

THE INFLUENCE OF CAREER STAGE, PRACTICE TYPE AND LOCATION, AND GENDER ON SURGICAL PRACTICES AMONG BOARD-CERTIFIED PLASTIC SURGEONS PERFORMING BREAST AUGMENTATION

ABSTRACT

Background: Breast augmentation is the most commonly performed cosmetic surgical procedure in the United States. Surgical preferences vary with respect to surgical technique and postoperative care.

Objective: Investigators examined self-reported data to investigate the association between career stage, practice type, and practice location to clinical practices among board-certified plastic surgeons performing breast augmentation.

Methods: In October 2009 a link to an online survey was emailed to all active members of the American Society of Plastic Surgeons practicing within the United States. Response frequencies were calculated for surgeon demographics and practice description, patient characteristics, and surgical preferences. Surgical preferences were analyzed for associations with years in practice, practice type and location, and physician gender.

Results: 898 complete responses were received for a response rate of 18.9% percent. Surgeons performing breast augmentation were more frequently male, between the ages of 46 and 65 years, and have practiced for at least 20 years in solo private practice and in suburban settings. Surgical volume most frequently consists of 10-25% cosmetic surgery, with 10-50 breast augmentations performed per year. Implants used were most frequently between 300 and 400 cc; smooth, round, and silicone; and placed into the subpectoral or dual-plane pocket through an infra-mammary incision. Surgeons in practice for five years or less were more likely to use smooth, round silicone implants; to select implants smaller than 300cc; to use the dual-plane pocket; and to recommend yearly follow-up. Surgeons in practice for more than 20 years were more likely to use saline implants; utilize the subglandular plane; to perform closed capsulotomy; and to use drains. Surgeons at academic centers performed fewer breast augmentation surgeries and placed smaller implants than those in private practice, while surgeons in suburban locations performed more breast augmentations than those in urban or rural locations. Surgeons in the West performed the greatest number of augmentations, although the largest sized implants were placed in the Southwest. Compared with men, women surgeons appear significantly less likely to use saline implants, are less likely to perform more than 100 breast augmentations per year, and are significantly more likely to place implants sized less than 300 cc.

Conclusions: Surgeons performing breast augmentation tend to be in the middle to late stages of their career. Their practices remain predominantly non-cosmetic, and most perform a moderate number of augmentations. Surgical preferences are associated with years in practice and include differences in both technique and postoperative care. Location is associated with differences in procedural volume, implant size, incision location, and recommended follow-up time, while practice type is related to surgical volume, implant size, implant location, and percentage of cosmetic surgery performed. Gender based differences appear to exist,

specifically a higher use of saline implants, larger sized implants, and higher procedural volume among men surgeons.

INTRODUCTION

Breast augmentation remains the most popular surgical cosmetic procedure in the United States.¹ Surgeon preferences vary widely with respect to preoperative planning, surgical technique, and postoperative care. While general assumptions exist regarding the correlation of implant size and surgical volume with geographic location and practice type, a systematic review and statistical analysis of such differences has not been performed. Variations in practices based upon career stage and gender are also believed to exist, although the degree of and reason for such differences have not been previously examined. The aim of this study was therefore to investigate the prevalent practices of surgeons performing breast augmentation, to elucidate surgeon preferences based on career stage and practice location and type, to examine any differences related to physician gender. Possible explanations for significant differences are discussed.

MATERIALS AND METHODS

Study Design and Subjects:

In October 2009 a link to an online email questionnaire via SurveyMonkey was sent to 4737 active members of the American Society of Plastic Surgery (ASPS) practicing in the United States. The survey was available for a three-month period, with an email reminder sent in November 2009. There was no financial or other incentive for participation. Respondents included in analyses were limited to those who indicated that they perform breast augmentation.

Survey Instrument:

The multiple choice survey was compiled by the primary investigator and reviewed for its comprehensive nature by a convenience sample of plastic surgeons. The survey included questions on surgeon demographics and practice description, surgical techniques, and observed complications and methods of surveillance and treatment (see Figure 1).

Analysis:

Response frequencies were calculated for surgeon demographics, practice description, and surgical preferences. The chi-square (for independence and for trend), analysis of variance and nonparametric analysis of variance tests (Kruskal-Wallis) were utilized as appropriate. Surgical preferences by gender were evaluated using logistic regression analyses to control for years in practice. Each practice/preference served as a dichotomous outcome variable while gender served as the primary exposure variable. Years in practice, a polychotomous variable, was kept in each model using design variables.²

RESULTS

A total of 898 complete responses were received for a response rate of 18.9%. The 870 respondents that indicated they perform breast augmentation served as the study sample. Characteristics of the sample are shown in Table 1.

Surgeon Demographics and Practice Description:

Surgeons responding were predominantly male (87.1%), between the ages of 46 and 65 years (67.6%), have been in practice for 11-20 years (36.9%) or greater than 20 years (43.8%), practice in suburban (52.3%) or urban (40.8%) settings, and are in private solo practice (67.4%). 42.4% reported that cosmetic surgery makes up 10-25% of their practice, 22.1% have practices consisting of 51-75% cosmetic surgery, and 19.3% of practices are at least 75% cosmetic. 43% of respondents perform 10-50 breast augmentation surgeries per year, 22.6% perform 51-100 procedures per year, and 21.2% perform more than 100 procedures per year (Table I).

Patient Characteristics:

Respondents indicated that most of their patients were between the ages of 30 and 49 years (93.2%) and were Caucasian (81.0%). Patients were predominantly of medium build (70.8%) with a self-reported preoperative breast size of an A cup (29.1%) or a B cup (61%). The most frequently requested postoperative breast size was a C cup (78.3%) or a D cup (16.4%).

