



FAT GRAFTING- TO COUNTER THE FACIAL CONTOUR DEFORMITIES

Plastic Surgery

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ABSTRACT

Background: Facial contour deformities result from various causes like congenital, post-traumatic, post-surgical and others. They present as challenging problem to the plastic surgeon. Autologous fat is one of the filler materials which are easily available to correct these deformities. During the past two decades, there was spurt of interest in using autologous fat with fine cannulas. We aimed to assess our simple technique of fat grafting for these deformities with regard to its safety, efficacy and patient satisfaction. **Materials And Methods:** It's a retrospective study, conducted from January 2019 to December 2022. Total of 13 patients underwent autologous fat grafting for facial contour deformities. Patients with the deformity resulting from trauma, surgery and Romberg's disease were included in this study. Fat was harvested from the abdomen/thigh by syringe liposuction technique. Fat processing was done by gravity sedimentation method and injected using 1.8/2.0 mm cannula. Patients were evaluated preoperatively and at 3, 6, 9 and 12 months postoperatively. At the end of follow up, assessment was done regarding the patient satisfaction for the final outcome. **Results:** Among 13 patients 10 were females and 3 were males. Average follow up period was 9 months. All patients had good to excellent results in their subjective assessment with autologous fat grafting. There were no complications like oil cyst or granuloma formation. One patient developed infections at one of the injection site which was managed by incision and drainage. **Conclusion:** Autologous fat grafting is a safe, simple and long-lasting modality of management of various facial contour deformities in selected patients. More than one sitting may be required to achieve optimal outcome in some patients.

KEYWORDS

Fat grafting, Facial contour deformities, Autologous fat.

INTRODUCTION:

Face is the most expressive part of the body. Facial contour deformities have presented as a perplexing and challenging problem to the reconstructive and aesthetic surgeon. They present with varied aetiology and progressive deformity. The deformity may have varying depth of atrophy of skin, soft-tissue and skeleton.

The common aetiology include Romberg's disease, lipodystrophy, craniofacial microsomia, collagen vascular disorders and post-traumatic, excision or ablative defects. Prior to the correction of the deformity it is essential to ensure that the disease is inactive and the deficit remains stable for an accurate assessment. The objective of reconstruction is to restore the contour and achieve a harmonious facial symmetry. There are different modalities of correction of these deformities such as lipofilling, other filler materials, alloplastic implants and microsurgical reconstruction. Among them lipofilling seems to be simple and affordable procedure to counter the facial deformities.

During the past two decades, there has been a tremendous increase in fat grafting procedures for facial contour deformity and rejuvenation. Adipose tissue present in the subcutaneous layer is the ideal filler for correcting and remodelling any facial contour deformities. First fat auto-transplantation was attempted by Van der Meulen, in 1889^[1,2]

The first true autologous adipose tissue transplantation was performed by Gustav Adolf Neuber in 1893, using the small fat graft taken from the forearm and placed in the depressed scar over the infraorbital region due to tuberculous osteitis^[3]. The first use of adipose tissue for the aesthetic correction of the aging effects was done by Lexer in 1910^[4]. He used adipose tissue as fillers to stretch for grooves and wrinkles in the face especially in the malar prominence and infraorbital region.

During the first half of the twentieth century, many authors reported

various evolutionary methods of autologous fat grafting. The modern technique of liposuction was first introduced by Arpad and Giorgio^[5] in 1975. They made multiple 5mm incisions and introduced blunt hollow cannula attached to the suction source and criss-cross suctioning was made. In 1977, Illouz introduced modified equipment for reducing the risk of haemorrhage and less traumatic technique^[6]. The usage of disposable syringe of various gauges and size for adipose tissue aspiration was reported by the Brazilian Toledo, in 1988^[7].

The significance of this syringe liposuction is the precision and accuracy in measurement of fat tissue harvested and also injecting the adipose tissue less traumatically^[8]. A year later, Fournier proposed a new technique for adipose tissue infiltration, calling it lipofilling. The need for hypercorrection and the huge variability of results did not allow its broader developments in those years^[9,10].

