Facial Contouring and Rejuvenation with the Use of Fat Injection

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ABSTRACT
Aim: Reversing the effects of facial aging is achieved through a combination of the best techniques. Minimizing the appearance of fine wrinkles is an important part of treatment, which can include skin resurfacing, intradermal filling injections, or a combination of the two. The search for the ideal filling material continues, but intradermal fat injections can be a cheap and safe alternative to classic intradermal fillers. This study aims to evaluate the feasibility, validity, and reliability of micrograft, nanofat graft, sharp needle intradermal fat grafting (SNIF) technique.

Material and Methods: In this retrospective study, the records of 13 consecutive patients treated over 3 years were reviewed to evaluate the results of the technique including panfacial rejuvenation, contouring, augmentation with fat injection, and its complications.

Results: The results were evaluated by clinical examination and patient photographs. Aesthetically good healing was achieved using microfat graft, nanofat graft, sharp needle emulsified fat with intradermal injection techniques, the results lasted more than 1 year, which exceeded the expected time for absorbable dermal fillers (typically 3 to 6 months). No major complications were encountered; the most common minor complications were bruising and swelling.

Conclusion: Microfat and nanofat grafts, SNIF, are a safe and effective alternative to conventional absorbable dermal fillers for patients who can accept minor discomfort from donor site fat harvesting. Fat harvesting and injection techniques should be done precisely to achieve proper results and prevent complications.

Keywords: Plastic surgery; esthetic surgery; cosmetic surgery.

Yağ Enjeksiyonunun Yüze Kontür Verme ve Yüz Gençleştirme Kullanımı

ÖZ
Amaç: Yüz yaşlanmasının etkilerini tersine çevirme ve iyilik tekniklerin bir kombinasyonu ile elde edilir. Karşı kıvrımların görünümünü en aza indirmek, yüzey yenileme, intradermal dolgu enjeksiyonları veya ikinin bir kombinasyonu içerebilen tedavinin önemi bir parçasıdır. Ideal dolgu malzemesi arayışı devam etmektedir, ancak intradermal yağ enjeksiyonları klasik intradermal dolglarla ucuz ve güvenlidir alantatı olabilir. Çalışmanın amacı mikrogreft, nanogreft, keskin iğne intradermal yağ greftleme (SNIF) teknünün fizibilitesini, geçerliliğini ve güvenilirliğini değerlendirir.

Gereç ve Yöntemler: Çalışmamızda, 3 yıllık bir sürede tedavi edilen 13 arkadaş hastanın kayıtları panfasisal gençleştirme, kontür verme, augmente etme amacı ile alınan ve verme teknikleri dahil sonuçların değerlendirilmesi için gözden geçirildi.

Bulgular: Sonuçlar klinik muayene ve hasta fotoğrafları ile değerlendirildi. Mikroyağ grefti, nanoyağ grefti, keskin iğne ile emülsifiye edilmiş yağ ile intradermal enjeksiyon teknikleri kullanlarak estetik açıdan iyi iyileşme sağlanırken, sonuçların 1 yıldan fazla sürdü, bu da emilebilir dermal dolgu maddeleri (tipik olarak 3 ila 6 ay) için beklenen süreyi aştu. Hiçbir önemli komplikasyon oluşmadı; en sık görülen küçük komplikasyonlar morarma ve şişlikti. Sonuç: Mikroyağ ve nanoyağ grefti, SNIF, donor bölgesinden yazı alınmamadi küçük rahatlığına kabul edebilen hastalar için, klasik emilebilir dermal dolgu maddelerine güvenli ve etkili bir alternatifir. Yağ alma ve enjeksiyon teknikleri

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All the patients fitting the criteria were included in the augmentation with fat injection, and its complications. Including panfacial rejuvenation, contouring, patients treated between the years 2014 and 2019, were

**MATERIAL AND METHODS**

Fat autografts were prepared with different techniques in accordance with the needs of each patient. The use of these different sizes of fat grafts not only replaces the shortage of volume, but also the combination of deep injections or superficial injections with the help of the cannula, contributes to the reconstruction, rejuvenation and beautification of the entire facial area as a whole (1,2).

Fat grafts are widely used worldwide. While it was first used as a volume enhancer, it was also used in regenerative medicine because of the high amount of adult stem cells it contains (3). It is frequently preferred due to its easy and large amounts, adaptability to every structure and shape, easy application, and autologous texture. Fat grafts are used for aesthetic applications to refresh and support the skin and subcutaneous tissues. Since fat grafting is an easy and effective application, its use in aesthetic surgery has become increasingly indispensable. The fat graft is autogenous and allergy/rejection is not observed. Despite the easiness of application and low risk for complications, undesired results can occur if the basic principles are not followed. Obtaining, processing, and application of the fat graft should be done with the appropriate technique to reduce the negative results by taking the necessary measures (4-8).

