Population Analysis of the Perfect Breast: A Morphometric Analysis

Patrick Mallucci, M.B.Ch.B., M.D.
Olivier A. Branford, M.A., M.B.B.S., Ph.D.
London, United Kingdom

Background: The authors previously identified key objective parameters that define the aesthetic ideal of the breast in a study of 100 models with natural breasts. In this follow-up article, the opinion of the general public on ideal breast proportions was surveyed.
Methods: One thousand three hundred fifteen respondents were asked to rank the attractiveness of images of four women with varying breast sizes. Each of the women's breasts were morphed into four different proportions. One of the key features was the upper pole–to–lower pole percentage proportion, corresponding to ratios of 35:65, 45:55, 50:50, and 55:45. Rankings were analyzed according to population demographics. Effects of age, sex, nationality, and ethnicity were evaluated. The responses of 53 plastic surgeons were included.
Results: Breasts with an upper pole–to–lower pole ratio of 45:55 were universally scored highest, in particular, by 87 percent of women in their thirties (n = 190), 90 percent of men (n = 655), 94 percent of plastic surgeons (n = 53), 92 percent of North Americans (n = 89), 95 percent of South Americans (n = 23), 86 percent of Europeans (n = 982), 87 percent of Caucasians (n = 1016), and 87 percent of Asians (n = 209).
Conclusions: This study reaffirms the authors' previous findings that the 45:55 ratio has universal appeal in defining the ideal breast. The authors propose that this proportion should be used as a basis for design in aesthetic surgery. (*Plast. Reconstr. Surg.* 134: 436, 2014.)

In a previous article, we defined critical ideals of breast beauty based on an analysis of breast profiles of a series of 100 topless models with natural breasts.[1] We identified a recurring pattern in four key parameters in the studied breasts: an upper pole–to–lower pole ratio of 45:55 percent (i.e., slightly fuller lower pole than upper pole), an upward pointing nipple (20-degree mean angle), a straight/mildly concave upper pole slope, and a smooth lower pole convexity (Fig. 1). We illustrated that deviation from this pattern produced a less attractive breast.

The aim of the present population study was to test the response to various morphed breast proportions identifying key subgroups to ascertain which of the proportions was deemed most attractive. Demographic data were collected, including age, sex, nationality, and ethnicity. Respondents were asked to rank the attractiveness of images of women with morphed breasts of differing proportions in three-quarters profile pose in a series of four panels (Figs. 2 through 5). The women had a range of different breast sizes. Images were in random order with differing proportions of the vertical height of the upper pole to the lower pole corresponding to percentage ratios of 35:65, 45:55, 50:50, and 55:45. Individuals were asked to score each panel according to their preference, and the data were collected for each subgroup.

From the Cadogan Clinic; and the Department of Plastic Surgery, Royal Free Hampstead NHS Trust.
Received for publication October 23, 2013; accepted January 15, 2014.
Presented at the 82nd Annual Meeting of the American Society of Plastic Surgeons, in San Diego, California, October 11 through 15, 2013; the British Association of Plastic Surgeons Advanced Educational Course in Cosmetic Breast Surgery, in Manchester, England, April 15 to 16, 2013; the Atlanta Breast Surgery Symposium 29th Annual Meeting, in Atlanta, Georgia, January 11 through 13, 2013; and the Clinica Planas 18th International Course on Plastic and Aesthetic Surgery, in Barcelona, Spain, September 26 through 28, 2012.

DOI: 10.1097/PRS.0000000000000485

Disclosure: *No external sources of support, funding, or benefits were received for this article by the authors, who have no commercial interest to disclose.*

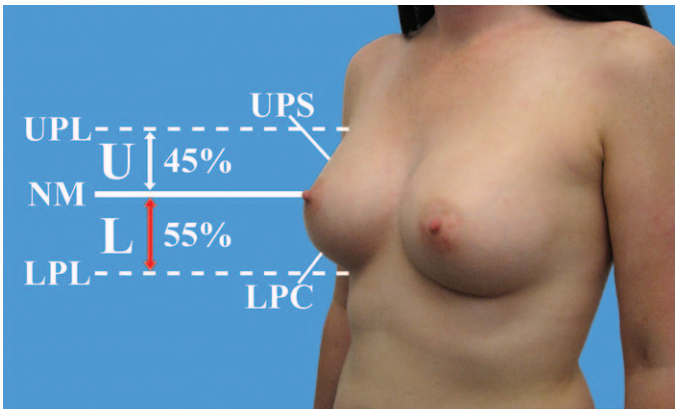

Fig. 1. Representative three-quarters profile view with standard breast parameters as used in the survey: upper pole–to–lower pole ratio, nipple angulation, and contour of upper and lower poles. The visible breast has an upper pole–to–lower pole ratio of 45:55, straight upper pole, and convex lower pole. *U*, upper pole; *L*, lower pole; *UPL*, upper pole line; *LPL*, lower pole line; *NM*, nipple meridian; *UPS*, upper pole slope; *LPC*, lower pole convexity.

SUBJECTS AND METHODS

Study Design

A study questionnaire was developed incorporating two sections: respondent demographics and morphed image panels as detailed below. One thousand three hundred fifteen men and women, including 53 plastic surgeons, were asked to rank the attractiveness of images of four women with morphed breasts of differing proportions in three-quarters profile pose.

Respondent Demographics

Individuals were asked to anonymously provide details of age, sex, nationality, and ethnicity. Populations were divided into the following subgroups: women per age group; women younger than 40 years versus women older than 40 years; men younger than 40 years versus men older than 40 years; women versus men; plastic surgeons; continent of origin; and ethnic descent.

Morphed Image Panels

Respondents were asked to grade four panels of images (Figs. 2 through 5). Each panel contained four morphed images of the same female chest. The women had a range of different breast sizes. Each woman had her breasts morphed into four different upper pole/lower pole proportions. The proportions selected included percentage ratios of 35:65, 45:55, 50:50, and 55:45, in random order.

The upper pole of the breast was defined by the intersection of two lines. The first line was the extension of the upper pole of the breast from the nipple upward onto the chest wall, and the second line was situated along the chest wall. The vertical height of the breast between the upper horizontal and the nipple meridian was defined as the upper pole (Fig. 1).

