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Cosmetic

All Seasons Vertical Augmentation Mastopexy: A Simple Algorithm, Clinical Experience, and Patient-reported Outcomes

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Background: The safety of augmentation mastopexy has been questioned. Staging has been recommended for women deemed to be at higher risk, such as women with greater degrees of ptosis. Most existing studies evaluate women treated with multiple methods, including the traditional Wise pattern. This retrospective study specifically evaluates vertical augmentation mastopexy. A simple algorithm is introduced.

Methods: From 2002 to 2016, 252 women underwent consecutive vertical augmentation mastopexies performed by the author, with no staged surgery. All patients underwent a vertical mastopexy using a medially based pedicle and intraoperative nipple siting. A subset of women treated from 2012 to 2016 were surveyed to obtain outcome data; 90 patients (inclusion rate, 90%) participated.

Results: The complication rate was 32.9%, including persistent ptosis, delayed wound healing, scar deformities, and asymmetry. There were no cases of nipple loss. An increased risk of complications was detected for smokers ($P < 0.01$), but not for combined procedures, secondary breast augmentations, or secondary mastopexies. The revision rate was 15.5%. Persistent nipple numbness was reported by 13.3% of respondents. Eighty percent of women were self-conscious about their breast appearance before surgery; 22% of respondents were self-conscious about their breasts after surgery. Seventy percent of respondents reported an improved quality of life, 94.4% would repeat the surgery, and 95.6% would recommend it.

Conclusions: A simple algorithm may be used to guide treatment in women who desire correction of ptosis and upper pole fullness. An "all seasons" vertical augmentation mastopexy is safe and widely applicable. Staging is unnecessary. *(Plast Reconstr Surg Glob Open 2016;4:e1170; doi: 10.1097/GOX.0000000000001170; Published online 27 December 2016.)*

Conventional wisdom holds that the variety of patient presentations obliges the surgeon to have a number of different techniques at his or her disposal.[1] In 1979, Georgiade et al[2] dismissed the concept of an "all seasons mammaplasty." This conclusion predated the popularization of the vertical technique with a medial pedicle by Hall-Findlay[3] in 1999.

Augmentation mastopexy is still regarded with trepidation by many plastic surgeons.[4] Several investigators[4–6] caution that this procedure not only combines complication rates but multiplies them. The conventional wisdom is that the operations are at cross purposes; the implant stretches the skin envelope, whereas the mastopexy tightens it.[5–11] Many surgeons advocate staging.[6–9]

In discussions of risk, the mastopexy method is often overlooked. The surgical technique is important because different dissections are likely to differ in their degree of safety. Almost all published series include patients treated with multiple techniques.[6,8,9,12–16] In 2 recent large series, the vertical method was used in 40% of patients in one study[7] and in 10% of patients in the other study.[16]

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In cosmetic surgery, the patient's opinion regarding the quality of the result is the most important indicator of surgical success.[17,18] Despite the popularity of vertical augmentation mastopexy, there is a deficiency of patient-reported outcome data; hence, the need for clinical and outcomes data related solely to the vertical method. This study differs from previous studies of augmentation mastopexy[6–9,12–16] in that no patient was selected for staging, avoiding selection bias.

METHODS

Patients

From August 2002 to July 2016, 252 women underwent consecutive vertical augmentation mastopexies performed by the author using a simple algorithm (Fig. 1). Unilateral procedures, breast reconstructions, and patients with resection weights of more than or equal to 300 g from at least 1 breast, categorized as "breast reductions plus implants,"[19,20] were excluded. The 300-g cutoff is arbitrary. This value was used to maintain consistency with other studies.[19,20]

An outcome survey was undertaken among the 100 most recently treated patients who underwent surgery between July 2012 and July 2016 (inclusion rate, 90%). Patients were interviewed either in person or by telephone privately by a member of the office staff. This retrospective study was determined to be exempt from institutional review board oversight by Chesapeake Institutional Review Board Services.

Surgery

A vertical elliptical resection pattern was marked preoperatively. A medially based pedicle[3] and intraoperative nipple siting were used in all patients. A mosque-dome or keyhole preoperative pattern was not used (**See video, Supplemental Digital Content 1**, which demonstrates preoperative marking. This video is available in the "related videos" section of the full-text article on PRSGlobalOpen.com or available at ***http://links.lww.com/PRSGO/A317***). The lower end of the ellipse was marked preoperatively just above the existing inframammary fold. Before performing the mastopexy, the breast implant was placed submuscularly, with partial release of the pectoralis muscle (**See video, Supplemental Digital Content 2**, which demonstrates implant insertion. This video is available in the "related videos" section of the full-text article on PRSGlobalOpen.com or available at ***http://links.lww.com/PRSGO/A318***; **See video, Supplemental Digital Content 3**, which demonstrates the vertical mastopexy dissection. This video is available in the "related videos" section of the full-text article on PRSGlobalOpen.com or available at ***http://links.lww.com/PRSGO/A319***). The lower pole resection width is difficult to predict in a mastopexy, particularly when