Fat grafts are harvested from the most suitable donor site by taking into consideration the patient needs. It is important to avoid any complications in the areas where the fat graft will be taken. The most commonly used donor areas in our application of fat graft injection to the face are the abdomen, inner thigh, inner-knee, flanks, and hip.

The first studies on fat grafting were in the early twentieth century (7, 9-11). In 1977, with the application of liposuction was introduced by Illouz (12). In 1986, fat injection application technique was standardized by Coleman. Following the introduction of adipose-derived stem cells, which were discovered in the first years of the 21st century, and its clinical application, has resulted in significant progress in recent years.(1-3, 13). Thus, the indications for fat grafting are gradually increasing, and currently, stem cell therapy applications from fat are taking the necessary measures (4-8).

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We used these injections alone in some patients, while others combined with surgical (lower-upper blepharoplasty, facelift, temporal lift etc.) or non-surgical (such as Erbium, fractional CO2 laser, chemical peeling etc.) surface regeneration and rejuvenation techniques.

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**MATERIAL AND METHODS**

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**Physical examination**

Initially, the patient is evaluated by inspection. If the patient has previously taken photographs, the skin/subcutaneous damage over the years can be evaluated better. Eyebrow position in the photos, eyelid contour height and malar fullness helps in evaluating. Physical examination generally evaluates the loss of facial fat compartments and bone tissue (such as temporals, eyebrow fat pads, tear troughs, pre-jowl sulcus, and mandibular edge.) Skin thickness is important. In patients with thin skin, the risk of visible lumps is higher if the fat is placed too superficially. Asymmetries of the face, volume losses, previous operations (swelling may take longer after fat injection of the patient with lower blepharoplasty), underlying bone and tooth problems, facial implants are noted. Areas suitable for fat transfer; forehead, temporal, eyebrow, lower and upper eyelids, zygoma, malar, buccal, cheek, chin, jawline, ear lobule, upper and lower lips. Sun rays are considered to be the most important environmental factor that impairs skin quality and causes skin aging. This also affects the results of the applied technique. For this reason, we ask our patients to take protective measures from the harmful effects of sun rays after the application. We make suggestions to increase skin moisture.

Preoperatively, it is important to take photographs of the patient from certain standard angles. It is important to accurately identify the patient's upright position, voids, looseness, asymmetry, and bone changes during marking. With the combination of local tumescent infiltration anesthesia and oral premedication (anxiolytic etc.), the patient can safely and comfortably transfer fat. While different anesthesia techniques may be preferred, we used oral anxiolytic and local infiltration in our studies.

**Fat harvesting procedure**

1. The donor area is wiped with a chlorhexidine sponge.
2. The entrance hole of the cannula is injected with local anesthesia with 1% lidocaine.
3. Approximately 200 ml of tumescent solution is infiltrated with a 2 mm Coleman infiltration cannula with the fanning technique (Figure 1a).
4. Approximately 30-50 mL of fat is taken with a 2.4 mm Tulip Triport Harvesting cannula (Figure 1b).
5. After the syringes are filtered, the micronized fat is taken into the 10ml syringe and passed from the 2.4mm Tulip microadapter to the 1 ml luer lock syringe (Figure 1c).
6. Microfat grafts are transformed into nanografts 40-60 times back and forth from 1.2 mm Tulip nanoadapter of micronized fat taken with Tulip microcanna (Figure 1d).

**Fat injection procedure**

1. Face is wiped with chlorhexidine sponge.
2. Local anesthesia is applied to the areas to be injected on the face with 1% Lidocaine with Epinephrine.
3. Cannula entry holes are punctured with 19 gauge needles to the areas of the face to be injected. The
It can be used in combination with fractional CO₂ laser or specific skincare. After 3 days, postoperative treatment does not require ecchymosis can be easily closed with a concealer cream. Puncture of superficial capillaries. Both erythema and erythema treatment. Ecchymosis can also as a result of the fat injection will disappear within one hour of recovery and ease for multiple procedures. It is routine to collect and freeze excessive amounts of fat to allow "retouching" in the first year. Patients will have a variable swelling and bruising that improves in the first 3 days, which improves in the next 7 days. They can continue applying cold for the first 4-6 hours, 15 minutes per hour. It is recommended to continue supplementing bromelain (pineapple extract) 2 times a day for 10 days after the procedure. Corset application to the degreased area is recommended for 48-72 hours. Patients are re-evaluated at the postoperative 7th-day for general evaluation and in the 3rd, 6th, 12th months to see if additional fat grafts are required. The injected stem cells enter a maturation period 6 months following the procedure. Successful results are obtained as a result of appropriate evaluations of each patient and application of techniques specific to patient’s needs.

