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A retrospective study of stromal vascular fraction gel and microfat grafting for nasolabial fold rejuvenation (A comparative clinical study)

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Abstract

Background and objective: The technique of fat grafting can affect the clinical outcomes and aesthetic potential. Micro-fat grafting consists of harvesting fat tissue by using a multi-perforated cannula with 1 mm hole. SR Coleman refined fat tissue that is transferred through a micro-cannula. Stromal vascular fraction (SVF) gel is a novel and mechanically processed fat product with high concentrations of adipose tissue which is derived from stem and other SVF cells. The objective of this study is to investigate and compare the aesthetic potential of microfat and extracellular matrix/stromal vascular fraction gel (SVF-gel) in nasolabial fold [NLF] rejuvenation.

Methods: This is a retrospective study included 20 patients who had both microfat injection and SVF gel grafting for various indications between 3 March 2021 to 27 July 2022 in Rizgary Teaching Hospital and private clinic in Erbil city. Surgeon's cost, patient's satisfaction, age, sex, smoking, pain and donor site appearance were evaluated. Microfat was harvested by with multiple 0.8 mm holes smooth side cannula, and processed with a fat stirrer to remove fibers. SVF-gel was prepared according to previously reported mechanical preparation method.

Results: All patients showed improvements in nasolabial fold rejuvenation and augmentation. The result showed that 57.1 of patients were satisfied with their SVF-gel grafting outcomes, while 52.9 of patients were satisfied with microfat grafting, and 10.9 of patients had mild postoperative bruise and pain. In comparison of patients and surgeon-rated satisfactions for SVF and microfat grafting the result was very close 52.9 and 51.8 respectively. SVF-gel and microfat showed effective nasolabial fold rejuvenation effects.

Conclusion: Stromal vascular fraction gel is effective for nasolabial fold rejuvenation, and looks to be superior to microfat injection for improvement of nasolabial fold skin quality.

Keywords: SFV grafting; Microfat grafting; Satisfaction.

Introduction

Deepening of the nasolabial fold (NLF) is regarded as a sign of aging, and facial rejuvenation procedures aim to shallow and smooth it out. More and more people now agree that lifting techniques alone are insufficient for most patients to have the most natural rejuvenation of the aging face.(1,2)

Gravity, loss of skin elasticity due to collagen degradation, volume loss due to fat shrinkage, and bone resorption are some of the key contributors to facial aging.(3) Recent study has focused on volume loss, which is cited as one of the main causes of aging. Aesthetically attractive facial rejuvenation has been achieved by repositioning the soft tissue along a vertical axis.(4)

The procedure of employing fat (Lipo-filling) as a face filler has become more popular in recent years. The main benefit of an autologous fat transplant is the low risk of hypersensitivity or an allergic

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reaction to a foreign body. With more than 48,000 fillings performed in 2015, it is the ninth most popular surgical treatment performed on the face, according to ASAPS. For the treatment of soft-tissue abnormalities, the first report of autologous fat transplantation dates back to the early twentieth century.[5,6]

Since Coleman's standardization of lipo-grafting methods, lipo-filling has developed into a powerful tool in the plastic surgeons tool box.[6] In Coleman's method, a sample of fat was taken from the body parts where it is most prevalent (the abdomen, the groin, the knee, and the area around the trochanter), followed by centrifugation and purified-fat-cell grafting.[7]

The popularity of liposuction for body reshaping and interest in the lipo-grafting operation are similar.[7] The ability to elevate or restore facial areas with volume loss or contour distortion using material that is already available may be the cause of the rise in the use of autologous fat transplants.[6,7] The original goal of fat grafting was to treat volume deficits brought on by illness, injury, or aging.[7,8]

The development of techniques methods for extracting and processing fat, as well as the existence of adipose-derived stem cells, may improve the viability of lipo-grafting longevity.[9] In the past, (± 2 mm in diameter) piercing cannula's was used to inject fat. Micro fat grafting, also known as lipo-filling with cannula's up to 0.7 mm, was reported by Tonnard in 2012.[6,10]

The micro fat demonstrated that there is less need for relipo-grafting and that the graft particles last longer.[6] The application of lipo-grafting is made more accurate by using small hole cannulas to extract the fat.[10]

The stromal vascular fraction (SVF) refers to a diverse collection of stem/stromal cells obtained from the perivascular and extracellular matrix (ECM) of the complex adipose tissue (ATC). Utilizing SVF in medical applications for regenerative purposes and wound healing shows promising potential in restoring functionality to tissues that have been damaged by injuries or chronic diseases. A gel called extracellular matrix/stromal vascular fraction gel (ECM/SVF-gel) was developed by Yao et al. using a novel technique involving the removal of a majority of lipids through centrifugation and flocculation. The researchers utilized this gel for tissue regeneration in scenarios such as scars, persistent wounds, and facial rejuvenation. Currently, this method is widely employed for scar treatment and facial rejuvenation.[11,12]

This study seeks to explore and compare the aesthetic capabilities of microfat and extracellular matrix/stromal vascular fraction (SVF) gel in rejuvenating the nasolabial fold (NLF), focusing on patient-based assessments, surgeon satisfaction and the effect of various factors including gender, age, skin type, smoking status, history of surgery, pain, complication donor site, complication recipient site on the satisfaction score of each procedure.

