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Breast

Improving Cost-efficiency in Bilateral Direct-to-Implant Reconstructions with Acellular Dermal Matrix

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Summary: The use of acellular dermal matrix (ADM) for bilateral breast reconstruction has increased in recent years. Detection of BCRA mutation and therefore bilateral risk-reduction mastectomy is one of the main reasons for this increase. High cost of ADM is considered a major drawback for its use. The authors present a new technique which allows the use of only one unit of ADM for both breasts. After assessing the viability of the skin of mastectomy flaps, a musculofascial pocket formed superiorly by pectoralis major, laterally by serratus fascia and inferiorly by rectus fascia, is performed. Then, the ADM is divided in two halves. We propose two different ways to divide the matrix, cutting it vertically or diagonally in two. The way in which the matrix should be cut depends on the distensibility of the pocket. Afterwards, the implant is inserted and the exposed area of the implant is covered by the ADM sutured to the edges of the musculofascial pocket. Using only one ADM unit for bilateral reconstruction, the procedure becomes not only more cost-effective but also can reduce complications such as seroma, rippling, wrinkling, and visibility by means of a better coverage with lesser foreign body load. Furthermore, the lesser the matrix used, the faster the integration is achieved.
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INTRODUCTION

Prophylactic mastectomy continues to increase since its effectiveness was proven to reduce the risk of developing breast cancer by more than 90%.[1] Some of the indications include mutation of BRCA1/2 genes, fear of recurrence after unilateral breast cancer, family history, or even when the screening of breast cancer is difficult.[2] In recent years, direct to implant (DTI) reconstructions have become the standard in many institutions due to the improvement in mastectomy techniques and the advancements in technology. One of the greatest revolutions was the introduction of Acellular Dermal Matrix (ADM), which provides complete coverage of the breast implant and allows the expansion of the lower pole.[3] In addition, different studies suggest that the use of ADM prevents capsule formation,[4,5] decreasing the capsular contracture rates. However, the use of ADM has been linked to higher complication rates such as infection, flap necrosis, and especially seroma.[6] Moreover, the cost can be another disadvantage when using ADM in bilateral breast reconstruction.

In an attempt to reduce costs while minimizing risks associated with the use of ADM, we offer a reliable technique for bilateral DTI reconstruction using only one ADM unit.

OPERATIVE TECHNIQUE

All the patients[11] underwent skin- (SSM) or nipple-sparing mastectomy (NSM) or skin-reducing mastectomy (SRM) performed by oncologic surgeons. Upon completion of the mastectomy, accurate evaluation of the skin flap was done. A proper case selection is critical for this kind of reconstruction. The exclusion criteria were active smokers, preoperative radiotherapy (except case 11), breast implant volume higher than 600 cc (range of implant volume used in our sample: 225–600 cc), and BMI >35.

If the perfusion of the mastectomy flaps or the nipple-areola complex is impaired, a traditional expander-based

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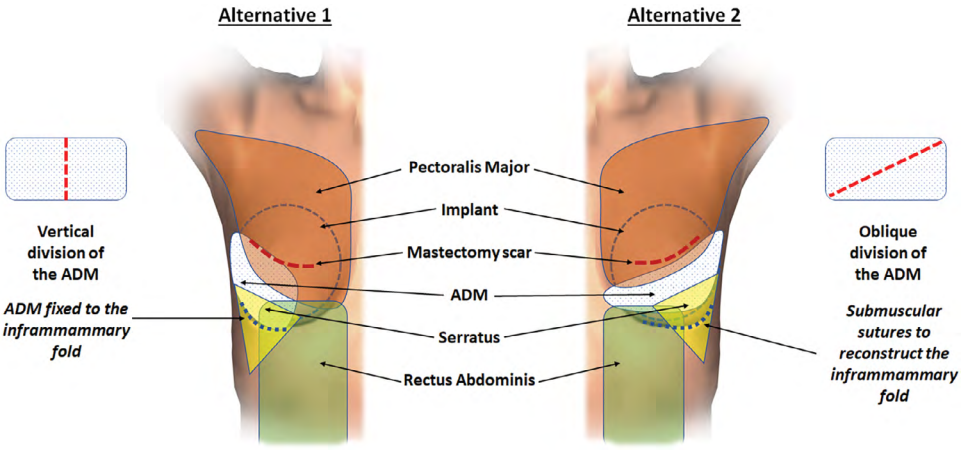

