



Autologous Fat Transfer in Oral and Maxillofacial Surgery- A Review

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ABSTRACT

One of the most popular facial cosmetic treatments is autologous fat grafting. Most patients typically have considerable amounts of fat reservoirs available. With no major difficulties, the fat grafting technique can be performed multiple times. Without concern for an immune response or carcinogenicity, facial tissues take autologous fat effortlessly. It is a well-liked method that could be applied in maxillofacial cosmetic surgery. This technique can be performed independently or as an add-on to any facial cosmetic surgery, including face lifts, to improve the final aesthetic result. However, it is generally accepted that the prognosis of fat grafting is closely tied to correct case selection and thorough surgical technique. The primary disadvantages of this operation are the potential for resorption and uncertain effects of the augmentation. This review paper gives overview about its application in oral and maxillofacial surgery.

KEY WORDS: FAT TRANSFER, COSMETIC SURGERY, FACIAL RECONSTRUCTION, TRAUMA, CONGENITAL DEFORMITY

INTRODUCTION

The history of fat grafting began in 1893, when a German surgeon named Adolf Neuber published a report on his novel method for treating a young man's depressed scar in the infraorbital region [1]. Surprisingly, he also explained his numerous failures in treating larger defects and urged to reserve fat grafting for abnormalities the size of a bean. He removed a small amount of subdermal fat from the patient's upper arm and injected it to raise a depressed scar. Other surgeons occasionally duplicated this endeavor. Before suction lipectomy was adopted in 1983, the graft results were very contentious. This procedure offered a secure and responsible way to transfer and harvest fat. At this time, resorption and uncertain outcomes emerged as a new disadvantage of fat grafting. Coleman described the long-lasting effects of structural fat grafting. His idea focused primarily on improving an established technique while paying close attention to the treatment of fat cells without harm during harvesting, processing, and grafting. Using stem cells, platelet derivatives, and other additions to fat grafts, investigations are being conducted to transform structural fat grafting into a regenerative operation, ushering in a new age in the field of facial aesthetic surgery. Today, fat grafting is a well-known technique.

USAGE IN VARIOUS MAXILLOFACIAL SURGERIES

Fat grafting has been used for a variety of things, but it can generally be said that it enhances the quality of the patient's skin, moisturizes the facial skin, and can be used as a filler to cover defects, alter contours, and lastly add volume to the face. These two primary characteristics of fat grafts serve as the foundation for the principal indications of fat grafts.

1. Soft tissue augmentation and rejuvenation: Since volume loss is one of the key causes that reveals characteristics of an ageing face, fat grafts may be able to make up for volume deficits as we age. Aging is a complex phenomenon. This technique can be carried out on its own or in conjunction with others for facial or brow rejuvenation. The function of soft tissue in the overall aesthetic appearance of the face cannot be understated. Fat injection may enhance soft tissue problems and allow the patient to achieve a more pleasing adjuvant to other major maxillofacial procedures like rhinoplasty and orthognathic surgery. [2,3,4]

2. Fat contouring can be utilised to conceal face characteristics that are very challenging to change using other reconstructive methods. Fat grafting procedures are widely used to address traumatic and developmental facial asymmetries, hemifacial hyperplasia, and progressive hemifacial atrophy (Pary-Romberg syndrome). There is a widespread trend toward the use of fillers to shape and augment facial tissues, particularly the lips, paranasal tissues, and cheeks; infection, foreign body reactions, and carcinogenicity of some fillers has made the fat transplant an appropriate material. It is simple to use as a filler in greater quantities, is less expensive when used in greater quantities, and is well accepted by the majority of patients. [1,7,8]

3. The use of fat grafting during rhinoplasty is growing quickly in favor. Dorsal abnormalities following rhinoplasty are very difficult to correct during revision rhinoplasty; using crushed or morselized cartilages or a delicate rasping is frequently ineffective and can even make the issue worse. Recent studies support the use of fat graft in select main cases, including radix augmentation, dorsal refinements, and alar pinch deformities, while more research is needed in this area. Fat injection has recently been reported to be successful in these circumstances. In order to achieve the desired results, it may be advisable to apply this risk-free but very unexpected approach on patients who have other obvious criteria for fat grafting.

SURGICAL TECHNIQUE

First, fat is extracted from a secondary donor site, then it is processed and purified using one of the established techniques to separate vital fat cells from other unnecessary components, and finally it is injected or transferred to the recipient site. Each step requires crucial attention and contributes to the surgical procedure's success. [1,5]

DONOR SITE SELECTION

The abdomen, suprapubic region, lateral thigh, medial thigh, and any other location of the body with a significant quantity of fat tissue can all be used for fat harvesting. Some writers contend that the medial knee contains the fewest elastic fibres and will produce better-quality fat, while other clinical trials do not support this conclusion. The primary considerations when choosing a donor location are patient cooperation, the surgeon's preference, and the contours of the donor site. It is assumed that all donor sites may produce a sufficient amount of essential fatty tissue. It is occasionally advised to use bilateral donor sites to prevent contour abnormalities in significant fat harvesting or in slim patients.