Methods

Clinical Data

This retrospective study included 20 patients who received both of SVF-gel and microfat transplant to restore volume in the nasolabial fold for nasolabial rejuvenation in private clinic and Rizgary Teaching Hospital in Erbil city between March 2021 to July 2022. The study includes surgery, follow up, data collection and results analysis. Patients were chosen consecutively and had different sex, age, skin type, smoking condition, history of surgery. None of the patients were diabetic or hypertensive. Patients who had a history of trauma, other underlying health conditions, previous surgeries, or filler injections in the specific injection area were excluded from the study.

The study followed the ethical guidelines outlined in the Helsinki Declaration and received approval from the Second Affiliated Hospital of Rizgary Teaching Hospital in Erbil, Kurdistan.

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Preoperative evaluation and special considerations

The overall health status and medical/ surgical history of each patient were assessed. Before the surgical procedure, photographs were consistently captured and documented to evaluate the individual's degree of aging, specifically focusing on the effects of gravity on the nasolabial fold. Additionally, thorough examination and marking of potential donor sites for fat harvesting were conducted with careful consideration.

Surgical Procedure

Patients with an actual fold of skin in the nasolabial area were treated with the microfat and SVF-gel grafting techniques on the left and right sides of the face, respectively.

Donor Site Selection

Lower abdomen and inner thighs are selected as donor site based on ease and safety of access

Fat harvesting

The collection of fat grafts was carried out with the patient under local anesthesia. For donor site pain relief and to control bleeding, a tumescent solution comprising 12 ml of 2% lidocaine and 0.5 mg of adrenaline in 500 mL of normal saline was administered. Subsequently, adipose tissue was manually suctioned using a 2.5-mm cannula attached to a 20-ml syringe.

Microfat grafting

The harvested lipo-aspirates were subjected to multiple washes with a saline solution using a sterile fine mesh made of nylon. This process aimed to eliminate clots, debris, and oil from the mixture. For microfat preparation, the rinsed lipo-aspirates were stirred with a fat stirrer featuring a barbed end. The barb effectively captured and removed the coarse fibers during a 2-minute stirring period. After allowing the mixture to settle for 20 minutes, the middle layer containing microfat was collected. To administer the microfat, a micro cannula with a diameter of 0.7 mm and a single hole was utilized (see Figure 1).

Stromal vascular fraction (SVF) gel grafting

SVF-gel was obtained following the procedure described by Yao et al.[11] The starting material for SVF-gel production was standard Coleman fat, which was prepared using the established Coleman technique. The lipoaspirate underwent centrifugation at 1200 g for 3 minutes to separate the Coleman fat in the middle layer. The bottom layer, consisting of the tumescent fluid, was discarded, and 20 mL of Coleman fat was transferred into two 20-mL syringes connected by a Luer-Lok connector with a 1.4 mm inner diameter. The fat was then transferred back and forth

Figure 1 Materials could be used for harvesting, preparation and grafting of micro fat

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between the two syringes (six to eight times) at a rate of 20 mL/s until it formed a homogeneous emulsion. Following this, it underwent centrifugation at 2000 g for 3 minutes. The middle layer, which accounted for approximately 20% of the original Coleman fat, was collected as SVF -gel for further utilization (see Figure 2).

The patient was positioned in an upright position for the injection of SVF-gel. The prepared SVF-gel was transferred into a 1-mL Luer-Lok syringe for the injection process. A single entry point was created at the lower portion of the nasolabial groove. Utilizing a blunt-tip injector with a diameter of0.9 mm, the SVF-gel was injected into the subdermal layer, allowing the injected materials to disperse evenly throughout the area.

Post injection care

To alleviate any discomfort, swelling, and aid in postoperative skin contouring, a cold compress was applied for the initial 48 hours. Standard postoperative care involved the administration of oral antibiotics and nonsteroidal anti-inflammatory drugs for a duration of three days.

Evaluation of Clinical Efficacy

The evaluation of clinical efficacy involved gathering the opinions of both the patients and the surgeon, along with reviewing photographs taken at 30, 90, and 180 days post-treatment. Safety assessment focused on observing and documenting any adverse events such as edema, ecchymosis, visible nodules, palpable abnormalities, or any unexpected symptoms. Changes in the patients' appearance captured in the photographs were assessed using the Global Aesthetic Improvement Scale (GAIS), which is defined as follows:

3. Very much improved: Significantly satisfactory cosmetic outcome after the injection.

2. Much improved: Noticeable improvement in appearance compared to the initial condition, although not entirely satisfactory for the patient. Additional treatment may slightly enhance the outcome.

1. Improved: Clear improvement in appearance compared to the initial condition. Consideration of complementary implant or retreatment may be appropriate.

