2 A Measurement System and Ideal Breast Shape

Abstract

Evaluation of changes in breast shape, including upper pole fullness, breast projection, and bottoming out, has been limited by a lack of an accepted definition of these entities and no standardized system for measurements. One-dimensional methods (e.g., tape measurements) are too simple and three-dimensional imaging is too complicated for general use. The nipple is not a suitable marker for measuring glandular ptosis because its position may not align with the level of the breast gland.

A practical two-dimensional measurement system provides plastic surgeons with a means to measure their results. This system is based on a horizontal plane drawn at the level of maximum postoperative breast projection. Standardized before-and-after frontal and lateral photographs are compared. Breast projection, upper pole projection, lower pole level, nipple level, lower pole width, breast area, and areola diameter are measured. The breast parenchymal ratio, convexity, breast mound elevation, lower pole ratio, and nipple displacement may be calculated from these simple measurements.

Patients prefer convexity and a breast shape that is fuller on the top than on the bottom. The nipple should be located at the level of maximum breast projection. Areola diameters <5 cm are preferred. A semicircular lower pole contour is ideal. Lower pole ratios (lower pole width/lower pole length) greater than 2 appear boxy. Such ratios are typically produced by Wise pattern mammaplasties, which trade projection for width. In a ptotic or hypertrophic breast, the breast takes on an elliptical shape. Ideally this shape is reduced to a semicircle after an effective mastopexy. The three-dimensional shape of the ideal lower pole is a sphere that is flattened in the anteroposterior dimension, called an oblate spheroid, which is also the shape of a round (non-form-stable) saline or silicone gel breast implant.

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The Need for a Measurement System

In all areas of medicine, measurements are needed to evaluate the effects of treatment. In cardiology, an electrocardiogram has served as a valuable measurement device for decades. Even abstract qualities such as intelligence may be measured using a number of instruments, including IQ tests. Unfortunately, breast surgery has long been viewed as an art more than a science [1]. Plastic surgeons have not been in the habit of measuring their results. Regrettably, it is possible, even in 2017, for a plastic surgeon to attend a full day of breast surgery presentations without viewing any measurements on standardized photographs. Instead, surgeons show plenty of before-and-after photographs and discuss their clinical impressions. It has been said that clinical impressions are "what is left in the chair after you get up." [2] Without measurements, cosmetic breast surgery has lagged in its development. This is particularly true in breast lift procedures, which are discussed in Chaps. 6 and 7.

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Measurements used in the past have been largely one-dimensional, such as the distance from the sternal notch to the nipple, or the distance from the nipple to the inframammary fold. One-dimensional measurements are inadequate in providing the needed parameters to evaluate change in breast shape. With advances in imaging and computer software, three-dimensional systems have been developed. Three-dimensional imaging is assumed to represent the future of breast measurements. However, there are problems that have not yet been solved, including the need for a virtual chest wall template.

Aside from lack of a standard measurement system, cosmetic breast surgery has suffered from a lack of a practical definition of breast parameters, such as upper pole fullness, breast projection, and bottoming out. What do these terms mean? A definition of terms is needed.

Nipple Position Versus Glandular Position

In 1976, a surgeon from Montreal, Paule Regnault, provided a classification system for breast ptosis [3]. Her classification linked the level of the nipple to the inframammary fold. First-degree ptosis was really no ptosis. The nipple was at or above the level of this fold. In second-degree ptosis the nipple was below it, and in third-degree ptosis the nipple was down-pointing. The concept of linking nipple and glandular position to evaluate breast ptosis is also used by Mallucci and Branford in their 45:55 breast ratio [4]. Eyck et al. [5] incorporate the Regnault classification in their Rainbow scale. The central problem with this method is that glandular sagging and nipple position are two different entities. The combination of ptotic breasts and high nipples, called pseudoptosis, is really nipple overelevation, which is caused by the Wise pattern mammaplasty, the dominant method used in North American since the 1970s. Two parameters are needed – a description of glandular level and a description of nipple level – without linking the two.

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Standardized Photographs

Gillies, one of the fathers of plastic surgery, reportedly once said that photography was the most important advance in the history of plastic surgery [6]. One can only imagine trying to judge surgical techniques before photographs were available. We need photographs because they represent the truth without relying on the surgeon's clinical impression. It only makes sense to standardize photographs. It would make no sense, for example, to take an after photograph much closer to the patient than the before photograph because such a maneuver would unfairly appear to enlarge the result. Similarly it would be unfair to have the patient tilt her chest after surgery to simulate a lift effect. Yet these maneuvers are done routinely and are discussed in detail in Chap. 5.

Zarem [7], in 1984, discussed the importance of standardized photographs. DiBernardo [8] provided guidelines in 1999. Unfortunately, these standards are still widely disregarded at meetings and in the literature [9]. Using the electrocardiogram analogy, this practice would be akin to changing the polarity of the EKG or the time scale on the printout. Such alterations would be regarded as unethical or even malpractice, yet they are tolerated in cosmetic breast surgery. Simply by insisting on standardized photographs, our journals would improve the quality of publications overnight. The number of publications with flawed methods would diminish as investigators learn for themselves the shortcomings of their methods. Plastic surgeons would learn that a breast augmentation does not elevate the nipple [10]. Proponents of the pectoralis muscle loop in mammaplasty would learn that this tunneling method does not really create upper pole fullness after all [11].

