

An Individualized Patient-centric Approach and Evolution towards Total Autologous Free Flap Breast Reconstruction in an Academic Setting

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Summary: Advances with newer perforator flaps and complex microsurgical techniques have enabled creative solutions in autologous breast reconstruction. For patients seeking total autologous breast reconstruction without the use of implants, body regions other than the abdomen have emerged to provide a substitute or additional donor tissue. In cases where abdominal perforator flaps are not possible (as with prior abdominoplasty), flaps taken from the lower back or thigh can be used. In situations of inadequate donor tissue in 1 body area, stacked multiple flap reconstruction is possible using donor tissue from multiple areas. In this article, we present our approach for individualizing treatment for breast reconstructive patients seeking to avoid permanent implants. We highlight how free perforator flap selection can not only serve to provide adequate tissue for body-appropriate breast reconstruction but may also be secondarily tailored to provide patient-specific aesthetic body contouring. Our preoperative patient counseling has evolved to involve flap selection based on clinical examination as well as advanced computed tomographic imaging of abdomen, thighs, and lower back. Decision to use 1 or more flaps is based on an assessment of whether the targeted body region(s) provide enough skin and fat for breast reconstruction, if the requisite perforator anatomy is available, and whether the effect of tissue procurement on their individualized aesthetic body contour is optimal. (*Plast Reconstr Surg Glob Open* 2020;8:e2681; doi: [10.1097/GOX.0000000000002681](https://doi.org/10.1097/GOX.0000000000002681); Published online 7 April 2020.)

INTRODUCTION

Advances with newer perforator flaps and complex microsurgical techniques have enabled creative solutions in autologous breast reconstruction. For patients seeking total autologous breast reconstruction without the use of implants, body regions other than the abdomen have emerged to provide substitute or additional donor tissue. In cases where abdominal perforator flaps are not possible (as with prior abdominoplasty), flaps taken from the lower back¹⁻³ or thigh⁴⁻¹⁹ can be used instead. In situations of inadequate donor tissue in 1 body area or a need for more tissue for a single breast, stacked multiple flap reconstruction is possible using donor tissue from multiple areas.^{4,9,14,15,20,21} The desire to avoid permanent

implants stems from the associated possible complications (infection, extrusion, capsular contracture, device failure [rupture], implant malposition, etc.) and higher rate of reconstruction failure.²² Use of autologous tissue avoids these considerations. Also, there is evidence suggesting that flap reconstruction may allow for quicker completion of stable reconstruction and thus fewer overall clinic visits.²² Additionally, autologous tissue ages much more naturally than a prosthetic device under thin soft tissue coverage.

In this article, we present our approach for individualizing treatment for breast reconstructive patients seeking to avoid permanent implants using autologous perforator free flaps. We discuss how free perforator flap selection can not only serve to provide adequate tissue for breast reconstruction but may be secondarily tailored to provide patient-specific aesthetic body contouring. Our preoperative patient counseling has evolved to involve flap selection based on clinical examination as well as advanced computed tomographic (CT) imaging of abdomen, both thighs, and the lower back. Decision to use 1 or more flaps is based on an assessment of whether the targeted body region(s) provide enough skin (envelope) and fat (volume) for breast reconstruction, the requisite perforator

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anatomy is available, and whether the effect of tissue procurement on their individualized aesthetic body contour is optimal. We aim to provide a total autologous and aesthetically optimized breast reconstruction utilizing perforator flaps that once harvested improve the overall body contour through appropriate flap selection and incision planning.

PATIENT SELECTION

Our practice is based on patient-centric decision-making. While we offer implant-based breast reconstruction, total autologous reconstruction is the only “permanent” reconstruction and therefore many patients choose this approach. There are numerous benefits to autologous-only reconstruction. First, it avoids complications stemming from the use of a permanent prosthesis such as infection, extrusion requiring explant, rupture, capsular contracture, implant malposition, or even further revision surgery. Most of our autologous breast reconstructions are still “delayed-immediate” with use of a temporary prosthesis (tissue expander) placed at the time of mastectomy. However, these implants usually remain in place for only 2–4 months. Second, though use of permanent prostheses may help control the shape of the reconstructed breast mound or maximize projection, implants age the breast more dramatically and in an accelerated fashion. This usually requires some form of maintenance revision surgery that patients often seek. Also, at times the skin envelope can thin to a point that some autologous tissue (latissimus flap) or total conversion is required.²³ Third, implants may need to be replaced every 10–15 years or even sooner. In those patients who have significant comorbidities, cannot or would prefer not to undergo a major free flap operation, or are reasonable implant-based reconstructive candidates, we may recommend reconstruction with use of implants or, in very rare situations, we will recommend no reconstruction. In patients with history of irradiation, we may not recommend use of permanent implants due to higher rate of failure of reconstruction²⁴ unless they are used concurrently with a latissimus flap or in rare circumstances a free perforator flap.