A lower horizontal line was drawn at the level of the inframammary fold. The vertical height of the breast between the lower pole line and the nipple meridian was defined as the lower pole of the breast (Fig. 1).

Images were created using the Liquefy Filter feature in Adobe Photoshop CS4 (Adobe Systems, Inc., San Jose, Calif.). Tools used included Forward Warp, Twirl, Pucker, Bloat, and Push to achieve the different proportions. Images were magnified and the accuracy of the stated proportions checked using the ruler function in Photoshop CS4 so that all proportions were within 1 percent of the stated values. Morphed photographs were used rather than black-and-white tracings as in previous studies.[2]

Respondents were asked to rank the breasts in each of the panels in order of attractiveness from 1 (most attractive) to 4 (least attractive). Images were captured in three-quarters profile view to observe the profile of the right breast.

Statistical Analysis

Statistical assessment of these data was carried out using SigmaStat 2.0 (Jandel Scientific Software, San Rafael, Calif.). The percentage of respondents ranking the different breast proportions as their first choice was calculated for each

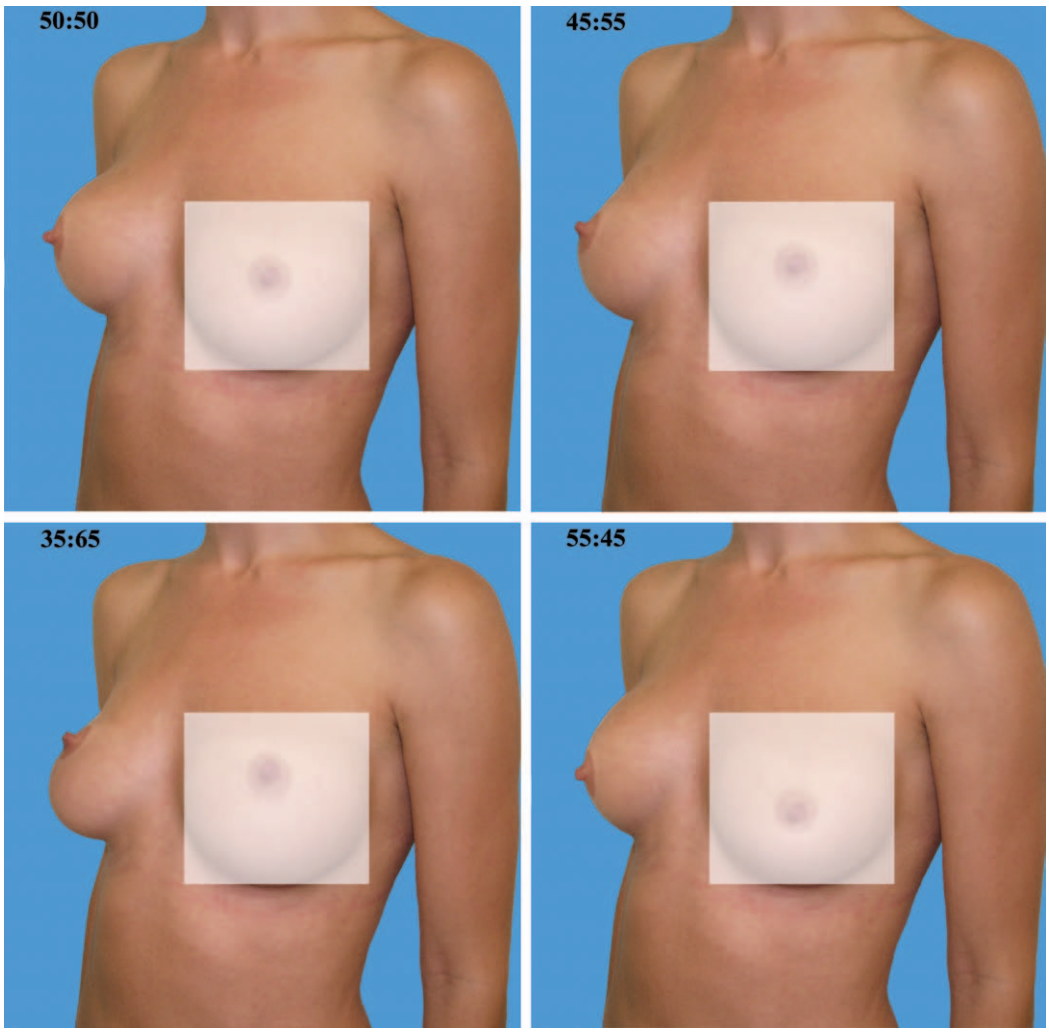

Fig. 2. Panel 1: Randomized image panel of smaller breast size. The upper pole–to–lower pole percentage ratios are shown for each image. These ratios were not depicted in the images in the original study but are here for clarity for the reader.

demographic group. The data for the various demographic groups were compared using the Mann-Whitney test for nonparametric data, and the Kruskal-Wallis test was used where three or more nonparametric groups were compared. The *Z* test was used to compare proportions.

RESULTS

A total of 1315 respondents (660 women and 655 men), including 53 independent plastic surgeons (15 women and 38 men), completed the questionnaires.

Respondent Demographics

Demographic data are summarized in Tables 1 through 4. There was an even representation from both sexes, with substantial representations from each age group. Participants included individuals from six continents (i.e., Africa, Asia, Australasia, Europe, North America, and South America). Three hundred thirty-three of these were non-European (25 percent of the total). Two hundred ninety-nine respondents (23 percent of the total) were from non-Caucasian ethnic backgrounds (Arab, Asian, and Black).

Panel Scores

Overall

All demographic groups universally ranked the 45:55 upper pole–to–lower pole percentage ratio as the most attractive breast across all four panels (Table 5). The 50:50 ratio was the second most popular first choice in all demographic analyses. Figures 6 to 11 show a summary of the preferences for each of the subgroups studied.

