Can We Standardize the Techniques for Fat Grafting?

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KEYWORDS

• Fat transplantation • Fat grafting • Lipotransfer • Coleman technique • Surgical technique

KEY POINTS

- The preferred donor sites include the low abdomen and inner thigh, especially in younger patients.
- Fat grafts should be harvested with lower negative pressure via modified liposuction technique to ensure the integrity as well as the optimal level of cellular function.
- Fat grafts should be processed with centrifugation that can reliably produce purified fat and concentrated growth factors and adipose-derived stem cells, all of which are beneficial to graft retention.
- Fat grafts should be placed following certain principles with gentle injection of a small amount per pass in multiple tissue planes and levels with multiple passes to ensure maximal contact of the graft with vascularized tissue in the recipient site.

INTRODUCTION

Fat grafting can be a good option for soft tissue augmentation because fat is abundant, readily available, inexpensive, host compatible, and can be harvested easily and repeatedly.[1] However, the overall survival rate of a fat graft is around 50% in most reported studies, which has not been considered ideal for clinical practice. The goal of improving graft retention has been, therefore, the constant driving force for scientists and clinicians to search for better techniques for fat grafting.

Refinement of fat grafting techniques has largely been investigated to maintain the fat graft's viability and to create a better environment in the recipient site for fat graft survival. In this article, the authors primarily introduce one possible preferred technique for autologous fat grafting based on the most recent scientific studies by many investigators. The authors propose it as a standardized technique because this would be a more scientifically sound approach. The authors hope the readers will be able to use the information provided here to achieve the best possible outcome of fat grafting for their patients.

CLASSIFICATIONS FOR FAT GRAFTING

The fat grafting technique can be arbitrarily classified into 5 essential components: how to select the donor sites, how to harvest the fat grafts, how to process the fat grafts, how to prepare the recipient sites, and how to inject the fat grafts. Fat grafting can also be arbitrarily divided into 3 categories based on the volume needed: Small-volume fat grafting (<100 mL) is performed primarily for facial rejuvenation or regenerative approach. Large-volume fat grafting

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Clin Plastic Surg 42 (2015) 199–208
http://dx.doi.org/10.1016/j.cps.2014.12.005

(100–200 mL) is performed primarily for breast and body contouring. Mega-volume fat grafting (>300 mL) is performed primarily for buttock augmentation or breast augmentation or reconstruction. Each category may have its respective technique for the procedure.[2]

BASIC CONSIDERATIONS FOR FAT GRAFTING

Donor Site Selection

A variety of body areas that uniformly have abundant or excess fat are suitable as donor sites for harvest of fat grafts, such as the abdomen, flanks, buttocks, medial and lateral thighs, or knees. As a general rule, donor sites are selected that enhance the body contour and are easily accessible in the supine position, which is the position that is used for almost all facial and body augmentation procedures. Although there is no evidence of a favorable donor site for harvest of fat grafts because the viability of adipocytes within the fat grafts from different donor sites may be considered equal, a higher concentration of adipose-derived stem cells (ADSCs) is found in the lower abdomen and inner thigh in one study.[3] In addition, in a younger age group (<45 years old), fat grafts harvested from both the lower abdomen and inner thigh have higher viability based on a single assay test.[4] With what we know about the potential role of ADSCs in fat grafting,[5] the lower abdomen and inner thighs should, therefore, be chosen as the better donor sites for fat transplantation (**Fig. 1**).[3,4] These donor sites are not only easily accessible by the surgeons with patients in the supine position but also scientifically sound as long as patients have an adequate amount of adipose tissue in those areas. If patients are placed in the prone position, the posterior medial thigh, lateral thigh, and flank areas can be the primary donor sites for harvest of more fat grafts. The palm and pinch test should be performed in the donor tissue to determine if there is adequate fat reserve and to quickly estimate the amount of fat that can be harvested.[6] A palm size is roughly measured as 200 cm^2, whereas a pinch test predicts the layer thickness of the fat graft to be harvested. For example, even in a thin patient, a 0.25-cm layer thickness of fat harvested over the surface area of a palm will yield 50 mL of fat graft (200 cm^2 × 0.25 cm = 50 mL). Therefore, we can harvest 250 mL of fat solely from the anterior surface of a woman's thigh that has 5 palm measures.

Fig. 1. Lower abdomen as a commonly selected donor site for small-volume fat grafting.

Anesthesia

Anesthesia for harvest of fat grafts can be performed under general anesthesia, epidural anesthesia, or local anesthesia with or without sedation. Intravenous sedation is routinely used in conjunction with regional or local anesthesia if requested by patients. The tumescent solution used for donor site analgesia or hemostasis should contain the lowest concentration of lidocaine possible because its high concentration may have a detrimental effect on the adipocyte function and viability.[7] In general, the authors often use 0.01% to 0.02% of lidocaine in Ringer lactate if the fat grafting procedure is performed under general anesthesia and 0.04% if the procedure is under local anesthesia with or without sedation. The tumescent solution also contains epinephrine with a concentration of 1:1,000,000. Epinephrine can precipitate vasoconstriction in the donor sites as well as the recipient sites, which may decrease blood loss, bruising, hematoma, and the possibility of intra-arterial injection of the transplanted fat, especially when injecting around periorbital areas or in the face.

Fat Graft Harvesting

The syringe aspiration, as a relatively less traumatic method for harvest of fat grafts, is supported by the more recent studies and should be considered as a standardized technique of choice for harvest of fat grafts.[8] However, this technique can be time consuming even for experienced surgeons; the large quantity of fat grafts may not be easily obtained with this technique. Several manufactures have attempted to develop an ideal device that combines the fat harvest, process, and transfer.[9] Unfortunately, only a few such devices have been studied comprehensively for their reliability; their usefulness is still debatable even among the experts in the field.[10,11]