

Comparison of fat maintenance in the face with centrifuge versus filtered and washed fat

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Background: Autogenous fat injection of the face is a viable and lasting remedy for soft tissue loss and has become a mainstay in facial rejuvenation. Fat transfer as either a stand-alone technique or as an adjunct to other filler technique and lifting depending on patient needs. Although soft tissue augmentation with autologous fat transfer has been increasingly used by esthetic surgeon, but there is no agreement concerning the best way of processing the harvested fat before injection. This study compared the clinical results obtained using simple filtered and washed fat via metal sieve with those achieved by means of pure centrifuged fat. **Materials and Methods:** A prospective single-blind analysis on 32 healthy patients undergoing nasolabial fold fat transplantation from 2009 to 2011 (simple sampling). Patients assigned in two groups randomly. The face of half (16 subjects) was injected with centrifuged, another half with simple filtered and washed fat to evaluate the effect of preparation methods on fat graft viability. Objective method was used to evaluate the results, involving the evaluation of postoperative photographs (in month 1, 6 and 12) by an esthetic surgeon (according to the nasolabial scale). Subjective method was a self-assessment obtained from patients about general level of satisfaction and improvement of skin texture, statistical analysis were performed by means of the Wilcoxon and Mann–Whitney test. Acquired data were analyzed using SPSS version 15 and a value of $P > 0.05$ was considered as significant. **Results:** There was no significant difference in the survival of grafted fat between the Group 1 (fat-processing with centrifuge at 3400 rpm for 1-min) and Group 2 (washing the fat in the sieve). **Conclusion:** Our data suggest that the centrifuge of the fat does not enhance survival of grafted fat ($P > 0.05$).

Key words: Centrifuge, fat, fat transfer, soft tissue augmentation, transfer

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INTRODUCTION

Facial aging is a multifactorial and multidimensional process. The dynamics of decreasing skin elasticity, loss of subcutaneous tissue and underlying bone resorption interplay to contribute to midface deflation and petosis. Autogenous fat injection of the midface is viable and lasting remedy for midface soft tissue loss and has become a mainstay in facial rejuvenation.^[1] Adipose tissue is readily available, inexpensive, host-compatible and can be harvested easily and repeatedly when needed^[2] without fear of allergies or foreign body reaction.^[3] Despite clinical optimism associated with autologous fat transfer, uncertainty remains among practitioners regarding the viability of transplanted fat.^[4]

There is no set way of processing fat to ensure the graft viability and optimal take.^[5] Although various preparation techniques have been suggested for improving the long term survival of the fat grafts,^[6] the most frequently used processing methods are: Washing

with saline solution, decantation and centrifugation.^[7] The purpose of this study was to evaluate the outcome of the two most common methods of adipose tissue purification for soft tissue augmentation in nasolabial region. The two chosen procedure were:

1. Centrifugation at 3400 rpm for 1-min and
2. Filtration with metal sieve and cleansing with normal saline.

PATIENTS AND METHODS

The sampling was conducted on those applicants who were referred to spadana clinic in Isfahan from 2009 to 2011 (simple sampling). Inclusion criteria, were aged 35-50 patients who requested the correction of nasolabial fold with no previous injection in this area at all. Exclusion criteria included severe photoaging, coagulopathy disorder, severe systemic diseases, and infection in the site of fat injection and previous fat or gel injection in nasolabial fold.

A single-blind clinical trial study was carried out on 32 healthy patients undergoing nasolabial fat

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transplantation. The patients had no information about the type of fat-processing, while the surgeon was aware.

A randomly division of 32 patients based on odd and even numbers (every other one) was performed. The first group was named centrifuge and the second filtration and wash.

To comply with the ethical issue, only one processing method was used on both sides of each person because of probable difference in fat survival between the two methods.

Harvesting

Area to be suctioned was low flank and first infiltrated with tumescent solution (lidocaine 0.05% and epinephrine 1:1,000,000 in ringer lactate solution). Liposuction was performed using a 2 mm, three holes, blunt cannula attached to a 10 mL Luer-Lok syringe under manual regulation of negative pressure, not exceeding 2cc to prevent lipolysis.

Fat-processing

Patients randomly divided into two groups: Group 1 included 16 patients, the obtained adipose tissue was centrifuged at 3400 rpm for 1-min resulting in formation of three layers [Figure 1]; top layer of oil from ruptured adipocytes, middle of usable fat tissue and a bottom layer of blood and tumescent solution. Group 2, which consists of 16 patients, aspirated fat was filtered under sterile condition using a metal sieve and then washed with 0.9% saline solution to concentrate the fat particles and separate them from fluids and debris. The purified fat was then collected using a sterile spoon and placed in a 10 cc Luer-Lok syringe.

Fat injection

After block anesthesia of mental and infra-orbital nerve, the purified fat tissue was transferred from the 10 cc syringe into the 1cc syringe through a two way connector [Figure 2]. The fat was injected through a 1 and 1.5 mm blunt tip cannula with a lateral opening.

