

Preoperative Sizing in Breast Augmentation

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Background: Implant size selection in breast augmentation patients is one of many variables to be determined before surgery. Few methods exist today that allow the patient to participate in this process and accurately determine optimal size. The authors describe a simple method of preoperative sizing using silicone implant samples.

Methods: A total of 567 patients underwent breast augmentation: 297 had surgery before implementation of preoperative sizing and 270 patients were sized preoperatively. Sizing consisted of fitting the patients with various size silicone implants in a larger bra at least twice before surgery to determine desired size. Surveys were sent to both groups to inquire about overall satisfaction, how many preferred a different size postoperatively, and how many ultimately underwent size change surgery.

Results: One hundred two responses (34.3 percent) were obtained from the control group and 142 (52.6 percent) were obtained from the sized group. Sized patients received smaller implants (average, 276.6 cc nonsized versus 246.4 cc sized; $p < 0.001$). Four patients (1.4 percent) in the control group underwent a size change procedure compared with none in the sized group. In the sized cohort, 69 percent believe they are the size that the process predicted, 21 percent are smaller, 9 percent are larger, and 1 percent did not answer the question.

Conclusions: Sized patients were more satisfied than controls and fewer were interested in having a different size implant postoperatively. Sized patients indicated that preoperative sizing was both helpful and reasonably accurate in predicting final breast size. (*Plast. Reconstr. Surg.* 125: 1781, 2010.)

Patients pursuing breast augmentation have many options to consider before surgery, including surgeon, incision location, pocket plane, and multiple implant factors such as filler type, shape, profile type, texture, volume, and sometimes manufacturer. Implant diameter is another important variable, although it is less obvious to the layperson. Some have additional factors to consider such as the need for a simultaneous mastopexy that can be performed by several different methods and may be unilateral, bilateral, or require a different approach on each side. Ancillary procedures such as correction of inverted nipples or nipple reduction in the postpartum patient are options that add to the decision-making process.

Most patients today conduct considerable research, much of it Internet based, and usually see several physicians before committing to a defini-

tive surgical plan. Arguably the most elusive factor to settle with certainty before surgery is implant size. Many patients have fixed notions of size based either on cup size, celebrity or Internet photographs, the experience of friends (both good and bad), or their personality. However, none of these factors is of proven benefit in selecting the proper implant size.

Verbal communication alone between the patient and physician, even if supplemented with adjunctive information as described above, is an unreliable method for determining implant size. When the decision is perceived to be a unilateral one on the part of the physician, the patient does not feel compelled to accept responsibility for that decision if she is disappointed after surgery. The need for additional surgery for a size change is associated with anxiety, urgency, and the belief that the surgeon is at fault or at least should bear the responsibility for the cost of replacement sur-

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Received for publication June 22, 2009; accepted September 8, 2009.

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DOI: 10.1097/PRS.0b013e3181cb6530

Disclosure: *Neither of the authors has a financial interest in any of the products or devices mentioned in this article.*

gery. Some surgeons tend to use a size larger than may be necessary to hedge their bets and avoid this situation, often perpetuating the folklore that patients always wish they were a little larger anyway.

Some practitioners have attempted to use a combination of chest wall measurements and “bust circumference” to determine implant size, whereas others have constructed tables that correlate implant volume with bra size for reference.^{1,2} Others rely on a set of specific tissue characteristics and measurements to determine optimal implant size.³⁻⁶ Although this latter method seeks to make size selection more scientific, it ultimately presents optimal size to the patient as a *fait accompli* without participation beyond her anatomy. This does not guarantee a happier patient, although it may provide the surgeon with stronger footing for discouraging pursuit of size change surgery later.

Many experienced surgeons seek to have the patient more actively involved in size selection in a way that will help preview the result. Some have described using rice or saline in a bag to estimate the size of the implant required.⁷⁻⁹ Today, there are Web sites on the Internet that describe the “rice test” for prospective patients to perform at home.^{10,11} A method of preoperative sizing that the authors have been using for the past several years and that constitutes the basis for this report consists of fitting patients with their desired bra size and placing various size sample silicone gel implants in the bra to simulate the result that each size would achieve (Fig. 1). This allows the patient to preview final breast size and, by participating in the sizing process, accept responsibility for the outcome together with the surgeon. The goal is to minimize the prospect for patient dissatisfaction

after surgery that can ultimately lead to secondary surgery to change implant size.

