

The Posterior Arm Flap for Reshaping the Postbariatric Breast

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Background: Postbariatric surgery, either by itself or in association with other procedures, tries to correct physical defects and body deformities. Because of the intrinsic complexity of massive weight loss (MWL) patients, more than a single procedure is, most of the time, required. We report a combined surgical method able to improve arms' and breasts' contour that aims to obtain a satisfying functional and aesthetic result by reducing surgical times and costs.

Methods: A female MWL patient with proper body mass index was clinically evaluated and considered suitable for surgery. While authors performed a modified Pascal-Le Louarn brachioplasty for the upper arm, a standard McKissock mastopexy followed by a Wise pattern skin closure was selected to obtain the breast lift. By sparing the proximal pedicle, the fasciocutaneous flaps were harvested on both posteromedial sides of the arms. The posterior arm flaps (PAF) were tunneled and transposed below the subcutaneous skin bridge across the axilla and finally used to increase the breast mound.

Results: In the immediate postoperative follow-up, no complications were reported. After the 6-month and 1-year follow-up, both arms' silhouette was documented as healthy and symmetric. Breasts were soft, without any signs of ptosis and/or contracture. No skin disorders or scar hypertrophy or lymphedema were reported.

Conclusions: PAF in breast contouring procedures is an interesting surgical option, but more patients need to be treated to validate the effectiveness of the procedure. This technique should be considered when there is a need for simultaneously improving arm's contour and breast's volume and shape. (*Plast Reconstr Surg Glob Open* 2019;7:e2434; doi: 10.1097/GOX.0000000000002434; Published online 9 September 2019.)

INTRODUCTION

Postbariatric surgery tries to correct physical defects and body deformities to which the alteration of collagen and elastic fiber ratio contributes, causing a particular horizontal laxity of the connective tissue, that leads to characteristic skin rolls, ptosis, and shape asymmetries.¹ The combined execution of different surgical procedures represents a common practice in plastic surgery but patient safety always has to be considered²⁻⁵ and the accurate assessment of body mass index (BMI; <30 kg/m²)⁶ is pivotal to prevent postoperative complications.

Combination of mastoplasty and brachioplasty is one of the most common associations in postbariatric surgery. The use of autologous tissue for mastoplasty

avoids problems derived from breast implants⁷ and different body areas (abdomen, lateral torso, back, arms) are suitable donor sites for autoaugmentation procedures.

The posterior arm flap (PAF) was first described by Masquelet and Rinaldi⁸ and Masquelet et al.⁹ as a free

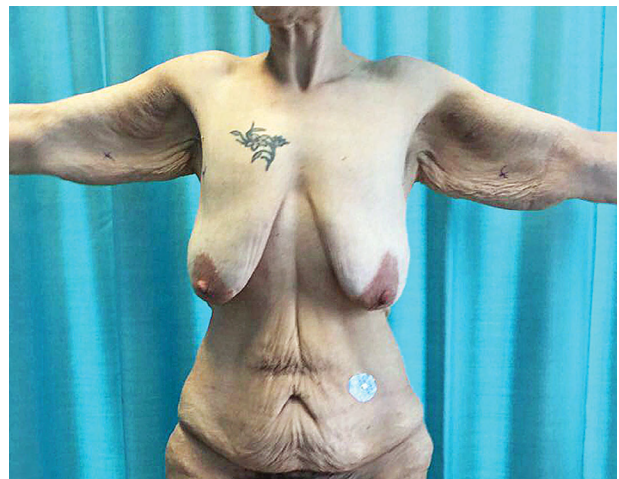


Fig. 1. Preoperative assessment.