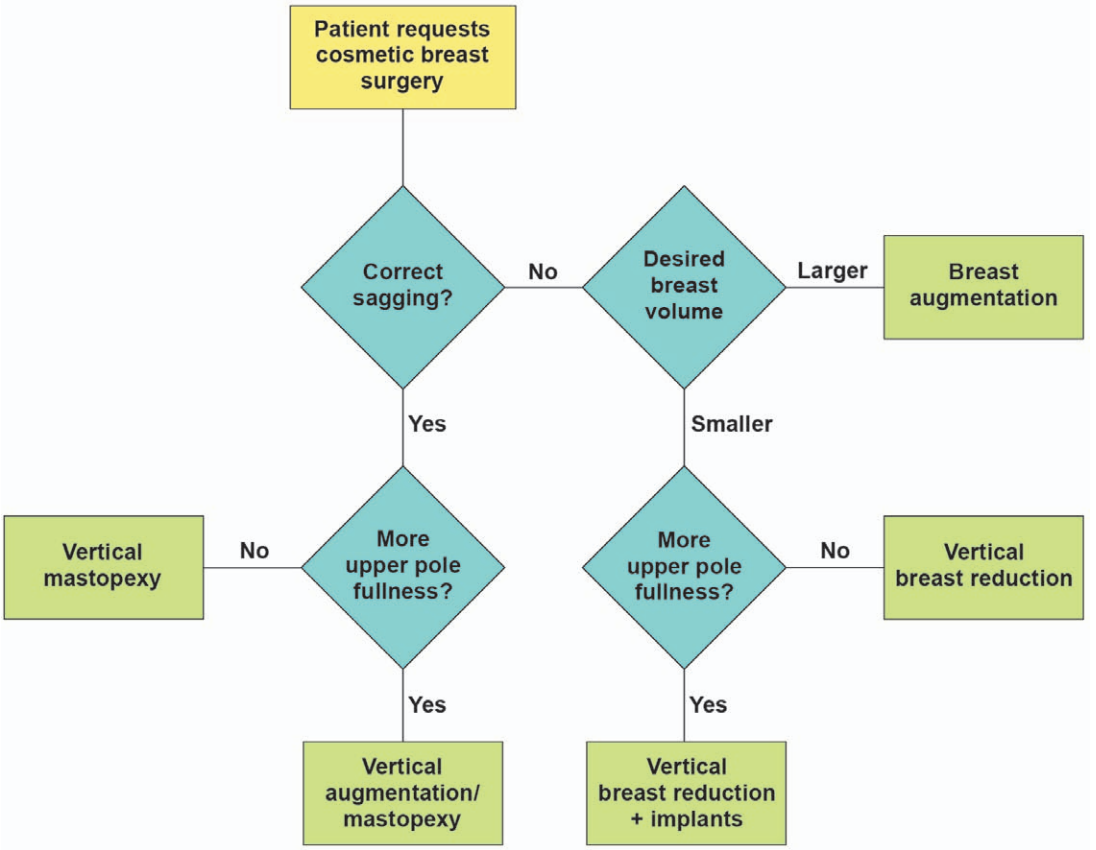
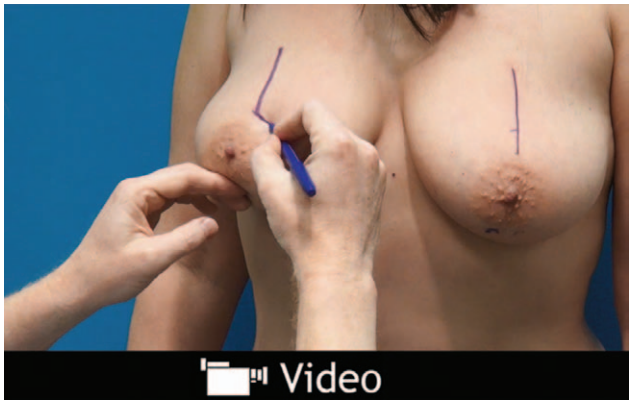
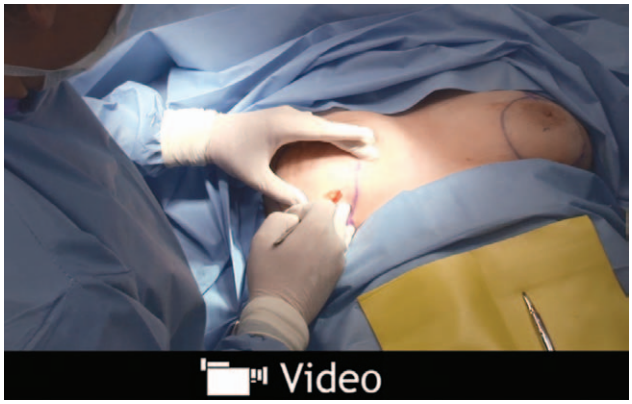


Fig. 1. Simplified algorithm for cosmetic breast surgery. Only 2 procedures are needed: breast augmentation and vertical mammaplasty (labeled a breast reduction for patients with ≥300 g tissue removed from at least 1 breast). The procedures are performed either individually or in combination.



Video Graphic 1. See video, Supplemental Digital Content 1, which demonstrates preoperative marking. This video is available in the "related videos" section of the full-text article on PRSGlobalOpen.com or available at ***http://links.lww.com/PRSGO/A317***.

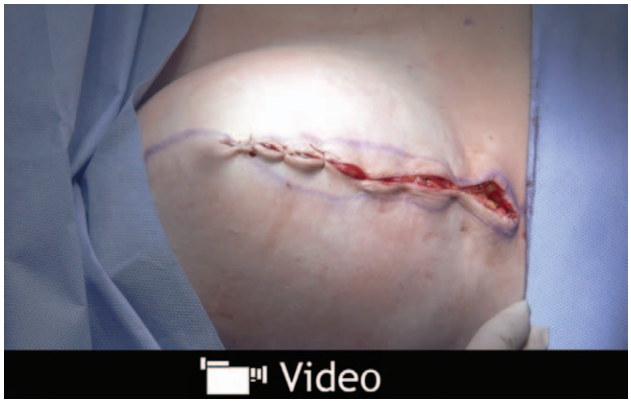


Video Graphic 2. See video, Supplemental Digital Content 2, which demonstrates the insertion of the breast implant. This video is available in the "related videos" section of the full-text article on PRSGlobalOpen.com or available at ***http://links.lww.com/PRSGO/A318***.

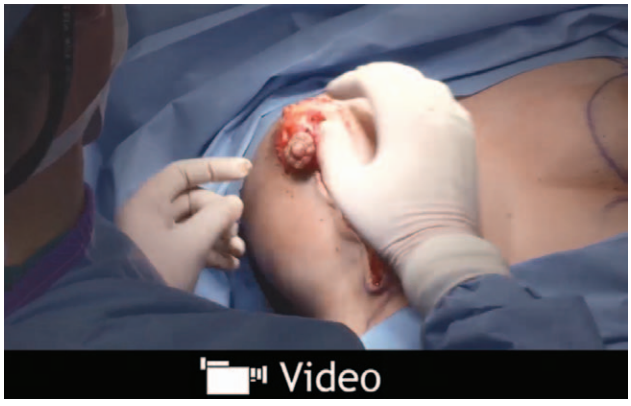
Video Graphic 3. See video, Supplemental Digital Content 3, which demonstrates the vertical mastopexy dissection. This video is available in the "related videos" section of the full-text article on PRSGlobalOpen.com or available at ***http://links.lww.com/PRSGO/A319***.

an implant is inserted simultaneously. Intraoperative adjustments are needed to avoid under- or overresection. The final lower pole resection margins were determined after insertion of the breast implant and creation of the new breast mound, not necessarily aligning with the preoperative markings. The deepithelialized right medial pedicle extended from approximately 1 to 4 o'clock (8 to 11 o'clock on the left breast) along the areola margin to include the third and fourth anterior cutaneous sensory branches.[21]

The new nipple/areola site was determined after insertion of the breast implant and creation of the new breast mound (**See video, Supplemental Digital Content 4**, which demonstrates intraoperative nipple siting. This video is available in the "related videos" section of the full-text article on PRSGlobalOpen.com or available at ***http://links.lww.com/PRSGO/A320***; **See video, Supplemental Digital Content 5**, depicting the wound closure. This video is available in the "related videos" section of the full-text article on PRSGlobalOpen.com or available at ***http://links.lww.com/PRSGO/A321***). The nipple was positioned in reference to the breast mound, not to a predetermined level or distance to the sternal notch. The author does not find it necessary to sit the patient up during surgery. A short inverted-T modification was used in patients in whom the vertical scar extended



Video Graphic 4. See video, Supplemental Digital Content 4, which demonstrates intraoperative nipple siting. This video is available in the "related videos" section of the full-text article on PRSGlobalOpen.com or available at ***http://links.lww.com/PRSGO/A320***.



Video Graphic 5. See video, Supplemental Digital Content 5, which demonstrates the wound closure. This video is available in the "related videos" section of the full-text article on PRSGlobalOpen.com or available at ***http://links.lww.com/PRSGO/A321***.

below the level of the new (elevated) inframammary crease. The length of this horizontal scar was much shorter than the inframammary component of the Wise pattern, just long enough to remove the inferior dog ear. No drains were used. A vertical mastopexy was used for all secondary augmentation mastopexies. In secondary cases, the nipple position rarely required elevation, facilitating a wider base that always included a medial pedicle and frequently was extended to include the superior areola hemicircumference. In secondary cases requiring no change in the nipple position and only tightening of the lower pole, a periareolar incision may be unnecessary. This series did not include such cases, which might be considered revisions. Breast implants typically settle over time, and some women request a larger size. In patients with existing breast implants, the subpectoral pocket was usually expanded superiorly to accommodate the new implant at a higher level on the chest wall.