The revolutionary gain in autologous adipose tissue grafting was obtained after the introduction of the advanced technique of fat harvesting by Coleman, in 1977^[11]. His method of harvesting the fat had substantially reduced complication and improved overall graft survival^[12]. There is rapid transition in the fat harvesting technique following Coleman's publications. He defined that the fat harvesting, refinement and transfer are the key to successful fat grafting^[13].

In 2001, Adipose-derived stem cells (ASCs) were first discovered^[14]. ASCs and Stromal Vascular Fraction present in the adipose tissue have the properties of proliferative potential and Neo-angiogenesis. These properties result in significant improvement in skin quality and contour correction by lipofilling.

In this study, we provide details of our simple method of fat grafting in a step wise manner of its harvesting, processing and transfer for facial contour deformities. And also we had aimed to study its effectiveness and safety in correcting these facial deformities and the patient satisfaction following the procedure.

MATERIALS AND METHODS:

It is a retrospective study, conducted in our centre from January 2019 to December 2022 comprising of 13 patients (10 females & 3 males) **Figure 1**. They underwent autologous fat grafting for the following facial contour deformities (Romberg's disease -4 cases, post-traumatic - 4 cases and post-surgical - 5 cases) **Figure 2**. Standardized photographs were taken pre-operatively. Potential donor site was identified preoperatively by pinching the skin fold thickness for adipose tissue deposits. It was lower abdomen in 11 patients and medial thigh in 2 patients.

Inclusion Criteria:

Romberg's disease, Post traumatic and Post-surgical facial contour deformities.

Exclusion criteria:

Deformities resulting from other causes, hypertrophic scar tendencies and those underwent other procedures.

Instrumentation and Materials:

Lipo-suction 3mm infiltration cannula (**Figure 3**), 3mm Lipo-Suction cannula (**Figure 4**), Luer-lock syringes 50 cc (**Figure 5**) and 10cc, 1.8mm & 2mm fat injection cannulas (**Figure 6**), 3way adapter (**Figure 7**) for fat transfer between syringes.

Donor site:

Potential donor site was marked in a standing position in order to identify the available adipose tissue deposits. (**Figure 8**)

Marking recipient area:

The fat graft recipient areas in the face were marked pre-operatively (**Figure 9**).

Surgical Procedure:**Fat harvesting technique:**

Under General anaesthesia, the face and the donor site for liposuction were prepped and draped. The tumescent solution containing 400ml 0.9% Normal saline, 2 ampoules of 1 mg/ml adrenaline (to obtain 1:200000 dilution) and 30ml of 2% lidocaine (20mg/ml) and 10ml of 7.5% sodium bicarbonate was used. A 2mm stab incision using the number 11 blade was made in the donor site and tumescent solution was slowly infiltrated using 3mm infiltration Cannula and waited for 10 minutes.

Fat was harvested using a negative suction method by 3mm liposuction cannula connected to a 50 cc Luer-lock syringe in a spoke of a wheel pattern. By withdrawing the plunger, negative pressure is provided, back and forth hand movement gathers fat into the syringe; as the vigorous negative pressure will endanger vital fat cells, plunger of the syringe is withdrawn for shorter distance to create minimal negative pressure.

Fat processing:

The 50cc syringes containing the harvested fat was kept in an inverted vertical position (**Figure 10**) for 15 minutes as shown in Figure. By Gravity sedimentation method, the fat graft got separated from the tumescent solution which was in the lower part, and from the lipid layer which was found over the top.

The tumescent solution got drained in 15 minutes and the middle fat layer was transferred to 10cc syringes (**Figure 7**) and the top lipid layer was discarded.

Injection:

The final suspension of the fat graft in 10cc syringes was injected into the recipient area with 1.8/2.0 mm cannula by using fanning technique in various sites marked preoperatively into the subcutaneous plane. Appearance of yellowish white discoloration at the injection site was considered as the end point.

