



Variants of Fat Grafting: From Structural Fat Grafting to Microfat, Sharp-Needle Intradermal Fat (SNIF), Nanofat, Emulsion, SNIE, FAMI, and SEEFI

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The wide acceptance of fat grafting in recent years has ushered in a large number of new clinical applications. Specifically in the facial region, in addition to its standard role in correcting volume loss in facial fat compartments [1–4], fat grafting has aroused a great deal of interest as a possible regenerator of tissues and as a means of improving skin quality [5–7].

The expansion of fat grafting and its applications in areas of the face such as the eyelids, where the skin is very thin and where any irregularities are likely to be visible or palpable, has sparked interest in the development and study of new ways of fat processing. Today, ever thinner and smaller grafts are being obtained and injected, without compromising their cellular viability [8–11].

Traditionally, fat grafting has achieved good results as a filler. However, it has not become widely accepted in finer contouring, where conventional fillers such as hyaluronic acid continue to be preferred. At our practice, we initially performed fat injections only via cannulas, and in cases of marked folds and a deep, long-standing central wrinkle, we found that the wrinkle reappeared even though the surgery had been successful. In these cases, attempts at overfilling did not produce satisfactory results. Much the same

occurred with facial fine lines. Today, the development of needle injection techniques [7, 12–14] has allowed surgeons not only to be more precise but also to perform the injections in a more superficial plane and thus to use fat grafts as fine fillers.

Thanks to improvements in our understanding of the composition of the grafts that are being injected, new types of grafts have been proposed which aim not to add volume but to improve skin quality.

Given the growth in the number of techniques now available for fat injection, in this chapter, we describe the methods for obtaining, preparing, and injecting these grafts and outline their main indications.

Fat Grafting: Types and Preparation

Microfat Grafting

Unlike Coleman's structural fat grafting [15] and similar variants which used a 2–3-mm diameter suction cannula, the fat is obtained through low-pressure liposuction (0.5 atm) with a 2.4-mm microport harvester cannulas with barbed and beveled 1-mm ports (Tulip Medical Products, San Diego, California, USA).

Once obtained, the fat needs to be isolated from the blood, debris, water, the components of the solution used for the tumescence, and the oil

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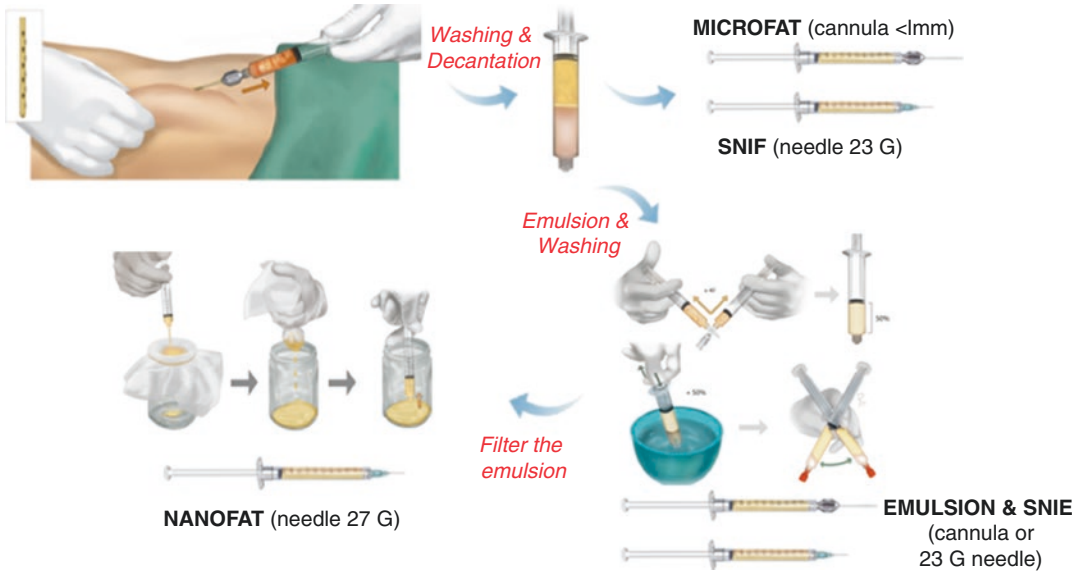


Fig. 1 Preparation of the main variants of fat grafting: microfat grafting, sharp-needle intradermal fat grafting (SNIF), emulsion, sharp-needle intradermal emulsion (SNIE), and nanofat grafting

resulting from the breakdown of the fatty acids during aspiration. To do this, either centrifugation, decantation, or washing can be used. In the case of injection via a cannula, any of these three methods is appropriate; however, if part of the fat is to be injected via a needle, it is advisable not to use centrifugation since the fat obtained is more compacted and can easily obstruct the needle.