A number of points are essential when taking photographs. The focal distance needs to be constant. For this reason a fixed focal length is preferred. To maintain consistency, I have used the same Nikon 60 mm lens for breast and body photographs since I started practice in 1989, simply switching it from an analog camera to a digital camera in about 2000. The same poses are needed and the same arm positions. The chest should not be overly cropped. Care should be taken so that the patient is not tilted. A constant blue background and identical lighting are used. Shadows are avoided by using at least two light sources. A tape on the floor ensures that patients stand in the same place, in the same room.

Two-Dimensional Breast Measurements

In order to study my own patients, and to evaluate published results, I developed a new measurement system and definition of terms, first presented at the 2008 meeting of the American Society of Plastic Surgeons [12] and published in *Plastic and Reconstructive Surgery* in 2012 [13]. I have used this system to study published breast surgery articles [14] and to study my own patients [15–17]. The system turned out to be practical and reproducible. Now I had a benchmark to use to evaluate the results of others and myself. Graf [18] called it an "excellent measurement methodology" and an "important step in objectively evaluating results in breast surgery, especially at a time when there is increasing demand for evidence-based medicine." Hall-Findlay [19], in her discussion, wrote "If more of us use this type of measurement system, we can provide more 'science' to the 'art' of plastic surgery." Nevertheless, this method has not gained widespread acceptance. One lecturer at an instructional course said that if he had to perform all those measurements, he would vomit (I believe he was exaggerating). At a recent meeting, a long-retired plastic surgeon commented to me, "With all those measurements, Dr. Swanson, it's a wonder you find time to operate." The irony is that I perform my breast surgery without making any of these measurements. These measurements are made later, to evaluate before-and-after photographs, at a time of my choosing, on weekends, for example. I have found no better way to evaluate my results. Only outcome studies (i.e., soliciting my patient's opinion, not my own) rival their value.

Computer Software

Even with strict attention to focal distances and body positions, it is impossible to exactly match photographs. A difference of a few percentage points in focal distance, or a slight change in posture, can make a difference. Hence the need for computer-assisted photographic matching.

Almost all plastic surgeons own a computerized photographic archival system to store digital photographs. Canfield Scientific (Fairfield, N.J.) and other companies offer computer software to facilitate image matching. Using a cursor, two fixed landmarks are selected and the software then matches the images for size and, just as importantly, orientation. The landmarks are typically surface skin lesions (outside the surgical area) or bony references such as the sternal notch – landmarks that are unlikely to change position after surgery. Obviously, landmarks on the breasts are avoided. Photographs are calibrated by taking a photograph of the patient holding a ruler, eliminating a need for using pixel counts. Frontal and lateral images are matched [13]. Oblique photographs are not used for measurements because they are often rotated slightly and there is no method to correct for different degrees of rotation.

Lateral Views

The key to my measurement system is incorporation of a horizontal and vertical reference plane. The nipple level is not suitable because its level may or may not correlate with the level of the breast mound. Using the nipple as the reference plane was a limitation of the Regnault classification and recent updates, as discussed above.

The inframammary fold level is known to change after surgery [20], so it cannot be used either. A horizontal plane drawn at the level of maximum *postoperative* breast projection (MPost) provides an ideal reference plane (Fig. 2.1). This plane works, of course, only if both before and after photographs are available. This requirement is easily met because such comparisons are needed anyway in evaluating the effect of treatment or even no treatment. This line is easy to draw. The computer automatically makes it perfectly horizontal. It is just a matter of placing the reference line at the level of maximum breast projection, which is easy to eyeball. Next, another horizontal plane is drawn at the level of the sternal notch. This bony landmark was selected because it does not change after surgery. Its level is easy to assess on the frontal photographs. Its level is more difficult to gauge on lateral photographs. However, even if this level is labeled a little high or a little low, it is not a problem as long as the same plane is being used for comparison. A third horizontal line bisects these two. Next, a vertical line, the "posterior breast margin," is dropped at the level of the sternal notch (indicated by the higher horizontal plane). These planes serve as the grid on which measurements are then made.

The distance along MPost to the leading edge of the breast is the "breast projection." The distance along the bisecting plane to the edge of the breast is the "upper pole projection." This plane also provides a reference plane for the nipple level. Ideally, the nipple is situated at this level. Nipple displacement is defined as the vertical distance between the nipple and this plane. A positive displacement is one in which the nipple is lower than this plane; a negative displacement is caused by nipple overelevation.