All procedures were performed on an outpatient basis using total intravenous anesthesia and a laryngeal mask airway (**See video, Supplemental Digital Content 6**, which demonstrates the completion of surgery and the patient 24 hours after surgery. This video is available in the "related videos" section of the full-text article on PRSGlobalOpen.com or available at ***http://links.lww.com/PRSGO/A322***). Beginning in 2013, all patients underwent surveillance for deep venous thromboses using Doppler ultrasound imaging.[22] Ultrasound screening examinations were performed before surgery, the day after surgery, and approximately 1 week after surgery.[22] Chemoprophylaxis was not used. Patients typically received cefazolin 1 g IV preoperatively followed by 3 doses of cephalexin 500 mg PO q12h.

Statistical Analysis

Statistical analyses were performed using IBM SPSS for Windows version 20.0 (IBM Corp., Armonk, N.Y.). The Pearson chi-square test of independence was used to compare categorical variables. Correlations were tested using Pearson correlations. In view of multiple comparisons, a P value of less than 0.01 was considered significant.

Video Graphic 6. See video, Supplemental Digital Content 6, which demonstrates the completion of surgery and the patient seen in follow-up 24 hours after surgery. This video is available in the "related videos" section of the full-text article on PRSGlobalOpen.com or available at ***http://links.lww.com/PRSGO/A322***.

RESULTS

The mean patient age was 43 years, and the mean follow-up time was 9.4 months (range, 0.2–45.7 mo). The mean implant volume was 372 mL (range, 150–800 mL). Two hundred thirty patients (91.3%) elected to have saline-filled implants (Table 1). Thirty-four women (13.5%) had undergone previous mastopexies or breast reductions. In all secondary cases, an inverted-T scar was present, suggesting that a Wise pattern had been used.

The complication rate was 32.9%, including persistent ptosis (8.7%), scar deformities (7.9%), delayed wound healing (7.1%), and size asymmetry (6.0%). Less frequent complications included capsular contracture (4.8%) and cellulitis (4.0%). Two deep venous thromboses (0.8%)

Table 1. Patient Data

	(%)
n	252
Age, y	
Mean	43.1
SD	11.2
Range	17.0–74.3
Follow-up time, mo	
Mean	9.4
SD	7.5
Range	0.2–45.7
Smoking status	
Nonsmoker	208 (82.5)
Smoker	44 (17.5)
Body mass index, kg/m^2	
Mean	25.4
SD	4.7
Range	15.6–41.9
Right implant volume, mL	
Mean	371.7
SD	102.6
Range	180–800
Left implant volume, mL	
Mean	371.5
SD	100.9
Range	150–800
Implant style	
Saline*	230 (91.3)
Silicone gel†	22 (8.7)
Right tissue weight, g	
Mean	91.2
SD	64.0
Range	2–298
Left tissue weight, g	
Mean	91.6
SD	62.3
Range	5–297
Augmentation	
Primary	181 (71.8)
Secondary	71 (28.2)
Mastopexy‡	
Primary	218 (86.5)
Secondary	34 (13.5)
In combination with other procedures	
No	97 (38.5)
Yes	155 (61.5)
Operating time for breast procedures only, min	
Mean	126.5
SD	24.9
Range	42–222

*Mentor (Mentor Corp., Santa Barbara, Calif.) Style 1600 smooth, round, Moderate Profile implant (n = 22); Mentor Style 2000 smooth, round, Moderate Plus Profile implant (n = 85); Inamed/Allergan (Allergan, Inc., Irvine, Calif.), Natrelle Style 68, smooth, round, Moderate Profile implant (n = 123).
†Mentor Style 7000 Moderate Profile Gel (n = 17); Allergan Style 15 Midrange Profile Gel (n = 5).
‡19 patients underwent both secondary augmentations and mastopexies.

were detected (Table 2). One hematoma and one seroma were encountered, and there were no implant deflations. There were no hospital admissions and no blood transfusions. There were no cases of nipple loss.

The revision rate was 15.5% (Table 3). No significant correlations were detected between the incidence of complications and age, body mass index, resection weights, implant volumes, or operating time. A significant ($P < 0.01$) correlation was detected for patients with a smoking history but not for combined procedures, secondary breast augmentations, or secondary mastopexies (Table 4). Delayed wound healing was not significantly associated with secondary mastopexy.

Patient-reported Outcomes

Fifteen patients (16.7%) reported dissatisfaction with their scars. Approximately half of the women (48.9%) reported at least temporary nipple numbness, which was persistent in at least 1 nipple in 12 women (13.3%). Eighty percent of women were self-conscious about their breast appearance before surgery; 22% of respondents reported that they were self-conscious about their breasts after surgery. Seventy-six women (84.4%) were satisfied with their result, 85 women (94.4%) would repeat the surgery, and 86 patients (95.6%) would recommend it. All but 3 women (96.7%) were pleased that they had chosen to have implants. Self-esteem was improved in 85.6% of patients, and 70.0% of respondents reported an improved quality of life (Table 5).

DISCUSSION

Both the resection width (raising the inframammary fold[23]) and implant volume (lowering the inframammary fold[23]) affect the level of the new inframammary fold, so that the lower end of the incision relative to the new inframammary fold is unknown until after implant insertion and creation of the new breast mound. A vertical mastopexy elevates the inframammary fold[23] because a lower pole tissue wedge is removed, and the medial and lateral pillars are brought together, tightening the breast circumference. The length of the vertical scar is longer than for a Wise pattern, typically 10 to 12 cm.[3,20] The vertical method does not constrict the lower pole, unlike the Wise pattern mammaplasty.[24]

Table 2. Complications*

	(%)
n	252
Complications	
No	169 (67.1)
Yes	83 (32.9)
Persistent ptosis	22 (8.7)
Scar deformity	20 (7.9)
Delayed wound healing	18 (7.1)
Size asymmetry	15 (6.0)
Capsular contracture	12 (4.8)
Cellulitis/infection	10 (4.0)
Allergic reaction	4 (1.6)
Deep venous thrombosis	2 (0.8)
Hematoma	1 (0.4)
Seroma	1 (0.4)
Implant deflation	0
Synmastia	0
Total	105

*22 patients had 2 complications.

Table 3. Treatment of Complications*

	(%)
n	252
Surgical treatment of complications	
No	213 (84.5)
Yes	39 (15.5)
Reoperations (total intravenous sedation)	
Lower pole revision for persistent ptosis	21 (8.3)
Open capsulotomy	10 (4.0)
Scar revision	8 (3.2)
Revision of areola irregularity	4 (1.6)
Implant replacement	2 (0.8)
Evacuation of hematoma	1 (0.4)
Wound revision	1 (0.4)
Correction of implant malposition	1 (0.4)
Total reoperations	48

*9 patients underwent 2 surgical treatments of complications.