PATIENTS AND METHODS

Technique of Preoperative Sizing

Preoperative sizing is performed at least two times before surgery. The first session is generally more time consuming and is usually done with the nursing staff, whereas the second session is done with the surgeon, as it is either largely confirmatory or the surgeon can give additional input to guide the process. Patients unable to clearly state a narrow range of preferred sizes are brought back for a third visit if necessary. The goal is to narrow the choice down to two sizes differing by not more than 25 cc. Patients are advised that this narrow range represents approximately one-eighth of a cup size and the final selection thereafter is best left as an intraoperative decision.

The process begins by fitting the patient with a larger bra that has underwires but minimal padding. This is most often a C cup, although a D cup may be used in some young nulliparous patients and a B cup in some older and more conservative postpartum patients. The chest circumference is variable and generally the same as the patient normally wears (even though many patients do not necessarily wear the correct size bra for their chest circumference).¹² Patients are advised that the bra cup material adds volume by itself and that this varies depending on the type of bra. In our sizing bra, the extra volume measured 30 cc per side (Fig. 2). This volume can be added to the final size implant preferred by the patient during



Fig. 1. Breast implant size box containing sample implant sizes.



Fig. 2. A sample 34C bra is shown. The cup from one side has been cut off, rolled, and compressed within a syringe to demonstrate a volume of approximately 30 cc. The excised cup material weighed only 12 g.

the sizing process if she seeks the outside volume that includes the bra.

The starting point in implant sample size is somewhat arbitrarily determined by taking into account height, weight, personality, and specific goals. Two different sizes are placed and the combination gradually increased until the patient feels the goal has been achieved. A common starting point is a 225-g implant on one side and a 250-g size on the other and working up (or less commonly down) from there. A thin form-fitting top is typically worn to examine the effects of the different sizes in front of a full-length mirror (Fig. 3). Once the patient has determined the desired size range, it is important to continue the process, placing larger sizes until they emphatically state “that is too much.” This final step in the sizing process can be helpful postoperatively in preventing a patient from lamenting that maybe she should have tried on a larger size.

It is generally best not to have friends or family members present during the sizing process, at least not during the first session. They may have aesthetic values that differ from those of the patient and sometimes have a relationship that may be competitive or otherwise emotionally charged. Supportive spouses and significant others are usually an asset, although in some cases the partner may harbor a different agenda regarding size.

The second visit with the physician serves to confirm the size preferred and allow for a conversation on how anatomy may either impose some restrictions regarding the size selected or suggest the use of a larger size than previously considered. Patients with either a narrow breast base (such as tubular breasts), poor postpartum skin elasticity, or a sharply defined inframammary crease located close to the areolar margin may require a smaller implant size than they prefer. In contrast, tall patients and those with a wide chest may benefit from greater volume and diameter than they thought was ideal. This meeting is also useful to decide which incision will be best. Sometimes, for example, the patient preferring a somewhat larger silicone implant may no longer be a candidate for a periareolar incision if her areolar diameter is small. An inframammary crease incision usually proves necessary in such a case.

Although sizing is performed with silicone implant samples, the process is the same for patients using saline implants. The saline implant size selected is one size smaller than the silicone sample. This allows overfilling to the desired volume to minimize the prospect of ripples and possibly premature deflation. For example, a patient who likes

a range between 275 and 300 g would be well suited for either a 250-cc implant or a 275-cc implant overfilled to achieve the same final volume range. As a practical matter, saline implant size is assumed to correspond in cubic centimeters to the size selected in grams of silicone.

Data Collection

A questionnaire was sent to a control group consisting of patients operated on between March 3, 2003, and October 6, 2005, and a sized group operated on between October 10, 2005, and July 16, 2008; all procedures were performed by the senior author (D.A.H.). The goal was to assess satisfaction with the procedure in general and with size specifically, at an interval of at least 6 months after surgery (Fig. 4). Patients who were sized preoperatively were sent a second questionnaire that inquired specifically about the sizing process (Fig. 5). Nonresponders to mail inquiry were called by phone to maximize the response rate.