Surgical Preferences:

Implant Size: The average implant size was between 300 and 400 cc, with 37.9% of surgeons reporting an average size of 301-350 cc, and 32.85% reporting an average size of 351-400 cc. 13.6% of respondents use implants sized 251-300 cc. When selecting a size, surgeons tend to rely on the patient's choice (42.8%) or their own aesthetic judgment (32.8%); 9.3% of respondents indicated that they use the TEPID™ system as the determining factor. Surgeons are divided almost equally on the intra-operative use of sizers: 35.3% never use sizers, 28.7% sometimes use sizers, and 31.5% always use sizers. Surgeons who use the patient's choice as the determining factor in selecting implant size are significantly more likely to place implants greater than 350 cc when compared to those who use their own judgment ($p < 0.05$). Surgeons who rely on their own judgment are more likely to use intraoperative sizers ($p < 0.01$).

Implant Location: 50.5% of surgeons prefer the subpectoral plane, 22.4% use the dual-plane approach, and 6.1% utilize the subglandular location. 17% of respondents indicated that they do not have a clear preference and that their choice for implant location is dictated by the patient's anatomy.

Incision Location: The infra-mammary incision was the preferred approach for 66.1% of surgeons while 22.8% use the peri-areolar incision, 7.3% favor the trans-axillary approach, and 0.2% utilize the trans-umbilical incision.

Implant Type: 43.7% of surgeons prefer silicone implants, 27.9% prefer saline, and 24.5% use both in even proportions. The majority of surgeons (86.7%) use smooth round implants, with those manufactured by Mentor (50.8%) favored over those manufactured by Allergan (32.8%).

Postoperative Care: Surgeons tend to use surgical bras only (46.9%) as opposed to compression dressings alone (18.2%) or breast straps alone (4.8%). A small percentage use surgical bras and breast straps (7.0%) or surgical bras and a compression dressing (4.6%), while 11.6% use no dressing. 91.6% of surgeons do not use drains routinely. After the first postoperative year, 57.4% of surgeons request yearly follow-up, 8% request biennial follow-up, and 26.6% require no further visits.

Complications: Surgeons reported that the most frequently observed complication in their practice is capsular contracture, which was observed by 82.3% of respondents. 59.4% of surgeons indicated that less than 5% of their patients had experienced a Baker grade II or higher capsular contracture, while 25.6% reported a rate between 5 and 10%. 64.5% of surgeons did not observe a difference in the contracture rate based upon the use of silicone versus saline implants. Among those who perform both subglandular and subpectoral augmentations, 49.9% reported a higher incidence of contracture following subglandular augmentation. Following the first capsular contracture of Baker grade II or higher, 52.2% of respondents perform open capsulotomy or capsulectomy and implant exchange within the same pocket; 21.3% perform open capsulotomy or capsulectomy and implant exchange to a new pocket; 32.1% prescribe Accolate, Singulair, or other medications; 26% observe the patient; 6.3% perform closed capsulotomy; and 2.2% recommend implant removal. Following the second contracture, 34.7% perform open capsulotomy or capsulectomy and implant exchange within the same pocket; 47.9% perform open capsulotomy or capsulectomy and implant exchange to a new pocket; 13.4% prescribe Accolate, Singulair, or other medications; 15.3% recommend implant removal; and 3.1% perform closed capsulotomy. Preferred methods for preventing capsular contracture include prophylactic antibiotics (71.3%); implant massage (66.3%); cleaning powder from gloves prior to handling the implant (51.3%); vitamin E (18.0%); Accolate (14.3%) or Singulair (13.1%); and external ultrasound (5.2%). Other frequently observed complications included implant rippling (observed by 76.4% of respondents), implant deflation or rupture (76.2%), hematoma (74.0%), sensory changes of the nipple areolar complex (60.8%), implant displacement or rotation (53.6%), the “double-bubble” deformity (45.4%), and infection (42.8%). Methods of infection prevention include administering intravenous antibiotics preoperatively (86.7%); pocket irrigation (78.5%); prescribing oral antibiotics pre- or postoperatively (51.0%); and glove change prior to implant insertion (41.7%). Pockets are irrigated with triple antibiotic solution (33.9%), Bacitracin solution (29.1%), saline (23.6%), and/or Betadine solution (20.8%).

Surgical Preferences by Years in Practice:

Surgical preferences by years in practice, divided into four categories, are shown in Table 2. Group comparisons revealed the following:

Surgeons in practice for 5 years or less were significantly more likely than all other responding surgeons to use silicone implants (50.6% vs. 42.0% for those in practice > 5 years, $p < 0.05$); to report an average implant size less than 300 cc (34.3% vs. 14.9%, $p < 0.01$); to use the dual-plane

pocket (40.0% vs. 21.7%, $p<0.05$); and, to recommend yearly follow-up (80.0% vs. 56.4%, $p<0.01$).

Surgeons in practice for 6-10 years were more likely than surgeons in practice for 11-20 years to place implants sized less than 300 cc (21.1% vs. 10.9%, $p<0.01$). When compared to surgeons in practice for more than 20 years, surgeons in practice for 6-10 years were more likely to use silicone implants (51.9% vs. 39.9%, $p<0.05$), and to use the dual-plane approach (28.6% vs. 18.6%, $p<0.05$).

