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Evaluation of anatomical and round breast implant aesthetics and preferences in Dutch young lay and plastic surgeon cohort

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Summary *Background:* Literature remains inconclusive on the attractiveness and natural aspect of anatomical breast implants, and thus far, studies have failed to demonstrate the visible difference in implants that are in practice compared to those that are round. This study was undertaken to evaluate (1) whether lay and professional participants can distinguish between breasts augmented with either round or anatomical breast implants and (2) their opinion with regard to naturalness and attractiveness of these augmented breasts.
Methods: Twenty breast augmentations (10 anatomical and 10 round implants), each depicted by two postoperative pictures, were scored by 100 lay participants and 15 plastic surgeons. Implant volume ranged from 275 to 400 g. Ptotic or malformed breasts were excluded. Finally, they had to score the most natural, unnatural, attractive, and unattractive breast shapes on a schematic depiction of breast types with varying upper poles.
Results: The rate of correct implant identifications was 74.0% (1480/2000 observations, $p < 0.001$) in the lay and 67.3% (202/300 observations, $p < 0.001$) in the surgeon cohort. Breasts with anatomical implants were rated as significantly more natural (3.3 ± 1.0 vs. 2.6 ± 1.0,

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$p < 0.001$ and 3.3 ± 1.0 vs. 2.2 ± 0.9, $p < 0.001$, respectively) and more attractive (3.1 ± 1.0 vs. 2.6 ± 1.0, $p < 0.001$ and 3.6 ± 0.9 vs. 2.7 ± 0.9, $p < 0.001$, respectively) versus round implants by both lay participants and surgeons. Participants preferred breasts with a neutral or slightly negative upper pole contour.

Conclusion: Participants were able to distinguish between the results achieved with either anatomical or round textured Allergan breast implants and found augmented breasts with the anatomical implants more natural and attractive.

Introduction

In 2015, almost 1.5 million breast augmentations were performed worldwide according to the International Society of Aesthetic Plastic Surgeons (ISAPS), thus making them one of the most performed aesthetic surgical procedures.[1] Medical companies have been anticipating the huge demand for by offering a wide selection of implants with different shapes, surfaces, and sizes. During the nineties, anatomical, form stable breast implants were introduced and popularized by Dr. Tebbetts stating they would give a more natural aesthetic result, compared to round implants.[2] Since then, the use of anatomical implants became widespread and achieved a definite role in breast augmentation owing to reported satisfactory outcomes.[3-5] However, literature remains rather undecided on whether anatomical implants actually result in a more natural appearance.[6] Plastic surgeons have been argued to be incapable of distinguishing round from anatomical implants in their patients.[7-11] A similar study reported identical outcomes in an upright position, but in a laying position, breasts augmented with round implants appeared more natural.[8] Previous literature has demonstrated that patients and plastic surgeons have different preferences regarding breast aesthetics.[12] Given that studies have focused on clinicians' opinions with regard to breast implant aesthetics, we believe the lay public should not be neglected. It is highly important to consider their input because they may undergo breast augmentation in the future.

Therefore, we surveyed a student cohort without any background in plastic surgery to determine their opinion about the naturalness and attractiveness of augmented breasts with round or anatomical implants and whether they could distinguish among implant types. Evaluations were compared with those among a series of Dutch plastic surgeons and senior plastic surgery residents.

Methods

Study population

Breast augmentations were performed between 2013 and 2014 at Bergman Clinics Heerenveen by senior authors B.v.d.L. and M.C. Textured round implants [TSF and TSM series by Allergan (Dublin, Ireland)] were used by B.v.d.L. and anatomical implants [MF and MM series by Allergan (Dublin, Ireland)] by M.C. Breasts were augmented using Dr. Tebbetts' technique: dual plane breast augmentation.[13] After approval by the institutional review board, postoperative photographs were obtained of patients who met inclusion criteria. All photographs were taken 12 months postoperative as part of routine follow-up. Based on previous literature and clinical practice experience, an inclusive range of "medium" implants between 275 and 400 g was selected.[14] Breasts showing signs of malformation or ptosis were excluded to minimalize bias. Ten patients were randomly selected from both implant cohorts and photographs (anterior and oblique view) were put in presentation slides. Patient characteristics are presented in Table 1. The 20 presentation slides were presented in a random order and scored by 100 university students (50 males and females) who were recruited for participation on campus. The slides were also evaluated by 15 plastic surgeons or senior residents.

