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IDEAS AND INNOVATIONS

Breast

Use of a Bioabsorbable Implant-Acellular Dermal Matrix Construct to Facilitate Oncoplastic Breast-conserving Surgery

Jean-Claude D. Schwartz, MD, PhD

Summary: Deformity after partial mastectomy for breast cancer is not uncommon. The immediate replacement of breast volume by a bioabsorbable implant has been shown to facilitate tissue ingrowth, maintain breast contour, reduce scarring and fibrosis, and preserve cosmesis. Soft tissue coverage is critical to minimize palpability and to prevent infection and extrusion of this device, especially after radiotherapy. This coverage is often not possible after significant oncological resection or in leaner patients. Here, we describe the use of a bioabsorbable implant-acellular dermal matrix construct in patients with insufficient soft tissue coverage after wide local excision. *(Plast Reconstr Surg Glob Open 2021;9:e3356; doi: 10.1097/GOX.0000000000003356; Published online 25 January 2021.)*

INTRODUCTION

Breast deformity after breast conservation surgery is not uncommon[1] and is difficult to correct.[2,3] Recently, surgeons have described a bioabsorbable implant that is placed into the lumpectomy bed.[4] Initially devised to accurately direct radiotherapy, many realized it also facilitated fibrous tissue ingrowth with maintenance of breast contour.[5] As with any prosthetic subjected to radiotherapy, tissue coverage is critical to prevent complications. In patients who lack such coverage, we have found that a bioabsorbable implant-acellular dermal matrix (BIADM) construct can facilitate reconstruction (Fig. 1). Here, we describe 5 patients in whom we employ this strategy.

PATIENTS AND METHODS

Five patients underwent BIADM implantation during partial mastectomy. Institutional review board approval and written informed consent were obtained for off-label use of the BioZorb (Hologic, Inc., Marlborough, Mass.), comprising polylactic acid and 6 titanium clips, wrapped in Cortiva regular acellular dermal matrix (ADM) (RTI Surgical, Alachua, Fla.) for partial breast reconstruction (Figs. 2, 3). We typically use 5 cm × 8 cm (DH0508) or 5 cm × 10 cm (DH0510) Cortiva ADM. Patients are informed that while ADM and BioZorb have been extensively studied in breast reconstruction and surgical oncology, respectively, they have not been studied in the manner in which we are currently using them. All cases are reviewed prospectively in a multidisciplinary tumor board. The implant comes in 6 sizes (2cm × 2 cm to 4 cm × 5 cm), taking 1–2 years to resorb, leaving just clips behind. While previous recommendations were to use an implant that approximated the tumor size and not the lumpectomy specimen to allow for the tissue closed over the device,[6] we chose implant sizes based on the lumpectomy specimen as no tissue would be approximated over the BioZorb. The BIADM is sutured to the surrounding tissues of the defect, with its anterior and posterior surfaces in apposition to skin and chest wall, respectively. (**See figure, Supplemental Digital Content 1**, which displays a 57-year-old woman with a 2.5-cm central right breast cancer requiring excision of her nipple-areola complex with history of subpectoral breast augmentation. She requests breast conservation with preservation of her implants with bilateral mastopexy. We proceed with Wise-pattern resection of her right breast cancer and contralateral mastopexy. Her final pathology reveals multiple positive margins. She refuses mastectomy and other methods to preserve her breast but agrees to placement of the BIADM. http://links.lww.com/PRSGO/B551.) We leave a drain to facilitate efficient integration of the ADM. The skin is then closed over the BIADM.

From the Department of Surgery, Northside Hospital Gwinnett, Northside Gwinnett Surgical Associates, Lawrenceville, Ga.

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Fig. 1. Forty-seven-year-old woman (body mass index = 18.1) with a 1.8-cm upper-inner quadrant right breast cancer with history of subpectoral breast augmentation desiring breast conservation. Her margins are positive after 2 wide local excisions. She requests an additional attempt at breast conservation but refuses a local flap for reconstruction. She agrees to immediate volume replacement with a BIADM construct to prevent significant postoperative deformity.

RESULTS

Patients' ages and body mass indexes ranged from 47 to 76 years (mean = 57.8, SD = 10.3) and 18.1 to 41.3 kg/m^2 (mean = 27.1, SD = 8.5), respectively. All patients underwent successful breast conservation and radiotherapy with at least 12-month follow-up. There were no infections, seromas, device removals, or complaints of palpability. We were satisfied with the aesthetic outcomes in all patients (Fig. 4). (**See figure, Supplemental Digital Content 1**, http://links.lww.com/PRSGO/B551.)

One patient required 3 surgeries to clear her margins, another required 2 surgeries, and 3 required 1 surgery. Tumor locations were upper-inner quadrant (3), central (1), and upper-outer quadrant (1). Two patients had a history of subpectoral augmentation desiring preservation

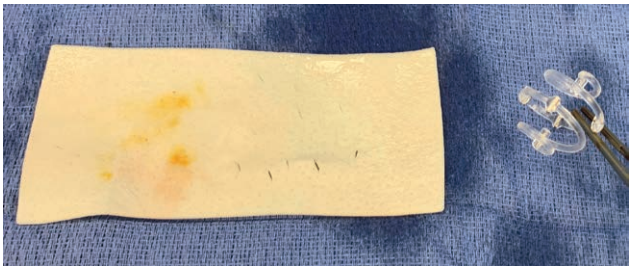

Fig. 2. The bioabsorbable implant composed of polylactic acid and 6 titanium clips adjacent to the ADM that will be used to wrap the implant.

