BFACE: A Framework for Evaluating Breast Aesthetics

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Summary: Although much has been written about breast aesthetics, the literature lacks a simple yet systematic and comprehensive approach for preoperative breast assessment. With use of the mnemonic "BFACE," the breast surgeon will analyze the bony skeleton and the breast footprint, areola, conus, and envelope. The authors present a thorough review of the important parameters that define the ideal breast, and several techniques for perceiving asymmetries more clearly. Strategic surgical planning is enabled by accurate perception. (*Plast. Reconstr. Surg.* 140: 287e, 2017.)

Develop your senses, especially learn how to see.
—Leonardo da Vinci

As breast surgeons, our success depends as much on accurate assessment of the aesthetic issues at hand as on technical competence. Blondeel et al. and Hall-Findlay have written extensively about the footprint, conus, and envelope as key elements for assessment and planning of breast surgery.[1–5] We believe that the bony skeleton and nipple-areola complex are also pivotal elements. We would like to present a system for the complete and efficient breast assessment of the patient and her photographs based on the mnemonic BFACE (bones, footprint, areola, conus, and envelope) (Table 1). Using the BFACE instrument, we survey the breast aesthetics literature. We also suggest an additional breast subunit, the preaxillary mound. As roughly 80 to 90 percent of patients are asymmetrical,[6,7] we will present several visualization modalities to help appreciate these asymmetries. The goal of this article is for the experienced plastic surgeon and the novice to be able to better plan surgical interventions by completing the visual examination of the breasts in a more effective and systematic manner.

BONES

The bony skeleton plays an important yet often overlooked role in the assessment of breast aesthetics. The interplay of a patient's shoulders, sternum, spine, and ribs dramatically affects perception of the breast.[1,6–11] Rohrich et al. have found that 9 percent of patients have chest wall asymmetries.[6] Pectus excavatum and carinatum exist on a spectrum of severity and influence breast placement, vector, and cleavage. A patient with a mild pectus carinatum deformity will be unpleasantly surprised after breast augmentation that the vector of her breasts and nipple-areola complexes is now obviously lateral, unless this has been discussed preoperatively. In contrast, breast implants will tend to slide medially in a pectus excavatum patient (Fig. 1). Poland syndrome may include hypoplastic ribs and soft-tissue deficiencies. Scoliosis impacts breast appearance by means of sternal and shoulder position, and is also independently associated with breast asymmetry[8] (Fig. 2). Even when the spine is aligned anatomically, many patients stand with one shoulder elevated. The breast ipsilateral to the depressed shoulder will appear to have a lower nipple-areola complex and/or inframammary fold. Further evaluation may reveal that the measured distance of the sternal notch to the nipple-areola complex or inframammary fold is actually symmetrical bilaterally[11] (Fig. 3). This patient needs to decide whether the goal should be breast mound symmetry in absolute terms or in reference to postural habits.

FOOTPRINT

The footprint is the shape of the outline of the breast as it is positioned on the chest wall and the contour of that interface.[1] Blondeel et al. articulated that the footprint is invariable after

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Table 1. Components of the BFACE Assessment

BFACE Component	Example
Bones	
Chest wall	Pectus excavatum, pectus carinatum, Poland syndrome
Spine	Scoliosis
Shoulders	Position discrepancies
Footprint	
Location	High, low
Contour	Constricted, tuberous deformity
IMF	Asymmetries
Medial and lateral cleavage	Symmastia, telemastia
Areola	
Size	Diameter, proportion to breast
Position	Asymmetries, cardinal measurements, upper-to-lower pole ratio
Vector	*x* axis, *y* axis, nipple tilt
Projection	Areolar herniation, inverted nipple, contractility
Conus	
Shape	Preoperative photographic inversion, intraoperative “strapless dress” and “contour” tests
Volume	Proportion to body, ptosis
Subunits	Quadrants, lateral chest wall, PAM
Envelope	
Qualitative	Fibrosis, striae, scars, hyperpigmentation or hypopigmentation
Quantitative	Excessive, deficient

IMF, inframammary fold; PAM, preaxillary mound.

puberty, whereas Hall-Findlay has advocated that it does change, often lowering over time.[1,12] She has also shown that breast augmentation has a limited role in raising the upper border of the breast footprint, especially because an implant concomitantly raises the upper border and drops the inframammary fold—especially with larger implants[12] (Fig. 4). This has been corroborated by Swanson.[13] This fold-lowering effect is evident even in patients in whom the inframammary fold has not been transgressed. Patients need to be aware that a mastopexy will not raise the footprint of the breast any higher than its natural anatomical location.