Data collection

Participants were interviewed using a three-part questionnaire. In part one, participants were asked about their age, sex, and whether they had undergone breast augmentation to rule out any possible bias. Additionally, participants were shown a picture of a round and anatomical implant and asked what implant type they thought would give the best natural result. In part two, participants were shown postoperative pictures of 20 breast augmentations and asked the following questions: (1) How natural do you find the shape of this breast? (2) How attractive do you find this breast shape? (3) What type of breast implant, round or anatomical, was used for achieving this result? Two 5-point Likert scales ranging from very unnatural/unattractive to very natural/attractive were used for rating. In part three, participants were requested to identify on a scale with a variety of breast shapes the most (1) natural, (2) unnatural, (3) attractive, and (4) unattractive breast profile. These breast shapes were derived from a system described by Hsia et al.,[12] which ranks the displacement of the upper breast pole ranging from convex shape (positive) to concave shape (negative).

Statistical analysis

Data were analyzed as separate observations [(100 lay observers x 20 cases = 2000 observations) and (15 surgeon observers x 20 cases = 300 observations)] instead of an average per observer or case. The Pearson's chi-square test was used to analyze group differences for categorical variables and the t-test for continuous variables. Univariate analysis with a linear regression model was performed with all variables;

Table 1 Overall patient characteristics.

Patient	Anatomical implant			Round implant		
	Age (years)	Projection	Volume (grams)	Age (years)	Projection	Volume (grams)
1	30	MF	295	34	TSM	275
2	27	MF	375	34	TSF	385
3	29	MM	280	42	TSF	325
4	29	MF	375	33	TSF	345
5	37	MM	280	38	TSF	365
6	33	MF	310	26	TSF	365
7	52	MM	280	33	TSM	360
8	20	MF	375	47	TSF	365
9	32	MF	375	37	TSM	310
10	31	MF	335	22	TSF	345
Mean (±SD)	32 (±8.3)*		318 (±43.2) †	34.6 (±7.2)*		344 (±32.6) †

Age measured at the time of surgery, and evaluated photographs were taken 1 year postoperative. P-values for * ($p = 0.463$) and † ($p = 0.146$) were not statistically significant.

significant variables were included in multivariate analysis. Correlation between naturalness and attractiveness was determined with Pearson's correlation analysis. SPSS Statistics version 21.0 (IBM Inc., Armonk, NY, USA) was used for statistical analyses. A $p < 0.05$ was deemed significant.

Results

The mean age of lay participants was 21.3 years (±2.7); males 22.0 years (±3.3) and females 20.6 years (±1.7). There were eight plastic surgeons (four males and four females) and seven senior residents (four males and three females). The mean age of surgeons was 38.4 years (±6.2); males 38.8 years (±6.6) and females 38.0 years (±6.1). No female participants had undergone breast augmentation.

When participants were asked for the opinion about what implant type they thought would give the best natural result, the vast majority (97.0%) of the lay group stated anatomical implants: three male participants stated round implants. Surgeons refused to answer this question, as they all believed this was fully dependent on patient characteristics.

Identification of implant type

Lay participants were able to correctly distinguish between round and anatomical implants with 74.0% accuracy ($p < 0.001$). In total, 72.2% of anatomical implants and 75.8% of round implants were correctly identified ($p < 0.001$ and $p < 0.001$, respectively). Although round implants were more frequently identified as such, the rates of correct identifications of the two implant types were not significantly different ($p = 0.066$). There also was no significant difference between female (75.1%) and male participants (72.9%) with regard to correct identifications ($p = 0.262$). For one patient (Figures 1 and 2) with anatomical implants, the vast majority of lay participants (85.0%) and surgeons (86.7%) scored incorrectly.