The lower pole level is the vertical distance from the most inferior point of the breast to the MPost plane. Changes in the lower pole level measure the effectiveness of techniques intended to correct breast sagging (glandular ptosis). This level is preferable to the inframammary fold for several reasons. First, the lower pole level is the level that the patient sees when she looks in the mirror. Second, the inframammary fold tends to be hidden, particularly in women with ptosis. Third, the inframammary fold level can change after surgery, making it an unreliable landmark [20].

Some other measurements, calculated using these reference planes, are useful. Area calculations can also be made using the Canfield system and a cursor. The dividing plane is again the MPost plane. The ratio of the upper pole area to the lower pole area (the breast area above and below the MPost plane) is the breast parenchymal ratio (BPR). Higher ratios reflect a more "perky" appearance, preferred by most women [21]. Lower ratios appear more "bottomed out." The term "ptosis" is not used in this system so as to avoid confusion with the Regnault classification [3].

The vertical distance between the preoperative (MPre) and postoperative planes (MPost) of maximum projection yields "breast mound elevation." This is a useful measurement because it assesses the degree of upward movement of the gland itself, revealing the effectiveness (or lack of effectiveness) of a mammaplasty.

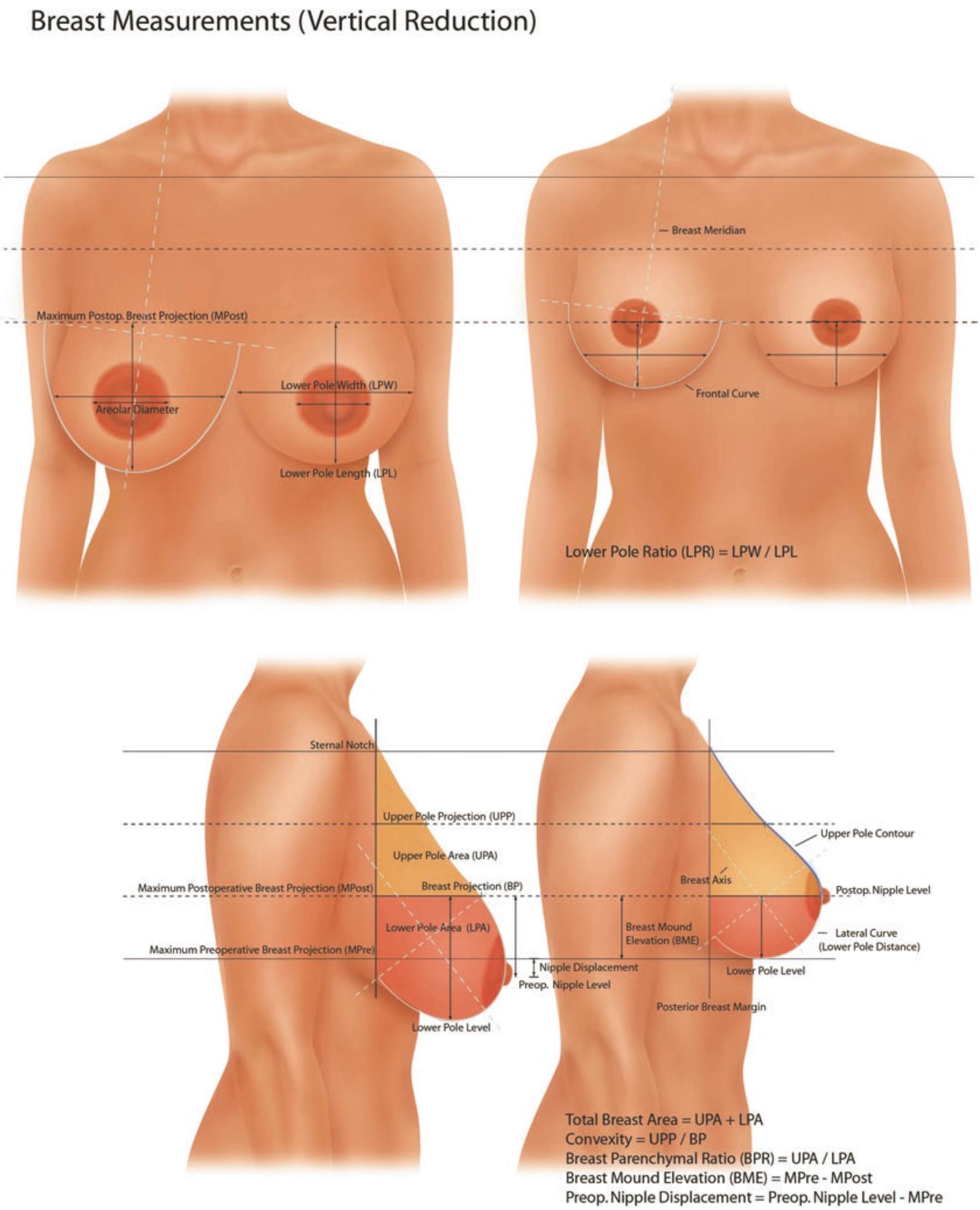

Fig. 2.1 Measurements and definitions. (*Left*) Preoperative and (*right*) postoperative illustrations depicting a vertical breast reduction. The nipple level is appropriately situated at the level of maximum breast projection. (*Above*) The breast meridian bisects the breast and courses obliquely to the junction of the neck and shoulder. Ideally, the shape of the lower pole changes from a semi-ellipse (scalene ellipsoid in three dimensions) to a semicircle (oblate spheroid in three dimensions) after surgery. There is a modest increment in breast projection and upper pole projection (Reprinted from Swanson [13]. With permission from Wolters Kluwer Health)

