Does the Autologous Fat Grafting Technique Serve the Need for Reconstructive Surgery in Oral Cancer Patients? A Prospective Evaluation in Beauty Seekers

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Abstract

Cancer is a dreadful disease that getting increased day by day. In which oral cancer majorly induced by tobacco has caused a devastating effect on facial look. Even though several advancements in medicine have paved the way for understanding the cancer molecular troops, surgery, chemotherapy and radiotherapy has become inevitable procedure for cancer therapy. These procedures remove the tumor but tremendously change the aesthetic look of the patients thereby affecting the physical and mental health of patients. Autologous fat grafting (AFG), also known as lipofilling is a soft tissue augmentation technique, that is widely employed in aesthetic and reconstructive surgery to achieve facial rejuvenation and body shape remodelling. AFG is known for its biocompatibility, low immunogenicity, allergenicity with the advantage of wound healing properties. By taking accord of the advantage of AFG we have assessed the effect of autologous fat in the facial space and the occurrence of postoperative complications in a comparative way before and after the surgery in beauty seekers. Further patient satisfaction and potential complications after the autologous fat filling in different spots of the facial space were investigated by clinical evaluations, patient-reported outcomes, and photographic assessments. The outcome of the experiment has warranted 100% patient satisfaction in terms of improved facial contour, skin glossiness, skin elasticity, ptosis, and facial depression. The overall satisfaction rate for both surgeons and patients was above 80%. Based on the experimental evidence, we have postulated the advantage of utilizing the AFG technique as a reconstructive procedure for oral cancer patients after cancer treatment. This will uplift the aesthetic physical appearance thereby boosting the patient's mental health and confidence.

Keywords: Autologous fat grafting; Reconstructive surgery; Fat fillers; Lipofilling; Oral cancer.

Introduction

Cancer attributes to the leading death worldwide causing close to 10 million deaths in 2020 [1]. Which oral cancer is the sixth most common cancer with a high occurrence rate in South Asia [2]? Oral cancer is persuaded by various physical, chemical, biological carcinogens and the lifestyle which has drastically hampered the prophylactic measures. As to curb the advancements of metastasis and disease complexity common procedure employed is chemotherapy radiotherapy and surgery. Even though they provide the cure to the patient, these procedure causes tissue damage, aesthetic detects, irregularities, atrophic skin, irreversible tissue damage, scar, and so on [3]. This has tremendously changed the aesthetic look of the patients thereby affecting the physical and mental health of patients.

Autologous fat grafting (AFG), also known as lipofilling is a soft tissue augmentation technique, that is widely employed in aesthetic and reconstructive surgery to achieve facial rejuvenation and body shape remodeling [4, 5]. AFG is known for its benignity, reliability, predictability, and higher biocompatible affordable technique to improvising the tissue deformities and reconstruction. The fat cell grafts are considered the closest acceptable autologous soft tissue which can be easily harvested with low donor-recipient morbidity, low immunogenicity, allergenicity. In addition, they possess the advantage of wound healing due to the presence of cytokine profiles and certain extracellular matrices [6, 7].

Moscatello *et al* [8] showed that the further important surface space of the troubled fat lobules on the recipient bed worked on fat endurance after infusion. Li *et al.* [9] have carried out a study on facial fat filling under the guidance of the anatomical structure of the facial fat chamber. They proposed that injecting a small amount of fat into the subcutaneous layer was enough to make the transition between the zygomatic arch and the buccal and mandibular regions look natural, which provided a personalized approach based on the facial fat compartment theory [10, 11]. The aforementioned overcomes the disadvantages of another grafting, cosmetic surgery techniques, and artificial materials such as prosthesis, hyaluronic acid, and Botulinum toxin Type A [12].

Owing to this, authors have proposed to evaluate the feasibility of utilizing the AFG technique to oral cancer patients after cancer treatment to improvise the facial aesthetics. In order, we have assessed the effect of autologous fat in the facial space and the occurrence of postoperative complications in a comparative way before and after the surgery. Further patient satisfaction and potential complications after the autologous fat filling in different spots of the facial space were investigated.