The inframammary fold is one of the many zones of adherence of the body and consists of skin and fascial attachments between the chest wall and the dermis and is not truly part of the breast proper.[12,14,15] It is the relatively fixed, inferior aspect of the breast footprint. Hall-Findlay feels that superior and superomedial pedicles in reduction mammaplasty can raise the inframammary fold because of resection of lower pole tissue.[5] This is further supported by Swanson in the context of vertical mastopexies.[16] The inframammary fold descends with weight gain, although this may not become obvious until after massive weight loss. This effect is more marked in the lateral portion of the inframammary fold, which also tends to descend with age.[17] Irradiated lumpectomy patients should be aware that the shrinkage of the footprint and the attendant upward shift of the inframammary fold and medialization of the cleavage may not be corrected by reconstruction (Fig. 5). Many women presenting for augmentation are often not aware of their inframammary fold asymmetries, with the right inframammary fold usually residing lower.[18] Patients should be involved in the decision as to whether the inframammary folds should be respected, as they are at risk of asymmetric upper poles, or whether the implant on the lower side should be placed somewhat higher on the chest. Lowering the higher fold, although often the most desirable option aesthetically, can be unpredictable, as once the fold has been violated, an implant may continue its descent despite attempts at fixation.[19] Adjusting a discrepancy in inframammary folds will inevitably change the distance from the inframammary fold to the nipple-areola complex. This will now alter the appearance of the position of the nipple-areola complex on the breast mound, at times creating a new asymmetry. Absolute right-to-left symmetry of the nipple-areola complexes may not be as important as harmonious placement of the nipple-areola complex within the confines of each breast. This may be a shortcoming of the techniques for breast assessment that emphasize mathematical nipple-areola complex symmetry.[20] Patients with tuberous breast deformity should be aware that the tuberous footprint is constricted, deficient vertically and horizontally, and challenging to alter.[4] The inframammary fold can be reset in expander-based reconstruction, although the surgeon should be aware that the permanent implant will sit lower than the adherent tissue expander did, especially with larger, heavier implants. This is more apparent with unilateral reconstructions. The inframammary fold can be inadvertently lowered with abdominal undermining and closure, especially in a pedicled transverse rectus abdominis myocutaneous flap because of the inherent inframammary fold disruption. This is also true but not as pronounced with microvascular autologous reconstruction and abdominoplasty.

The interface of the conus and the footprint medially and laterally defines the medial and lateral cleavages. Native cleavage distance will dictate ultimate prosthesis position (Fig. 6). The medial cleavage in a submuscular augmentation is limited by the sternal origin of the pectoralis major muscle. Narrow medial cleavage, although frequently

Fig. 1. Right pectus excavatum, best appreciated in the lateral view. Subsequent augmentation results in medialization of the prostheses.

