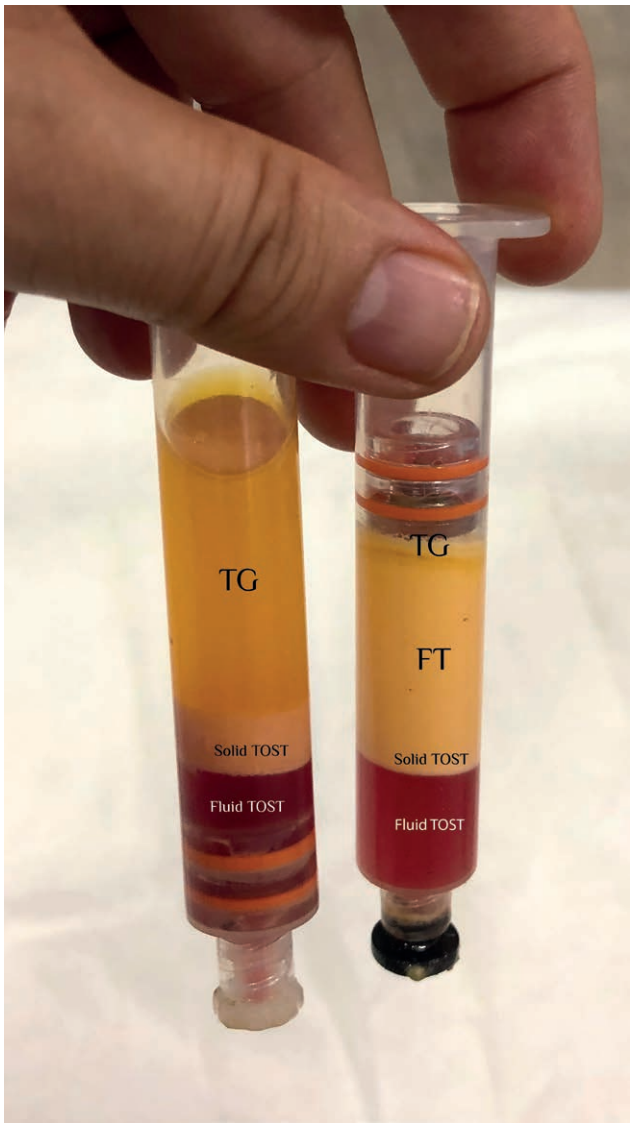

Fig. 1. View of the final products of mechanical stromal cell isolation systems. In the left syringe, there are three layers as final product of blunt systems (connector, filter, or beads). From top to the bottom: TG, solid TOST (total stromal cell) as cell aggregates, and fluid section of stromal cells (fluid TOST). Due to high blunt pressure, there is no intact fat tissue. In the right syringe, there are four different layers as the final product of sharp-blade system. From top to the bottom: TG, intact FT, solid TOST (total stromal cell) as cell aggregates, and fluid section of stromal cells (fluid TOST). Sharp blades cause low trauma to the fat tissue but more separation of stromal cells from parenchymal cells.

1. In an approach that does not damage the tissue, such as sharp blades, as in the IPs protocol described by Copcu, four separate layers will remain as a result of all processes: the triglycerides (TGs) at the top, the

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Fig. 2. Four layers of mechanical stromal cell transfer (MEST): from left to right: triglycerides, intact fat tissue, cell aggregate (solid TOST), fluid TOST. We are using the last two sections as stromal cell applications.

still-intact and viable adipose tissue next, the cell aggregate with the ECM and stromal cell clusters in the third layer, and the total stromal cells in liquid form last (Fig. 2).

2. On the other hand, in the three-layer model in which the adipose tissue is disintegrated by using the connector, filter, or beads system, the TG is at the top, cell aggregate in the middle, and stromal cells in liquid form at the bottom.

Thus, whatever device or method is used, the objective is to remove parenchymal tissues (fat) and TG to obtain stromal tissues. The coexistence of the ECM with these cells is the reason that using mechanical methods has the advantage over the use of enzymes, but adipocytes are not included in the ECM.[5] The main purpose of all mechanical processes is to create fat-free fat tissue, that is, to separate the fat tissue from the parenchymal cells—adipocytes—and to apply only stromal cells and ECM. In other words, the process is diet (fat-free) fat grafting using today's popular terminology. This approach will avoid complexity in terms of nomenclature, at least for the present.

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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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