Table 4. Correlations between Incidence of Complications and Patient-related Parameters*

Parameter	r	P
Age	–0.140	0.039
Smoking history	0.196	0.004
Body mass index	–0.086	0.216
Right breast implant volume	0.000	0.997
Left breast implant volume	–0.017	0.797
Right breast resection weight	0.094	0.194
Left breast resection weight	0.129	0.073
Secondary augmentation	0.035	0.608
Secondary mastopexy	0.079	0.244
Combined surgery (face or body)	–0.127	0.060
Operating time (breast surgery only)	0.150	0.032

*Complications were measured dichotomously. Correlations were computed using Pearson correlations.

Recent clinical[20] and intraoperative breast perfusion data[25] suggest that the dangers attributed to the combined surgery may not derive from combining procedures after all. The increased risk to nipple/areola perfusion is related to the mastopexy technique.[20,26] The limitations of nonvertical techniques are exposed when an implant is introduced.[20] For example, adding an implant may create pressure on a long, inferiorly based pedicle, further reducing nipple/areola perfusion and possibly tipping the balance to necrosis.[20] In a periareolar mastopexy, the breast area being stretched has already undergone skin resection, increasing tissue tension.[20]

The clinical data obtained in this study pertain to the author's complete experience with vertical augmentation mastopexy, dating to 2002, including his learning curve experience. A shorter 4-year period for surveys was chosen to maximize the inclusion rate. The 90% response rate satisfies the 80% benchmark for evidence-based medicine.[27]

Mastopexy Techniques

With greater than 100 published methods,[26] mammaplasty has long been a subject of confusion for plastic surgeons. Numerous skin patterns and pedicles are used.[28,29] Algorithms can be complicated.[30–32] Lee et al[8] published an algorithm based on skin measurements and recommended staging for patients with more than 6 cm of vertical skin excess. The basis for this algorithm is unclear. Patients with greater skin elasticity should be even better

Table 5. Survey Data for 90 Patients

	(%)
No. of surveys	90
Age, y	
Mean	44.2
SD	11.7
Range	22.6–69.1
Follow-up time, mo	
Mean	9.2
SD	9.5
Range	1.0–41.2
Back, shoulder, or neck pain before surgery	
No	70 (77.8)
Yes	20 (22.2)
Back, shoulder, or neck pain after surgery	
No	73 (81.1)
Yes	17 (18.9)
Difficulty exercising before surgery	
No	75 (83.3)
Yes	15 (16.7)
Difficulty exercising after surgery	
No	84 (93.3)
Yes	6 (6.7)
Reason for surgery	
Improve appearance	74 (82.2)
Lessen discomfort	0 (0)
Both	16 (17.8)
Time off work, d	
Mean	8.0
Median	6
SD	7.8
Range	0–45
Duration of pain, d	
Mean	8.8
Median	5
SD	11.6
Range	0–60
"Back to normal," d	
Mean	34.4
Median	30
SD	23.5
Range	2–90
Pain Rating (1–10)*	
Mean	5.3
SD	2.3
Range	1–10
Complications (reported by patient)	
No	63 (70.0)
Yes	27 (30.0)
Scars	
Well hidden	18 (20.0)
Visible but okay	57 (63.3)
Unhappy	15 (16.7)
Nipple numbness	
No	46 (51.1)
Yes	44 (48.9)
Location of numbness	
Unilateral	13 (29.5)
Bilateral	31 (70.5)
Did feeling return?	
No	12 (27.3)
Yes	19 (43.2)
Partially	13 (29.5)
Self-conscious with the appearance of your breasts before surgery	
No	18 (20.0)
Yes	72 (80.0)
Self-conscious with the appearance of your breasts after surgery	
No	70 (77.8)
Yes	20 (22.2)
Satisfied with the result	
No	14 (15.6)
Yes	76 (84.4)
Meet expectations	
No	15 (16.7)
Yes	57 (63.3)
Exceeded	18 (20.0)
Would you do it again?	
No	5 (5.6)
Yes	85 (94.4)
Would you recommend the surgery to someone else?	
No	4 (4.4)
Yes	86 (95.6)
Result rating (1–10)†	
Mean	8.0
Median	8
SD	2.0
Range	1–10
Pleased you had implants	
No	3 (3.3)
Yes	87 (96.7)
Improved self-esteem or self-confidence	
Not at all	13 (14.4)
A little	26 (28.9)
A lot	51 (56.7)
Improved quality of life	
No	27 (30.0)
A little	23 (25.6)
A lot	40 (44.4)
Breast size after	
Just right	73 (81.1)
Prefer smaller	10 (11.1)
Prefer larger	7 (7.8)

*Patients were asked to rate their postoperative pain level on a scale of 1 (no pain) to 10 (most severe pain).
†Patients were asked to rate their result on a scale of 1 (worst) to 10 (best).

candidates for one-stage surgery; the implant and lower pole resection work together to take up the slack. In many technical respects, the procedures are synergistic, not opposing.[20]

The mean resection weight per breast was 91 g (range, 2–298 g), similar to the resection weights reported by Beale et al (111.2 ± 131.5 g).[6] The traditional recommendation is to use a periareolar resection for cases of minor ptosis, vertical mammaplasty for more moderate degrees of breast ptosis, and an inverted-T technique for major ptosis.[1,28] A periareolar resection removes extra tissue from around the areola but provides minimal breast mound elevation.[26] By omitting a lower pole tissue resection, the effectiveness of this mastopexy technique is compromised.[26,33] Periareolar mastopexy, popularized by Benelli,[34] has fallen into disfavor as plastic surgeons recognize its limitations.[33,35] Nevertheless, periareolar mastopexy remains a useful procedure for minimizing a large areola or for small adjustments in the position of the nipple/areola.

Closure of a horizontal ellipse reduces projection and constricts the lower pole while increasing the width.[26] Unfortunately, patients after a Wise pattern mammaplasty often resemble preoperative candidates for a vertical augmentation mastopexy.[20] The vertical technique provides greater upper pole projection, breast projection, and more conical lower poles (Figs. 2–4).[24] Not surprisingly, patients prefer the aesthetic result of the vertical method.[36]

Vertical Mammaplasty

Many publications refer to a "vertical scar" mastopexy or reduction or "short scar" mammaplasty. These labels miss an important point. The most important consider-