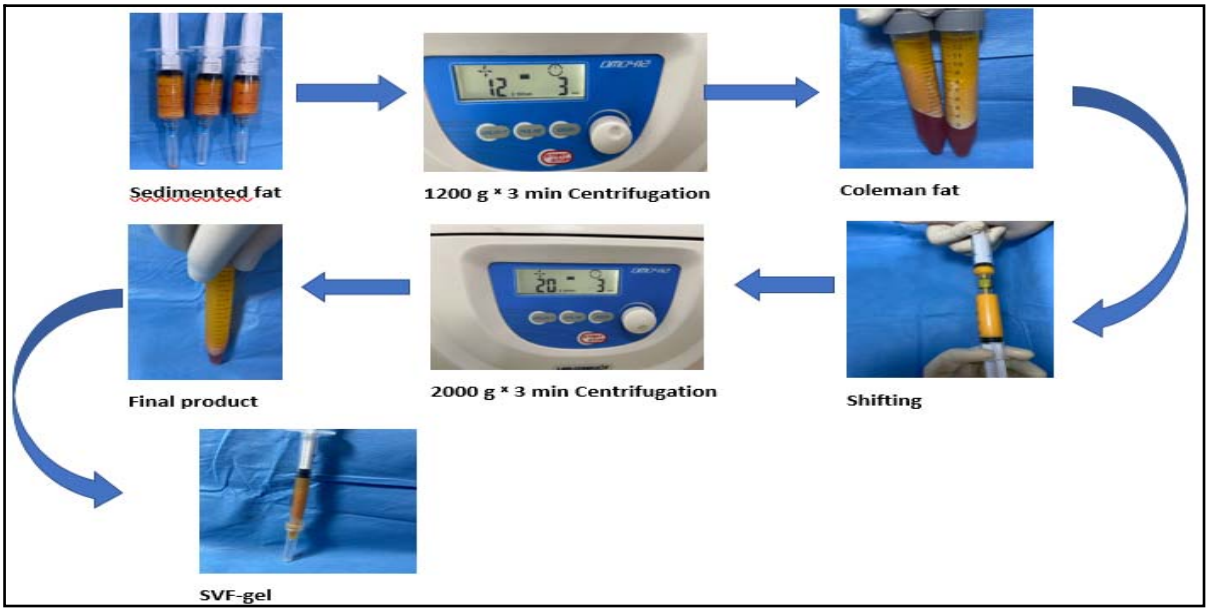

Figure 2 The processing procedure of SVF-gel

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0. No change: The appearance remains essentially the same as the original condition.
-1. Worse: The appearance is worse than the original condition.

Statistical analysis

The data analysis was conducted using the Statistical Package for Social Sciences (SPSS) software, version 25. Fisher's exact test was utilized instead of the Chi-square test when the expected frequency value was less than 5 or when it accounted for in more than 20% of the cells in the table. The Mann-Whitney test was employed to compare the mean ranks of satisfaction scores between two groups. To determine the strength of correlation between the satisfaction scores of surgeons and patients, the Spearman rho correlation coefficient was calculated. A *P*-value of ≤0.05 was deemed statistically significant.

Ethical Consideration

All procedures finalized in accordance with the ethical standards of the Institutional Committee, the 1964 Helsinki declaration and its later amendments. Written informed consent was obtained from all patients. This study is in line with the STROCSS criteria.

Results

Descriptive indicators of the sample group and research variables

Basic characteristics of the patients

Seventeen patients were included in the study. Their mean age (SD) was 37. 4 (8.2) years, the median was 38 years, and the age range was 22 – 50 years. The largest proportion (47.1%) of the sample was aged 40-50 years, and the majority (82.4%) were females. More than half (58.8%) of the patients were of skin type 2, and the majority (82.4%) were non-smokers. All of them had no medical history, and around one third (29.4%) had history of Cesarean section (Table 1).

Table 1 Basic characteristics of the patients

	No.	(%)
Age (years)		
20-29	4	(23.5)
30-39	5	(29.4)
≥ 40	8	(47.1)
Gender		
Male	3	(17.6)
Female	14	(82.4)
Skin type		
2	4	(23.5)
3	10	(58.8)
4	3	(17.6)
Smoking		
Yes	3	(17.6)
No	14	(82.4)
Medical history		
None	17	(100.0)
Surgical history		
Cesarean section	5	(29.4)
None	12	(70.6)
Total	17	(100.0)

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Donors and recipients' sites complications

It is evident in Figure 1 that 52.9% of the patients had severe pain, 41.2% had moderate pain and 5.9% had mild pain. Pain levels are assessed using visual analog scales.

The majority (70.6%) of the donors had no complication at the site of donation, 11.8% had bruises, and another 11.8% had pain. No recipient site complication was detected (Table 2).

Patients and surgeons' satisfaction

Patients and surgeons' satisfaction of the two grafting methods:

The mean (and mean rank) of patients' satisfaction score of the SVF gel grafting group was higher than that of the microfat gel grafting (57.06 and 52.94 respectively), but the difference was not significant (P = 0.290). There was also not significant difference between the two methods regarding the surgeons' satisfaction scores (P = 0.474) as presented in (Table 3).

Table 2 Donors and recipients' sites complications

	No.	(%) N = 17
Donor site complications		
None	12	(70.6)
Bruise	2	(11.8)
Bruise and pain	1	(5.9)
Pain	2	(11.8)
Recipient site complications		
None	17	(100.0)

Table 3 Patients and surgeons' satisfaction scores of the two grafting methods

	Stromal vascular fraction (SVF) gel grafting			Microfat gel grafting			
	Mean	(SD)	Mean Rank	Mean	(SD)	Mean Rank	*P**
Patient satisfaction score	57.06	(19.93)	19.32	52.94	(15.72)	15.68	0.290
Surgeon satisfaction score	52.94	(18.96)	18.76	51.76	(15.90)	16.24	0.474

*By Mann Whitney test.

