Core Fat Graft Injection in Depressed Scar Augmentation

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ABSTRACT

The aim of this study is to assess the success of core fat graft in management of depressed scars. Forty patients presented with subcutaneous defects due to depressed scars were managed with core fat graft injection. The results were good with significant improvement of personal satisfaction postinjection in comparison to pre-injection state. The overall mean percentage increase in personal satisfaction (64% out of total score). Recipient site brusing and pigmentation were the only complication in six out of forty patient.

Conclusion: Core fat grafting technique is simple and effective in augmenting depressed scars. The technique is simple, with short operative time & the cost is cheap.

INTRODUCTION

Fat transplants have been used for many purposes since 1889. Fat grafting has been performed to fill in depressed scars and the subdermis [1].

Fat permanency and survival in the injected zone were quite variable and unpredictable because of complications as infections, liquefaction, and resorption. The ultimate failure of these grafts was probably caused in part by the technique used to obtain the fat: Surgery (dissection) performed to manipulate and macerate the adipose tissue and further destroy the adipocyte [2,3].

At the end of the 1970s, Kesselring [4] and Illouz [5] suggested a new surgical technique: liposuction. Since 1980, several studies have highlighted different findings on transplantation of fat obtained by liposuction [6-9] and adipose cell vitality ranging from 30% to 70% [10,11,12]. In 1992, Coleman [7] first described a new technique for improving adipose cell survival. Currently, adipose tissue can be harvested easily with minimal trauma.

Autologous fat has unpredictable success rates, and there is no agreement among the physicians as to the ideal methodology for harvesting and handling of fat grafts [13,14,15].

A lot of efforts and techniques have been introduced in an attempt to improve injected fat survival, including atraumatic fat harvesting liposuction techniques, fat washing to eliminate inflammatory mediators, centrifugation, and incubating fat grafts with different bioactive agents. Other studies have demonstrated no advantage to the use of centrifugation and pretreatment of tissue with insulin on lipocyte viability [16].

Core fat graft is en bloc fat graft harvesting which is less traumatic to the graft and theoretically reduces tissue loss and improves fat graft survival. However, en bloc fat graft augmentation requires donor and recipient incisions and has the potential for visibility of the scar [17].

In this study the core fat graft will be evaluated for its effectiveness in filling depressed scars.

PATIENTS AND METHODS

This is a case series prospective descriptive study done in Plastic Surgery Unit, Suez Canal University Hospitals on forty patients complaining of subcutaneous defects due to depressed scars using core fat graft injection.

All patients presented with subcutaneous defects due to depressed scar, in both sexes in all ages were included. Excluded patients were those associated with severe chronic illness as (chronic renal failure, chronic liver disease, etc....), patients with history of hematological disorders, mentally or psychologically disordered patients, and prior chemotherapy, radiotherapy, chronic use of corticoids.

Patients were subjected to a detailed thorough history taking, and scar specifications (cause of the scar, duration of the scar, previous medical or surgical treatment of the scar).

Surgical technique:

The surgical technique is same technique used by Guyuron et al. (2007), the only modification is using a conventional 1 cc syringe used for insulin injection and trimming it obliquely with a scalpel 21.

The face and lower abdomen are sterilized with betadine, the deep subcutaneous tissue over the lower abdominal paraumbilical region is infiltrated with 0.5% lidocaine hydrochloride with epinephrine (1:100,000). A 1cc syringe (used for insulin injection) was trimmed on an oblique fashion using scalpel. A 5mm incision was made within the inferior border of the umbilicus to provide access to the donor-site fat. The oblique end of the syringe was introduced through the paraumbilical incision. The surgeon rotated and advanced the syringe forward while gently pulling on the syringe piston only to accommodate fat, which is delivered into the syringe. No suction effect was created. Pulling the piston simply created a sufficient space to allow the fat to move into the syringe. It is the combination of rotation and advancement of the syringe with the surgeon's right hand (for a right-handed surgeon) and a gentle external squeeze with the left hand that delivers the fat into the syringe (boring effect). A total of 1cc of aspirate was removed with each entry. This delivery technique provided an en bloc fat graft that was placed into the recipient bed. Either a pair of baby metzenbaum scissors or the same syringe containing the fat was used to create a space in the recipient site by means of the same technique without an attempt to withdraw the piston. As the syringe was retrieved, the syringe piston was used to deliver the fat into the newly created recipient space.

