



AN EASY AUTOLOGOUS MICRO FAT INJECTION TECHNIQUE FOR THE CORRECTION OF AESTHETIC FACIAL CONTOUR DEFORMITIES.

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ABSTRACT

Introduction: After the introduction of liposuction by Illouz and Fournier in 1980s there was spurt of interest in autologous microfat grafting by fine cannulas. The Facial volume deficit contour deformities occur from a variety of causes like ageing, congenital, post traumatic, post surgical, post infective and others. To fill these volume deficit contour deformities, there are lot of filler materials available. Autologous Fat is an excellent filler which is easily available with least morbidity at donor area. This article reports on the simple technique utilizing easily available commodities in the operation theatre for microfat injection of facial contour deformities with long term volume retention effect.

Aim : To validate this simple technique of autologous micro fat injection for the correction of facial contour deformities.

Patients and methods: Coleman devised techniques for fat aspiration and injection by using specialised cannulas, and syringes, also sophisticated equipment like centrifuge is needed. In our clinical study, by using simple technique of harvesting, separating and refining the fat and subsequently using blunt 14 G needle with one ml syringes for injection, author corrected the facial deformities in an average 1.4 attempts in 36 cases to give predictable and lasting correction results. Without centrifugation and keeping the syringe erect on its end, allowed the fat layer to separate by its own density. The autologous microfat was refined before injection by decanting and saline washing. This technique also employs simple instruments readily available in operation theatre

Results: All had maintained good to excellent results except 2 patients with respect to correction of deformities in an average follow up of 24 month. Only 4 (three Romberg's disease case and one case of idiopathic sub cutaneous fat atrophy) patients had two procedures separated on average by 3.5 months rest of them (32 cases) needed no secondary procedure. Two patients had purpura, 16 had mild to moderate postoperative edema, all resolved on conservative treatment. Neither at donor nor at recipient sites, any other complications noted in our series. Facial skin qualities improved in all cases. Skin pigmentation in the Romberg's also improved well in all 3 cases.

Conclusion: This simple autologous micro fat injection is easily adoptable technique resulting in the good lasting and predictable aesthetic results. This can be carried out in any simple sterile environment utilizing easily available commodities in any operation theatre except for the syringe liposuction cannula.

KEYWORDS : simple fat injection technique, micro fat, face rejuvenation by fat injection, contour correction by fat injection.

INTRODUCTION

Autologous Fat injection is a minimally invasive procedure wherein the autogenous columns of fat tissue is injected in to various tissue planes, to rejuvenate ageing face or to re contour the volume loss deformities caused by trauma (injection, injury, operation, fracture, dislocation etc.,), developmental, congenital, post excisional, post infective, autonomic imbalances sequelae and in condition with unknown etiology like Romberg's disease. Most of the time this is used as a technique for camouflage correction of aesthetic deformity rather than for anatomical correction. Coleman (1) devised techniques for fat aspiration and injection by using specialised cannulas, and syringes. He also envisaged centrifuging the fat aspirate as the technique to get predictable outcome. Macro fat is simply the liposuction aspirate. Micro fat is the fat harvested through small 1mm cannulas with syringes. Nanofat is obtained from the micro or macro fat by emulsifying it after filtration. Also nano fat is injected with 26 gauge needles (2). In this study we used autologous microfat injections. After the introduction of liposuction by Illouz and Fournier (3) in 1980s there was spurt of interest in autologous microfat grafting by fine cannulas. The facial volume deficit contour deformities have varied etiologies and there are number of filler materials available to correct them. Autologous fat is also one of such filler which is easily available with least morbidity at donor area.

There are four following ways one can prevent the fat absorption following autologous micro fat injection and thereby get predictable and lasting results.

- To obtain the fat columns with viable adipocytes without any damage during aspiration from subcutaneous tissue planes and to prevent any damage in subsequent procedures like concentrating, refining and injection.
- To get pure fat tissues without contamination of blood cells, tumescent fluids, damaged fat cells (oily fat with fatty acids) or other cell debris. (These contaminants are causing the rapid resorption of transplanted fat tissue).
- Placement of this fat as thin strings in criss cross, multilayered, lattice pattern manner establishes more vasogenic interstices which increase the take and healing of the transplanted fat tissue.
- Possibly by including the stem cells and other progenitor cells fraction along with injected fat tissue potentially helps in the retaining volume of viable adipocytes and also paves the way for regeneration as shown by several studies (4,5).