Surgeons in practice for 11-20 years were more likely than surgeons in practice for 5 years or less to use the subpectoral plane (48.3% vs. 34.3%, $p<0.05$). When compared to surgeons in practice for 6-10 years, they were more likely to place larger implants, specifically those sized between 351-400 cc (30.4% vs. 26.3%, $p<0.05$). When compared to surgeons in practice for more than 20 years, there were multiple significant differences. In particular, surgeons in practice for 11-20 years were more likely to use larger implants sized between 351-400 cc (38.6% vs. 30.4%, $p<0.05$); to use smooth round implants (91.6% vs. 81.4%, $p<0.01$); to report a contracture rate of less than 5% (62.6% vs. 50.7%, $p<0.01$); to use a surgical bra (65.1% vs. 53.5%, $p<0.01$); and, to follow patients following the first postoperative year (55.5% vs. 58.3%, $p<0.01$).

Surgeons in practice for more than 20 years were more likely than all other responding surgeons to use saline implants (33.3% vs. 23.7%, $p<0.01$); to place anatomic implants (2.6% vs. 0.4%, $p<0.05$); to use the subglandular plane (9.7% vs. 3.3%, $p<0.01$); and to use surgical drains (5.8% vs. 2.0%, $p<0.01$).

In analyzing data from questions that had non-mutually exclusive response categories, certain trends were discovered (as shown in Table 2). Specifically, the following increased alongside years in practice: the use of no form of pocket irrigation ($p<0.01$); the use of closed capsulotomy after the first and second capsular contracture ($p<0.01$); and, the use of a “sleeve” for infection prevention ($p<0.05$). Alternatively, the following decreased with years in practice: the use of triple antibiotic solution for pocket irrigation ($p<0.01$); the use of breast implant massage to prevent capsular contracture ($p<0.05$); the use of open capsulotomy / capsulectomy with implant exchange to the same pocket after both the first and second capsular contracture ($p<0.05$); the use of open capsulotomy/capsulectomy with implant exchange to a different pocket after first capsular contracture ($p<0.05$); the use of oral antibiotics for infection prevention ($p<0.05$); the practice of changing gloves prior to implant insertion for infection prevention ($p<0.01$); the “no-touch” technique for infection prevention ($p<0.01$); and, the use of pocket irrigation for infection prevention ($p<0.05$).

Surgical Preferences by Practice Type:

There was no difference in the number of breast augmentation surgeries performed based upon the type of private practice—solo, single-specialty or multi-specialty. However, surgeons in solo private practice were more likely to report a higher percentage of cosmetic surgery, with 67.9% reporting a cosmetic case load greater than 50%, compared to 61.2% of single-specialty

groups and 46.8% of multispecialty groups ($p<0.01$). Responding surgeons at academic centers perform significantly fewer breast augmentation surgeries when compared to those in private practice: <10 cases per year (29.6% vs. 7.8%), 10 – 50 (61.1% vs. 41.8%), 50 – 100 (5.6% vs. 23.9%), and >100 (1.9% vs. 22.6%) ($p<0.01$). Private practice physicians also perform more cosmetic surgery compared to those at academic centers (> 50% of volume is cosmetic, 65% vs. 37%, $p<0.01$). Practice setting evaluations showed that 50% of suburban practices perform more than 50 breast augmentations per year compared to 38% of urban practices ($p<0.01$). 43% of urban practices reported a case volume of more than 75% cosmetic surgery compared to 16% of rural practices ($p<0.01$). There was no correlation between implant size and practice setting ($p=0.35$). There was no correlation between the type of private practice and implant size. Surgeons in private practice, however, were more than twice as likely as academic surgeons to place implants larger than 350 cc (44.4% vs. 18.5%, $p<0.01$). Surgeons in rural, suburban and urban practices had similar requested postoperative sizes, but surgeons in rural locations were significantly more likely to use the subglandular plane (12.1% vs. 4.2% vs. 7.6%, respectively, $p<0.05$, Figure 2).

Surgical Preferences by Location:

Surgeons in the West perform significantly more breast augmentation procedures and cosmetic surgery than surgeons in the Northeast (> 100 breast augmentations per year, 29.1% vs. 9.9%, $p<0.01$; >75% of volume is cosmetic, 56.0% vs. 28.6%, $p<0.01$, Figure 3). The patient age range and race among all five locations were similar, but Northeast surgeons reported a greater proportion of patients with a “small frame” body type (37.0% vs. 23.1%, $p<0.05$). Surgeons in the Midwest and Northeast reported an average preoperative size of an A cup for 36.2% and 38.6% of their patients, respectively, compared with approximately 26.1% for the other three regions ($p=0.06$). The requested postoperative size was largest in the Southwest, with 30.4% of practices reporting that a D cup or larger was the most frequently requested size, compared to 24.7% in the West, 15.7% in the Southeast, 13.5% in the Midwest, and 4.9% in the Northeast ($p<0.01$). Average implant size placed was also largest in the Southwest, with 57.8% of surgeons using an average implant size greater than 350 cc compared to 47.3% in the West, 46.4% in the Southeast, 45.5% in the Midwest, and 21.4% in the Northeast ($p<0.01$, Figure 3). Surgeons in the West utilize the peri-areolar incision significantly more often (37.8% vs. 26.6% in the Southeast, 19.7% in the Northeast, 14.6% in the Midwest, and 13.1% in the Southwest, $p<0.01$). The type of implant placed, pocket selected, irrigation solution, use of drains, dressing choices, and infection prevention measures did not vary with practice location. There were, however, differences in recommended patient follow-up, with significantly more practices in the Midwest (38.5%) and Southeast (32.5%) reporting that they do not require any follow-up following the first postoperative year when compared to practices in the Northeast (23.5%), West (22.2%), and Southwest (21.4%) ($p<0.01$).

