

Tissue Expander versus Tissue Expander and Latissimus Flap in Morbidly Obese Breast Reconstruction Patients

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Background: Immediate postmastectomy breast reconstruction in morbidly obese patients represents a challenge because neither prosthetic nor abdominal-based options may be suitable.

Methods: This study compared a previously published cohort of immediate prosthetic reconstruction of 346 patients (511 breasts) of whom 49 patients (67 breasts) were morbidly obese (defined as a body mass index > 35) with a morbidly obese patient population whose breasts were reconstructed immediately following postmastectomy with latissimus flap and tissue expander (21 patients and 22 breasts) in the same time period. The preoperative risk factors of mastectomy such as tobacco use, diabetes, and prior radiation and the postoperative complications of mastectomy such as skin necrosis, seroma, and prosthesis loss were examined. The explantation of the tissue expander provided a defined endpoint of reconstruction failure.

Results: The average body mass index in the tissue expander/implant group and in the latissimus flap plus tissue expander/implant group was 40.9 and 40.1, respectively. The risk profile of diabetes and tobacco use was similar in both groups. Fifteen of the 67 breasts (22.3%) of the tissue expander/implant group and 15 of the 23 breasts (65.2%) of the latissimus flap group had received prior radiation. The prosthesis loss was 13 of 67 breasts (19.4%) that had tissue-expander-alone reconstruction and 1 of 22 (4.8%) in the latissimus group that had tissue expander reconstruction. Modification of donor-site incision and skin-island location in the latissimus group of patients can minimize scar deformity.

Conclusion: The loss rate in immediate postmastectomy reconstruction in morbidly obese patients with latissimus flap plus tissue expander was substantially lower than the loss rate in those with breast reconstructed with tissue expander alone. (*Plast Reconstr Surg Glob Open* 2015;3:e323; doi: 10.1097/GOX.0000000000000248; Published online 9 March 2015)

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Received for publication May 26, 2014; accepted November 6, 2014.

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DOI: 10.1097/GOX.0000000000000248

Breast reconstruction, similar to most medical and surgical therapies, has had an evolutionary history. Before the advent of the myocutaneous era, tissue transfer for reconstructive purposes, including postmastectomy breast reconstruction, was hobbled by the necessity for multiple stages and the frequency of failure. The description

Disclosure: The authors have no financial interest to declare in relation to the content of this article. The Article Processing Charge was paid for by the authors.

by Bostwick¹ of the utilitarian value of the latissimus has enabled launching breast reconstruction process in the mainstream of plastic surgery. Although the results were quite acceptable, the necessity for an implant and the concomitant rate of capsular contraction set the stage for the latissimus to be eclipsed by abdominal-based autogenous reconstruction using the transverse rectus abdominis muscle flap, which was popularized by Hartrampf et al.²

Two-stage alloplastic reconstruction has been benefited by the acceptance of skin-sparing mastectomy techniques by the oncologic surgeon and by the availability of improved tissue expanders. Propelled perhaps by reasons other than those cited above, 2-stage prosthetic reconstruction, that is, tissue expansion followed by placement of a permanent implant, has become the predominant method of breast reconstruction, which is to some degree enhanced by a substantial increase in immediate bilateral reconstruction.³ Since 2005, human acellular dermal matrix (ADM) has been an integral element of prosthetic reconstruction, which is described as a “pectoralis extender” placed as a soft-tissue hammock between inferior-lateral native breast skin and over the lower portion of the expander. Despite the purported advantages of the 2-stage reconstruction process, some recent reports have prompted concerns about an increased incidence of complications, particularly infection and expander loss.^{4,5}

Two epidemiological developments have had an impact on the practice of postmastectomy breast reconstruction: (1) the increase in the proportion of mastectomy patients who have undergone breast reconstruction from 14% in 2001 to approximately 35–40% at present⁶ and (2) the increase in the number of breast reconstruction patients who are obese, which is as a result of the national obesity epidemic.⁷

Our previous study of a comparison of the complications in 2 groups of immediate postmastectomy reconstruction, that is, ADM versus no-ADM groups, identified high body mass index (BMI) and/or prior irradiation as the discrete risk factors for expander loss in the presence of ADM.⁴ The thrust of this study was 2-fold: (1) to quantify the magnitude of the increased risk of 2-stage prosthetic reconstruction with and without human ADM in morbidly obese patients and (2) to compare that risk of the use of the latissimus flap and tissue expander in morbidly obese patients with immediate postmastectomy reconstruction.