Condee Green et al (4) in their study compared the effect of centrifuging technique with simple decantation, washing procedure for fat concentration and refining. They compared mainly the viability of the adipocytes. They aspirated micro fat from the lower abdomen and the fat samples were divided in to two. One set of fat aspirate was subjected to centrifuging and other samples concentrated by decanting and washing. They compared the morphology of the adipocytes and the quantity of viable adipocytes between these two sets of samples. They concluded in their study that in the decanting, washing technique of concentrating and refining fat, yielded more quantity of viable adipocytes with normal morphology than with centrifuging technique. Study also revealed

that, more viable stem cells were found in the decanted and washed sample.

This article elicits how the combination of simple atraumatic technique of autologous fat harvest, easy adoptable fat separation-refinement and subsequently fat injection based on sound physiology principles had resulted in predictable and lasting results in the reconstruction of aesthetic volume loss face contour deformities.

AIM

To analyze the aesthetic outcome of simple micro fat injection technique in 36 patients who had various regional volume deficit contour deformities of face.

PATIENTS AND METHODS

Thirty-six patients, 27 males and 9 females within the age group of 20 to 60 years, with volume deficit contour deformities of the face were selected based on the following selection and exclusion criteria. This study was conducted from January 2012 to December 2016. Demographic data of patients seen in table no 1.

Selection criteria

1. All facial volume deficit contour deformity patients with realistic expectation and desire; no mental disturbances; fit enough to undergo the procedure; normal coagulation profile were selected
2. Those patients with ensured follow up and compliance for the procedure only were selected

Exclusion criteria

1. Patients who had other contour deformities treated simultaneously were excluded
2. Patients with co morbid medical illnesses like diabetes were excluded
3. Patients with drug and radiotherapy induced iatrogenic facial contour deformities were excluded.
4. Patients who had undergone fat injection in conjunction with prosthetic augmentation of face were excluded.

In our series we did not get any patients for primary correction ageing deformity. But one patient who had undergone extended SMAS facelift operation with bilateral supra facial parotidectomy was presented with bilateral moderate pre auricular contour deformities. He was included in the study for micro fat injection.

Preoperative preparation

All patients with facial contour deformities had at least two consultations with the plastic surgery team. They were screened for any body dysmorphic disorders and mental disturbances. Those patients with good motivation and with realistic expectations were only selected. After all basic required investigations for general anesthesia, their normal coagulation profiles were ensured. Written elaborate informed consent was obtained in all cases, after explaining the complications (including their rate of occurrence in the authors experience), their remedies and need for the secondary procedures. Their consent for using their photographs for education and research purposes were also obtained. One another warning given to all these patients were that as long as they maintain their weight, problem of donor dominance of the micro fat would not arise.

Technique of micro fat injection

All 36 patients had undergone general anesthesia considering both large volume injection (more than 25 cc of refined, concentrated micro fat) in 11 cases and also because we do not use lignocaine in tumescent solution as we speculated that lignocaine can temporarily paralyze the many antiport channels of biphospholipid layer of cells which are needed for their maintaining the milieu interior and therefore their viability. This was even established in the study published by Joshua. J. Golman et al in 2016 (6). Goldman et al in their study concluded that using lignocaine in the tumescent solution increase the apoptosis and degeneration of adipocytes, stromal vascular fraction stem cells. General anesthesia were administered through orotracheal tube, which was fixed in the

midlines without distortion of facial features, the whole face was prepped and draped. The end point of injection is to achieve the symmetry of face, which was facilitated by preparing the whole face and hairline with betadine sponges and then draping. Again before the induction of anesthesia to prevent reactive edema during fat injection, which will interfere with judgment of symmetrical correction by visual and tactile methods, all of them preoperatively received parenteral 8 mg of dexamethasone as apart of premedication. We never overcorrect the deformity as it replaces one deformity by another, and this was not a tenable option for the author. In all 3 (2 females and one male) Romberg's disease cases symmetry was achieved after secondary micro fat injection, which was performed in an average of 3.5-month interval following primary procedure. This is appropriate because the thin adherent skin in Romberg's hemi facial atrophy thickens with vascularity after primary procedure and therefore it stretches effectively to accommodate more fat during later procedures. According to author another sound principle followed in the injection of micro fat is not to inject beyond the point of blanching of overlying skin. This is because when injected above the capillary closing pressure, which is 20 to 40 mm of hg, it precipitates the reverberating ischemia; edema cycle, which brings in the local compartment syndrome and in turn this, compromises the take and healing of transplanted fat.