Surgeons answered a total of 202 questions (67.3%) correctly ($p < 0.001$), with significantly fewer surgeons than lay participants (74.0%, $p = 0.015$). The percentage

(1)

(2)

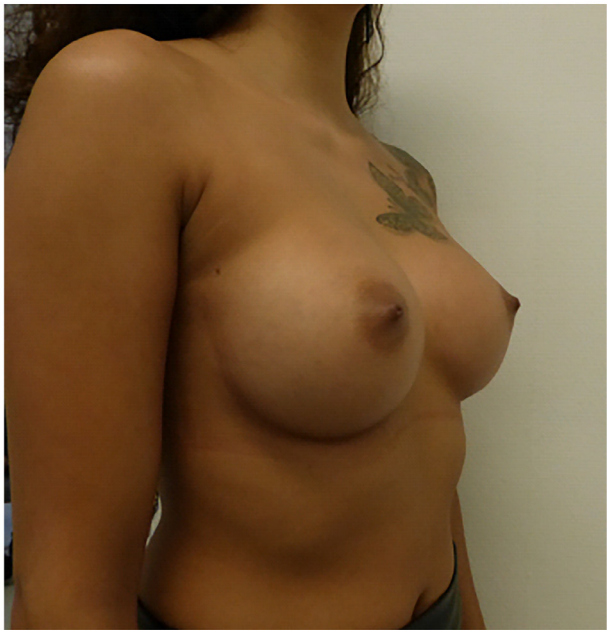

Fig. 1 and 2 A 33-year-old patient underwent bilateral breast augmentation with 375 g Natrelle® Style 410MF anatomical implants but was mistaken for round by 85% of the observations. Pictures were taken 12 months postoperative.

Table 2 Multivariate analysis in the lay participant cohort analyzing predictive factors for high naturalness and attractiveness scores.

	Beta	95% CI		P-value
		Lower	Upper	
Naturalness				
Round/anatomical	0.733	0.647	0.819	<0.001
Male/female	−0.173	−0.259	−0.087	<0.001
Attractiveness				
Round/anatomical	0.506	0.423	0.589	<0.001
Male/female	−0.277	−0.364	−0.191	<0.001
Age (years)	0.003	−0.013	0.020	0.688

of correctly answered anatomical augmented breasts was 64.0% ($p < 0.001$) and 70.7% ($p < 0.001$) for round implants ($p = 0.218$). Male (68.1%) and female (66.4%) surgeons were equally skilled at identifying the implant type ($p = 0.755$).

Naturalness

Lay participants rated results of breasts with anatomical implants more natural than breasts with round implants (3.3 ± 1.0 versus 2.6 ± 1.0, $p < 0.001$), with males significantly more than females (3.0 ± 1.0 versus 2.8 ± 1.1, $p < 0.001$). Male participants gave a mean score of 3.3 (± 1.0) for breasts with anatomical implants and of 2.7 (± 0.9) for breasts with round implants ($p < 0.001$), whereas female participants gave a score of 3.3 (± 1.0) for those with anatomical implants and of 2.4 (± 1.0) for those with round implants ($p < 0.001$), respectively. In multivariate analysis, breasts with anatomical implants ($p < 0.001$; 95% confidence interval [CI]: 0.647 to 0.819) and male gender ($p < 0.001$; 95% CI: −0.259 to −0.087) were predictive factors for a higher score with regard to naturalness (Table 2). Lay participants rated breasts with round implants more natural than surgeons (2.6 ± 1.0 versus 2.2 ± 0.9, $p < 0.001$). Conversely, surgeons rated breasts augmented with anatomical implants more natural than lay participants (3.3 ± 1.0 versus 2.2 ± 0.9, $p < 0.001$), both male (3.3 ± 1.0 versus 2.3 ± 0.9, $p < 0.001$) and female (3.3 ± 1.1 versus 2.2 ± 0.9, $p < 0.001$). Male (2.8 ± 1.1) and female (2.7 ± 1.1) surgeons also rated augmentations equally natural ($p = 0.497$). Anatomical implants ($p < 0.001$; 95% CI: 0.862 to 1.298) were identified as the only significant predictive factor in univariate analysis for the surgeon group.