Statistical Analysis

A two-sample independent measures *t* test was performed to analyze implant volume in breast augmentation patients treated with or without our preoperative sizing device. Cohen's *d* was reported to show the size of the treatment effect (by convention, $0.2 < d < 0.8$ corresponds to a medium effect size). Fisher's exact test was used to evaluate wanting smaller or larger breast augmentations following surgery in patients treated with or without our preoperative sizing device. The Wilcoxon rank sum test was performed to assess the data obtained from the questionnaires. Results for ratio data were reported as mean \pm SE and those for ordinal data were expressed as median and corresponding interquartile range. In all cases, the level for statistical significance was set at $p < 0.05$.

RESULTS

The control group consisted of 297 patients and the sized group contained 270 patients. One hundred two responses (34.3 percent) were obtained from the control group and 142 (52.6 percent) were obtained from the sized group. Fourteen percent of surveys in the control group and 12 percent in the sized group were returned because of change of address with no forwarding address available. The median interval between surgery and the survey response was 21 months in the control group (interquartile range, 9 to 71 months) and 12 months in the sized group (in-



Fig. 3. A patient is shown preoperatively (*above, left*), with a 275-g implant used as a sizer on the right and a 300-g implant on the left in the sizing bra (*above, center*), and with an overlying garment (*above, right*). Postoperative views show the patient with 300-cc submuscular saline implants filled to 305 cc on the right and 320 cc on the left (*below, left*) and wearing the same sizing bra (*below, center*) and outer garment (*below, right*).

terquartile range, 6 to 36 months) (Table 1). The average implant volume was 276.6 ± 53.4 g/cc in the control group and 246.4 ± 49.5 g/cc in the sized group, corresponding to a statistically significant difference and a medium effect size ($p < 0.001$, $d = 0.6$). Twenty-one respondents (7.1 per-

cent) in the control group preferred either a larger or smaller size than they had, whereas 11 respondents (4.1 percent) in the sized group felt the same way, corresponding to no statistically significant difference. Overall procedure satisfaction was measured on a scale of 1 (not helpful) to

1. How satisfied are you with the overall results of your surgery (circle one number below)?

1	2	3	4	5
(not satisfied)				(extremely satisfied)
 2. Are you satisfied with your size? Yes No
 3. Would you prefer to be larger? Yes No
 4. Would you prefer to be smaller? Yes No
- Comments:

Fig. 4. Initial questionnaire sent to patients in both study arms.

1. How helpful was preoperative sizing to you? (circle one number below)

1	2	3	4	5
(not helpful)				(extremely helpful)
2. How well did preoperative sizing correlate with your final result?

1	2	3	4	5
(poor)				(excellent)
3. Choose one of the following:
 - A. I am smaller than what the sizing predicted.
 - B. I am larger than what the sizing predicted.
 - C. I am the size that sizing predicted.

Fig. 5. Follow-up questionnaire sent only to patients who underwent preoperative sizing.

Table 1. Intergroup Comparison

Group	No. of Patients	Surveys Received (%)	Average Implant Volume (g/cc)	Would Prefer Different Size (%)	Procedure Satisfaction Average*	Had Size Change Surgery (%)
Control	297	102 (34)	276.6†	21 (21)	4.2	4 (4)
Sized	270	142 (53)	246.4	11 (16)	4.5	0 (0)

*On a scale ranging from 0 to 5.

† $p < 0.001$.

5 (extremely helpful). The median score for satisfaction was 5 in both the control and the sized groups. There were four size change procedures (1.4 percent) performed in the control group and none performed in the sized group, corresponding to no statistically significant difference.

The second survey sent only to the sized group showed a median score of 4.5 (interquartile range, 4 to 5) for rating the usefulness of the sizing process on a scale of 1 (not helpful) to 5 (extremely helpful). The median score for rating the correlation between the sizing preview and the actual result achieved was 4 (interquartile range, 3 to 5) on a scale of 1 (poor) to 5 (excellent). Twenty-one percent of the sized group felt that they were smaller than what the sizing predicted, 9 percent felt they were larger than what the sizing pre-

dicted, and 69 percent believed they were the same size as the sizing predicted.

DISCUSSION

Preoperative sizing allows the patient to participate in size selection. This imparts a sense of responsibility for the final result that does not exist in cases where the physician unilaterally decides optimal volume. It also allows the patient's spouse, significant other, or key family member(s) to participate in the process. Although the latter has the potential to cause confusion because of a diversity of opinion, it more often than not is helpful in finalizing a narrow size range from which the patient can choose.