Evaluation of the results of the technique:

Evaluation sheet:

- Patient's satisfaction level on a scale from 0 to 10 (10 = highly satisfied).
- Donor site incision visibility on a scale from 0 to 10 (0 = very visible).
- Visibility of the skin contour depression at the donor site on a scale from 0 to 10 (0 = very depressed).
- Psychological improvement post injection on a scale from 0 to 10 (0 = very depressed).
- Complications: Bruising or edema more than 10 days.

Postoperative photography were taken preoperatively and 1, 3, 6 & 12 months postoperatively.

Data management:

- Data will be collected from patients in the form of a written questionnaire.
- Gathered data were processed using SPSS version 15 (SPSS Inc., Chicago, IL, USA).

- *p*-value and Chi-square tests will be used to test the significance of relations between different variables.
- Data will be presented in the form of tables and figures using Microsoft word computer package ver. 2007.

RESULTS

The mean age of all participants was 21.8 ± 5.1 years, ranging between 12 and 31 years, half of the patients were 20-25 years old. The study sample consisted of 12 (30.0%) males and 28 (70.0%) females. Table (1) shows that in half of cases, the injection site was forehead. Face was the injection site among 40% of patients.

As presented in Table (2), there was a statistically significant improvement of patients' satisfaction at post-injection compared to pre-injection. Most of patients had bad feelings regarding the scar at pre-injection. After injection, 40% of patients have excellent evaluation of their personal satisfaction. The overall mean percentage increase in personal satisfaction was 64% out of total score. Table (3) showed also a statistically significant improvement in mean scores of patients' satisfaction at post-injection compared to pre-injection state (p<0.001).

Table (1): Distribution injection site among the studied patients (n=40).

Injection site	Number	Percentage (%)	
Arms	4	10	
Forehead	20	50	
Face	16	40	

Table (2): Comparison of patients' satisfaction at pre and post injection (n=40).

Personal satisfaction	Pre-injection	Post-injection	Significance
	No. (%)	No. (%)	test <i>p</i> -value
Bad (0-2) Moderate (3, 4) Good (5-8) Excellent (9,10)	32 (80) 8 (20) 0 0	0 12 (30) 12 (30) 16 (40)	X ² (3)=60.8 a p<0.001*

a Chi-square test.

* Statistically significant at p < 0.05 & 95% confidence level.

Table (3): Comparison of patients' satisfaction score between pre and post injection (n=40).

	Pre-injection Mean±SD	Post-injection Mean±SD	Significance test <i>p</i> -value
Patient's kSatisfaction	1.8±1.4	8.2±1.7	<i>t</i> (39)=20.4 b <i>p</i> <0.001*
score			-

b Paired *t*-test.

* Statistically significant at p < 0.05 & 95% confidence level.



Fig. (1): Tip of a conventional syringe (used for insulin injection) is cut obliquely and is thin-walled to harvest fat and deliver it to the tissue bed.



Fig. (2): A sample of extracted fat using "core" fat grafting technique. The fat graft has an intact structure [24].





Fig. (3): (Left) An incision approximately 5mm long is made in the inner portion of the umbilicus. (Right) The beveled syringe is inserted in the deep subcutaneous plane, and the incision margins are stabilized using skin hooks. As the beveled syringe is advanced, it is rotated and the plunger is retracted enough to accommodate the cored-out fat. No vacuum is created [24].





Fig. (4): A 22 year old female patient presented with post traumatic depressed scar in the forehead. Left. Preoperative view, Right. 6m post operatively.



Fig. (5): A 19 year old female with congenital depression in the forehead and area of scalp alopecia. Left. Preoperative, Right. 6m post operatively with excision of the scalp Alopecia.



Fig. (6): A 23y old female with depressed scar in the forehead. Left, Preoperative photos. Right, 6 months postoperatively.

DISCUSSION

Core fat graft technique is a non traumatizing method of fat harvesting using trimmed insulin syringe. In this study fat injection was done for small subcutaneous tissue augmentation mainly in patients complaining of depressed post traumatic scars.

