Facial Lipoifilling for the Treatment of Facial Asymmetry Following Permanent Synthetic Filler Morbidity

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ABSTRACT

With the transient past popularity of permanent dermal fillers, there was an associated and consequent rise in complication rates. Facial asymmetry following synthetic filler morbidity remains a valid concern. Here, we study the use of lipofilling as a rescue procedure that is safe, easy, and effective in the correction of facial asymmetry following synthetic grafting. All our patients exhibited significant improvement in self-assessment reports and volume retention was maintained for the whole duration of follow up which was 6 months.

Keywords: *Lipoinjection; Lipofilling; Fat Grafting; Facial Asymmetry; Filler; Hydrogel; Aesthetic*

Running Title: Lipofilling after permanent filler
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INTRODUCTION

Dermal synthetic fillers have been in use for over fifty years [(1)]. Although initially utilized for the management of congenital and traumatic facial defects [(2)], the use of synthetic injectable fillers has extended to reverse facial aging as part of the growing non-surgical facial rejuvenation market [(3)]. The loss of dermal thickness due to fat decay and breakdown of extracellular matrix occurs with age from repeated mimetic muscle function and causes deepening of wrinkles, that even a surgical facelift procedure would not be able to reverse without some sort of volume substitute [(1)].

There are many types of synthetic fillers, each with a unique set of characteristics, advantages, disadvantages, and indications [(4)]. Synthetic fillers can be broadly categorized into 1) non-permanent (e.g. collagen and hyaluronic acid) that last for a short duration of months before resorption by macrophage activity, 2) semi-permanent (e.g. calcium hydroxyapatite and poly-l-lactic) that elicit a fibroblast response and last longer for years, and 3) permanent (e.g. silicone, polymethylmethacrylate, and polyacrylamide hydrogel (Aquamid)) that also work through fibrogenesis and last the longest [(4,5)].

Multiple studies have been published in the literature that report on the long-term efficacy and safety of permanent fillers [(6,7)]. Although from an aesthetic point of view, the subjective results were generally favorable for up to 5 years of follow up[(6)], concerns regarding safety of the implants have been raised [(8,9)]. Complications of synthetic implants include local tissue reaction, pigmentation, infection, sensory complaints, and migration of the implant [(8)]. Furthermore, there have been reports of consequent facial asymmetry or irregularity resulting in patient dissatisfaction[(7)]. In such situations, removing the hydrogel implants has proved to be challenging, and thus the correction of implant aesthetic complications becomes a difficult task [(8)].

Lipofilling (lipoinjection, or fat grafting) is a safe and effective alternative to synthetic fillers. Grafted fat has gained popularity in the recent years as an ideal filler material in primary aesthetic procedures or as an adjunct to others, being autologous, biocompatible, abundant, removable and potentially permanent[(10)]. The advantages of lipofilling are not limited to volumetric and contouring ones, but it has been observed that the grafted fat improves the quality of the surrounding tissue, including aging reversal[(11)]. Paracrine signaling from adipose-derived adult stem cells involving the TGF-

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β/Smad and Wnt/β-catenin signaling pathways may play a role in the normalization of the microenvironment around grafted adipocytes and preadipocytes [10,12]. Thus, newer techniques in lipofilling include cell-assisted lipotransfer (CAL) and stromal vascular fraction (SVF), or the newer "nanofat" which involves mechanical destruction of most adipocytes and extraction of SVF and CD34+ cells for injection, reducing the volumetric effect of the lipofilling procedure but markedly increasing its tissue revitalization capacity [13].

In this work, we set out to evaluate the efficacy and safety of lipofilling in the correction of facial asymmetry secondary to permanent synthetic filler morbidity.

METHODS

This prospective single-arm case series study was conducted in two private plastic and reconstructive surgery centers in Kuwait in the period between January and December of 2018. The study adhered to the Tenets of the Declaration of Helsinki and informed consents were signed by all participants.

