Aesthetic Surgery Journal
2018, Vol 38(2) 133–148

DOI: 10.1093/asj/sjx104
www.aestheticsurgeryjournal.com
OXFORD UNIVERSITY PRESS

Current Trends in Breast Augmentation: An International Analysis

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Abstract

Background: Breast augmentation surgery remains the most frequently performed aesthetic surgical procedure worldwide. However, many variations exist regarding preoperative planning, surgical management, and postoperative care.

Objectives: The goal was to evaluate current trends and practices in breast augmentation, with a focus on international variability.

Methods: A questionnaire was sent to over 5000 active breast surgeons in 44 countries worldwide. The survey inquired about current controversies, new technologies, common practices, secondary procedures, and surgeon demographics. The findings and variations were evaluated and correlated to evidence-based literature.

Results: There were a total 628 respondents equaling a response rate of approximately 18%. While certain approaches and common practices prevail also on an international basis, there exist several geographic controversies. For example, while almost fifty percent of surgeons in the United States and Latin America never use anatomically shaped implants, in Europe and Oceania most surgeons use them. Similarly, in Latin America, Europe, Asia, and Oceania, over 80% of surgeons use silicone implants only, whereas in the United States only 20% use them – meanwhile US surgeons use the largest implants (78% > 300 cc). Internationally dominant practice preferences include preoperative sizing with silicone implants, as well as the use of inframammary incisions and partial submuscular pockets.

Conclusions: Significant differences exist when comparing most common surgical breast augmentation approaches on an international basis. While certain techniques seem to be universal standards, there still remain several controversies. Further standardizing this most common aesthetic surgical procedure according to evidence-based guidelines will help to improve outcomes.

Editorial Decision date: May 11, 2017; online publish-ahead-of-print June 7, 2017.

Breast augmentation continues to be the most frequently performed aesthetic surgical procedure worldwide, with a total of 1,488,992 cases reported in 2015.[1] Although there exists consensus regarding several aspects of the surgery, a plethora of controversies remain.[2,3] The surgeon has several choices regarding implant selection methodology, incisions, pocket plane, surgical technique, postoperative management, and the handling of various complications. During the past years, use of autologous fat, acellular dermal matrices, 3-dimensional imaging, insertion funnels, and anatomically shaped implants have added even more options to be considered.[4-11]

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Recently, Hidalgo et al conducted a US-based study evaluating current breast augmentation trends and pointed out that while certain most common surgical approaches exists, new technologies are only slowly integrated into daily practice.[12] The aim of this study was to compare breast augmentation techniques on an international level and to the previously published US-based data of Hidalgo and Sinno, in order to further standardize this procedure according to evidence-based guidelines.

METHODS

A 38-item, online survey was designed (D.H.) and the questionnaire sent to 5052 active breast surgeons in 44 countries, using a professional e-mail marketing service (Mailchimp, Atlanta, GA, USA). Surgeons were contacted by e-mail correspondence through contact listings in national and international specialty societies, which were chosen based on the size of their listed members (>500). Societies without public listings were contacted directly to inquire about their members and respective e-mail addresses (Table 1). The survey addressed 5 areas of interest: current controversies, new technologies, common practices, technical considerations in secondary procedures, and member demographics. It was launched on June 1, 2016 and reminders were sent 4, 8, and 12 weeks later. The survey was closed on December 31, 2016. Responses were anonymous and the results were tabulated using Microsoft Excel (Microsoft Corp., Redmond, WA). Questions that included a commentary option were studied individually to uncover relevant issues potentially overlooked by question design. A blank copy of the survey is available online as Supplementary Material at www.aestheticsurgeryjournal.com.

RESULTS

A total of 628 responses were gathered. To enhance statistical power, the single countries were grouped by major geographic regions into Latin America (n = 139), Europe (n = 341), Asia (n = 90), and Oceania (n = 58),[13] and then compared to the US-based data of Hidalgo and Sinno.[12] A total response rate of 12.3% was obtained, which needs to be adjusted due to high bounce rates of the recipients' e-mail servers of up to 30%. Taking the mean bounce rate into consideration, a response rate of approximately 18% was achieved. The response rates for each of the 4 email campaigns were 7%, 7%, 2%, and 2%, respectively. Only fully completed questionnaires were included in the analysis.

Table 1. Countries of Collected Data and Contacted International Plastic Surgery Societies

Region	Countries	Contacted societies
Latin America and the Caribbean	Argentina, Brazil, Mexico, Chile, Venezuela, Mexico, and Peru	Brazilian Society of Plastic Surgery ("Sociedade Brasileira da Cirurgia Plastica"), Colombian Society of Aesthetic and Reconstructive Plastic Surgery ("Sociedad Colombiana de Cirugia Plastica Estetica y Reconstructiva")
Western Europe	Austria, Belgium, Luxembourg, France, Germany, Italy, Norway, Portugal, Spain, Sweden, Lithuania, Switzerland, the Netherlands, Ireland, and the United Kingdom	Austrian Society of Aesthetic and Reconstructive Plastic Surgery ("Österreichische Gesellschaft für Plastische, Ästhetische und Rekonstruktive Chirurgie"), French Society of Aesthetic and Reconstructive Plastic Surgery ("La Société française de Chirurgie Plastique Reconstructrice et Esthétique"), German Association of Plastic Surgeons ("Vereinigung der Deutschen Ästhetisch-Plastischen Chirurgen"), Italian Society of Plastic Reconstructive and Aesthetic Surgery ("Società Italiana di Chirurgia Plastica Ricostruttiva ed Estetica"), Spanish Society of Plastic Reconstructive and Aesthetic Surgery ("Sociedad Española de Cirugia Plastica Reparadora y Estètica"), Swiss Society of Plastic Reconstructive and Aesthetic Surgery ("Schweizerische Gesellschaft für Plastische, Rekonstruktive und Ästhetische Chirurgie"), British Association of Plastic Reconstructive and Aesthetic Surgeons
Eastern Europe	Czech Republic, Serbia	Contacted individually
Oceania	Australia	Contacted individually
Eastern Asia	China, Japan, Philippines, and Republic of Korea	Japanese Society of Plastic and Reconstructive Surgery, Korean Society for Aesthetic Plastic Surgery
Southern Asia	India	Indian Association of Aesthetic Plastic Surgeons
South-Eastern Asia	Thailand, Myanmar, Laos, Singapore, Indonesia, and Malaysia	Society of Aesthetic Plastic Surgeons of Thailand
Western Asia	Israel, Jordan, Lebanon, Turkey, and United Arab Emirates	Oriental Society of Aesthetic Plastic Surgery, Turkish Society of Plastic-Reconstructive and Aesthetic Surgeons
North Africa	Algeria	Contacted individually
Eastern Africa	Egypt	Contacted individually
Southern Africa	Republic of South Africa	Contacted individually

Surgeon experience was distributed reasonably even among the 6 intervals of practice time surveyed, although over one third of respondents of all regions reported a work experience of more than 20 years.

