Fat Harvesting from the Excised Dermolipectomy Flaps for Fat Augmentation in Various Individuals

Ashraf Elsebaie MD, Ahmed Abdelsalam Hafiz MD, Ahmed Maher MD, Rasha Abdelkader MD Department of General Surgery, Plastic Surgery Unit, Cairo University

ABSTRACT

Introduction: Autologous fat grafting has for cosmetic reasons shown great interest among operators and has been the procedure of choice in certain scenarios as well as gaining popularity with patients. The current study, reports the fat grafting experience in various patients presentations either [1] with limited donor sites for fat or [2] not willing to have comorbidities in various body sites in patients undergoing dermolipectomy. In addition detailed procedures concerning effectiveness and safe results of grafting where evaluated. Methods: harvesting was performed using A 20-ml syringe connected to a 3- hole blunt cannula with a diameter of 3 mm or less from the excised dermolipectomy flaps. After cleaning with the harverst USING cool physiological saline solution to wash off blood cells, the fat was then processed using the open method for concentration and to separate the fat globules from the fluids, oil, and debris. A single hole 14-gauge blunt cannula was utilized for placement of the haevested graft via a 3-mm incision in the recipient area. The fat was there after injected into the recipient area infiltrating from the deep and MOVING towards the superficial tissue planes. Results: Twenty female patients have been included in the current study utilizing this procedure. Most patients were those who had suffering from fluctuations of weight resulting in abdominal apron. Ages ranged from 18 to 45 years, with a mean of 31.3 vears. The volumes grafted ranged between 120-250 mL [average, 205 mL] per side in both breast and buttocks injection and about 40cc in the face and in addressing post liposuction depressions. Most cases had mild to moderate improvement in their recipient area regarding volume and shape in addition to the suppleness and natural appearance of the RESULTs. Conclusions: Excised dermolipectomy flaps have shown to be an alternative overlooked source of fat harvesting in cases that require an autologous augmentation. This approach for soft tissue augmentation can be suitable in various patients requiring mild to moderate volumes and requiring a dermolipectomy. While still peserving the fat of the excised flaps and minimizing the patient co- morbidities of liposuction from alternative sites in the body. Excess skin redundancy acts as a good source for fat harvesting during body excisional procedures especially dermolipectomy flaps in [1] thin patients with limited donar area, [2] average built patients not willing to undergo liposuction in available donar sites in an attempt to avoid more morbidities [ecchymosis, seroma...etc] in these areas. Otherwise, alloplastic material used alone or following early first stage 1 fat transfer is advised if significant volume is required.

Key Words: autologous fat transfer, thin patients, dermolipectomy flaps, limited donor areas.

INTRODUCTION

Autologous fat transfer was first described over 100 years ago, by Neuber ^[1], who utilized excised fat to treat scar depressions by fat filling. By the early 1900s, there were reports of A successful subcutaneous facial augmentation procedure using autologous fat ^[2,3]. It wasn't until the mid 1980s, however, that layered micro grafts became practical for use in soft tissue augmentation acting like filler. This use was enabled mostly due to advances in liposuction techniques that made harvesting much more feasible^[4,5]. Fournier ^[6] and later Coleman^[7], developed the basic techniques of manual aspiration and micro-lipo injection, which is still in practice till our present day. However, the availability of suitable fat donor site can sometimes be limited, this can be true particularly in thin or moderately built athletic individuals.

Fillers that are commercially available, including modified hyaluronic acid compounds, have become popular for cosmetic modification of rhytids, correction and modification of age related volume loss, in scar treatment and camouflage, as well as in cases presenting with facial hemi atrophy^[8]. As they are non-

