

Dealing with the Displaced Nipple–Areola Complex in Macromastia Using a Superomedial Pedicle and Inverted T Pattern

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Background: In macromastia, especially in patients with a raised BMI, the nipple areola complex (NAC) may be displaced from the breast midline/meridian. This is poorly documented, and there is little published on surgical management. The aim of the study was to identify the incidence of displaced NAC in macromastia and discuss the management using the superomedial pedicle, by canting the vertical limbs of the inverted T/keyhole. The study also aimed to postulate a theory of pathogenesis.

Methods: The study is a retrospective review for a two-and-a-half year period. For study inclusion, the NAC had to be displaced 3 cm or more from the breast meridian. A superomedial pedicle was used with an inverted T pattern. The vertical limbs of the keyhole were canted medially for medially displaced NACs and laterally for laterally displaced NACs.

Results: Fifteen patients were identified: three with medial and 12 with laterally displaced NAC. Mean age was 35 years (range 21–61) with a mean BMI of 31 (range 27–37). The mean mass of tissue excised was 1158 g (range 330–1969 g). The mean follow up is 7 months (range 2–21 months). One patient suffered partial areola loss, and 2 patients had a breakdown at the angle of sorrow/inverted T junction.

Conclusions: The displaced NAC is not uncommon in women with a raised BMI presenting for breast reduction. Canting the vertical limbs of the keyhole away from the deviated NAC yields satisfactory results in treating patients with a displaced NAC using a superomedial pedicle. A theory of possible pathogenesis is postulated; global attenuation of the breast footplate occurs, leading to lateral and inferior displacement of the NAC. (*Plast Reconstr Surg Glob Open* 2022;10:e4105; doi: 10.1097/GOX.0000000000004105; Published online 17 February 2022.)

INTRODUCTION

Macromastia is a clinical diagnosis implying an enlarged breast. Although there is literature documenting that breast asymmetry is quite a common finding,^{1,2} the changes that occur with macromastia are less commonly described. It is more than just simple enlargement. The vast majority of these patients present with physical symptoms, which are improved after surgery.¹

Brown et al³ and others⁴ have documented that there is descent of the inframammary fold (IMF) with

macromastia, and that this is more prevalent with increasing body mass index (BMI). Hudson and Lelala⁴ confirmed this finding, but also noted that in macromastia, the position of the nipple areola complex (NAC) is frequently not in the meridian of the enlarged breast. Their anthropomorphic study documented that 45% of patients who presented with macromastia have a laterally displaced NAC, whereas 20% have a medially displaced NAC.

Interestingly, there is little literature regarding NAC malposition, or how to manage it. Iorio et al⁵, in a 2013 *PRS* Viewpoint, reported on 32 patients with a medialized NAC, and noted that theirs was the first report documenting management of this entity. They also noted that using a superomedial pedicle with a traditionally designed short vertical limb of the inverted T can lead to tension on the pedicle, which predisposes to wound dehiscence and

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Received for publication August 4, 2021; accepted October 27, 2021.

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DOI: 10.1097/GOX.0000000000004105

Disclosure: The authors have no financial interest to declare in relation to the content of this article.

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nipple–areola complex necrosis.⁵ Hence, both marking and executing a breast reduction using a superomedial pedicle in these patients are unique challenges that have not been well described.

This article reports the management and outcome on 15 patients in a consecutive series of 125 patients, where the NAC was displaced either medially or laterally more than 3 cm from the breast meridian. In all cases a superomedial pedicle was used. The pathophysiology of the displaced NAC is also explored.

METHOD

A retrospective study was performed on 125 patients undergoing breast reduction over a 2.5-year period. All patients clinically had macromastia. The breast meridian was marked. The current position of the nipple is ignored when marking the breast meridian.

Three methods are used to verify this line:

- A tape measure is placed around the patient's neck and positioned in the middle of the breast to verify the breast meridian.
- The midpoint of the clavicle is marked. Then a line is drawn down the middle of the sternum. A second line is drawn 1.5 cm medial to this line to indicate the medial border of the breast. A third line marks the anterior axillary line. This midline is plotted between the anterior axillary line and the medial border of the breast, starting at the mid clavicle.
- This line is then "eyeballed" by an experienced surgeon. Only then is the new nipple position marked on the breast meridian.