Methodology

Ethical approval

The study was approved by the Institutional Review Board of Shandong Provincial Hospital (IRB No. SDPH202139002) and was performed according to the guidelines of Good Clinical Practice and the Declaration of Helsinki principles. Written informed consent was obtained from all patients after explaining the limitations, benefits, and realistic surgical outcomes. Preoperative images were also obtained for the documentation.

Inclusion and Exclusion criteria

Fifty-two patients who underwent AFG for facial rejuvenation between January 2016 and December 2020 were enrolled in this study and prospectively followed up for 3, 6, 8, 12, 24, and 36-months. The inclusion criteria were the age group of ≥ 18 years. Patients who had a positive pregnancy test or were breastfeeding were excluded from the study. Other exclusion criteria were current infection at the treatment site and systemic diseases (such as diabetes, hypertension, iatrogenic coagulation disorders, disorders of lipid metabolism, and history of connective tissue disorders). Preoperative laboratory tests, including a complete blood routine, comprehensive chemistries, and prothrombin time/partial thromboplastin time, were performed to assess the patient's current health status.

Surgical procedure

Donor site and marking

Considering the availability of accessible adipose tissue and the individual facial features of each patient, outer thighs (saddlebags) were mainly selected as the donor site. However, the lower abdomen, inside thighs, periumbilical, and buttock were occasionally preferred. Preoperative marking of the surgical site was done before administering general anesthesia, with the patients standing.

Tumescent and Fat harvesting

Harvesting and subsequent fat injection were performed using a previously published method [5]. For patients who received general anesthesia, a tumescent solution (500 mL) containing normal saline, 0.5 ml of 0.1 % epinephrine (1:100,000), and 10 ml of 2 % lidocaine was administered through a multi-hole infiltration cannula (diameter 1.5 mm). However, 15 mL of 2% lidocaine was injected into the individuals upon administration of a local anesthetic. The entire procedure was carried out with extreme caution, with the tumescent solution being injected gently from one site to another until maximum vasoconstriction was achieved at the fat donor site. After waiting for 10 minutes, a 10 mL Luer-lock syringe connected to a liposuction needle with a blunt 3 mm tip was used to extract the adipose tissue under negative pressure, minimizing the potential oxidation and injury to adipose tissue.

Fat purification

After collection, the fat was allowed to stand to eliminate excess water and blood. For this procedure, the same 10 mL syringe that was utilized for fat harvesting was used. The syringe was then capped and centrifuged at 3000 rpm for 3 minutes, resulting in the separation of fat grafts into three distinct layers: oil in the upper layer, intact adipose aspirates in the middle layer, and cell debris in the lower layer [6]. Finally, the deep portion of the middle layer was collected in a new 1 mL syringe, capped, and stored in an upright position for subsequent use.

Fat implantation

A disposable 18-gauge needle established an entry site in the skin to treat the temporal, frontal, and orbital regions (at the forehead, upper anterior space of masseter muscles, corner regions of the mouth, zygomatic arch, and areas surrounding the eye). Before fat grafting, all patients (regardless of the anesthetic modality) were injected with tumescent fluid (same composition as described for donor site) to fill the facial spaces. The surgeon decided on the graft volume after considering individual patient conditions. An injecting cannula aided fat transfer from a 1 mL syringe into a recipient facial site. Special attention was taken to homogenously deposit the fat. Finally, the stabbed area of the face was stern-stripped and oral antibiotics were administered to avoid microbial infection.

Aesthetic Outcome Evaluation

At the end of each follow-up visit, the aesthetic improvement of the patients was evaluated by the operating surgeon. A four-point Likert scale was used to score the results: 1 = excellent (for utterly satisfactory results); 2 = good (for substantially satisfactory results); 3 = fair (for somewhat satisfactory results); and 4 = poor (for unsatisfactory results). Patient satisfaction was documented using a questionnaire based on five evaluation indicators: correction of facial depression, improvement of facial droop, improvement of fine facial lines, and naturalness of facial expression, with each given a score of 20. A score over 90 points was considered excellent, 81-90 good, 70-80 moderate, and 70 the lowest. The degree to which patients were satisfied with their surgical outcomes was derived using the following formula:

$$Patient\ satisfaction\ index\ (PSI)\ \% = \frac{(Excellent\ score + Good\ score) * 100}{Maximum\ possible\ score}$$

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Regular postoperative care was administered in each case for the first seven days following surgery. In addition, the injected fat volume, follow-up period, observed complications, treatment site, and patient satisfaction scores were recorded.