Attractiveness

Breasts with anatomical implants were rated significantly more attractive than breasts with round implants (3.1 ± 1.0 versus 2.6 ± 1.0, $p < 0.001$) in the lay group, by both male (3.2 ± 1.0 versus 2.8 ± 1.0, $p < 0.001$) and female (3.0 ± 0.9 versus 2.4 ± 0.9, $p < 0.001$) participants. Overall, breast augmentations were rated significantly more attractive by males (3.0 ± 1.0 versus 2.7 ± 1.0, $p < 0.001$). Breasts with anatomical implants ($p < 0.001$; 95% CI: 0.423 to 0.589) and male gender ($p < 0.001$; 95% CI: −0.364 to −0.191) were predictive in multivariate analysis for higher attractiveness scores (Table 2). Naturalness and attractiveness were significantly correlated in our lay cohort ($r = 0.552$, $p < 0.001$).

Similar to the lay group, attractiveness scores of surgeons were significantly higher in breasts augmented with anatomical implants (3.6 ± 0.9 versus 2.7 ± 0.9, $p < 0.001$). However, surgeon scores were significantly higher than the lay group scores (3.6 ± 0.9 versus 3.1 ± 1.0, $p < 0.001$). Overall attractiveness ratings by male (3.3 ± 1.0) and female (3.1 ± 1.1) surgeons were similar ($p = 0.123$). Anatomical implants were preferred by both males (3.6 ± 0.8 versus 2.9 ± 0.9, $p < 0.001$) and females (3.6 ± 0.9 versus 2.5 ± 0.9, $p < 0.001$). Anatomical implants were again the only significant predictor in univariate analysis for high attractiveness scores of surgeons ($p < 0.001$; 95% CI: 0.718 to 1.122). Naturalness and attractiveness were also correlated in the surgeon cohort ($r = 0.645$, $p < 0.001$).

Finally, participants were asked to identify the most natural, unnatural, attractive, and unattractive breast profile of a schematic drawing scale of Hsia et al.,[12] ranging from concave to convex shapes. Most of the upper pole fullness (5) were judged to be most unnatural and unattractive and a neutral or slightly negative upper pole was considered to be most natural and attractive (see Figures 3 and 4).

Discussion

Our results demonstrate that participants were able to distinguish between breasts with either round or anatomical Allergan textured implants (range 275 to 400 g) in the majority of cases. In total, 74.0% of 2000 observations in the lay group and 67.3% of 300 observations in the surgeon group were correctly identified (anatomical implants 72.2% in the lay group and 70.7% in the surgeon group identified versus 75.8% and 64.0% for round implants, respectively). There were no differences in the rates of correct identifications between genders. Furthermore, a correlation between naturalness and attractiveness was found. Breasts with anatomical implants scored significantly higher than breasts with round implants with regard to these two aspects. A neutral or slightly negative upper pole was considered most natural and attractive.

The findings of our study greatly differ from those of previous studies that found no visible difference between breasts with either anatomical or round implants upon photographic evaluation.[7-10,15,16] Gahm et al. compared the two implant types in bilateral breast reconstructions and found no differences in breast aesthetics or patient satisfaction.[10] The authors argued that the final shape of the breast is influenced by several factors including overlying tissue, chest shape, and sometimes capsular development, which all more or less camouflage the underlying implant contour to make any possible differences less apparent. Rubi et al. also reported implant type in augmented breasts to be indistinguishable by plastic surgeons and nurses; their study counted 1800 observations, which is fewer than the 2000 lay and 300 surgeon observations in our study.[7] We believe that their study may contain an inherent bias, as observers rated photographs twice. Moreover, we agree with Agko et al. that withholding profile aspects results in an incomplete judgment of the augmented breast.[17] It is possible that plastic