Then the distance from the breast meridian to the nipple, either medial (Fig. 1A, Fig. 2A) or lateral (Fig. 3A, 4A), was measured. For inclusion in the study, the distance from the breast meridian to the nipple had to be 3 cm or more. In all patients, the distance from the suprasternal notch to the nipple was measured. Also, the distance from the nipple to the inframammary fold was measured in centimeters.

Data collected also included BMI, associated comorbidities, and mass of tissue excised (in grams). Postoperative complications were also recorded. Exclusion criteria were mastopexy and augmentation of any sort. Only bilateral cases were included. University ethical approval was obtained. Also, all patients signed informed consent, and the study was conducted in accordance with the guiding principles of the Declaration of Helsinki.

Technique/Marking

The patient is marked standing. Standard measurements are performed as mentioned above. All patients had a Wise keyhole/inverted T pattern with a superomedial pedicle drawn. The meridian of the breast is drawn first—ignoring the position of the nipple. The new nipple position is marked on the marked breast meridian, at or just above the projected NAC relative to the IMF.

When the NAC is in the midline of the breast (not applicable in this study), the two vertical limbs of the

Takeaways

Question: Is it possible to treat the displaced nipple areola complex using the superomedial pedicle and inverted T pattern? What is the likely pathophysiology of nipple displacement?

Findings: Yes, it is possible by canting the vertical limbs of the keyhole pattern. The pathogenesis is due to ligament attenuation.

Meaning: Successful breast reduction can be achieved by modification of standard markings.

inverted T/keyhole are usually equidistant from the NAC. However, in this study, the NAC was displaced from the breast meridian. To ensure easy rotation of the NAC, the vertical limbs of the keyhole were canted.

The vertical limbs of the keyhole/inverted T were canted medially for a medially displaced NAC (Fig. 2B) and laterally for a laterally based NAC (Fig. 3A). There is some clinical judgment required as this canting is designed to allow easy NAC transposition to the new nipple position without tension when a superomedial pedicle is employed.

RESULTS

There were 125 patients in the study, of whom 15 patients (mean age 35 years, range 21–61) had displacement of the NAC of 3 cm or greater (see Table 1). In this study, three patients had medially displaced NACs (Figs. 1, 2), whereas 12 had laterally displaced NACs (Figs. 3, 4). See Table 1 for patient data. The mean BMI of these patients was 31 (range 27–37); 10 patients had a BMI of 30 or above (Table 1). The mean mass of tissue excised was 1158 g (range 300–1969 g) (Table 1).

Complications

All patients did well and the repositioned NAC remained central (Figs. 1C, D, Figs. 2B, C, Figs. 3C, D, Fig. 4B). There were no nipple viability problems. One patient had some areola loss that responded to dressings. She had tested positive for COVID-19 and her surgery was deferred. At a subsequent test performed 3 weeks later, she was COVID-19 negative, and surgery went ahead. She also had breakdown at the T/angle of sorrow that also responded to dressings. Another two patients had minor bilateral breakdown at the angle of sorrow/ inverted T junction, which responded to dressings. The mean follow up was over 7 months (range 2–21 mo).

DISCUSSION

There is a paucity of literature regarding anthropometric changes that occur with macromastia and how to correct them, which is surprising, as breast reduction is one of the most common operations performed in the USA.¹ Brown et al noted greater breast asymmetry in patients with macromastia.³ They also reported IMF descent occurring with macromastia. They and others reported that the