PREOPERATIVE COUNSELING

Many of our patients present seeking autologous-only breast reconstruction. In all new breast reconstructive

consultations, as indicated earlier, we present all safe and standard options. Contraindications to autologous-only free flap breast reconstruction in our practice includes any comorbidity (like recent cardiac event, history of organ failure or transplantation) that would exclude them from long duration general anesthesia or extensive personal and/or family history of abnormal clotting, emotional or psychological instability, insulin dependent diabetes, or significant obesity. We do not have a strict body mass index (BMI) threshold over which we will not perform a free flap operation (we are highly selective in patients with BMI > 40 based on preoperative counseling and excellent flap perforators and flap anatomy visualized on CTA). However, higher BMI patients are counseled extensively on their increased risk of wound complications, and, if abdominally based flaps are considered, are often counseled on the possibility of umbilical stalk removal²⁵ at the time of reconstruction. Neo-umbilicus reconstruction is considered in the future. We always ask patients about their prior surgical history, including whether they have had a prior abdominoplasty or aggressive liposuction of the abdomen, flanks, lower back or thighs—which may exclude them from candidacy for a safe planned use of a region-specific perforator flap. That being said, we do not consider liposuction alone as an absolute contraindication to perforator flap harvest. Once a patient is determined to be a candidate for autologous-only breast reconstruction, they are examined in all regions. We focus attention on examining the possible donor sites, which includes the abdomen, thighs, and lower back. In our practice, the primary perforator flap remains the deep inferior epigastric perforator with its variations (ie, muscle-sparing transverse rectus abdominis muscle flap). In our experience of >1100 abdominally based flaps, the largest transferred hemi-abdominal flap has been about 2000 g. The abdominal region generally provides the most skin and fat for creation of the breast skin envelop and shaping. If the abdominal donor site is unavailable (due to prior surgery) or insufficient in terms of skin or adiposity, our secondary donor option has historically been the profunda artery perforator flap or (if unavailable) the medial circumflex femoral artery perforator flap as a variant of the transverse upper gracilis flap. We do not commonly use the lateral thigh perforator flap since most of our patients do not have predominant lateral thigh skin excess and adiposity and

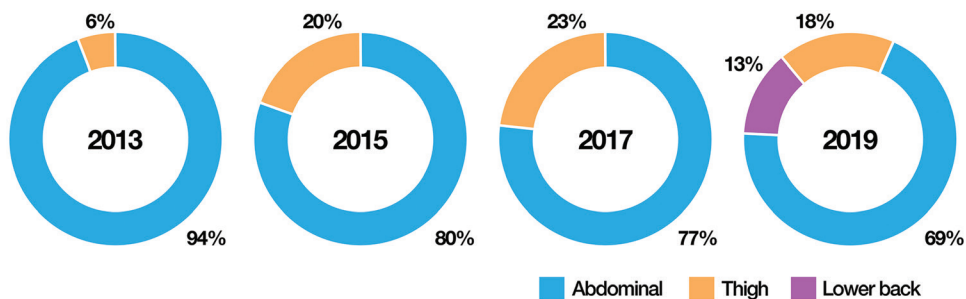


Fig. 1. Timeline illustrating our practice evolution, as progressively more flaps taken from the thighs or lower back for total autologous breast reconstruction have been used to better individualize total autologous breast reconstruction.

may result in an aesthetically unappealing contour/scarring at the donor site. However, the lateral thigh perforator flap may be indicated in some cases. Thigh-based flaps can provide up to ~800 g of tissue. Recently, we have added the lumbar artery perforator (LAP) flap to our armamentarium. This has in part stemmed from the unavailability of our primary and/or secondary flap options in certain patients as well as the observation that some patients have more tissue in the lower lumbar region than either the abdomen and/or thighs. Although our experience to-date is limited to around 25 flaps, the largest LAP flap was 930 g. In the past, we have used superior gluteal artery perforator flaps but have abandoned their use primarily due to resultant potentially un-aesthetic contour in the gluteal region. Consequently of this decision-making, we obtain CT angiographic imaging of the abdomen, both thighs, and the lower back on most prospective autologous-only breast reconstructive patients to facilitate decision-making.^{16,26} Figure 1 illustrates our practice evolution, wherein progressively more perforator flaps taken from the thighs or lower back have been used for breast reconstruction. In 2011, 100% of our total autologous perforator flap breast reconstructions involved free flaps taken from the abdomen. In contrast and thus far in 2019, only 69% involved perforator flaps from the abdomen, whereas 18% of flaps were taken from the thighs and 13% from the lower back.

