The Difference between Stromal Vascular Fraction Isolation and Fat Emulsification

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Published in:
Plastic and Reconstructive Surgery

DOI:
10.1097/PRS.0000000000006366

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DISCLOSURE

None of the authors has a financial interest in any of the products or devices mentioned in this article.

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The Difference between Stromal Vascular Fraction Isolation and Fat Emulsification: A Crucial Role for Centrifugation

Sir:

Stromal vascular fraction is a great breakthrough in regenerative medicine because it improves both scars and wound healing. Therefore, a growing number of mechanical dissociation procedures have been developed that destroy adipocytes and subsequently isolate tissue stromal vascular fraction.[1] Most procedures are based on shearing of tissue: powerful stroking of lipoaspirate through a small channel in a transfer hub to break down adipocytes and reduce volume, and preserving cell-to-cell communication, including extracellular matrix.[1]

Since the mid-1990s, a comparable shuffling technique has already been used to emulsify lipoaspirate.[2] Emulsification is performed to evenly divide all components of adipose tissue (i.e., fat and infiltration fluid), resulting in an injectable substance of comparable volume with intact adipocytes. For good clinical understanding, it is of importance to distinguish between a mechanical isolation or an emulsification procedure. Based on difference in volume reduction between both techniques, the amount of destroyed adipocytes will differ and the amount of oil after centrifugation can simply distinguish between both types of procedures.

In the literature, many mechanical isolation procedures have not included a final centrifugation step.[1] Therefore, we also hypothesized that some recently described procedures are mentioned as being isolation procedures (e.g., the nanofat procedure) but are actually emulsification procedures.[3] In a short experiment, we processed fat ($n = 5$) by using two different mechanical isolation procedures to isolate tissue stromal vascular fraction (e.g., our own developed fractionation of adipose tissue procedure and the nanofat procedure).[3,4] Both mechanical isolation procedures were performed as originally described. As a control for both groups, 10 ml of one-time centrifuged adipose tissue was used. The nanofat sample was centrifuged afterward to see whether oil would appear. Furthermore, all samples were formalin-fixed and embedded in paraffin and stained with toluidine blue to visualize the morphology.

The fractionation of adipose tissue procedure resulted in 1 ml of aqueous fraction containing a small pellet fraction, 1 ml of stromal vascular fraction and 8 ml of oil (Fig. 1, *left*). The nanofat procedure resulted in 2 ml of infiltration fluid and 4 to 5 ml of adipose tissue, and had no detectable oil fraction (Fig. 1, *right*). This was corroborated by toluidine blue staining, which showed more stromal fraction and less intact adipocytes in the isolated stromal vascular fraction prepared by means of the fractionation of adipose tissue procedure as compared to stromal vascular fraction isolated by the nanofat procedure and control fat (data not shown).

In our hands, virtually no oil appeared with the nanofat procedure, which indicates that this procedure leaves adipocytes intact. We therefore hypothesize that the difference in fluid content caused by difference in pretreatment of the lipoaspirate (i.e., only decantation for the nanofat procedure versus centrifugation for the fractionation of adipose tissue procedure) apparently protects the adipocytes when forced through the single 2.4-mm-hole Luer-to-Luer transfer.

Based on our findings, we can conclude that a simple final centrifugation step can determine the amount of oil as evidence of the amount of destroyed fat. In this way, emulsification procedures can easily be distinguished from isolation procedures. The fractionation of adipose tissue procedure appears to be a mechanical dissociation procedure resulting in a small-volume tissue stromal vascular fraction, whereas the nanofat procedure appears to be an emulsification procedure.

DOI: 10.1097/PRS.0000000000006366

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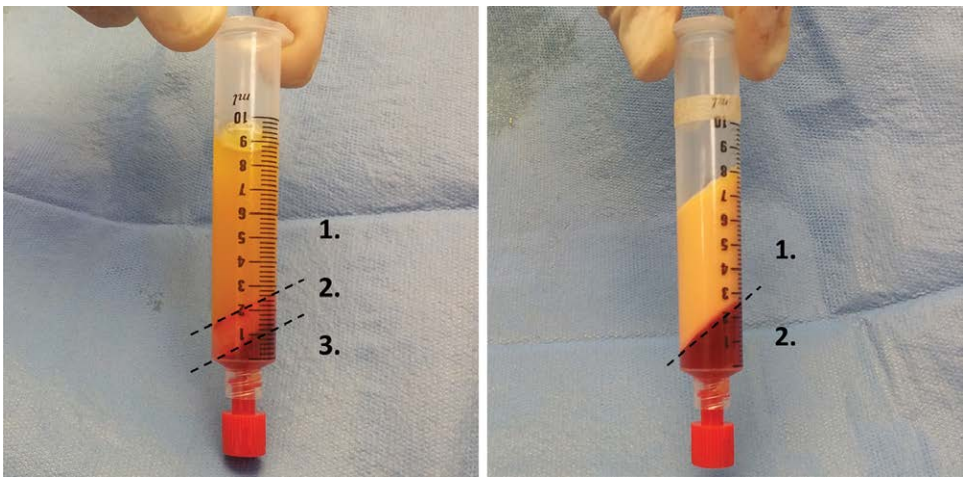

Fig. 1. (*Left*) Result of the fractionation of adipose tissue procedure. *1*, Oily fraction; *2*, stromal vascular fraction; *3*, aqueous fraction containing a small pellet fraction. (*Right*) Result of the nanofat procedure. *1*, Adipose tissue; *2*, infiltration fluid.

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DISCLOSURE

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Use of Cavilon for Making Surgical-Site Markings Indelible

Sir:

Marking of the surgical site is important; especially in plastic surgery. Skin markings are used to design surgical incisions, important landmarks, areas of deepithelialization, and others. Also, markings may be performed in certain positions before the patient is taken on the operating table (e.g., in mammaplasty, the markings are performed with the patient in the erect position).

Surgical scrubbing often smudges the preoperative markings or can even completely erase them.[1] Also, prolonged surgery can expose the markings to body fluids, which can also fade or erase them.

Innovative methods of marking the surgical site have been investigated. These may be cumbersome (such as applying henna)[2] or can potentially cause hypertrophic scar or keloid (caused by scratching). Various different companies and types of felt-tip pens have also been investigated in an effort to find a more robust ink.[3]

We have assessed the use of Cavilon (3M, Maplewood, Minn.) to make the markings more indelible. Cavilon is a terpolymer that forms a breathable, transparent, protective coating on the skin and results in an acrylate surface that resists removal. It is composed of hexamethyldisiloxane (65 to 90%), isooctane (5 to 30%), acrylate terpolymer (3 to 12%), and