We enrolled subjects that had undergone facial rejuvenation using permanent fillers (Hydrogel) and were unsatisfied with the aesthetic outcome at the time of presentation due to subsequent infection, migration, under correction, or surface irregularity, all resulting in facial asymmetry. Patients were offered either a filler removal procedure, or lipofilling as an alternative safe and quick adjunct procedure for contouring and adjustment, with the explanation of the benefits, hazards, and expected outcome of each procedure. All patients in our study made an informed decision of opting for lipofilling. Patients were excluded from the study if they had undergone previous facial lipofilling, filler manipulation, had an active infection, had a congenital or traumatic scarring facial condition, or had a rare contraindication to lipofilling (e.g. unavailability of donor fat tissue due to low body weight).

All subjects had pre-procedure photographs taken and were asked to rate their facial aesthetic perception to have a baseline quantitative assessment, using a numerical scale from 1 to 10, where 1 represented the least satisfaction and 10 represented the most. Results were tabulated by a third party and inaccessible to any of the principal investigators of the study until the time of study completion.

We followed the classic Coleman technique for harvesting and grafting fat tissue [14]. Patients first underwent preoperative marking of the destined recipient grafting sites (Figures 1 and 2). Under completely sterile conditions and sedation, donor sites selected for fat harvesting to enhance body contour (mainly the abdomen and thighs) were surgically handled. Local anesthesia in the form of Ringer's lactate with 1:200,000 adrenaline and 0.5% lidocaine were infiltrated in 3 premade 3 mm stab incisions (made using number 11 blade). A volume of 1 mL of infiltration solution was used for each 1 mL of required harvested fat. Fat harvesting was carried out using a two-holed Coleman cannula with a blunt tip inserted into the same stab incisions and connected to a 10 mL syringe. Gentle negative pressure was created, and removal of filled syringes was followed by capping and placement into a centrifuge that spun at a rate of 3000 rotations per minute for 3 minutes. The desired middle layer of refined fat was isolated into 5 mL syringes intended for use in transplantation.

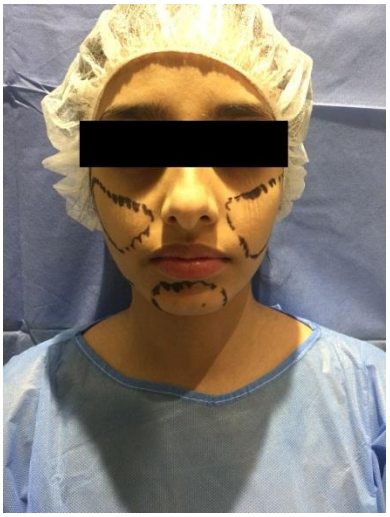

Fig. 1. Preoperative marking of destined facial fat grafting sites in a study subject, front view

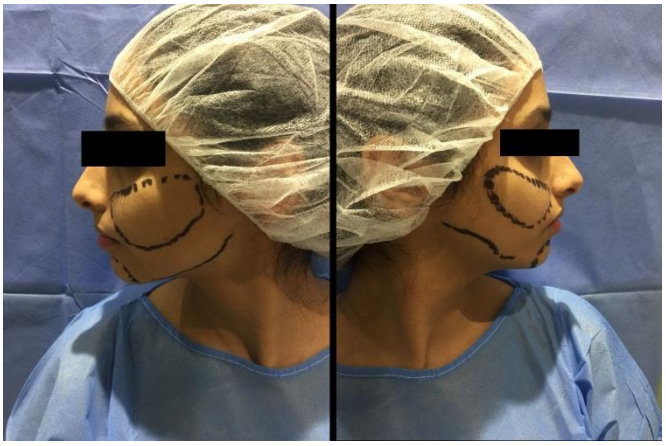

Fig. 2. Preoperative marking of destined facial fat grafting sites in a study subject, side view

Blunt 17-gauge cannulas were generally used for fat insertion unless adhesions were found; in such cases sharp-tipped cannulas were preferred. Insertion of the cannulas was through the same incision sites used for infiltration anesthesia. Fat parcels were only injected during needle withdrawal until desired volumes were reached.

Patients were discharged on the same day of the surgery with a prescription of an oral non-steroidal anti-inflammatory agent (Ibuprofen 600 mg, 3 times daily) and a broad-spectrum antibiotic (co-amoxiclav 500 mg, twice daily), together with instructions of sleeping with the head elevated and cold facial compressors for the first two days following the procedure. A follow up schedule of 1 day, 1 week, 1 month, and 6 months was placed. In each visit, assessment of the wound status, implant status, subjective aesthetic status, and any other complication was carried out.