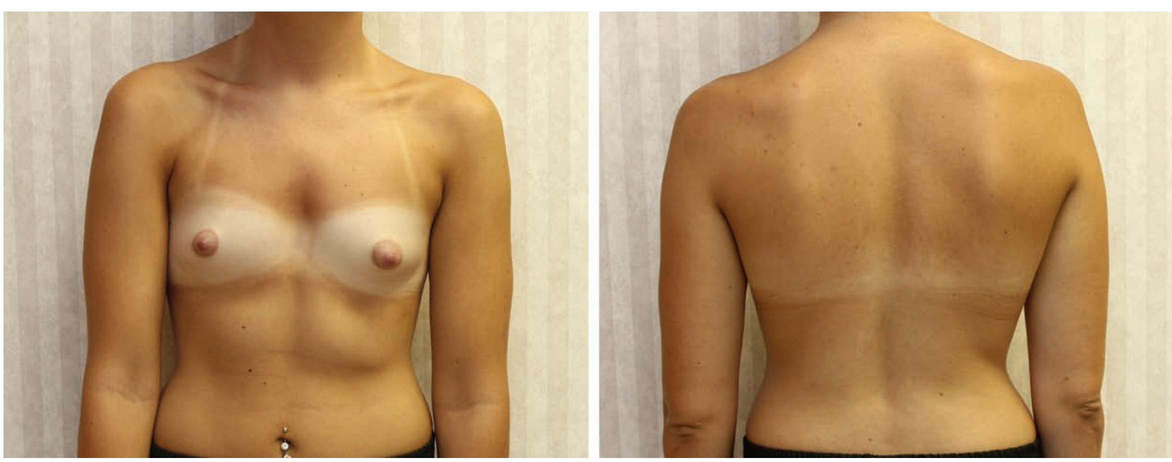

Fig. 2. Scoliosis patient, depressed left shoulder, and subsequent inferiorly displaced left inframammary fold. Note underlying breast asymmetry of the nipple-areola complex and inframammary fold.

requested by patients, is often not a characteristic of younger, denser breasts. As Hsia and Thomson note, it is not uncommon that what is portrayed by the surgeon as aesthetically pleasing may differ from the patient's perception.[21] The ideal lateral cleavage, often referred to by patients as "side cleavage," is either flush with or slightly lateral to the anterior axillary line.

Fig. 3. Discrepancies in shoulder position as evidenced by the line transecting the sternal notch will give the illusion of breast asymmetry despite equivalent sternal notch–to-nipple distances.

The view of the patient from the foot of the operating table (worm's-eye view) affords a unique and often optimal opportunity for assessing the medial and lateral cleavage, especially in prosthetic-based surgery.[22] The medial cleavage in an implant-based reconstruction will often lateralize and seem to disappear when that patient is supine, revealing telemastia, an unnatural void between breast mounds. This may be addressed by a combination of fat grafting, mobilizing the implants medially by means of a lateral capsulorrhaphy or placing prostheses with a wider base width. By the same token, apparent excessive side cleavage en face in these patients will either be a footprint that needs to be centralized or true lateral breast/chest excess that needs to be excised; this distinction can often only be made by viewing the breast from the foot of the bed. This view comes close to allowing the surgeon to appreciate the patient's perception of her own projection when looking down. It gives a unique opportunity for the surgeon to accurately select implant profile.

AREOLA

The nipple-areola complex is an important landmark and defining aspect of breast aesthetics. Its visual characteristics include size, position, projection, vector, state of contraction, and symmetry with the contralateral side. The accepted standard for areola diameter has been classically set at 38 to 45 mm with reference to the diameter of nipple sizers,[23] but a smaller areola diameter may be more appropriate in smaller breasts. The areola typically enlarges with age, weight gain, pregnancy, and ptosis. Pérez-Guisado et al. have found that reconstructive patients prefer an areola diameter of 36.5 mm, as opposed to the average preoperative diameter of 52.5 mm.[24] Swanson states that women with areolar diameters of 6.44 cm found them too large.[13] Hauben et al., analyzing 37 "normal" subjects, argue that the ideal proportion of the areola to the breast is 1:3.4.[25]

Regarding positioning, Yeslev et al. found a 95.4 rate of asymmetry in areola location among 111 women presenting for breast augmentation.[18] Tebbetts has argued that the ideal placement for the nipple-areola complex can be calculated by multiplying the base width by two-thirds with the skin on stretch.[26] This is an important and practical improvement on the classic but now archaic concepts of Penn's sternal notch–to–nipple-areola complex distance of 22 cm, Maliniac's humeral midpoint, or Lassus' projection of 2 cm below the humeral point, and is particularly useful in planning

Fig. 4. (*Left*) Abdominal nevus at the level of the patient's inframammary fold. (*Right*) After augmentation, the inframammary fold–lowering effect of the implant can be easily seen in relation to the existing nevus.

