



Full breast reconstruction with fat and how to recycle the “dog-ear”

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Abstract: Mastectomy without immediate reconstruction leaves us with a population of women who may need a new breast in a delayed fashion. These women are often elderly, not fit for major flap surgery or reluctant to have long scars or implants. Free fat grafting has mainly been used as an adjunct to other reconstructive methods. We present an option for delayed full breast reconstruction with free fat grafting alone. In some cases, we utilize the lateral excess as a flap in combination with fat grafting. Patient selection is crucial. A lady fitting this reconstruction method should have fat to donate, preferably in several different regions as well as redundant skin on the chest-wall and only minor radiation damage. Also, breast size requirements need to be sensible. The Fat is harvested in a closed system under general or local anesthesia. Following a few minutes decantation, the fat is put into syringes and injected from 4–6 entrance points into 3–4 layers with a blunt cannula. Depending on the width, height and thickness of the receiving chest wall, the transferred volume varies between 150–300 cc/operation. In general, 2–5 operations are needed to reconstruct a breast with fat alone. If the patient presents with lateral excess tissue, this can be utilized as a local, fasciocutaneous flap, de-epithelialized and rotated 180 degrees to support the inferior border of the new breast. This enables inferolateral definition and control of the breast footprint. The secret behind success in free fat grafting for full breast reconstruction lies in the small technical details and works safely and efficiently in a selected group of patients.

Keywords: Fat grafting; breast; post-mastectomy; lateral control; delayed reconstruction

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Introduction

Surgical treatment of breast cancer today often comprises breast conserving therapy including oncoplastic solutions or mastectomy and immediate reconstruction. There is however, a small population of women who in the past did—or still undergo simple “skin-wasting” mastectomy. Some of them seek reconstruction in a delayed manner.

Five-year breast cancer overall survival exceeded 90% several years ago in our country, which leaves us with a lot of women who have beaten the disease but who are left with a surgery or radiotherapy induced disability. Fat grafting has become the tool of choice to both fill tissue defects and to treat radiation damage and scar pain (1,2). In breast reconstruction, it has traditionally been regarded as an additional technique to implant or flap reconstruction, or to

correct the results following breast conserving therapy.

To reconstruct the whole breast with free fat grafting alone was described and popularized by Khouri (3), in combination with external expansion prior to surgery. Longo *et al.* published a small series of immediate/delayed reconstructions where the breast envelope was spared and fat was injected 6 months later (4). In 2013, we showed in a multicenter study that complete breast reconstruction is possible using large volume of fat in multiple sessions (5). The present work aims to visualize the tactics and technical details of a simple approach to reconstruction of the whole breast using fat grafting. It also contains a reminder not to let the breast surgeon remove the lateral dog-ear, but rather to recycle it for lateral definition of the breast base and to enhance the lower pole (*Figure 1*).



Figure 1 Visualized fat grafting (6).

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Operative techniques

Patient selection

Patients opting for this reconstructive technique should have a mindset of having 2–5 short day-surgeries a few months apart, instead of having one major free flap operation or an implant exchanged every 1–10 years. The patients should preferably have redundant chest-wall skin. Radiation is not a contraindication, but severe radiation damage makes the procedure(s) more difficult. A BMI below 19 makes serial fat harvesting challenging. Furthermore, severe obesity makes the quality of the fat poor (large vacuoles and an ongoing tissue inflammation) and adds to the risk for systemic complications. Large breasts do not promote breast or neck & shoulder health. But if that is the particular wish of the patient or the culture and social demands around her, this reconstruction method is not an option.

Donor site selection

Women come in different sizes and shapes and the location of the best subcutaneous fat deposits vary some. The upper or lower abdomen is often good donor sites, as well as the inner or outer thigh. Redundant skin is common around the waist after pregnancies, however, if the BMI is low, this tissue consists mainly of skin and very small fat cells surrounded by tight fibrosis. When serial surgeries are planned, it is clever to use one donor site at the time, since every time a site has been used, some scar is left behind, which means that the best fat has already been used and harvesting becomes more difficult. From a practical point of view washing, draping and aftercare of the abdomen is the

least time consuming, and thus this is usually my first choice if it suits the patient. The thighs can also be used one at the time, however, the patients have to be properly informed that the other thigh will be used in the next surgery and that the thighs will be asymmetrical until then. Harvesting technique

The donor site is first injected with adrenaline (1 mg/1,000 mL) fluid. Patients are operated either in general or local anesthesia. If local anesthesia is used, the injectable fluid also contains low concentrations of lidocaine; 1% lidocaine 60 mL/1,000 mL. In addition, skin incisions are injected separately with 0.5% lidocaine.