Results and Discussion

In the present study, most of the participants were females, with a female-to-male ratio of 16:1, the facial clearance, including superior temporal space, anterior zygomatic space, buccal clearance, and so on, was taken as the filling sites. The patients' age ranged from 28 to 62 years, with a mean age of 41.6 ± 9.2 years. The mean follow-up period was 18.3 months (range, 6 to 36 months, excluding a 28-year-old female patient who was followed up for 40 months). Table 1 summarizes the quantity of fat augmentation that was injected into each measured site (range, 5-20 mL), based on the facial morphology and the desired corrections. The anterior zygomatic, upper anterior masseter, superior temporal, and frontal reticular tissues were the most frequently injected fat graft locations. Frontal reticular tissue received the maximum fat volume (20 mL).

During follow-up visits, cosmetic evaluation of preoperative and postoperative photographs showed 100% patient satisfaction in terms of improved facial contour, skin glossiness, skin elasticity, ptosis, and facial depression. The overall satisfaction rate for both surgeons and patients was above 80%, as shown in Table 2. Figure 1 illustrates four representative cases of cosmetic improvement achieved after 6, 12, and 36 months of follow-up. Standardization and facial portion analysis through meticulous photography are critical steps in assessing the postoperative results of fat grafting, typically achieved through 2D photography [16]. The 2D imaging was used to evaluate the aesthetic results of the surgery, providing a higher level of satisfaction among patients and surgeons.

Table 1: Injected volume per facial site with their effects

Filling position	Number(n, %)	Filling amount (mL)	Effects
Frontal reticular tissue layer	43(82.6)	20	Projecting forehead
Superior temporal space	48(92.3)	4-6	Projecting forehead
Zygomatic anterior space	52(100)	2-3	Correct the central sag, Projecting apple muscle
Upper anterior space of masseter	49(94.2)	4-8	Correct the depression under the zygomatic arch on both sides of the cheeks and lift the saggy jaw
Buccal clearance	23(44.2)	2	Correct the sag and sag outside the corner of the mouth
Anterior inferior orbital space	10(19.2)	0.5-1	Correct the tears ditch
Superior anterior orbital space	4(7.7)	0.5-1	Correct the upper eye socket depression

Table 2: Evaluation of Treatment

Evaluation	Insufficient correction(n,%)	Sufficient correction(n,%)
Patient	-	52 (100)
Surgeon	9 (17.3)	44 (84.6)

In this study, although we could not estimate the amount of fat retained at each facial site and only knew the total amount of fat grafted, the atrophy corrections for different facial compartments were significant and lasted for the entire follow-up period. Despite this, nine patients underwent additional fat grafting sessions to correct asymmetries, perhaps have ensued due to the differences in graft vascularization, delaying the healing of the first graft.

Swelling and edema were the most common complaint in all patients, which was an expected outcome of the normal postoperative course. Yet, two patients developed complications including a bulged superior orbital septum (adjusted using fat aspiration after 6 months) and a soft tumor deep into the right cheek (corrected by graft manipulation). No other complications were observed, such as evidence of donor site hematoma, nerve or vascular injury, necrosis, calcification, or surgical site infections.

In the past, various dermal fillers have been tested with varying degrees of success. However, fat fillers have gradually become a cheaper and more effective replacement for augmenting soft tissue for cosmetic indications [15]. Other therapeutic implications of AFG, employed either as a stand-alone maneuver or as an adjunct to other facelift surgeries include breast reconstruction, periocular facial rejuvenation, correction of congenital deformities (Parry-Romberg syndrome, Poland syndrome, Dupuytren's and Raynaud's diseases, and pectus excavatum), treatment of burn scars, hand rejuvenation, augmentation rhinoplasty, and breast and gluteal augmentation [16,17].