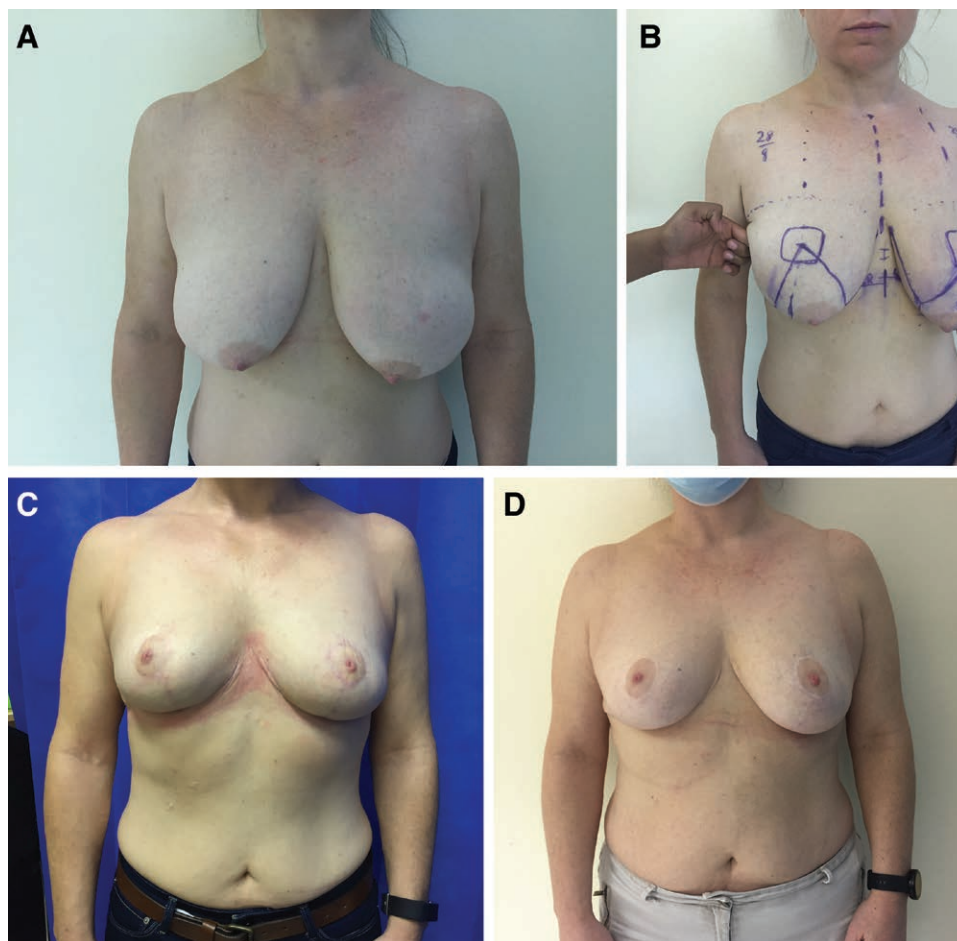


Fig. 1. Clinical example. A, Patient 2 in this group (Table 1), 35 years old with a BMI of 29 showing medial displaced NAC. B, By manually lifting the lateral aspect of the IMF, the nipple assumes a more central position. C, Postoperative view at 6 months showing NAC now in meridian of breast (anterior view). D, Patient now at 21 months postoperative. The NAC is still in midline compared with 1A.

breast footplate migrates inferolaterally in patients with large breasts. In addition, displacement of the NAC from the breast meridian is not uncommon.^{3,4} There is surprisingly little literature dealing with the displaced nipple-areola complex in breast reduction, especially when using a superomedial pedicle. Furthermore, the pathogenesis of this condition has never been described and our postulate is noted below.

There is attenuation of the ligamentous support of the breast in macromastia. Not only is the IMF displaced inferiorly by the weight of the enlarged breast, but the whole footplate appears to enlarge. Recent anatomical studies have delineated factors that may predispose to this occurring.^{6,7} Gaskin et al in their cadaveric study showed that the perimeter of the breast was attached to the chest wall.⁶ This was caused by periosteal attached ligaments medially and a fascial ligamentous structure laterally. They suggest that these ligaments attenuate, which explains the tendency of the breast to splay laterally and inferiorly with age, and in macromastia.⁵ As a consequence of the tighter medial fibers, the NAC would be pulled medially (Figs. 1A and 2A) as the lateral fibers attenuated more than the medial fibers. This

is clearly shown in Figure 2B when the lateral IMF is much lower than the medial IMF, with the whole breast footplate extending inferolaterally. This is confirmed by manipulating the IMF at its lateral end only (Fig. 1B): if the lateral aspect of the fold is elevated digitally (thereby “shortening” the attenuated lateral ligaments), the nipple assumes a more central position.

In contrast, it is suggested that with macromastia and particularly in patients with an raised BMI,⁴ that all the breast perimeter ligaments attenuate^{6,7} and the whole breast footplate is then expanded, especially the lateral aspect of the breast, which now extends into the axilla. This was evident in 9 patients in this study, who all had a BMI higher than 30. In these patients, the ligamentous attenuation is more global, with particular attenuation of the medial ligaments, so that the breast footplate slides inferiorly and laterally.^{1,3,4} Consequently, the NAC displaces inferiorly and laterally (see Fig. 4A). This may explain why lateral NAC displacement occurs more commonly (12 of 15 in this study, 80%) than medial displacement in patients with a high BMI.⁴ Hence, by elevating the medial aspect of the IMF superiorly, the nipple is repositioned in the breast meridian again.