Although no method provides a perfect simulation, this technique does allow the patient to preview

the result and assess her appearance in a variety of clothing types. It also serves as a basis for dialogue between the physician and patient to take into account other factors that influence final size selection. For example, patients often have to be urged to consider larger sizes because even conservative size implant samples can initially seem to make a drastic difference. In addition, patient height, chest width, and lower body contour are important factors that may argue for either a larger or smaller size depending on particular anatomy and patient-specific tissue characteristics.³⁻⁵ Other anatomical constraints such as a sharply defined inframammary crease that is located relatively close to the inferior areolar margin will often impose limits on implant diameter.¹³ Placing an implant that is too large in this particular setting is a common cause of “double-bubble” deformity. Tubular breast shape, although fortunately uncommon, is a more extreme example of a situation where anatomy limits implant choice.

Preoperative sizing allows the surgeon to properly counsel the patient on the issue of volume versus diameter as it pertains to specific anatomical characteristics. This will minimize the possibility of creating a postoperative shape problem as a result of using implant volume as the dominant criterion for size selection. Moreover, it will allow the physician to consider early on in the process alternate implant types to arrive at the optimal volume-to-diameter ratio. For all of these reasons, the surgeon should be intimately involved in the sizing process and not delegate this entirely to the nursing staff.

Some believe that sizing underestimates the final result because some of the volume is “lost” when placed in a retropectoral plane, an idea that is based on conjecture at best, not fact. It has not proven necessary to arbitrarily increase the implant size beyond that which the patient has chosen to accommodate this notion. However, it is important to make the patient aware that the bra itself can add as much as 30 cc volume depending on the type (Fig. 2).

Another common practice is for surgeons to err on the larger side when it comes to selecting implant size to avoid the unhappy patient who may then seek size change surgery.¹⁴ It could be argued that postoperative problems such as double-bubble deformity and others may occur less commonly if implants are not routinely picked slightly larger than what appears good to make certain that the patient is happy with size selection. Although downsizing implants is less common than a request for larger implants, the former scenario does occur

and may also be a result of this practice. As this study demonstrates, somewhat smaller implants can be used without compromising patient satisfaction when preoperative sizing is incorporated as an integral part of preoperative preparation.

Another advantage of preoperative sizing is that two different size implants can be tested simultaneously in patients with volume asymmetry. This will aid both the patient and the physician in deciding whether or not to use different sizes in those whose breasts differ in small volumes and how many sizes different may be needed in those with greater volume differences.

The average implant size used in this study is relatively small and likely reflects the study population treated. The senior author’s breast augmentation patients reside in the Northeast, a region arguably more conservative than other (i.e., warmer) parts of the country. Also, most are postpartum patients seeking volume restoration more than significantly larger breast size. There is no reason to believe, however, that the practice of preoperative sizing would not be of equal value in practices where implant volumes average higher by 100 cc or more.

Interestingly, this study shows that a similar proportion of both sized and unsized patients wish to be a different size postoperatively, usually larger. Although the difference in revision rates between groups did not reach statistical significance (potentially because the low incidence of revisions in both groups), none of the patients in the sized group underwent size change surgery. This supports the assertion that patients who participate in size selection assume at least as much responsibility for the final choice as the surgeon. They are more willing to accept the result that they have without indulging in an ongoing mental debate that ultimately leads to further surgery.

Retrospective studies have well-known limitations, and studies using surveys suffer from incomplete response rates. Despite these limitations and the fact that the data did not often show statistically significant differences in patient satisfaction or revision rates, our clinical impression remains that preoperative sizing is quite useful. We believe this simple technique can easily be incorporated into the practice of any surgeon performing breast augmentation. Routine use of preoperative sizing in our practice has virtually eliminated the occurrence of frantic early postoperative telephone calls from patients who feel they are too small. It has reduced patient anxiety more than any other factor and has transformed the care of the breast augmentation patient in our practice into a more

uniformly rewarding and positive experience for both the patient and physician.

CONCLUSIONS

Although preoperative sizing is a highly subjective process, it has nevertheless proven to be a valuable tool in the management of a challenging patient population. Patients tend to be happier with their result than those who do not undergo preoperative sizing. Although some patients are not completely satisfied with their size despite preoperative sizing, they rarely seek size change surgery. It is expected that future improvements in methodology and equipment will improve the precision of the technique.

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ACKNOWLEDGMENTS

The authors thank Andrew Weinstein for statistical analysis and Paola Lisi for data management in the preparation of this article.

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