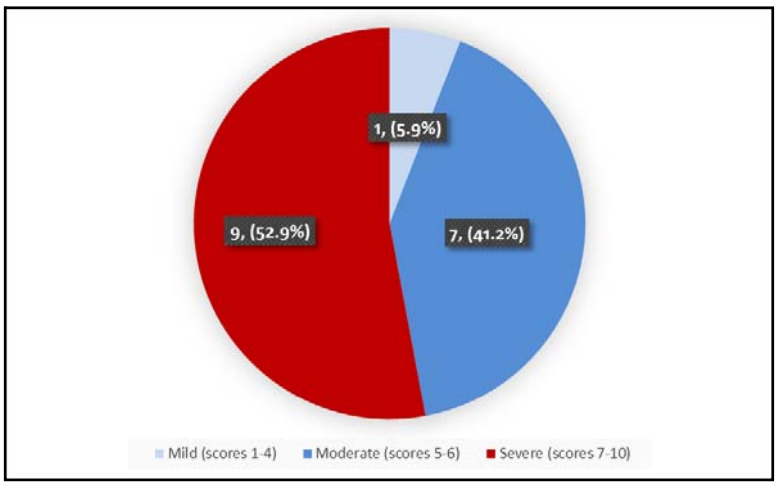

Figure 1 Distribution of sample by degree of pain

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The 100 scores satisfaction scale was divided into three groups, those who scored less than the median (< 60 out of 100) were considered of low satisfaction, those who scored 60 (which is the median) were considered as moderately satisfied, and those who scored more than 60 were considered as highly satisfied. More than one third (35.3%) of the SVF group were highly satisfied, compared with 11.8% of the microfat group, but the difference was not significant (*P* = 0.292).

The same pattern was for the surgeons, where it is evident that 29.4% of the surgeons were highly satisfied with the SVF gel grafting, compared with 11.8% for the microfat gel grafting (*P* = 0.553) as presented in Table 4.

A strong significant positive correlation was detected between surgeons and patients' satisfaction scores for the SVF gel graft (rho = 0.886, *P* <0.001) as presented in (Figure 2).

Table 4 Patients and surgeons' satisfaction categories of the two grafting methods

	SVF No. (%)	Microfat No. (%)	Total No. (%)	
Patient's satisfaction				
Low	5 (29.4)	7 (41.2)	12 (35.3)	
Moderate	6 (35.3)	8 (47.1)	14 (41.2)	
High	6 (35.3)	2 (11.8)	8 (23.5)	0.292*
Surgeons satisfaction				
Low	6 (35.3)	8 (47.1)	14 (41.2)	
Moderate	6 (35.3)	7 (41.2)	13 (38.2)	
High	5 (29.4)	2 (11.8)	7 (20.6)	0.553*
Total	17 (100.0)	17 (100.0)	34 (100.0)	

*By Fisher's exact test.

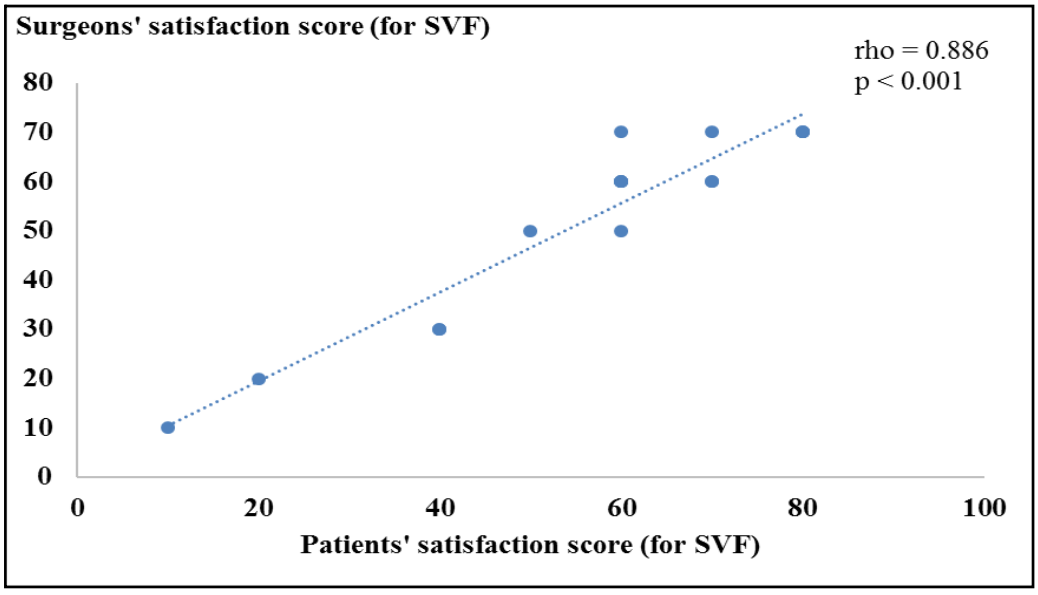

Figure 2 Correlation between surgeons and patients' satisfaction scores for the SVF gel graft.