Fig. 1. The different alternatives to use only one ADM for both breasts in bilateral breast reconstruction.

reconstruction is performed. After observing good vascularization of the skin flaps, the procedure begins by creating a musculofascial pocket. The pocket is delimited superiorly by the pectoralis major, laterally by the serratus fascia, and inferiorly by the rectus fascia. The junction between both pectoralis and rectus fascia is preserved when possible. Then, rigorous hemostasis is achieved and the pocked is rinsed using an antibiotic solution (Gentamicin 80 mg and Cefazolin 2 g in a 100 cc of saline). The same solution is used to hydrate the ADM for ~1 minute in room temperature before manipulating it.

Thereafter, the ADM (8×16 cm^2, bovine acellular dermal collagen matrix, Surgimend, LifeSciences) is divided in two halves. It is important to note that the proposed technique is indicated when using ADM without polarity. The matrix can be divided two different ways depending of the extension of the defect and the distensibility of the pocket (Fig. 1). The first alternative consists in cutting it vertically in two, resulting in a squared shape. This is indicated when the implant's exposed area is limited to the lateral border of the pocket by means of an easily distended pocket and a preserved pectoralis-rectus abdominis junction. The matrix is then fixed following the inframammary fold under the serratus fascia using PDS, providing a double coverage in the lateral aspect (ADM + fascia) and an increased contact of the matrix with vascularized tissue.

Conversely, the matrix is divided diagonally in the second alternative. This variation is indicated when the pocket, especially in its medial aspect, is less distensible and the pectoralis-rectus abdominis junction is not preserved, resulting in a wider lower exposed area of the implant. Afterwards, the ADM is sutured to the musculofascial edges, reconstructing the inframammary fold using PDS.

Once ADM tailoring is assessed and fixed inferiorly, the pocket is rinsed with the antibiotic solution. Two drains are placed in the subpectoral and prepectoral planes, and the appropriate implant is inserted. Then, the matrix is sutured to the inferolateral border of the pectoralis major, ensuring the complete coverage of the implant (Fig. 2).

Finally, mastectomy flaps are adapted avoiding the scar's contact with the ADM. Preferably the scar should be over the musculofascial flaps. In our opinion, placing the scar over a well vascularized surface reduces the risk of infection

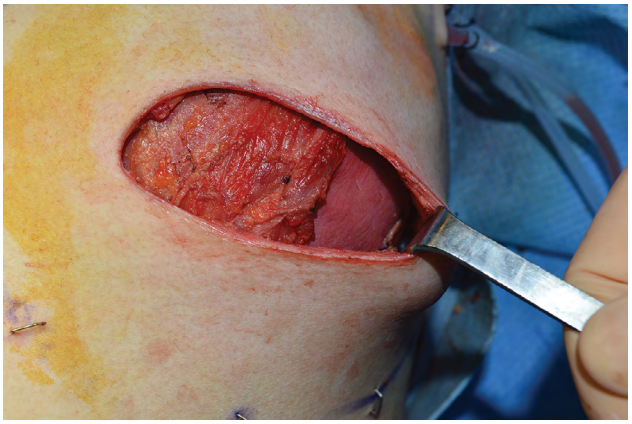

Fig. 2. Intraoperative view of the matrix colocation in a skin-sparing mastectomy.

and dehiscence. When the mastectomy is performed by an SSM fold approach, the first option described provides a better coverage avoiding direct contact between scar and ADM. (**See Video 1 [online]**, which demonstrates the different steps of the proposed technique for bilateral direct-to-implant breast reconstruction using only one unit of ADM.)

Drains are maintained 14 days. There were no major complications reported in any patients (Table 1). No breast nor volume alterations have been reported for 1 year after the procedure and all the patients were satisfied with the result (Figs. 3 and 4). Pectoralis animation deformity was limited due to extensive dissection. (**See Video 2 [online]**, which shows pectoralis animation deformity in a patient after bilateral direct-to-implant breast reconstruction using only one unit of ADM.)