PREPARATION OF DONOR SITE

After making a small 2-3mm stab incision, 20 to 30cc of local anesthetic (lidocaine with 1/200,000 epinephrine) is injected into the donor site. After 10 to 15 minutes, fat harvesting may begin through the same stab incision.

HARVESTING OF FAT

The use of microcannula in 1981 transformed the method of extracting fat from an open approach and direct resection of fatty tissues to a straightforward conservative operation. Some authors use a 10mm syringe to produce negative pressure in this procedure, and the cannula is attached to the syringe. Cannula may be connected to a suction machine, and the machine's negative pressure draws fat packages from donor locations into a sterile reservoir. It is proposed that the method of fat harvesting should be based on curettage of several openings located on the lateral sides of a cannula. By withdrawing the plunger, negative pressure is provided, and back and forth hand movements will gather fat into the syringe. However, it is believed that vigorous negative pressure will endanger vital fatty cells. A 10cc syringe with a cannula attached, a small amount of negative pressure on the plunger, along with gentle back-and-forth hand movements during a somewhat longer duration of suctioning, will gather a significant amount of fat in the syringe. [5,11]

DIFFICULTIES IN HANDLING :

1. Because important fat cells are so delicate, it is imperative to adhere strictly to sterility and infection control guidelines. Any contamination could cause an infection, damage the crucial cells, or cause early resorption. [5,13]
2. Larger cannula will speed up the treatment but accept larger particles, which is not desired for facial tissues and may potentially distort the donor sites. Small diameter cannula (2-3mm) can easily transfer the fat particles and impose minimal stress to cells.
3. Although it takes longer, low negative pressure (1-3mm negative pressure by withdrawing the plunger injection of fluid. Larger amounts of local anesthetic may be added to ringer's solutions. It is typically advised to infiltrate 1cc of local anesthetic for every cc of extracted fat. Fat cells will float when exposed to a super wet environment (injection of tumescent solution), which is frequently utilized in liposuction procedures and should be avoided.
4. Fat harvested using blood. It is advised to cease the fat harvesting process when blood is observed in the harvesting syringe and move on to another donor location since it is thought that blood causes viable fat cells to degrade more quickly and easily.

PROCESSING OF OBTAINED FAT

Local anesthetic and ringer's solution, which is the solution that is typically injected prior to surgery, make up the first part of a typical harvest. This liquid is partially transferred to harvested fat and must be separated to prevent the devastating effects of epinephrine on fat cells. The second part is an oily liquid that is devoid of vital fat cells. This liquid has no negative effects on the donor site when injected, but it interferes with intraoperative decisions since it prolongs recovery time and causes postoperative swelling, therefore it is best separated from the third and main component, which are the crucial fatty cells. Any activity that might aid in separating fat cells from two other superfluous components is referred to as "fat processing." Numerous techniques have been developed. [1,5]

STEPS IN CENTRIFUGE:

1. Harvested fat is placed in 10cc syringes and centrifuged.
2. To separate various components, the syringes are placed in their designated slots in a centrifuge and spun for three minutes at 3000 rpm.
3. The second component consists of fat cells that are transferred to many 1 cc syringes and prepared for injection. The first component is a liquid that may be readily ejected by applying light pressure to the plunger.[5]

FILTERING

In order to create a more concentrated fatty compartment, some surgeons seal both sides of a strainer and swirl it for a short period of time after harvesting the fat. Once the strainer is opened on one side, the fat is transferred to sterile surgical spoons or spatulas and prepared for Lipoinjection.

SELECTION OF PROCESSING:

It is clear that skills and expertise, careful handling of fat, and sterility may directly affect the success rate of each technique. Numerous studies have attempted to compare the known techniques, but up to this point none of these trials have persuaded the surgeons to abandon one technique and unanimously accept the other.

PREPARATION FOR AUTOLOGOUS FAT TRANSFER

Prior to surgery, injection locations are meticulously planned and noted; potential injection cannula courses are then sketched with a marker before the customary preparation and draping are carried out.

INJECTION TECHNIQUE

A cannula is softly placed after a stabbing incision is made at a predetermined site. A little amount of fat (0.3 to 0.5cc) is injected while the cannula is being gently moved to create a tunnel. This technique is repeated multiple times until the entire amount of pre-planned fat is given to the recipient location. To avoid any potential delayed resorption and relapse, a 40–60% overcorrection may be applied.

