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Autologous Fat Grafting-A Journey towards Ideal Filler

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Abstract

Introduction

Autologous fat grafting is very inexpensive and less morbid option for correcting aesthetic appearance of depressed scar, facial deformity and augmentation of various body parts. Unpredictable and inconsistent results of fat grafting procedure had resulted in declining interest among surgeons. However, popularity of fat grafting procedures has increased nowadays owing to better understanding of fat harvesting and processing techniques.

Materials and methods

A prospective observational study was performed at our institute from January 2017 to December 2020 on total 15 consecutive patients with facial contour deformities and depressed or asymmetric scars who had been underwent autologous fat grafting. After harvesting fat manually, fat cells were separated without centrifugation and injected at recipient sites. Subjective evaluation of patients was done at 1 year by questionnaire and objective evaluation by photographs.

Results

Out of 15 patients on subjective assessment 11 patients were satisfied while 4 patients required reoperations to satisfy their visible asymmetry. 3 patients were unsatisfied even after reoperation. Objective assessment yielded a mean score of 7.9 out of 10.

Conclusion

Fat grafting can be considered a very powerful tool to correct asymmetry or deformed scars with depression. Gentle syringe aspiration and use of manual sedimentation have resulted in fairly predictable result. Autologous fat has made its place closest to the ideal filler.

Keywords: fat grafting, autologous fat, ideal filler.

1. Introduction

The transfer of autologous fat has been performed since 1890s¹ and as injectable grafts since the 1920s²; however, popularity of fat grafting procedures has increased owing to better understanding of fat harvesting and processing techniques. History of free fat grafts dates back to the early 1890s when Neuber first performed an autologous fat transfer for scarred tissue.¹ However, it was soon noticed that majority of grafted fat undergoes resorption. Unpredictable and inconsistent results of fat grafting procedure had resulted in declining interest among surgeons. In 1950, Peer proposed adipocyte survival theory in which he stated that quantity of viable adipocytes is inversely proportional to graft resorption.³ In 1990s, Coleman published concept of structural fat grafting.⁴ He emphasized on atraumatic surgical technique in harvesting and processing of fat. Unpredictable results with fat grafting procedure are often encountered because of variable fat resorption. Various studies have reported variable percentage of fat resorption ranging from 20 to 90%⁵⁻⁸. Despite higher percentage of graft resorption, surgeons have continued to use fat grafting procedures because of inexpensive and less morbid nature of the procedure. Moreover, risk of host rejection and prolong hospital stay can be obviated. Fat grafting is commonly used for facial

scars, facial deformities, lip augmentation, chin augmentation, breast augmentation, and so on.

In this article, we have used autologous fat for correction of congenital facial deformities, scars and posttraumatic nonfunctional facial deformities. We have evaluated our results post operatively with clinical photography and in terms of patient satisfaction rate.

2. Materials and Methods

A prospective observational study was performed at department of plastic surgery, N.H.L. medical college and Smt.Shardaben general hospital, Ahmedabad from January 2017 to december 2020. Total 15 consecutive patients with facial contour deformities and depressed or asymmetric scars who underwent fat grafting were included in the study. Demographic data (i.e., age, sex, race, and body mass index), disease related data (i.e., diagnosis and previous surgery at the site that received fat grafting), surgery-related data (i.e., donor site, recipient site, and injected volume), and outcome data (i.e. facial symmetry analyses and complications) were collected through medical records, clinical photographs and interviews with all patients. All subjects were enrolled after receipt of a consent form signed by the patients or their parents.

The site-specific fat augmentation principles^{9, 10}, using the Coleman technique¹⁰, were thoroughly adopted in all procedures. Under general anesthesia, patients were prepared with all aseptic precautions. Fat harvesting was done by manual aspiration with a gentle back-and-forth movement using a 10-ml syringe attached to a 3-mm two-hole cannula with a blunt tip, the fat tissue was gradually collected from medial aspect of thigh or anterior abdominal wall. The lipoaspirates in syringes were kept in upright position for around 20 minutes allowing the fat cells to get separated. Resultant 3 layers in syringes would be consisting uppermost oil layer, middle fat cells and lowermost RBCs. The middle layer was carefully transferred to 1-ml syringes (**Figure 1,2**). A 3- or 2-mL Luer lock syringe with blunt tipped cannula of 3-mm bore or blunt tipped Epidural needle attached to its nozzle is used for fat infiltration. Through small stab incision, the cannula is used to create subcutaneous tunnels in a fan-shaped manner into which the fat cells are deposited as the cannula is withdrawn. In cases of fat grafting in scarred tissue, subcision was done using 16-gauge needle. Over correction of 25% was done considering postoperative resorption. All patients were given post operative IV antibiotics for 1 to 5 days along with analgesics. Ice fomentation was advised to reduce ecchymosis and edema. Semi sitting posture or limb elevation was advised as per the area operated to reduce edema.

Clinically, results were evaluated by subjective and objective assessment.