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Figure 3 shows also that there was a strong significant positive correlation between the surgeons and patients' satisfaction scores for the microfat gel graft (rho = 0.945, *P* <0.001) (Figure 3).

Patients and surgeons' satisfaction of the two grafting methods by age and smoking

No significant association was detected between age and satisfaction with SVF gel graft (*P* = 1.000), but it is evident in Table 5 that 42.9% of the non-smokers were highly satisfied with the outcome compared with 0% among smokers (*P* = 0.015) (Table 5).

It is evident in Table 6 that there was no significant association between patients' satisfaction with microfat gel graft with age (*P* = 0.409), and smoking (*P* = 0.074) (Table 6).

Table 5 Patients' satisfaction with SVF gel graft by age and smoking

	Patients' satisfaction with SVF gel graft			
	Low	Moderate	High	
	No. (%)	No. (%)	No. (%)	
Age (years)				
20-29	1 (25.0)	2 (50.0)	1 (25.0)	
30-39	2 (40.0)	1 (20.0)	2 (40.0)	
≥ 40	2 (25.0)	3 (37.5)	3 (37.5)	1.000*
Smoking				
Smokers	3 (100.0)	0 (0.0)	0 (0.0)	
Non-smokers	2 (14.3)	6 (42.9)	6 (42.9)	0.015*
Total	5 (29.4)	6 (35.3)	6 (35.5)	

*By Fisher's exact test.

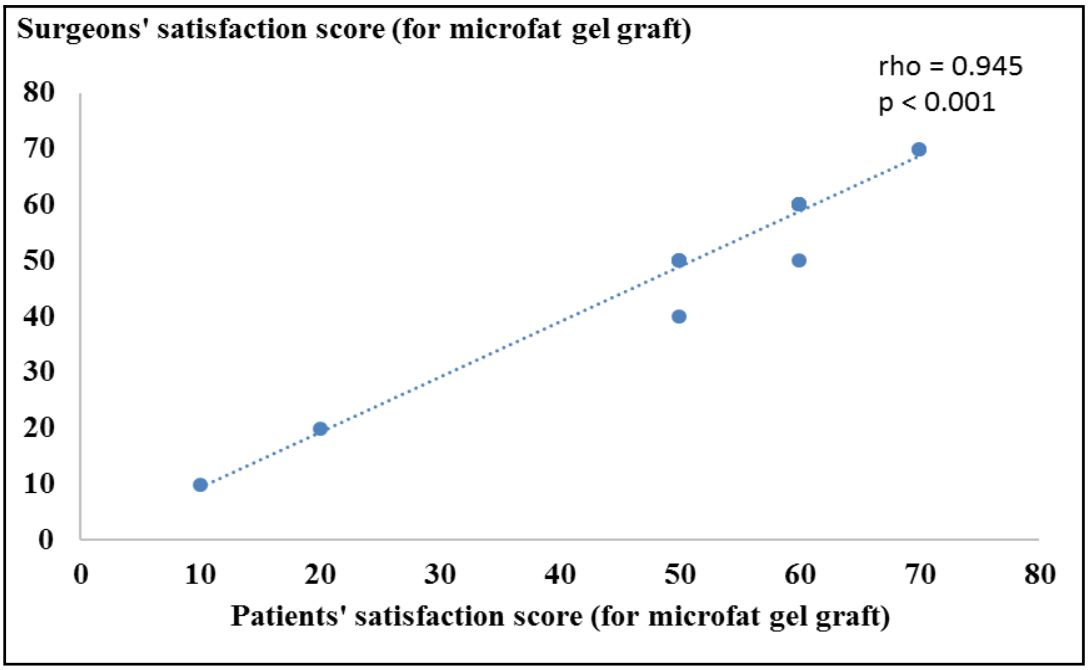

Figure 3 Correlation between surgeons and patients' satisfaction scores for the microfat gel graft

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Comparison of the satisfaction level in patients and surgeons

The average satisfaction level of patients from SVF grafting 57.6 was higher than microfat method 52.9 while the surgeon satisfaction from SVF and microfat grafting method was close, 52.9 and 51.7 respectively.

According to these results, SVF method was more effective in nasolabial fold rejuvenation from patients' point of view but there was no difference between the effectiveness of these two methods from surgeon point of view.

Discussion

The rise in popularity of microfat and SVF-gel techniques can be attributed to the positive influence of adipose-derived stem cells (ASCs) on improving skin quality through paracrine mechanisms and immunoregulation Furthermore, the precise administration of these substances into the superficial layers using sharp needles has significantly contributed to the widespread acceptance and adoption of these techniques.

Microfat is obtained by utilizing a cannula that is equipped with small side holes, typically with a diameter of less than 1 mm. In laboratory studies, it has been demonstrated that this approach maintains the structural integrity of fat lobules without subjecting them to mechanical emulsification. Nevertheless, when it comes to superficial grafts using finer needles, the untreated fat particles that contain coarse fibers are not deemed suitable. In contrast, nanofat and SVF-gel can be easily injected into superficial layers using finer needles, particularly 27-gauge needles. However, the processing of nanofat and SVF-gel can disrupt the tissue structure, potentially impacting the overall function of adipose tissue as endocrine organs compared to intact fat particles. Additionally, their interaction with the recipient tissue bed may be compromised following grafting.