Post operative aspects and follow up:

For all patients standardized photographs were obtained in the immediate post-operative period and at 3, 6, 9 and 12 months postoperatively. At the end of the follow up, assessment was done regarding the patient satisfaction for the final outcome.

Every patient was asked for his or her satisfaction for the end result. Patients' scores were documented in the medical records as a 5-point

Likert scale, with 1 being extremely dissatisfied, 5 being extremely satisfied and 3 being neutral.

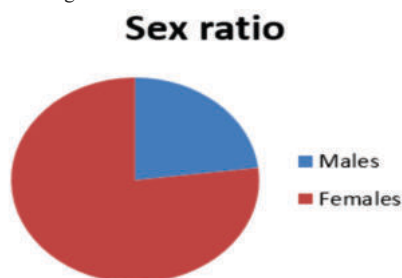
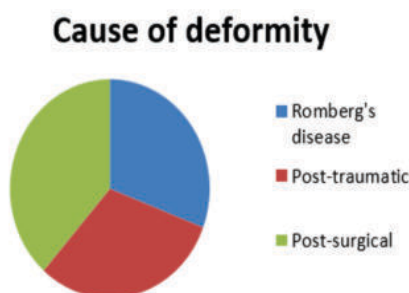
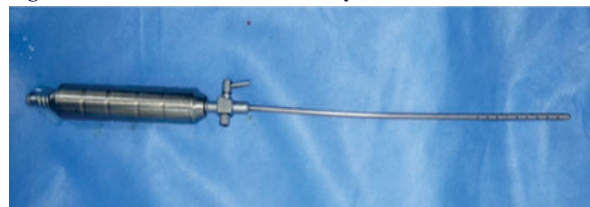
**Figure 1: Sex Ratio****Figure 2: Causes for contour deformity****Figure 3: 3mm infiltration cannula****Figure 4: 3mm Lipo-suction cannula****Figure 5: 50cc Luer-lock syringes****Figure 6: 1.8 & 2 mm injection cannulas**



Figure 7: 3way adaptor for fat transfer



Figure 8: Donor site marking



Figure 9: Pre-op marking



Figure 10: Fat processing by sedimentation



Figure 11.1 Parry Romberg disease -pre-op



Figure 11.2: Immediate post-op



Figure 11.3: 3 months post-op



Figure 12.1: Post-surgical - left maxillectomy defect



Figure 12.2: 3 months post-op



Figure 12.3: 9 months post-op

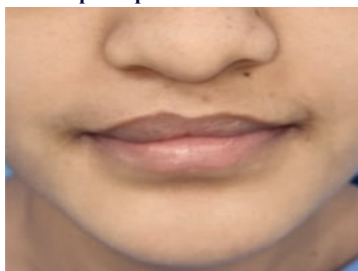


Figure 13.1: Post-surgical upper lip scar



Figure 13.2: Early post-op



Figure 14.1: Parry Romberg disease-pre-op



Figure 14.2: 6 months post-op



Figure 14.3: One year post-op

Table 1

S. No.	Age / Sex	Type of patients	Site of contour deformity	Volume of fat injected	No. of sitting	Follow-up period	Patient Satisfaction (LIKERT scale)
1	28/ F	Romberg's disease	Hemiface	52ml	1	10 months	5
2	40/ F	Post-traumatic	Right chin	15ml	1	12 months	5
3	23/ F	Post-surgical	Upper lip	4ml	1	6 months	4
4	41/ F	Post-surgical	Left chin	11ml	1	12 months	5
5	33/ F	Romberg's disease	Hemiface	53ml/24 ml	2	12 months	3
6	29/ F	Post-traumatic	Left cheek	27ml	1	12 months	5
7	37/ M	Romberg's disease	Hemiface	43ml/20 ml	2	12 months	3
8	39/ F	Post-traumatic	Left zygoma	12ml	1	9 months	5
9	29/ M	Post-surgical	Right nasolabial	11ml	1	6 months	4
10	25/ F	Romberg's disease	Hemiface	50ml	1	9 months	4
11	45/ M	Post-traumatic	Right forehead	18ml	1	11 months	4
12	57/ F	Post-surgical	Right zygoma	14ml	1	6 months	4
13	47/ F	Post-surgical	Left cheek	28ml	1	9 months	5