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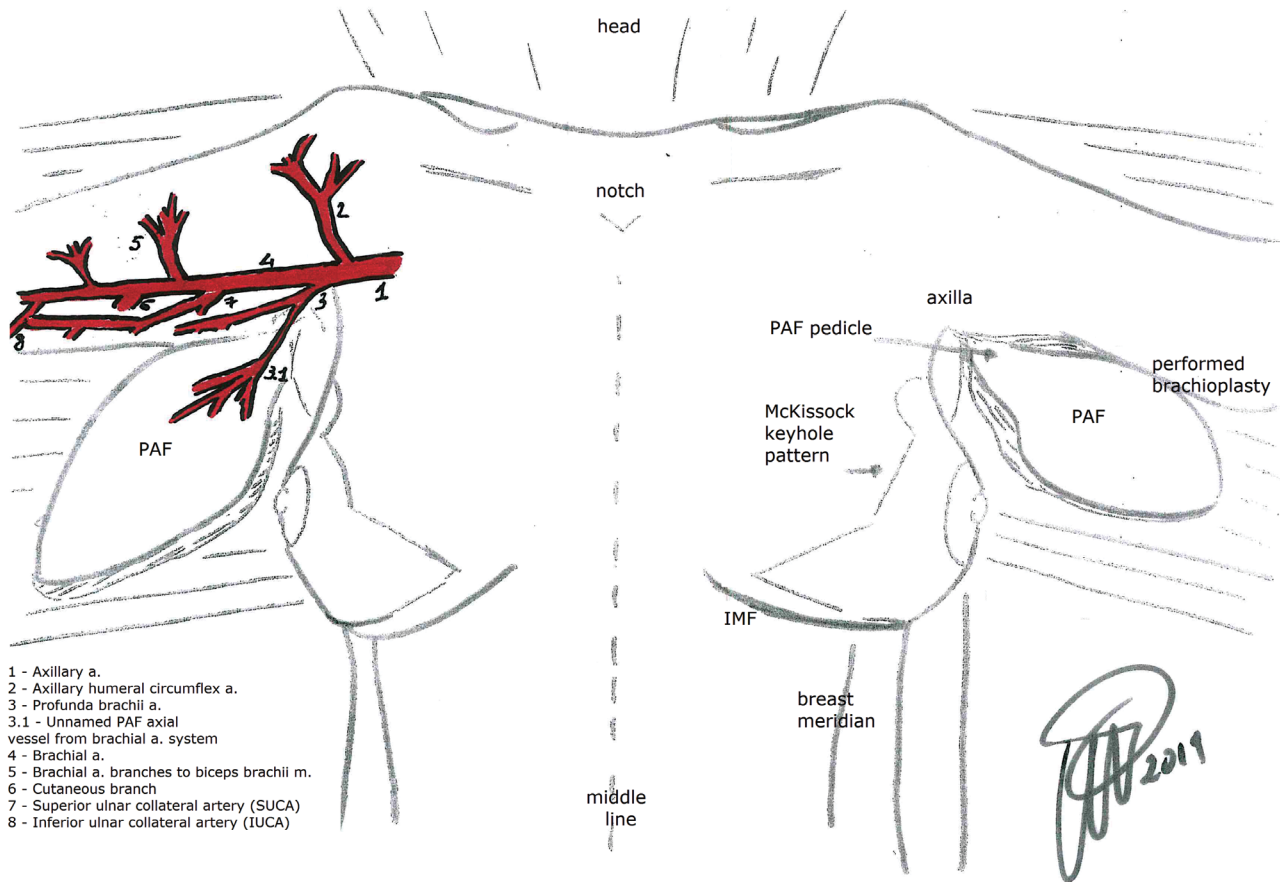


Fig. 2. Vascularity of the PAF based on profunda brachii artery or the brachial artery system. IMF , inframammary fold; PAF, posterior arm flap.



Fig. 3. Posteromedial arm flap harvesting.

flap for hand and foot reconstruction and then classified as fasciocutaneous flap-type A by Cormack and Lamberty.¹⁰

The PAF is harvested on the posteromedial region of the arm. Its pedicle, with a mean length of 4.4 cm, emerges between the long head of the triceps brachii and the teres major tendon, just under a fibrous arch, and contains an unnamed artery (1.5 mm average diameter) de-



Fig. 4. De-epithelized posterior arm flap and McKissock procedure.