Microfat is injected via 0.7–0.9-mm cannulas (always less than 1 mm in diameter) into the subcutaneous plane [8–11], in contrast to structural fat grafting (Fig. 1).

Sharp-Needle Intradermal Fat (SNIF)

Needle injection has been carried out for a number of years and several authors have already described its use [12]. However, it was Tonnard's group [13] who coined the term sharp-needle intradermal fat (SNIF) for the injection of microfat via a needle.

With SNIF, the surgeon can work in either a superficial subdermal plane or a deep intradermal plane using 23-gauge sharp needles. This technique minimizes the appearance of fine lines and wrinkles and allows greater precision.

Emulsion and Sharp-Needle Intradermal Emulsion (SNIE)

After obtaining the microfat, a mechanical emulsion is created by passing the fat 30 times between two 10-cc syringes connected by a Luer-Lock connector. As the emulsion is created, it acquires a lighter yellowish color. It is then decanted and washed with saline solution before being transferred to 1-cc syringes for injection [16].

A recent study [17] of the mechanical procedure of shuffling lipoaspirated fat found that it does not alter the tissue viability or its microscopic structure, nor does it affect the stromal vascular fraction (SVF).

The injection can be performed with cannulas, but also with 27-gauge needles (SNIE) in cases of fine lines, injecting the fat in a superficial plane.

Nanofat Grafting

Nanofat grafting was recently described by Tonnard et al. [6], not for adding volume but for injecting SVF cells. Although the evidence is very limited, Tonnard et al. saw that by creating a

mechanical emulsion of a sample of a microfat graft and filtering it through a nylon membrane, they were able to preserve a significant proportion of the stromal vascular component with the same proliferation and differentiation capacity of the stem cells and without any viable adipocytes.

Unlike the commonly accepted methods for obtaining SVF cells such as separation by the use of collagenases or other digestive enzymes, mechanical emulsion can be created by transferring the fat 30 times through two syringes and filtering the emulsion through non-absorbent nylon membranes in order to separate the cells from the remnants of connective tissue.

The nanofat is injected with 27-gauge needles in a superficial dermal plane in order to improve skin quality. After the injection, the color of the skin becomes a little lighter.

Superficial Enhanced Fluid Fat Injection (SEFFI)

Superficial enhanced fluid fat is obtained by liposuction using a 2-mm diameter cannula with a side-port size of 0.5–0.8 mm. After rinsing and centrifugation for 1 min at 2000 rpm, the fat is enhanced with platelet-rich plasma (PRP). The concentrated PRP is mixed with the fat to obtain a final concentration of 10% of the total fat harvested [7, 14].

Superficial enhanced fluid fat is usually injected using 20–23-gauge needles in a superficial plane and is useful for treating the periorbital area and the lips, among other sites.

Fat Autograft Muscle Injection (FAMI)

FAMI [18, 19] differs from the above techniques mainly in terms of the site where the fat tissue is deposited: directly inside the muscles and beneath the periosteum, via the injection of 1–3 cc of fat in a retrograde fashion from the muscular insertion to its origin. Engrafting the muscles of facial expression may improve graft retention and therefore its predictability and symmetry.

FAMI is harvested via syringe aspiration, refined with centrifugation, and injected with specific curved cannulas to the muscles of facial expression.

Clinical Applications: Our Approach to Facial Rejuvenation

One of the clearest indications for these fat grafting techniques is the restoration of volume in specific sites as a complement to classical facial rejuvenation surgeries such as blepharoplasty and face lift.

Practically all elderly patients present a negative facial vector [1–3], with loss of volume in the malar region. To restore the facial projection and contour in this area, we inject microfat grafting through two entry points—one in the proximal third of the zygomatic arch and the other at the height of the nasolabial groove—dividing the fat compartments into “deep malar,” “deep medial malar,” and “high lateral deep malar.” A more superficial injection is also performed until the desired volume and contour are achieved (Fig. 2a–d).

Later, in order to obtain a more natural brow-palpebral-malar transition, we usually complement the blepharoplasty with a volumetric rejuvenation of the periorbital rim in an attempt to create a supportive frame for the periorbital [16]. Above the upper eyelid, fat is injected in the glabellar region and in the superomedial angle of the orbital rim, followed by an enhancement of the tail of the eyebrow from the midpupillary line in order to avoid damage to the supraorbital neurovascular bundle. The microfat adds volume, and great care is taken to perform the injection above the orbital rim.