Previous studies have compared cannulas with multiple side holes measuring 0.8 and 1.0 mm in diameter. Nevertheless, harvesting fat using smaller side hole cannulas, specifically 0.3 and 0.5 mm in diameter, has been found to be a time-consuming and labor-intensive procedure. Furthermore, following centrifugation, it was observed that the lipoaspirates obtained using these smaller side hole cannulas contained a noticeably higher amount of oil in the top layer. This increase in oil content indicated that

Table 6 Patients' satisfaction with microfat gel graft by age and smoking

	Patients' satisfaction with microfat gel graft			
	Low	Moderate	High	
	No. (%)	No. (%)	No. (%)	
Age (years)				
20-29	1 (25.0)	2 (50.0)	1 (25.0)	
30-39	3 (60.0)	1 (20.0)	1 (20.0)	
≥ 40	3 (37.5)	5 (62.5)	0 (0.0)	0.409*
Smoking				
Smokers	3 (100.0)	0 (0.0)	0 (0.0)	
Non-smokers	4 (28.6)	8 (57.1)	2 (14.3)	0.074*
Total	7 (41.2)	8 (47.1)	2 (11.8)	

*By Fisher's exact test.

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suffered significant damage, a finding that was further confirmed through microscopic examination. Additionally, the glucose transport test conducted currently suggests that the use of smaller side hole cannulas leads to decreased viability of adipose tissue.[14]

In a study by Rosen et al.[15] it was observed that fat particles obtained using a 0.3-mm cannula resulted in the formation of smaller, individual adipocytes. Conversely, samples obtained using a 0.8-mm cannula preserved a more complex structure of fat particles. Based on these findings, the current study opted to utilize a cannula with 0.8-mm side holes for the harvesting of microfat. This choice facilitated the easy removal of coarse fibers present in the aspirates, thereby improving the quality of the harvested microfat samples.

The microfat prepared in this study demonstrated smooth processing when injected through a 27-gauge needle. It is important to note that the side holes of the cannula used in this study are blunt, which differs from the suggestion made by Tonnard et al.[16] who proposed the use of 1.0-mm sharp holes with barbs. Caggiati et al.[17] reported that lipoaspirates harvested using the barbed cannula contained a higher number of ASCs compared to those obtained using a blunt cannula. However, it should be noted that the barbs on the cannula can potentially cut through fibrous septa, resulting in grafts that contain coarser fibers. This increased presence of coarse fibers raises concerns about potential blockages during the injection process.

Microfat and SVF-gel exhibit differ significantly in both macroscopic structure and microstructure. In the case of nanofat, the mature adipocytes are intentionally disrupted, resulting in the release of a significant amount of lipid, which contributes to the majority of the graft's volume. While a moderate inflammatory response caused by a small quantity of lipids can stimulate tissue regeneration by attracting and activating monocytes/ macrophages at the recipient site.[18] an excess of lipids in nanofat can lead to a severe inflammatory response and fibrosis.[19] Moreover, it is important to note that nanofat is not suitable for volume restoration purposes.

In the SVF-gel group, the gel-like substance contains a mixture of fragmented extracellular matrix, enriched SVF cells, and residual mature adipocytes or cell walls. While efforts are made to remove most of the lipids, it is worth noting that the amount of initial fat required to prepare an equivalent sample size is 4 times greater than that of microfat. This higher fat requirement results in increased trauma at the donor sites, which may limit its application in thin patients seeking volume augmentation. Alternatively, microfat shows a distinct deep yellow color and a fine granular texture, while maintaining the intact three-dimensional architecture of adipose tissue.

In microfat, the mature adipocytes, SVF cells, fibrous scaffolds, and capillary fragments are all still present. Unlike SVF-gel, microfat enables the mature adipocytes to survive in their natural environment, providing a conducive niche for SVF cells to promote optimal tissue regeneration.[20] This preservation of the natural cellular environment in microfat contributes to enhanced tissue regeneration potential.

Previous studies have examined and compared various aspects of SVF cells, including adipose-derived stem cells (ASCs) and endothelial cell populations, in terms of their potential for tissue regeneration. These studies have analyzed differences in SVF cell yield, viability, immunophenotype, proliferation rate, and their ability to differentiate into multiple cell lineages among the 3 types of samples. By assessing these characteristics, researchers aimed to gain a comprehensive understanding of the unique properties and regenerative potential associated with SVF cells derived

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from different sources.

The number of viable SVF cells obtained from nanofat was found to decrease by nearly fivefold in comparison to microfat samples. This decrease indicates that SVF cells can experience damage when fat particles are mechanically emulsified.[21] While the SVF cell yield from SVF-gel was double that of microfat, normalizing the calculated numbers by the volume of the original fat provided further confirmation of the detrimental effects of emulsification on SVF cells. These findings highlight the importance of minimizing mechanical disruption during the processing of fat samples to preserve the viability and functionality of SVF cells.