January

2018

autologous, they are subject to low but significant complication rates due to allergy, extrusion, infectious disease transmission, and foreign body reaction. However, the majority are also relatively costly and have a short life span of a few months within the body.In contrast, autologous fat is significantly inexpensive, autogenic and easy to harvest, this elevates the adjunctive risks of associated with allogenic fillers and implants. Fat, which depends on the relocation of living adipocytes, is additionally much more longlasting and can be classified more or less as a nearly permanent filler, this is however dependant on several factors involving the harvesting and processing, furthermore. The technique reinjection techniques play a pivotal role, alongside with the vascularity of the recipient bed plays an important role. However the major disadvantage of fat transfer remains the high variability in resorption rates of the grafts both short and long term^[6]. This high variability, when combined with cases presenting with a shortage in donor sites and volume shortages, can pose a significant problem. An estimate of resorption rates by volume as high as 70% have been detected in some series ^[6,7]. Anticipation of partial loss necessitates initial volume overcorrection, and the unfortunate loss of transferred adipocytes will ultimately require reinjection. A great deal of the scientific studies and papers covering autologous fat grafting and transfer have therefore focused on the optimization of graft at the various steps of the process: choosing candidates for surgery, choice of potential donor site, recipient site preparation, fat harvesting, the processing, and techniques and sites of reinjection. Yet still with the best scenarios there will remain some rate of reabsorption that will require reinjection in most cases.

With regard to donor site selection, several studies have further assessed fat cells harvested from multiple sites and compared their viability. In one example, Rohrich et al.^[9] compared harvests in regards to the site wether the abdomen, flank, thigh, and medial knee are utilized. And concluded that all harvest sites produced a statistically equivalent count of viable cells. Similarly, von Heimburg et al.^[10] Compared the pre-adipocytes removed from the abdominal area, breast, and buttocks. The fat cell viability from all these regions were found to be comparable using both excisional and liposuction

techniques. Based on these reports it seems likely that donor site choice plays a minimal role in graft survivability. Choosing a site, therefore, should be based on ease, safety of access, patient preference and most important availability Fig. 1.



Fig. 1: Layers of dermolipectomy flap for fat harvesting ^[20]

PATIENTS AND METHODS

Twenty female patients either with limited fat donor site requiring fat injection and/or ^[2] those patients preferring not to have other donor site morbidities [including ecchymosis, seroma, oedema] from liposuction from January 2017 to December 2017. All cases were scheduled for a dermolipectomy for redundant abdominal skin. And were all performed under general anesthesia and placed in the proper positioning. Patient received standard prophylactic antibiotic 1 hour prior to the procedure. Most patients were massive weight loss either post bariatric surgery or non surgical weight loss. Mean age was 31.3 years ranging from 18 -to 45 years,. The cases included: seven patinents who recived fat augmentation of the face, seven addresing the buttocks area, three addresing the breast and three for postliposuction deformities. The Grafted volume has differed according to the needs of each case, with targeted recipient site ranging between 120-250 mL [average, 205 mL] in the breasts and buttocks per side. Where an average of 40 cc was utilized for the facial area and in cases suffering from post liposuction irregularities deformities. Routine work and up for abdominoplasty patient was done. Patient history was recorded with regards to pregnancy, number of children, previous operations, chronic medical diseases and conditions such as diabetes. hypertension, smoking and use of blood thinners. Clinical examinations to detect previous scars in abdomen, divercation of recti, herniae, skin redundancy were performed and all findings

2018

documented. Investigations according to each individual case in the form of routine laboratory investigations and abdominal ultrasound if recommended where performed.

Operative Technique

formal abdominoplasty After or dermolipectomy, excision of the dermofatty flap is performed. These large pieces of deromofatty excised tissue should be considered as a precious donor source for fat harvesting. Either dry liposuction is performed as there is no need of fluid infiltration of the tissue as the risk of bleeding or postoperative pain is alleviated, however infiltration of fluid was sometimes preferred to facilitate hydrodissection and fat harvesting. A BLUNT 3-hole cannula was utilized for harvesting with A diameter equal to or less than 3 mm, this was introduced directly into the fatty layer of the excised abdominal apron and liposuction is done using closed sterile system [syringe or machine] (Fig. 4&5&6&7&8).