METHODS

From a previously published study⁴ of immediate prosthetic reconstruction from 2001 to 2012, 346 pa-

tients (511 breasts) who had been reconstructed with a 2-stage approach of the use of submuscular tissue expander (2001–2005) or tissue expander–acellular dermis (ACD; 2005–2012) that was followed by placement of a permanent implant were identified. In that study, 49 patients (67 breasts) were morbidly obese, that is, with a BMI ≥ 35 . During July 2001–2013, 21 patients (22 breasts) who were also morbidly obese had immediate 2-stage reconstruction with latissimus flap and tissue expander and subsequent placement of an implant. Preoperative risk factors such as tobacco use, diabetes, and prior radiation and postoperative complications such as mastectomy skin necrosis, infection, and prosthesis loss were examined. The analysis compared prosthetic loss between morbidly obese patients reconstructed with tissue expander alone and those patients reconstructed with tissue expander and latissimus flap, both performed immediately postmastectomy. Explanation of the tissue expander provided a bright-line or defined the endpoint of reconstruction failure.

Technique

The procedural method of tissue expander placement with or without ADM has been described previously.⁴ When used, the latissimus muscle with the incorporated skin island was rotated from the back donor site into the mastectomy defect at the time of mastectomy. Depending on the issues of chemotherapy, the second stage in both groups consisted of removal of the tissue expander and placement of an implant. All patients in the latissimus group had a 2-stage approach.

Statistical Analysis

Associations between binary patient and surgical outcomes were analyzed using chi-square test or Fisher exact two-tailed test.

RESULTS

The prosthesis loss in morbidly obese patients reconstructed with tissue expander alone with the use of ACD was 18%, and in patients reconstructed with tissue expander without ACD, it was 23.5%. This difference was not statistically significant, and the 2 were combined into a single cohort for comparison with the results of the latissimus group (Table 1).

The patients in the 2 groups, tissue-expander–alone group and latissimus flap plus tissue expander group, were similar in age, incidence of diabetes, smoking, and average BMI (Table 2). The latissimus group had a significantly higher incidence of prior radiotherapy than the tissue-expander–alone group, that is, 68.2% versus 22.3%, respectively (Table 2). The incidence of

Table 1. Prosthesis Loss with the Use of ACD and No-ACD in Patients with BMI \geq 35

	ACD	No-ACD
Patients/breasts	35/50	14/17
Prosthesis loss	9/50 (18%)	4/17 (23.5%)

The ACD and no-ACD groups were combined into a single cohort.

the postoperative mastectomy skin necrosis was similar between the 2 groups, but the incidence of seroma occurrence was statistically more significant in the patients in the tissue-expander-alone group (58.2%) when compared with those in the latissimus group (18.2%), all in the back donor site (Table 3). The tissue expander loss in the tissue-expander-alone group was 19.4% versus 4.5% in the latissimus group, leading to a result that trended toward significance ($P = 0.11$).