Patients were asked to complete a postoperative survey of their subjective facial aesthetic perspective using the same scale employed preoperatively. Data were tabulated and analyzed in comparison to preoperative data using SPSS v25 and descriptive statistics were carried out. Where appropriate, the student t-test was employed to compare means and a value less than 0.05 was considered statistically significant.

RESULTS

Seven female cases were included in this work. The age range was 34 – 62 years, with a mean of 45.9 years and standard deviation (SD) of 8.9 years. The mean duration between the initial permanent filler insertion and the lipofilling procedure was 5 months (SD: 2.4 months).

All our patients had satisfactory volume fat filling immediately postoperatively, that persisted for the 6 months duration of follow up. Figures 3 and 4 depict frontal-view preoperative vs. postoperative images at one month follow up of two of our study subjects. Note the correction of facial symmetry and the indistinguishable grafting. Figure 5 depicts side-view preoperative (A, B) images of a 52-year-old patient with facial asymmetry following permanent implant insertion and six-months postoperative images (C, D) after lipofilling.

Patient-reported satisfaction ratings preoperatively and at 6 months postoperatively are depicted in table 1. The mean subjective facial aesthetic preoperative score was 3. 86 (SD: 1.25), while the mean postoperative score at 6 months was 7 (SD: 1.31), the difference was statistically significant ($p = 0.0006$). The mean change in score points was 3 points.

We detected minimal postoperative complications in our studied sample. No cases of postoperative infection were detected, neither were signs of damage to any of the deeper facial structures. Bruising and edema were transient and mild in all cases. Only one case felt like there was some underfilling, which was managed by regrafting after 1 month until a satisfactory volume was reached.

Table 1. Comparative analysis of preoperative and postoperative (6 months) subjective aesthetic scores on a scale of 1 – 10.

Preoperative Scores Mean ± SD	Postoperative Scores Mean ± SD	P value
3. 86 ± 1.25	7 ± 1.31	**0.0006***

*Statistically Significant

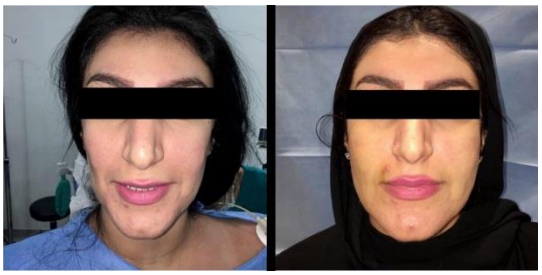

Fig. 3. Preoperative (left) and one-month postoperative (right) frontal images of a 49-year-old female patient undergoing facial lipofilling three months following synthetic filling implantation.

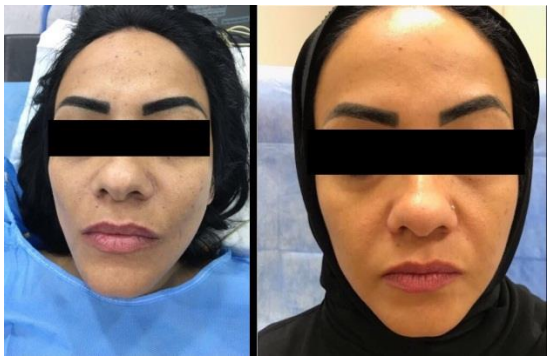

Figure 4. Preoperative (left) and one-month postoperative (right) frontal images of a 37-year-old female patient undergoing facial lipofilling five months following synthetic filling implantation.