The upper pole contour may be linear, concave, convex, or ogee shaped (S-shaped). These are qualitative assessments. The ratio of upper pole projection to breast projection is called “convexity” and is a useful parameter to evaluate upper pole fullness. Finally, the “lower pole distance” may be measured. This parameter is less useful than the others, but can be evaluated to determine the degree of constriction of the lower pole. This is relevant to a comparison of vertical and Wise pattern mastopexies. The Wise pattern is more likely to constrict the lower pole, especially if the vertical limb is limited to 5 cm, as is commonly done.

Frontal Views

The width of the breast halfway between the MPost plane and its lower pole level on the frontal view is labeled “lower pole width.” The lower pole length is simply the distance between the MPost plane and the lowermost point on the breast (same as lower pole level on lateral view). The “lower pole ratio,” representing lower pole width/lower pole length, gauges the boxiness of the lower pole. The frontal view also allows measurement of the areola diameter. Frontal and lateral measurements on a typical breast augmentation patient are illustrated in Figs. 2.2 and 2.3.

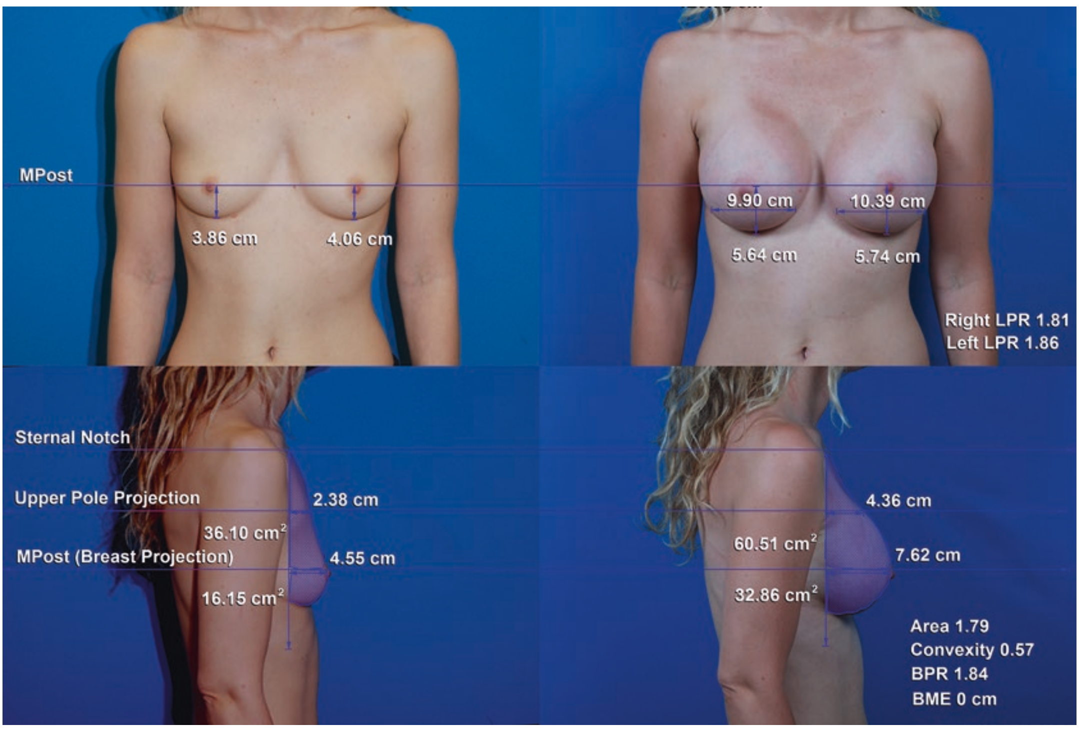

Fig. 2.2 This 30-year-old nulliparous woman is shown before (*left*) and 3 months after (*right*) a submuscular breast augmentation using smooth, round, moderate plus profile saline implants (Mentor Corp., Santa Barbara, Calif.) inflated to 450 cc. Upper and lower pole breast areas (*shaded*) are measured above and below the plane of maximum breast projection. Lower pole ratios less than 2.0 indicate a nonboxy shape. The total breast area is increased 79%. After surgery, the upper pole profile is convex. The postoperative breast parenchymal ratio is 1.84. Photographs are matched for size and orientation using the Mirror 7.1.1 imaging software (Canfield Scientific, Fairfield, N.J.). *MPost* maximum postoperative breast projection, *LPR* lower pole ratio, *BPR* breast parenchymal ratio, *BME* breast mound elevation