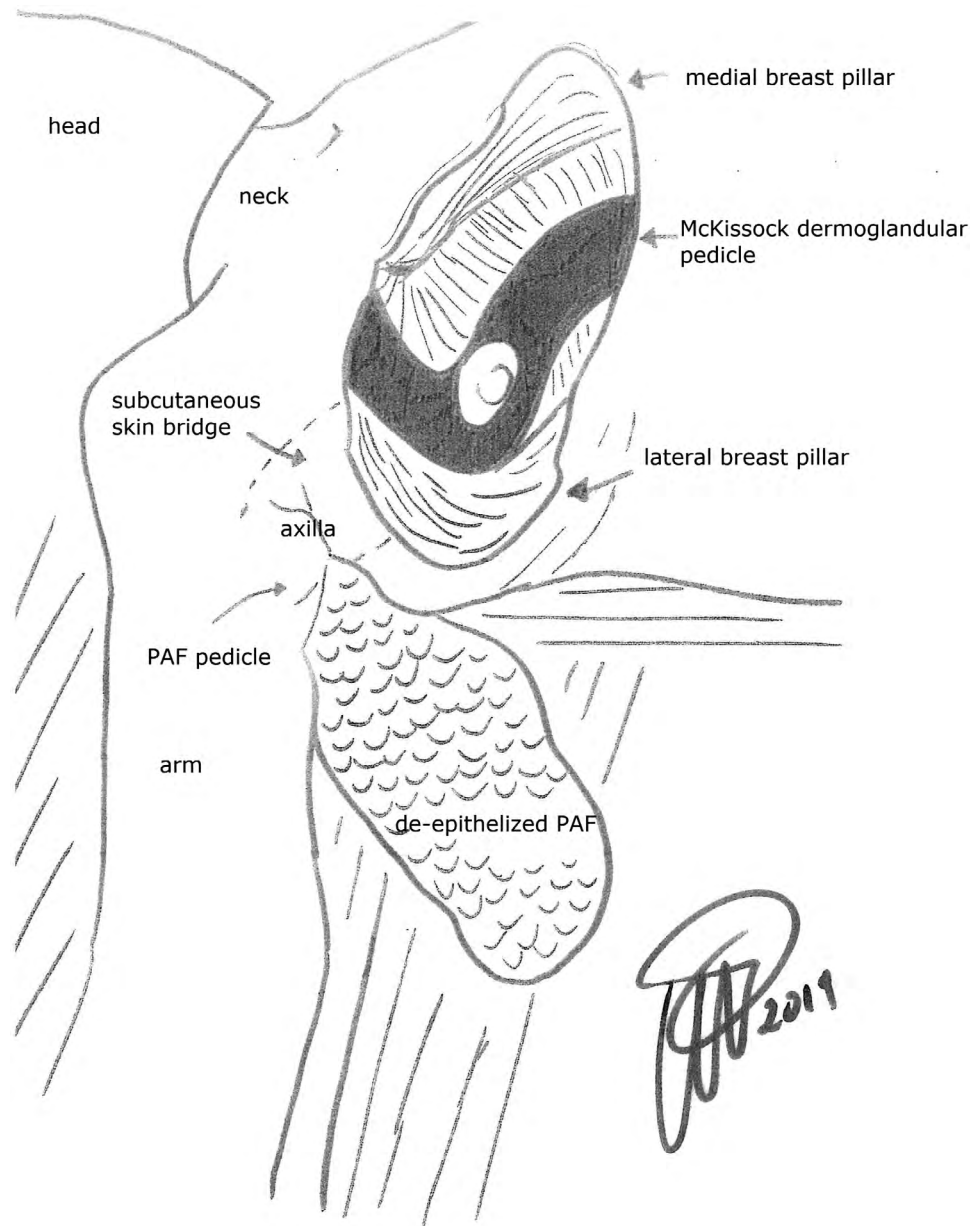


Fig. 5. De-epithelized PAF and McKissock procedure, with subcutaneous skin bridge shown. PAF indicates posterior arm flap.

rived from the brachial artery (71% of cases) or from the profunda brachii artery (23.5%) with 2 accompanying venae comitantes.^{8,9} Sometimes, the flap vascularity relies on vessels branching either from the superficial ulnar collateral artery or from the inferior ulnar artery or from the superficial brachial artery.^{11,12} The flap skin paddle matches with the excision area of the brachioplasty, to reduce unpleasant surgical signs along the posteromedial region of the arm. Rotation and transposition of the PAF below a subcutaneous skin bridge across the axillary region allow to reshape the breast mound.