In the lateral part of the rim, we inject variable amounts of microfat and try to improve the static periorbital wrinkles using SNIE. In the lower eyelid, both the tear trough and the tear valley are injected with emulsion via a cannula. Microfat is also injected in the brow-palpebral-malar transition. This area frequently presents irregularities, and so great care is needed to use the correct quantity and to ensure a homogeneous distribution of the grafts.

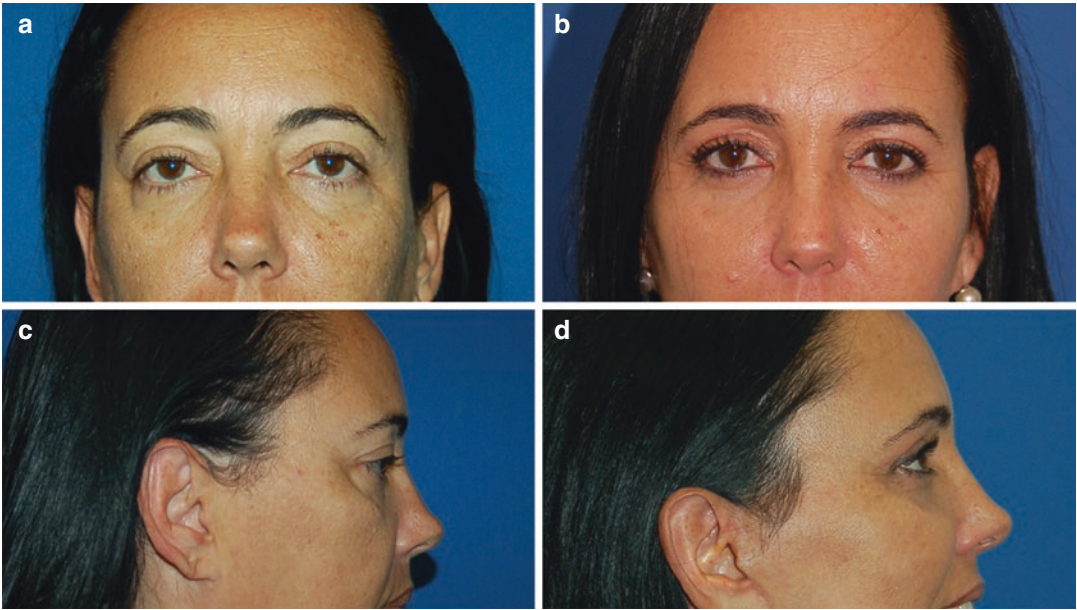


Fig. 2 Clinical case of a minimally invasive facelift, blepharoplasty and lipofilling. Fat grafting with microfat was performed in the malar region, the eyebrow, and the temporal region. Emulsion was used in the lower eyelid, in the tear trough, and for correction of crow's feet and the

outer edge of the orbital rim. Also a mesotherapy with emulsion and PRP was performed to improve skin quality. (a) Preoperative frontal view; (b) final result, frontal view; (c) preoperative lateral view; and (d) final result, lateral view

In the lower facial third [16], both the nasolabial and the melomental grooves can benefit from a deep injection of microfat. If the central wrinkle persists, we perform SNIF injections perpendicularly to the wrinkle in a superficial subdermal plane over a distance of approximately 1 cm in each injection. The remaining volumetric applications in this area, such as chin augmentation in cases of rhinoplasty or homogenization of the mandibular ridge, are performed with microfat grafting in order to restore the lost volume.

In older, poor quality skin, we may also perform mesoplasties with emulsion or nanofat [6] throughout the facial region. Nanofat can also be useful in patients who have dark circles around the eyes or in the tear trough. When nanofat is injected in the periorbital area, the surgeon should warn the patient that the bruising may remain for between 3 and 4 weeks.

After the treatment, the area is washed with alcohol and an antibiotic cream and cold packs are applied for the first 2 h. All patients are seen

the day after the intervention and weekly during the first month, and then at three-, six-, and twelve-month intervals. At 6 months the need for further treatment is assessed.

Summary

The development of new ways to process and inject fat, reducing the graft size and performing the injection via needles, has given rise to a range of new applications for fat grafting, above all in the facial region. Combinations of deep and superficial injections of autologous fat grafts are an efficient complement to classical surgical techniques for achieving the most natural results. To a large extent they resolve volumetric deficits when working at deep levels and can also be used for finer remodeling.

Further research is needed to assess the impact on clinical practice of these new methods for processing fat grafts as well as to compare their efficacy with respect to conventional fillers.

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