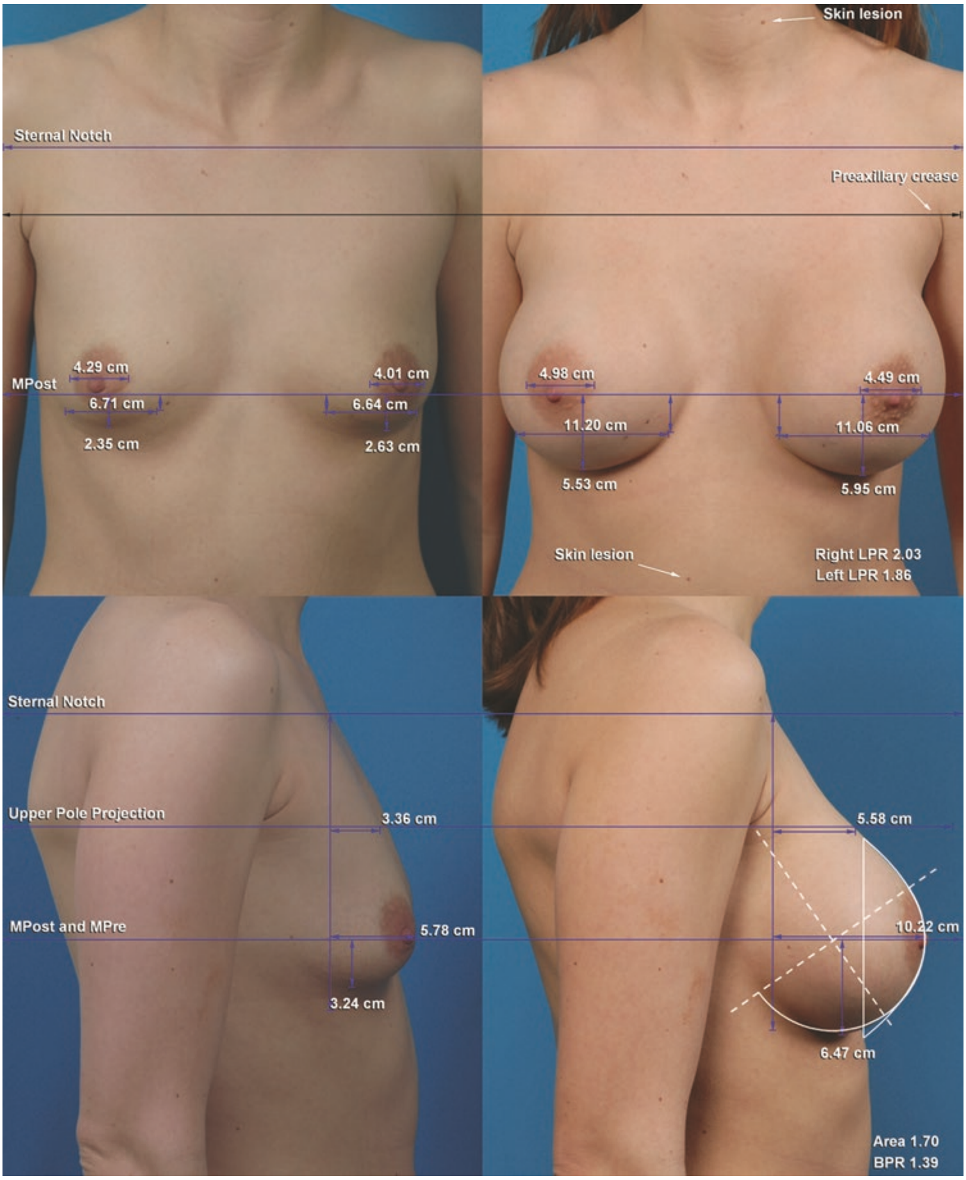

Fig. 2.3 Orientation-matched views obtained (*left*) preoperatively and (*right*) 9.4 months postoperatively of a 27-year-old breast augmentation patient treated with Mentor smooth, round, moderate plus profile saline-filled implants (Mentor Corp., Santa Barbara, Calif.) inflated to 360 cc. (*Above, right*) Although the images are standardized and matched (note the unchanged positions of skin lesions of the neck and lower abdomen), soft-tissue landmarks have changed. The shoulders and the upper extent of the preaxillary creases are lower in the postoperative frontal photograph. (*Below, right*) The lateral view shows an increase in breast projection of 4.4 cm and an increase in upper pole projection of 2.2 cm. The lower pole level drops 3.2 cm. Total breast area increases 70%. After surgery, the upper pole contour changes from linear to parabolic. The semicircular outline of the lower pole is evident. The inframammary fold is lower after surgery. The nipple level and breast mound level (maximum postoperative breast projection – maximum preoperative breast projection) are unchanged. *MPost* maximum postoperative breast projection, *MPre* maximum preoperative breast projection, *LPR* lower pole ratio, *BPR*, breast parenchymal ratio (Reprinted from Swanson [13]. With permission from Wolters Kluwer Health)

Breast References

Upper pole fullness and breast projection are discussed regularly, but have not been rigorously defined. The distance from the chest wall to the nipple [22] has been used to measure the "ideal" breast [23], but this measurement is impractical for ptotic breasts. One problem is the determination of a suitable reference plane. Breast "projection" loses its meaning if the projection is at the level of the abdomen, which may well be the case in a large ptotic breast. Furthermore, nipple position may or may not coincide with the level of the breast mound, a shortcoming of the Regnault classification [3], which does not quantify upper/lower breast proportions or the degree of descent of breast tissue.