In our study the mean age of the patients was 21.8 years with half of the patients between age 20-25 years which reflects the domination of the young age in the population of the study. This could be explained by the psychological trauma of the scars in the young patients more than older ones. On the contrary, Fontdevila et al. [17] and Cervelli et al. [18] showed mean age 45 and 40 respectively as they were concerned with fat injection for rejuvenations and in chronic lower-extremity ulcers which mostly occurs in old age.

Hendi [19] who worked on facial re-contouring using fat transfer, the mean age was 35 years.

Most of the studied patients were females (70%) of the studied population. This realizes that the psychological impact of the scar on the females is much more than in male patients. Hendi and DE Benito [20] showed 100% female sex in the studied population which confirms the idea that females are psychologically affected with skin problems more than males. Fontdevila et al. (2008) in another study, showed that males were 70% of their studied population.

The donor site in 90% of the studied patients was from the periumbilical region versus 10% from the gluteal region. This could be explained that most of the candidates had abundant abdominal fat which made harvesting from the peri-umblical region easier. Patients whose donor site were in the gluteal region were mostly children with little fat in the periumblical region, Padoin et al. [21] found that the lipoaspirate cell concentration in the lower abdomen and inner thighs were significantly higher than other sites as these sites might be sources of the adult mesenchymal cells. This could improve the viability of the injected fat. Guyuron et al. [22] and Jackson et al. [23] were using the same donor sites most probably due to the same reasons; easy accessibility and abundant fat.

Face was the site of augmentation in 90% of the patients, half of the them in forehead. Only 10% were scars and depressions in arms. This reflects that most of annoying scars are facial; pushing those patient for seeking medical advice. Many other studies were concerned with facial augmentation and re-contouring like Cervelli & Gentile [24], Fontdevila et al. [17], Hendi [19], Guyuron et al. [22] and Dasiou-Plakida [25]. Others like Pereira LH et al. [26] used fat injection in the deep subcutaneous tissue plan of the buttocks and lower limbs and Jackson et al. [23] who was concerned with re-contouring of a large subcutaneous post-radiation thigh defect with autologous fat transplantation.

The volume of injected fat ranged between 2-5cc, with mean 3.2cc as most of the subcutaneous defects in this study were relatively small. Guyuron et al. [22] stated the volume of injected fat ranged between 1 and 4cc per site as they were working in facial augmentation of small areas like our study. Cervelli and Gentile [18] stated that they injected about 120cc fat mixed with platelet gel, this could be explained that they were treating progressive hemifacial atrophy.

The study witnessed a significant improvement of personal satisfaction post-injection in comparison to pre-injection state with an overall mean percentage increase in personal satisfaction was 64% out of total score with mean patient satisfaction score 8.2 ± 1.7 on a scale 0 to 10 (10 = very satisfied), and this is an indicator of the good effect of fat injection in doing a significant change in the depressed area or the scar.

Guyuron et al. [22] stated that the mean patient's satisfaction score was 7.64 ± 2.97 on a scale 0 to 10 (10 = very satisfied) 0020, which reflects the effectiveness of the technique used, while Jackson et al. [23] stated patient satisfaction was 96% although it was said that the volume "take" was not always sufficient in the observers opinion, as recontouring was involving post radiation subcuta-

neous defects in the lower limbs which are not obvious like face.

Conclusion:

Core fat grafting technique is simple and effective in augmenting many subcutaneous regions of the face and depressed scars. It is ideal for small defects that couldn't be treated with fillers alone. the technique is simple, operative time was short and the cost is cheap, as no special or sophisticated instruments are needed.