To reduce postoperative pain, all patients had a pectoral block (PECs) as well as an intercostal block using 10–20 cc of levobupivacaine per side.

DISCUSSION

Implant-based reconstruction is the most common procedure, especially after bilateral mastectomies. In 2013, a study showed a 200% increase rate in implant-

Table 1. Sample of Patients Who Underwent the Proposed Technique Indicating the Implant Volume, the Type of ADM Cut, the Presence of Radiotherapy Treatment, the Complications, and the Type of Mastectomy

Patient	Implant Volume (ml)	Type of ADM	Radiotherapy	Complications	Type of Mastectomy
1	440	Square	No	—	SSM
2	330	Square	No	—	SSM
3	270	Square	No	—	SSM
4	390	Square	No	—	SRM
5	370	Square	No	—	SSM
6	295	Triangle	No	—	SSM
7	440	Square	Postoperative, unilateral	Baker II contracture*	NSM
8	600	Triangle	No	—	SRM
9	225	Square	No	—	SSM
10	295	Square	No	—	NSM
11	360	Triangle	Previous, unilateral	Baker II contracture†	SRM

*Capsular contracture was diagnosed 11 months after the radiotherapy treatment.
†Capsular contracture was diagnosed 10 months after the breast reconstruction.

Fig. 3. Preoperative status of a 38-year-old woman carrying the BRCA mutation.

Fig. 4. Postoperative appearance of the patient in Figure 3 at 24 months after skin-sparing mastectomy with direct to implant reconstruction using 270 cc implants. The ADM was cut vertically in two, resulting in a squared shape. The nipple areola reconstruction was done 6 months after the breast reconstruction.

based reconstruction.[7] This is possibly explained because an implant-based reconstruction is a simpler technique than microsurgical free flaps. Moreover, younger women constitute an increasing proportion of breast reconstructions. Because of their premenopausal status and a more active lifestyle they may have less adiposity to allow bilateral autologous breast reconstruction.[8] Furthermore, young women prefer the non-ptotic appearance of implants as opposed to the appearance of autologous tissue reconstruction.[9] Recovery time is a usual concern among patients. When using free flaps, the patients are admitted

between 4 and 8 days, but with implant-based reconstruction the patients can be discharged 24–48 hours after the reconstruction, or it can even be done as an outpatient procedure.

The authors consider their technique to have some advantages compared with traditional DTI techniques. As a matter of fact, using one matrix for both breasts reduces the costs of the reconstruction procedure when comparing with the standard techniques. However, this is not only intended to reduce costs but also to avoid some complications related to the use of ADM, such as seroma or infection.[10,11] Some of the reasons for these complications are related to the introduction of an avascular body which needs time to achieve complete integration. We consider that using less matrix makes a faster integration with less inflammatory response possible. Additionally, a well vascularized musculofascial pocket with a bigger contact surface with the ADM may accelerate the integration process while minimizing the complications.

Alternatively, the prepectoral breast reconstruction is increasing in popularity. Some authors have reported favorable early cosmetic results and low levels of postoperative pain as secondary outcomes following prepectoral reconstruction; however, these were not patient reported.[12] Nevertheless, by performing an anesthetic block,[13] as we do, a good level of analgesia is provided.

Prepectoral breast reconstruction is associated with different complications. In a recent study, more visibility of the implant and rippling were observed in prepectoral breast reconstructions compared with the subpectoral implant placement.[14] Rippling and wrinkling are very common in the setting of prepectoral reconstruction forcing the surgeon to perform autologous fat grafting to increase the thickness of the mastectomy skin flaps.[15]

Once reporting this technique clinically with successful results after more than 1 year of follow-up, we suggest that this approach could be a new valuable tool for breast reconstruction. To the best of our knowledge, this new approach offers the advantages of a one stage breast reconstruction, while avoiding some drawbacks related to the use of ADM such as the cost, which is reduced by half, the foreign body reaction and the integration failure. Furthermore, the proposed technique offers a predictable strategy to achieve the desired aesthetic outcome, making this procedure more reliable and easier for both novice and experienced surgeons.

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