Prepectoral Versus Subpectoral Breast Reconstruction in High–Body Mass Index Patients

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Background: The effect of body mass index (BMI) on complication rates in prepectoral implant-based breast reconstruction is not well established. The purpose of this study was to compare complication rates between different BMI groups in subpectoral and prepectoral reconstruction.

Methods: A single-surgeon, 4-year, retrospective review was performed of consecutive prosthetic breast reconstructions. During this time, the senior author's practice shifted from a subpectoral to prepectoral technique. Patients were stratified into BMI subgroups (<25, 25–35, and >35 kg/m^2) and complication rates were analyzed. A survey was administered to blinded medical personnel and patients comparing esthetic results.

Results: Implant-based reconstructions were performed in 195 patients (103 subpectoral and 92 prepectoral). No significant difference in major complication rate was observed between techniques. Among patients with BMI greater than 35 kg/m^2, implant exposure occurred at a significantly higher rate in the prepectoral group ($P = 0.04$). In patients with BMI greater than 25 kg/m^2, minor asymmetry was more prevalent with prepectoral reconstruction (12.3% vs 0%; $P = 0.02$). Regardless of technique, the odds of reoperation increased by 7% per point increase in BMI, although this did not reach statistical significance ($P = 0.07$; odds ratio, 1.07; 95% confidence interval, 0.99–1.15).

A total of 66 survey responses were received. Physicians rated esthetic results more positively than patients did. Patients with a BMI of less than 25 kg/m^2 were rated better than other BMI groups in nearly all categories. The position of submuscular reconstruction was rated significantly better than prepectoral.

Conclusions: There is a trend toward higher complication rates in prepectoral versus subpectoral breast reconstruction with increasing BMI. Nonetheless, the technique appears to be safe, with comparable clinical and cosmetic results.

Key Words: breast reconstruction, obesity, breast reconstruction in obese patients, prepectoral versus subpectoral, prepectoral breast reconstruction and obesity, outcomes of prepectoral reconstruction, prepectoral and esthetic outcomes, subcutaneous pocket, subcutaneous breast reconstruction, breast reconstruction with acellular dermal matrix, breast reconstruction with ADM

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In recent years, prepectoral breast reconstruction with an acellular dermal matrix (ADM) wrap has emerged as a major technique in prosthetic-based breast reconstruction. This treatment modality has many cited advantages over subpectoral placement, including faster time to final tissue expander fill volume, less postoperative pain, shorter operative times, and absence of animation deformity.[1,2] Moreover, several early outcome assessments support its safety in a variety of settings, including perioperative radiation.[3,4] To date, there are no studies illustrating its long-term performance or outcomes. Intuitively, soft-tissue support provided in this technique may be less robust than highly vascularized muscle; hence, the use of this technique has been discouraged in certain patient groups (ie, those with thin mastectomy flaps, history of smoking, postradiation skin damage, obesity, and/or significant ptosis).[2,5] Criteria for proper patient selection are still being developed and are likely a key determinant of reconstructive outcome.

Not surprisingly, the literature supports increased complication rates in high–body mass index (BMI) patients, irrespective of reconstructive technique.[6] Many patients presenting for reconstruction fall into this category, as a result of the known pathogenic link between obesity and breast cancer.[7] The reconstructive surgeon should therefore approach treatment modalities with a knowledge of the relative impact that increasing BMI will have on both clinical and esthetic outcomes.

The current recommendations for prepectoral breast reconstruction in high-BMI patients are discordant. Previously, obesity has been cited as a contraindication to prepectoral breast reconstruction.[8] This is contradictory to other series, which cite advantages to prepectoral breast reconstruction in patients with high BMI.[2,5,9]

In comparison of prepectoral and subpectoral implant placement in high-BMI patients, the senior author has anecdotally noted similar esthetic results and complication rates. In this study, we seek to quantitatively assess and compare complication rates and esthetic outcomes among different BMI groups after subpectoral and prepectoral reconstruction. A secondary aim is to present our experience in transitioning from a subpectoral to prepectoral technique.

METHODS

An institutional review board–approved, retrospective review of the electronic medical record was performed for all patients who underwent implant-based breast reconstruction by the senior author between 2014 and 2018. Patient demographics (including age, comorbidities, history of chemotherapies or radiotherapies, and preoperative BMI), length of follow-up, and complications were recorded. Complications were categorized as major, which required an unplanned return to the operating room, or minor, which were managed in the outpatient setting. Complications included hematoma, seroma, asymmetry (determined subjectively by the operative surgeon in follow up), implant exposure, flap necrosis, and delayed wound healing. Patients were stratified by BMI into 3 ranges: low (<25 kg/m^2), intermediate (25–35 kg/m^2), and high BMI (>35 kg/m^2).