The aim of this article is to present a combined brachioplasty and mastopexy with autologous tissue augmentation of the breast by the use of an adipocutaneous variation of

fasciocutaneous PAF described by Masquelet and Rinaldi⁸ and Masquelet et al.⁹

MATERIALS AND METHODS

A 42-year old white woman, with a clinical history of severe obesity (maximum BMI of 44.29 kg/m²), arterial hypertension, and chronic use of tobacco, reached a final BMI of 22.68 kg/m² after a sleeve gastrectomy. The patient had upper arm batwing and significant breast ptosis (Fig. 1).

Preoperative Planning

After general conditions' assessments, the patient was clinically evaluated in our department. Due to the impor-



Fig. 6. Posterior arm flap insetting.

tant correlations among obesity, massive weight loss, and psychiatric disorders, the patient was considered suitable for surgery by a multidisciplinary team composed of a psychiatrist, a psychologist, an internist, and a plastic surgeon.^{13–15}

Constant weight, stable hematological condition, and the absence of nutritional deficit in 6 months before surgery have been considered as fundamental requirements.

Preoperatively, a complete clinical and instrumental investigation of the mammary glands was performed to exclude breast cancer or soft tissue masses. Upper limbs sonography excluded venous or arterial insufficiency. Finally, 1 month before surgery, the patient stopped smoking because of the enhanced risk of flap loss and wound complications.^{16–19}

Brachioplasty skin markings were carried out with the patient in an upright position and abducted arms to evaluate the ptosis grade and the upper arms shape. Considering the Pascal-Le Louarn technique and the final position of the scars,²⁰ authors planned the flap along the base of the axillary cable (about 10×20 cm). Vascularity of the PAF was ensured by the axial vessels derived from the profunda brachii artery or from the brachial artery system (Fig. 2). McKissock mastopexy²¹ was selected to achieve the breast lift with a Wise pattern skin closure, due to the safety of its tripedicated vascularity (posterior, superior, inferior) and the wide possibility of glandular reshaping.

Surgical Procedure

Surgery was carried out with the patient in supine position and abducted arms, in general anesthesia and orotracheal intubation. Preoperatively, cefazolin IV was used as antibiotic prophylaxis.

A brachioplasty was performed through an elliptical incision drawn along the posteromedial side of both arms. The adipocutaneous flaps were harvested by performing a distal-to-proximal dissection of the arm, just above the deep fascia (proper triceps brachii muscle fascia), sparing the subfascial plexus. The pedicle of PAF was identified 4 cm distal to the posterior axillary fold. The axial vessel of the PAF arose from profunda brachii artery, just few centimeters after its origin from the brachial artery (Fig. 3). After the dissection, the flap vascularity was confirmed by using a hand-held Doppler probe. An accurate de-epithelialization of skin paddles (about 10×20 cm) was performed to obtain a dermal-subcutaneous flap ready to be buried (Figs. 4, 5).

A McKissock mastopexy with key-hole pattern incision was carried out. Authors used a tripedicated (superior, posterior, inferior) vertical gland flap for the nipple-areola complex (NAC) survival and a breast lifting with absorbable braided suture #2-0 (Polyglactin 910-Novosyn, B. Braun Surgical, S.A., Rubi, Barcelona, Spain). PAF was tunneled and transposed below an axillary defatted skin bridge (for a lower risk of superolateral bulging of the breast) and finally positioned through the dermoglandular breast flap under the NAC, by extending it from the lateral to the medial breast, to obtain breast autoaugmentation, restoring volume and contour (Figs. 6, 7). Afterward, PAF was secured with absorbable braided sutures #2-0 (Polyglactin 910-Novosyn, B. Braun Surgical, S.A.) to pectoralis major fascia and the McKissock flap, in a retro-glandular position as a prosthesis. One silicone drainage CH-15 was positioned for each breast and limb.

A layered suture, both the arms and the breasts were performed with interrupted absorbable synthetic suture #3-0 (Glyconate-Monosyn, B. Braun Surgical, S.A.) and running subcuticular absorbable synthetic suture #4-0 (Glyconate-Monosyn, B. Braun Surgical, S.A.) was used for breast skin closure. Metallic agraphes were applied to both arm's wounds. Sterile petrolatum gauzes and cotton gauzes were used for the postoperative dressing. The total surgery time was 3 hours 40 minutes.