OPERATIVE PLANNING

Once the CT imaging is done and reviewed, we corroborate our clinical examination of the abdomen, both thighs, and the lower back with available perforator anatomy in those regions to facilitate operative planning. In

the case where adequate perforators in a desired donor region are not visible on imaging, we will often plan on using a flap from another region. Imaging is always reviewed with the patients as part of the informed consent process. Our objectives are to select flap(s) from a region of the body that will provide adequate donor tissue for reconstruction, has the required perforator anatomy, and once procured will facilitate an improved aesthetic body contour in the donor region and overall harmonious shape. In some cases, this may mean using a LAP instead of a deep inferior epigastric perforator if the resulting aesthetic truncal contour is improved with procurement of the LAP flap(s). In other case, it may mean a patient has a predominance of skin excess and adiposity in the thighs making her a favorable candidate for use of thigh-based perforator flaps. Figures 2–4 show photographs of prospective breast reconstructive patients each with unique body contours. From an individualized aesthetic standpoint, each may be better candidates for reconstruction using perforator flaps from different regions: the abdomen (Fig. 2), the thighs (Fig. 3), or the lower back (Fig. 4).

In patients who have minimal available tissue at 1 or more possible donor sites, the assessment is made whether performing a stacked multiple flap reconstruction is indicated. The determination for whether multiple flaps are needed per side is based on estimating how much donor tissue is available at each of the possible donor regions and how much tissue is needed to create body-appropriate breasts that meet patient expectations all the while attempting to decrease donor morbidity. That determination is highly subjective but it is a reasonable assessment, and our ability to estimate this accurately has improved with more experience. Figure 5 illustrates a patient who

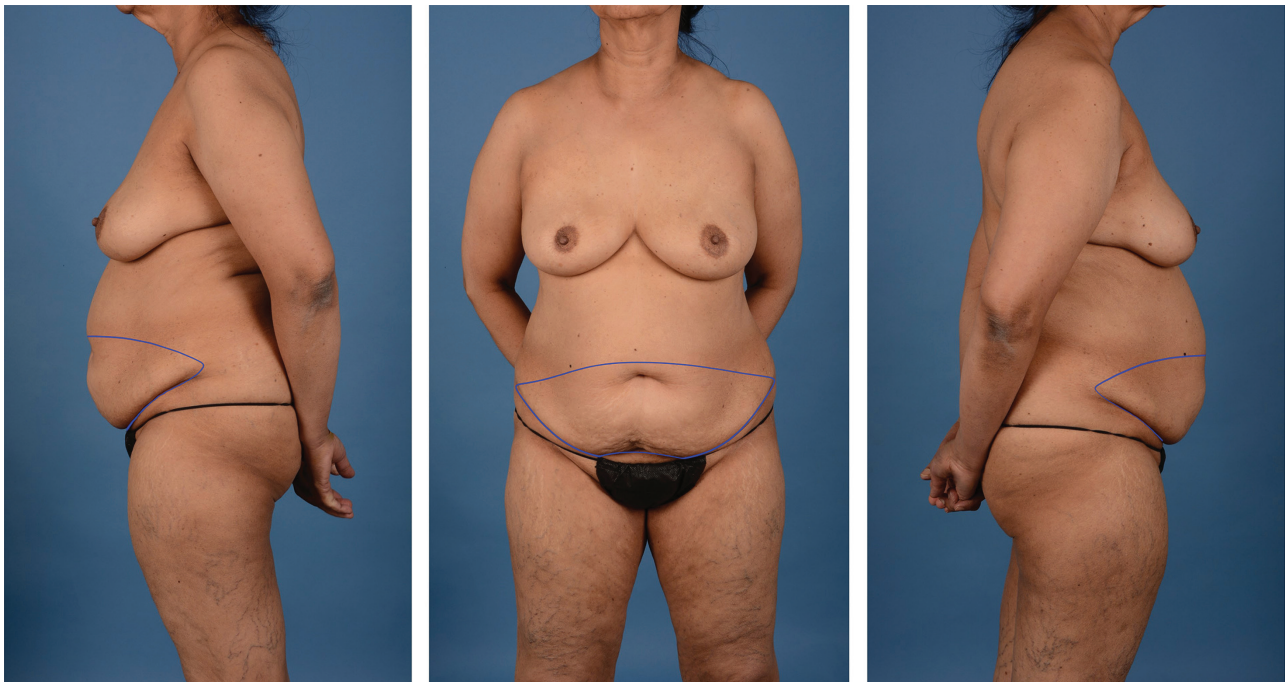


Fig. 2. Patient preoperative photographs illustrating an abdominal-based breast reconstructive candidate. Note the predominance of truncal skin excess and adiposity in the lower abdomen.



Fig. 3. Patient preoperative photographs illustrating a thigh-based free flap breast reconstructive candidate. Note the predominance of skin and adiposity of the lateral and posteromedial thigh.