In all regions, the practice type was solo in the majority of surgeons (United States, 52%; Latin America, 48%; Oceania, 48%; and Asia and Europe: 31%). In Latin America, Europe, and Asia practice type was similar regarding solo practice, shared facility and small plastic surgery group (about 20% of respondents). In the United States, the small plastic surgery group (20%) was the second most common practice pattern, and in Oceania it was the solo-practice – shared facility (38%).

In the United States and Europe, practice types were distributed evenly when disregarding the 2% (United States) and 4% (Europe) solely reconstructive practices, whereas in Latin America most respondents (45%) perform 75% cosmetic and 25% reconstructive surgery. In Oceania almost half of surgeons practices (42%) are 50% cosmetic and 50% reconstructive oriented, while in Asia practices are more reconstructive oriented.

Except for the United States, the majority of surgeons perform no more than 50 augmentations per year (Asia, 89%; Oceania, 72%; Latin America, 63%; Europe, 60%; and the United States, 49%). About a third of respondents in the United States (36%), Europe (34%), and Latin America (30%) perform between 51 and 150 breast augmentations annually (Table 2).

In the United States and Latin America, about half of all respondents never use anatomically shaped implants, and the vast majority of the remainder use them less than half the time, whereas in Europe, Asia, and Oceania their use is much more common (Figure 1).

The 3 greatest concerns regarding anatomical implant use in Europe, Asia, and Oceania (in order) were the malrotation potential, the lack of proof for aesthetic superiority compared with round implants, and the higher cost. In the United States, higher cost was the second most common concern and in Latin America it was the lack of proof for aesthetic superiority.

Regarding the use of autologous fat *solely* as a primary breast augmentation technique, in the United States, Latin America, and Oceania it is used by less than 25% of respondents. For those that do consider it, the vast majority use it less than 50% of the time. In contrast, in Europe and Asia over 50% of surgeons use it (Figure 2).

The greatest objections to solely fat grafting included the possible need for multiple procedures, the limited augmentation potential, and cost, with different reasoning within the given countries. For instance, in Latin America most respondents (60%) pointed out the limited augmentation potential of fat grafting, in Asia, cost was considered the major limiting factor.

Regarding the use of autologous fat as a *supplemental* technique together with implants, in the United States and in Oceania more than half of respondents do not use it at all. In Europe and Asia it was the opposite, with about 2/3 at least sometimes using it.

However, there was also international agreement. In all regions, the majority of respondents (53% to 69%) thought that implants have no negative effect on the reading of mammographies. Only in Oceania 40% of respondents believed that it can impair readings.

Regarding deep venous thrombosis, about one third of respondents in the United States and Europe, and 41% of respondents in Latin America and 57% in Asia would choose not to perform breast augmentation on a factor V Leiden heterozygous patient. In Oceania, only 17% would not operate on such a patient. In all regions, the remainder would choose to do so using sequential compression devices at the very least. About half of all respondents would add anticoagulation/chemoprophylaxis as an additional preventive measure. Lastly, between 2 (Asia) and 14 (Oceania) percent of surgeons have encountered a case of anaplastic large cell lymphoma (ALCL) in their practice (Table 3).

Overall, only few surgeons currently use 3D imaging in their practice, except for in Oceania where about 43% use it (Figure 3). The most important advantages cited by users in all regions were that it is an effective tool for marketing, patient education, and sizing.

Almost 60% of surgeons in the United States work with acellular dermal matrices for revision procedures or in secondary breast augmentation, whereas in all other regions the majority do not use such materials (Figure 4).

In the United States, the most common indications (in descending order) to use acellular dermal matrices (ADMs) included as a capsulorrhaphy buttress, to treat ripples or thin tissues, and in cases of capsular contracture, while in most other regions rippling and contour deformities were mentioned first.

More than half of surgeons worldwide do not use funnels for implant insertion (Europe, 83%; Asia, 76%; Latin America, 75%; and the United States, 52%), whereas in Oceania their use is much more common (Figure 5). For the majority of nonusers, the most common objections were that they are believed not to be necessary and carry extra cost. The use of protective plastic sheeting was another matter of discordance, with in Latin America only 25% using it, while in other countries the rate was up to 60% (Oceania). Most surgeons use it to cover the nipple-areola complex, and a much smaller number to cover the incision area (Table 4).

Most surgeons surveyed prefer either round silicone implants, silicone forms, or tissue-based systems for preoperative sizing, only in Europe and Oceania sizing with silicone forms is more common. “Rice bags” are rarely

Table 2. Respondent Demographics and Practice Pattern ($n = 628$)

Characteristic	Latin America (% of total respondents, $n = 139$)	Europe (% of total respondents, $n = 341$)	Asia (% of total respondents, $n = 90$)	Oceania (% of total respondents, $n = 58$)
Country of practice (n)				
Argentina (25)	18.0			
Brazil (97)	69.8			
Peru (17)	12.2			
Austrian (12)		3.5		
Belgium (3)		0.9		
Denmark (21)		6.2		
England (26)		7.6		
France (50)		14.7		
Germany (62)		18.2		
Ireland (4)		1.2		
Italy (104)		30.5		
Scotland (5)		1.5		
Spain (2)		0.6		
Switzerland (52)		15.2		
Bahrain (2)			2.2	
India (35)			38.9	
Malaysia (6)			6.7	
Philippines (8)			8.9	
Singapore (21)			23.3	
Taiwan (4)			4.4	
United Arab Emirates (14)			15.6	
Australia (54)				93.1
New Zealand (4)				6.9
Years in practice (y)				
0-5	2.2	7.1	11.1	3.4
6-10	20.9	11.8	8.9	13.8
11-15	20.9	20.0	28.9	17.2
16-20	12.2	13.5	20.0	17.2
21-25	14.4	19.4	17.8	34.5
>25	29.5	27.6	13.3	13.8
Type of practice				
Solo	48.2	30.6	31.1	48.3
Solo practice–shared facility	21.6	19.4	20.0	37.9
Small plastic surgery group (2-5 surgeons)	18.7	22.4	20.0	6.9

Table 2. Continued

Characteristic	Latin America (% of total respondents, *n* = 139)	Europe (% of total respondents, *n* = 341)	Asia (% of total respondents, *n* = 90)	Oceania (% of total respondents, *n* = 58)
Large plastic surgery practice (≥6 surgeons)	3.6	18.2	6.7	6.9
Other (eg, multispecialty group. academic. military)	7.9	9.4	22.2	0.0
Nature of practice				
100% reconstructive	0.0	3.5	2.2	0.0
25% cosmetic. 75% reconstructive	11.5	21.2	35.6	27.6
50% cosmetic. 50% reconstructive	18.7	27.1	22.2	41.4
75% cosmetic. 25% reconstructive	45.3	21.8	26.7	20.7
100% cosmetic	24.5	26.5	13.3	10.3
Annual number of primary augmentations				
1-50	63.3	60.0	88.9	72.4
51-150	30.2	34.1	11.1	13.8
151-250	5.0	2.9	0.0	10.3
251-350	1.4	1.2	0.0	3.4
>350	0.0	1.8	0.0	0.0

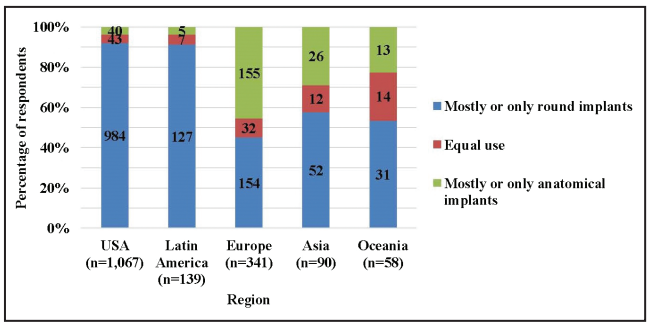

Figure 1. International distribution of used implant shape type.