All mastectomies were performed by surgical oncology. Breast reconstructions were performed in delayed or immediate fashion based on individual patient circumstances (ie, need for perioperative radiation, patient preference, initial concern for flap viability after mastectomy). The primary surgeon gauged mastectomy flap viability clinically in the operating room before reconstruction. A permanent implant was placed at the time of mastectomy ("direct-to-implant") or after tissue expansion, depending on preoperative and desired postoperative breast size. Implants were chosen by the senior author based on preoperative breast measurements. Both Allergan (Irvine, CA) and Mentor (Santa Barbara, CA) tissue expanders and permanent implants were used.

If the subpectoral technique was used, a pocket was developed using electrocautery in the loose areolar tissue plane between the pectoralis major and minor. An 8 × 16 cm sheet of ADM was used to

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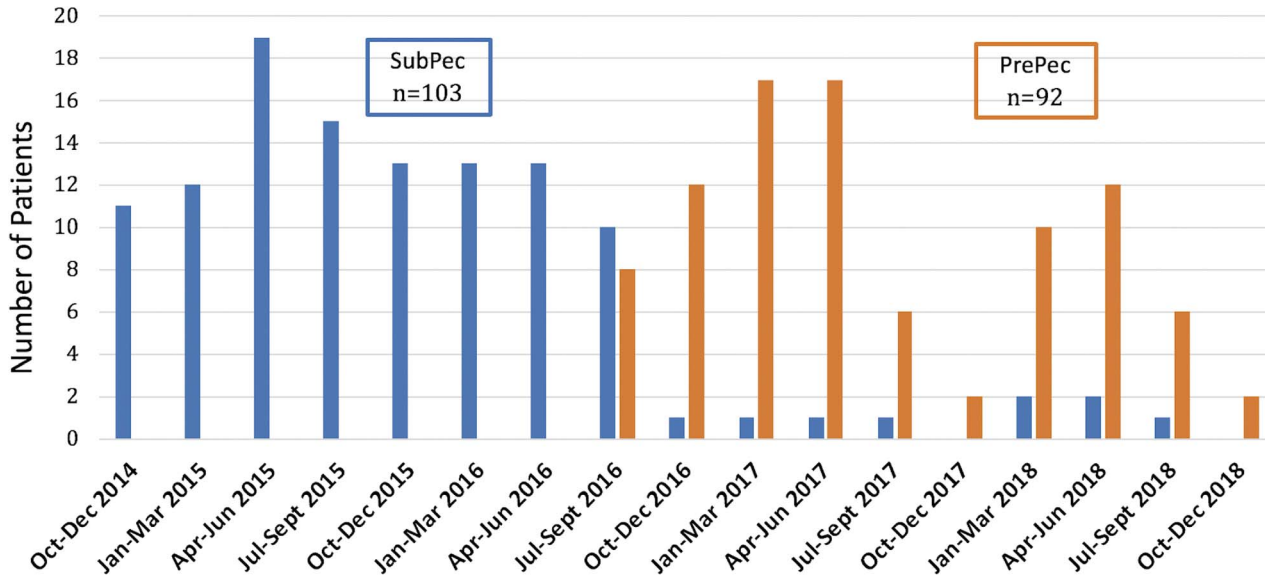

FIGURE 1. Senior author's technical transition. Depicted here is the practice pattern of the senior author during the study period, with the transition to prepectoral reconstruction occurring between July and September 2016. full color online

create an inferolateral sling by suturing the ADM to the chest wall at the inframammary fold and lateral breast curve. The prosthetic was inserted into the subpectoral pocket, now reinforced by the ADM sling beyond the inferior and lateral borders of the pectoralis major muscle. Additional sutures were placed as necessary to secure the implant in its final position on the reconstructed breast mound. Drains were positioned bilaterally, and the skin was closed in a layered fashion. Tissue expanders, if used, were filled to approximately 25% to 30% of the total volume, based clinically on the amount of skin tension.

In prepectoral patients, a large piece of ADM was used to wrap the entire surface of the prosthesis on the back table. The ADM was sewn to itself using 3-0 vicryl sutures on the posterior surface of the prosthesis. This was inserted into the breast pocket just superficial to the pectoralis major muscle. After ensuring proper positioning for the reconstructed breast, suture tabs and ADM wrap were used to suture the construct to the chest wall. All patients had subcutaneous drains placed bilaterally. Layered closure was performed, and if an expander was placed, it was filled to approximately 50% to 55% of the total volume, depending on the amount clinical skin tension.