Table 1. List of surgical and non-surgical procedures

| Procedure                      | Number of patients | Percentage of patients |
|--------------------------------|--------------------|------------------------|
| Botox                          | 12                 | 92.3%                  |
| Radiofrequency                 | 9                  | 69.2%                  |
| Chemical Peeling (TCA)         | 2                  | 15.4%                  |
| Microfat graft                 | 13                 | 100%                   |
| Nanofat graft                  | 10                 | 76.9%                  |
| SNIF                           | 11                 | 84.6%                  |
| Blepharoplasty                 | 4                  | 30.8%                  |
| Temporal lift                  | 3                  | 23.1%                  |
| Face lift                      | 1                  | 7.7%                   |

Sharp Needle Intradermal Fat Grafting

The mean follow-up was 23 months (12 months-36 months). No further treatment was performed on 13 patients for at least 1 year because either they were not considered appropriate by the physician or the patients didn’t feel the need for additional procedures in this period. None of the patients had serious complications such as asymmetry, lymphedema, contour deformity, irregularity, nodularity, induration, cyst, infection, necrosis, or fat embolism due to intravascular injection. The bruising of the treated area was observed in 1 (7.7%) of the patients. It declined in 1 week. 2 (15.4%) of the patients had mild swelling that lasted 5 days after the procedure. Although 1 patient lost a significant amount of weight in 1 year, the results remained stable (Figure 2,3,4,5).

Table 2. Summary of patient data

| Parameter                      | Mean       | Standard Deviation | Minimum-Maximum |
|--------------------------------|------------|--------------------|-----------------|
| Age (years)                    | 42.4       | 5.9                | 34-53           |
| Body mass index (BMI)          | 23         | 2.5                | 20-27           |
| Microfat graft volume (ml)     | 9.76       | 4.4                | 4-17            |
| Nanofat graft volume (ml)      | 2.4        | 0.5                | 2-3             |
| SNIF volume (ml)               | 2.36       | 0.67               | 2-4             |
| Total injection volume (ml)    | 13.2       | 6.2                | 5-21            |
| Follow-up period (month)       | 23         | 7.7                | 12-36           |

Sharp Needle Intradermal Fat Grafting
Figure 1. (a) Fat injection cannulas (0.7-1.2 mm Tulip). Special blunt cannulas are required to safely perform fat grafting and poor outcomes are likely if sharp hypodermic needles are used. Sharp needle injection also poses a risk of fat embolization and related problems. (b) microfat graft adapter, (c) nanofat graft adapter. (d,e) Fat harvesting instruments. (d) 1.6-mm Coleman local anesthetic infiltration cannula, (e) 2.4-mm Tulip Triport harvesting cannula. 1mL and 10-mL Luer lock syringe.

Figure 2. Fat Injections. (a-e) A 48 year old patient before procedure. She has had no prior surgery. (f-k) Shaded areas show where the fat was placed. 2 ml microfat was placed in each upper orbit, 1 ml microfat graft was placed in each tear trough, 3 ml microfat graft and 1.5 ml nanofat graft was placed in each infra-orbital area, 1.5 ml SNIF was placed in each nasolabial crease and smoker line in each lip. 1 ml microfat graft was placed in each marionette. Total of 20 ml of fat injection was performed.

DISCUSSION
Subcutaneous fat loss, muscle atrophy and hypertrophy of the aging face, bone resorption and loss of skin elasticity create a cosmetically unpleasant appearance. In the face of this situation, the cosmetic surgeon should plan the rejuvenation program that best meets the needs of the patient.

In the past decade, there have been more publications on the elucidation of the subcutaneous facial structure and age-related changes (22). Rohrich and Pessa (23) have shown that the subcutaneous adipose tissue is not a single whole piece, but in the form of multiple fat compartments by muscles and muscles.

Superficial fat compartments; orbital fat compartments (superior, inferior, lateral), nasolabial, cheek fat compartments (medial, middle, lateral temporal), and deep fat compartments; sub-orbicularis oculi are defined as fat compartments (medial, lateral), deep cheek compartments (medial, lateral). This provides ease in locating and correcting the volume deficiency. Applying fat grafts to deep compartments provides contouring, lifting, and shallow applications to improve wrinkle and skin texture quality. Classical fat grafting is often used to create large amounts of volume, especially in breast reconstructive cases. In these cases, it is very important to
protect as many adipocytes as possible. Nanofat cannot create a significant fat volume. Therefore, the indications for nanofat injection are different compared to microfat grafting. Nanofat grafting is often combined with microfat grafting models, where nanofat grafting is used to improve the skin quality and improve atrophic skin areas. In our experience, unlike microfat, the effect of nanofat usually lasts with a delay of 4 weeks to 3 months. Since adipocytes do not survive the emulsification process, it can be questioned whether a nanofat transfer is a "fat grafting" procedure. The biggest effect of nanofat injection is probably a stem cell activity.