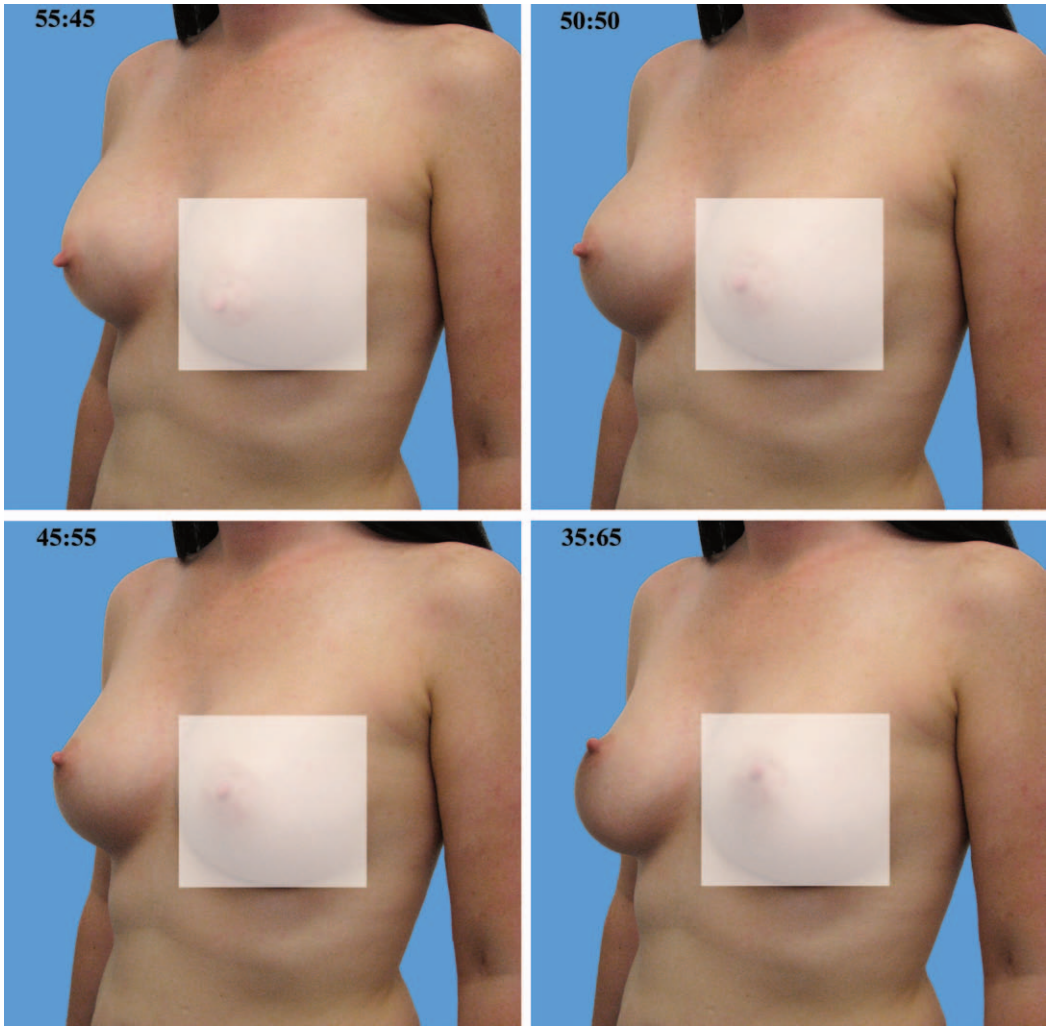

Fig. 3. Panel 2: Randomized image panel of medium breast size. The upper pole–to–lower pole percentage ratios are shown for each image.

Women per Age Group

Eighty-seven percent of women in their thirties ($n = 190$) ranked the 45:55 percentage ratio as the most attractive breast type, with the next highest ranking being for women younger than 30 years [$n = 277$ (83 percent)], followed by women in their forties [$n = 129$ (78 percent)], and finally women older than 50 years [$n = 64$ (72 percent)], as shown in Figure 6. When comparing the overall percentage of women choosing the 45:55 breast type as being the most attractive across the four panels between age groups, there was no statistically significant difference between women younger than 30 years and those in their thirties. In contrast to this, there was a statistically significant difference in this overall proportion between women in their thirties and women in their forties ($p < 0.05$), with the younger women preferring the more natural 45:55 breast type.

Women Younger than 40 Years versus Women Older than 40 Years

Eighty-five percent of women younger than 40 years ($n = 467$) ranked the 45:55 as the most attractive breast type, compared with 76 percent of women older than 40 years ($n = 193$), as shown in Figure 7. This difference was statistically significant ($p < 0.05$). The 50:50 breast type was the second most popular proportion to be chosen as being the most attractive, after the 45:55 type. However, only 12 percent of women younger than 40 years and 17 percent of women older than 40 years chose the 50:50 as their preferred shape.

Men Younger than 40 Years versus Men Older than 40 Years

Ninety-one percent of men younger than 40 years ($n = 479$) ranked the 45:55 as the most attractive breast type. Similarly, 86 percent of men older than 40 years ($n = 176$) preferred the 45:55