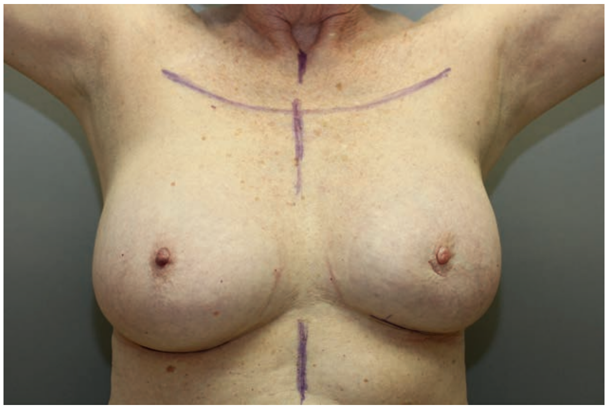

Fig. 5. Fibrotic changes and contracture after radiation therapy to the left breast, revealing a vertically and horizontally constricted footprint.

nipple placement in mastopexy.[27–29] Nonetheless, measuring ideal nipple position in a breast reduction using Tebbetts' technique[26] can be physically cumbersome and may place a high nipple-areola complex in a wide breast. In this situation, positioning the nipple-areola complex at the projected level of the inframammary fold (Pitanguy's point) onto the face of the breast is a classic, practical, and reliable technique.[30] If Tebbetts delineated the ideal height of the nipple, or *x* axis, Fabié et al. looked at the longitudinal, or *y* axis, by defining the ideal vector to be an angle of 38 degrees from the suprasternal notch to the nipple-areola complex.[26,31] It has classically been described as being on the breast meridian dropped from the midclavicular point. Swanson feels strongly that the most important predictor of nipple location is at the point of maximal breast projection, as described by Wise.[13,32]

Mallucci and Branford have convincingly argued that the ideal breast has an upper-to-lower pole volume ratio of 45:55,[33,34] with the nipple-areola complex being the determinant break point between the upper and lower poles. They further argue that the nipple-areola complex vector should ideally point superiorly at an angle of 20 degrees.[33] This concept is not universal in that a skyward tilt of the nipple can reflect implant bottoming-out and/or pseudoptosis following reduction.[35,36] It is important to note that although it may be ideal for 55 percent of the volume of the breast to lie below the nipple-areola complex, a nipple-areola complex visually above the breast equator is not often found in nature and can be an aesthetic shortcoming of both vertical mastopexy and reduction techniques and overly large breast augmentations. The nipple should ideally accentuate the apical projection of the breast.[13,35]

The nipple-areola complex in a tubular breast deformity is well known to be pseudoherniated[4] and excessively projecting, but this deformity can also occur in isolation in patients without any other stigmata of tuberous deformity. Again, this anomaly may be accentuated by breast augmentation, especially in the early postoperative period, when the breast is edematous. Finally, the surgeon should be cognizant of the fact that the nipple-areola complex is not a static landmark. A contracted nipple-areola complex can give an inaccurate impression of the true breast appearance. With the above parameters in mind, ideal nipple proportions and placement can be planned, and dissonant nipple-areola appearance and placement can be analyzed and possibly ameliorated.

CONUS

The most complex concept of the breast assessment is the conus, which encompasses the