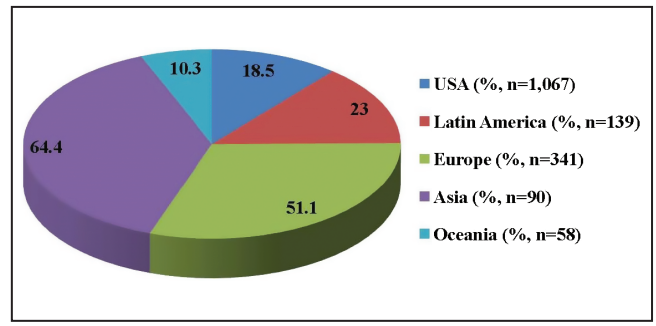

Figure 2. Percentage of respondents that use autologous fat for primary augmentation.

employed (4% to 22%), and even fewer surgeons either use 3D imaging or no method at all.

Worldwide, over 80% of surgeons use 100% silicone implants only, whereas in the United States only 22% use that type only. Similarly striking was the different preference regarding implant shell surfaces (Figure 6).

In the United States and Oceania, over two thirds of surgeons usually use implant sizes greater than 300 cc (in the United States 36% of respondents uses implant sizes even greater than 350 cc), whereas in Europe and Asia surgeons mostly use volumes smaller than 300 cc.

Inframammary incisions were in all regions by far the most common approaches to create an implant pocket and the second most common was the periareolar incision.

In most instances, partial submuscular pockets are dissected, except for in Latin America, where the subglandular location is preferred. The subfascial pocket plane is overall rarely used, except for in Latin America and Asia (Figure 7).

Over 93% of all respondents administer intravenous antibiotics at induction of anesthesia, and almost two thirds use postoperative antibiotics. In the United States, pocket irrigation with classic triple-antibiotic solution is performed by 53%, whereas in all other regions it was only used by 7% (Asia) to 24% (Oceania) of surgeons. Povidone-iodine, either with or without additional antibiotics, is irrigation of choice for about one third of surgeons (except for in Latin America).

Table 3. Responses Regarding Current Controversies

Characteristic	Latin America (% of total respondents, *n* = 139)	Europe (% of total respondents, *n* = 341)	Asia (% of total respondents, *n* = 90)	Oceania (% of total respondents, *n* = 58)
Use anatomical implants				
Never	53.2	12.9	42.2	10.3
<50%	38.1	32.4	15.6	43.1
Half the time	5.0	9.4	13.3	24.1
>50%	2.9	35.5	15.6	15.5
Always	0.7	10.0	13.3	6.9
Concerns regarding anatomical implants				
No concerns	16.5	26.5	22.2	13.8
Aesthetic result not proven superior	48.2	25.9	31.1	27.6
Malrotation potential	38.8	62.9	48.9	65.5
Texturization problem (late seroma, ALCL)	12.9	18.8	13.3	48.3
Limited incision options	4.3	7.6	2.2	0.0
Larger incision	5.0	10.6	15.6	6.9
Higher cost	28.1	25.9	42.2	27.6
Other	1.4	1.8	0.0	5.2
Use of autologous fat for primary augmentation				
Never	77.0	49.9	35.6	89.7
<50%	18.7	43.4	55.6	10.3
Half the time	1.4	3.5	4.4	0.0
>50%	1.4	2.3	4.4	0.0
Always	1.4	0.6	0.0	0.0
Concerns regarding autologous fat as a primary technique				
No concerns	24.5	8.8	6.7	10.3
Process too complex	5.0	11.8	8.9	13.8
Limited augmentation potential	59.7	72.4	57.8	65.5
Potential donor-site deformity	8.6	17.6	2.2	31.0
May require multiple fat-grafting procedures	57.6	74.1	17.8	75.9
Cost	8.6	28.8	68.9	37.9
Other	6.5	8.2	11.1	20.7
Use of autologous fat as a supplemental technique				
Never	28.8	27.6	37.8	65.5
<50%	54.0	63.2	44.4	31.0
Half the time	4.3	2.9	6.7	0.0
>50%	10.8	5.6	11.1	3.4
Always	2.2	0.6	0.0	0.0

Table 3. Continued

Characteristic	Latin America (% of total respondents, *n* = 139)	Europe (% of total respondents, *n* = 341)	Asia (% of total respondents, *n* = 90)	Oceania (% of total respondents, *n* = 58)
You think breast implants influence reading of mammographies				
Positively	9.4	8.2	20.0	6.9
Negatively	23.7	25.0	11.1	39.7
No influence	66.9	66.8	68.9	53.4
Seen a case of ALCL in your practice				
Yes	4.3	7.1	2.2	13.8
No	95.7	92.9	97.8	86.2
Whether or not to operate on a heterozygous factor V Leiden patient				
Yes, no special precautions beyond SCDs	15.1	11.2	12.2	17.2
Yes, with anticoagulation/chemoprophylaxis and SCDs	41.0	50.9	21.1	58.6
Yes, with SCDs and postoperative ultrasound	2.9	3.5	10.0	6.9
No	41.0	34.4	56.7	17.2

ALCL, anaplastic large cell lymphoma; SCD, sequential compression device

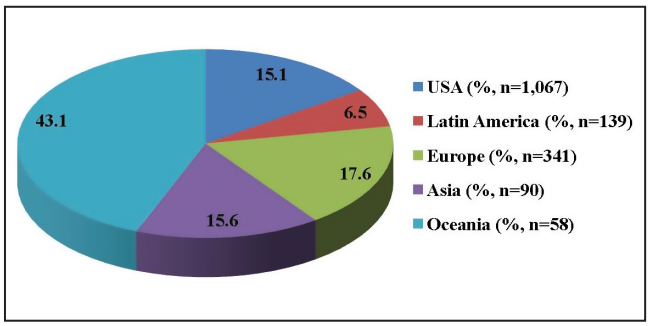

Figure 3. Percentage of respondents that use 3-dimensional imaging technology.

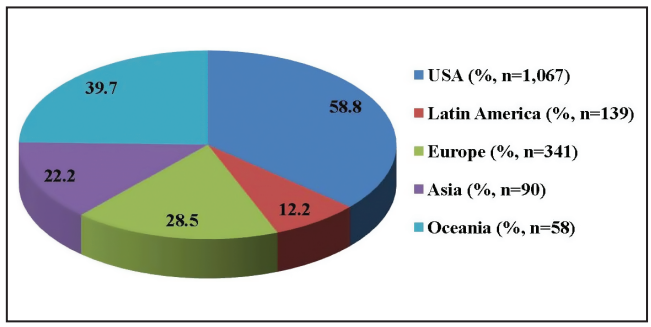

Figure 4. Percentage of respondents that use ADM in secondary cases.