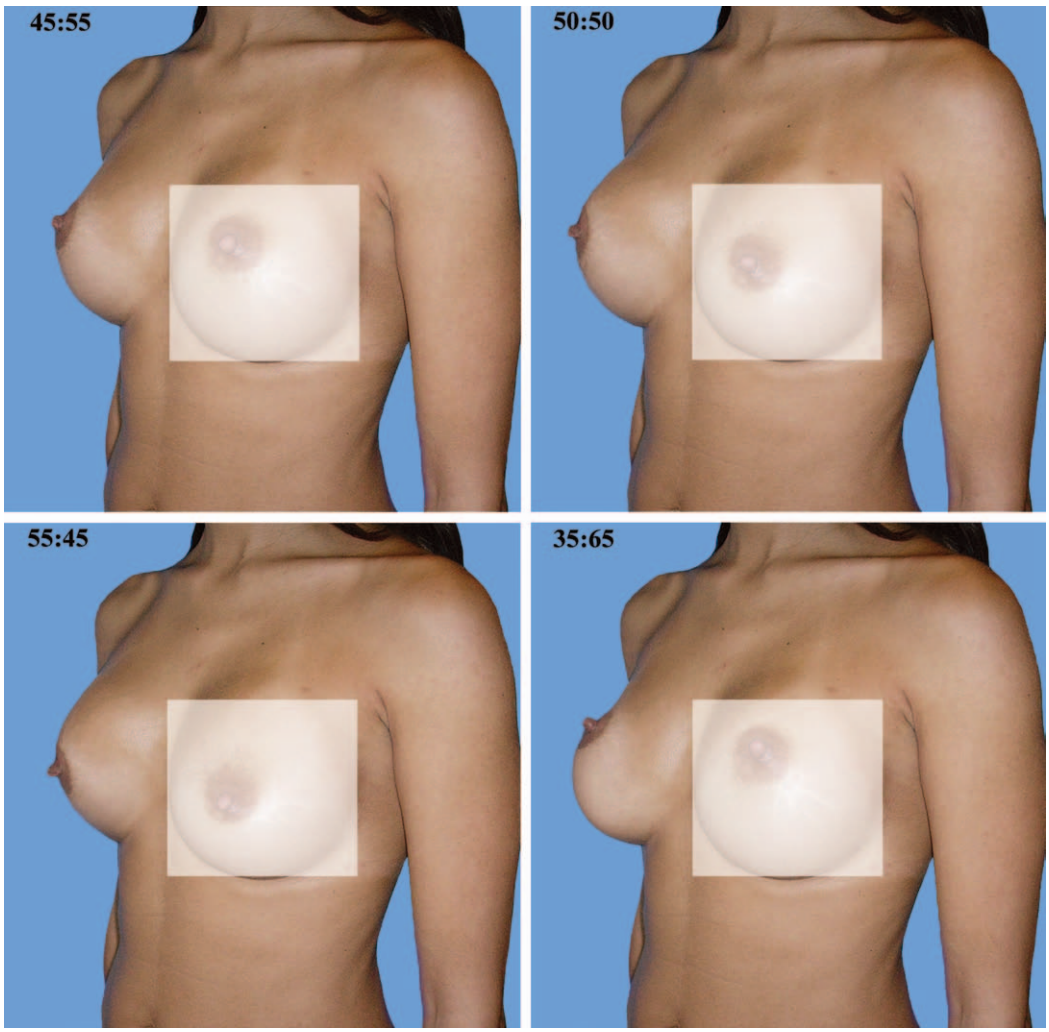

Fig. 4. Panel 3: Randomized image panel of large breast size. The upper pole–to–lower pole percentage ratios are shown for each image.

over other breast types, as shown in Figure 7. There was no statistically significant difference in the proportion of men younger than and older than 40 years choosing the 45:55 breast as their preferred breast type. The second most popular breast type was the 50:50 proportion. However, only 5 percent of men younger than 40 years and 7 percent of men older than 40 years chose the 50:50 as their preferred shape.

Women versus Men

Overall, 90 percent of men ($n = 655$) ranked the 45:55 as the most attractive breast compared with 82 percent of women ($n = 660$), as shown in Figure 8. This difference was statistically significant ($p < 0.001$). In addition, a significantly greater proportion of women (13 percent) than men (6 percent) ranked the 50:50 breast as their preferred breast type ($p < 0.001$), although this accounted for a minority of respondents, with effectively only one in eight women and one in 16 men choosing this breast type.

Plastic Surgeons

Ninety-four percent of plastic surgeons ($n = 53$) rated the 45:55 proportion as the most attractive breast type, with 92 percent of female plastic surgeons ($n = 15$) and 95 percent of male plastic surgeons ($n = 38$) ranking the 45:55 breast type highest (Fig. 9). There was no significant difference in the ranking of the preferred choice of breast type for any of the four panels between female and male plastic surgeons. Furthermore, there was no significant difference in the proportion of male and female plastic surgeons ranking the 45:55 as their preferred breast type overall.

Continent of Origin

Respondents from all continents ranked the 45:55 as the preferred breast type, as shown in