Postoperative Care

Immediately after surgery, the patient wore the surgical bra for the following 40 postoperative days. Arm lift compression garments with long sleeves were carefully used. The patient was discharged on the second postoperative day, after the removal of 4 drainages. After the hospital discharge, no fever or significant symptoms were detected. The patient was invited to use a medical scar gel (Same Plast, SAME, Parma, Italy) twice a day and silicone sheets (Dermatix, Hanson Medical, Kingston, Wash.) starting from the third week after surgery, for the next 4 months.

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research commit-

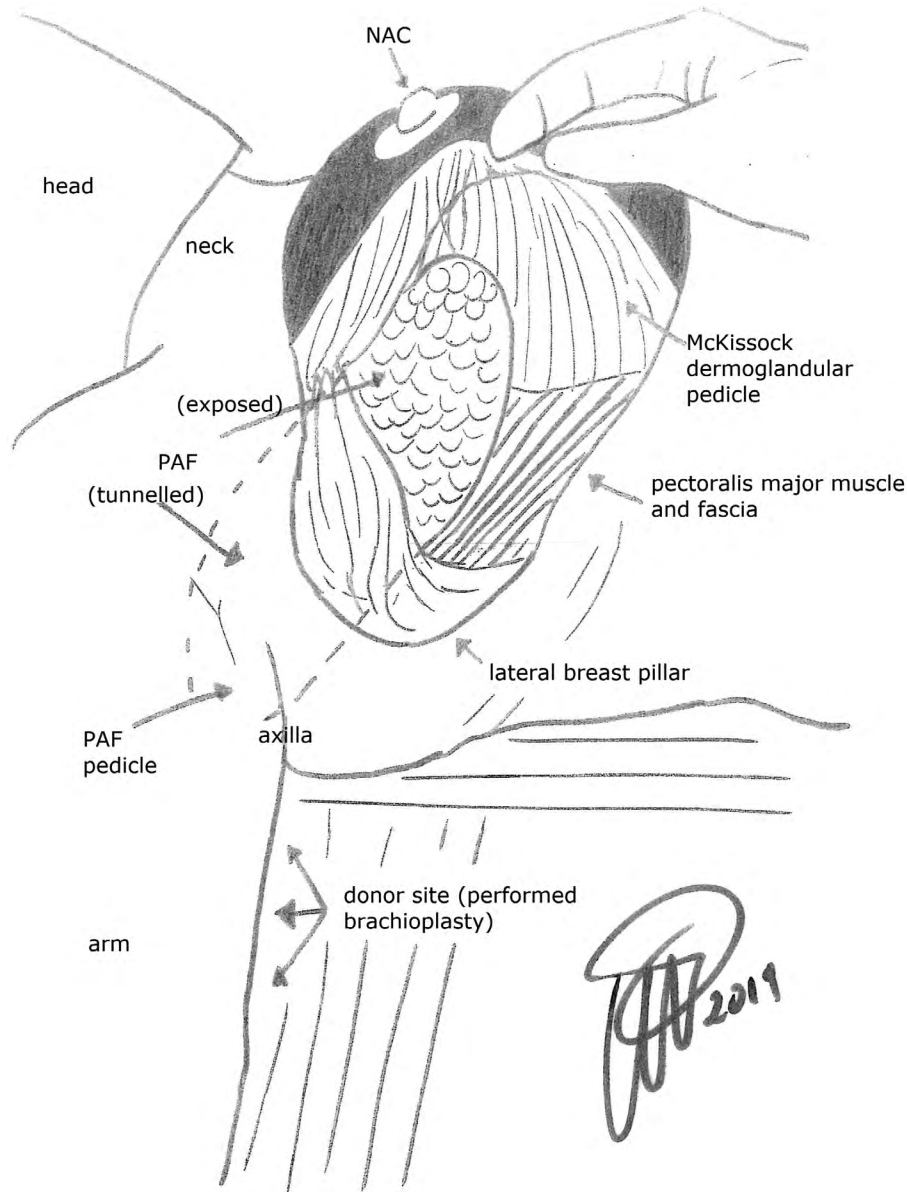


Fig. 7. PAF tunnelled and transposed below subcutaneous skin bridge. NAC indicates nipple-areola complex; PAF, posterior arm flap.

tee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

RESULTS

During the postoperative follow-up, no complications such as seroma, hematoma, and surgical wounds dehiscence were reported. Some ecchymoses and postoperative breast and arm edema resolved before the end of the first-month follow-up. The patient did not complain about pain or inability during daily movements and did not need any kinesitherapy to return to normal activities.