Identifying where the breast stops and the chest wall starts has been another source of frustration for investigators. The one-dimensional system used by Mallucci and Branford [4] is weakened by the subjectivity in determining the upper margin of the breast. Most three-dimensional measurement systems share this problem. Unlike the lower extent of the breast, which is defined by the lower pole level, the upper pole level is not well defined. The sternal notch serves as a useful landmark because it is static. It is not meant to reflect a breast border. Indeed, the sternal notch level is located well above the upper margin of the breast. Consequently, the level of upper pole projection is not measured halfway up the breast, but rather just below the upper border of the breast.

Importantly, this system eliminates the chest wall as a reference. The chest wall contribution does not change postoperatively and does not affect comparisons of measurements. Any lateral breast tissue that falls behind the posterior breast margin is not clinically meaningful. This is a major advantage over three-dimensional systems that must somehow assign a dividing plane between the breast and the chest wall. A virtual chest wall template is created, introducing guesswork. Only radiological imaging such as an MRI, CT scan, or possibly ultrasound could reliably define this border. It is much better to simply eliminate the need for its determination.

> The chest wall contribution does not change postoperatively and does not affect comparisons of measurements.

The frontal measurements provide a means to assess boxiness of the lower pole, a frequent criticism of the inferior pedicle inverted-T technique [24–28]. Previously, there has been no measurement to assess the shape of the lower pole, so that these observations could not be objectively evaluated.

Measuring Breast Volume

Although there are techniques for measuring breast volume, they are inaccurate and cumbersome, involving water or air displacement [29, 30], plaster molds [31], adjustable measuring cones [23, 32], and mammograms [33]. Stereo photography has been used [34]. Investigators have used laser scanners and cameras with sophisticated software to produce three-dimensional reconstructions [35–42]. In addition to the additional expense and complexity, there are substantial practical limitations to three-dimensional photography. One is the need for a virtual chest wall template. Other problems include the subjectivity involved in assigning landmarks, introducing variability and error. It can be difficult to image the underside of the breast [41, 42], especially in large and ptotic breasts [37, 38]. Small discrepancies in assigning margins can produce large variations in volume calculations [38].

Previous studies have often involved tedious or complicated measurements. One study used 21 tape measurements on each breast, plus volume measurements using adjustable measuring cones [23]. Three-dimensional computer reconstructions [35–42] can be highly technical, making them difficult for the average plastic surgeon to understand, let alone use in practice. None of these techniques has found general acceptance and – perhaps the real test of any system – none has been used to compare different techniques and aesthetic results.

Advantages of a Two-Dimensional Reference System

Interestingly, measurements of breast projection, lower pole level, breast mound elevation, and parenchymal distribution (analogous to the breast parenchymal ratio) obtained from three-dimensional analysis [39] can all be rendered using two-dimensional imaging. Even in cases of asymmetry, volume measurements are not usually necessary; a two-dimensional comparison of breast area serves effectively to compare sizes. The change in size and proportions is important for shape analysis, not the absolute volume of the breast. Because the contribution of the chest wall does not affect comparisons, there is no need for creation of a virtual chest wall template, which is a complicated software application that introduces the potential for error. Shadowing of the inframammary area is not a limitation, making the lower pole amenable to shape analysis.

> The change in size and proportions is important for shape analysis, not the absolute volume of the breast.

Einstein famously commented that "everything should be made as simple as possible, but not too simple." One-dimensional measurements such as those used by Westreich [23] are too tedious, involve too much reading error, take too long to do on patients, and are hopelessly archaic in the computer age. Three-dimensional renderings are always touted as the measurement system of the future, but are still complicated. By analogy, sophisticated three-dimensional renderings of the electrical activity of the heart are available. However, these methods do not replace the utility of a two-dimensional EKG, used by cardiologists for decades and still the standard. A two-dimensional system offers a Goldilocks option, not too simple and not too complex. All relevant breast shape parameters are available. A major practical advantage is the ability to apply this system to existing lateral and frontal photographs. Retrospective studies are possible. Published photographs can be matched and evaluated. Any new claim of breast autoaugmentation can be tested (See Chap. 5).

This system is applicable to the whole spectrum of cosmetic breast surgery – breast augmentation, mastopexy, reduction, and combinations. It takes only 1 min to take the photographs. There is no need for an expensive or complicated photographic setup. Measurements may be made later on the computer. This means there is no added patient embarrassment or time commitment. As a result, patient acceptance is virtually 100%. Institutional Review Boards are likely to grant approvals or waivers for retrospective or prospective studies because there is no potentially harmful intervention and patient privacy may be maintained.