REFERENCES

- 1- Chajchir A., Benzaquen I. and Wexler E.: Fat Injection. Aesth. Plast. Surg., 14: 127-136, 1990.
- 2- Billings E. Jr and May J. Jr: Historical review and present status of free fat graft autotransplantation in plastic and reconstructive surgery. Plast. Reconstr. Surg., 83: 368-381, 1989.
- 3- Coleman S.: Facial recontouring with lipostructure. Clin. Plast. Surg., 24: 347-367, 1997.
- 4- Coleman S.: Long-term survival of fat transplants: Controlled demonstrations. Aesth. Plast. Surg., 19: 421-425, 1995.
- 5- Ellenbogen R.: Fat transfer: Current use in practice. Clin. Plast. Surg., 27: 545-556, 2000.
- 6- Ersek R.: Tranplantation of purified autologous fat; A 3 year follow-up is disappointing. Plast. Reconstr. Surg., 87: 219-227, 1991.
- 7- Illouz Y.: Body contouring by lipolysis; A 5-year experience with over 3,000 cases. Plast. Reconstr. Surg., 72: 591-597, 1983.
- 8- Illouz Y.: Present results of fat injection. Aesth. Plast. Surg., 12: 175-181, 1988.
- Kesselring U.: Regional fat aspiration for body contouring. Plast. Reconstr. Surg., 72: 610-619, 1983.
- 10- Mojallal A. and Foyatier J.: Historical review of the use of adipose tissue transfer in plastic and reconstructive surgery. Ann. Chir. Plast. Esthét., 49: 419-425, 2004.
- 11- Peer L.: Transplantation of fat. Plast. Reconstr. Surg., 1: 251-261, 1977.
- 12- Teimourian B., Chajchir A., Gotkin R. and Reisin J.: Semiliquid autologous fat transplantation. Adv. Plast. Reconstr. Surg., 5: 57-59, 1989.
- 13- Von Heimburg D. and Pallua N.: Two-year histological outcome of facial lipofilling. Ann. Plast. Surg., 46: 644-646, 2001.
- 14- Rohrich R., Rios J. and Fagien S.: Role of new fillers in facial rejuvenation; A cautions outlook. Plast. Reconstr. Surg., 112: 1899-2006, 2003.
- 15- Klein A.: Skin filling; Collagen and other injectables of the skin. Dermatol. Clin., 19: 491-495, 2001.
- 16- Cooperman L. and Michael D.: The immunogenicity of injectable collagen I; A one-year prospective study. J. Am. Acad. Dermatol., 10: 638-641, 1984.

- 17- Fontdevila J., Serra-Renom J.M., Raigosa M., et al.: Assessing the Long-Term Viability of Facial Fat Grafts: An Objective Measure Using Computed Tomography, Aesthetic Surgery Journal, 28: 380-386, 2008.
- 18- Cervelli V., Gentile P. and Grimaldi M.: Regenerative Surgery: Use of Fat Grafting Combined with Platelet-Rich Plasma for Chronic Lower-Extremity Ulcers, Aesth. Plast. Surg., 33: 340-345, 2009.
- Hendi A.: Facial Re-Contouring using Autologous Fat Transfer, Egypt, J. Plast. Reconstr. Surg., 34: 65-69, 2010.
- 20- DE Benito J., Fernandez I. and Nada V.: Treatment of Depressed Scars with a Dissecting Cannula and an Autologous Fat Graft, Aesth. Plast. Surg., 23: 367-370, 1999.
- 21- Padoin A.V., Braga-Silva J., Martins P., et al.: Sources of Processed Lipoaspirate Cells: Influence of Donor Site on Cell Concentration, Plast. Reconstr. Surg., 122: 614-618, 2008.

- 22- Guyuron B. and Majzoub R.K.: Facial Augmentation with Core Fat Graft:A Preliminary Report, Plast. Reconstr. Surg., 120: 295-302, 2007.
- 23- Jakson I.T., Simman R., Tholen R., et al.: A Successful Long-Term Method of Fat Grafting: Recontouring of a Large Subcutaneous Postradiation Thigh Defect with Autologous Fat Transplantation, Aesth. Plast. Surg., 25: 165-169, 2001.
- 24- Cervelli V. and Gentile P.: Use of Cell Fat Mixed with Platelet Gel in Progressive Hemifacial Atrophy, Aesth. Plast. Surg., 33: 22-27, 2009.
- 25- Dasiou-Plakida D.: Fat injections for facial rejuvenation: 17 years experience in 1720 patients, Journal of Cosmetic Dermatology, 2: 119-125, 2004.
- 26- Pereira L.H. and Radwanski H.N.: Fat grafting of the buttocks and lower limbs. Aesthetic. Plast. Surg., 20: 409-416, 1996.