Fig. 2: Liposuction of excised dermolipectomy flaps for fat harvesting

General Considerations

Factors insuring reliable and optimal adipocyte harvesting, which are originally applicable irrespective of donor site where considered and thoroughly followed with all cases. These included the introduction of only up to 2 cc of negative pressure to the syringe during the harvesting avoiding the risk of adipocyte lysis caused by excessive negative pressure. The non dominant operator hand is utilized to stabilize the excised dermolipectomy flap by smooth traction on the surface of the skin of the excised dermo lipectomy flap or with gentle pick up. The suction cannula should be best inserted within the central depth of the fat pad to achieve the maximum possible amount of harvest yield. In situations where the cannula appears to be clogged or if the

suction force is lost, the cannula should thereby be detached from the entire place and the tip should be cleared also the plunger can be retracted back until we insure that the suction cannula has been cleared from and fat. Air that might have been drawn into the syringe should be forced out expelling it before resuming the suction. Fibrous tissue entrapment within the cannula will most likely be the cause if the operator notices that still no additional fat is entering the syringe. The fat harvested is afterwards processed by washing using cool physiological normal saline from any blood present, after which flirting the fat using the open method this where a cotton towel is used as a platform to concentrate fat tissue also this process helps in separating it from any fluids, the oil, and debris. All standard sterilization precautions and practice were meticulously maintained. There after the harvested fat is transferred to be grafted at the recipient site using a, blunt single hole 14gauge cannula via a 3-mm incision in the recipient area skin . The injection was performed from deep to superficial within various muscle and/or subcutaneous planes at the desired recipient site. Routine post operative instructions to the patients including semi sitting position, early ambulation was encouraged to guard against DVT, Compression garments to enhance the fat graft take and survival, and patients are instrusted to avoid direct postural pressure on site of lipofilling for about six weeks ..

RESULTS

Twenty female patients were included in this current study. Patients undergoing this method were either those who lacked other suitable sites for lipodystrophy and/or who preferred not to have any other areas liposuctioned. Most patient cases suffered from fluctuations of weight and /or repeated pregnancies resulting in an abdominal apron. The patient population age ranged from 18-45 years, with a average of 31.3 years.

These included: seven cases receiving facial fat injection, seven cases that underwent injection in the buttocks area, three cases with injections of the breasts and three cases to treat post liposuction irregularities and deformities. Volumes transferred differed according to each case and area of application. Utilizing 120-250 mL [205 ml on average] in the breasts and

buttocks per side. Also an average of 40 cc was needed in the face and when treating post liposuction deformities. The majority of results showed mild to moderate improvement concerning the augmented area as regards volume and shape with a supple and natural result. Patient satisfaction was measured through a patient satisfaction scale ranging form 1-10, with 1 being the least satisfied and 10 being the most. The patient satisfaction with the fat grafting and combination of the procedures ranged at 9.3 in cases addressing buttocks augmentation, 9.9 in breast lipo augmentation and 8.3 for patiatients injected in the face and the weighted average was 9.4. We had within average resorption rates ranging from 30 t0 50 percent within the first year. One case suffered from bruising and swelling which resolved spontaneously. Those requiring additional volume agmentation where later treated using other alloplastic fillers. Table 1 & (Fig. 3).

Table 1: Satisfaction of the Patients

Januarv

	Butts	Breasts	Face
Total Cases	7	7	3
Satisfaction rating	9.3	9.9	8.3

2018



Fig. 3: Level of patient satisfaction



Fig. (4a&b): Thin patient underwent abdominoplasty also asking for fat injection of butts



