Research Article

Outcome Of Autologous Fat Grafting In Facial Contour Deformities with Tumescent Solution On Recipient Site

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Abstract

Objective: The study aimed to find the percentage reduction of fat graft in autologous fat grafting for facial contour deformities with tumescent solution infiltration at recipient site.

Methodology: This descriptive case series was held at Plastic Surgery Department from September 1st 2019 to March 1st 2020. Patients with contour deformities requiring fat grafting were included in the study. Amount of fat grafted was measured with ultrasonography on 3rd post-op day, then again at 3 months, to calculate percentage reduction of fat graft and grouped into two categories for the purpose of this study: <30% reduction, and >30% reduction.

Results: A total of 121 patients were included in this study. 57.02% (n=69) had <30% reduction in fat whereas 42.98%(n=52) had >30% reduction.

Conclusion: We concluded that a significant percentage of reduction of fat graft was recorded in autologous fat grafting for facial contour deformities with tumescent solution infiltration at recipient site

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Introduction

Contour deformities of the face that require augmentation often result from a variety of congenital, developmental or acquired (trauma, infections, etc.) disorders. Over time fat grafting has gained immense popularity as an efficient technique to re-contour the face for these deformities. A number of important advantages are attributed to autologous fat: it is biocompatible, inexpensive, and easily obtainable in large amounts, with minimal morbidity. Furthermore, the vast majority of patients are satisfied with the short as well as long-term results.[1] Pioneered by Coleman et al, this technique and its indications are continually expanding.[2] It has thus become one of the most commonly performed procedures by plastic surgeons for facial re-contouring. However, there is lack of reliability and consistency of clinical results, which often creates the need for multiple fat grafting procedures.[3-5] The survival of adipose tissue is dependent on multiple factors in the micro environment of the area grafted.[6-7] These include variations in donor sites, fat harvesting and injection techniques. Many studies have been undertaken to find the standard fat grafting and processing techniques since the survival rate of grafted fat has been reported to be variable, ranging from 40 to 80 percent. The reasons for this variation in fat survival are however, still unpredictable.[8-12] To date, there is no published consensus on the optimal technique for fat grafting or graft retention longevity data which makes further research in this particular field evermore necessary.[13]

There is a lack of data evaluating effects of tumescent solution on fat graft viability after infiltration at recipient site. It is thought that infiltrating tumescent solution over the recipient site produces vasoconstriction which

decreases vascular permeability and fluid extravasation thus decreasing intra-operative bleeding, collection and hematoma formation. This not only helps to reduce bruising but also decreases chances of accidental intravascular embolization of fat.[14] It also results in lesser activation of cytokines and pro-inflammatory mediators, reducing chances of infection. All these factors may improve fat cell viability in areas infiltrated with tumescent solution and give better clinical results. The rationale of this study is to evaluate the clinical outcome of fat graft with tumescent infiltration at the recipient site in terms of fat graft retention.

Methodology

This was a descriptive case series held at the Plastic Surgery Department from September 1st 2019 to March 1st 2020, after approval by the hospital's ethics committee and taking informed consent from participants. Non probability, consecutive sampling was used. A sample size of 121 was calculated at 95% confidence level and 6% margin of error and taking expected frequency of reduction as 13%.[14] Patients having facial contour deformities, aged 5-70 years of both genders were included. Patients with contour deformities where previously graft was applied or with skin adherent to underlying bone were excluded. Patients with bleeding abnormalities, uncontrolled diabetes and hypertension, and connective tissue disorders were also excluded from the study.

Demographic, clinical (site and etiology of the deformity) and laboratory data of patients were collected. Pre-operative photographs were taken under standard lighting, distance, views and camera make and settings. All procedures were carried out under GA. After standard preparation and draping, areas requiring fat grafting were marked with a permament marker (as depicted in Figure 1). An appropriate quantity of tumescent solution was infiltrated at recipient site. Fat was harvested from abdomen or lateral side of thigh using 3mm two-hole blunt cannulas with 10ml syringe after infiltrating tumescent solution. Tumescent solution was a mixture of lignocaine and epinephrine in normal saline prepared as 0.4% lignocaine and 1:1,000,000 epinephrine

Fat was processed by sedimentation and filtration. It was then injected 30 minutes after tumescent infiltration with 1.5mm blunt-tip cannula. Fat was placed in different planes from deep to superficial layers in small volume till clinical symmetry was achieved with opposite normal side. Quantity of fat injected was noted in millimeters.

Figure 1: *Pre-Operative Mapping of Areas to be Injected with Fat*

Ultrasound was done at 72 hours to measure the total soft tissue thickness. Repeat ultrasound was done at 3 months follow-up. The percentage reduction of fat graft was calculated from these two values, as follows:

$$\text{Percentage reduction} = \frac{\text{Fat thickness at 72 hours} - \text{at 3 months} \times 100}{\text{Fat thickness at 72 hours}}$$

To ensure accuracy in measurement areas were marked with reference to anatomic landmarks using a permanent marker, pictures were taken and the same areas were examined in the follow-up visits. The same sonographer performed both follow-up ultrasounds measuring soft tissue thickness in millimeters.