Author technique consists of 3 steps

Step no 1. HARVESTING MICRO FAT COLUMNS;

In all patients the donor site as discussed with patient and it was either Love handle or lower abdomen region. After marking the donor area with marker it was injected with tumescent solution (composition – 400 ml of normal saline with two ampoules of adrenalin in 1 in 1000 dilution to give 1 in 200000 adrenalin dilution; no hyalase or lignocaine used) until good tissue turgor was obtained with no pinching is possible. Tumescent was injected with blunt 14-gauge cannula through multiple needle punctures placed radially at the donor area. After 15 minutes waiting time, gentle harvesting of fat without any architectural or mechanical damage to fat tissue columns was achieved by low-pressure 10 ml syringe suction using special liposuction cannulas (figure 1). These cannulas can be fitted with 10 ml plastic or glass syringes with rubber shod at nozzle. Micro fat harvest was continued until the three and half times the projected volume for injection was obtained. This was achieved in all cases without producing any deformity to the donor area.



Figure no 1; special 1 mm cannula for the harvest of microfat

Step no 2. SEPARATION AND REFINEMENT OF THE HARVESTED MICROFAT

Simple gravitational separation of fat was achieved by standing inverted syringes with tip capped with needle and cover after removing the plunger. It takes on an average 14.5 minute for the fat to get separated by gravitation floatation technique based on its own density. The top layer contains the liquid, damaged fat and central large one where the yellow fat separates. The blood and tumescent forms the lower most layer. The very little liquid fat was wicked out and the lower layer was removed by removing the needle cap. After that a saline was poured in to these syringes, which again was decanted. Another saline wash was given in those cases

where the fat was looking pinkish with contamination of blood cells. Then using the three-way stopper, which is also readily available in operation theatres, the concentrated washed fat was transferred to multiple 1 ml syringes gently.



Figure no 2 showing the inverted syringes in varying stages of gravitational separation

Step no3. MICROFAT INJECTION

Placement of fat in thin strings of fat columns (using 14 gauge needles fitted on 1 ml syringes) in a multilayered criss cross lattice pattern to create vasogenic interstices which increase the fat take culminate in the predictable lasting results. The 14 gauge cannulas were easily prepared within minutes by the scrub nurses from the readily available 14 gauge needles whose bevels were removed with 240 grit fine sterile sand paper. Initially the recipient area was marked and multiple needle punctures were made radially which serves as portal for blunt 14G cannulas made in operation theatre. Fat is injected only on withdrawal of needle. All planes are injected from the sub dermal to the supra periosteal level. If accidentally large globule is injected it was sucked out carefully using the suction cannula. Massaging was never done as it evokes more edema than redistribution of fat. This continued until the desired symmetry was achieved or without causing blanching of overlying skin especially in the Romberg's disease cases. More importantly special care was taken to avoid the surface irregularities. Single fine sutures were used for the closure of needle ports, as they were too small.



Figure no 3. Showing preoperative marking of the area with patient in sitting posture



Figure no 4. Fourteen gauge fat injection needles after the bevel is removed



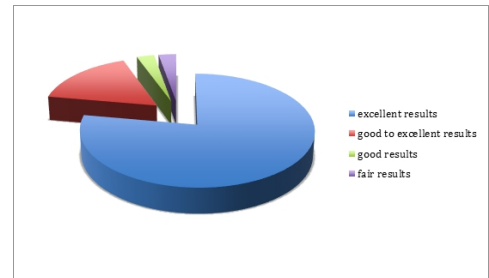
Figure no5; the prepared fat is transferred to insulin syringes fitted with modified 14 G needle

Postoperative course

Abdominal compression garment was placed over the donor area after the ports were close with sutures. Cottony fluffy dressings were used in the regions of fat injection the face area. Patients were instructed to shower after 24 hours. They were advised not to do any massage or apply pressure over these regions of face. After 48 hours they were discharged. They were followed on monthly interval. On an average patients were followed for 24 months. In Romberg's disease patients were seen at frequent interval at the rate of twice a week to take them for secondary procedure after quality of skin had improved.