Only six breast measurements are needed, made on ordinary frontal and lateral photographs. The only hard part is matching the photographs, but this job is greatly facilitated by imaging software. It is interesting to reflect on the fact that such measurements could have been made decades ago, but it would have been much more tedious to line up the photographs and make subtle enlargements or reductions, for example, on a photocopier.

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It is difficult to conceive of a system any simpler (in reference to Einstein's quote), because photographic standardization and matching is needed regardless of the type of measurement system that is used. This system also assists in better defining the characteristics of ideal breast shape, as discussed below.

Breast Dimensions

Only six dimensions are needed to provide an accurate representation of breast shape. The curved lines connecting these points are not arbitrary, or subject to artistic interpretation, but conform to natural (governed by the laws of physics) semicircular and elliptical shapes that are defined with a minimum of two points and an axis (Fig. 2.1). No longer is it necessary to make 21 measurements (a disincentive for even the most patient surgeon) [23]. The six requisite measurements are:

1. Breast projection
2. Upper pole projection
3. Lower pole level
4. Nipple level
5. Lower pole length
6. Lower pole width

On the frontal view, once the lower pole length and width are plotted, and the breast meridian is drawn, the semicircular (ideal) or elliptical (preoperative) contour of the breast outline may be constructed. Similarly, on the lateral view, once the breast projection and lower pole level are known, the breast outline may be drawn, aligned along the axis of the breast (Fig. 2.1). Illustrations based on these measurements ("mammographs") allow comparison of breast shapes using different surgical techniques [14–17]. These mammographs are featured in each of the chapters (Chaps. 3, 6, 7, and 8) and provide valuable measurement-based visual aids.

The nipple should be located at the level of maximum breast projection [23]. Some traditional measurements are not needed to define breast shape. The sternal-notch-to-nipple distance is affected by the length of the torso and is not relevant to breast aesthetics [30]. The level of the inframammary fold is difficult to judge, hidden behind the breast, and is subject to considerable error when translated to the front of the breast [18, 43]. Its level is subject to change, either elevation in a vertical mastopexy [20] or lowering in a breast augmentation (Figs. 2.2 and 2.3) [20, 44], so that it cannot be used as a reliable reference plane. The distance from the areolar border to the inframammary fold may be longer than the traditional 5 cm, particularly in vertical procedures [45, 46]. Because of these limitations, one-dimensional measurements made with a tape measure [23, 44] do not provide sufficient reference data to render breast shape.

Ideal Breast Shape

In discussing ideal breast shape, patient satisfaction should be the relevant criterion, not the natural breast shape [47]. The normal breast may contain greater volume in the lower pole than the upper pole [48, 49], and the lateral profile of the upper pole may be linear or slightly concave [48], but normality is not the objective. Patients prefer convexity [21] and a breast shape that is fuller on the top than on the bottom, a finding that is hardly surprising in view of the purpose of bras. A breast parenchymal ratio of 1.5 or more, the reverse of the existing ratio in patients who present with large ptotic breasts [15], is desirable. An areolar diameter of 3.5 to 4.5 cm is considered attractive [49]. Areolar diameters <5 cm are preferred by patients [15, 50]. Women who have had breast implants tend to report very high levels of satisfaction [47]. The breast shape of such a patient serves as a useful guide in evaluating characteristics of a desirable breast shape (Figs. 2.2 and 2.3).

> Patients prefer convexity and a breast shape that is fuller on the top than on the bottom, a finding that is hardly surprising in view of the purpose of bras.

Surprisingly, few existing guidelines describe ideal or even normal breast shape. The normal breast has been described as spherical [51], hemispheric [49, 52, 53], conical [23, 52, 54–57], teardrop [23], dome shaped [58], and paraboloid [59]. However, these descriptions are overly simplified. Breast shape is first considered in two dimensions.

Frontal View

Ideally, when the patient stands and the breast settles, the "frontal curve" settles into a semicircle (Figs. 2.2 and 2.3).

A semicircle, the cross-section of a hemisphere, has a lower pole ratio of 1.73 (calculated using the Pythagorean theorem). Boxy lower poles are not

