



Bridging autologous reconstruction with pre-pectoral tissue expanders

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Abstract: Pre-pectoral reconstruction is steadily becoming more mainstream with recent publications showing equivalent results with traditional sub-pectoral published literature. Multiple authors have demonstrated short-term acceptable rates of infection, expander failure, success in radiated patients, and overall patient satisfaction. Some data has even shown improved outcomes in prepectoral reconstruction when compared to published subpectoral literature. For the past 4 years, our practices have utilized a “piggy-back” method of immediate pre-pectoral expander reconstruction before performing delayed immediate microsurgical free tissue transfers. This method has many advantages and has in many cases become our standard for patients wanting deep inferior epigastric perforator flaps (DIEPs) for definitive reconstruction.

Keywords: Prepectoral tissue expanders; piggyback technique; deep inferior epigastric perforator flaps (DIEP flaps)

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Pre-pectoral reconstruction is steadily becoming more mainstream with recent publications showing equivalent results with traditional sub-pectoral published literature. Multiple authors have shown short-term data that infection rates, rates of expander failure, success rates in radiated patients, and patient satisfaction are acceptable, and in some cases improved when compared to the published literature. For the past 4 years, our practice has utilized a “piggy-back” method of immediate pre-pectoral expander reconstruction before performing delayed microsurgical free tissue transfer. This method has many advantages and has become our standard in patients wanting deep inferior epigastric perforator flaps (DIEPs) for definitive reconstruction.

Our practices are primarily reconstructive practices with an emphasis on cancer restoration. We utilize microsurgical techniques in many of our treated patients. All new active

cancer patients are encouraged to undergo immediate expander reconstruction and many prophylactic patients are also treated with immediate tissue expanders. We find that initial pre-pectoral tissue expander placement has multiple advantages. These advantages include the ability to re-shape and re-size the reconstructed breast, to avoid potential radiation to autologous tissue, to avoid delayed wound healing and hence delayed timing of chemotherapy if indicated, to minimize total operative time, and to provide improved control of the microsurgical environment. These advantages have resulted in many our delayed DIEP flap breast reconstruction patients undergoing initial placement of tissue expanders.

Before the advent of pre-pectoral reconstruction, we still utilized subpectoral bridging expanders. While many of the above reasons for utilizing expanders prior to autologous

tissue reconstruction were still pertinent, we feel the success of pre-pectoral reconstruction has fundamentally improved this process. The traditional subpectoral method involved removing these expanders during the delayed immediate DIEP flap operation. This involved dissecting the pectoralis major muscle and acellular dermal matrix off the mastectomy skin flaps and advancing the muscle back to the chest wall and re-suturing it near the inframammary fold. In essence, postmastectomy anatomy had to be restored before autologous tissue was inset into the pocket once occupied by breast parenchyma. We have found that avoidance of this pectoralis muscle dissection can save a reconstructive microsurgeon significant amount of precious time during the surgery. Previously, we observed that performing dissection of the internal mammary vessels after post-pectoral tissue expander placement often proved to be challenging secondary to inflammation and scar tissue present in part from the subpectoral dissection as well as the tissue expander itself. Internal mammary vessel dissection proved to be even more challenging in the setting of post mastectomy radiation therapy. Tissue expander placement in a prepectoral plane has allowed us to avoid some of the previously described challenges. Additionally, with prepectoral tissue expander placement, we find exposure of the internal mammary vessels to be significantly less challenging as this technique seems to better preserve the tissue plane deep to the pectoralis major muscle as well as at the level of the intercostal spaces as well as the plane deep to the intercostal muscles.

The continued success of implant-based pre-pectoral breast reconstruction has been dependent upon improved cohesivity of silicone gel implants, improvements in autologous fat harvest, grafting techniques and technology, as well as the use of acellular dermal matrices (ADMs) for total anterior coverage of tissue expanders and ultimately implants. We have expanded upon these successes by using prepectoral expanders prior to microsurgical techniques. We feel that the versatility of expander reconstruction has also made this an essential step in achieving optimal results with autologous reconstruction. The bridging technique of prepectoral expanders prior to DIEP flap reconstruction is useful in many patients as it helps produce a more desirable pocket and skin envelope. Previous literature has shown that pre-expansion allows elimination of a “patch-like” appearance lending to improved aesthetic outcomes in delayed DIEP flaps (1). The preexistence of a tissue expander produces a skin envelope and mastectomy pocket which allow the autologous tissue to be better positioned on