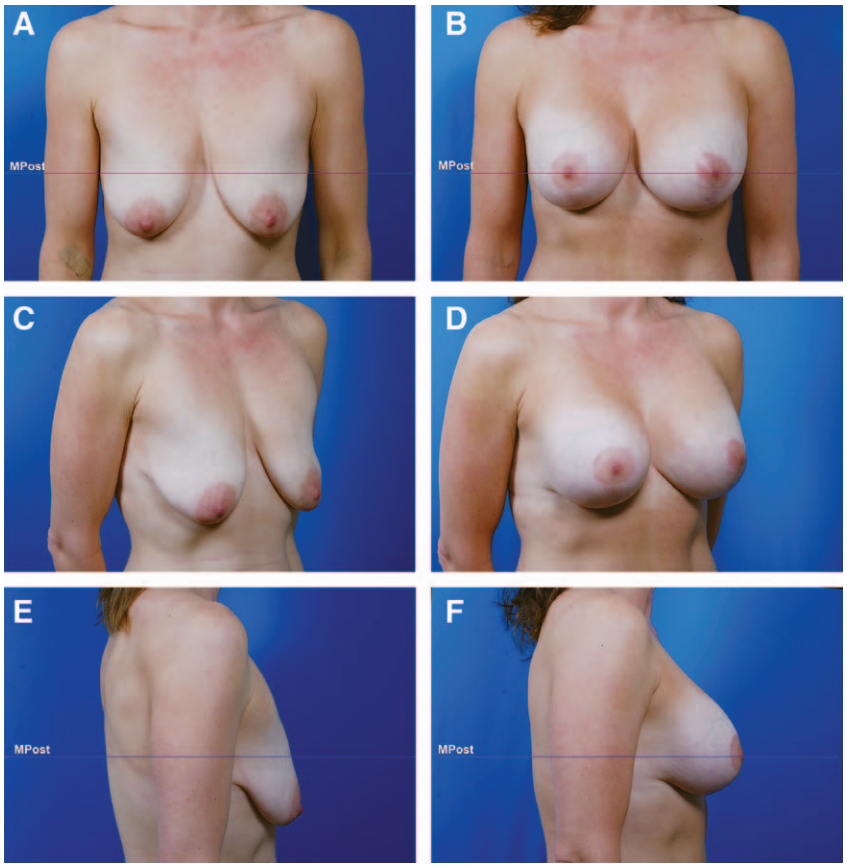


Fig. 2. This 41-year-old woman had marked deflation and breast ptosis. She wished to be restored to a C-cup size. She is seen before (A, C, and E) and 13 months after (B, D, and F) a vertical augmentation mastopexy. She chose saline-filled implants (smooth, round, Natrelle Style 68 MP, Allergan Inc., Irvine, Calif.) inflated to 330 mL. Resection weights: right, 52 g; left, 47 g. An abdominoplasty and liposuction of the abdomen and flanks were performed simultaneously. The plane of maximum postoperative breast projection (MPost) is determined visually on standardized photographs matched for size and orientation using the Canfield 7.4.1 Mirror Imaging software (Canfield Scientific, Fairfield, N.J.). This reference plane facilitates before-and-after comparisons of breast projection, lower pole level, and breast mound elevation.

ation in a vertical mammaplasty is not the resulting scar but the parenchymal dissection.[37,38]

A Wise pattern is often recommended for women with major ptosis,[1,28] such as after massive weight loss. However, the vertical parenchymal dissection may be combined with an inverted-T modification of the lower pole incision to maximize skin removal (often cited as an advantage for the Wise pattern) while preserving the advantages of a vertical parenchymal dissection. A short, safe medial pedicle is preferable to a long inferior pedicle, which jeopardizes nipple/areola perfusion. The scar resembles the scar from a Wise pattern mammaplasty in that there is an inframammary component. However, the parenchymal dissection is completely different, and the horizontal scar is much shorter. It is possible to gather skin (with short-term pleating) to keep the scar short and concealed within the inframammary fold. The term "vertical mammaplasty" is preferred over "vertical scar mammaplasty" because the scar after a vertical mammaplasty is not always just vertical.[20] Vertical mammaplasties are not really "short scar" techniques (the anchor scar might be considered a "long scar") and should not be considered in the same category as periareolar resections. Mammaplasties are better categorized as vertical and nonvertical.

All Seasons Augmentation Mastopexy

Although the idea of an "all seasons" mammaplasty has been dismissed in the past,[2] a growing number of plastic surgeons use the vertical technique exclusively,[20,39–44] including the author, who abandoned the Wise pattern in 2002. Its versatility is demonstrated in 3 patients (Figs. 2–5). Figures 4 and 5 depict the patient featured in Supplemental Digital Content 1–6, and in Supplemental Digital Content 7 (**See video, Supplemental Digital Content 7**, which displays the entire procedure in one clip. This video is available in the "related videos" section of the full-text article on PRSGlobalOpen.com or available at ***http://links.lww.com/PRSGO/A323***). Any patient who is a candidate for breast augmentation and vertical mastopexy performed individually is a candidate for the combined procedure.[20]

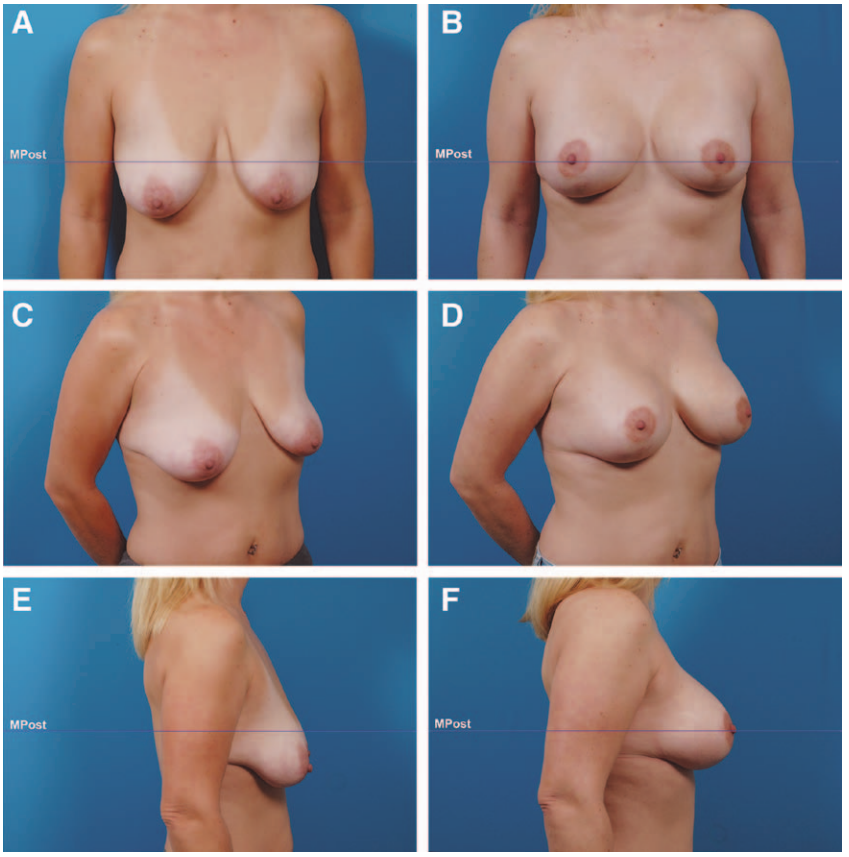


Fig. 3. This 41-year-old woman had asymmetrical breasts. She is seen before (A, C, and E) and 1.5 years after (B, D, and F) a vertical augmentation mastopexy. She chose saline-filled implants (smooth, round, Moderate Plus Profile, Mentor Corp., Santa Barbara, Calif.), which were inflated to 280 mL on the right side and 300 mL on the left side. Resection weights: right, 81 g; left, 58 g. MPost, plane of maximum postoperative breast projection.