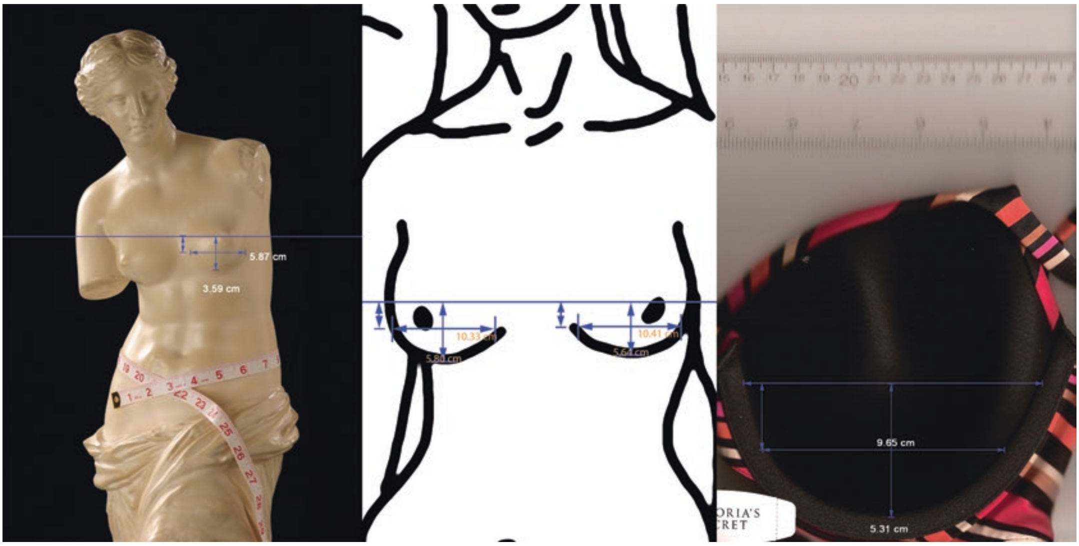

Fig. 2.4 Examples of lower pole ratios (lower pole width/lower pole length). (*Left*) The Venus de Milo statue has a left breast LPR of about 1.6. (*Center*) The female figure on the *Pioneer 10* spacecraft has an LPR of 1.8. (*Right*) The most popular Victoria's Secret (Victoria's Secret Co., Columbus, Oh.) bra, Style 1816, 34C, incorporates an LPR of 1.8

to be found in art, science [60], or contemporary culture. A ratio approaching that of a semicircle is desirable. Values much greater than 2.0 appear boxy. The left breast of the Venus de Milo statue (on the cover of every issue of *Plastic and Reconstructive Surgery*) has a lower pole ratio of 1.6. The female figure on the *Pioneer 10* spacecraft has a lower pole ratio of 1.8 [60]. The popular Victoria's Secret (Victoria's Secret Co., Columbus, Oh.) bra, Style 1816, 34C, also incorporates a lower pole ratio of 1.8 (Fig. 2.4) [13].

> Boxy lower poles are not to be found in art, science, or contemporary culture.

Lateral View

The contour of the upper pole of the breast, from the takeoff on the upper chest wall to the point of maximum breast projection, is ideally slightly convex [23, 43]. A linear or ogee-shaped upper pole contour (Fig. 2.1) is commonly found in patients presenting for a mastopexy or breast reduction [15].

The lateral profile of the lower pole ("lateral curve") is partly circular, for at least a quarter-circle, from the point of maximum breast projection to the lowest point on the breast. The lower pole level is the same as the level of the inframammary crease in an immature or hypoplastic breast; the circular profile stops after describing an arc of about 90 degrees (Figs. 2.2 and 2.3). After augmentation, which causes lowering of the lower pole [2], or in a mature, pendulous breast, the lateral curve continues its arc past the lower pole level, almost completing, or completing a semicircle (Figs. 2.2 and 2.3).

In a ptotic or hypertrophic breast, the lateral curve becomes a semi-ellipse (Fig. 2.1), the expected shape of an elastic circle that has been subjected to the uniform downward pull of gravity. Ideally, the semi-ellipse is reduced to a semicircle after surgery (Fig. 2.1).

Oblique views, which are really hybrid lateral/frontal views, are often pleasing to the eye, but can hide asymmetry, cannot be standardized because of small differences in rotation, and are therefore unsuitable for measurements.

Three-Dimensional Breast Shape

The three-dimensional shape of the upper pole is paraboloid. In the immature or hypoplastic breast, the lower pole shape is defined by the inframammary fold, which describes a semicircle on frontal projection (Figs. 2.2 and 2.3).

As the breast matures, becomes pendulous, and starts to hang below the level of the inframammary fold, or in a breast augmentation patient, the lower pole still resembles a semicircle on frontal view, but now the semicircle outlines the lower pole of the breast, not the inframammary fold. The lateral view reveals a semicircular profile of the lower pole as the lateral curve dips to the lower pole level and then rises to meet the chest wall at the inframammary fold (Fig. 2.1). The width of the breast exceeds its projection, which is why the underside of the breast is not a hemisphere. With semicircular profiles on frontal and lateral views, the three-dimensional shape of the ideal lower pole is a sphere that is flattened in the anteroposterior dimension, called an oblate spheroid, which is also the shape of a round (non-form-stable) saline or silicone gel breast implant [13].

Subject to gravity, the breast tissue sags in a symmetrical fashion centered on the breast meridian. The shape of the lower pole of the breast stretches from a spheroid to a shape resembling the lower half of an ellipsoid (Fig. 2.1). However, it is not equally elliptical on frontal and lateral views. It is more flattened in the anteroposterior dimension (like a partially deflated football), because the breast flattens as it rests on the chest wall [13].

It has been said that what we measure, we tend to improve (and the opposite is true too) [1].

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