Fig. (5a&b): Dermolipectomy flaps before excision



Fig. (6): Dermolipectomy flaps after excision



Fig. (7): Liposuction of excised flaps for fat harvesting



Fig. (8): Fibrous septa with removed fat cells

DISCUSSION

There problem posed in thin and average body built individuals concerning the limited donor sites for adipose graft harvesting has always acted towards limiting autologous fat utilization for areas where volume augmentation is required. nevertheless, a portion of these patients especially those following massive weight loss, whether following bariatric surgeries or non surgical procedures having excess skin redundancy which may act as an viable alternative reliable source of fat harvesting during body excisional procedures especially with dermolipectomy flaps. Skouge^[11] classified the indications regarding of fat transplantation to include [1] Facial: Aging changes, Melolabial grooves, Central cheek Subcommissural depressions, depressions, Flattened upper lip, Glabella, Diffuse age related lipoatrophy, Lip augmentation, Chin augmentation, Malar augmentation, Scars, Lipoatrophy, Traumatic acne-Idiopathic lipodystrophy and facial Facial hemiatrophy [2] Nonfacial - as in Rejuvenation of the hands and in treatment of contour defects of the body and Depressions, including those induced by liposution – also cases requiring Breast enlargement - and Traumatic scars treatement. Selection of a Donor area for fat harvesting in certain individuals who are thin, or in athletic individuals should be thoroughly evaluated for the presence of adequate donor fat, in instances where there is limited donor fat sites that are available during the examination, the use of alloplastic implants to obtain an acceptable desired result might prove essential. Patients that had undergone massive body lipo-contouring may also have limited fat deposits from areas of previous harvest, and it is always easier to harvest from virgin territories that had not been previously subjected to prior body liposuctioning and have been proven to yeild superior quality of adipose fat. For individuals with past history of undergoing liposuctioning, overlooked areas can prove sufficient and present an excellent source for harvesting examples include the waist roll descending along the lower back, the triceps, and the inner knee. yet the problem to remain however in the amount in regards to the volume needed which may remain limiting in itself as well as the need for multiple fills when using adipose grafts . Although fat has and can be harvested from sites of prior lipo suctioning, the quality as well as quantity of fat may be limited as the area is

January

50

2018

usually more fibrotic. Preoperative evaluation can aid to determine which region would be preferred and superior for harvesting. Donor site in women include the trunk [lower abdomen, hip and waist] and extremities [inner, outer and anterior thigh, the buttock, triceps and inner kneel.In men they include mostly the lower part of the abdomen and hip. The site of choice for harvesting fat is not evidence based and depends on surgeon preference as well as patient requirements therefore a detailed discussion with the patient prior to the surgery with explanation of the pros and cons is corner stone. The study published in 2004 by Rohrich et al.^[9] compared adipose viability in vitro among fat tissues removed from the different donor sites of the body including abdomen, flank, thigh, and medial knee. This study reported no disparity in the midst of the different donor sites as regards to the harversted graft, though it is important to highlight that the analysis was performed on samples only within 5 h after harvest. Trepsat^[12] reported his preference for the inner side of the knee for fat harvesting. He reported it to be the superior for areas of facial fat transfer especially the lower palpebral area as he reported the transplanted cells where "less fibrous in nature, more supple, and provided smaller individual tissue particles." The increased levels lipoprotein lipase within adipocytes in the grafts that where harvested from areas of the abdomen (lower part) or the thigh area have convinced some authors that these fat grafts may be more resistant to anoxia. Survival of adipocytes is mostly reliant on the technique used relevant to the harvesting and injection. Damage is inversely proportionate to the caliber of the instrument used to extract and also used in injecting. Skouge^[11] raised the question of whether washing decreases the viability of fragile adipocytes, nevertheless the presence and failure to properly wash off the blood cells from the fat cells being injected stimulates macrophage activity to remove the cells thus also adversely affecting the result. Cleaning the cells in a physiologic saline solution before injection helps alleviates that problem. While Campbell et al.^[13] that adipocyte integrity concluded and metabolism of fat fragments subjected to mechanical manipulation by liposuction remained intact. Accordingly McCurdy ^[14] analyzed the grafted survival rates and accordingly reached the that the technical factors to conclusion