RESULTS

All had maintained good to excellent results except two patients with respect to correction of deformities in an average 24 months follow up. Two independent observers carried this assessment. Then the average score was obtained. (Chart no 1).



Excellent results (score 5) in 28 patients; good to excellent (score 4) in 6 patients; good result in (score 3) in one patient; fair result in (score 2); poor result in none (score 1). This is the result of 24 months post op assessment by two independent observers.

Only 4 (three Romberg's and one case of idiopathic sub cutaneous fat atrophy) patients had two procedures separated on average by 3.5 months interval. Rest of them (32 cases) had only single procedure. Two patients had purpura that resolved on conservative treatment. Mild (13 cases) to moderate edema (3 cases) in the first post operative day noted in 16 cases which all resolved completely within 24 hours on conservative management like head end elevation and analgesics in the post operative period. Neither at donor nor at recipient sites, no other complications noted in our series including any iatrogenic deformities. Skin qualities like color, stretchability and thickness improved in all cases. Skin pigmentation in Romberg's also improved in all 3 cases. In two patients had persistent erythema for 4 days post operative period treated conservatively healed well. (See table no1)

Case no	Age /sex	Etiology/distribution	Number of fat injection attempts/ amount of refined micro fat injected.	Complications On average 24 months follow up
1.	23/M	PT CH	1/12ml	Mild post operative edema

2	24/F	RM HF	2/45 ml (P) +13ml (S)	Purpura, skin pigmentation resolved+ mild edema
3.	22/M	RM HF	2/43 ml (P) +20ml(S)	Skin pigmen-tation resolved well. Mild edema on day 1
4	42/F	IPL CH	1/9ml	Nil
5	36/F	DE CH	1/11ml	Nil
6	22/M	DE CH+MS	1/20 ml	Nil
7	40/M	PT TM	1/11 ml	Nil
8	20/M	PT CH LL	1/16 ml	Mild post operative edema
9	22/M	IPL bilateral CH+LL	1/30ml	Nil
11	30/F	DE CH TM	1/30 ml	Nil
12	59/F	IPL CH	1/14ml	Nil
13	24/F	PT LL	1/3.5 ml	Nil
14	44/M	DE MP bilateral	1/7 ml	Mild postoperative edema
15	45/M	PT TT MP CH	1/28 ml	Mild post operative edema
16	20/M	DE MS bilateral	1/31 ml	Mild post operative edema
17	25/M	PT TT MP CH	1/ 31 ml	Mild post operative edema
18	34/M	PT TT	1/3.5 ml	Nil
19	32/M	IPL MP	1/ 7ml	Nil
20	50/M	IPL CH LL	1/15ml	Nil
21	36/F	IPL FR bilateral	1/ 9 ml	Nil
21	47/M	IPL CH MS	1/ 26 ml	Moderate postoperative edema
22	23/M	DE bilateral MS+CH	1/29ml	Mild postop edema on day 1
23	43/M	IPL bilateral TM	1/30.5 ml	Nil
24	46/M	DE bilateral TT	1/10.5 ml	Mild post operative edema on day 1
25	30/M	PT FR	1/13 ml	Nil
26	39/M	PT TT LL	1/ 19ml	Nil
27	31/M	PT TM MP	1 / 22 ml	Mild post operative edema on day 1
28	55/M	DE CH LL	1/26 ml	Nil
29	29/M	PT MS	1/12 ml	Mild post operative edema on day 1
30	22/F	RM HF	2/50ml(P) +21ml(S)	Moderate edema in 1 st postop + purpura resolved
31	53/M	PT CH unilateral	1/ 13 ml	Nil
32	26/M	PT TT	1/12ml	Nil
33	22/M	PT MP	1 / 4.5 ml	Nil
34	50/M	PT FR	1/7ml	Nil
35	45/M	PFLT bilateral MS	1/15 ml	Moderate post op edema
36	36/F	PT TM Bilateral	1/12 ml	Mild post op edema