DISCUSSION

Two parallel trends have had an impact on postmastectomy breast reconstruction: (1) reconstruction in the same operative setting because mastectomy is now performed on a much wider spectrum of patients than it was in the past and (2) an epidemiological phenomenon termed the obesity epidemic. A significant proportion of the United States populace has become overweight, obese, or morbidly obese. Considerable geographic variation in obesity exists in the US population. The regional population that is served by our medical community is the most obese population in the United States.⁷ Currently, greater than 70% of immediate breast reconstruction is single- or 2-stage implant-based. Yet, obesity and prior radiation are known risk factors of failure in immediate implant-based breast reconstruction.⁸ Other risk factors identified for the occurrence of infection and loss of the prosthesis in the setting of tissue expander/implant reconstruction

Table 2. Characteristics of Patients in Tissue-expander-alone Group versus Latissimus Flap Plus Tissue Expander Group

	Tissue Expander/Implant (<i>n</i> = 49 Patients/67 Breasts)	Latissimus Flap + Tissue Expander/Implants (<i>n</i> = 21 Patients/22 Breasts)	<i>P</i>
Age, y	47.2	48.1	
Diabetes, <i>n</i> (%)	12 (18)	5 (23.8)	0.96
Smoker, <i>n</i> (%)	0 (0)	1 (5.3)	0.30
Average BMI	40.9	40.7	
Prior RT, <i>n</i> (%)	15 (22.3)	15 (68.2)	0.002
Postoperative RT, <i>n</i> (%)	2 (3)	1 (4.8)	0.18

RT, radiation therapy.

Table 3. Outcomes

	Tissue Expander Alone/Implant (<i>n</i> = 49 Patients/67 Breasts)	Latissimus Flap + Tissue Expander/Implants (<i>n</i> = 21 Patients/22 Breasts)	<i>P</i>
Mastectomy skin necrosis, <i>n</i> (%)	13 (19.4)	3 (13.6%)	0.8
Seroma, <i>n</i> (%)	39 (58.2)	5 (23.8)	0.96
Tissue expander loss, <i>n</i> (%)	13 (19.4)	1 (4.5)	0.11

include tobacco use and mastectomy skin necrosis.⁴ Recent research has demonstrated a 25% prosthesis loss in morbidly obese patients.⁹

The concomitant use of human ADM may increase the frequency of prosthesis loss, but analysis of prosthesis loss and reconstruction failure between no-ADM and ADM use in morbidly obese patients in our series helped in determining that although an increased risk of tissue expander loss occurred, the frequency (23.5% and 18%) was similar, and so these 2 groups were combined into the tissue-expander-alone cohort. The results were similar to that of the only prior report of the occurrence of reconstruction failure in morbidly obese patients reconstructed with tissue expander/implant alone.⁹

Our prior investigation⁴ determined a prohibitively high incidence of infection and expander loss when ADM was used in immediate postmastectomy reconstruction in previously irradiated patients. The current study, an examination of the same cohort, established morbid obesity as a significant risk factor for prosthesis loss with or without the use of ADM. Yet, a wide spectrum of patients request for, and are referred to, performing breast reconstruction in the same setting as that of mastectomy. Given the trend toward a more obese populace, an increased proportion of those patients undergoing reconstruction will be morbidly obese. Although an autogenous option could be viewed as advisable in this group, abdominal-based reconstruction probably may not be appropriate in morbidly obese patients. The use of 2-stage implant reconstruction, in addition to the issue of increased expander loss in obese patients, frequently leads to a less than optimal aesthetic result. If reconstructed with tissue expander/implant, obese patients are much more likely to be dissatisfied with the aesthetic result than if their breasts are reconstructed with autogenous methods.¹⁰ The employment of the latissimus flap in this scenario, immediate breast reconstruction in morbidly obese patients, resulted in a difference in the rate of infection and expander loss. Although the latissimus