Complications

Surgeons differ in how they define a complication.[20] Some investigators do not consider cosmetic issues such as asymmetry, persistent ptosis, or scar deformities as complications.[45] Others do not recognize implant size change as a complication.[7] The vertical repair does not appear as neat as a Wise pattern on the operating table, with pleats along the incision line.[28] A higher revision rate has been reported.[36] However, an implant takes up volume and minimizes skin gathering, reducing the need for an inverted-T component.[20] The revision rate in the present study (15.5%) is slightly lower than the rate reported for predominantly Wise pattern augmentation mastopexies (19.3%)[6] despite a larger mean implant volume (372 vs 247 mL). The hematoma rate (0.4%) compares favorably with breast augmentation alone (2.7%),[18] possibly because of improved exposure. The capsular contracture rate (4.8%) is very similar to another large study of augmentation mastopexy.[7]

No double bubbles were encountered. Secure approximation of the medial and lateral pillars helps prevent inferior implant displacement. For implant insertion, the author prefers a horizontal incision within the lower pole, above the existing inframammary fold, with a submuscular dissection cephalad to the inframammary ligaments.[46]

Technical points include (1) a willingness to "T" off the lower end of the mammaplasty when needed; (2) adequate resection of excessive lower pole parenchyma; (3) tightening of the lower pole and coning of the breast; and (4) intraoperative nipple positioning just below the apex of the breast to prevent nipple overelevation. With these adjustments, the need for revisions for persistent ptosis has dropped in half from 10.3% to 5% for the most recent 100 cases. Adequate parenchymal resection of the lower pole avoids a "mastopexy wrecking bulge"[47] or a snoopy deformity. Direct excision is used rather than liposuction so as to adequately remove denser breast tissue along with fat from the lower pole and to limit tissue trauma. A 39-mm areola marking ring is preferred because the areola tends to stretch about 1 cm postoperatively.[48] Women prefer areola diameters that do not exceed 5 cm.[49] There was no correlation between complications and secondary mastopexies, including delayed wound healing. Women who have had previous Wise pattern mammaplasties may be safely treated using the vertical technique,[20,50] provided that a wide areola attachment is preserved.

Breast Implants

Subpectoral implant placement adds a layer of tissue cover and is preferred by most operators.[6–8,10,12–16,20] However,

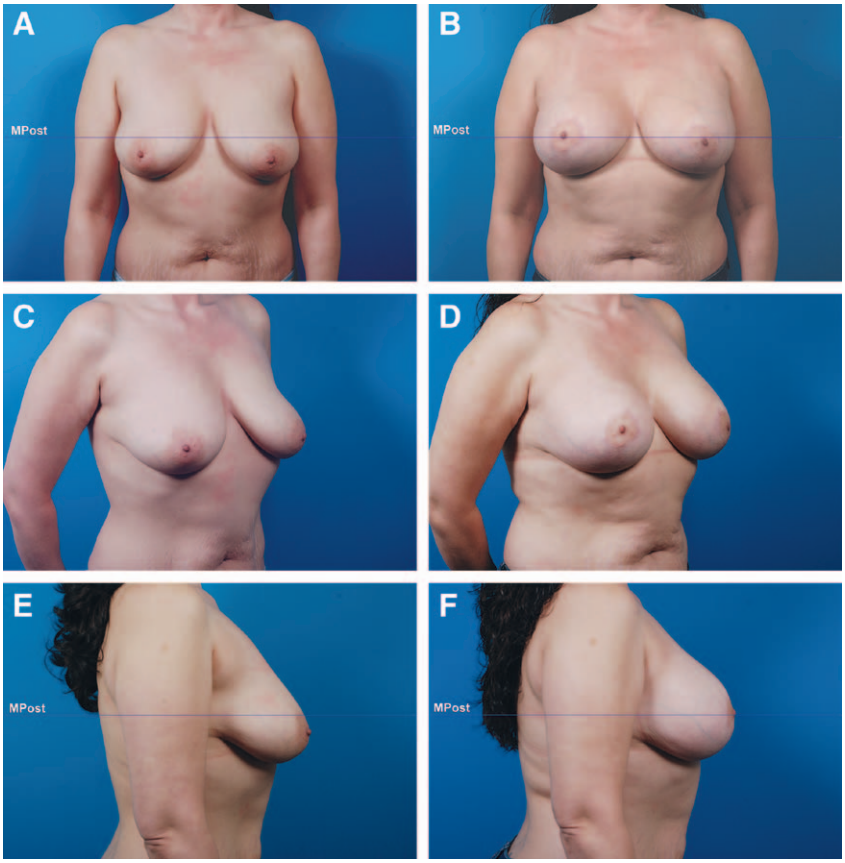


Fig. 4. This 35-year-old woman requested a full D-cup size. This is the same patient depicted in the videos (Supplemental Digital Contents 1–7, ***http://links.lww.com/PRSGO/A317***, ***http://links.lww.com/PRSGO/A318***, ***http://links.lww.com/PRSGO/A319***, ***http://links.lww.com/PRSGO/A320***, ***http://links.lww.com/PRSGO/A321***, and ***http://links.lww.com/PRSGO/A322***). She is seen before (A, C, and E) and 9 months after (B, D, and F) a vertical augmentation mastopexy. She chose saline-filled implants (smooth, round, Allergan Natrelle Style 68 MP), which were inflated to 360 mL on the right side and 375 mL on the left side. Resection weights: right breast, 116 g; left breast, 128 g. MPost, plane of maximum postoperative breast projection.

prepectoral placement is a valid alternative, particularly in women with adequate breast tissue, and avoids an animation deformity. There is a general preference for silicone gel implants[29] although some surgeons more commonly insert saline implants.[6,20] Silicone gel implants have traditionally been favored for a more natural feel characteristic and possibly less rippling.[35] However, in a woman who has a moderate breast volume, this difference may be negligible, particular in a subpectoral pocket. The author does not use more cohesive, form-stable implants because they have not been shown to produce a superior outcome[51,52] and have disadvantages that include firmness, rotation, expense, and texturing—which is linked to late seromas, double capsules, and anaplastic large cell lymphoma.[53,54] Mean implant volumes in other studies vary from 306 to 450 mL.[6–8,15,16,55] In this study, the average implant volume was 372 mL, 20 mL less than the average for breast augmentations without mastopexy,[18] and similar to the mean volume in the study by Calobrace et al[7] (392 mL). Measurements of nipple/areola perfusion[25] reveal that implant sizes up to 575 mL may be safely inserted using a vertical method and medial pedicle. It has been suggested that, logically, larger implants should have a higher complication rate.[8] However, neither this study nor the study by Calobrace et al[7] substantiates this claim. Larger implants correlate with greater patient satisfaction.[18,49]

Nipple Sensation

Eighty percent of women undergoing reduction mammaplasty report that nipple sensation is important sexually.[56] Regardless, sensate body parts are always to be preferred. An inverted-T pedicle sacrifices all superficial innervation to the nipple. The deep innervation is precarious and depends on the extent of the deep dissection. Courtiss and Goldwyn[57] reported that 35% of women experience persistent nipple numbness 2 years after an inverted-T, inferior pedicle breast reduction–much higher than the 13.3% rate of persistent nipple numbness in the present study. Although many surgeons favor a superior or superomedial pedicle, Schlenz et al[58] found that a superior pedicle compromises nipple sensation by sacrificing the deep in-