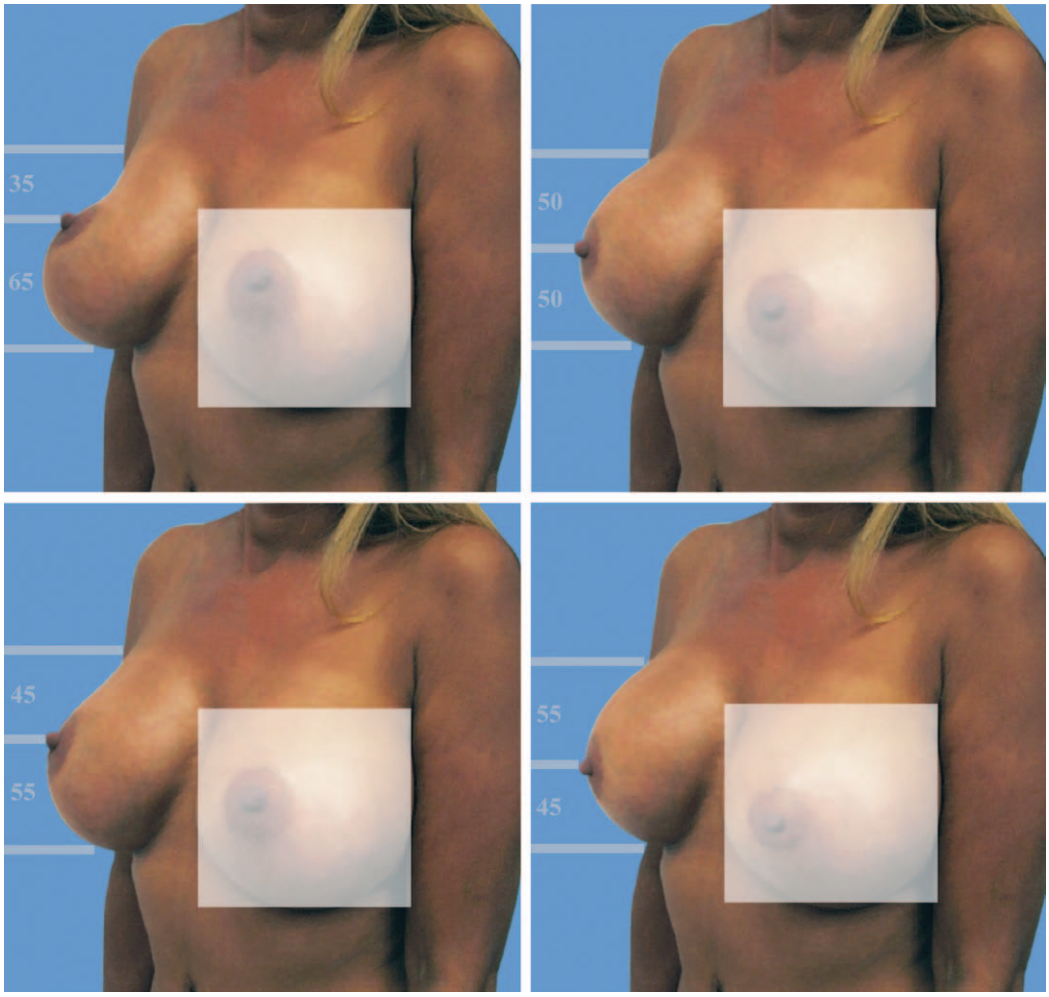

Fig. 5. Panel 4: Randomized image panel of very large breast size. The upper pole–to–lower pole percentage ratios are shown for each image, with lines drawn for the upper pole line, nipple meridian, and lower pole line as indicated in Figure 1.

Figure 10. South Americans (n = 23) rated the 45:55 ratio highest, with 95 percent choosing it as their preferred breast type. This was followed in decreasing order by North Americans [n = 89 (92 percent)], Australasians [n = 49 (89 percent)], Europeans [n = 982 (86 percent)], Asians [n = 139 (80 percent)], and Africans [n = 33 (76 percent)]. There was a converse trend for the group of respondents choosing the 50:50 as their preferred breast type, with 17 percent of Africans, 13 percent of Asians, 9 percent of Europeans, 9 percent of Australasians, 5 percent of North Americans, and 3 percent of South Americans finding it the most attractive breast shape (Fig. 10). In the North American group, there were 39 female and 50 male respondents. Overall, 93 percent of

Table 1. Demographic Information Regarding Sex of Survey Respondents for the Entire Cohort and for Plastic Surgeons

	Entire Cohort (%)	Plastic Surgeons (%)
No.	1315	53
Sex		
No. of female respondents	660 (50)	15 (28)
No. of male respondents	655 (50)	38 (72)

Table 2. Demographic Information Regarding Age Distributions of Survey Respondents of Different Sexes*

	Female (%)	Male (%)
No.	660	655
Age group		
29 yr or younger	277 (42)	202 (31)
30–39 yr	190 (29)	277 (42)
40–49 yr	129 (20)	126 (19)
50 yr or older	64 (10)	50 (8)

*Values are given as number per age category (%).

Table 3. Demographic Information Regarding Continent of Origin of Survey Respondents*

	No. (%)
Entire cohort	1315
Africa	33 (3)
North America	89 (7)
South America	23 (2)
Asia	139 (11)
Australasia	49 (4)
Europe	982 (75)

*Values are given as number per continent (%).

Table 4. Demographic Information Regarding Ethnic Descent of Survey Respondents

	No. (%)
Entire cohort	1315
Caucasian	1016 (77)
Asian	209 (16)
Black	75 (6)
Arab	15 (1)

female and 92 percent of male North American respondents rated the 45:55 as the most attractive breast across the four panels, with no statistically significant difference in this overall proportion between men and women.

Ethnic Descent

Respondents of different ethnic descents all rated the 45:55 breast as their preferred breast type (Fig. 11). Those of Asian origin (n = 209) chose the 45:55 as the most attractive breast in 87 percent of cases. Similarly, 87 percent of Caucasians (n = 1016) chose the 45:55 breast as their preferred type. The corresponding figures were lower for those of Black [n = 75 (75 percent)] or Arabic descent [n = 15 (72 percent)]. The differences in group preference were reflected in the second most preferred breast type, with 19 percent of those of Black origin, 17 percent of Arabic origin, 11 percent of Asian origin, and 9 percent of Caucasians selecting the 50:50 breast type.

DISCUSSION

The results of this study highlight fundamental patterns of preferred breast proportion across population groups, redefining perceptions of breast attractiveness. The overwhelming finding is that all subgroups found the 45:55 proportion across the four image panels the most attractive of the breast forms presented.

Table 5. Summary of Mean Results for Each Respondent Demographic Group for Each of the Four Morphed Image Panels, and Overall Mean Result across the Four Panels*

Demographic Group	No.	Panel 1, Smaller Breast	Panel 2, Medium Breast	Panel 3, Large Breast	Panel 4, Largest Breast	Overall Mean
Women per age group						
Women up to 29 yr	277	83	80	84	84	83
Women in their 30s	190	87	85	88	88	87
Women in their 40s	129	73	81	79	81	78
Women older than 50 yr	64	75	75	70	69	72
Women and men younger than 40, older than 40 yr						
Women younger than 40 yr	467	85	82	86	86	85
Women older than 40 yr	193	74	79	76	77	76
Men younger than 40 yr	479	89	92	93	90	91
Men older than 40 yr	176	86	86	87	86	86
Women vs. men						
Female overall	660	82	81	83	83	82
Men overall	655	88	91	92	89	90
Plastic surgeons						
Plastic surgeons overall	53	98	92	94	92	94
Female plastic surgeons	15	100	93	87	87	92
Male plastic surgeons	38	97	92	97	95	95
Continent of origin						
Africa	33	73	70	82	79	76
North America	89	89	93	93	94	92
South America	23	91	96	100	91	95
Asia	139	78	82	81	77	80
Australasia	49	88	92	86	90	89
Europe	982	86	86	88	86	86
Ethnic origin						
Caucasian	1016	85	87	89	87	87
Asian	209	87	86	87	86	87
Black	75	73	73	75	79	75
Arab	15	80	80	60	67	72

*Results are presented as mean percentage of respondents choosing the 45:55 ratio as the most attractive breast type.