Surgical Preferences by Gender:

After controlling for years in practice, women surgeons were found to be significantly more likely than men surgeons to place implants sized less than 300 cc (23.2% vs. 14.1%, $p<0.05$). There was no significant difference between surgeon gender and patient-requested postoperative size (17.3% of men surgeons reported a request for a “D” cup compared to 11.6%

of women surgeons, $p=0.24$). Men surgeons were significantly more likely to use saline implants (29.4% vs. 17.9%, $p<0.05$). Women surgeons used silicone implants more frequently than men surgeons, although this number did not reach statistical significance (52.7% vs. 42.3%, $p=0.10$). Compared to women surgeons, men surgeons were more likely to perform more than 100 breast augmentations per year (22.8% vs. 9.8%, $p<0.01$). There was no association between the gender of the surgeon and preferred location for implant placement, method used to determine implant size, or recommended patient follow-up time (Table 3).

DISCUSSION

The current study is the largest survey of board-certified plastic surgeon breast augmentation practice patterns to date. Notable findings from the survey include that surgeons who perform breast augmentation are most frequently mid-to-late career, in solo practice, and perform breast augmentation as a relative minority of their total surgical volume. They tend to have specific preferences or practice patterns that appear to be related to years in practice, practice location and type, and gender.

Surgical decisions and techniques change as the surgeon matures, reflecting not only the surgeon's training and experience, but also the current literature. Training in plastic surgery has evolved, and later-career surgeons may continue practice patterns that are no longer in line with current treatment standards. The degree to which these two sometimes competing influences manifest in practice patterns has remained unclear. Surgeons in practice for 5 years or less showed a tendency to be both conservative and cautious, as demonstrated by their tendency to use smaller implants, to change the implant pocket for the first capsular contracture, and to recommend yearly follow-up. Their preference for silicone implants, which re-entered the market in 2006³; the dual-plane technique, which was initially described in 2001⁴; and triple-antibiotic irrigation, which was detailed in 2006⁵, reflects their comfort level with devices and techniques which were available and promoted during their training and the early stages of their careers.

Surgeons in practice for 6-10 years were similar to their younger colleagues in their preference for silicone implants, smaller implant sizes, and triple-antibiotic irrigation. However, this group also showed the beginning of the tendency of more senior surgeons in the survey to recommend medication in addition to or instead of surgery for capsular contracture. This could indicate either greater experience with the challenges of treating capsular contracture, or greater confidence in exploring new treatment options. The use of non-surgical modalities, specifically the use of ultrasound and leukotriene inhibitors, were most frequently described after 2000, which would correlate with the exposure of this group of surgeons to these techniques in their training and early careers.⁶⁻¹³ Similarly, this group also showed the beginning of the trend of later-career surgeons to request less frequent follow-up, although the reason for this is unclear and may be related to personal experience.

The greatest number of differences was seen between surgeons in practice for 11-20 years and those in practice for greater than 20 years, suggesting that significant changes in surgical

practices may occur during this middle stage of the breast augmentation surgeon's career, or alternatively that a dramatic change in training standards and curriculum occurred during the years between these two groups. Compared to their senior colleagues, surgeons in practice for 11-20 years were more aggressive in their selection of larger implant sizes and in their tendency to perform an open procedure for the first capsular contracture. However, they were also more likely to use a number of adjunct measures during and after surgery, including the use of triple-antibiotic irrigation, oral and intravenous antibiotics, glove change prior to implant placement, use of a surgical bra, and more frequent follow-up. It was notable that surgeons in practice for more than 20 years were more likely to prefer saline implants, which would likely reflect the wide availability of this device and their voluminous experience with it during the majority of their careers. In addition, these surgeons were in practice during the FDA moratorium on silicone breast implants in 1992, which could have adversely affected their opinion of silicone gel implants. The higher preference for anatomic implants by surgeons in practice for more than 20 years might be explained by device availability as well, as trials for anatomic, highly cohesive silicone gel implants began in 2001.¹⁴ However, this group was also more likely to report that their implant choice depended upon the patient's anatomy, and therefore their preference for anatomic implants may simply reflect their significant experience with matching patients to devices. Although only a small number of surgeons reported that they perform closed capsulotomy, use the subglandular plane, and place drains routinely, the association of these techniques with more than 20 years in practice most likely reflects techniques which were more widely used during both these surgeons' training and in the early part of their careers.⁵⁻⁷ Perhaps the most remarkable finding regarding surgeons in practice for more than 20 years was their general tendency to perform fewer numbers of adjunct procedures, and to perform fewer open procedures for capsular contracture. This streamlined approach is difficult to interpret, as it could indicate either that later-career surgeons do not adopt new techniques as readily, or that their experience has shown them that many adjunct procedures are simply unnecessary.

Differences between practice types were generally expected, with surgeons in solo private practice performing more cosmetic surgery than their academic or multi-specialty colleagues. It is unclear, however, as to why surgeons in private practice would place larger implants than those in an academic setting, since presumably patients with similar body types would be equally distributed among both settings. However, because academic surgeons generally perform fewer breast augmentation surgeries, this may simply reflect a conservative approach on their part. Although the survey results indicated that surgeons in rural locations are more likely to place implants in the subglandular location, this group also included a large number of surgeons in practice for more than 20 years.