accomplish the goal of 40-50% transplanted adipocyte survival include: 1. Low vascularity of donor site, 2. High vascularity for recipient site, 3. Low pressure technique of aspiration, 4. Filtering and washing harvested adipocytes, 5. Use of 2mm cannula for placement to minimize adipocyte injury, 6. Multilayred deposition of fat, 7. Overcorrection while filling the recipient site. Despite the multiple techniques that were proposed for preparation aimed at improving survival of fat cells. The technique utilized in the current study directed towards preparing and the harvesting of the adipocytes for grafting followed the method proposed by Kuran and Tumerdem^[15]: Being easy and effective while still insuring safety. The aspirate was filtered after cool gentle washing with physiological saline solution this was donein order to cleanse it from the blood and oil remnants amidst other debris. Similarly to Condé-Green et al^[16] the treatment of the aspirate by physiological saline cleansing not only insured the maintenance a meaningful adipocyte count but also insured the viability as well as the integrity and helped in the disposal of the blood cell that contaminate the aspirate . nevertheless the graft remained to contain a substantial number of endothelial and mesenchymal stem cells, these in turn may contribute to an increased neoangiogenesis, decreased rates of apoptosis, and the promotion of differentiation of the adipocytes.

Fat Grafts that are of too large a volume may suffer from central necrosis this is caused by the diffusion lack affecting the central part depriving the cells from nutrition as well as the lack of neoangiogenesis centrally. Therefore limiting the amount of cells injected with each pass of the cannula will insure an increased surface area of contact between the grafted adipocytes and native tissue at the recipient bed. Small globular placement will additionally help prevent cyst formation that can be the reason behind resorption over the long term. Johnson^[17] proved the correlation of cyst formation in relation to the amount injected. The macrophages lining the Oil cysts that develop at the necrotic patches, will ultimately lead to this resorption. However initially mimicking a successful outcome Coleman's technique for grafting is very popular among surgeons, which utilizes miniscule injection targeted at maximizing this contact, nevertheless it took 3 hours on average to graft 250 mL into each breast. Thus the ischemic time

improvement that is achieved after multiple (2 – 3) sessions of fat grafting mandates the presence

of adequate adipose donor sites, this is addressed

dermolipectomy flaps excised during the various

procedures. Also interestingly, when patients

underwent the consequent sessions, the result

appeared to significantly improve, a reason

behind this phenomenon might be due to the

increased vascularization due to the previously

transplanted fat promoting neoangiogenesis. This

all adds to the buildup concept and whistle

preserving virgin areas that can be utilized in

subsequent procedures. Thin patients especially

following weight loss by different means may

have skin redundancy which instead of being

wasted and thrown away during body excisional

surgery, could be utilized as a precious donor

tissue for fat cell harvesting. One of these areas is

the apron excised in dermolipectomy. Therefore, autologous fat transfer utilized for soft tissue

augmentation can be rendered suitable for thin women who have insufficient fat donor area

otherwise

wasted

the

by

preserving

result from fat transplantation where minimal and (extracorporealy) outweighed the benefits of the seldom encountered. Also similar complications technique aimed at reduction of trauma to the fat due to liposuction of donor sites are generally during injection. Therefore limiting the ischemia avoided as the harvesting occurs from the excised time by fully preparing the excised flaps before portion thus aidding in a smoother less painful excision in cases were wet liposuction was to be recovery. Other major complications reported in carried out additionally working in teams to literature where loss of vision which may be secondary to fat embolism in the glabellar area^[19]. insure minimal time loss and carrying out the harvesting and preparation immediately during It is important to note that None of the patients in all procedures . to address the problem faced with this study had glabellar injections related to the resorption with fat transplantation, 30-50% over previously mentioned complication and the injection is ordinarily used. Asadi and Haramis^[18] practice is generally not performed by the determined that subdermal injection is important surgeons. Calcifications mimicking carcinoma has for long-term result., the outcomes for lipofilling unfortunately been related to fat augmentation of In the present study correlated well in regards to the breasts. However the etiology can be the total volumes of injected fat that was attributed towards the procedure as the timing of estimated in accordance to the intended recipient appearance and distribution and character of area of lipofilling. Thus the survival of the calcification can settle the cause. adipose grafts is a multifactorial process as previously mentioned. Additionally the cosmetic

CONCLUSION

Excess skin redundancy acts as a good source for fat harvesting during body excisional procedures especially dermolipectomy flaps in [1] thin patients with limited donor area. [2] average built patients not willing to undergo liposuction in available donor sites in an attempt to avoid more morbidities [ecchymosis, seroma...etc] in these areas while preserving virgin donor areas for future harvest. This also helps in preserving other potential donor sites that can be limited and precious for further sessions of grafting. The pain and morbidity (ecchymosis, seroma ect) in addition related to the liposuction of the donor area is completely elevated thus insuring a smoother recovery with the need of less post operative pain medications. Thus making it a feasible option for utilization when av+ailable and required.