RESULTS:

Among the 13 patients (Table 1) included in the study 10 were females and 3 were males. Four patients with Romberg's disease (Figure 11 & 14), 4 patients with post-traumatic and 5 patients with post-surgical (Figure 12 & 13) contour deformities were managed with autologous fat grafting. Their age ranged from 23 years to 57 years with an average age being 36 years. The donor site was the lower abdomen in 11 patients (85%) and medial thigh in 2 patients (15%). Postoperatively the patient complained of pain and oedema in the donor site which resolved on an average of 10 days (range 7-14 day). Average volume of fat injected per patient was 26ml ranging from 4ml to 53 ml. The average follow-up period of the patients was 9 months (range from 6 to 12 months). During the follow up period, no patients received other concomitant procedures or topical treatment.

Minor complication like pain and bruising, observed in all patients, were managed conservatively. No complication like fat cyst and granuloma formation were noted. But one patient developed infection at one of the injection site which needed an incision and drainage in immediate post-op period. Skin qualities like stretchability and thickness were improved in all cases. In 3 patients with Romberg's disease skin pigmentation also improved. The following scores were obtained in the 5-point Likert scale from the patients for assessing the improvement in the facial contour deformity. There were 6 patients (46%) who experienced extreme satisfaction (scale 5), 5 patients (38%) were satisfied (scale-4) with the results. 2 patients (16%) were neutral with their results (scale-3). These 2 patients with Romberg's

disease needed second sitting of the same procedure 3 months after their first operation and were satisfied (scale 4) after that.

DISCUSSION:

Facial tissues readily accept autologous fat without any fear of immune reaction or carcinogenicity. The main drawback of this procedure is possibility of resorption and unpredictable results of the filling effect; however the prognosis of fat grafting is directly related to proper case selection and meticulous surgical technique. Coleman explained structural fat grafting with long lasting results.^[13] His concept was mainly a refinement of known technique with a great attention to atraumatic handling of fat cells during harvesting, processing and grafting. The lower abdomen and inner thighs were chosen as the better donor sites because of the two reasons. These sites are easily accessible by the surgeons with a patient in the supine position, and also scientifically sound as they have higher concentration of stem cells than other donor sites as long as patients have adequate amount of adipose tissue in those areas.^[15] Common methods for processing fat grafts include centrifugation, filtration, or gravity sedimentation. We preferred gravity sedimentation method as it was simple and also avoids exposure to ambient air which is detrimental to adipocyte viability because of drying and potential bacterial contamination. The key to a success in fat grafting is to achieve an even distribution of fat grafts in the recipient site. By doing so, the injected fat grafts have a maximal amount of contact with the tissue in the recipient site for better fat graft survival through plasmatic imbibitions and neovascularisation. Grafting with small volume in each pass gets better surgical outcomes and also complications such as fibrosis, oil cyst formation, calcification, or even infection with large-bolus grafting can be avoided. To achieve this goal, small volume of fat grafts should be injected in each pass. Slow injection of 0.5 to 1 ml per second at the recipient site during the withdrawal phase in each pass will minimize trauma to the fat graft.^{[16],[17]} Overcorrection for "better" graft survival at the recipient site seems to be unscientific. In addition, significant overcorrection may increase the incidence of fat necrosis and subsequent calcification or even severe infection.^[18] In patients who required second sitting of fat grafting, it was deferred until 3-6 months postoperatively to diminish the inflammatory response.^[19]

CONCLUSION:

Autologous fat grafting to the face is a safe and reliable option to counter facial contour deformities. Proper selection of donor site, atraumatic syringe-suction fat harvesting, processing by gravity sedimentation and placing small amount of graft during each pass as the cannula is withdrawn produce predictable results. The transplanted fat can survive well in the face with this fat grafting technique. More than one injection may be required to achieve optimal outcome in some patients.

Conflict Of Interest

Nil

Disclosure

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