Findings regarding regional differences also generally confirmed prior assumptions. Survey respondents from the West perform significantly more cosmetic surgery and breast augmentation in particular, a finding which correlates with ASPS statistics in which breast augmentation makes up 37% of all cosmetic surgical procedures in the Mountain-Pacific region.¹ This is notably higher than all other regions in which breast augmentation makes up 14%-16% of the total cosmetic volume.¹ Although surgeons from the Southwest do indeed

place significantly larger implants, the average size requested was also larger in the Southwest. Therefore, this difference cannot be attributed to surgeon preference alone. Surgeons in the West are more likely to favor the peri-areolar incision, but the survey did not elucidate whether this was secondary to surgeon or patient preference. Midwest and Southeastern practices were more likely to discharge patients from care following their first postoperative year, but the reason for this is not clear.

Examining surgical practices and preferences by surgeon gender revealed unexpected results. Specifically, these results suggest a tendency among women surgeons to place smaller implants or to prefer smaller breasts in their patients. The reason for the preference of men surgeons for saline implants is unclear. While it was hypothesized that women surgeons would be more likely to perform large numbers of breast augmentations, the current survey showed that men surgeons were twice as likely to perform more than 100 breast augmentations per year compared to women surgeons. Of note, the percentage of women surgeons responding to this survey (12.9%) did not differ significantly from the percentage of women surgeons who are active members of ASPS (12.3%) ($p=0.68$).¹⁸

Limitations of this study included a relatively low response rate of 18.9%. In particular, the response rates for the years in practice groups of 5 years or less, and 6 to 10 years, were very low when compared to the other two groups. However, each of these groups included only five years or duration, as compared to at least ten years for the other two groups. In addition, because only active members of the ASPS were surveyed, the starting number of eligible surgeons in practice for less than 5 years was likely small. It is also likely that non-responders in the same years of practice categories underwent comparable training to their responding colleagues, and thus would have reported similar practices. Nevertheless, results for surgeons in practice for 5 years or less and for 6 to 10 years should be interpreted with caution given the possibility of non-responder bias. Several questions in the survey listed responses which may not have been clear to some responders. For example, the question regarding preferred implant location did not specify “subpectoral” as complete subpectoral placement, as opposed to the dual-plane I position in which the implant is placed in a partial subpectoral position. In addition, subfascial placement was not offered as a choice in this category. The questions on capsular contracture were specifically limited to allow the survey to be completed in a short period of time, but many additional questions could be asked regarding items such as the use of acellular dermal matrices, and whether or not implant exchange is always performed at the time of surgery. Certainly, the lack of clear guidelines on the treatment of capsular contracture limits the interpretations from the results of any survey on this topic. Finally, the ranges selected for years in practice were based upon a general impression of pivotal time points in a surgeon’s career, although there is no data in the surgical literature which clearly defines such points. Indeed, the number of changes in the practice of breast augmentation in the United States over the past 20 years renders interpretation of some of these differences difficult.

CONCLUSIONS

There are a number of factors that influence the breast augmentation surgeon's choices with regards to preoperative, intra-operative, and post-operative care. Geographic location is associated with differences in procedural volume, implant size, incision location, and recommended follow-up time. Practice type is related to not only the volume of surgery performed, but also the implant size, implant location, and percentage of cosmetic surgery. Career stage has a significant influence on the surgeon's choices. Surgeons in this survey were more likely to retain the use of techniques learned during their training or early in their careers, suggesting that they rely more on their experience and personal training, rather than adopting the current literature, as their careers advance. Finally, specific gender based differences exist with regards to not only the implant size and type, but also the procedural volume.

The authors wish to thank Robert C. Silich, MD, Linda Li, MD, and Greg Ratliff, MD for their valuable feedback regarding the survey design and outcomes.

REFERENCES

1. American Society of Aesthetic Plastic Surgeons, National Statistics, 2010.
2. Hosmer DW, Lemeshow S. Applied Logistic Regression (2nd ed.). New York: John Wiley & Sons, 2000.
3. US Food and Drug Administration: Center for Devices and Radiological Health. Guidance for industry and FDA staff: Saline, silicone gel, and alternative breast implants. November 17, 2006. Available at <http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm071228.html>. Accessed February 15, 2011.
4. Tebbetts JB. Dual plane breast augmentation: optimizing implant - soft-tissue relationships in a wide range of breast types. *Plast Reconstr Surg* 2001; 107: 1255-1272.
5. Adams WP, Rios JL, Smith SS. Enhancing patient outcomes in aesthetic and reconstructive breast surgery using triple antibiotic breast irrigation: six-year prospective study. *Plast Reconstr Surg* 2006; 117: 30-36.
6. Schlesinger SL, Ellenbogen R, Desvigne MN, et al. Zafirlukast (Accolate): a new treatment for capsular contracture. *Aesthetic Surg J* 2002; 22: 329-335.
7. Scuderi N, Mazzocchi M, Rubino C. Effects of zafirlukast on capsular contracture: controlled study measuring the mammary compliance. *Int J Immunopathol Pharmacol* 2007; 20: 557-584.
8. Reid R, Greve S, Casas L. The effect of zafirlukast (Accolate) on early capsular contracture in the primary augmentation patient: a pilot study. *Aesthetic Surgery J* 2005; 25: 26-30.
9. Huang CK, Handel N. Effects of Singulair (montelukast) treatment for capsular contracture. *Aesthetic Surgery J* 2010; 30: 404-410.
10. Gyskiewicz JM. Investigation of Accolate and Singulair for treatment of capsular contracture raised safety concerns. *Aesthetic Surg J* 2003; 23: 98-102.
11. Planas J, Migliano E, Wagenfuhr J, Castillo S. External ultrasonic treatment of capsular contractures in breast implants. *Aesthetic Plast Surg* 1997; 21: 395-397.
12. Planas J. Prophylactic use of external ultrasound for breast implant capsular contracture. *Aesthetic Surg J* 2002; 22: 205-207.
13. Planas J, Cervelli V, Planas G. Five-year experience on ultrasonic treatment of breast contractures. *Aesthetic Plast Surg* 2001; 25: 89-93.