the chest resulting in improved projection of the autologous tissue reconstruction while simultaneously allowing for a tighter, more predictable skin envelope which can aid in the correction of pre-surgical ptosis. We find that instead of suturing the lateral portions of the flap down to the serratus anterior fascia (as was a necessary step when trying to achieve projection of autologous tissue) that placement of a prepectoral tissue expander prior to the delayed immediate DIEP flap reconstruction produces a well-defined lateral border of the mastectomy pocket. Prior placement of a tissue expander minimizes and often completely mitigates the need for any additional lateral pexy sutures or lateral capsulorrhaphy. Additionally, the process of expander reconstruction can allow for wise pattern skin envelope reductions over the expander creating a controlled pocket in patients with large volume or ptotic breasts. We noticed that skin envelope reductions performed simultaneously with immediate free flap reconstructions often led to worsened mastectomy flap necrosis thought to be in part secondary to the weight and pressure an immediate free flap transfers imposes on the mastectomy skin flap and its limited blood supply. We feel that this additional insult can be partially alleviated by placing a partially air-filled initial expander. Tissue expander versatility also allows for improved alignment between the volume of the mastectomy pocket and the volume of available abdominal tissue. This produces a more “hand in glove” reconstruction and essentially allows for prefabrication of the desired mastectomy pocket best suited to match the abdominal flap. In situations when patients have larger volume breasts and less available abdominal tissue, the prepectoral expander along with appropriately tailored skin excision can be used to make a smaller pocket and tighter skin envelope in preparation for autologous tissue reconstruction. Conversely, in patients with smaller breast volume when compared to available abdominal donor tissue, the prepectoral expander can be used to expand the mastectomy pocket allowing for a larger autologous tissue reconstruction should the patient desire. With this we feel that the prepectoral tissue expander creates a pocket best suited to produce optimal volume, projection, and shape of the ultimate autologous reconstruction.

The effects of immediate adjuvant oncological therapies on autologous tissue breast reconstructions have been well documented. Adjuvant chemotherapy (often recommended to start 4 weeks after mastectomy) can be delayed secondary to wound healing complications of the breast reconstruction as well as the abdominal surgical closures in the setting

of immediate abdominally-based autologous free tissue transfer. There is evidence that neoadjuvant therapy can cause an increase in abdominal wall morbidity with autologous tissue reconstructions (2). Additionally, the effects of post mastectomy radiation therapy on autologous tissue have been shown to potentially produce increased rate of fat necrosis, worsening asymmetry, as well as an overall decrease in reconstruction aesthetics (3,4). As radiation indications have broadened, more patients are potential candidates for post mastectomy radiation therapy which can lead to an increased possibility of radiating autologous tissue. Post-mastectomy radiation is associated with an increase incidence of adverse effects (5). Prior to the advent of pre-pectoral implant-based breast reconstruction patients who had a possibility of being recommended to proceed with post-mastectomy radiation therapy were offered either delayed autologous breast reconstruction or initial placement of a tissue expander placed post-pectoral (with an inferior pole acellular dermal matrix sling). In patients with post-pectoral tissue expanders who ultimately proceeded with autologous reconstruction, removal of tissue expanders and reconstruction with autologous tissue proved to be challenging and time consuming as this procedure required dissection of the entire pectoralis major muscle and securing the muscle to the chest wall.

Controlling the operative as well as microsurgical environment is an important factor when optimizing success rates and developing an optimal breast reconstruction center. We feel that the prepectoral tissue expander preparation prior to the delayed DIEP flap reconstruction can improve on the ultimate microsurgical environment and ultimately translate to decreased rates of return to the operating room (OR). Challenges we regularly faced in the past when it came to immediate free tissue transfer breast reconstruction included the unpredictable nature of variable operative times (with different breast surgical oncologists) which often led to unpredictable surgical teams and as well as the initial difficulties with coordination of multiple surgeons on the same day. Delays with sentinel lymph node biopsies, awaiting frozen section results, and possible completion lymphadectomies all can lead to delays in starting the reconstructive portion of the procedure. Additionally, sentinel nodes harboring metastases or multiple axillary lymph nodes being grossly positive can increase the likelihood that post-mastectomy radiation therapy may be indicated and possibly lead to intraoperative cancellation of DIEP flap reconstruction in an attempt to avoid radiating an otherwise healthy flap. Such a

cancellation can lead to scheduling mishaps and represents a significant lapse in maximizing the microsurgeon's time. Many these issues can be mitigated by bridging autologous tissue reconstruction with an immediate pre-pectoral expander. Placement of prepectoral tissue expanders at the time of mastectomies has allowed for autologous free tissue transfer reconstructions to be performed in a more controlled environment. With this technique it has become much easier to regularly schedule first start surgeries in the same operating room with the same perioperative staff. This change has allowed for easier scheduling of two surgeons as well as two advanced practice providers for each case and a routine that is obsessively reproducible.