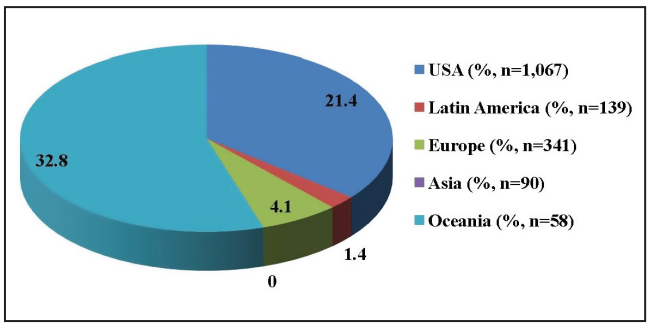

Figure 5. Percentage of respondents that always use insertion funnels.

In the United States and Asia, more than half of respondents recommend a postoperative implant massage regimen, while in all other countries the majority of surgeons do not. Regarding nonsurgical methods for treating capsular contracture, many surgeons in the United States and Asia begin with massage therapy, in Oceania and Europe the majority of surgeons think that there is no nonsurgical treatment method. Similarly, pharmacologic agents are administered by about half of surgeons in the United States and Latin America, while in Europe (79%), Asia (78%), and Oceania (97%), most respondents never use them (Table 5).

The most common reasons to perform a reoperation were quoted to be capsular contracture and need for a size change. In all regions, first-time capsular contracture is usually treated by either anterior capsulectomy (29% to 46%) or total capsulectomy (35% to 44%). The third commonly selected surgical technique was the neopocket formation. Recurrent contracture is typically approached by capsulectomy and neopocket formation, while to treat a double-bubble deformity or bottoming-out, capsulorrhaphy alone is the preferred option (Table 6).

Table 4. Responses Regarding New Technologies

Characteristic	Latin America (% of total respondents, *n* = 139)	Europe (% of total respondents, *n* = 341)	Asia (% of total respondents, *n* = 90)	Oceania (% of total respondents, *n* = 58)
Use of 3-dimensional imaging technology				
Yes	6.5	17.6	15.6	43.1
No	93.5	82.4	84.4	56.9
If yes, assess the role of 3-dimensional imaging in your practice				
No concerns	18.0	46.7	28.6	16.0
It is an effective marketing tool	44.4	93.3	71.4	64.0
It is an effective educational tool	77.8	46.7	71.4	72.0
It is an effective sizing tool	55.6	30.0	100.0	72.0
It has made the consultation process overly complex	66.7	16.7	14.3	0.0
It has not proven worth the cost and effort	7.2	36.7	71.4	0.0
Other	0.0	6.7	14.3	16.0
Use of ADM in secondary cases	1.8	—	—	—
Yes	12.2	28.5	22.2	39.7
No	87.8	71.5	77.8	60.3
If yes, for what purposes				
Capsular contracture	29.4	30.9	40.0	26.1
Contour deformities	58.8	43.3	10.0	34.8
Capsulorrhaphy buttress	11.8	33.0	20.0	52.2
Ripples or thin tissues	82.4	70.1	60.0	60.9
Other	0.0	10.3	10.0	17.4
Use of insertion funnels				
Never	74.8	82.9	75.6	46.6
Less than half the time	11.5	11.2	8.9	17.2
Half the time	2.2	0.0	4.4	0.0
Only for small incisions/large implants	7.2	1.2	4.4	3.4
More than half the time	2.9	0.6	6.7	0.0
Always	1.4	4.1	0.0	32.8
If not, why?				
Extra cost	33.7	24.8	55.9	66.7
Adds extra step	7.7	15.6	17.6	14.8
Not applicable for form-stable implants	5.8	17.7	2.9	22.2
Concerned it may weaken shell	2.9	6.4	2.9	7.4
Not necessary	71.2	72.3	64.7	88.9
Other	1.9	8.5	5.9	7.4

Table 4. Continued

Characteristic	Latin America (% of total respondents, *n* = 139)	Europe (% of total respondents, *n* = 341)	Asia (% of total respondents, *n* = 90)	Oceania (% of total respondents, *n* = 58)
Use of adhesive plastic sheeting for skin protection before implant insertion				
Yes, over the nipple-areola complex	15.1	26.5	26.7	32.8
Yes, over the incision	5.8	1.2	4.4	3.4
Yes, over both nipple-areola complex and the incision	4.3	6.5	15.6	24.1
No, I do not use it	74.8	65.9	53.3	39.7

ADM, acellular dermal matrix.

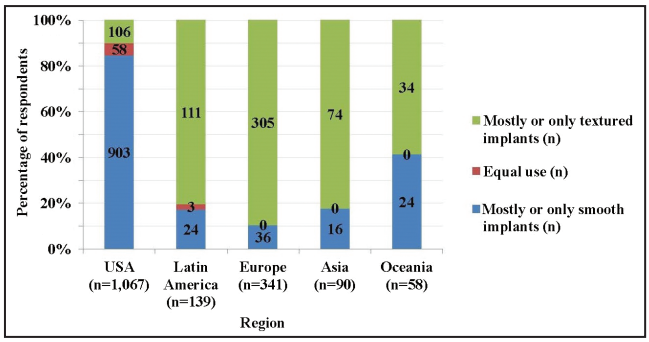

Figure 6. International distribution of used implant shell surface type.

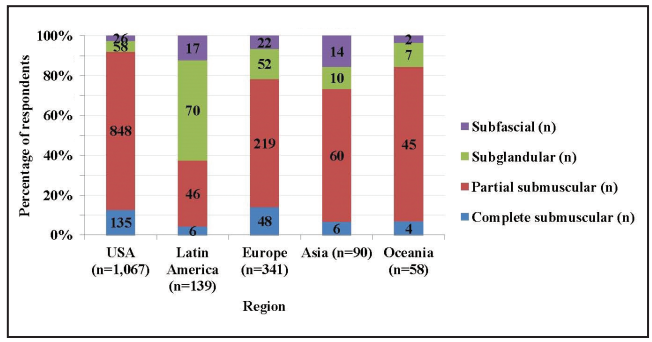

Figure 7. International distribution of most commonly used pocket location.

DISCUSSION

Breast augmentation is an increasingly common performed operation, but apparently there exists significant international discordance regarding several aspects of the procedure. This may be due to a variety of reasons, including:

1) Surgeons preference based on training, experience and tradition
2) Cost
3) Hesitance to embrace new technology for personal as well as potentially legal reasons (different healthcare systems)
4) Lack of knowledge regarding established standards

The assumption that trends are geographically based was one of the working hypotheses. It appears that such trends, be it fashion, design, or technology, usually have a place of origin and then spread. Regarding aesthetic surgery, in many instances, trends arguably emerge in the United States. It was therefore one of the aims to evaluate if there exist current practice preferences in the United States which are, based on current literature, common standards and soon to be established elsewhere or vice versa. Comparing the United States to the rest of the world would be possible, but given the potential influence of different cultures and ethnic backgrounds, we opted to present the responses broken down. Unfortunately, information regarding location of practice of the surgeons was not obtained on a state level, so trends within the United States could not be analyzed in further detail.