Subsequent expansion performed with either technique began 2 weeks postoperatively and proceeded based on individual patient pain tolerance and skin tension. Tissue expanders were exchanged with permanent implants approximately 2 months after final expansion, if clinical course permitted.

An institutional review board–approved, anonymous survey of physicians, nurses, medical personnel, and breast reconstruction patients was administered using a REDCap database. Survey participants were blinded to reconstructive technique and asked to rate the volume, shape, position, symmetry, and overall esthetic outcome in each of 15 sets of standardized postoperative patient photos. A combination of both prepectoral and subpectoral patient photos was randomly selected for inclusion in the survey, to compare esthetic results between techniques. Patients depicted in the survey represented a wide range of BMIs. A 5-point Likert scale was used to rank each parameter (1 being "poor" and 5 being "excellent").

Statistical software (Microsoft Excel and GraphPad Prism) was used to perform all statistical analysis. Comparison between groups was performed using χ^2 tests for proportions and t tests or analysis of variance for continuous variables. Regression analysis was performed to identify independent outcome predictors. Statistical significance was defined as P value less than 0.05.

RESULTS

A total of 195 patients underwent breast reconstruction by the senior author between 2014 and 2018. Ninety-two (47.2%) and 103 (52.8%) patients underwent prepectoral and subpectoral reconstruction, respectively. The senior author's transition from subpectoral to prepectoral placement occurred between July and September 2016 (Fig. 1). Body mass index was significantly higher among prepectoral patients; otherwise, the 2 groups were not dissimilar (Table 1). Distribution of BMI is depicted in Figure 2. Mean follow-up in subpectoral patients was significantly longer (16.1 vs 10.9 months; $P < 0.0001$). Bilateral reconstruction was performed in most cases. In the subpectoral group, 5 patients underwent direct-to-implant reconstruction at the time of mastectomy. Seven patients underwent direct-to-implant reconstruction in the prepectoral group.

Patients in each operative group were stratified into low (<25 kg/m^2), intermediate (25–35 kg/m^2), and high (>35 kg/m^2) BMI ranges. Patient demographics as well as complication type and frequency for each subgroup are noted in Table 2. There was a higher incidence of diabetes in

TABLE 1. Demographics of Study Patients

	Subpectoral	Prepectoral	*P*
Number of patients	103 (53)	92 (47)	
Age, y	55.5 ± 1.1	53.0 ± 1.3	0.1231
BMI, kg/m^2	27.8 ± 0.6	30.2 ± 0.6	0.0088*
Bilateral reconstruction	99 (96)	82 (89)	0.0930
Chemotherapy	36 (35)	41 (45)	0.1875
Radiation therapy	34 (33)	30 (33)	>0.9999
Smoking	16 (16)	11 (12)	0.5366
Length of follow-up (months)	16.1 ± 1.1	10.9 ± 0.7	<0.0001*

Data are mean ± SEM or n (%).

*Statistically significant in the univariate analysis ($P < 0.05$).

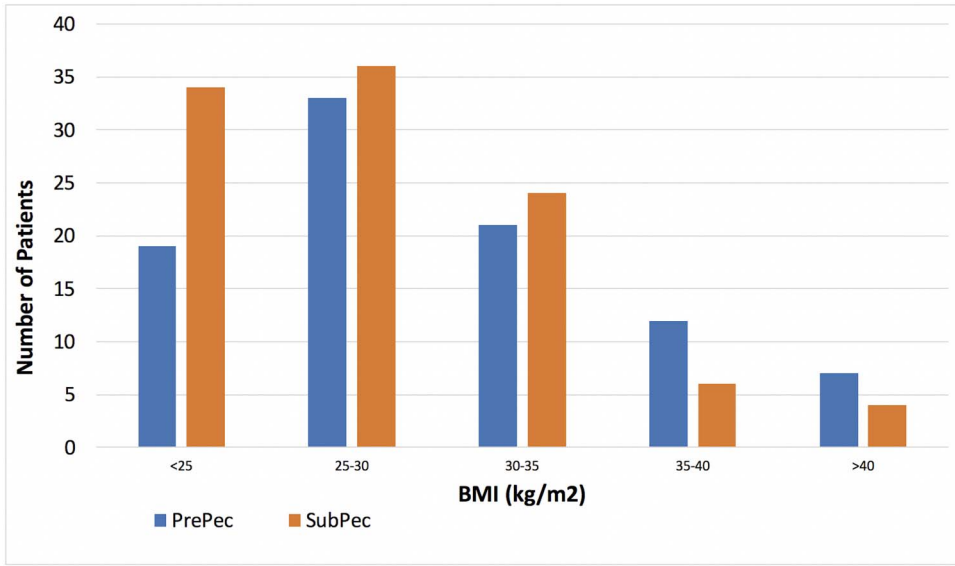

FIGURE 2. BMI distribution. Depicted here is the distribution of body mass index of patients in our series. PrePec indicates prepectoral breast reconstructions; SubPec, subpectoral breast reconstructions. full color online