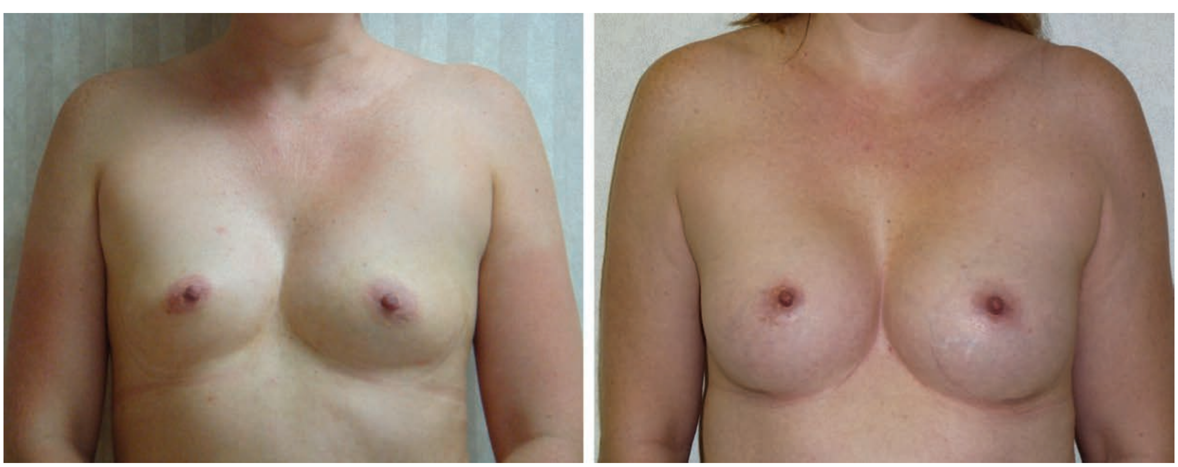

Fig. 6. Preexisting medially oriented breasts will influence final implant position.

shape, volume, and projection of the breast. Once again, the conus was first described by Blondeel et al.[1] and then expanded on by Hall-Findlay.[12] We have found that accurately assessing the conus is facilitated by examining all or part of the breast out of context. As Burget and Menick stated in their influential article on aesthetic perception and the subunit principle, "Perception is an active process, involving selection, … motivation and expectation significantly affect how we organize this input. We see what we expect to see."[37] A powerful tool borrowed from the realm of the visual arts is to invert the preoperative photographs[38,39] (Fig. 7). By taking the breasts out of context, preconceived ideas of what is present are eliminated; the shapes alone can be analyzed and symmetry assessed in a more objective manner. When viewing photographs, a blank sheet of paper can also be placed on the image and progressively lowered to highlight asymmetries that are otherwise not apparent.

In the operating room, we often see better using two modalities. In the "strapless dress test," the patient is flexed to a seated position and the lower two-thirds of the breasts are covered with a sterile towel to isolate the upper breast and cleavage (Fig. 8). This allows for isolated assessment of the portion of the breasts that is often visible in clothes. The "contour test" (D. P. Luppens, M.D., oral communication, September of 2014) involves covering both breasts with a wet paper drape (often included in the packaging of a surgical gown), again with the patient in the seated position. The wet paper shows the contours distinctly by eliminating the distraction of the nipple-areola complexes and skin shadows.

With regard to volume, it is commonly held that an aesthetic conus is proportional to the body, but this concept is subjective and variable from culture to culture and over time. Mallucci and Branford noted that the shape of the upper 45 percent of the breast is linear or slightly concave, whereas the lower 55 percent is ideally convex, a concept that is the basis for "anatomical" breast prostheses.[33] It should be noted, however, that many patients prefer a more rounded upper pole. In general, an attractive breast has minimal tissue below the inframammary fold. There are many systems of ptosis classification that have been reviewed comprehensively by Shiffman.[40] Kirwan has also presented his own system of ptosis assessment, and Regnault's classification of ptosis, based on nipple and gland position relative to the inframammary fold, persists because of its simplicity.[41,42] Others prefer a more mathematical approach.

The subunit concept is well known to plastic surgeons and was first described by Burget and Menick in reference to nasal reconstruction.[37] Restifo first extended the concept to the breast,[43] and it has been adopted by others.[44–47] Unfortunately, there has not been unanimity in defining breast subunits. For simplicity, we will divide the breast into traditional quadrants. Using the quadrant system, Bailey et al. have found that the upper inner quadrant is most important aesthetically to women.[45] Brown et al. note that with weight gain or progressive ptosis, the lower lateral subunit is the one that enlarges and descends the most.[17] Bar-Meir et al. proposed a fifth breast subunit, "the lateral chest wall."[46] Gill et al. referred to this area as the "transverse subaxillary roll."[47] This is of paramount importance in breast reduction and massive weight loss patients. It is a constant area of concern in mastectomy patients in whom the triad of lateral breast anesthesia, occasional anesthesia