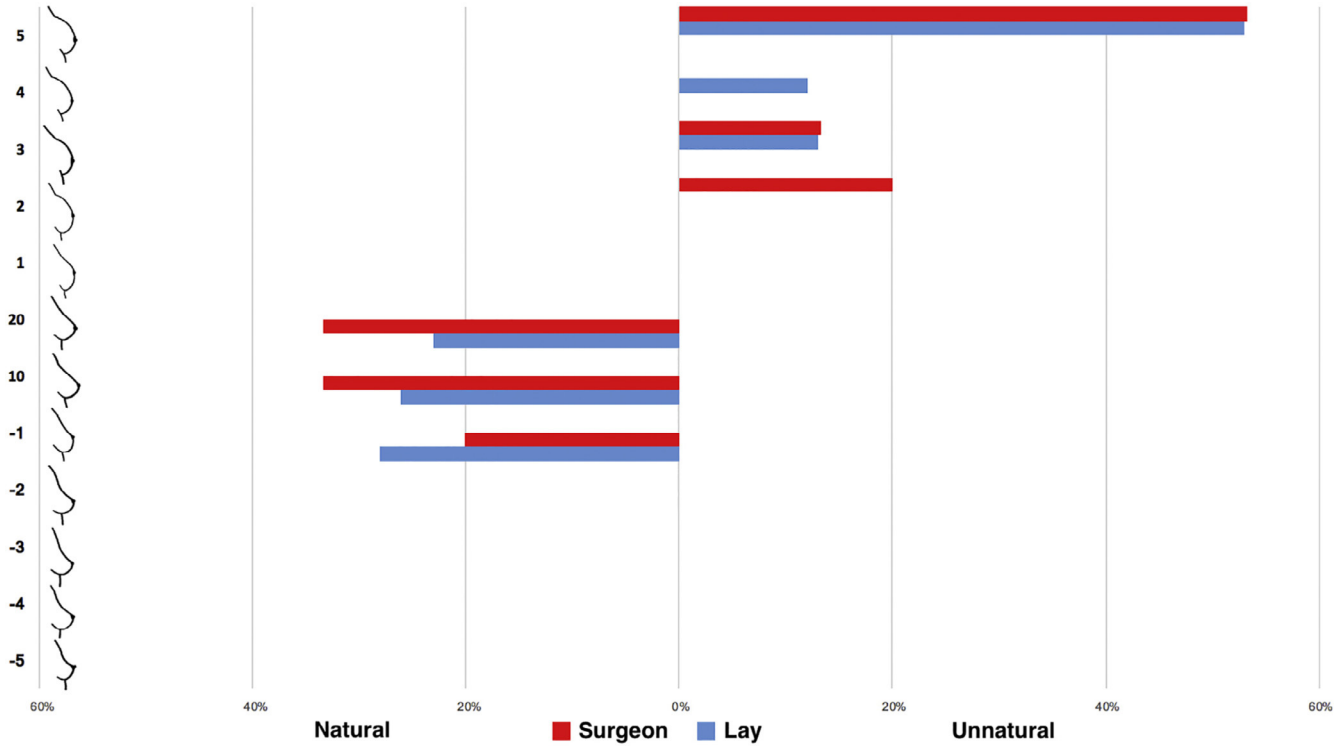

Fig. 3 Rating of the most natural and unnatural upper pole contours of schematic drawings derived from Hsia et al. by all participants. The highest count for each category and above 10% is depicted in this illustration.