In this setting, the ongoing debate when to use which type of implant is certainly one of the most controversial and relevant issues, as choosing the right implant shape is a key decision. Besides volume, breast proportion and shape play the major roles to achieve an aesthetically pleasing outcome. Anatomical and round prosthesis can be used successfully,[14]#8232;and the surgeon should assess the potential benefits of both types during the surgical planning process. In 2015, Hedén et al discussed some misconceptions regarding anatomical implants and stated that they should primarily be used in cases of poor soft tissue coverage, tuberous breasts, or a short lower pole.[15] A widespread opinion is that anatomic implants will create a more natural look, but are associated with the possibility of malrotation (estimated risk between 5.2% and 14%). However, with appropriate surgical planning and techniques, these risks can be minimized.[16-18] Despite these facts, when evaluating the aesthetic results and patient satisfaction comparing anatomically shaped and round implants,[19] several authors observed the inability to visually identify the type of implant used.[20-22] This discrepancy also becomes apparent in the presented survey population. About 90% of surgeons in the United States and Latin America never use anatomically shaped implants, whereas

Table 5. Responses Regarding Common Practices

Characteristic	Latin America (% of total respondents, *n* = 139)	Europe (% of total respondents, *n* = 341)	Asia (% of total respondents, *n* = 90)	Oceania (% of total respondents, *n* = 58)
Method for implant selection				
Sizing using round silicone implants	49.6	32.4	35.6	31.0
Sizimg with silicone forms	27.3	48.2	26.7	58.6
"Rice bags" or other as preoperative sizers	4.3	15.9	8.9	27.6
"High-five" or other tissue-based system	10.8	12.9	22.2	20.7
Imaging technology	3.6	11.8	2.2	20.7
None	15.8	13.5	24.4	3.4
Implant filler type used				
100% silicone	92.8	94.7	80.0	86.2
Mostly silicone/some saline	7.2	4.7	15.6	13.8
Equal use	0.0	0.0	2.2	0.0
Mostly saline/some silicone	0.0	0.0	0.0	0.0
100% saline	0.0	0.6	2.2	0.0
Implant shell surface type used				
100% smooth	5.0	5.3	11.1	6.9
Mostly smooth/some textured	12.2	5.3	6.7	34.5
Equal use	2.2	0.0	0.0	0.0
Mostly textured/some smooth	9.4	14.1	28.9	24.1
100% textured	70.5	75.4	53.3	34.5
Polyurethane	0.7	0.0	0.0	0.0
Usual implant size range				
< 250 cc	4.3	5.9	4.4	0.0
250–300 cc	27.3	41.8	53.3	19.0
275–325 cc	36.0	31.8	26.7	10.3
300–350 cc	25.9	15.3	13.3	53.4
> 350 cc	6.5	5.3	2.2	17.2
Implant manufacturer use				
Allergan (Irvine, CA)	46.0	58.1	57.8	51.7
Mentor (Santa Barbara, CA, USA)	49.6	43.4	71.1	65.5
Sientra (Santa Barbara, CA)	11.5	2.9	4.4	20.7
Silimed (Rio de Janeiro, Brazil)	21.6	0.6	8.9	3.4
Eurosilicone (Apt Cedex, France)	14.4	7.6	4.4	0.0
Sebbin (Boissy-l'Aillerie, France)	0.0	8.8	0.0	0.0
Arion (Mougins Sophia-Antipolis, France)	0.7	7.0	0.0	0.0

Table 5. Continued

Characteristic	Latin America (% of total respondents, *n* = 139)	Europe (% of total respondents, *n* = 341)	Asia (% of total respondents, *n* = 90)	Oceania (% of total respondents, *n* = 58)
Nagor (Glasgow, UK)	2.2	8.2	11.1	6.9
Polytech (Dieburg, Germany)	4.3	12.9	6.7	3.4
Refinex (Shenzhen, China)	0.0	0.0	0.0	0.0
Other	5.8	12.3	2.2	6.9
Most common incision				
Axillary	2.9	5.9	4.4	0.0
Periareolar	25.9	21.2	8.9	3.4
Inframammary	71.2	72.4	86.7	96.6
Periumbilical	0.0	0.0	0.0	0.0
Most common pocket location				
Complete submuscular	4.3	14.1	6.7	6.9
Partial submuscular	33.1	64.2	66.7	77.6
Subglandular	50.4	15.2	11.1	12.1
Subfascial	12.2	6.5	15.6	3.4
Use of antibiotic prophylaxis				
Intravenous antibiotics at induction of anesthesia	95.7	94.4	95.6	93.1
Povidone-iodine (only) irrigation	5.8	21.1	24.4	55.2
Povidone-iodine/bacitracin or neomycin irrigation	4.3	8.2	13.3	10.3
Classic triple-antibiotic irrigation	22.3	11.7	6.7	24.1
Other irrigation type	12.2	14.1	15.6	6.9
Postoperative oral antibiotics	61.9	35.2	62.2	65.5
Never use antibiotic prophylaxis	1.4	0.6	0.0	0.0
Use of postoperative massage				
Yes	28.1	22.4	53.3	29.3
No	71.9	77.6	46.7	70.7
Recommendation for return to unrestricted activities				
1 day	1.4	0.6	2.2	3.4
1 week	10.8	4.1	8.9	0.0
2-3 weeks	23.0	25.3	35.6	24.1
4 weeks	22.3	27.1	20.0	22.4
6 weeks	16.5	28.8	24.4	43.1
2-3 months	25.9	14.1	8.9	6.9
Use of pharmacologic agents for capsular contracture				
Yes, prophylactically in all	0.7	4.1	2.2	0.0

Table 5. Continued

Characteristic	Latin America (% of total respondents, *n* = 139)	Europe (% of total respondents, *n* = 341)	Asia (% of total respondents, *n* = 90)	Oceania (% of total respondents, *n* = 58)
Yes, only at first sign of onset	28.1	10.6	20.0	3.4
Yes, as first option in established contracture	20.1	5.9	0.0	0.0
Never	51.1	79.4	77.8	96.6
Are they effective in reducing capsular contracture				
Yes	13.7	3.5	4.4	3.4
Only if started early	8.6	6.5	6.7	0.0
Not sure	58.3	63.5	80.0	62.1
No	19.4	26.5	8.9	34.5
Nonsurgical methods for treating capsular contracture				
Leukotriene inhibitors	38.8	11.1	15.6	3.4
Papaverine	0.0	0.6	0.0	0.0
Cox-2 inhibitor	5.0	5.9	8.9	0.0
External ultrasound	22.3	4.1	6.7	0.0
Pulsed electromagnetic field therapy	0.0	0.6	0.0	0.0
Massage	38.8	21.1	37.8	24.1
Closed capsulotomy	5.0	4.7	11.1	3.4
None	43.2	58.1	33.3	72.4
Other	2.9	2.9	0.0	3.4

in Europe, Asia, and Oceania 22% to 46% of surgeons do. One third of European surgeons even use them more than half the time, and smaller implants tend to be used in lower BMI patients, which are potentially better suited for such devices.[23]

Autologous fat transfer for breast augmentation is a growing sector and a still developing technology.[5-7,11] The safety of the technique has been evaluated extensively. Groen et al conducted a systematic review including a large series of patients having received a cosmetic breast augmentation with autologous fat, and showed that complication rates and radiological findings are similar to those after implant-based breast augmentation.[24] In the setting of breast malignancies, as reported by Kronowitz et al, the only group in which the loco-regional cancer recurrence rate was higher in the lipofilling cohort was a subgroup treated with hormonal therapy.[25] The presented analysis revealed that autologous fat as a primary breast augmentation technique is used notably more often in Europe and Asia compared to the other countries. There was concern expressed by some respondents as write-in comments, that the technique does not have FDA approval and may cause legal problems (eg, Australia) due to the potential interference with breast cancer screening and the current lack of long-term experience.