Figure 1: Representative cases of patients who received fat grafts for facial rejuvenation

A. Preoperative (left) and 6-month postoperative images of a 54-year-old female. The frontal reticular tissue layer, anterior zygomatic, the upper part of the anterior masseter, buccal area, and anterior inferior orbital septum showed aesthetic improvements (Case 1). B. Diagonal view (right and left) of a 36-year-old female. Preoperative (right) and 6 months after the graft was implanted (left). Filled areas included the anterior superior and inferior orbital septa (Case 2). C. Right and left diagonal view of a 40-year-old female—Preoperative (right) and 12 months after the fat graft (left). Anterior zygomatic, the upper part of the anterior masseter, and buccal regions were areas that received cosmetic enhancement (Case 3). D. Frontal view of a 46-year-old female, preoperative (right) and 36 months post-operative(left) photographs of the frontal reticular tissue layer, anterior zygomatic (received two grafts), the upper part of the anterior masseter (two grafts), buccal, the anterior superior orbital septum, and anterior inferior orbital septum regions(Case 4).

Clinical observation studies have demonstrated long-term differences in the outcomes of fat implantation at various anatomic facial region planes [18]. In addition, significantly the quantity of the fat graft is severely connected to the volume of adipose tissue in the patients. Lipomodelling increases the volume of an area of a

body. Moreover, the presence of the mesenchymal stem cells in the adipose tissue would play a superior role in repairing the tissue deformities [13].

Previously, Li et al. [9] proposed a fat grafting method based on a compartment distribution model, delineating functional zones from transitional zones for the distribution of fat in different anatomic recipient sites. In this study, the authors advocated grafting fat tissue deep into the tissue layer for the premaxillary area and into the subcutaneous layer for the nasal labial groove, brow tail, and temporal region. Further, when fat grafts were implanted in the frontal region or the cheek area, the sub-galea layer and below the zygomatic arches were preferred locations. Similarly, other researchers have explored different strategies to graft fat cells in various facial layers (single or multiple planes) for more satisfactory patient outcomes. While lipofilling is generally accepted as a safe procedure, several publications across literature have reported events of various sequelae, ranging from minor skin irregularities, asymmetries, prolonged edema to devastating complications, such as systemic infections, bleeding, graft hypertrophy, fat necrosis, fat embolism, and cerebral infarction, resulting from the intravascular injection, improper intraoperative disinfection, and liposuction contamination [12-18]

Autologous fat joining for facial revival addresses an integral asset in the plastic surgeon's tools while making a face's energetic and alluring look Notwithstanding its volumizing impacts and skin remuneration, facial fat joining stays an optimal filler decision for face revival because of its life span, cost-viability, compatibility with living tissue, hazard outline, and fulfilment rates contrasted with other soft tissue fillers [19]. A more superior comprehension of facial maturing mechanism, comprising of fat decay and ptosis of the distinctive facial compartments, has permitted fat joining to be regarded as a potential procedure for facial restoration [20].

CONCLUSIONS

We have assessed the effect of autologous fat in the facial space and the occurrence of postoperative complications in a comparative way before and after the surgery in beauty seekers. Further patient satisfaction and potential complications after the autologous fat filling in different spots of the facial space were investigated by clinical evaluations, patient-reported outcomes, and photographic assessments.

Autologous fat filling in facial space positively affected facial rejuvenation and beauty treatment, a safe and effective surgical procedure, and was worthy of positive clinical promotion and application. In addition to this, the presence of stem cells in the adipose tissue shall provide additional support for tissue repairmen and restoration of originality. Thus, signifies the advantage of utilizing the AFG technique for oral cancer patients to improvise the lost originality and appearance after cancer surgery. The present study has provided evident insights on utilizing the AFG technique as a cheap effective surgical procedure to contour deformities, irregularities, facial lines. Correct depression thereby uplifting the quality of life and physical-mental health of oral cancer patients.

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