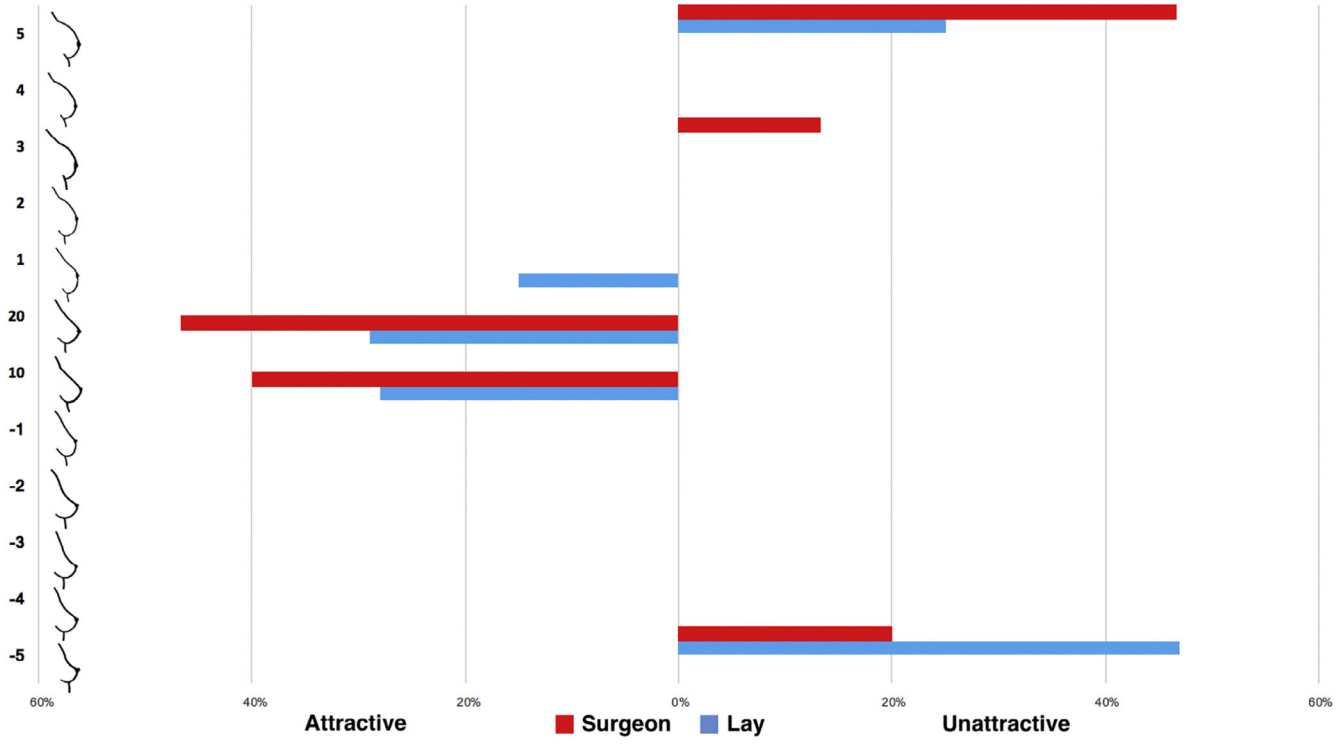

Fig. 4 Rating of the most attractive and unattractive upper pole contours of schematic drawings derived from Hsia et al. by all participants. The highest count for each category and above 10% is depicted in this illustration.

surgeons have a more idealistic image of breast augmentations compared to the lay population and are somewhat "professionally blinded." Although the average ratings of both implant types were relatively low and breast augmentation did not seem to be quite popular in our critical lay cohort, participants were able to differentiate less appealing (round) breast aesthetics slightly better than appealing (anatomical) breasts. Breasts with round implants had a higher rate of correct classifications despite being rated lower in naturalness and attractiveness by both genders in the lay and surgeon groups. Male lay observers, however, rated breast augmentations significantly more natural and attractive than female lay observers; this was not the case for male and female surgeons. Surgeons rated augmentations with anatomical implants significantly more attractive than the lay population, although both groups had a strong preference for this type. This may suggest that a gender bias exists in the lay group, whereas the higher ratings in the surgeon group are professionally driven, thus equalizing scores of both genders. This was reaffirmed by multivariate analysis in the lay group; anatomical implants and male gender were predictive factors of high scores. Univariate analysis showed that anatomical implants were the only predictive factor for high scores in the surgeon cohort; hence, multivariate analysis was not performed.

In our experience, both implant types have good clinical outcomes and result in high patient satisfaction, which is consistent with the results of other studies despite their claims that implant types are indistinguishable.[7,9,10,15,16]

Both plastic surgeons and women who underwent, or were contemplating, breast surgery were common observers in past studies.[7,10,15,16] We not only were primarily interested in the opinion of lay people but also compared this with the opinion of professionals. Presented information was carefully selected to avoid biasing our participants and contained no information, thus suggesting that anatomical implants will result in a more natural result, an assumption that is often used in marketing and communication. Anterior and oblique views of each patient were included, but not lateral views, as we believe that these are most natural and commonly used for portraying breasts (e.g., magazines).