Early studies indicated that the preparation of SVF-gel involved transferring fat particles between syringes attached to a connector approximately 30 times. In a subsequent study, it was suggested that reducing the number of conversions to 6 to 8 times could help minimize SVF cell damage.[21] However, the issue of whether emulsification causes damage to SVF cells remains controversial. The varying results observed in different studies could be attributed to differences in factors such as fat particle size, viscosity, injection pressure and speed, and the inner diameter of the connector. Unfortunately, a standardized preparation procedure for SVF-gel has not been established to date, which further adds to the complexity and uncertainty surrounding this topic.

In this study, the protocols previously established for nanofat and SVF-gel were meticulously followed, taking into account the influence of various factors. Results from the study showed that proliferation and multiple-lineage differentiation did not exhibit significant differences between the groups. However, an interesting finding was that the proportion of ASC populations among the isolated SVF cells was higher in the SVF-gel group compared to the microfat group. Several factors could potentially contribute to these differences.[22]

During the production of microfat, the fibers and associated capillaries that harbor ASCs are eliminated.[20] Alternately, when fat is emulsified to create nanofat and SVF-gel, the ASCs are mechanically separated from their connected sites. Klle et al. have suggested that for cell-assisted lipotransfer, an effective number of ASCs is more than 10 million cells/mL. In this context, the limited enhancement of cells through fat emulsification may not have a significant impact on the outcome of the graft. This is because SVF-gel, which condenses SVF cells by two to three times, still maintains a considerable concentration of ASCs.[22]

Furthermore, the emulsification process can compromise the viability and microenvironment of cells within the emulsified fat, making them more vulnerable to attack by immune cells from the host. In contrast, microfat provides better retention, viability, mobility, and adhesion of cells.[23] As a result, the emulsification process may not be necessary and could potentially be avoided to preserve the favorable characteristics of microfat for cellular therapies.

In the present randomized controlled study, it was found that there was no significant difference in the rejuvenation and augmentation effects of the nasolabial fold between SVF gel and microfat grafting methods. All patients experienced improvements in nasolabial fold rejuvenation and augmentation. Some patients reported mild postoperative pain and bruising. When assessing patient and surgeon satisfaction, it was observed that more patients were satisfied with the outcomes of SVF-gel grafting compared to microfat grafting. However, when considering the ratings provided by the surgeons, satisfaction levels were very similar for both SVF-gel and microfat grafting procedures. Age and smoking were identified as the most influential factors affecting both patient and surgeon satisfaction, with a negative correlation. In conclusion, both SVF-gel and microfat

grafting demonstrated effective rejuvenation effects on the nasolabial fold.

In the study's limitations section, several noteworthy aspects deserve attention. Firstly, it is essential to acknowledge that the number of study cases was relatively limited. While the findings provide valuable insights, it is recommended to consider a larger sample size in future research endeavors to enhance the statistical robustness and generalizability of the results.

Another limitation worth mentioning is the relatively short duration of the follow-up period for the study cases. Due to this constraint, the ability to observe long-term outcomes was restricted. In forthcoming studies, extending the follow-up duration would allow for a more comprehensive understanding of the interventions' effectiveness over time.

Moreover, it is crucial to acknowledge the absence of cytological analysis facilities to assess the quality of stromal vascular fraction (SVF) and fat in the study. This limitation might have impacted the precision and accuracy of the results, as the quality of these components can influence the overall outcomes. Future investigations should prioritize incorporating cytological analysis to ensure a more thorough evaluation of SVF and fat characteristics.

We recommend that while the present study offers valuable insights, there are certain limitations that must be considered. To enhance the credibility and applicability of future research in this domain, essential steps include expanding the sample size, increasing the follow-up duration, and incorporating cytological analysis facilities.

Conclusion

The age and smoking were the most effective factors on both patient and surgeon satisfactions with negative correlation. Both SVF-gel and microfat showed effective nasolabial fold rejuvenation effects. According to these results, SVF method was more effective in nasolabial fold rejuvenation from patients' point of view but there was no difference between the effectiveness of these two methods from surgeon point of view.

Competing interests

The authors declare that they have no competing interests.