Regarding ALCL, while the absolute risk of developing it is extremely low among women with implant mammoplasties (about 1 to 3 cases per million women), this malignancy occurs much more frequently in this group when compared with the general population (high relative risk).[26] Despite being so rare, it appears interesting that according to the presented survey 2% to 14% of all plastic surgeons have encountered a case of ALCL in their practice, underscoring the importance of continuous retro- and prospective data acquisition in order to allow for better risk stratification. A higher-risk patient population also includes Factor V Leiden patients. Affected heterozygote individuals have a 3 to 10 times higher risk for developing deep venous thrombosis compared with the general population.[27] Regardless, about half of surgeons would operate on such a patient using sequential compression devices at the very least, while adding anticoagulation/chemoprophylaxis as an additional preventive measure. Only in Asia, most surgeons would avoid performing a breast augmentation in a heterozygous patient, which might be due the extremely rare prevalence in that

Table 6. Responses Regarding Technical Considerations in Secondary Procedures

Characteristic	Latin America (% of total respondents, *n* = 139)	Europe (% of total respondents, *n* = 341)	Asia (% of total respondents, *n* = 90)	Oceania (% of total respondents, *n* = 58)
Most common reasons for reoperation beyond hematoma or infection				
Capsular contracture	54.0	60.0	57.8	48.3
Implant malposition	5.8	15.9	4.4	13.8
Implant failure	4.3	7.1	2.2	24.1
Seroma	5.0	2.4	2.2	3.4
Size change	30.9	14.7	33.3	10.3
Surgical technique most commonly used for capsular contracture				
Anterior capsulectomy	37.4	28.5	33.3	27.6
Total capsulectomy	43.9	45.0	37.8	37.9
Capsulectomy with ADM lining	0.0	2.4	0.0	0.0
Neopocket formation	17.3	22.9	26.7	34.5
Neopocket with ADM lining	1.4	1.2	2.2	0.0
Most common technique for treating recurrent capsular contracture in patients with subpectoral (dual-plane) implants				
Anterior capsulectomy	16.5	22.1	34.4	24.1
Total capsulectomy	30.2	28.2	11.1	44.8
Capsulectomy with ADM pocket lining	2.9	5.3	8.9	6.9
Neopocket formation	28.8	22.1	15.6	10.3
Neopocket with ADM pocket lining	2.9	5.3	4.4	3.4
No surgical treatment if bilateral capsular contracture and symmetric	1.4	2.9	4.4	0.0
No surgery and consider removing implants	14.4	10.6	21.1	6.9
Change to polyurethane implants	2.9	3.5	0.0	3.4
Most common treatment for double-bubble or bottoming-out				
Percutaneous suture or external support for early onset	7.9	4.4	4.4	10.3
Capsulorrhaphy alone	44.6	66.5	37.8	62.1
Capsulorrhaphy with ADM buttress	10.8	18.8	17.8	27.6
Remove implants and replace later	36.7	10.3	40.0	0.0

ADM, acellular dermal matrix.

region and the associated lack of experience regarding prevention and treatment.

In the wide field of new technologies, many advances such as the introduction of ADMs,[28-30] insertion funnels,[31] or protective sheets have been described and promoted. Increased cost of the surgery and the lack of a clear consensus regarding their effectiveness might explain the international variation regarding the use of such products.

Trying to preoperatively determine implant size on tissue-based systems has several advantages over other methods like using externally applied sizers, rice bags, or similar.[32] The latter techniques remain the most commonly employed however, both in the United States and abroad. Three-dimensional imaging and preoperative surgical simulation have also been some of the newer emerging technologies, but have not caught on as one might have suspected and internationally, few surgeons use it. Compared to the United States, in other countries hardly any surgeons believe it to be a good marketing, educational, or preoperative sizing tool.

Besides implant shape, few issues surrounding breast augmentation have been discussed more extensively than

those regarding filling material. In all surveyed countries, over 80% of surgeons use 100% silicone implants only, whereas in the United States only 20% use that type only. Generally, it has been shown that silicone implants appear to be safe with a high degree of patient satisfaction.[33] While better evidence from larger studies is still needed to clarify associations between silicone breast implants and health outcomes,[34,35] silicone implants remain the internationally by far most preferred option. As over ten years have passed since silicone implants were reimplemented in the United States, the profound discrepancy cannot easily be explained. Also considering the use of textured vs smooth breast implants there were striking differences, with at least 80% of surgeons in Europe, Latin America, and Asia using mostly textured implant shell surfaces, while in the United States 85% of respondents use mostly or even exclusively smooth implants. This appears of interest, as textured implants tend to have lower rates of capsular contracture, less risk of displacement, and lower rates of infection.[36] However, they are currently thought to be associated with higher rates of ALCL development, as propagated by the ASPS and ASAPS.[37]

Implant placement is another area of discordance, mostly regarding common practices in Latin America, where surgeons often use a subglandular or subfascial location. Originally described and popularized by Graf et al,[38] several subsequent Latin American studies have commented on the advantages of subfascial implant placement, which might explain why it is more popular in those countries.[39,40] Current evidence regarding advantages of subfascial placement, however, is less conclusive. Despite not specifically commenting on subfascial placement, a recent meta-analysis performed by Egeberg et al evaluating the outcomes of 17,520 breast augmentations, showed that a subglandular implant placement increases the chances of developing a capsular contracture 2-fold compared to submuscular placement.[41-43] Ultimately, more data will be needed to better assess the value of subfascial implant placement.[44]

In order to prevent infection and potentially also biofilm formation, use of prophylactic antibiotics perioperatively and during the postoperative phase is commonplace, despite the fact that while there exists strong evidence that patients undergoing clean aesthetic breast surgery benefit from routine prophylaxis, there is currently only weak evidence regarding optimal antibiotic dose and duration[45] or optimal irrigation type.[46]

Measures for prevention of capsule formation were also surprisingly diverse. For instance, in the United States and Europe almost half the surgeons use pharmacologic agents to prevent or treat capsular contracture – regardless of the fact that 78% (United States) to 96% (Oceania) do not think that they work or are at least not sure about it, which goes in line with the little supportive evidence for such treatment.[47]

Reoperations are not uncommon in breast augmentation surgery, and while capsular contracture and size change were uniformly the most common reasons to perform such operations in all countries except for Oceania, treatment approaches were very different. With ADMs mostly used in the United States to treat recurrent contractures, only when faced with double-bubble deformities or bottoming out do such matrices seem to play a major role in other countries.