For a good quality graft, it is important not to destroy the cells during harvest. Low pressure suction (either a standardized device <400 mmHg, or small syringes) and gentle movements guarantee both a blood free viable graft and low donor-site morbidity. Harvesting a fair amount of fat (200–300 cc) in 10–15 minutes is possible in a good donor. This adds to cost-efficiency by keeping OR minutes low. In my experience water assisted devices efficiently harvest good quality blood free lipoaspirate, which can easily be separated from excess fluid by simple decantation in a closed system with a minimum of handling.

Injection technique

Systematic injection, using blunt straight and curved cannulas, 1.65–2.1 cm in thickness and 7–15 cm of length are used to build up a 3D pattern of thin rows of fat leaving every fat particle in close vicinity of vascularized tissue is of great importance for fat survival. The entrance points are placed in both ends of the mastectomy scar as well as along the inframammary fold amounting to 6–7 different directions of fat injection. The deepest layer is addressed first. The fat is gently injected into the pectoralis major or right on top of it in a fan-like pattern of rows (0.5–1 cc/tunnel) about 1 cm apart from each of the entrance points. It is possible to inject 100 cc, before moving to the next layer: the subcutaneous layer. This is the easiest layer to inject. Once more every entrance point is used to inject fat in a fan-like pattern of tunnels. The third and most fun layer is the very superficial layer, just underneath the dermis, where a curved cannula pointing upwards is used to access the right layer. These tunnels can be put closer to each other, and you can actually see the breast grow. Also, the skin envelope usually develops dramatically.

In order to respect the footprint, it is necessary stop 1 cm before the inferolateral border of the footprint,

because the grafted fat tends to spread out on a slightly wider area than intended.

Using the “dog ear” to address the lower pole

Patients with a high BMI are often left with excess tissue in the axilla after mastectomy. This “sausage-like” excess tissue often causes functional distress, and patients ask to have it removed. However, instead of throwing it away, it can be used as a random flap to enhance the volume of the lower pole of the breast and gain lateral control of the footprint.

Markings are done standing up. The flap, shaped according to excess skin and fat with about 2:1 dimensions is drawn in the lateral aspect of the chest wall, not reaching further back, than operating the patient on her back allows. It is also useful to ask the patient to raise the arm upright and check that the planned skin removal is not too tight and does not restrict arm movement. Fat harvesting is done as described above, decanted, and some of it is transferred to the chest wall before doing the flap. Then the flap is de-epithelialized, raised, harvesting all the redundant excess subcutaneous. The flap is raised crossing the lateral border of the latissimus dorsi muscle along the chest wall/serratus muscle until the lateral border of pectoralis major muscle is reached. It is not necessary to look for intercostal perforators, or isolating them, and altogether the surgery is very straight forward and does not require microvascular skills. At this point, a few more syringes of fat can be injected into the pectoralis major muscle and into the subcutaneous pocket under perfect visual control. Thereafter a cavity with the width of the flap is dissected between the pectoralis major muscle and the mastectomy scar, and the flap is flipped 180 degrees and placed in the tunnel, and fastened with a pull-through stitch medially. The flap fits best when the de-epithelialized skin points “downwards” towards the pectoral muscles. The lateral aspect of the inframammary fold is defined by a few stiches connecting the flap to the chest wall. The donor site is closed primarily, drained with a piece of a rubber glove. Finally, the new breast is further augmented with the remaining fat in the subcutaneous and subdermal layers.