prepectoral patients compared with subpectoral patients in the group with BMI greater than 35 kg/m^2 ($P = 0.017$). Considering BMI as a continuous variable, increasing BMI was associated with major complication, conferring a 7% increase in reoperation rate with every 1-point increase in BMI. Notably, this association approached but did not reach statistical significance (odds ratio, 1.07; 95% confidence interval, 0.99–1.15; $P = 0.07$).

Neither major nor minor complication rates differed significantly between the 2 techniques overall (Table 2). In patients with BMI greater than 35 kg/m^2, there were 2 implant exposures in the

TABLE 2. Risk Factors and Complication Rates for Different Body Mass Index Groups by Reconstruction Technique

	Pre-Pec, BMI <25 kg/m^2 (n = 19)	Sub-Pec, BMI <25 kg/m^2 (n = 34)	Pre-Pec, BMI 25–35 kg/m^2 (n = 54)	Sub-Pec, BMI 25–35 kg/m^2 (n = 60)	Pre-Pec, BMI >35 kg/m^2 (n = 19)	Sub-Pec, BMI >35 kg/m^2 (n = 9)	*P*
Risk factors							
Perioperative chemo	5 (26%)	10 (29%)	24 (44%)	22 (37%)	12 (63%)	4 (44%)	0.16
Perioperative radiation	4 (21%)	10 (29%)	16 (30%)	22 (37%)	10 (53%)	2 (22%)	0.36
Smoker	2 (11%)	5 (15%)	5 (9%)	9 (15%)	4 (21%)	2 (22%)	0.68
Diabetes	0	1 (3%)	8 (15%)	10 (17%)	6 (32%)	2 (22%)	0.017*
Age, mean ± SEM, y	52.7 ± 13.2	56.3 ± 9.3	53.8 ± 12.7	55.4 ± 12.0	51.1 ± 8.7	53.6 ± 9.0	0.47
Complications							
Any major†	0	2 (6%)	6 (11%)	2 (3%)	4 (21%)	1 (11%)	0.09
Seroma—major	0	0	0	0	0	0	N/A
infection— major	0	1 (3%)	3 (6%)	2 (3%)	2 (11%)	1 (11%)	0.47
Hematoma—major	0	0	2 (4%)	0	0	0	0.53
Flap necrosis—major	0	0	0	0	0	0	N/A
Asymmetry—major	0	0	1 (2%)	0	0	0	0.69
Implant exposure—major	0	1 (3%)	0	0	2 (11%)	0	0.041*
Any minor	1 (5%)	10 (29%)	16 (30%)	11 (18%)	6 (32%)	2 (22%)	0.19
Seroma—minor	1 (5%)	5 (15%)	4 (7%)	4 (7%)	1 (5%)	0	0.78
Infection—minor	1 (5%)	3 (9%)	10 (19%)	8 (13%)	4 (21%)	2 (22%)	0.51
Hematoma—minor	0	0	0	1 (1%)	0	0	>0.99
Flap necrosis—minor	0	1 (3%)	0	0	0	1 (1%)	0.42
Asymmetry—minor	0	3 (9%)	7 (13%)	0	2 (11%)	0	0.024*

*Statistically significant in the regression analysis ($P < 0.05$).

†Major complications were defined as those requiring reoperation.

Abbreviations: BMI, Body Mass Index, units kg/m^2; Pre-Pec, Pre-pectoral breast reconstruction; Sub-Pec, Sub-pectoral breast reconstruction.

TABLE 3. Learning Curve in Transitioning a Practice From Subpectoral to Prepectoral Reconstruction