While several noticeable findings could be elucidated, the presented survey analysis certainly also has several limitations. One lies in the nature of its design being an electronically disseminated questionnaire, with an overall moderate response rate of about 18%. While response rates are generally considered to be the most widely compared statistic for judging the quality of surveys, they are also one of the most controversial features,[48] especially as they have been declining, both in the United States and in most of the industrialized world, for at least several decades.[49] Several authors have consequently questioned their validity as a research method.[50]

Nonetheless, according to the current literature, surveys remain to be a valuable tool to assess current trends and practice preferences in plastic surgery. In this setting, for most studies response rates seem to settle between 10% and 20%.[51-55]

Another limitation lies in the fact that the survey was very detailed and rather lengthy to take, which might have imposed some bias as in the end potentially only surgeons with a particular interest in the matter completed all questions. Analysis did show however, that there were no significant correlations regarding number of performed procedures and preferences, and also not regarding surgeon experience, which was considerably high with over one third of respondents in all regions having reported a work experience of more than 20 years.

This study is also limited by the fact that no outcome measures were analyzed. To investigate patient outcomes based on nonstandardized questions appeared to be of little validity, however. Part of the assumption is therefore that surgeons employ the technique they feel most comfortable with, and which produces the best results in their hands.

In the end, surgeons will undoubtedly always need to customize their technique in respect to the individual patient, and therefore the presented common practices have to be seen in context of this limitation. However, assuming that patients are equally often different in all regions thus equally often requiring deviations from the standard approach, most preferred treatments still maintain their validity.

There exist many different approaches towards breast augmentation surgery, as illustrated, certainly also influenced by geographic and cultural factors. Nonetheless, while decision making is multifactorial, it is apparently not always made according to evidence base, as the latter should be universally accepted.

CONCLUSION

There exists accordance regarding several aspects of breast augmentation surgery, however international practice patterns remain very incoherent. While distinct techniques can already be advocated independent of location, plastic surgeons may still benefit from internationally applicable high-level studies in order to create standardized evidence-based practice guidelines and further improve outcomes.

Supplementary Material

This article contains supplementary material located online at www.aestheticsurgeryjournal.com.

Disclosures

The authors declared no potential conflicts of interest with respect to the research, authorship, and publication of this article.

Funding

The authors received no financial support for the research, authorship, and publication of this article.

REFERENCES

1. International Society of Aesthetic Plastic Surgery. ISAPS International Survey on Aesthetic/Cosmetic Procedures Performed in 2015. USA: 8. http://www.isaps.org/Media/Default/global-statistics/2016%20ISAPS%20Results.pdf. Accessed January 20, 2017.
2. Hidalgo DA. Breast augmentation: choosing the optimal incision, implant, and pocket plane. *Plast Reconstr Surg*. 2000;105(6):2202-2216; discussion 2217.
3. Hidalgo DA, Spector JA. Breast augmentation. *Plast Reconstr Surg*. 2014;133(4):567e-583e.
4. Chang JB, Small KH, Choi M, Karp NS. Three-dimensional surface imaging in plastic surgery: foundation, practical applications, and beyond. *Plast Reconstr Surg*. 2015;135(5):1295-1304.
5. Del Vecchio DA, Bucky LP. Breast augmentation using preexpansion and autologous fat transplantation: a clinical radiographic study. *Plast Reconstr Surg*. 2011;127(6):2441-2450.
6. Khouri R, Del Vecchio D. Breast reconstruction and augmentation using pre-expansion and autologous fat transplantation. *Clin Plast Surg*. 2009;36(2):269-80, viii.
7. Khouri RK, Eisenmann-Klein M, Cardoso E, et al. Brava and autologous fat transfer is a safe and effective breast augmentation alternative: results of a 6-year, 81-patient, prospective multicenter study. *Plast Reconstr Surg*. 2012;129(5):1173-1187.
8. Kovacs L, Eder M, Zimmermann A, et al. Three-dimensional evaluation of breast augmentation and the influence of anatomic and round implants on operative breast shape changes. *Aesthetic Plast Surg*. 2012;36(4):879-887.
9. Maxwell GP, Gabriel A. Acellular dermal matrix for reoperative breast augmentation. *Plast Reconstr Surg*. 2014;134(5):932-938.
10. Roostaeian J, Adams WP Jr. Three-dimensional imaging for breast augmentation: Is this technology providing accurate simulations? *Aesthet Surg J*. 2014;34(6):857-875.
11. Voglimacci M, Garrido I, Mojallal A, et al. Autologous fat grafting for cosmetic breast augmentation: a systematic review. *Aesthet Surg J*. 2015;35(4):378-393.
12. Hidalgo DA, Sinno S. Current trends and controversies in breast augmentation. *Plast Reconstr Surg*. 2016;137(4):1142-1150.
13. United Nations. Department of Economic and Social Affairs. *Classification of Countries by Major Areas and Region of the World. In World Population Prospects: The 2010 Revision, Volume I: Comprehensive Tables. Population Division*. New York. 2011.
14. Friedman T, Davidovitch N, Scheflan M. Comparative double blind clinical study on round versus shaped cohesive gel implants. *Aesthet Surg J*. 2006;26(5):530-536.
15. Hedén P, Montemurro P, Adams WP Jr, Germann G, Scheflan M, Maxwell GP. Anatomical and Round Breast Implants: How to Select and Indications for Use. *Plast Reconstr Surg*. 2015;136(2):263-272.
16. Adams WP Jr. The process of breast augmentation: four sequential steps for optimizing outcomes for patients. *Plast Reconstr Surg*. 2008;122(6):1892-1900.
17. Maxwell GP, Sche an M, Spear S, Nava MB, Hedén P. The evidence and rationale for macrotextured breast implants and consensus recommendations for optimising their effectiveness. *Aesthet Surg J*. 2014:34:876-881.
18. Hedén P. Breast augmentation with anatomic, high-cohesiveness silicone gel implants (European experience). In: Spear SL, ed. *Surgery of the Breast: Principles and Art*. 3rd ed. Philadelphia: Wolters Kluwer/Lippincott Williams & Wilkins; 2011:1322-1345.
19. Gahm J, Edsander-Nord A, Jurell G, Wickman M. No differences in aesthetic outcome or patient satisfaction between anatomically shaped and round expandable implants in bilateral breast reconstructions: a randomized study. *Plast Reconstr Surg*. 2010;126(5):1419-1427.
20. Friedman T, Davidovitch N, Scheflan M. Comparative double blind clinical study on round versus shaped cohesive gel implants. *Aesthet Surg J*. 2006;26(5):530-536.
21. Rubi CG, Lozano JA, Pérez-Espadero A, Leache ME. Comparing round and anatomically shaped implants in augmentation mammaplasty: the experts' ability to differentiate the type of implant. *Plast Reconstr Surg*. 2017;139(1):60-64.
22. Bronz G. A comparison of naturally shaped and round implants. *Aesthet Surg J*. 2002;22(3):238-246.