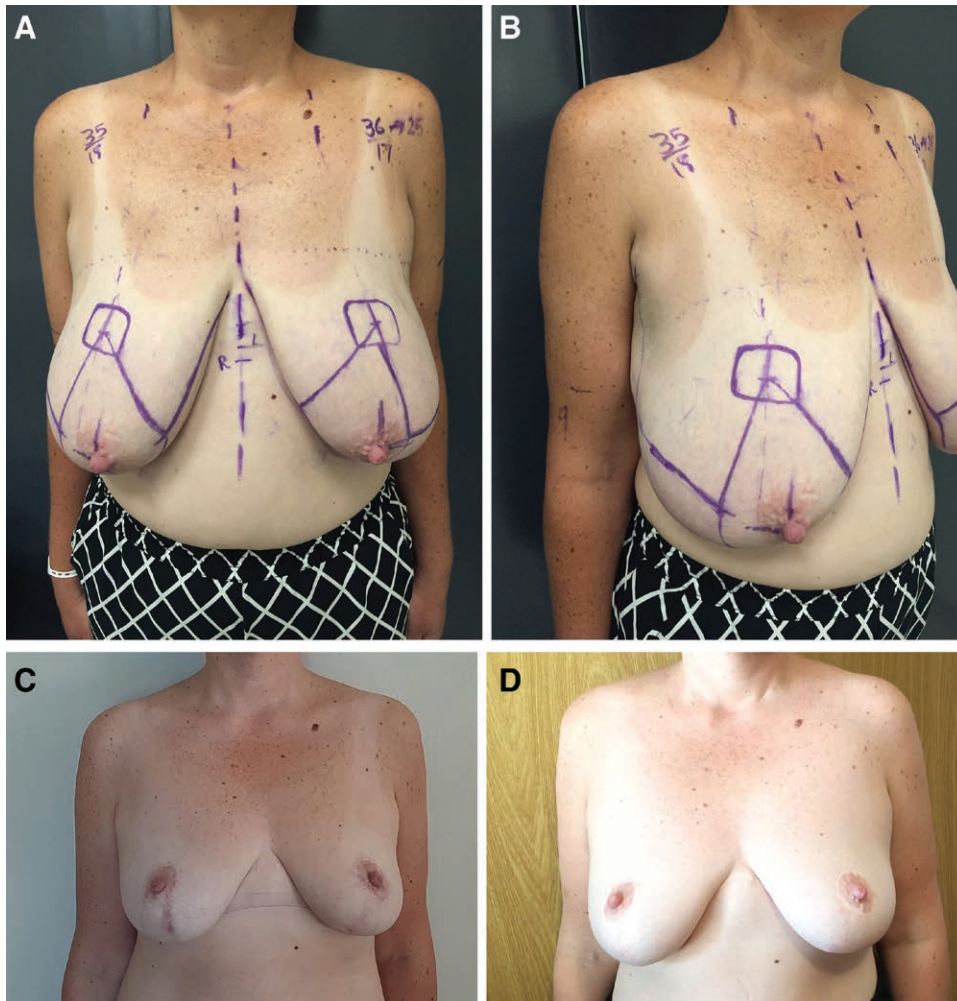


Fig. 2. Clinical example. A, Patient with medially displaced NAC (this is patient 3 in Table 1). Note how the vertical limbs of the keyhole have been canted medially to allow the superomedial pedicle to rotate with ease. B, Oblique view. Note that the lateral IMF is not at the same level as the medial IMF. It is displaced medially and inferiorly. C, Patient 7 months postoperative with NAC in the meridian of breast. D, Patient after 21 months. Nipple in midline compared with Figure 2A.

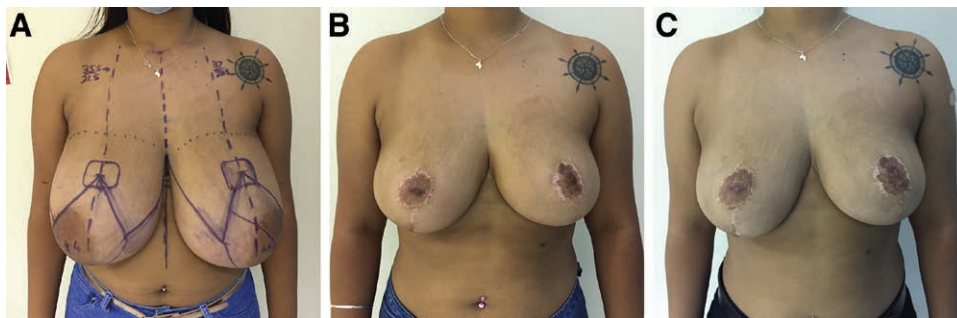


Fig. 3. Clinical example. A, Preoperative patient with laterally displaced NAC marked. The position of the nipple is ignored in marking the breast meridian (stippled line). Note that NAC is not in the middle of keyhole. This is patient number 1 in Table 1. B, Patient postoperative at 8 months. NAC now in central position. C, Patient at 13 months postoperative. Nipples remain in midline. Poor nipple projection present preoperatively.