Dressings and aftercare

Excess fluid is removed from the donor sites by pushing with a flat hand towards the skin incisions. Thereafter a long-lasting local anesthetic (Ropivacaine, 7.5 mg/kg, 20–30 mL) is injected with a blunt cannula evenly into

the donor site. Incisions are closed with 6-0 monocryl inverted intradermal interrupted sutures. Compression garments are put on in the OR, and kept 24/7 for 7–21 days, depending on individual recovery. The recipient site incisions are closed by tape alone, and the area is covered loosely by a thick layer of dressings, Dacron, wool, or other warming materials. The patient is advised to keep the area free of pressure and avoid vigorous movement for at least 2 weeks. Oxygen is administered 2 L/min until discharge from hospital, if there is no contraindication (obstructive lung disease). Most patients are discharged on the same day as the surgery. If used for a fasciocutaneous flap, the pull-through stich is removed one week after surgery. At 2 weeks, patients can go back to using a bra with a soft external prosthesis if needed. Sick leave varies between 2–14 days. The fat retention is monitored 3 months after surgery and the next surgery is scheduled 4–6 months after the previous one if needed.

Comments

At our institution, this technique has offered yet another, very welcome option in the wide armamentarium of breast reconstruction methods. Here are a few personal comments out of my 10-year experience.

Harvesting fat using a water assisted liposuction (WAL) closed system is a matter of personal preference and availability. We have experienced that the quality of the bloodless harvested fat, the minimal donor site morbidity, the complete lack of infections, the short operating time and especially the high yield of the grafted fat justifies the additional cost of a WAL device. Using a device to evenly distribute the cells at the recipient site has also added to the quality of our grafting technique.

The most fun layer to inject is the very superficial layer, just underneath the dermis, where a curved cannula pointing upwards gives access next to the skin. These tunnels can be put closer to each other, and you can actually see the breast grow. Also, the skin envelope usually develops dramatically.

When to stop?

Every chest wall is individual, and there is no standard volume to be injected. The variables affecting how much can be grafted in one session comprise the thorax width and height (2D footprint), thickness of soft tissue above the ribs, and skin redundancy. We do not have any tissue pressure measuring device to tell us when to stop, but when all the

above-mentioned passes (intramuscular, subcutaneous and subdermal) are done and turgor is clearly increased it is probably enough. If lipoaspirate escapes from one or several of the injection sites, it is usually a sign that you have already put too much and that there is a larger accumulation (pool) of cells in a certain area. Grafted volumes/session can thus vary between 100 and 350 cc.

Grafting fat in too large quantities into the same “tunnel” leads to oily cysts that present 6–12 months postoperatively in a tumor-like fashion, thus making the patient worried. Patient information regarding the oily cysts is important to prevent anxiety and fear for cancer recurrence, but nevertheless, every palpable tumor should be investigated radiologically and if needed with a core needle biopsy.

Radiotherapy is not a contraindication to reconstruction by fat grafting, but it brings some limitations to the technique. Skin quality improves tremendously and in irradiated patients the first session of fat grafting is considered to be a “pre-fabrication” for the next steps. It is wise not to try to recycle the dog-ear in the first operation (as seen on the right hand side in the video), but rather to wait for the chest wall to soften following one or two sessions of fat grafting and then raise the lateral fasciocutaneous flap for lateral control of the breast base and augmentation of the inferior part of the breast above the infra-mammary fold. This needs to be clearly explained to the patient from the beginning, so that they know what lies ahead. Fat grafts may in the long run not vascularize to the same extent as in non-irradiated tissue, and this may increase the risk for late fat necrosis.

In well selected patients, the use of external- or internal expander (3) prior to fat grafting does not seem to be indicated. The multiple entrance point fat grafting procedure differs from the one first described by Klaus Ueberreiter’s group (5). This allows for a larger number of separate passes with the cannula and thus injection of a larger volume of fat with a chance to survive.

To reconstruct a breast with fat alone in combination with a lateral fasciocutaneous flap/dog ear can offer a tremendous functional and psychosocial benefit to

mastectomized women leading an active life. The surgery is technically easy, safe and quick and the results durable over time. Patient selection is crucial. Especially elderly breast cancer patients may be embraced by this method.

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None.

Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

Informed Consent: Written informed consent was obtained from the patients for publication of this manuscript and any accompanying images.

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