Table no1. PT-post traumatic sequelae; IPL –idiopathic lipodystrophy; DE –developmental; RM-Romberg’s disease; PFLT-Post face lift pre auricular deformities; HF- hemi face; CH- cheek; FR-forehead; TM-temple; MS parotid-masseteric region. LL – Lips;TT-Tear trough; MP- Malar prominence



Figure no6; 14 ml of fat injected for the depressed and scared area in the left cheek. 18 months post op result. No adjuvant procedures carried out. Note the improvement in the scar



Figure no7 ; 22 year old female with right side Rombergs disease treated in two sessions of injection with 50 ml and 21ml of fat respectively. 15 months final photograph



Figure no 8 ; A case of idiopathic lipodystrophy left parotido-masseteric and cheek region treated with single session 15ml of fat injection. 18 months post op picture.

DISCUSSION

The first historical report of fat grafting dates back to 1893 by Neuber (7). Early proponents of autologous fat grafting experienced great difficulties as the outcome of their procedure were neither predictable nor lasting. Several studies have shown unacceptable high reabsorption rates (8). Now this is explainable by their technique of harvest and transplantation of the fat graft. Ever since the study in 1955 (9) hypothesized the feasibility of transplanted cell survival we have continuous progressive understanding in the healing of the transplanted fat tissue. The common underlying factor for the initial survival of either the fat cells of the injected fat columns or its small but significant subset of stem cell population is dictated by the conducive oxygenated environment provided by the patent capillaries in the interstium of recipient area. In the studies conducted by Pu LL et al (10,11) had shown the superior results of Coleman fat injection by comparison with other techniques of autologous fat harvest and transplant. These studies standardized the fat injection technique. Most of the time micro fat injection was used as camouflage correction of aesthetic deformity rather than anatomical correction. The long-term retention of volume of transplanted micro fat, in our series can be attributed to the four following cardinal factors maintained in our study - 1. Avoid damage of fat tissue while harvest, concentration and subsequent injection. This is because the damaged adipocytes release the fatty acids and oily fat in the interstium at the recipient site invokes severe inflammatory reaction and causes the absorption of remaining undamaged fat tissue. Also damage reduces the total volume of viable adipocytes. Considering this we have used low-pressure harvest system with fine cannulas fitted on the 10 ml syringes. We also used 1ml syringes with blunt 14 g needle cannulas for injection in atraumatic way and fat was deposited only during the withdrawal of cannula. Study by Min Zhu etal (12) had shown that extracellular lipid accounts for approximately 12 percent of the total graft volume in grafts prepared by centrifugation and approximately 8 percent of grafts prepared by gravity sedimentation method. So In our series

we used only gravitational sedimentation and decantation as the method of refining the harvested micro fat. The apoptosis of adipocytes and stem cells were also prevented because we deliberately avoided the lignocaine in the tumescent solution (6). 2. Removing all the blood contaminants, tumescent solution, cell debris optimizes the long-term volume retention. This we have done in our series assiduously in syringe washes with normal saline until visible pure fat was obtained free of contamination. 3. To create vasogenic interstices while injecting increase the take and healing of the transplanted fat. This was achieved in our series by injecting technique of criss cross-multilayered lattice pattern injection. 4. For long term retention of volume of transplanted fat one should not inject at recipient site too tightly and too much volume as this shuts off capillaries and produce loss of perfusion to the transplanted fat tissue. Assiduous follow up of these principles paved the way for lasting results in our series. Also we have achieved all these with simple instruments, which are readily available in any operation theatre. This easily adoptable technique can be practiced with short learning curve.

CONCLUSION

This simple autologous micro fat injection is easy adoptable technique resulting in the good lasting and predictable aesthetic results. This can be carried out in any simple sterile environment utilizing easily available instruments in any operation theatre except for the syringe liposuction cannula. Lasting symmetry can be achieved with long-term volume retention of transplanted microfat tissue and also this can be achieved by adopting this simple technique possibly in single attempt

CONFLICT OF INTEREST

Nil

DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article. No external funding was received.

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