(See Video [online], which shows a patient with a laterally displaced NAC; by manipulating the medial aspect of NAC only, the NAC assumes a more central position.)

In this study only three patients with lateral displacement of the NAC had a BMI of 30 or higher; however in all three patients the BMI was still higher than 26.



Fig. 4. Clinical examples. A, Anterior view of patient with laterally displaced NAC (patient 5 in Table 1, with a BMI of 37). The red dots mark the breast meridian (the solid red line marks the pedicle). Patient 6 months postoperative (B). NAC now in breast meridian.

The superomedial pedicle has become a popular option for macromastia.⁸ The superomedial pedicle allows a wide resection of tissue particularly where it is excess—that is, in the inferior pole of the breast. It enjoys a guaranteed blood supply from the second and third intercostal vessels; in contrast, the inferior pedicle is more tenuous as an axial vessel, and is absent in almost a third of cases.⁹

However, unlike the inferior pedicle, pedicle rotation is required to inset the nipple in its new position. However, how to manage the displaced NAC when using a superomedial pedicle is not widely reported. When the nipple is displaced medially (Figs. 1A and 2A, B), if a traditional keyhole is designed with the vertical limbs drawn from the breast meridian, the medial limb of the vertical limb of

Table 1. Patient Demographic Data

Patient No.	Age	BMI	SN-N (cm) N-IMF (cm)	NAC Displacement	Excised Right (g)	Excised Left (g)	Complications	Follow Up (mo)	CX
1	24	34	R 35.5/21.5 L 37/23.5	3 cm lat 3 cm lat	1057	1294	Nil	13 mo	10 mo
2	35	29	R 28/8 L 29.5/8.5	3 cm medial 3 cm medial	354	330	Nil	21 mo	18 mo
3	40	30	R 35/18 L 36/17	3 cm medial 3 cm medial	800	770	Nil	21 mo	1 y
4	21	27	R 33/17 L 34/18	3 cm med 3 cm med	804	792	Partial right areola loss	12 mo	9 mo
5	43	37	R 46/21 L 45/25	4 cm lat 3 cm lat	1969	1964	Minor dehiscence	6 mo	6 mo
6	32	33	R 37/19 L 36/19	4 cm lat 4 cm lat	1100	1290	Nil	6 mo	6 mo
7	44	32	R 34/18 L 34/18	3 cm lat 4 cm lat	722	1000	Nil	6 mo	6 mo
8	30	33	R 37/19 L 37/21	5 cm right lat 4 cm left lat	1400	1600	Nil	5 mo	
9	33	27	R 34/20 L 35/19	4 cm right lat 3 cm left lat	1500	1300	Nil	5 mo	
10	61	34	R 44/22 L 45/23	5 cm right lat 5 cm left lat	1800	1900	Minor dehiscence	4 mo	
11	29	30	R 33/20 L 34/20	5 cm right lat 5 cm left lat	1000	1100	Nil	3 mo	
12	37	28	R 35/19 L 33/21	4 cm right lat 5 cm left lat	1200	1000	Nil	3 mo	
13	32	28	R 35/21 L 38/23	4 cm right lat 5 cm left lat	1100	1400	Nil	2 mo	
14	34	33	R 34/20 L 35/20	3 cm right lat 4 cm left lat	1300	1500	Nil	4 mo	
15	37	35	R 33/16 L 34/16	4 cm right lat 3 cm left lat	684	710	Nil	2 mo	

the keyhole sits adjacent to the medially displaced NAC and, hence, this restricts NAC rotation into the new nipple position. A large backcut may be then required to facilitate rotation, but this impairs pedicle vascularity. In contrast, when the NAC is displaced laterally a centrally designed keyhole results in a longer pedicle with a more tenuous blood supply. Also, NAC inset may be more difficult due to kinking. In addition, the concept of fixing the IMF to prevent further descent is another important component of treatment¹⁰ (Figs. 3A and 4A). In addition, the concept of fixing the IMF to prevent further descent is another important component of treatment.¹⁰