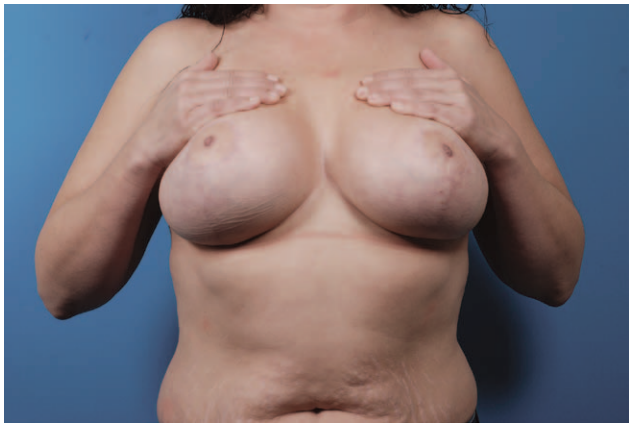
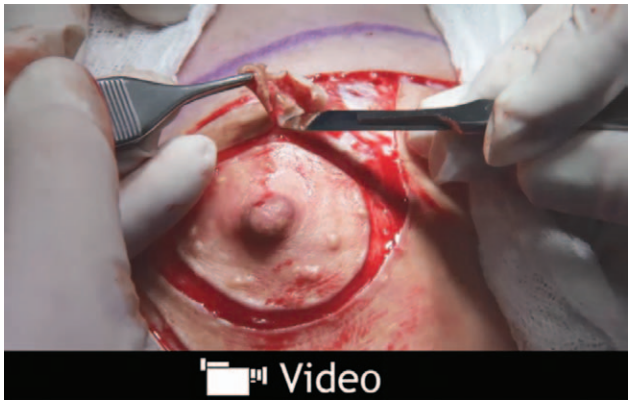


Fig. 5. Close-up view of the breast scars 9 months after surgery in the 35-year-old patient depicted in Figure 4. The vertical scar does not extend below the inframammary fold.



Video Graphic 7. See video, Supplemental Digital Content 7, the full-length video, which demonstrates preoperative marking, anesthesia, surgery, and postoperative photographs with measurements for a 35-year-old woman undergoing vertical augmentation mastopexy. This video is available in the "related videos" section of the full-text article on PRSGlobalOpen.com or available at ***http://links.lww.com/PRSGO/A323***.

nervation. The author prefers to maintain a parenchymal attachment deep to the nipple/areola complex in an effort to preserve deep innervation and a medial pedicle to capture the dominant medially based superficial innervation.[21]

Study Limitations

The mean follow-up time was 9.4 months. Therefore, long-term complications such as implant deflation or capsular contracture are likely to be underrepresented. A specific operation is evaluated—vertical augmentation mastopexy with a medially based pedicle. Certainly, there are many variations in technique from the method described here that may achieve an optimal outcome.

Study Strengths

No patient was selected for staged treatment, avoiding selection bias. A large patient population and consecutive patients add to the reliability of the study findings. The consistency of the same surgeon and technique avoids confounding variables. Outcome data provide valuable information from the patient's perspective.

CONCLUSIONS

A simple algorithm may be used to select the treatment of women with breast ptosis and volume deficiency. The combined procedure is safe and widely applicable. Staging is unnecessary. Patient-reported outcome data are favorable, with 94.4% of patients reporting that they would repeat the surgery (**See video, Supplemental Digital Content 7**, which displays the entire procedure in one clip. This video is available in the "related videos" section of the full-text article on PRSGlobalOpen.com or available at ***http://links.lww.com/PRSGO/A323***).

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REFERENCES

1. Rohrich RJ, Thornton JF, Jakubietz RG, et al. The limited scar mastopexy: current concepts and approaches to correct breast ptosis. *Plast Reconstr Surg.* 2004;114:1622–1630.
2. Georgiade NG, Serafin D, Riefkohl R, et al. Is there a reduction mammaplasty for "all seasons?". *Plast Reconstr Surg.* 1979;63:765–773.
3. Hall-Findlay EJ. A simplified vertical reduction mammaplasty: shortening the learning curve. *Plast Reconstr Surg.* 1999;104:748–759; discussion 760.
4. Spear SL. Augmentation/mastopexy: "Surgeon, beware." *Plast Reconstr Surg.* 2003:112:905–906.
5. Spear SL, Dayan JH, Clemens MW. Augmentation mastopexy. *Clin Plast Surg.* 2009;36:105–115, vii; discussion 117.
6. Beale EW, Ramanadham S, Harrison B, et al. Achieving predictability in augmentation mastopexy. *Plast Reconstr Surg.* 2014;133:284e–292e.
7. Calobrace MB, Herdt DR, Cothron KJ. Simultaneous augmentation/mastopexy: a retrospective 5-year review of 332 consecutive cases. *Plast Reconstr Surg.* 2013;131:145–156.
8. Lee MR, Unger JG, Adams WP Jr. The tissue-based triad: a process approach to augmentation mastopexy. *Plast Reconstr Surg.* 2014;134:215–225.
9. Don Parsa F, Brickman M, Parsa AA. Augmentation/mastopexy. *Plast Reconstr Surg.* 2005;115:1428–1429.
10. Persoff MM. Vertical mastopexy with expansion augmentation. *Aesthetic Plast Surg.* 2003;27:13–19.
11. Spring MA, Hartmann EC, Stevens WG. Strategies and challenges in simultaneous augmentation mastopexy. *Clin Plast Surg.* 2015;42:505–518.
12. Spear SL, Boehmler JH, Clemens MW. Augmentation/mastopexy: a 3-year review of a single surgeon's practice. *Plast Reconstr Surg.* 2006;118(Suppl):136S–147S.
13. Cárdenas-Camarena L, Ramírez-Macías R; International Confederation for Plastic Reconstructive and Aesthetic Surgery; International Society of Aesthetic Plastic Surgery; Iberolatinoamerican Plastic Surgery Federation; Mexican Association of Plastic Esthetic and Reconstructive Surgery; Western Mexican Association of Plastic, Esthetic and Reconstructive Surgery; Jalisco College of Plastic Surgeons. Augmentation/mastopexy: how to select and perform the proper technique. *Aesthetic Plast Surg.* 2006;30:21–33.