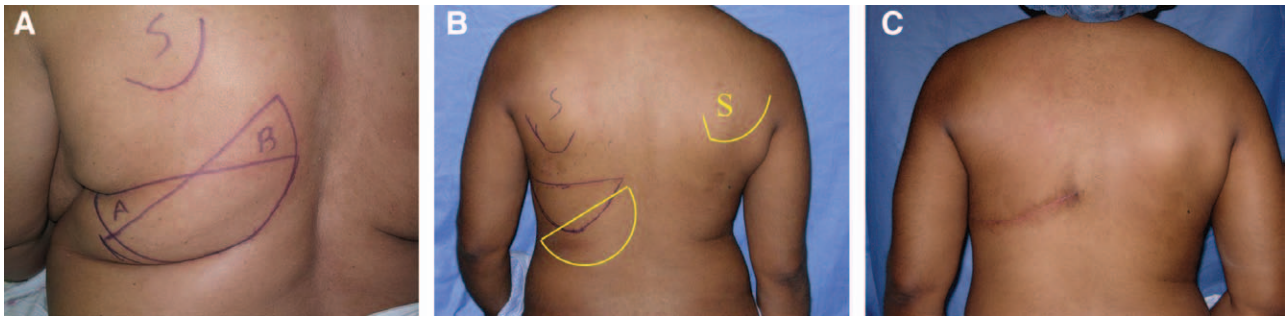


Fig. 1. A, Modifying an ellipse to that of a cup configuration and tilting the cup more obliquely will provide a curvilinear rather than a straight-line closure that will more closely follow the skin tension lines. B, A skin island placed more inferiorly will parallel the tension lines. C, The final incision closure is too superiorly located rather than more inferiorly located on the back.

cohort was relatively small ($n = 22$), only one patient sustained loss of the tissue expander. The study was underpowered to achieve a statistical significance ($P = 0.11$); nevertheless, the difference in implant loss was substantial. Presumably, the well-vascularized latissimus muscle used as a flap has the ability to suppress bacterial growth.^{11,12} The impression was also that the abundance of subcutaneous fat incorporated within and immediately adjacent to the skin island provided an enhanced aesthetic result, although no objective assessment of that outcome was performed.

The risk factors of diabetes (18% vs 26.3%) and tobacco use (0% vs 5.3%) were not significantly different between the 2 groups. Age and average BMI

(approximately 41) were also similar between the 2 groups. Tobacco use was nearly nonexistent. The other risk factor of prior radiation was significantly higher ($P \geq 0.05$) in the patients of the latissimus group than in the patients of the prosthetic reconstruction group (68.2% vs 22.3%), which is a reflection of preferential selection by patients and surgeons of an autogenous option in previously irradiated patients. Disa et al¹³ have reported an experience with immediate latissimus reconstruction in the previously irradiated patient with prosthesis loss but in 2 of 51 patients, a figure that is comparable to ours. The occurrence of the postoperative risk factor of mastectomy skin necrosis was nearly equal in the 2 groups, 19.4% versus 18.2%. By contrast, the other postoperative risk factor examined, that is, the occurrence of seroma, was statistically significant in the prosthetic reconstruction group in that a majority (58%) of the prosthetic-only patients who eventually lost their tissue expander sustained this complication. A postoperative seroma in the tissue expander group of morbidly obese patients surrounded the prosthesis, and this was detected after drain removal. This seroma set the stage for infection and expander loss, usually on a delayed basis. By contrast, postoperative seromas in the latissimus group were significantly less common in occurrence, and if they occurred, they usually occurred in the back donor site. The relatively low incidence of seroma may be related to our harvest of the latissimus with sharp dissection rather than electrocautery. Only an aggressive approach to the occurrence of seromas using repeated aspirations prevented a higher incidence of prosthesis loss.

The principal drawback from the patient's perspective of the use of the latissimus flap as an option for breast reconstruction is the incisional scar. Although ultimate patient satisfaction with latissimus reconstruction is quite high,¹⁴ design and placement of the skin island may have a favorable impact on the appearance of the scar and the patient's perception of the same. The original design by Bostwick et al¹



Fig. 2. A more inferiorly placed latissimus donor-site scar that parallels the skin tension lines.