Description of technique

The piggy back technique of pre-pectoral expanders prior to DIEP flap reconstruction is the same as that of prepectoral tissue expander reconstruction performed in immediate reconstruction after mastectomy. We begin by examining the mastectomy skin flap perfusion with either Indocyanine Green (IcG) angiography or clinical judgement. If the flaps are well-perfused, then we proceed with tissue expander reconstruction. If smaller areas of decreased perfusion are appreciated on exam or on IcG angiography then we proceed with reconstruction with a partially filled expander to minimize pressure. Minimal areas of decreased perfusion along the incision lines are directly excised and we proceed with the expander placement. If IcG angiography demonstrated global decreased mastectomy skin perfusion, then no immediate reconstruction is performed and the mastectomy is closed over drains. We then allow for the mastectomy skin to declare itself and proceed with excisional debridement if indicated. We will then utilize either delayed autologous tissue or tissue expander reconstruction. We have found the ideal timeframe is within 2–3 weeks. Additionally, we have selectively used fat grafting of thin mastectomy flaps after 2 weeks to prepare for an eventual prepectoral tissue expander. Multilevel intercostal blocks with liposomal bupivacaine has improved postoperative pain control resulting in selected outpatient mastectomies with tissue expanders. We utilize ADMs (Alloderm) for soft tissue reinforcement. Our institutions prefer perforated ADMs or manually fenestrated ADMs for complete coverage of the anterior side of the expander. Either two pieces of contour large ADMs are sutured together along the short side or one larger (16x20) piece is utilized for this “tent” technique to the pectoralis muscle

and fascia as well as the serratus fascia along the lateral border. Our technique is similar to the described technique in current literature (6). The dermal side is placed oriented superficial with particular attention to the inferior and lateral cuff that is created with the dermal side down for reinforcement of these critical borders. Once the expander and ADM are in place, lateral plication is done to close off the pocket and prevent seromas and dead space. The expander is then re-inflated in order to fill the entire mastectomy pocket without producing undue tension on the overlying mastectomy skin envelope. Air or saline can be used up to the limits of mastectomy flap perfusion. This can once again be confirmed with ICG angiography. Drains are placed routinely and larger surface areas can be controlled with two drains per side. We then re-drape the mastectomy flap with nipple complex repositioning if needed. We do sit the patients up to confirm placement and symmetry. Foley catheters are removed after the procedure and patients are either discharged as outpatients or 23-hour stays. Judicious usage of Tegaderm dressings or negative pressure incisional vacuum assisted devices can assist in minimizing post-operative morbidity. On average we wait 3 months prior to returning to the OR for definitive microsurgical reconstruction allowing for a well-defined skin envelope over the expander. We feel that aesthetics is maximized with this pre-fabrication technique allowing for improved coordination of the available abdominal tissue volume to patient desires as well as with the limitations of available tissue. Prepectoral reconstruction can be done more efficiently with decreased operative time and without dissection of the pectoralis major muscle leading to the decreased subsequent morbidity without expansion deep to the muscle.

Discussion

Prepectoral reconstruction has been shown to have many advantages over traditional subpectoral reconstruction. For the past several years, our reconstructive practices are more routinely utilizing prepectoral expanders as a precursor to microsurgical free tissue transfer. We feel that this “piggy back” technique has numerous advantages to immediate reconstruction. These advantages include the ability to optimize shape and size, to avoid delay of adjuvant therapies secondary to wound healing issues, and to optimize the microsurgical environment as well as perioperative efficiencies. This combined procedure

utilizes the strengths of both autologous and prosthetic reconstruction techniques and provides what we believe to be an optimal reconstruction. Microsurgical techniques are believed to be the most robust form of breast reconstruction with highest long-term satisfaction outcomes and the least long-term complications. We have found that it is difficult to contour and provide satisfactory shape and projection of autologous tissue in the immediate reconstruction environment secondary to the laxity of the mastectomy skin and postoperative descent of the remaining envelope. Prepectoral tissue expander placement and bridging to autologous tissue reconstruction is an ideal technique to help avoid common pitfalls often seen with immediate autologous tissue reconstruction. By bridging autologous breast reconstruction with prepectoral tissue expanders we have found that we can produce a more reliable surgical and perioperative environment while simultaneously achieving a more controlled mastectomy pocket and what we believe to be an improved aesthetic result.

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Footnote

Conflicts of Interest: Dr. KR Lee is a consultant for Allergan, Inc. He received no compensation or support for this manuscript. Dr. N Clavin has no conflicts of interest to declare.

References

1. Schwarz K, Tahiri Y. Subcutaneous pre-expansion of mastectomy flaps before breast reconstruction with deep inferior epigastric perforator flaps: eliminating the patch-like appearance and improving aesthetic outcomes. *Ann Plast Surg* 2011;66:124-7.
2. Patel SA, Sandberg LJ, Ranganath B, et al. Impact of adjuvant chemotherapy on abdominal wall hernias and bulges after muscle-sparing free TRAM flaps for breast reconstruction. *Ann Plast Surg* 2014;73:62-7.
3. Rogers NE, Allen RJ. Radiation effects on breast reconstruction with the deep inferior epigastric perforator flap. *Plast Reconstr Surg* 2002;109:1919-24; discussion 1925-6.
4. Kronowitz SJ, Robb GL. Radiation therapy and breast

- reconstruction: a critical review of the literature. *Plast Reconstr Surg* 2009;124:395-408.
5. El-Sabawi B, Sosin M, Carey JN, et al. Breast reconstruction and adjuvant therapy: A systematic review of surgical outcomes. *J Surg Oncol* 2015;112:458-64.
 6. Nahabedian MY. Current Approaches to Prepectoral Breast Reconstruction. *Plast Reconstr Surg* 2018;142:871-80.

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