The 6 months check-up showed a soft and symmetric arms silhouette with a good scar quality. No skin retrac-

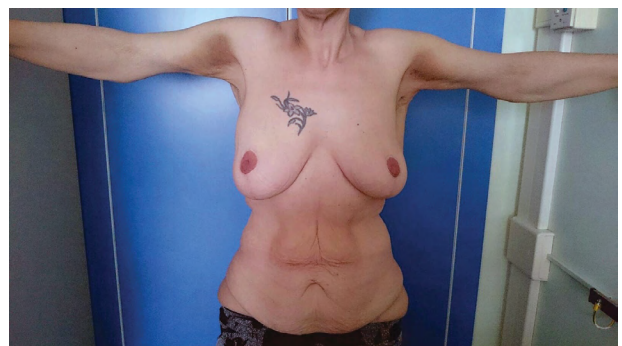


Fig. 8. One-year follow-up.

Table 1. Alternative Flaps for Autologous Breast Augmentation

Flap	PAF ¹⁵	ICAP ³⁶	LICAP ²⁷	Spiral Flap ²⁸	LD flap ²⁹⁻³³	TDAP Flap ³⁴⁻³⁷
Anatomy	Posteromedial aspect of the arm	Lateral and posterior aspect of chest wall	Lateral and posterior aspect of chest wall	Lateral and posterior aspect of chest wall	Upper back region	Upper back region
Vascularity	Adipocutaneous flap variant 180° arc of rotation Brachial artery system	Fasciocutaneous flap 90° arc of rotation Lateral or anterior intercostal perforator vessels	Perforator flap 180° arc of rotation Lateral or anterior intercostal perforator vessels	Fasciocutaneous flap 90° arc of rotation Lateral intercostal perforator vessels and pectoral vasculature	Musculocutaneous flap 180° arc of rotation Thoracodorsal artery (Mathes and Nahai type V flap)	Perforator flap 180° arc of rotation Descending branch of the thoracodorsal artery
Size	Up to 10×20 cm	Up to 15–20 cm length	Up to 13×25 cm	Up to 15–20 cm length	Up to 38×10 cm	Up to 38×10 cm
Advantages	No need of perforator dissection Useful when arm soft tissue redundancies are present and patient requests a concurrent brachioplasty No need of preoperative US investigation Contributes both lateral and medial breast Similar consistency from native breast	No need of perforator dissection Treat chest “back rolls” In postbariatric patients No risk of lymphedema of upper limb (choice in oncological breast reconstruction ^{29,30}) Validated use with breast implants Similar consistency from native breast	Large flap Treat chest “side roll” in postbariatric patients No risk of lymphedema of upper limb Contribute both lateral and medial breast Validated use with breast implants Similar consistency from native breast	No need of perforator dissection Treat chest “back rolls” in postbariatric patients No risk of lymphedema of upper limb Validated use with breast implants Similar consistency from native breast	Large flap Adequate volume if thoracodorsal n. intact No animation if denervated Validated use with breast implants Contributes both lateral and medial breast No risk of lymphedema of upper limb	Cover breast implant (34–40) Contribute both lateral and medial breast No animation No muscle sacrifice Validated use with breast implants Contributes both lateral and medial breast Similar consistency from native breast No risk of lymphedema of upper limb
Disadvantages	Unusable in extremely thin patient with no skin redundancies Use with breast implants is still to be evaluated Risk of lymphedema of upper limb (if inappropriate PAF harvesting)	Need of preoperative US investigation Contributes more to the lateral breast	Need of perforator dissection Need of preoperative US investigation Contributes more to the lateral breast	Need of preoperative US investigation Contributes more to the lateral breast	Musculocutaneous tissue appears different in consistency from native breast Risk of animation in reconstructed breast (if thoracodorsal n. intact) Muscle damage of the back region	Limited volume if compared with LD flap Need of perforator dissection Need of preoperative US investigation

Alternative flaps for autologous breast augmentation.
ICAP (inter-costal artery perforator) flap LD (latissimus dorsi) flap LICAP (lateral inter-costal artery perforator) flap PAF, posterior arm flap; TDAP (thoracodorsal artery perforator) flap

tion or ptosis and no recurrent batwing deformities and liponecrosis were reported. Breasts were soft, not painful, and pleasantly shaped. A mild bulging on the lateral upper quadrant of the right breast was noticed, maybe due to inadequate defatting of the skin bridge across the axilla.