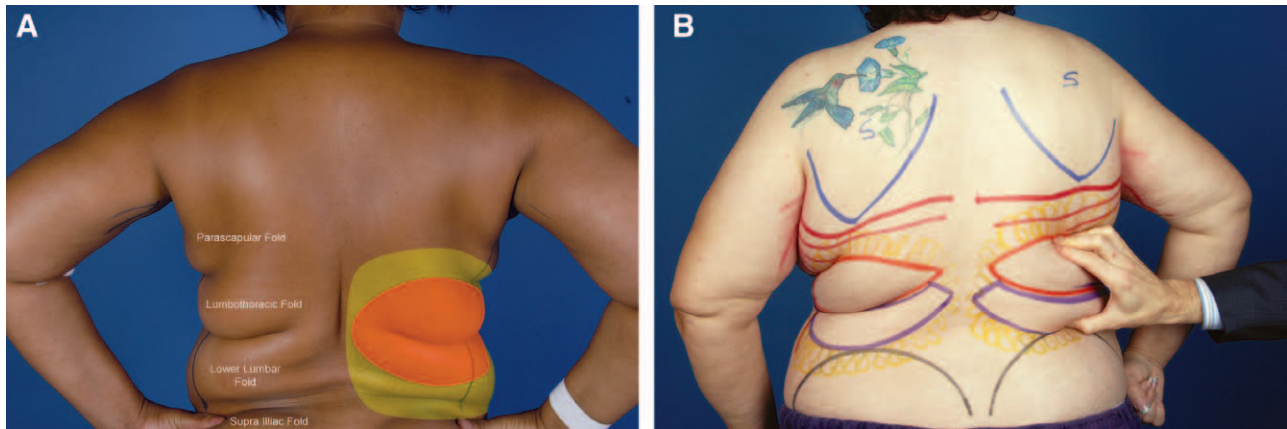


Fig. 3. A, Diagram of the fat compartments related to the latissimus dorsi flap. B, Diagram of the double-bubble pinch test for incorporation in a totally autogenous latissimus dorsi flap. Baily SH, Saint-Cyr M, Oni G, et al. The lower transverse extended latissimus dorsi flap based on fat compartments of the back for breast reconstruction: anatomical study and clinical results. *Plast Reconstr Surg.* 2011;128:382e–394e.

was a vertical oblique orientation and subsequently a transverse and superiorly oriented location of the flap on the back, with the latter an attempt to conceal the scar beneath the brassiere. Certainly, a vertical oblique skin island design harvests the maximal number of perforators from the descending branch of the thoracodorsal artery,¹⁵ provides easy access, and enables splitting the muscle in the direction of the fibers. Yet, the orientation of the scar at right angles to the relaxed skin tension lines and natural folds of the back when viewed by the patient who has undergone by breast reconstruction may be deemed unacceptable. A transverse skin island orientation will create a horizontal rather than a vertical closure and scar. However, the specific location of a transversely oriented skin island is critical as well. A study¹⁶ of patient opinion about skin island location determined that a low, as opposed to a middle or upper back donor site, was preferred. If the design is modified from a simple ellipse to more of a “T-cup” configuration, donor-site closure will more closely parallel the relaxed skin tension lines. Evidence exists, based on the perfasome theory, that perfusion of a more inferiorly placed skin

island will be adequate for breast reconstruction and will fulfill patients’ opinions about a low back scar.¹⁷ In sum, a low transverse skin island placement, rotation of the skin island obliquely and more inferiorly, and design of the island to close in a gentle convex-concave curve rather than a straight line may provide an aesthetically optimal scar (Figs. 1, 2). Also, because the flap and skin island swing as a pendulum rather than rotate from the back to the location on the anterior chest, the oblique orientation will shift to more of a transverse direction, and the design of the skin island needs to compensate for this shift with the pendulum effect. Because the flap swings as a pendulum rather than rotates, the orientation of the skin island needs to compensate for the shift in orientation with the pendulum effect.