References

1. Dhir K, Binder W. Solid midfacial implants: when fillers are not enough. Facial Plastic Surgery. 2016; 32(05):480-7. DOI: 10.1055/s-0036-1587596.
2. Fitzgerald R, Graivier MH, Kane M, Lorenc ZP, Vleggaar D, Werschler WP, Kenkel JM. Update on facial aging. Aesthet Surg J. 2010; 30(1_Supplement):11S-24S. https://doi.org/10.1177/1090820X10378696.
3. Swift A, Liew S, Weinkle S, Garcia JK, Silberberg MB. The facial aging process from the "inside out". Aesthet Surg J. 2021; 41(10):1107-19. https://doi.org/10.1093/asj/sjaa339.
4. Jacono A, Bryant LM. Extended deep plane facelift: incorporating facial retaining ligament release and composite flap shifts to maximize midface, jawline and neck rejuvenation. Clin Plast Surg. 2018; 45(4):527-54. https://doi.org/10.1016/j.cps.2018.06.007.
5. Blumenschein AR, Freitas-Junior R, Tuffanin AT, Blumenschein DI. Lipoenxertia nas mamas: procedimento consagrado ou experimental?. Revista Brasileira de Cirurgia Plástica. 2012; 27:616-22. https://doi.org/10.1590/S1983-51752012000400025.
6. Zeltzer AA, Tonnard PL, Verpaele AM. Sharp-needle intradermal fat grafting (SNIF). Aesthet Surg J. 2012; 32(5):554-61. https://doi.org/10.1177/1090820X12445082.
7. Lindenblatt N, van Hulle A, Verpaele AM, Tonnard PL. The role of microfat grafting in facial contouring. Aesthet Surg J. 2015; 35(7):763-71. https://doi.org/10.1093/asj/sjv083.
8. Jeong JH. Recent Advancements in Autologous Fat Grafting. Archives of Aesthetic Plastic Surgery. 2014; 20(1):3-7. DOI: 10.14730/aaps.2014.20.1.3.
9. Grabin S, Antes G, Stark GB, Motschall E, Buroh S, Lampert FM. Cell-assisted lipotransfer: A critical appraisal of the evidence. Dtsch Arztebl Int. 2015; 112(15):255. DOI:10.3238/arztebl.2015.0255.
10. Tonnard P, Verpaele A, Peeters G, Hamdi M, Cornelissen M, Declercq H. Nanofat grafting: basic research and clinical applications. Plastic and Reconstructive Surgery. 2013; 132(4):1017-26. DOI:10.1097/PRS.0b013e31829fe1b0.
11. Yao Y, Dong Z, Liao Y, Zhang P, Ma J, Gao J, et al. Adipose extracellular matrix/stromal

vascular fraction gel: a novel adipose tissue–derived injectable for stem cell therapy. Plastic and Reconstructive Surgery. 2017; 139(4):867-79. DOI:10.1097/PRS.0000000000003214.
12. Yao Y, Cai J, Zhang P, Liao Y, Yuan Y, Dong Z, et al. Adipose stromal vascular fraction gel grafting: a new method for tissue volumization and rejuvenation. Dermatologic Surgery. 2018; 44(10):1278-86. DOI:10.1097/DSS.0000000000001556.
13. Al-Ghadban S, Bunnell BA. Adipose tissue-derived stem cells: immunomodulatory effects and therapeutic potential. Physiology. 2020; 35(2):125-33. https://doi.org/10.1152/physiol.00021.2019.
14. Lei H, Zheng D, Ma GE, Li Q. Assessment of effects of physical or chemical factors on fat particle viability by glucose transport test. Annals of Plastic Surgery. 2014; 73(2):225-30. DOI: 10.1097/SAP.0b013e318271005f.
15. Becker H, Vazquez OA, Rosen T. Cannula size effect on stromal vascular fraction content of fat grafts. Plast Reconstr Surg Glob Open. 2021; 9(3). DOI:10.1097/GOX.0000000000003471.
16. Ramakrishnan VM, Boyd NL. The adipose stromal vascular fraction as a complex cellular source for tissue engineering applications. Tissue Eng Part B Rev. 2018; 24(4):289-99. https://doi.org/10.1089/ten.teb.2017.0061.
17. Caggiati A, Germani A, Di Carlo A, Borsellino G, Capogrossi MC, Picozza M. Naturally adipose stromal cell-enriched fat graft: comparative polychromatic flow cytometry study of fat harvested by barbed or blunt multihole cannula. Aesthet Surg J. 2017; 37(5):591-602. https://doi.org/10.1093/asj/sjw211.
18. Yang Z, Jin S, He Y, Zhang X, Han X, Li F. Comparison of microfat, nanofat, and extracellular matrix/stromal vascular fraction gel for skin rejuvenation: basic research and clinical applications. Aesthet Surg J. 2021; 41(11):NP1557-70. https://doi.org/10.1093/asj/sjab033.
19. Zhang X, Huang B, Yang M, Yin B, Cai L, Tang X, et al. Single session of combined microfat and subcision in the treatment of Grade 4 atrophic acne scars. J Cosmet Dermatol. 2022; 21(10):4254-60. https://doi.org/10.1111/jocd.14784.
20. Sharma S, Muthu S, Jeyaraman M, Ranjan R, Jha SK. Translational products of adipose tissue-derived mesenchymal stem cells: Bench to bedside applications. World J Stem Cells. 2021; 13(10):1360. DOI:10.4252/wjsc.v13.i10.1360.
21. Oberbauer E, Steffenhagen C, Wurzer C, Gabriel C, Redl H, Wolbank S. Enzymatic and non-enzymatic isolation systems for adipose tissue-derived cells: current state of the art. Cell Regen. 2015; 4(1):1-4. https://doi.org/10.1186/s13619-015-0020-0.
22. Wang Y, Wu Y. Assessment of the clinical efficacy of cell-assisted lipotransfer and conventional fat graft: a meta-analysis based on case-control studies. J Orthop Surg Res. 2017; 12(1):1-7. https://doi.org/10.1186/s13018-017-0645-5.
23. Alharbi Z, Opländer C, Almakadi S, Fritz A, Vogt M, Pallua N. Conventional vs. micro-fat harvesting: how fat harvesting technique affects tissue-engineering approaches using adipose tissue-derived stem/stromal cells. J Plast Reconstr Aesthet Surg. 2013; 66(9):1271-8. https://doi.org/10.1016/j.bjps.2013.04.015.