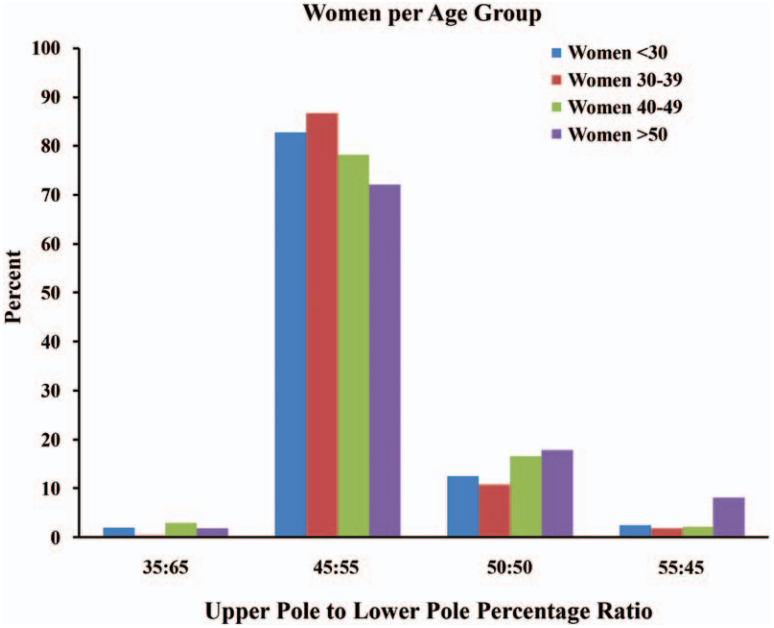

Fig. 6. Mean percentage of women in different age groups choosing each breast proportion as their first choice.

The next most popular choice after the 45:55 proportion was the 50:50 ratio, with the other two choices ranking very low across all groups and panels. These findings are in keeping with the observation of our original article[1] illustrating that the greater the deviation from the 45:55 norm, the more unattractive the breast becomes.

Some of the most important findings come from the analysis of the results in women and subsequent comparison with the responses in men. In the analysis of women, and looking at results by decade, comparison was made between younger women (younger than 40 years) and more mature women (older than 40 years)—those younger than 40 years had a greater preference for the 45:55

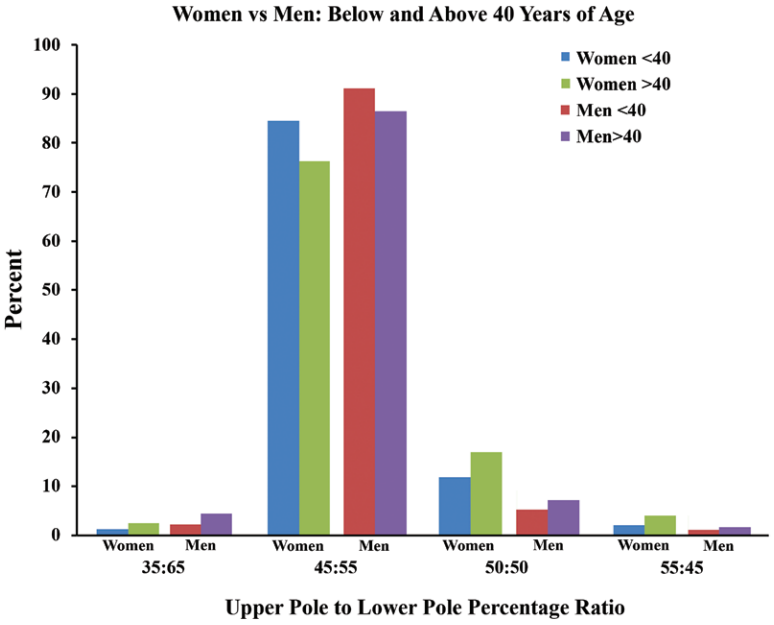

Fig. 7. Mean percentage of women and men choosing each breast proportion as their first choice, subdivided into those younger than 40 years and those older than 40 years for each sex.

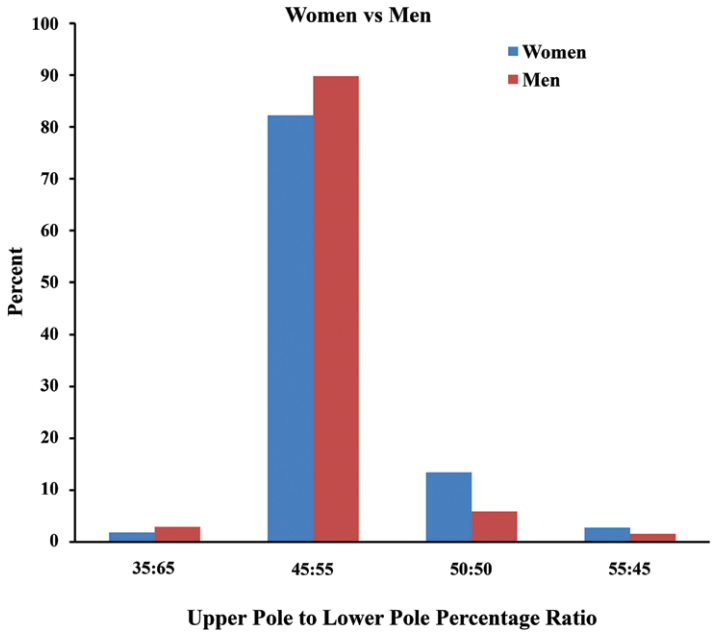

Fig. 8. Mean percentage of women and men choosing each breast proportion as their first choice.

breast ratio than those older than 40 years (85 percent versus 76 percent), which was statistically significant. This observation reflects preference in the prime captive age group for augmentation (i.e., seven of eight women younger than 40 years had a greater preference for the more natural appearance as opposed to one of eight who chose the 50:50 ratio, an important consideration in planning for breast augmentation for either preference in this cohort). The change in profile selection with age is interesting, with the more mature group choosing more upper pole fullness, perhaps as a reflection of their own loss of projection over time.