	All Pre-Pec (n = 92)	All Sub-Pec (n = 103)	*P*	Last 20 Sub-Pec	First 20 Pre-Pec	Last 20 Pre-Pec	*P*
Risk factors							
Perioperative chemo	41 (45%)	36 (35%)	0.19	10 (50%)	8 (40%)	8 (40%)	0.85
Perioperative radiation	30 (33%)	34 (33%)	>0.99	10 (50%)	7 (35%)	3 (15%)	0.075
Smoker	11 (12%)	16 (16%)	0.54	1 (5%)	5 (25%)	2 (10%)	0.25
Diabetes	14 (15%)	13 (13%)	0.68	3 (15%)	2 (10%)	3 (15%)	>0.99
Age, mean ± SEM, y	53.0 ± 12.0	55.5 ± 10.9	0.12	57.7 ± 9.0	47.7 ± 11.9	55.5 ± 12.0	0.021*
Follow-up, mo	10.9 ± 6.4	16.1 ± 11.3	<0.0001*	14.8 ± 8.8	15.5 ± 7.6	4.4 ± 2.3	<0.0001*
Complications							
Reoperations	10 (11%)	5 (5%)	0.18	1 (5%)	4 (20%)	2 (10%)	0.48
Seroma—major†	0	0	N/A	0	0	0	N/A
Infection—major	5 (5%)	4 (4%)	0.74	0	1 (5%)	2 (10%)	0.77
Hematoma—major	2 (2%)	0	0.22	0	2 (10%)	0	0.32
Flap necrosis—major	0	0	N/A	0	0	0	N/A
Asymmetry—major	1 (1%)	0	0.47	0	0	0	0.47
Implant exposure—major	2 (2%)	1 (1%)	0.6	1 (5%)	1 (5%)	0	>0.99
Any minor	23 (25%)	23 (22%)	0.74	7 (35%)	4 (20%)	4 (20%)	0.6
Seroma—minor	6 (7%)	9 (9%)	0.6	6 (30%)	2 (10%)	1 (5%)	0.12
Infection—minor	15 (16%)	13 (13%)	0.54	2 (10%)	3 (15%)	3 (15%)	>0.99
Hematoma—minor	0	1 (1%)	>0.99	0	0	0	N/A
Flap necrosis—minor	0	1 (1%)	>0.99	0	0	1 (1%)	>0.99
Asymmetry—minor	9 (10%)	3 (3%)	0.071	2 (10%)	2 (10%)	1 (5%)	>0.99

Last 20 Sub-Pec indicates the last 20 subpectoral breast reconstructions performed in this patient series before transition of the practice to prepectoral placement of breast tissue expander/breast implant with acellular dermal matrix wrap. First 20 Pre-Pec is the first 20 prepectoral breast reconstructions performed by the senior author. Last 20 Pre-Pec represents the last 20 prepectoral breast reconstructions performed by the senior author.

*Statistically significant in the regression analysis ($P < 0.05$).

†Major complications were defined as those requiring reoperation.

prepectoral group and 0 in the subpectoral group, which was statistically significant ($P = 0.041$). In addition, a higher incidence of minor asymmetry was observed in prepectoral patients in the intermediate BMI range ($P = 0.024$), but no difference was seen in seroma, hematoma, minor infection, or flap necrosis rates.

Prepectoral outcomes were analyzed temporally by comparing complication rates in the first and last 20 prepectoral reconstructions, in an attempt to reveal any difference in the primary surgeon's proficiency with the technique during the transition (Table 3). Complication rates were not statistically different between these 2 groups, although follow-up was significantly longer for the first 20 prepectoral patients (4.4 vs 15.5 months).

Sixty-six responses were collected from the esthetic outcomes survey, which polled 23 physicians, 10 nurses, 20 plastic surgery staff members, and 13 patients. The position of subpectoral implants was rated higher than that of prepectoral implants (3.10 vs 2.82; $P < 0.01$). The

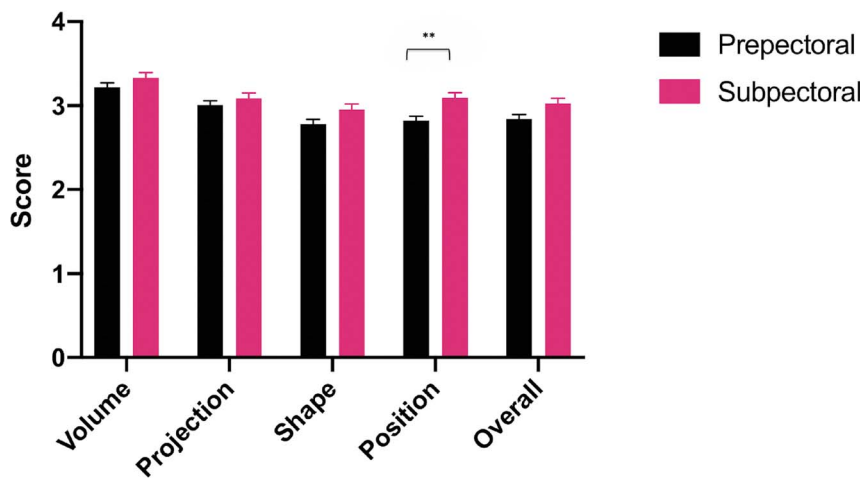

FIGURE 3. Esthetic outcome scores by technique. **Statistically significant difference, $P < 0.01$. full color online