Harvest of the latissimus flap in morbidly obese patients may require these modifications. In an important study, the fat compartments of the back have been analyzed and classified.¹⁸ The authors used, as we have done, the contents of the most inferior of the 3 fat compartments, the lumbar, but they also harvested the middle or lumbothoracic in pursuit

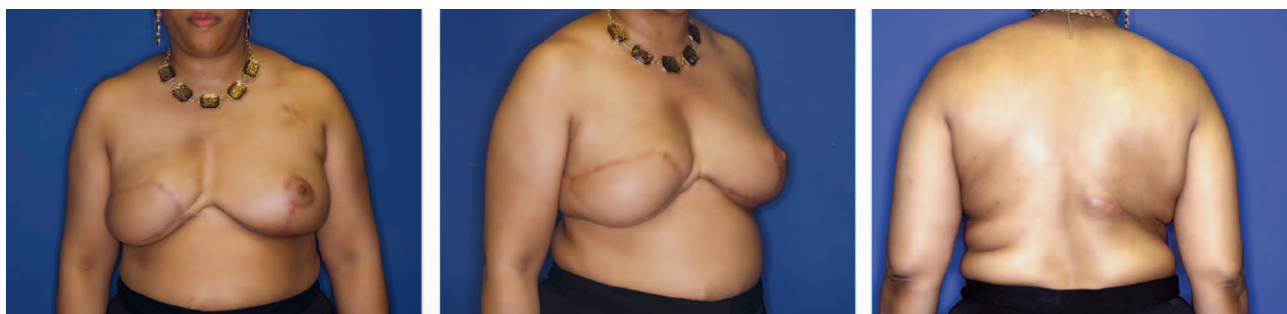


Fig. 4. Latissimus reconstruction in a morbidly obese patient before nipple-areola reconstruction with reduction on the contralateral side. A, anterior, B, oblique, C, posterior views.

of a totally autogenous reconstruction (Figs. 3A, B). We elected the placement of a tissue expander at the time of flap rotation and avoided a totally autogenous reconstruction (Figs. 4A, B), given our experience and that of others with the increased complication rate in the donor site from the harvest of a total autogenous reconstruction particularly in morbidly obese women with large breasts.

Obesity has been established as a risk factor for both autogenous and alloplastic breast reconstruction but, until recently, it has not been quantified for the latter. In this series, in the presence of morbid obesity in patients, the use of a tissue expander resulted in a 20% loss rate of the expander. By contrast, when the tissue expander was combined with the latissimus flap in the same population of patients, the outcome was a significantly lower incidence of prosthesis loss. This dramatic reduction in failure of the reconstruction was achieved despite a history of prior irradiation in the majority of morbidly obese latissimus-group patients (Fig. 5). Although the initial impetus to select the latissimus as the reconstructive option for immediate mastectomy reconstruction was a history of prior irradiation, more recently with the recognition of morbid obesity as a significant risk factor, the latissimus has become the method of choice for reconstruction.

Our current consultation with the pre-mastectomy breast reconstruction patient who is morbidly obese centers on the risk profile with tissue expander versus tissue expander and latissimus, the option should tissue expander alone fail (a latissimus flap), and the acceptability of the donor-site scar if a latissimus is elected as the option. Although in the past the impetus to select latissimus as the reconstructive method for immediate mastectomy reconstruction

was a history of prior irradiation, more recently (with recognition of obesity as a significant risk factor) the latissimus flap, if the patient concurs, has become the reconstructive method of choice.

CONCLUSIONS

Immediate postmastectomy breast reconstruction in morbidly obese patients presents a challenge. The risk of failure of prosthetic reconstruction is 20–25%, and the patient should be so advised preoperatively. The use of the latissimus flap plus tissue expander in this patient population is recommended because of the dramatically lower incidence of infection and expander loss with the flap. Design of the donor-site harvest with the skin island placed inferior will permit closure in a relaxed skin tension line and a more acceptable donor-site scar.

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ACKNOWLEDGMENT

We acknowledge the assistance of Elizabeth Tolley, PhD, in the statistical analysis.

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Fig. 5. A postoperative result with breast reduction accomplished on the contralateral side. Virtually all of the morbidly obese breast reconstruction patients will require a contralateral breast reduction.

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