Skin aging is a multi-factor process. Skin aging occurs with the effect of multiple external and internal factors. The frequency and severity of these factors change the skin and subcutaneous tissues over time. We, physicians, frequently detect these changes in patients in the form of weakening of the skin quality, dryness, loss of elasticity, wrinkles and sagging. The purpose of our treatment planning is to replace the missing tissues that cause this appearance and refresh the skin.

The ideal dermal filler should have an efficacy that has been demonstrated by clinical studies and should be cost-effective. Dermal fillers with minimal side effects should be preferred. The longevity of the result of the filler must also be taken into account (8, 24). Filling materials can be obtained from different sources. Filling materials can be divided into two categories as the ones obtained from the patient’s own body (autologous) and the ones from other biologically compatible sources (heterologous) (25). Sometimes, after a few months, delayed side effects can occur and appear as granulomas, sometimes permanent, under the skin. Although these late-period complications, they are often encountered after the application of fillings that are not obtained from the patient’s own body, that is, obtained from heterologous sources despite being biologically compatible. Managing these complications is challenging for the physician. Examples of these kind of complications include superficial epithelization problems in the skin, regional swelling and lymph tissue involvement (26). In our study, Since autologous fat grafts are used as fillers, there are no problems with the use of heterologous fillers.

As a result of long years of studies, the histological and cellular effects of fat-derived stromal vascular fraction (SVF) have begun to be better understood. Clinical results obtained by nanofat grafting support the hypothesis that the use of the entire cell mixture and their natural scaffolds (extracellular matrix, structural tissues and intracellular messengers) may be more valuable than any of the SVF components used (7, 11).

With the nanofat grafting technique, the cells that we have prepared and made suitable for infiltration should be given to the recipient area as carefully as possible. In Coleman's classical macrophage graft technique, cannulas with wider ends and high probability of complications are used. Smaller cannulas have become popular for sensitive thin surface areas such as eyelids and lips. The small particle fat grafts, also known as microfat grafts, were used as a 23-gauge sharp needle intradermal fat graft published as SNIF technique of these small particle fat grafts by thinning and further thinning. Recently, it has been aimed to inject fat through smaller needles (27 gauge) into more sensitive thin surface areas to ensure filling of very fine rhythms and improving the quality of the skin. To allow the fat graft to pass through these 27 gauge needles, microfats were mechanically emulsified and converted into nanofat. The surprising clinical changes in the quality and texture of the treated skin areas allowed us to use it in our patients. In this study, we share our results and experiences that we achieved with the combined use of microfat, nanofat, and SNIF technique.

Nanofat is a method mainly used to make the skin structure healthier. Although dermal fillers are often used to increase tissue fullness, our goal in using nanofat is to rejuvenate the skin rather than filling it. Nanofat is used in many clinical conditions and lesions (scar, atrophic and pigmented skin) that may cause skin aging. Nanofat application has become the main component of our procedure. At the same time, it was observed that better results were obtained by combining the nanofat technique with the microfat and SNIF technique in suitable patients in certain anatomical regions. This technique has proven to be applicable to almost every patient. Nanofat is usually applied in combination with SNIF for microfat or superficial rhythms to correct facial volume. Erbium can also be combined with chemical peeling surface resurfacing techniques such as fractional CO2 laser and trichloroacetic acid (TCA).

Areas in need of treatment vary from patient to patient, and planning an fat grafting procedure requires a different look at the face according to the needs of the patient and the doctor's experience; Any area that can be successfully treated with non-autologous injectable fillers, temporals, forehead, eyebrows, glabella, radix, supraorbital (upper eyelid), infraorbital (lower eyelid), malar, tear groove, nasolabial, geniomandibular groove, The jaw areas can potentially be treated with fat grafting (27,28). In our study, the full face evaluation of our patients, microfat, nanofat, and SNIF application were used in combination with the required areas and good results were obtained.

In our study; we detected positive changes in the quality, pigmentation and texture of patients' facial skin after the fat grafts were transferred to certain areas of the face in different emulsions and modifications (microfat, nanofat etc.). We used microfat grafts, nanofat grafts for the correction of atrophic skin damage caused by age and sun damage, healing of the lower eyelid hyperpigmentation, full face rejuvenation and beautification together with SNIF for enhancing skin quality.

Microfat, nanofat graft and SNIF are safe and effective alternatives to conventional absorbable dermal fillers for patients who can accept minor discomfort of fat intake from the donor area. Harvesting and injection techniques should be done precisely to achieve proper results and prevent complications.

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