Fig. 4. Patient preoperative photographs illustrating a lower back-based free flap breast reconstructive candidate. Note the predominance of skin and adiposity of the lumbar area with relative paucity in the posteromedial thigh.

underwent stacked bilateral breast reconstruction using multiple perforator flaps from the abdomen and thighs. Please note the resultant aesthetically appealing and body-appropriate breast reconstruction with an improved truncal and thigh contour. This outcome would not have been

possible using flaps from 1 region alone in this particular patient. We have a relatively low threshold for the use of stacked flaps and note that about 28% of our total flap clinical volume is multiple flaps for 1 side. Multiple or stacked flap reconstructions and especially bilateral cases

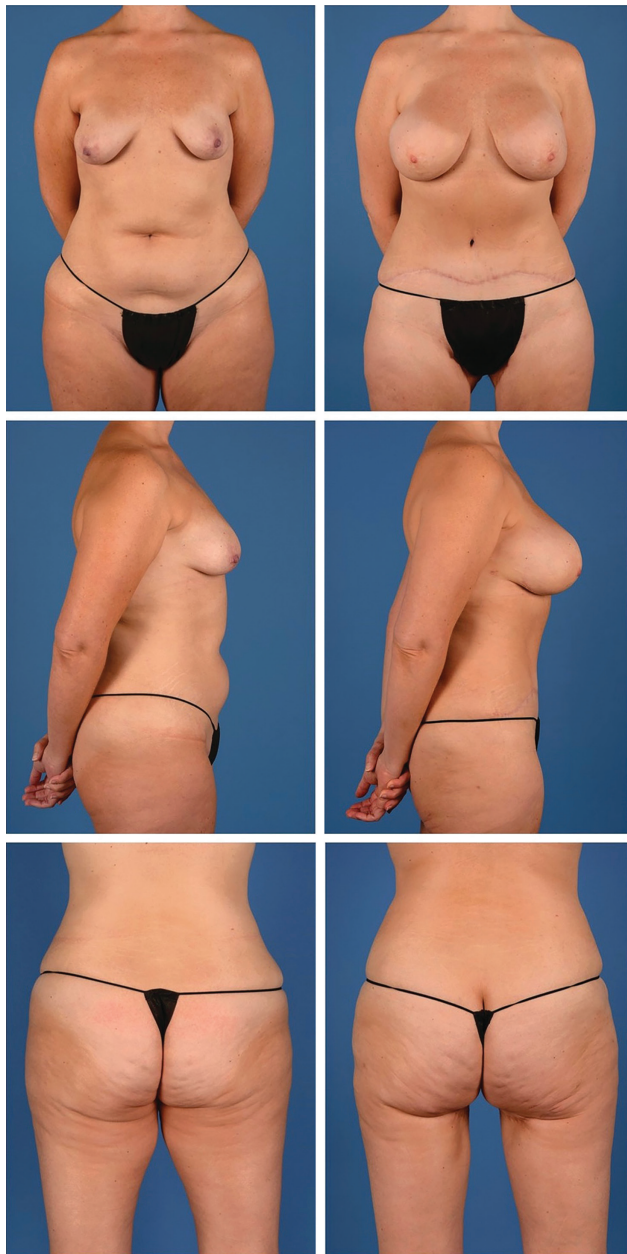


Fig. 5. Patient pre- and 6-month postoperative photographs illustrating a stacked multiple flap bilateral breast reconstruction patient. Performing abdominal-based flap reconstruction alone may not have provided adequate tissue for creation of aesthetical-optimized breasts. The addition of secondary flaps from the thighs enabled body-appropriate breast reconstruction. Note the improved overall truncal and thigh aesthetic contour following reconstruction.

are best done with a team approach involving attending co-surgery and a well-trained microsurgical operative personnel. This enables maximum creative flexibility while providing optimal patient safety and operative efficiency.

CONCLUSIONS

Availability of newer or emerging donor perforator flaps have enabled more individualized autologous-only

or total autologous breast reconstruction with care to optimize the region-specific and overall aesthetic body contour. Advanced microsurgical technique and experience with stacked multiple flap breast reconstruction, even in bilateral cases, have enabled total autologous reconstruction of aesthetically optimized body-appropriate breasts in cases wherein a single donor site fails to provide an adequate amount of tissue, especially in radiated fields. Clinical examination and advanced CT imaging of all possible donor regions, including the abdomen, both thighs, and the lower back, is part of our preoperative counseling and paramount to operative planning for all patients that are candidates for microsurgical breast reconstruction in our practice. The goal of achieving a desirable breast reconstruction with avoidance of implants can be done safely and efficiently with the use of 1 or more perforator flap(s) from different body regions to provide an optimized patient-specific aesthetic result for the reconstruction as well as the donor site. We emphasize the need to have a coordinated and experienced microsurgical team with use of 2 focused and task-oriented attending surgeons even in an academic setting that also benefits resident education and training.

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