14. Jewell M, Jewell J. A comparison of outcomes involving highly cohesive, form-stable breast implants from two manufacturers in patients undergoing primary breast augmentation. *Aesthetic Surg J* 2010; 30: 51-65.
15. Vazquez B, Given KS, Houston GC. Breast augmentation: a review of subglandular and submuscular implantation. *Aesthet Plast Surg*. 1987; 11: 101-105.
16. Nelson GD. Complications of closed compression after augmentation mammoplasty. *Plast Reconstr Surg* 1980; 66: 71-73.
17. Moufarrege R, Beauregard G, Bosse JP, Papillon J, Perras C. Outcome of mammary capsulotomies. *Ann Plast Surg* 1987; 19: 62-64.
18. American Society of Plastic Surgeons, data accurate as of November 15, 2010.

Table 1. Clinical and practice characteristics of respondents. N=870.

	No.	(%)
AGE		
30-35 years	6	(0.7)
36-45 years	185	(21.3)
46-55 years	361	(41.5)
56-65 years	227	(26.1)
>65 years	91	(10.4)
GENDER		
Male	758	(87.1)
Female	112	(12.9)
YEARS IN PRACTICE		
<5 years	35	(4.0)
6 – 10 years	133	(15.3)
11 – 20 years	321	(36.9)
>20 years	381	(43.8)
PRACTICE LOCATION		
Southeast ¹	248	(28.5)
Northeast ²	182	(20.9)
Midwest ³	156	(17.9)
West ⁴	182	(20.9)
Southwest ⁵	102	(11.7)

	No.	(%)
PRACTICE SETTING		
Suburban	455	(52.3)
Urban	355	(40.8)
Rural	58	(6.7)
PRACTICE TYPE		
Private practice, solo	586	(67.4)
Private practice, single-specialty group	178	(20.5)
Private practice, multi-specialty group	47	(5.4)
Academic/university center	54	(6.2)
COSMETIC CASELOAD		
<10%	43	(4.9)
10 – 25%	369	(42.4)
26 – 50%	98	(11.3)
51 – 75%	192	(22.1)
>75%	168	(19.3)
NUMBER OF AUGMENTATIONS / YEAR		
<10	80	(9.2)
10-50	375	(43.1)
51-100	197	(22.6)
>100	184	(21.2)

- 1 Alabama, Arkansas, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, West Virginia
- 2 Connecticut, Delaware, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont
- 3 Ohio, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, Wisconsin
- 4 Alaska, California, Colorado, Hawaii, Idaho, Montana, Nevada, Oregon, Utah, Washington, Wyoming
- 5 Arizona, New Mexico, Oklahoma, Texas

Table 2. Self-reported surgical practices by years of practice. N=870.

	Years of Practice								p-value*
	≤ 5 (n=35)		6 – 10 (n=133)		11 – 20 (n=321)		> 20 (n=381)		
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	
IMPLANT SIZE									
≤300 cc	12	(34.3)	28	(21.1)	35	(10.9)	61	(16.0)	<0.05
301 – 350 cc	12	(34.3)	43	(32.3)	121	(37.7)	154	(40.4)	0.11
351 – 400 cc	10	(28.6)	35	(26.3)	124	(38.6)	116	(30.4)	0.82
>400 cc	1	(2.9)	16	(12.0)	33	(10.3)	35	(9.2)	0.96
IMPLANT MATERIAL									
Saline	9	(25.7)	24	(18.0)	83	(25.9)	127	(33.3)	<0.01
Silicone	16	(45.7)	69	(51.9)	143	(44.5)	152	(39.9)	<0.05
Both	10	(28.6)	29	(21.8)	87	(27.1)	87	(22.8)	0.55
IMPLANT TYPE									
Smooth, round	34	(97.1)	116	(87.2)	294	(91.6)	310	(81.4)	<0.01
Textured, round	1	(2.9)	3	(2.3)	13	(4.0)	24	(6.3)	<0.05
Anatomic	0	--	0	--	2	(0.6)	10	(2.6)	<0.05
Varies	0	--	3	(2.3)	4	(1.2)	22	(5.8)	<0.01
INCISION LOCATION									
Inframammary	25	(71.4)	92	(69.2)	215	(67.0)	243	(63.8)	0.16
Peri-areolar	10	(28.6)	25	(18.8)	77	(24.0)	86	(22.6)	0.96
Transaxillary	0	--	5	(3.8)	20	(6.2)	36	(9.4)	<0.05
Transumbilical	0	--	0	--	1	(0.3)	1	(0.3)	0.90
POCKET IRRIGATION									
Saline	12	(34.3)	24	(18.0)	66	(20.6)	103	(27.0)	0.22
Water	0	--	0	--	2	(0.6)	1	(0.3)	0.47
Bacitracin solution	15	(42.9)	37	(27.8)	95	(29.6)	106	(27.8)	0.26
Triple Antibiotic solution	16	(45.7)	61	(45.9)	112	(34.9)	106	(27.8)	<0.01
Betadine solution	4	(11.4)	24	(18.0)	72	(22.4)	81	(21.3)	0.24
None of the above	1	(2.9)	3	(2.3)	17	(5.3)	31	(8.1)	<0.01