REFERENCES

- 1. Neuber GA. Fettransplantation. Vehr Dtsch Ges Chir 1893; 22:66.
- 2. Lexer E. Frei fettransplantation. Dtsch Med Wochenschr 1910: 36:640.
- 3. Bruning P. Cited by Broeckaert TJ. Contribution a l'etude des greffes adipeuses. Bull Acad R Med Belgique 1919;28: 440.
- 4. Illouz YG. De l'utilization de la graisse aspire pour combler les defects cutanes. Rev Chir Esth Langue Franc 1985; 10:13.

deposits requiring a mild to moderate volume lipofilling with redundant skin undergoing dermolipectomy making it a potential overlooked donor site while aiding in insuring the preservation of the multifactorial process needed in insuring the best outcomes both during and in subsequent procedures. Complications such as Bruising, Lastly,

temporary swelling, and tenderness that may

51

- Illouz YG. The fat cell "graft". A new technique to fill depressions. Plast Reconstr Surg 1986;78[1]:122–123.
- 6. Fournier P. Fat grafting: My technique. Dermatol Surg 2000; 26:1117.
- 7. Coleman SR. Structural fat grafts: The ideal filler? Clin Plast Surg 2001;28[1]:111–119.
- Broder KW, Cohen SR. An overview of permanent and semipermanent fillers. Plast Reconstr Surg 2006;118[3 Suppl]: 7S–14S.
- Rohrich RJ, Sorokin ES, Brown SA. In search of improved fat transfer viability: A quantitative analysis of the role of centrifugations and harvest site. Plast Reconstr Surg 2004; 114[1]:391–395.
- Von Heimburg D, Hemmerich K, Haydarlioglu S, Staiger H, Pallua N. Comparison of viable cell yield from excised versus aspirated adipose tissue. Cells Tissues Organs 2004;178[2]:87–92.
- 11. Skouge J. The effectiveness and long term survival of transplanted fat. Presented at Amer Acad Cosmet Surg, Philadelphia; 7–9 Aug 1992.
- 12. Trepsat F. Periorbital rejuvenation combining fat grafting and blepharoplasties. Aesthetic Plast Surg 2003;27[4]: 243–253.
- 13. Campbell GL, Laudenslager N, Newman J. The effect of mechanical stress on adipocyte

morphology and metabolism. Am J Cosmet Surg. 1987;4[2]:89–94.

- McCurdy JA Jr. Five years of experience using fat for leg contouring [Commentary]. Am J Cosmet Surg. 1995;12[3]:228.
- 15. Kuran I, Tumerdem B. A new simple method used to prepare fat for injection. Aesthetic Plast Surg. 2005; 29: 18–22.
- 16. Condé-Green A, de Amorim NF, Pitanguy I. Influence of decantation, washing and centrifugation on adipocyte and mesenchymal stem cell content of aspirated adipose tissue: a comparative study. J Plast Reconstr Aesthet Surg. 2010; 63: 1375– 1381.
- 17. Johnson GW. Body contouring by macroinjection of autogenous fat. Am J Cosmet Surg. 1987;4[2]:103–9.
- Asadi M, Haramis HT. Successful autologous fat injection at 5-year follow-up. Plast Reconstr Surg. 1993;91[4]:755–6.
- Teimourian B. Blindness following fat injection. Plast Reconstr Surg. 1988;82[2]:361.
- 20. Melvin A Shiffman,Autologus fat transfer: art, science and clinical practice, Springer,2010:p 22