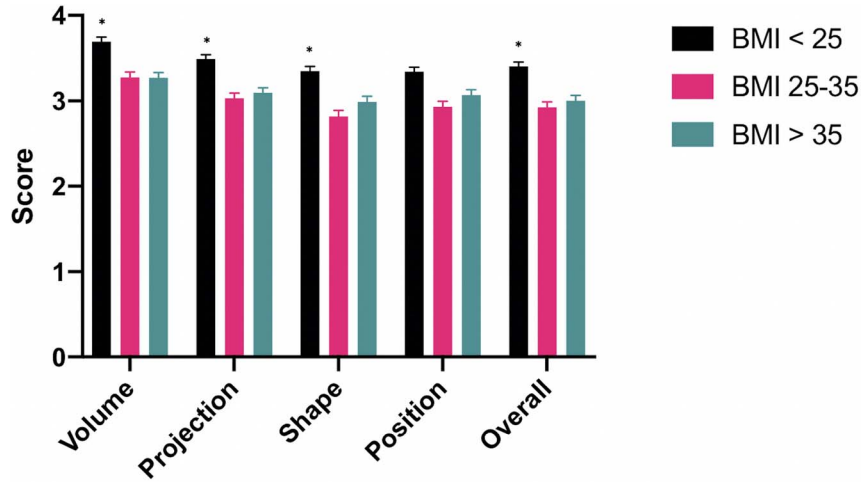

FIGURE 4. Esthetic scores by BMI. full color online

remaining parameters ranked by respondents (volume, shape, symmetry, and overall cosmesis) were not significantly different based on reconstructive technique (Fig. 3). Notably, low-BMI patients had significantly better ratings than the higher BMI groups in all categories except for position (Fig. 4). Physicians consistently rated the overall esthetic result higher than patients did, with a mean overall result score of 3.33 and 2.73, respectively ($P < 0.0001$). The greatest disparity between physician and patient scoring was in the volume and projection categories, with physicians rating outcomes significantly higher (Fig. 5). An example of standardized photos and questions included in the survey are included (Fig. 6, Table 4).

DISCUSSION

Coinciding with the resurgence of the prepectoral technique is an increase in both reconstructive need and obesity prevalence in the population as a whole.[10,11] With the rise in popularity of this technique and an increasing number of obese patients seeking breast reconstruction, the reconstructive surgeon should be aware of its utility and limitations. A study published recently by Banuelos et al[12] challenges the idea that obesity is a contraindication to prepectoral breast reconstruction, citing similar rates of complication and explantation in prepectoral and subpectoral reconstruction in an obese cohort. In the present study, we corroborate this finding and add to the body of evidence that esthetic outcomes are comparable to subpectoral reconstruction in this population. To our knowledge, this is the first single-surgeon study comparing complication rates and esthetic results between these techniques in obese patients.

Until recently, evidence supporting prepectoral reconstruction in high-BMI patients was scarce in the literature. Several early studies establishing the safety of this technique excluded patients with BMI greater than 30 kg/m^2.[13–16] The earliest recommendations stressed that the technique be used with caution in this population, and only in minimally comorbid patients.[2] Concomitant diabetes, perioperative radiation, and/or history of smoking in the obese patient have been considered relative contraindications in the obese patient seeking prepectoral reconstruction.[2,5] Obesity as an independent risk factor in breast surgery has been well quantified. Per unit increase in BMI, the odds of reconstructive failure have been shown to increase by 7.9% to 8.6%.[12,17] In our study cohort, we observed a similar increase in risk (7%), although this value did not reach statistical significance ($P = 0.07$). This known increase in operative risk should inform the surgeon; but as our data show, it is not clearly potentiated by implant position.

Across a broad range of BMIs, we demonstrate that major and minor complication rates are similar with the prepectoral technique to