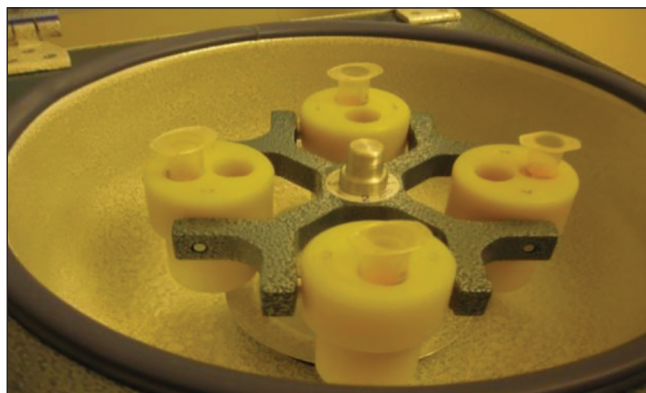


Figure 1: The syringes in the centrifuge

Marking

The markings are made with arrow pointing to the depth of the nasolabial fold crease, indicating the need for filling either on both sides of the crease or in the premaxillary region.

Incision

Lower midmalar incision provides access for the perpendicular placement of tissue and an incision in the mandibular border or near commissure, provides access for the longitudinal placement of tissue [Figures 3 and 4].

Technique

The graft was performed following the principle of structural fat grafting.^[8] Fat injection was performed very gently while withdrawing the cannula by applying a slight pressure. The primary level of placement is immediately subcutaneous to deliver structural integrity to the cutaneous element of the fold and then multiple strips of tiny particles of viable fat can be deposited on different level, fanning out from the entrance site.

By placing the fat from two direction, area are infiltrated rather than lines, adding that fullness feathers into surrounding areas. Placement from a longitudinal direction only can result in circumscribed, sharply, delineated and visible placement of the fat. Care should be taken to avoid creating too much of a mound lateral to the fold, because that can accentuate the already existing fold.

Postoperative care consisted of applying small steri-strips on incision site, administering systemic antibiotic, cool compress on the face, and compression garment in the aspirated districts. Massage to the nasolabial area is not recommended because of ischemic risk in grafted fat.

Photographs were obtained preoperatively and systematically at month 1, 6, 12 postoperatively



Figure 2: Fat transfer between syringes through a two way connector

[Figures 5-10]. Position, facial expression and camera setting were standardized. Subjective and objective methods were used to assess the results.

The subjective method was a self-assessment obtained from patients about general level of satisfaction and improvement of skin texture. Their scoring of satisfaction was 1 (low), 2

(moderate) and 3 (high). Hematoma and edema disappear after 2-3 weeks, thus the initial evaluation was done 1-month after fat injection.

The objective method was performed by an esthetic surgeon on the patient pictures in month 1, 6 and 12. The



Figure 3: Longitudinal fat placement through an incision near the commissure



Figure 4: Perpendicular fat placement through lower mid-malar incision



Figure 5: Group 1 (centrifuge) presurgery



Figure 6: Group 1 (centrifuge) at the end of surgery



Figure 7: Group 1 (centrifuge) 12 months after surgery



Figure 8: Group 2 (filter and wash) presurgery

depth of nasolabial fold was evaluated according to scale of Lemperle.

- 0 – No wrinkle
- 1 – Just perceptible wrinkle
- 2 – Shallow wrinkle
- 3 – Moderate deep wrinkle
- 4 – Deep wrinkle, well-defined edges
- 5 – Very deep wrinkle, redundant fold.

The nasolabial scoring of each patient recorded individually at these 3 times by the same physician and same scaling and acquired scores in month 1 was going to be the base of further statistical analyses for comparison with month 6 and 12.

The difference of scores between month 6 with month 1 and also between month 12 with month 1 were calculated. Finally, the mean of score differences of all patients were used to compare the method of fat centrifuge with fat filtration/washing.

In this study, the baseline was the patient data in month 1 that compare with months 6 and 12 because hematoma and edema disappear after 2-3 weeks, thus the initial evaluation was done 1-month after fat injection. In this article the depth of nasolabial fold before treatment is not important but in fact we want to know, how much fat maintain in month 6 and 12 in the face, after filling nasolabial fold. In this way, we compare fat maintenance in two methods.

In addition of mentioned evaluation and analysis, the amount of patient satisfaction based on treatment results were asked and recorded in month 12 according to the scale 1 = low 2 = moderate 3 = high.

Statistical analysis was performed by means of the Wilcoxon and Mann–Whitney test. Acquired data analyzed by SPSS version 15 and a value of $P > 0.05$ was considered as significant.



Figure 9: Group 2 (filter and wash) at the end of surgery

RESULTS

The frequency distribution of nasolabial scale was reported in the month 1, 6 and 12 after surgery [Table 1].