14. Stevens WG, Stoker DA, Freeman ME, et al. Is one-stage breast augmentation with mastopexy safe and effective? A review of 186 primary cases. *Aesthet Surg J.* 2006;26:674–681.
15. Stevens WG, Freeman ME, Stoker DA, et al. One-stage mastopexy with breast augmentation: a review of 321 patients. *Plast Reconstr Surg.* 2007;120:1674–1679.
16. Stevens WG, Macias LH, Spring M, et al. One-stage augmentation mastopexy: a review of 1192 simultaneous breast augmentation and mastopexy procedures in 615 consecutive patients. *Aesthet Surg J.* 2014;34:723–732.
17. Ching S, Thoma A, McCabe RE, et al. Measuring outcomes in aesthetic surgery: a comprehensive review of the literature. *Plast Reconstr Surg.* 2003;111:469–480; discussion 481.
18. Swanson E. Prospective outcome study of 225 cases of breast augmentation. *Plast Reconstr Surg.* 2013;131:1158–1166; discussion 1167–1168.
19. Swanson E. Breast reduction versus breast reduction plus implants: a comparative study with measurements and outcomes. *Plast Reconstr Surg Glob Open* 2014;2:e281.
20. Swanson E. Prospective comparative clinical evaluation of 784 consecutive cases of breast augmentation and vertical mammaplasty, performed individually and in combination. *Plast Reconstr Surg.* 2013;132:30e–45e; discussion 46e–47e.
21. Schlenz I, Kuzbari R, Gruber H, et al. The sensitivity of the nipple-areola complex: an anatomic study. *Plast Reconstr Surg.* 2000;105:905–909.
22. Swanson E. Doppler ultrasound imaging for detection of deep vein thrombosis in plastic surgery outpatients: a prospective controlled study. *Aesthet Surg J.* 2015;35:204–214.
23. Swanson E. Photometric evaluation of inframammary crease level after cosmetic breast surgery. *Aesthet Surg J.* 2010;30:832–837.
24. Swanson E. Comparison of vertical and inverted-T mammaplasties using photographic measurements. *Plast Reconstr Surg Glob Open* 2013;1:e89.
25. Swanson E. Safety of vertical augmentation-mastopexy: prospective evaluation of breast perfusion using laser fluorescence imaging. *Aesthet Surg J.* 2015;35:938–949.
26. Swanson E. A retrospective photometric study of 82 published reports of mastopexy and breast reduction. *Plast Reconstr Surg.* 2011;128:1282–1301.
27. Sackett DL, Straus SE, Richardson WS, et al. Therapy. In: *Evidence-based Medicine.* 2nd ed. Toronto: Churchill Livingstone; 2000:105–154.
28. Wong C, Vucovich M, Rohrich R. Mastopexy and reduction mammoplasty pedicles and skin resection patterns. *Plast Reconstr Surg Glob Open.* 2014;2:e202.
29. Khavanin N, Jordan SW, Rambachan A, et al. A systematic review of single-stage augmentation-mastopexy. *Plast Reconstr Surg.* 2014;134:922–931.
30. Tebbetts JB. A process for quantifying aesthetic and functional breast surgery: II. Applying quantified dimensions of the skin envelope to design and preoperative planning for mastopexy and breast reduction. *Plast Reconstr Surg.* 2014;133:527–542.
31. Parsa AA, Jackowe DJ, Parsa FD. A new algorithm for breast mastopexy/augmentation. *Plast Reconstr Surg.* 2010;125:75e–77e.
32. Tessone A, Millet E, Weissman O, et al. Evading a surgical pitfall: mastopexy–augmentation made simple. *Aesthetic Plast Surg.* 2011;35:1073–1078.
33. Rohrich RJ, Gosman AA, Brown SA, et al. Mastopexy preferences: a survey of board-certified plastic surgeons. *Plast Reconstr Surg.* 2006;118:1631–1638.
34. Benelli L. A new periareolar mammaplasty: the "round block" technique. *Aesthetic Plast Surg.* 1990;14:93–100.
35. Spring MA, Macias LH, Nadeau M, et al. Secondary augmentation-mastopexy: indications, preferred practices, and the treatment of complications. *Aesthet Surg J.* 2014;34:1018–1040.
36. Cruz-Korchin N, Korchin L. Vertical versus Wise pattern breast reduction: patient satisfaction, revision rates, and complications. *Plast Reconstr Surg.* 2003;112:1573–1578; discussion 1579.
37. Hall-Findlay EJ. The three breast dimensions: analysis and effecting change. *Plast Reconstr Surg.* 2010;125:1632–1642.
38. Nahai F. Current preferences for breast reduction techniques: a survey of board-certified plastic surgeons 2002 (Discussion). *Plast Reconstr Surg.* 2004;114:1734–1736.
39. Chen CM, White C, Warren SM, et al. Simplifying the vertical reduction mammaplasty. *Plast Reconstr Surg.* 2004;113:162–172; discussion 173.
40. Serra MP, Longhi P, Sinha M. Breast reduction with a superomedial pedicle and a vertical scar (Hall-Findlay's technique): experience with 210 consecutive patients. *Ann Plast Surg.* 2010;64:275–278.
41. Neaman KC, Armstrong SD, Mendonca SJ, et al. Vertical reduction mammaplasty utilizing the superomedial pedicle: is it really for everyone? *Aesthet Surg J.* 2012;32:718–725.
42. Lista F, Ahmad J. Vertical scar reduction mammaplasty: a 15-year experience including a review of 250 consecutive cases. *Plast Reconstr Surg.* 2006;117:2152–2165; discussion 2166.
43. Hofmann AK, Wuestner-Hofmann MC, Bassetto F, et al. Breast reduction: modified "Lejour technique" in 500 large breasts. *Plast Reconstr Surg.* 2007;120:1095–1104; discussion 1105.
44. Amini P, Stasch T, Theodorou P, et al. Vertical reduction mammaplasty combined with a superomedial pedicle in gigantomastia. *Ann Plast Surg.* 2010;64:279–285.
45. Thoma A, Ignacy TA, Duku EK, et al. Randomized controlled trial comparing health-related quality of life in patients undergoing vertical scar versus inverted T-shaped reduction mammaplasty. *Plast Reconstr Surg.* 2013;132:48e–60e.
46. Swanson E. Can we really control the inframammary fold (IMF) in breast augmentation? *Aesthet Surg J.* 2016;36:NP313–NP314.
47. Flowers RS, Smith EM Jr. "Flip-flap" mastopexy. *Aesthetic Plast Surg.* 1998;22:425–429.
48. Swanson E. Prospective photographic measurement study of 196 cases of breast augmentation, mastopexy, augmentation/mastopexy, and breast reduction. *Plast Reconstr Surg.* 2013;131:802e–819e.
49. Swanson E. Prospective outcome study of 106 cases of vertical mastopexy, augmentation/mastopexy, and breast reduction. *J Plast Reconstr Aesthet Surg.* 2013;66:937–949.
50. Lista F, Austin RE, Singh Y, et al. Vertical scar reduction mammaplasty. *Plast Reconstr Surg.* 2015;136:23–25.
51. Hidalgo DA, Spector JA. Breast augmentation. *Plast Reconstr Surg.* 2014;133:567e–583e.
52. Hidalgo DA, Sinno S. Current trends and controversies in breast augmentation. *Plast Reconstr Surg.* 2016;137:1142–1150.
53. Hall-Findlay EJ. Breast implant complication review: double capsules and late seromas. *Plast Reconstr Surg.* 2011;127:56–66.
54. Brody GS, Deapen D, Taylor CR, et al. Anaplastic large cell lymphoma occurring in women with breast implants: analysis of 173 cases. *Plast Reconstr Surg.* 2015;135:695–705.
55. Scheer J, Patel A, Blount A, et al. One-stage augmentation and mastopexy: a review of outcomes in a large patient population. *Plast Reconstr Surg.* 2012;130(Suppl 5S-1):85–86.
56. Cerovac S, Ali FS, Blizard R, et al. Psychosexual function in women who have undergone reduction mammaplasty. *Plast Reconstr Surg.* 2005;116:1306–1313.
57. Courtiss EH, Goldwyn RM. Breast sensation before and after plastic surgery. *Plast Reconstr Surg.* 1976;58:1–13.
58. Schlenz I, Rigel S, Schemper M, et al. Alteration of nipple and areola sensitivity by reduction mammaplasty: a prospective comparison of five techniques. *Plast Reconstr Surg.* 2005;115:743–751; discussion 752.