Comparison of responses by men and women is possibly the most unpredicted finding. Men

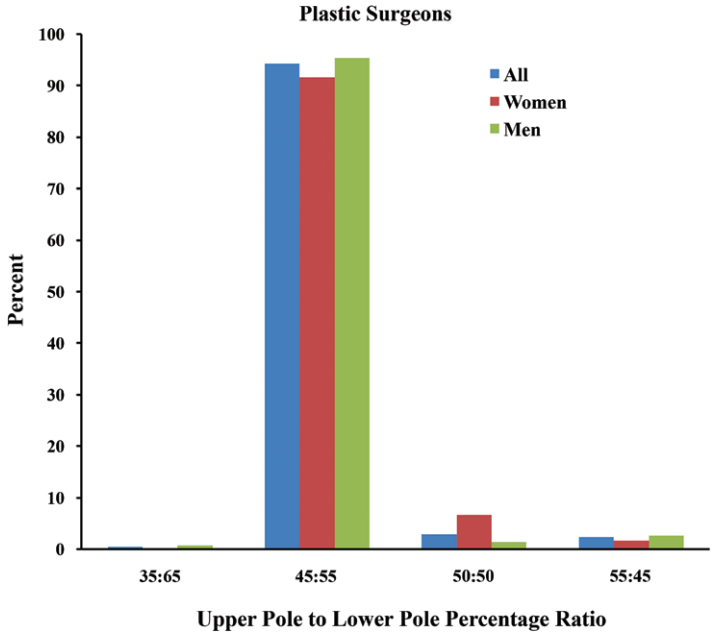

Fig. 9. Mean percentage of plastic surgeons choosing each breast proportion as their first choice, also subdivided into female and male plastic surgeons.

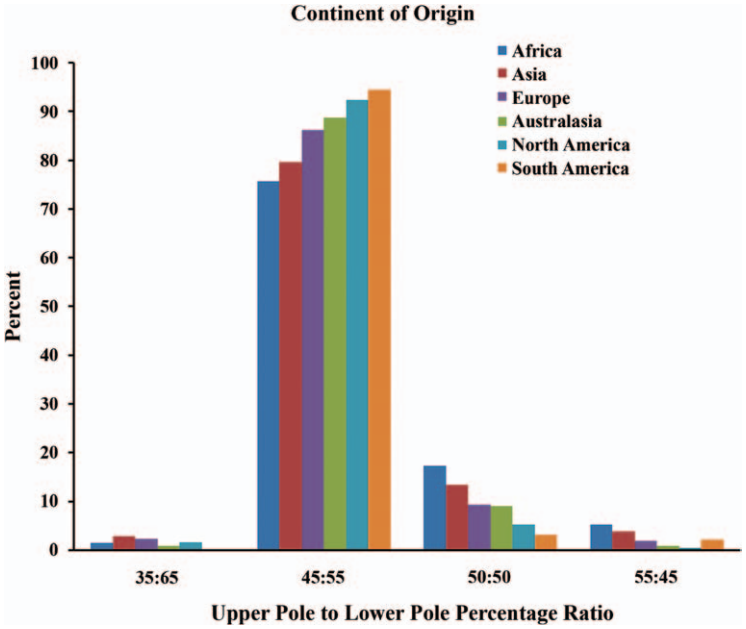

Fig. 10. Mean percentage of respondents from different continents of origin choosing each breast proportion as their first choice.

overall had a higher preference for the 45:55 ratio than women (90 percent versus 82 percent). This too was statistically significant, suggesting that men actually prefer more natural appearing breasts than do women. This is in stark contrast to previously misplaced assumptions that men prefer oversized or "fake" breasts, a view that has long been held as a clichéd interpretation of male preference.

Other important findings have also emerged; the assumption that there are significant intercultural differences in perception of beauty is not upheld by this study. The 45:55 ratio was overwhelmingly the most popularly chosen ratio across all ethnic groups, with a slight decline in preference in those of Arabic and Black origin, but even in these subgroups, 72 to 75 percent chose the more natural appearance.

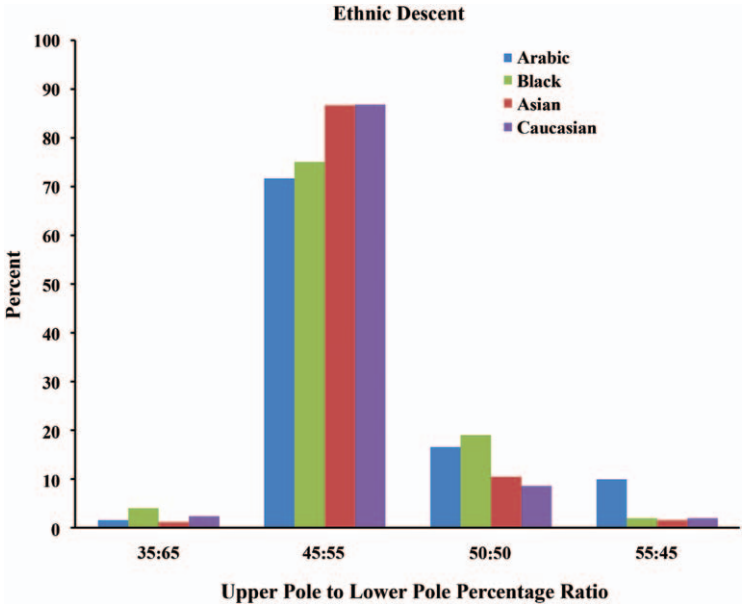

Fig. 11. Mean percentage of respondents from different ethnic descents choosing each breast proportion as their first choice.

Both South Americans and North Americans showed strong preference for the 45:55 over the other proportions (95 percent and 92 percent, respectively). North American patterns of implantation may seem slightly at odds with these observations and, although definition of the breast parameters outlined above have previously been ascribed as being of "European" ideal, this is not borne out by our results.