In both participant cohorts, the natural aspect of the breast was considered most important, thus significantly correlating with attractiveness. It has been reported that the patient's body may affect the aesthetics of the breast implant, either masking implant features or giving the false appearance of being another implant type (see also Figures 1 and 2).[18] As such, small volume round implants may be perceived as being anatomical, whereas large volume anatomical implants may be perceived as round.[18] Patients should be aware that implant volumes exceeding the initial breast "footprint" volume are likely to result in a less natural outcome, regardless of implant shape.[2] A Mexican study analyzed 932 patients who had bilateral breast implants (787 high and ultrahigh projection round and 145 anatomical with various projections) and proposed to use anatomical implants in patients with (a) mammary asymmetry, (b) small breast volume, (c) a prominent thoracic wall, and (d) for breasts with small inferior mammary volume.[19] Round implants were recommended for (a) patients with breasts that will completely cover implant shape, (b) moderate breast pseudoptosis, and (c) upper pole deficit. We consider BMI as an important factor to be considered when electing implant type; some breast augmentations require volume, some shape, and others both. Although both implants may have the same volume, anatomical implants can vary in three different dimensions (height, width, and projection), whereas round implants vary only in two dimensions (height/width and projection). Anatomical implants of medium projection were used at the time of implantation based on surgeon preferences. The Allergan MM and MF-410 series used in our study have more similar characteristics to Allergan TSM and TSF round implants, and we assume that increasing projection is likely to lead to more obvious distinction. In our experience, as well as others, anatomical implants provide a slightly lifting effect and therefore can be used in patients with minor breast ptosis.

Women opting for breast augmentation can have preferential wishes different from plastic surgeons, as they seek more fullness of the breast and upper pole.[12] In these cases, round implants may be favored over anatomical, thus providing good long-term results and additionally eliminating the risk of implant rotation. To minimize the risk of rotation when anatomical implants are preferred, surgeons should avoid breaching the anatomical structure possibly causing relaxation of the lateral pocket.[2] Textured anatomical implants are believed to rotate less easily due to the increased tissue adherence, although the textured surface of these implants has been listed as a possible risk factor for Anaplastic Large Cell Lymphoma (ALCL).[20]

Previously, Hsia et al.[12] described the differences between the natural and attractive breast ideals of patients seeking breast augmentation, the general population, and plastic surgeons. The average age of women in their study was more than that in our study (35 versus 20.6), and breasts with convex breast profiles were rated slightly more attractive than concave. Friedman et al.[16] reported that women above the age of 35 years tend to prefer round implants, whereas younger women preferred anatomical implants. Participants were also asked to grade the upper pole of breasts with regard to naturalness: breasts with round implants score the highest.[16] Lay (female) participants in our study were rather young, which could explain why breasts with anatomical implants scored higher in naturalness and attractiveness. Furthermore, both genders preferred a neutral or negative upper pole (concave shape), and this was the same case for surgeons. Cultural preferences may be another point that could explain for the popularity of neutral and negative upper poles in our cohort of students, which we deliberately have chosen as a resemblance of the upcoming (Dutch) generation. Upper pole fullness was seen as unnatural by many of our participants, whereas neutral and negative upper poles were considered natural and thus attractive.

The correlation of naturalness and attractiveness inevitably resulted in an inherent bias when participants became aware that all breasts were augmented. As such, this is a limitation and the results regarding naturalness and attractiveness should thus be interpreted appropriately as it represents a young population, which seemed slightly negatively biased toward breast augmentation. Another limitation is the selection of postoperative pictures without standardization according to the "45:55 ratio," which is recognized as a general parameter to the ideal breast aesthetic.[21]

We encompassed a variety of breasts regarding shape and size yet were aware that this can also be a limiting factor. However, we decided to use a limited medium implant volume range (275–400 g), thereby allowing a realistic comparison of breast aesthetics of implant sizes that are most commonly used. We did not exclude patients based on body modifications; however, the tattoo of the patient depicted in Figures 1 and 2 may have created an optical illusion, which may explain why for this patient ≥85% of the observations were incorrectly scored by both participant groups.

Conclusion

Whether the shape of anatomical implants and their characteristics result in a more natural appearance when used for breast augmentation remains a controversial topic. In contrast to previous literature, we found evidence that outcomes of breast augmentations with either round or anatomical textured Allergan implants are distinguishable by both lay persons and plastic surgery professionals. Moreover, all participants rated results of breasts augmented with anatomical textured Allergan implants significantly more natural and attractive than round textured Allergan implants.

Although we believe that both natural and attractive results can be achieved with either round or anatomical textured breast implants, patient desires and characteristics have to be considered to get the most optimal result.

Conflict of interest

None.

Funding

None.

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