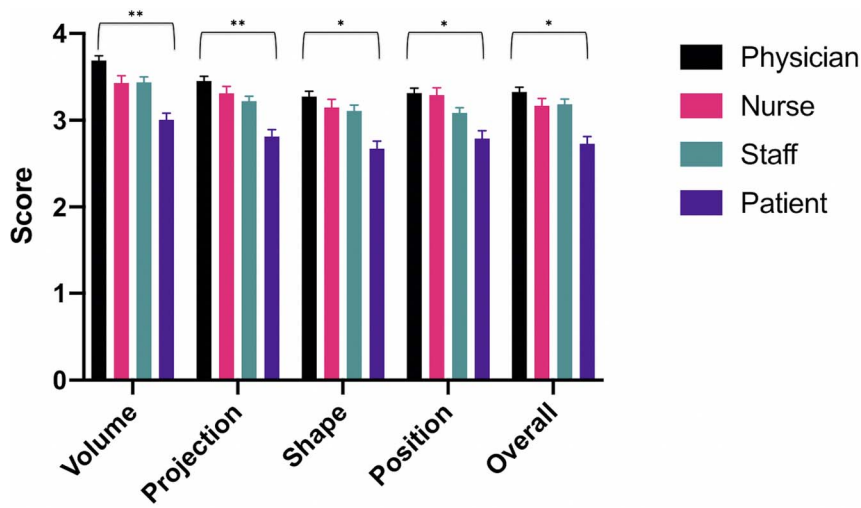

FIGURE 5. Esthetic scores by respondent. Statistically significant difference: *$P < 0.05$, **$P < 0.01$. full color online

FIGURE 6. Esthetic survey standardized patient photos. full color online

those seen with subpectoral placement, the current standard of care in prosthetic breast reconsruction.[8] This held true in our study despite the prepectoral cohort having a significantly higher mean BMI overall (30.2 vs 27.8, $P = 0.0088$) and increased incidence of chemotherapy (63% vs 44%), perioperative radiation (53% vs 22%), and diabetes (32% vs 22%) in the high-BMI range (Table 2). Smoking, diabetes, and radiation were not considered contraindications to prepectoral reconstruction, if mastectomy flaps were clinically well perfused at the time of reconstruction as determined by the primary surgeon. We report a low incidence of major infection (5%), implant exposure (2%), and seroma (7%) in cases of prepectoral reconstruction (Table 3), which is consistent with values reported in similar studies.[3,12] No prepectoral flap necrosis was observed in our series.

We did observe an increased incidence of implant exposure and minor asymmetry in the prepectoral group at the upper extreme of BMI, although the clinical significance of these findings is unclear. Our sample size in the BMI greater than 35 kg/m^2 range was relatively small, with a total of nine subpectoral patients reconstructed and a small number of asymmetry cases (n = 2) and implant exposure (n = 2) observed in the prepectoral group. We speculate that the increased rate of implant

TABLE 4. Esthetic Survey Questions*

Volume: how would the patient look if she were wearing a fitted bra and clothing?
- ○ Excellent: the reconstructed breast is the ideal size for this patient's body. It would most likely look natural and attractive if the patient were wearing a bra and clothing.
- ○ Very good
- ○ Good: the reconstructive breast is an appropriate size for this patient's body. Most observers would not know that the patient had breast reconstruction if she were wearing a bra and clothing.
- ○ Poor
- ○ Unacceptable: the reconstructed breast is clearly too large or too small for this patient's body, and it would look unnatural and unattractive even if the patient were wearing a bra and clothing.

Breast projection: how does the reconstructed breast look from the side?
- ○ Excellent: the breast shape is ideal and does not appear to droop. The nipple (if there is one) is at the center of the breast (pointing forward, "perky").
- ○ Very good
- ○ Good: the reconstructed breast has an obvious top, middle, and bottom, and the middle part projects the most. The bottom of the breast may sag a little, but it does not look unnatural.
- ○ Poor
- ○ Unacceptable: the reconstructed breast appears very "flat" and saggy.

Breast shape
- ○ Excellent: the reconstructed breast has a smooth transition from the chest wall to breast, with natural-appearing fullness. The implant is not visible at all.
- ○ Very good
- ○ Good: there is a mild step-off between the chest wall and the breast. The edges of the implant maybe visible to some observers.
- ○ Poor
- ○ Unacceptable: there is a significant, unnatural step-off between the chest wall and the breast. The edges of the implants are very obvious. The reconstructed breasts looks "stuck on."

Breast position: how does the reconstructed breast look from the front?
- ○ Excellent: the reconstructive breast is in the ideal position on the chest. The breasts are symmetric.
- ○ Very good
- ○ Good: the reconstructive breast maybe a little too high, too low, or too much to one side or the other. However, the position of the breast does not look unnatural. The breasts may be a little asymmetric.
- ○ Poor
- ○ Unacceptable: the reconstructed breast is in the wrong location on the chest, and it looks very unnatural. The breasts are very asymmetric.