Iorio et al,⁵ who only reported on patients in whom the NAC is displaced medially, suggested that the medial vertical limb of the keyhole pattern should be drawn longer to deal with this problem. They even suggested marking the medial vertical limb up to 10 cm in length. However, this may distort the breast aesthetics, or may require that the new nipple position is marked in a lower position to retain the suprasternal notch-to-nipple and nipple-to-IMF ratio. It is suggested that an alternative strategy is to cant the vertical limbs of the keyhole pattern. In the case of the medially displaced NAC (Fig. 1A and 2A, B), the cant would be medial to enable easier pedicle rotation. If the nipple is displaced laterally (Figs. 3A, 4A), the cant is lateral, to shorten the length of the pedicle. It is important to emphasize that the breast meridian is marked preoperatively in the middle of the breast, ignoring the current position of the NAC.¹¹

One of the potential problems of canting the NAC medially is shortening of the upper medial horizontal limb of the keyhole and conversely lengthening the upper horizontal lateral limb. Similarly, if the vertical limbs of the keyhole are canted laterally, it means that the upper horizontal medial limb of the keyhole is lengthened. This has not been a problem in these cases (Fig. 1C, D, Fig. 2C, D, Fig. 3C, D, and Fig. 4B). This is due to the elasticity of the breast skin in patients with macromastia.

There are some shortcomings in this study. It is a relatively small study. Inevitably, there may be some variations amongst observers when it comes to plotting the meridian of the breast. Also, only extreme (nipple > 3 cm from the meridian) NAC displacements were chosen, whereas lesser degrees of nipple malposition and asymmetry also occur.

The breast is surrounded by a fascial ring, which enlarges as the breast footplate enlarges, particularly in patients with a high BMI. In these patients, the breast enlarges more laterally and inferiorly, and the NAC is displaced laterally (Figs. 3A, 4A). This occurred in 87% of patients in this study. In some patients, the taut

medial ligaments displace the NAC medially (Figs. 1A, 2A, and 3A) from the breast meridian. Both situations can be dealt with using a superomedial pedicle, by canting the vertical limbs of the keyhole relative to the displaced NAC.

ACKNOWLEDGMENT

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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REFERENCES

- Colohan SM, Massenburg BB, Gougoutas AJ. Breast reduction: surgical techniques with an emphasis on evidence-based practice and outcomes. *Plast Reconstr Surg.* 2020;146:339e–350e.
- Rohrich RJ, Hartley W, Brown S. Incidence of breast and chest wall asymmetry in breast augmentation: a retrospective analysis of 100 patients. *Plast Reconstr Surg.* 2003;111:1513–1519; discussion 1520.
- Brown TP, Ringrose C, Hyland RE, et al. A method of assessing female breast morphometry and its clinical application. *Br J Plast Surg.* 1999;52:355–359.
- Hudson DA, Lelala NB. Anthropometric changes in a prospective study of 100 patients requesting breast reduction. *Plast Reconstr Surg Glob Open.* 2019;7:2150–2154.
- Iorio ML, Endara M, Ducic I. Reduction mammoplasty in patients with a medialised nipple areola complex: modification of the superomedial dermoglandular pedicle and skin pattern. *Plast Reconstr Surg.* 2013;131:302e–303e.
- Gaskin KM, Peoples GE, McGhee DE. The attachments of the breast to the chest wall: a dissection study. *Plast Reconstr Surg.* 2020;146:11e–22e.
- Matousek SA. Discussion: The attachments of the breast to the chest wall: a dissection study. *Plast Reconstr Surg.* 2020;146:23e–26e.
- Davison SP, Mesbahi AN, Ducic I, et al. The versatility of the superomedial pedicle with various skin reduction patterns. *Plast Reconstr Surg.* 2007;120:1466–1476.
- van Deventer PV. The blood-supply of the nipple-areola complex of the human mammary gland. *Aesth Plast Surg.* 2004;28:393–398.
- Atiyeh B, Ibrahim A, Saba S, et al. The inframammary fold (IMF): a poorly appreciated landmark in prosthetic/alloplastic breast aesthetic and reconstructive surgery. *Aesth Plast Surg.* 2017;41:806–814.
- Hall-Findlay EJ, Shestak KC. Breast reduction. *Plast Reconstr Surg.* 2015;136:531e–544e.