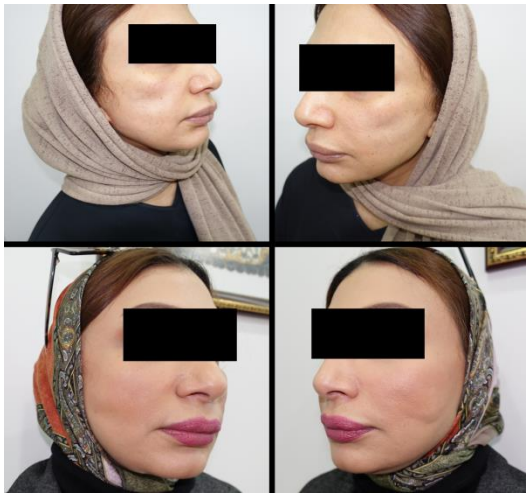

Fig. 5. Preoperative (A, B) side-view images of a 52-year-old patient with facial asymmetry following permanent implant insertion and six-months postoperative images (C, D) after lipofilling.

DISCUSSION

To the best of our knowledge, this work is the first to study the use of lipofilling as a rescue procedure for facial asymmetry secondary to permanent filler morbidity. In our experience, the procedure proved both safe and effective and received much welcoming from our patients.

In their study of complications after polyacrylamide hydrogel injection in a Chinese population, Shen et al. [8] identified 24 patients with reported complications. Those complications included infection, hematoma, filler migration, and nodular collections. Twenty three out of the 24 patients opted for removal of the implant, which was often difficult and incomplete. Two patients had some form of a permanent residual deformity and one patient had an ultimate scar. The authors warn about the unchecked use of permanent fillers. This is supported by other studies that have reported on complications of dermal fillers [15]. Nygart et al.[9] examined the use of prophylactic antibiotics with hydrogel implants and recommended their use to reduce the risk of bacterial biofilm formation and subsequent infection.

Autologous fat has been used for aesthetic purposes for over a hundred years now [1]. It has the advantage of being biocompatible, safe, effective, and long-lasting, with extra benefits to the surrounding tissue [10]. Although initially used for congenital and traumatic defects, the use of lipofilling has successfully extended to treat aged skin and scars, and improve the healing of wounds [16]. Lipofilling also has the advantage of being a repeatable procedure, until sufficient and satisfactory fat volume is reached [17]. Refinement of the techniques of fat harvesting, manipulation, and transplantation has produced a safe and reproducible method with negligible complication rates [11].

In a study of 34 patients that underwent lipofilling to correct temporal depression in elderly females[18], volume restoration was maintained for up to 3 years after the procedure, with half of the patients' self-evaluation being excellent, and 44.1% being good, and 5.9% being fair, with no poor assessments. Minimal bruising and swelling were detected and were the only complications.

This is in line with our work that revealed significant satisfaction among our study subjects with minimal complications.

Achieving facial symmetry after lipofilling is of utmost relevance to the procedure's outcome and patient satisfaction. In a study by Denadai et al.[19], 167 patients with facial deformity underwent lipofilling and were followed up for a period of 12 months. Facial symmetry was assessed using computational analysis. Facial symmetry was achieved at 12 months in 91.2% of the patients, yet 40% of the patients required augmentation of lipofilling to achieve satisfactory symmetry. It is to be remembered, however, that these patients were receiving fat grafts for facial deformities, some of which were extensive, progressive, or behaved pathologically different than the physiological aging process that requires grafting for a pure aesthetic purpose.

A concern regarding lipofilling is the duration of volume retention. A recent systematic review and meta-analysis conducted by Lv et al.[20] uncovered the diverse reporting methods, follow up duration, and varying retention rates in the literature, and thus concluded that the retention rates of fat grafts cannot be currently predicted. Better retention rates were, however, detected in secondary grafting procedures (like the one conducted in our study). The pooled complication rate was 2.8% and most were minimal complications. This supports our notion that fat grafting as an adjunct or correcting procedure provides better volume retention with minimal complications.

A limitation to our study is the single arm design. In our defense, all patients opted for the minimally invasive lipofilling instead of filler removal or replacement and thus we could not have a comparative study involving both approaches. Another limitation is our small sample size that makes generalizations from our work difficult. Larger, controlled studies are needed to detect if lipofilling is a superior modality to filler replacement or other modalities for correction of facial asymmetry secondary to original filler morbidity.

In conclusion, our work supports that facial lipofilling may be a safe, simple, accepted, and effective procedure in facial contouring and in restoration of facial symmetry following primary filler complication.

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