IMPORTANCE OF CANNULA DIAMETER

The cannula's size will unquestionably affect the size of the transferred fat particles; these sizes typically range from small (0.7 mm) cannulas used to fill tear troughs to bigger (up to 1.5 mm) cannulas that can be used for cheek and chin augmentations.

LOCALIZED STRATEGIES FOR VARIOUS MAXILLOFACIAL REGION

1. Lips are sensitive and mobile, making them difficult augmentation sites; some writers predict that motion will cause early resorption, while others report long-term stability in their cases. To enlarge the lips, a stab incision is made in the centre of the lip; the left and right sides are separately penetrated with a delicate cannula and each side is filled with 0.5cc of fat, and the central region is also filled with 0.5cc of fat.
2. Tear troughs: This location is crucial for fat grafting due to the thin skin and sensitive underlying tissue there. The use of a delicate cannula, gradual fat placements in little drops or bundles, and cautious injection technique may ensure an acceptable outcome in periorbital rejuvenation.
3. The malar pads may sag with age, flattening the malar contours on the face and chin. Fat grafting can easily conceal this unattractive deformity; 4cc of fat may be sufficient to recontour the cheeks. These sites receive treatment the most frequently. For chin and cheek augmentation, a somewhat big (1.2–1.5mm) cannula is typically utilized. Chin and cheek augmentation will only slightly improve soft tissue contours; they should not be considered a substitute for augmentations of the hard tissues.
4. Jaw lines: The aggravating effects of ageing include the gradual formation of jaw lines and the deepening of marionettes lines. These locations are easily accessible by small stab incisions made for the paranasal crease or through a second, smaller incision on the mandibular border.[1,9,12]

AMOUNT OF INJECTION:

Although it is normally advised to apply well-established parameters and make minor adjustments from case to case, the amount of graft may be dictated by particular case features.

COMPLICATIONS

Although fat grafting is a relatively safe surgery, there may be some swelling, bruising, and ecchymosis at the donor site and the face recipient site. These side effects are self-limiting and will go away on their own in two to three weeks at the most.

1. Accumulation of fat cells and obvious lumps beneath the skin: Sometimes, under thin skin, minor abnormalities and lumps can be felt and easily seen, resulting in an unattractive look. Preoperative planning and careful surgical technique may be the greatest ways to prevent this issue, as well as the majority of other difficulties. Smaller cannulas should be used for fat injection and transfer to enable the surgeon delicately position the fat graft in recipient tissues in thin skin locations like lower eyelids and tear troughs. Injection may be done in deeper tissues.

2. Resorption and relapse: Although some studies show long-lasting benefits following a single stage of surgery, resorption of grafted fat is frequently recorded. It is generally agreed that the predictability of results is directly influenced by the surgeon's skills and knowledge. After the typical predicted resorption, it is occasionally advised to perform 40 to 50 percent more contouring for the optimum outcomes.[1]

3. Face asymmetry: If the asymmetry persists after six months, a secondary revision fat grafting procedure may be planned. Asymmetries may be caused by uneven injections, which can be best avoided by careful planning and preoperative mapping throughout the face.

4. Asymmetric edema, which is prevalent in facial surgeries and may cause immediate postoperative asymmetries in cases of precise surgical techniques, is normally expected to be addressed as edema subsides.

5. Fat emboli: Fat particles that are lodged in medium- to large-sized blood vessels may travel to key organs and cause serious, potentially fatal issues. Among the cases that have been recorded are blindness and respiratory issues. This risk has been greatly diminished by the use of blunt cannula rather than the sharp needles that were previously employed for fat injection.[5,14]

CONCLUSION

Although fat grafting is most frequently employed for facial rejuvenation and cosmetic purposes, it can also be useful in a number of reconstructive procedures involving the craniofacial region. To fully correct traumatic, acquired, or congenital abnormalities, fat grafting can be performed alone or in conjunction with bony reconstruction. The study of adipose-derived stem cells has great promise for tissue engineering and regenerative medicine. The focus of current fat grafting research is on strategies that increase fat survival, like preconditioning the donor area and using platelet-rich plasma or stromal vascular fraction at the same time. This article enlightens the various techniques employed in oral and maxillofacial surgery.

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- Step by Step: Autologous Fat Transfer in Oral and Maxillofacial Surgery Citation Data *Journal of Oral and Maxillofacial Surgery*, ISSN: 0278-2391, Vol: 79, Issue: 1, Page: e4-e7 Publication Year 2021
- Clauser, Luigi MD*; Zavan, Barbara PhD†,‡; Galiè, Manlio MD§; Di Vittorio, Leonardo DDS||; Gardin, Chiara PhD†,‡; Bianchi, Andrea Edoardo MD*,¶. Autologous Fat Transfer for Facial Augmentation: Surgery and Regeneration. *Journal of Craniofacial Surgery* 30(3):p 682-685, May/June 2019. | DOI: 10.1097/SCS.00000000000005257
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