	Years of Practice				p-value*					
	≤ 5 (n=35)		6 – 10 (n=133)			11 – 20 (n=321)		> 20 (n=381)		
	No.	(%)	No.	(%)		No.	(%)	No.	(%)	
IMPLANT PLACEMENT										
Subpectoral	12	(34.3)	63	(47.4)	180	(56.1)	184	(48.3)	0.57	
Subglandular	2	(5.7)	7	(5.3)	7	(2.2)	37	(9.7)	<0.05	
Dual-Plane	14	(40.0)	38	(28.6)	72	(22.4)	71	(18.6)	<0.01	
No preference (varies with patient)	7	(20.0)	14	(10.5)	54	(16.8)	74	(19.4)	0.10	
CAPSULAR CONTRACTURE PREVENTIVE MEDICATIONS/TECHNIQUES										
Zafirlukast (Accolate)	7	(20.0)	20	(15.0)	47	(14.6)	50	(13.1)	0.76	
Montelukast (Singulair)	4	(11.4)	21	(15.8)	37	(11.5)	52	(13.6)	0.28	
Vitamin E	2	(5.7)	21	(15.8)	54	(16.8)	80	(21.0)	0.97	
Breast massage	27	(77.1)	95	(71.4)	220	(68.5)	235	(61.7)	<0.05	
External Ultrasound	2	(5.7)	4	(3.0)	20	(6.2)	19	(5.0)	0.56	
Prophylactic Antibiotics	27	(77.1)	98	(73.7)	221	(68.8)	274	(71.9)	0.74	
Cleaning Powder	21	(60.0)	64	(48.1)	160	(49.8)	201	(52.8)	0.67	
None	2	(5.7)	6	(4.5)	26	(8.1)	29	(7.6)	0.34	
CAPSULAR CONTRACTURE (Baker grade II or higher)										
< 5%	28	(80.0)	95	(71.4)	201	(62.6)	193	(50.7)	<0.01	
5 – 10%	5	(14.3)	23	(17.3)	78	(24.3)	117	(30.7)	<0.01	
10 – 15%	1	(2.9)	3	(2.3)	15	(4.7)	37	(9.7)	<0.01	
> 15%	0	--	0	--	6	(1.9)	14	(3.7)	0.15	
1ST CAPSULAR CONTRACTURE										
Observation	12	(34.3)	40	(30.1)	79	(24.6)	95	(24.9)	0.16	
Medications	9	(25.7)	41	(30.8)	104	(32.4)	125	(32.8)	0.44	
Closed capsulotomy	0	--	1	(0.8)	12	(3.7)	42	(11.0)	<0.01	
Open capsulotomy / capsulectomy (same pocket)	17	(48.6)	79	(59.4)	180	(56.1)	178	(46.7)	<0.05	
Open capsulotomy / capsulectomy (different pocket)	13	(37.1)	27	(20.3)	70	(21.8)	75	(19.7)	<0.05	
Implant Removal	1	(2.9)	1	(0.8)	6	(1.9)	11	(2.9)	0.26	

	Years of Practice								p-value*
	≤ 5 (n=35)		6 – 10 (n=133)		11 – 20 (n=321)		> 20 (n=381)		
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	
2ND CAPSULAR CONTRACTURE									
Observation	3	(8.6)	12	(9.0)	25	(7.8)	41	(10.8)	0.37
Medications	1	(2.9)	22	(16.5)	41	(12.8)	53	(13.9)	0.55
Closed capsulotomy	0	--	0	--	5	(1.6)	22	(5.8)	<0.01
Open capsulotomy / capsulectomy (same pocket)	18	(51.4)	43	(32.3)	108	(33.6)	133	(34.9)	<0.05
Open capsulotomy / capsulectomy (different pocket)	14	(40.0)	66	(49.6)	160	(49.8)	177	(46.5)	0.85
Implant removal	7	(20.0)	22	(16.5)	52	(16.2)	52	(13.6)	0.21
POSTOPERATIVE DRESSING									
Surgical bra	27	(77.1)	79	(59.4)	209	(65.1)	204	(53.5)	<0.01
Breast straps	4	(11.4)	23	(17.3)	50	(15.6)	46	(12.1)	0.24
Compression dressing	8	(22.9)	28	(21.1)	74	(23.1)	103	(27.0)	0.15
None	2	(5.7)	16	(12.0)	35	(10.9)	58	(15.2)	0.07
DRAIN USE									
Yes	2	(5.7)	1	(0.8)	7	(2.2)	22	(5.8)	<0.05
INFECTION PREVENTION									
Oral antibiotics	20	(57.1)	76	(57.1)	173	(53.9)	175	(45.9)	<0.05
Intravenous antibiotics	33	(94.3)	115	(86.5)	286	(89.1)	320	(84.0)	0.07
Change of gloves	20	(57.1)	76	(57.1)	138	(43.0)	129	(33.9)	<0.01
Use of "sleeve"	0	--	6	(4.5)	16	(5.0)	24	(6.3)	<0.05
"No-touch" technique	17	(48.6)	56	(42.1)	98	(30.5)	119	(31.2)	<0.01
Pocket irrigation	32	(91.4)	108	(81.2)	253	(78.8)	290	(76.1)	<0.05
None of the above	0	--	0	--	3	(0.9)	6	(1.6)	0.45
INITIAL YEAR FOLLOW-UP									
Yearly	28	(80.0)	71	(53.4)	178	(55.5)	222	(58.3)	<0.01
Every 2 years	0	--	14	(10.5)	17	(5.3)	38	(10.0)	0.54
Every 5 years	0	--	4	(3.0)	4	(1.2)	9	(2.4)	0.99

	Years of Practice				p-value*				
	≤ 5 (n=35)		6 – 10 (n=133)			11 – 20 (n=321)		> 20 (n=381)	
	No.	(%)	No.	(%)		No.	(%)	No.	(%)
Never	6	(17.1)	31	(23.3)	104	(32.4)	90	(23.6)	0.98

* p-value for trend over years of practice; significant numbers are bold-faced

Table 3. Differences in clinical practice by gender. N=870.