The present study has largely upheld the findings of our previous work defining parameters of breast beauty.[1] The observation that in the naked breast a slightly fuller lower pole is more desirable than upper pole fullness is fundamental and the basis of the 45:55 ratio. The combination of this ratio and the other previously identified parameters visually resonates with all subgroups. Although there is some variation throughout, the overwhelming selection of the 45:55 distribution suggests that breast beauty has universal appeal that largely transcends cultural, sex, and age differences—probably a truism for all things "beautiful" where there is a generality of recognition. Past assumptions that a full upper pole is deemed as attractive are not supported by our findings and, as such, this study challenges conventional thought about breast attractiveness where, traditionally, emphasis has been placed on upper pole fullness as a desirable goal in breast augmentation.

The pressure to fill the upper pole seems to be patient led and yet there appears to be no evidence that this is a desirable feature in the naked breast. We postulate that fullness of the upper pole is a desired appearance in clothing and that women tend to picture themselves clothed rather than thinking of the naked breast. Paradoxically, the desired clothed appearance often does not equate to attractiveness in the naked breast (i.e., exaggerated upper pole fullness is not attractive out of clothing).

This observation is critical for both patient and physician in understanding aesthetic goals. It is a subtle concept that becomes visually obvious when images are shown to patients as part of discussion. Our study is at odds with previous smaller studies suggesting that patients and surgeons have differing aesthetic ideals for the breast.[2]

The universal selection of the 45:55 ratio across the subgroups also raises the question as to which implant is the more appropriate choice for breast augmentation—round or anatomical? The overall findings would perhaps suggest that in many cases anatomical implants are most likely to recreate the stipulated proportions, yet round implants are far more commonly used worldwide. Form-stable anatomical implants have been shown to maintain their lower pole fullness in vivo,[3] and are associated with high patient satisfaction rates, producing natural appearing breasts with a low reoperation rate.[4–6] Interestingly, 94 percent of plastic surgeons questioned selected the 45:55 ratio as their most attractive option; this preference is often not reflected in practice. It remains to be seen whether the recent introduction of anatomical form-stable implants in the United States will bring a change in practice in North America. This is not to say that the aesthetic ideal cannot be achieved using round implants, but patient selection and precision of implant placement are perhaps more critical if this is to be achieved. Clearly, for those choosing the 50:50 fuller appearance, round implants would be the preferred choice.

The work of Tebbetts and Adams has contributed greatly to refinement in implant selection based on tissue dimensions and soft-tissue quality ultimately for the benefit of the patient.[7] This, coupled with refinement in surgical technique,[8] has resulted in reduced operation rates and better outcomes.[9,10]

Although previous authors have talked about some elements of breast shape and measurement, they have stopped short of objectively identifying specifics of breast beauty.[11–13] The present study and our previous work[1] have set about defining an aesthetic template around which to plan and aim for in all forms of aesthetic breast surgery, from reduction/mastopexy to breast augmentation and also in reconstruction. It recognizes that the vast majority of women (and men) seek natural beauty in their breasts and that the desire for an overfilled and oversized appearance seems to have infiltrated practice without challenge over the past decades. The negative consequences of oversizing are well established and among the most common reasons for reoperation.[14]

The clinical translational ability of the present study merits further investigation beyond the scope of this article. We are currently completing a study based on surgical planning to achieve the 45:55 ratio. The results of this clinical study will be released imminently.

The aesthetic ideal we present goes very much hand in hand with the safe practice and planning described previously. It serves as a visual guide for both patient and surgeon in primary and secondary surgery. The goal is to produce more acceptable, longer lasting results and ultimately more beautiful breasts.

Patrick Mallucci, M.B.Ch.B., M.D.
The Cadogan Clinic
120 Sloane Street
London SW1X 9BW, United Kingdom
pat.mallucci@googlemail.com

REFERENCES

1. Mallucci P, Branford OA. Concepts in aesthetic breast dimensions: Analysis of the ideal breast. *J Plast Reconstr Aesthet Surg.* 2012;65:8–16.
2. Hsia HC, Thomson JG. Differences in breast shape preferences between plastic surgeons and patients seeking breast augmentation. *Plast Reconstr Surg.* 2003;112:312–320; discussion 321.
3. Weum S, de Weerd L, Kristiansen B. Form stability of the Style 410 anatomically shaped cohesive silicone gel-filled breast implant in subglandular breast augmentation evaluated with magnetic resonance imaging. *Plast Reconstr Surg.* 2011;127:409–413.
4. Hedén P, Bronz G, Elberg JJ, et al. Long-term safety and effectiveness of style 410 highly cohesive silicone breast implants. *Aesthetic Plast Surg.* 2009;33:430–436; discussion 437–438.
5. Maxwell GP, Van Natta BW, Murphy DK, Slicton A, Bengtson BP. Natrelle style 410 form-stable silicone breast implants: Core study results at 6 years. *Aesthet Surg J.* 2012;32:709–717.
6. Jewell ML, Jewell JL. A comparison of outcomes involving highly cohesive, form-stable breast implants from two manufacturers in patients undergoing primary breast augmentation. *Aesthet Surg J.* 2010;30:51–65.
7. Tebbetts JB, Adams WP. Five critical decisions in breast augmentation using five measurements in 5 minutes: The high five decision support process. *Plast Reconstr Surg.* 2005;116:2005–2016.
8. Tebbetts JB. Dual plane breast augmentation: Optimizing implant-soft-tissue relationships in a wide range of breast types. *Plast Reconstr Surg.* 2006;118:81S–98S; discussion 99S–102S.
9. Spear SL, Bulan EJ, Venturi ML. Breast augmentation. *Plast Reconstr Surg.* 2006;118:188S–196S; discussion 197S–198S.
10. Adams WP Jr, Mallucci P. Breast augmentation. *Plast Reconstr Surg.* 2012;130:597e–611e.
11. Penn J. Breast reduction. *Br J Plast Surg.* 1955;7:357–371.
12. Hauben DJ, Adler N, Silfen R, Regev D. Breast-areola-nipple proportion. *Ann Plast Surg.* 2003;50:510–513.
13. Brody GS. The perfect breast: Is it attainable? Does it exist? *Plast Reconstr Surg.* 2004;113:1500–1503.
14. Tebbetts JB, Teitelbaum S. High- and extra-high-projection breast implants: Potential consequences for patients. *Plast Reconstr Surg.* 2010;126:2150–2159.