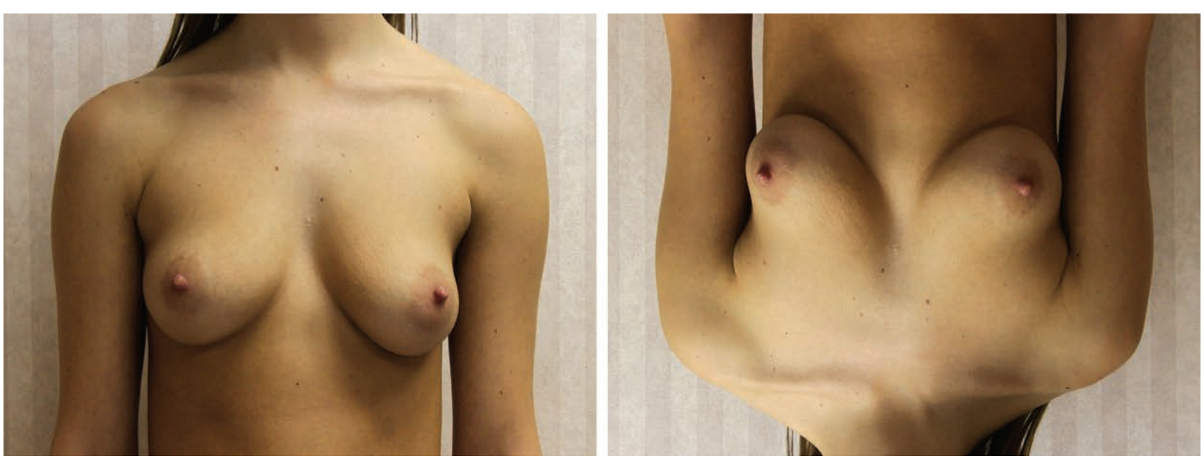

Fig. 7. Photographic inversion allows the surgeon to best appreciate conus and footprint subtleties.

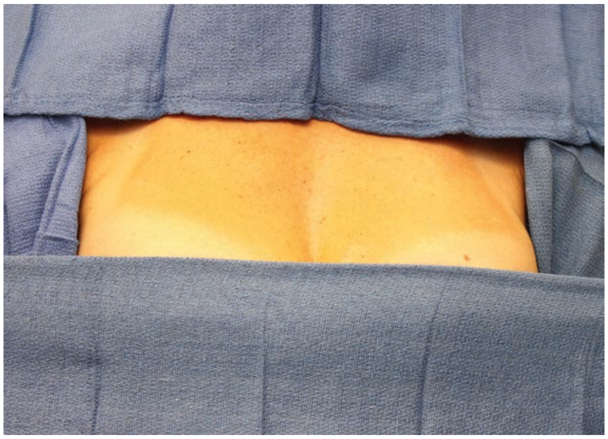

Fig. 8. The strapless dress test highlights the upper pole contour and cleavage.

of the inner arm from axillary node removal, and true skin/soft-tissue excess often conspire to create perceived fullness out of proportion to actual findings.

We would like to propose a sixth subunit, the preaxillary mound (PAM). This is fibrofatty tissue anterior to the axilla on the chest wall and distinct from the tail of Spence, which is always contiguous with the breast. The preaxillary mound is not unique to any particular body habitus, as it is seen in both obese and slender patients (Fig. 9). Although this tissue is not always visually connected to the breast proper, its presence impacts breast aesthetics. It can be addressed by liposuction alone or direct excision in conjunction with other procedures. In our experience, there is often a dermal fascial attachment inferior to the preaxillary mound creating an unsightly crease that may exacerbate the appearance of tissue protuberance. We recommend direct release of this dermal attachment in open procedures and needle or fork cannula aponeurotomy during suction-assisted lipectomy. The presence of a prosthesis, especially in breast reconstruction, can often exacerbate its appearance by pushing the preaxillary mound superiorly and into a location where it is more evident in and out of clothing.