	Men (n = 758)		Women (n = 112)		p-value*
	No.	(%)	No.	(%)	
IMPLANT MATERIAL					
Silicone	321	(42.3)	59	(52.7)	0.10
Saline	223	(29.4)	20	(17.9)	<0.05
IMPLANT SIZE					
<300 cc	107	(14.1)	26	(23.2)	<0.05
300 – 400 cc	535	(70.6)	80	(71.4)	0.57
>400 cc	88	(11.6)	0	---	0.97
POSTOPERATIVE SIZE REQUESTED					
“C” cup	599	(79.0)	93	(83.0)	0.47
“D” cup	131	(17.3)	13	(11.6)	0.24
BREAST AUGMENTATIONS PER YEAR					
<10	67	(8.8)	13	(11.6)	0.43
10-50	314	(41.4)	61	(54.5)	<0.01
50-100	176	(23.2)	21	(18.8)	0.35
>100	173	(22.8)	11	(9.8)	<0.01
IMPLANT PLACEMENT					
Subglandular	46	(6.1)	7	(6.3)	0.50
Subpectoral	388	(51.2)	51	(45.5)	0.25

	Men (n = 758)		Women (n = 112)		<i>p-value*</i>
	<i>No.</i>	<i>(%)</i>	<i>No.</i>	<i>(%)</i>	
Dual-Plane	166	(21.9)	29	(25.9)	0.69
No Preference	130	(17.2)	19	(17.0)	0.71
METHOD FOR DETERMINING SIZE					
Patient's Choice	321	(42.3)	51	(45.5)	0.36
Surgeon's Judgment	248	(32.7)	37	(33.0)	0.87
TEPID™ System	74	(9.8)	7	(6.3)	0.24
Other Method	87	(11.5)	11	(9.8)	0.64
FOLLOW-UP					
Yearly	442	(58.3)	57	(50.9)	0.15
Every two years	59	(7.8)	10	(8.9)	0.53
Every five years	15	(2.0)	2	(1.8)	0.91
Never	198	(26.1)	33	(29.5)	0.50

Above percentages do not add up to 100% due to non-response.

* adjusted for years in practice

Figure 1. Multiple-choice survey questions (response categories not shown).

1. Do you perform breast augmentation surgery in your practice?
2. What is your gender?
3. What is your age?
4. What is your race?
5. How many years have you been in practice?
6. Where is your practice located?
7. What is the setting of your practice?
8. What type of practice do you have?
9. What percentage of your practice is cosmetic?
10. Approximately how many breast augmentations do you perform each year?
11. What is the average age range of your breast augmentation patients?
12. What is the race of your typical augmentation patient?
13. What is the body frame of your typical augmentation patient?
14. What average breast size do you see preoperatively?
15. What is the most requested postoperative size in your practice?
16. What is the average size of implants that you place?
17. Do you use sizers intra-operatively?
18. Which do you rely on *the most* when determining the final implant size for a given patient?
19. What is your preferred location for implant placement?
20. What is your preferred incision location for implant placement?
21. Do you use primarily saline or silicone implants?
22. What type of implant do you typically use for cosmetic breast augmentation?
23. Which implant manufacturer do you primarily use?
24. What type of dressing do you place postoperatively?
25. Do you routinely use drains following breast augmentation?
26. What complications which you have experienced following breast augmentation?
27. What percentage of your patients undergoes surgery within six months of their initial procedure for the primary purpose of changing their implant size?
28. What percentage of your patients has experienced a Baker grade II or higher capsular contracture following augmentation?
29. Have you personally experienced more contractures after saline or silicone augmentation?
30. Have you personally experienced more contractures after subglandular or subpectoral placement of the breast implant?
31. What is your recommendation after a patient's first capsular contracture?
32. What is your recommendation after a patient's second capsular contracture?
33. Do you use any of the following medications or techniques to help prevent capsular contracture?
34. What measures do you take to prevent infection (check all that apply)?
35. What do you use to irrigate the implant pocket prior to placement?
36. After the initial year following surgery, how often do you request that your breast augmentation patients return for follow-up?

Figure 2. Preferred implant placement by practice setting. N=870.

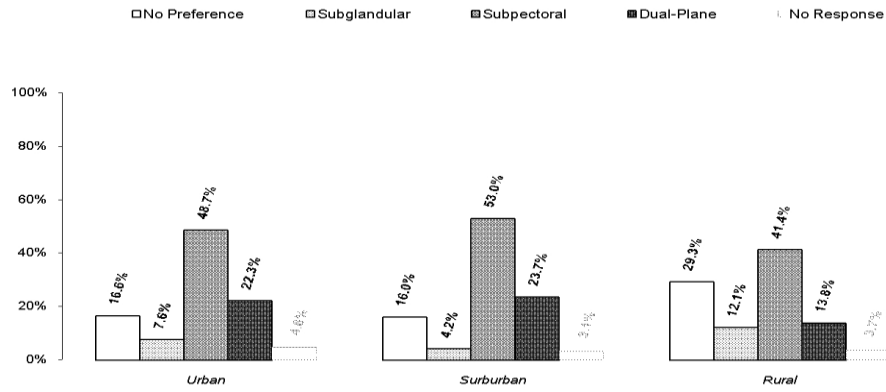


Figure 3. Number of breast augmentation surgeries, percentage of cosmetic surgeries, and average implant size placed by practice location. N=870.