Overall cosmetic result:
- ○ 1 Unacceptable
- ○ 2 Poor
- ○ 3 Good
- ○ 4 Very good
- ○ 5 Excellent

*Medical personnel and patients were blinded to reconstructive technique asked to view 15 sets of randomly selected standardized patient photos before answering the questions above.

exposure in the prepectoral group with BMI greater than 35 kg/m^2 (11% vs 0%; Table 2) may in part be attributed to higher rates of chemotherapy, perioperative radiation, and diabetes in this group compared with the subpectoral group. In addition, the prepectoral group included more patients with BMI greater than 40 kg/m^2 (n = 7 vs 3 in the subpectoral group). Nonetheless, at this extreme of BMI, pectoralis muscle coverage seems to be the safer option, although this recommendation would be clarified by larger studies in this patient population. In light of our results, most patients are reconstructed using a subpectoral pocket at BMI greater than 35 kg/m^2, although this decision is based also on patient preference and individual clinical circumstances. Patients in this group desiring prepectoral reconstruction are informed of this risk but not excluded solely on the basis of BMI. Overall, we feel that prepectoral reconstruction can be used reliably to reconstruct overweight and obese patients with an acceptably low complication rate.

The surgeon should consider the relative benefits of the prepectoral technique in the obese, which have been reported to include shorter operative time, less pain, and sparing of the pectoralis major muscle, on which patients may rely for stability when standing from a seated position.[2] Individual patient factors should influence operative decisions, but it is conceivable that such benefits may improve quality of life in the individual patient. The results of our study have changed the senior author's practice in favor of prepectoral reconstruction whenever feasible, as informed by the patient preference and clinical soft tissue quality. As mentioned previously, in patients with BMI greater than 35 kg/m^2, soft tissue of questionable quality, and/or heavily irradiated fields, the subpectoral technique is applied on a patient-by-patient basis. In our experience, patients subjectively have fewer postoperative pain issues with this technique. Although not included in our analysis, we find operative time to be less and the lack of animation deformity to be preferable.

As suggested in previous studies, the prepectoral approach is not technically challenging and can be expediently peformed.[2,5,15] In our series, the senior author was able to transition from a strictly subpectoral to largely prepectoral reconstructive practice in a 3-month period. Clinical outcomes were not significantly different between the early transition period and the most recent reconstructions, suggesting that the "learning curve" is manageable (Table 3). Anecdotally, the senior author reports shorter operative times compared with the subpectoral technique. This is the experience of a single surgeon in a regional population of patients; correlation with larger studies examining technical transition, operative times, and degree of surgical difficulty will be helpful as more surgeons implement this technique in their practice.

Esthetic outcomes were evaluated in our study using standardized patient photos and a Likert scale to rate results, which has precedent in the literature.[18] No difference was seen in ratings of volume, shape, symmetry, or overall cosmesis, although position was rated significantly better in subpectoral reconstructions. We hypothesize that this may be because of improved upper-pole volume in the subpectoral technique. Although not validated like some other patient reported outcome questionnaires, our survey addressed specific characteristics of reconstructed breasts that might visually distinguish prepectoral from subpectoral implant placement.[19–21] In addition, many surveys measure patient-reported outcomes; our survey respondents included physicians, nurses, medical staff, and breast reconstruction patients, which is rare in the literature.[14,22,23] Dynamic characteristics of reconstructed breasts, such as rippling, implant visibility, animation deformity, feel, and movement are arguably more important[21,24] but difficult to evaluate given the retrospective nature of this study. It will be important to evaluate long-term esthetic outcomes as the indications of the prepectoral technique continue to expand. Interestingly, our survey revealed that patients consistently rate esthetic outcomes lower than physicians do, which has been shown in other studies as well.[25–27] This result reflects the different expectations of patients versus plastic surgeons.[24]

Although this study included a large number of reconstructed breasts, it has several limitations, including its retrospective nature and relatively low power to detect differences between BMI range groups. Our follow-up is limited and does not capture late complications such as capsular contracture or need for revision. Large-scale, long-term outcome studies are needed to add validity to our claim that this technique is not inferior to subpectoral reconstructions in obese patients. We did not include cost analysis in our study, although the prepectoral technique requires a large amount of costly ADM, while still necessitating a second reconstructive stage in most cases. Additional studies including comparison of operative times and cost-benefit analysis would be beneficial.

CONCLUSION

This study supports the hypothesis that the prepectoral technique is safe in obese patients, despite the baseline increased surgical risk that is seen in patients with high BMI. Clinical and esthetic outcomes of prepectoral reconstruction were similar when compared with subpectoral reconstruction in an obese population. In this series, the senior author was able to make the transition from subpectoral to prepectoral reconstruction without compromising outcomes. In the senior author's experience, the prepectoral technique is a worthy reconstructive option and performs comparably to the subpectoral technique, though we favor the subpectoral approach at the upper extremes of BMI.

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