ENVELOPE

The skin envelope should be evaluated qualitatively by visual examination and quantitatively by measurement.[48–50] The presence of striae is an obvious indication of loss of skin elasticity. Stretched, inelastic skin is often coupled with fatty, less glandular breast tissue and is therefore a predictor of form maintenance after breast reshaping procedures such as mastopexy and reduction. Radiation changes, with their attendant fibrosis and shrinkage of the skin envelope, hyperpigmentation, and poor wound healing capacity, should be noted. The presence and quality of scars are critical in terms of predicting future blood flow and the aesthetics of future scars. Often overlooked in breast reconstruction, mastectomy scars will often impact breast reconstruction shape because of the inherent contractile nature of scars. Asymmetric mastectomy scars will often lead to discordant breast mound shape because of the forces of contraction (Fig. 10). The relative skin excess inferiorly and medially to the nipple-areola complex in nipple-sparing mastectomies translates into the need to intentionally fix the nipple inferiorly and medially so it will not gravitate superolaterally (Fig. 11). A less

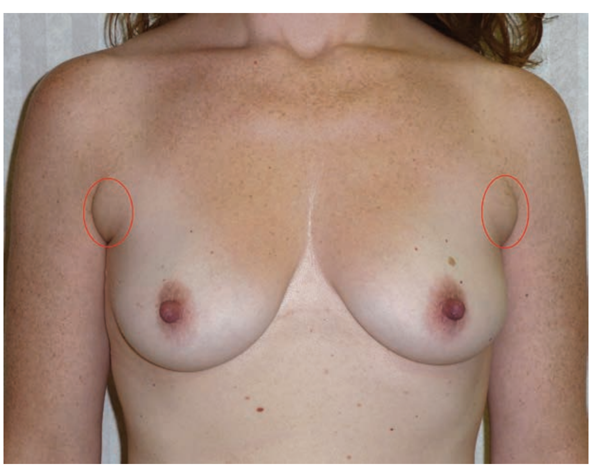

Fig. 9. A preaxillary mound (PAM), fibrofatty tissue anterior to the axilla, is not exclusive to the obese and can be seen in slender patients.

Fig. 10. Mastectomy scar placement impacts breast mound contour.

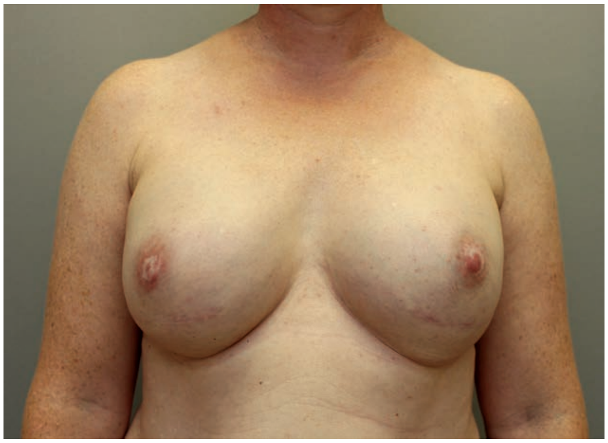

Fig. 11. Superolateral displacement of the nipple-areola complex is a common sequela of nipple-sparing mastectomy and requires operative planning to fixate the nipple-areola complex more accurately.

projecting tissue expander is often preferable in nipple-sparing mastectomies because a more projecting expander will stretch this already excessive lower pole skin further and raise the nipple-areola complex to an even higher, unnatural location. Skin deficiencies, especially of the lower pole, as in tuberous breast deformities, will greatly impact the success of breast augmentation.[51] When evaluating a patient for breast augmentation, a deflated and excessive skin envelope may require a larger implant and/or mastopexy.

CONCLUSIONS

Successful breast surgery is as dependent on an accurate assessment of anatomy as it is reliant on a mastery of technical skills. We have presented a brief synopsis of the breast aesthetics literature and the mnemonic BFACE to assist the experienced and the novice surgeon in surgical planning. A sixth breast subunit, the preaxillary mound, whose consideration contributes to overall aesthetic harmony, is proposed. We have reviewed several viewing techniques of the patient on the operating table and her photographs to help assess asymmetries. Photographic inversion, borrowed from the visual arts, is suggested. Armed with these concepts and tools, the plastic surgeon can better analyze breast anatomy, improve patient education, and plan surgery more accurately. Ultimately, our patients will benefit if we can learn to see more clearly.

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