Subjective evaluation of patients was done at 1 year in which patients were given a questionnaire as follows:

1. Any notable asymmetries in terms of volume of the treated areas (Yes/No)
2. The presence of any infection, thickened areas, ecchymosis, or pain on either side or any other postoperative complications (Yes/No)
3. Their level of satisfaction scoring from 0 (very bad) to 10 (very good)

In objective assessment, preoperative and series of postoperative photographs were given to a jury consisting

of another surgeon and residents & they were asked to evaluate outcomes by recording score from 0 (very bad) to 10 (very good).

4. Result

A total of 15 patients underwent autologous fat grafting at our institute from January 2017 to January 2020. All patients were followed up for period of 6 to 12 months to see for the retainment of grafts and any long term complications.

Out of 15 patients, 9 were female while 6 were male. 7 patients had facial contour deformity and 8 had deformed scar. Out of 7 patients with facial deformity, 4 patients had congenital facial asymmetry and 3 had post traumatic deformity. Out of 8 patients with scar deformity, 1 had breast region scarring post gynecomastia surgery, 2 had post burn depressed scar, 4 had post traumatic scar and 1 had scar over arm following suturing for CLW (clean lacerated wound).

Subjective assessment of patients suggest that 4 patients required repeat of procedures to satisfy their visible asymmetry after the first procedures and 2 patients were still dissatisfied with the results. None of the major wound or donor area complications were noted. Objective assessment yielded a mean score of 7.9 out of 10. [**Table.1**]

5. Discussion

Till date there is no ideal filler material available for contour correction or cosmetic improvement. Autologous fat is the closest thing to ideal filler⁹. It is readily available, inexpensive, and simple to obtain. There is no risk of host rejection or other immunologic responses. The procedure may be easily performed with minimal morbidity and less recovery time. Moreover, it can avoid other conventional reconstructive procedures. Major disadvantage in fat grafting procedure is its unpredictable resorption pattern. Various authors have reported variable amount of fat resorption. Based on histologic observations of free fat grafts, in 1956, Peer³ hypothesized the "cell survival theory." The theory states that after grafting, mechanical injury and ischemia induce the death of some cells in the periphery, whereas other more centrally located cells may survive initially by plasmatic imbibition and early revascularization. Scientific literature describes an absorption rate ranging from 20 to 90%. High fat graft resorption rates have been attributed to traumatic handling of the graft during harvest, processing, and injection.

Various harvesting and preparation techniques have been suggested. The goal of these techniques is to obtain greater adipocyte cell survival and, consequently, more reliable clinical results. Commonly used aspiration techniques are lipoaspiration and syringe aspiration. It is evident in literature so far that lipoaspiration using suction apparatus is more traumatic to adipocytes than syringe aspiration¹¹. Therefore, in our study, we have preferred to use syringe aspiration using a 10-mL syringe. We prefer not to pull the plunger maximally, as this negative pressure can be equivalent to liposuction pressures¹². The techniques for processing the lipoaspirate are substantially more controversial than the harvest techniques. Various preparation methods have been used and compared for adipocyte viability such as sedimentation, filtration, washing, centrifugation, treatment with growth factors, or a

combination of these. Smith et al¹⁷ have compared various preparatory methods such as washing with normal saline (NS), washing with ringer's lactate (RL), centrifugation, and washing plus centrifugation. They have recommended minimum manipulation of fat to yield maximum number of viable adipocytes. In our study, we allowed fat to get separated without centrifugation. We believe that high-speed centrifugation of 2,000 to 3,000 RPM can be detrimental to adipocyte viability and thus result in higher

fat resorption. Placement of fat in defects is performed through small stab incisions preferably from two directions. Tiny parcels of fat are deposited using 3-mm blunt cannula. Such placement of tiny parcels increases surface area of fat droplets exposing it to surrounding environment, thus facilitating its nutrition through growing blood vessels¹³. Fat deposition should be performed from deeper to more superficial tissues.

5. Tables and Figures

Table.1: showing result according to subjective and objective criteria.

Subjective Criteria	Questions Asked	Answer Yes/No	Results
1.	Notable Assymerty	11/4	73% Positive
2.	Wound Complication	0/15	100% Positive
3.	Level of Satisfaction	Range of 0 TO 10	Mean Score 8.4
Objective Criteria		Range of 0 TO 10	Mean Score OF 7.9



Fig.1: Showing fat was harvested by manual aspiration.



Fig.2. lipospirates was separated by keeping syringes vertical without centrifugation.



Fig. 3: Fat grafting for right cheek atrophy.



Fig.4: Fat grafting for depressed scar.

6. Conclusion

Fat grafting can be considered a very powerful tool to correct asymmetry or deformed scars with depression. To the best of our knowledge, fat grafting is well discussed by the scientific literature in the fields of craniofacial anomalies and facial rejuvenation, but little has been elaborated on its use in posttraumatic deformities. Although myriad varieties of harvesting and processing techniques and their combination have been studied, no single technique can be considered as gold standard. Nevertheless, in our study, gentle syringe aspiration and use of manual sedimentation have resulted in fairly predictable result. Fat grafting not only provides symmetry but also makes scar tissue supple and more favorable. Because of more predictable results than earlier era position of autologous fat has moved towards ideal filler material.

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