To evaluate the onset of lymphedema, a comparative assessment between preoperative and postoperative outcomes was performed. After 1, 6, and 12 months, accurate measurements of the forearm girth did not detect any changes before and after surgery. Postoperative absence of induration, and thus of lymphedema, was verified.

The patient was satisfied with the final aesthetic and functional result. The absence of liponecrosis, tissue edema, and chronic breast fistulas confirmed the survival of buried adipocutaneous PAF. No lateral displacements or asymmetries of the mammary gland were reported. One year later, the surgical results were stable, and the patient was in a good clinical condition (Fig. 8).

DISCUSSION

PAF was first described as a fasciocutaneous flap, harvested from the posteromedial aspect of the arm, with a vascularity based on an unnamed but constant artery derived from brachial artery or profunda brachii artery system.^{8,9} Its arc of rotation reaches 180°, contributing to reshaping the lateral and medial breast.

PAF has been reported as an islanded flap for regional reconstruction around the axilla, located in proximal arm, thorax or axillary cable, and for head and neck reconstruction. The constant anatomy, the favorable donor site morbidity, and freedom of flap inseting result in lower complication rates in the treatment of hidradenitis suppurativa, scar contractures, and postradiotherapy ulcers.^{22–25}

Therefore, we managed to make use of PAF in postbariatric breast reshape and reconstruction. The adipocutaneous PAF variant guarantees quality of the adipose tissue similar to the one obtained from inter-costal artery perforator (ICAP), lateral inter-costal artery perforator (LICAP), spiral, and thoracodorsal artery perforator (TDAP) flap and furthermore there are no significant differences in consistency between the autologous tissue augmentation supplied by PAF and the native breast tissue. The risk of lymphedema appears comparable to that of classic brachioplasty procedures.

A comparison between the alternative flaps for autologous breast augmentation is shown in Table 1. The need to treat different body districts (depending on soft tissue redundancies location, like “back roll,” “side roll,” “bat wing”) or the acceptance of a scar located on the posteromedial aspect of the arm or on the thorax could represent a possible explanation in selecting the reconstructive technique.

Based on the comparison made in Table 1, the flap choice is not affected by the tissue quality when using fasciocutaneous, adipocutaneous, or perforator flap or by the use of prosthetic implant. Conversely, the defect location of the breast (medial and/or lateral breast), the site that needs to be treated (upper and posterior lateral chest versus posteromedial arm), the location of the fu-

ture scar (thorax and back versus arm), the dimension of the flap (the LICAP flap and the latissimus dorsi flap are bigger than ICAP flap or PAF), and the risk of lymphedema (mild if PAF dissection is correctly performed in healthy/not oncological patients, severe in postaxillary lymphadenectomy patients) could address the flap alternative.

We selected McKissock mastopexy technique in combination with PAF breast autoaugmentation because of the advantages provided by the tripediced dermoglandular flap, which is characterized by a rich vascular support and poor chance of necrosis of NAC.^{30,37}

Potentially, the PAF is exploitable for breast implant coverage in oncological patient, if axillary lymphadenectomy is not performed, and in nononcological patient, when native soft tissues are not enough to ensure adequate prosthesis coverage.

Finally, our personal technique appeared quick and safe and combined breast and arms surgery allowed authors to reduce general anesthesia, overall time, and surgery costs.

CONCLUSIONS

The PAF provides a valuable option in body contouring surgery, by allowing the simultaneous treatment of 2 distinct sites deformities with 1 single combined procedure, without the use of breast implants. At present, our investigation does not allow to issue any recommendations: the effectiveness of this new combined procedure still to be validated with other cases. However, the satisfying result encouraged our team to apply this procedure to other patients.

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PATIENT CONSENT STATEMENT

Informed consent was obtained from all individual participants included in the study. Additional informed consent was obtained from all individual participants for whom identifying information is included in this article.

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