The data was analyzed using SPSS version 26. Qualitative variables like gender and etiology were expressed as frequencies and percentages. Quantitative variables like age, patient and physician assessment scores, total volume of fat injected in one procedure and percentage reduction in fat graft volume were expressed as mean (SD). Chi square test was used. A p-value of <0.05 was considered significant. The data was stratified for age, gender, site of harvest and volume of fat transferred.

Results

A total of 121 cases fulfilling the selection criteria were enrolled. Age distribution in the study is shown in Table 1 and gender distribution in Table 2. The mean volume of fat transferred was recorded as 112.89 ± 86.99. Fat harvest sites is shown in Table 3 and showed that the abdomen was the most frequent site of harvest.

Regarding percentage reduction in fat content, 57.02% (n=69) had <30% reduction whereas 42.98%(n=52) had >30% reduction. (Table No. 4). The data was stratified for age, gender, site of harvest and volume of fat transferred. (Table No. 5-7). Figures 2 and 3 depict representative cases.

Table 1: *Age Distribution*

Age(in years)	No. of patients	%
5-20	29	23.97
21-70	92	76.03
Total	**121**	**100**
Mean±SD	**23.24±4.14**	

Table 2: *Gender Distribution*

Gender	No. of patients	%
Male	18	14.88
Female	103	85.12
Total	**121**	**100**

Table 3: *Site of Fat Harvest*

Site of fat harvest	No. of patients	%
Abdomen	69	57.02
Buttock	25	20.66
Right thigh	27	22.32
Total	**121**	**100**

Table 4: *Percentage Reduction in Fat Graft Volume*

Percentage reduction in fat graft	No. of patients	%
<30%	69	57.02
>30%	52	42.98
Total	**121**	**100**

Table 5: *Percentage reduction in fat with regards to age and gender*

Variable	Percentage reduction in fat		P value
	<30%	>30%	
Age group (years)			0.000
5-20	19	10	
>21	10	82	
Gender			
males	9	9	
females	63	43	0.51

Table 6: *Stratification of Percentage Reduction of Fat with Regards to Site of Harvest*

Site of harvest	Percentage reduction in fat		P value
	<30%	>30%	
Abdomen	43	26	0.17
Buttock	11	14	0.14
Right thigh	15	12	0.86

Table 7: *Stratification for Frequency of Percentage Reduction inFat with Regards to Fat Injected*

Fat injected	Percentage reduction in fat		P value
	<30%	>30%	
Upto 100 ml	36	40	0.005
>100ml	33	12	

Figure 2: *Pre-op and 3 Months Post-op Pictures of a Patient who Underwent fat Grafting of Bilateral Cheeks*

Figure 3: *A Young Woman with Contour Deformity of Lower Face Underwent Fat Grafting and was Satisfied with Resultant Chin Projection and Contour of Angle of The Mandible at 3 Months*

Discussion

Autologous fat grafting has many beneficial qualities that make it advantageous for correcting contour deformities or augmenting soft-tissue for reconstructive or cosmetic indications. The tumescent technique helps to reduce postoperative bruising, swelling and pain at the donor site. Because blood loss is minimized during tumescent liposuction, use of the technique reduces the chance that a blood transfusion will be needed. The expanded fat compartments allow the cannula to travel smoothly beneath the skin as the fat is removed.

The physiological effect of lignocaine and adrenaline on fat cell viability is not established. The few studies that have discussed the effect of tumescent solution on donor site,[16-17] state that the effect of epinephrine on fat cell viability is unclear[18-19] or negligible. However, epinephrine can be used as a hemostatic and to prolong the effect of lignocaine.[20]

Lignocaine in some studies has been shown to inhibit the growth of adipocytes in culture, and to slow down glucose transport, but the effect is transient[16], whereas in other studies there was no difference on fat cell morphology and viability with infiltration anesthetic.[17,21]

Wen H and others[14] investigated the application of facial liposuction and fat grafting in the remodeling of facial contour. In their trial, subcutaneous facial liposuction with tumescent technique and chin fat grafting were performed in all the cases, and it was revealed that marked improvement was achieved in all the patients with stable results. However, complications, such as asymmetry, unsmooth appearance and sagging were retreated with acceptable results.

A recent study by Bashir et al[15] measured fat retention in terms of thickness which was found to have a mean of 18.62+7.2mm and 12.88+6.21mm at 72 hours and 6 months respectively. These figures correspond to a reduction of transplanted fat by 30.77(13%). The findings of our study are similar to this trial.

Based on the results of this study, we did not find any improvement in fat retention with using tumescent infiltration on recipient site, rather it resulted in significant resorption of fat.

The hypothesis that "infiltrating tumescent solution over the recipient site produces vasoconstriction, decreases vascular permeability and fluid extravasation thus decreasing intra operative bleeding, collection and hematoma formation" may be further evaluated in local multicenter trials so that guidelines may be established while dealing with facial contour deformities.

Conclusion

We concluded that a significant percentage of reduction of fat graft was recorded in autologous fat grafting for facial contour deformities with tumescent solution infiltration at recipient site.

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