Table 1 is a descriptive table.

There is no need to express information before surgery, because month 1 is baseline of study.

The nasolabial scales of each patient in deferent months were evaluated and recorded in order to compare and determine the probable changes of grafted fat [Tables 2 and 3].

Table 1: Objective assessment: Frequency distribution of changes in nasolabial fold

Group	Scale different	Frequency (percentage)
Centrifuge	0	4 (25)
	1	12 (75)
	2	0 (0)
Filtration and wash	0	2 (12.5)
	1	14 (87.5)
	2	0 (0)
P-value	0.564	

Table 2: Objective assessment: Comparison of nasolabial fold, month 6 and month 1

Group	Scale different	Frequency (percentage)
Centrifuge	0	0 (0)
	1	11 (68.8)
	2	5 (31.2)
Filtration and wash	0	0 (0)
	1	10 (62.5)
	2	6 (37.5)
P-value	0.780	



Figure 10: Group 2 (filter and wash) 12 months after surgery

It was concluded that there is no significant difference between two groups, $P > 0.05\%$ [Table 4].

The amount of patient satisfaction with three grades.

(1 = low 2 = mod. 3 = high) was evaluated [Table 5].

According to Mann-Whitney test, there was no significant difference of patient satisfaction between two groups [Table 6].

DISCUSSION

Centrifugation and filtration/washing are ways of fat graft processing to be evaluated and compared.^[9] A number of authors advocated washing the fat with saline solution,^[10-14] while others recommended centrifugation.

Although some claimed that the presence of blood in the injected fat would stimulate macrophage activity to remove fat cell^[15] the actual effect of blood in the graft has not yet been clearly elucidated.^[16]

Coleman stressed the importance of removing nonviable fat aspirated component such as oil, blood and lidocaine by centrifugation.^[17]

Centrifugation has been challenged by Rohrich *et al.*,^[18] who found the centrifugation laborious and cumbersome and with a fat survival rate no better than that for filtration. Smith *et al.*^[6] evaluated the effects of different harvesting and preparation techniques on human fat viability.

The authors concentrated on six different fat preparation techniques and reported no significant difference in fat cell viability, as assessed by graft weight stability or histologic evaluations Khater *et al.*^[19] in a clinical and experimental study, presented their experience with two different techniques of fat-processing: Centrifugation and serum washing. The authors concluded that in noncentrifuged adipose tissue, more activity preadipocytes are found, which could, which could possibly lead to enhanced changes of survival and even development of *de novo* fat.

A recent study by Conde-Green *et al.*^[3] compared the influence of the three most used fat-processing techniques (i.e., decantation, washing, and centrifugation) on the viability and number of adipocytes and mesenchymal stem cells in the aspirated fat. They conclude that washing is the best processing method for adipose tissue grafting, as it maintains adipocyte integrity and number, clears the fat of most blood contaminations, and has a greater number of endothelial cells and mesenchymal stem cells. Treatment with such substances as growth factors, β -blockers,

Table 3: Objective assessment: Comparison of the nasolabial fold, month 12 and month 1

Group	Scale	Month 1	Month 6	Month 12
Centrifuge	0	9	2	0
	1	3	8	6
	2	4	3	6
	3	0	3	2
	4	0	0	2
Filtration and wash	5	0	0	0
	0	8	0	0
	1	5	9	4
	2	3	5	7
	3	0	2	5
	4	0	0	0
	5	0	0	0

Table 4: Statistical analysis

	Different month 6 from 1	Different month 12 from 1
Mann-Whitney	112.00	120
Z	-0.892	-0.366
P-value	0.564	0.780

Table 5: Subjective assessment: Patient satisfaction

Patient satisfaction	1	2	3	Total
Method				
Centrifuge				
Count	4	10	2	16
Percentage	25	62.5	12	100
F and W				
Count	6	9	1	16
Percentage	37.5	56.5	6.3	100
Total count	10	19	3	32
Total percentage	31.3	59.4	9.4	100

Table 6: Statistical analysis

	Patient satisfaction
Mann-Whitney	108
Z	-0.865
P-value	0.468

insulin, growth media, and even hyperbaric have been attempted.^[20,21]

No consistent evidence exists that any of these maneuvers is superior to the others.^[6]

Centrifugation lead to fat homogenization, thus granting smoother filling of the eyelid and tear trough regions and allowing a precise injection of very small dose of fat.^[22,23]

The amount of injected fat must necessary be moderate to prevent fat necrosis and reabsorption.^[23]

We decided to evaluate the two most common fat grafting procedure by comparing clinical results obtained by means of simple filtered and washed fat with those achieved by fat centrifugation. This experimental study demonstrates no significant difference between the two fat-processing methods.

CONCLUSION

Both the subjective self-evaluation by patients and the objective assessment by esthetic surgeon lead to the conclusion that the two fat-processing methods considered in this study yield results with similar quality.

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