23. Broer PN, Juran S, Walker ME, et al. Aesthetic breast shape preferences among plastic surgeons. *Ann Plast Surg*. 2015;74(6):639-644.
24. Groen JW, Negenborn VL, Twisk JW, Ket JC, Mullender MG, Smit JM. Autologous fat grafting in cosmetic breast augmentation: a systematic review on radiological safety, complications, volume retention, and patient/surgeon satisfaction. *Aesthet Surg J*. 2016;36(9):993-1007.
25. Kronowitz SJ, Mandujano CC, Liu J, et al. Lipofilling of the Breast Does Not Increase the Risk of Recurrence of Breast Cancer: A Matched Controlled Study. *Plast Reconstr Surg*. 2016;137(2):385-393.
26. de Jong D, Vasmel WL, de Boer JP, et al. Anaplastic large-cell lymphoma in women with breast implants. *JAMA*. 2008;300(17):2030-2035.
27. O'Brien C, Devin MD, Michaels V, et al. Hereditary coagulopathies: Practical diagnosis and management for the plastic surgeon. *Plast Reconstr Surg*. 2010;125:1544-1552.
28. Cheng A, Lakhiani C, Saint-Cyr M. Treatment of capsular contracture using complete implant coverage by acellular dermal matrix: a novel technique. *Plast Reconstr Surg*. 2013;132(3):519-529.
29. Hester TR Jr, Ghazi BH, Moyer HR, Nahai FR, Wilton M, Stokes L. Use of dermal matrix to prevent capsular contracture in aesthetic breast surgery. *Plast Reconstr Surg*. 2012;130(5 Suppl 2):126S-136S.
30. Maxwell GP, Gabriel A. Revisionary breast surgery with acellular dermal matrices. *Aesthet Surg J*. 2011;31(6):700-710.
31. Flugstad NA, Pozner JN, Baxter RA, et al. Does Implant Insertion with a Funnel Decrease Capsular Contracture? A Preliminary Report. *Aesthet Surg J*. 2016;36(5):550-556.
32. Tebbetts JB, Adams WP. Five critical decisions in breast augmentation using five measurements in 5 minutes: the high five decision support process. *Plast Reconstr Surg*. 2005;116(7):2005-2016.
33. Stevens WG, Calobrace MB, Harrington J, Alizadeh K, Zeidler KR, d'Incelli RC. Nine-Year Core Study Data for Sientra's FDA-Approved Round and Shaped Implants with High-Strength Cohesive Silicone Gel. *Aesthet Surg J*. 2016;36(4):404-416.
34. Chao AH, Garza R 3rd, Povoski SP. A review of the use of silicone implants in breast surgery. *Expert Rev Med Devices*. 2016;13(2):143-156.
35. Balk EM, Earley A, Avendano EA, Raman G. Long-Term Health Outcomes in Women With Silicone Gel Breast Implants: A Systematic Review. *Ann Intern Med*. 2016;164(3):164-175.
36. Quinn TT, Miller GS, Rostek M, Cabalag MS, Rozen WM, Hunter-Smith DJ. Prosthetic breast reconstruction: indications and update. *Gland Surg*. 2016;5(2):174-186.
37. The American Society for Aesthetic Plastic Surgery. ASPS/ASAPS Update Breast Implant-Associated Anaplastic Large Cell Lymphoma (BIA-ALCL) Quick Facts and FAQs. 2016. USA: 1. http://www.surgery.org/downloads/blasts/BIA-ALCL/. Accessed January 30, 2017.
38. Graf RM, Bernardes A, Rippel R, Araujo LR, Damasio RC, Auersvald A. Subfascial breast implant: a new procedure. *Plast Reconstr Surg*. 2003;111(2):904-908.
39. Hunstad JP, Webb LS. Subfascial breast augmentation: a comprehensive experience. *Aesthetic Plast Surg*. 2010;34(3):365-373.
40. Tijerina VN, Saenz RA, Garcia-Guerrero J. Experience of 1000 cases on subfascial breast augmentation. *Aesthetic Plast Surg*. 2010;34(1):16-22.
41. Egeberg A, Sørensen JA. The impact of breast implant location on the risk of capsular contraction. *Ann Plast Surg*. 2016;77(2):255-259.
42. Wong CH, Samuel M, Tan BK, Song C. Capsular contracture in subglandular breast augmentation with textured versus smooth breast implants: a systematic review. *Plast Reconstr Surg*. 2006;118(5):1224-1236.
43. Malata CM, Feldberg L, Coleman DJ, Foo IT, Sharpe DT. Textured or smooth implants for breast augmentation? Three year follow-up of a prospective randomised controlled trial. *Br J Plast Surg*. 1997;50(2):99-105.
44. Brown T. Subfascial breast augmentation: is there any advantage over the submammary plane? *Aesthetic Plast Surg*. 2012;36(3):566-569.
45. Ariyan S, Martin J, Lal A, et al. Antibiotic prophylaxis for preventing surgical-site infection in plastic surgery: an evidence-based consensus conference statement from the American Association of Plastic Surgeons. *Plast Reconstr Surg*. 2015;135(6):1723-1739.
46. Drinane JJ, Kortes MJ, Bergman RS, Folkers BL. Evaluation of antibiotic irrigation versus saline irrigation in reducing the long-term incidence and severity of capsular contraction after primary augmentation mammoplasty. *Ann Plast Surg*. 2016;77(1):32-36.
47. Cheng HT, Lin FY, Chang SC. The effects of antileukotriene agents on capsular contracture: an evidence-based analysis. *Plast Reconstr Surg*. 2012;129(6):1018e-1020e.
48. Biemer PP, Lyberg LE. *Introduction to Survey Quality*. 1st ed. New York, NY: John Wiley & Sons; 2003;36-51.
49. de Leeuw E, de Heer W. Trends in household survey nonresponse: a longitudinal and international comparison. In: Groves RM, Dillman DA, Eltinge JL, Little RJA, eds. *Survey Nonresponse*. 1st ed. New York, NY: John Wiley & Sons; 2002:41-54.
50. Huffington A. Margin of arrogance is huge for pollsters, In: Kirk J, eds. *Chicago Sun-Times*. Chicago, IL; 1998:43.
51. Afifi AM, Kempton SJ, Gordon CR, et al. Evaluating current functional airway surgery during rhinoplasty: a survey of the American Society of Plastic Surgeons. *Aesthetic Plast Surg*. 2015;39(2):181-190.
52. Israel JS, Chen JT, Rao VK, Poore SO. Plastic surgeons' perceptions of the affordable care act: results of a national survey. *Plast Reconstr Surg Glob Open*. 2015;3(1):e293.
53. Losken A, Kapadia S, Egro FM, Baecher KM, Styblo TM, Carlson GW. Current opinion on the oncoplastic approach in the USA. *Breast J*. 2016;22(4):437-441.
54. Sinno S, Mehta K, Reavey PL, Simmons C, Stuzin JM. Current trends in facial rejuvenation: an assessment of ASPS members' use of fat grafting during face lifting. *Plast Reconstr Surg*. 2015;136(1):20e-30e.
55. Vargas CR, Chuang DJ, Lee BT. Assessment of patient health literacy: a national survey of plastic surgeons. *Plast Reconstr Surg*. 2014;134(6):1405-1414.