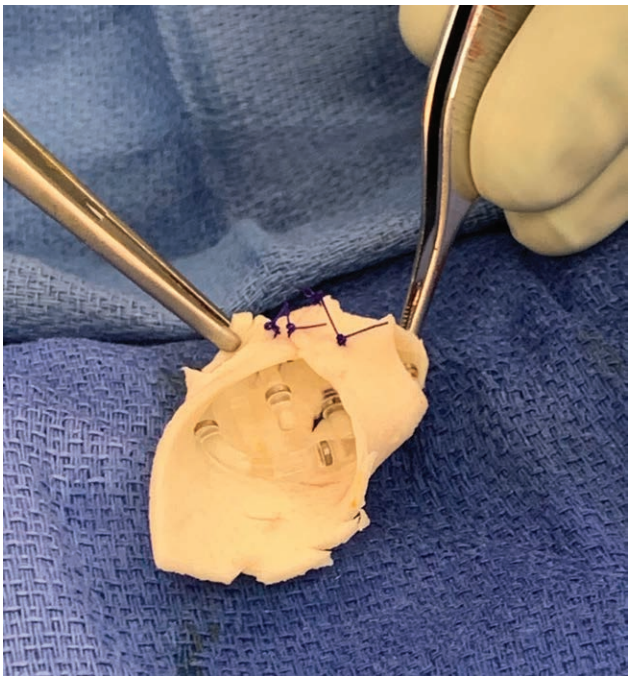

Fig. 3. The BIADM construct is assembled using absorbable suture.

Fig. 4. Sixteen months after the completion of radiotherapy and successful re-excision (her third surgery) and immediate placement of the BIADM construct. The arrow denotes the position of the implant which is subtly appreciated.

Table 1. Patient Demographics and Procedural Details

Patient	Age (y)	BMI (kg/m²)	Tumor Location	Weight of Lumpectomy (Combined, g)	No. Lumpectomy Surgeries Required	Size of ADM (cm²)	BioZorb Size (cm × cm)
1	47	18.1	UIQ	44	3	40	3 × 3
2	57	32.2	C	120	2	50	4 × 5
3	76	41.3	UIQ	40	1	40	3 × 3
4	49	21.2	UIQ	37	1	40	3 × 3
5	60	22.5	UOQ	90	1	50	4 × 4

BMI, body mass index; C, central; UIQ, upper-inner quadrant; UOQ, upper-outer quadrant.

of their implants (Fig. 4). (**See figure, Supplemental Digital Content 1**, http://links.lww.com/PRSGO/B551.) Both patients required re-excisions when the BIADM was placed after discussion of more complex methods of partial breast reconstruction and/or mastectomy.

Two patients had upper-inner quadrant cancers with incisions made directly over the tumor. (**See figure, Supplemental Digital Content 2**, which displays the patient 14 months after right breast radiotherapy and successful re-excision of her margins with immediate placement of the BIADM construct, http://links.lww.com/PRSGO/B552.) They had small and fatty-replaced breasts making standard volume displacement methods challenging. The patient depicted also had significant medical comorbidities and was offered immediate volume replacement with BIADM as a simpler and quicker option for partial breast reconstruction.

The final patient had a large upper-outer quadrant breast cancer in relation to her smaller breast size. She refused both perforator flap reconstruction and mastectomy but accepted immediate placement of the BIADM. Patient demographics and additional surgical details are provided in **Supplemental Digital Content 3**. (See **figure, Supplemental Digitel Content 3**, which displays a 76-year-old woman with a 2.5-cm upper-inner quadrant right breast cancer (http://links.lww.com/PRSGO/B553.). Given her multiple medical comorbidities and fatty-replaced breasts, we advise against any sophisticated approaches to reconstruct her lumpectomy defect. She agrees to immediate volume replacement with a BIADM construct. Here, she is shown 14 months after the completion of radiotherapy with a slightly smaller right breast and a subtle deformity in the right upper-inner quadrant.

DISCUSSION

BioZorb has been described to reconstruct partial mastectomy defects, encouraging tissue ingrowth with excellent aesthetic results in long-term follow-up.[6] After oncological resection, there is often minimal residual glandular or subcutaneous tissue, especially in underweight patients and/or in those with larger tumors. In these patients, placement of a naked BioZorb may increase the likelihood of complications during or after radiotherapy. We use ADM to provide additional cover between the skin and BioZorb. We believe BioZorb acts as a strut, keeping the anterior and posterior faces of the ADM open, allowing for tissue ingrowth in and around the device as it reabsorbs and new fibrous tissue becomes organized. ADM contains collagen, elastins, laminins, proteoglycans, and a basement membrane facilitating neovascularization, cytologic ingrowth, cell propagation, migration, differentiation, fibroblast infiltration, and epithelization and efficiently incorporates into surrounding tissues.[7] The efficient integration of the ADM with well-vascularized overlying skin in the weeks after surgery and before radiotherapy may safeguard against extrusion. The ADM provides a level surface for the skin to rest upon as opposed to the irregular twirls of the BioZorb, preventing fibrotic depression of the skin in the absence of soft tissue coverage. Finally, ADM, which is relatively resistant to the fibrotic contraction and injury secondary to radiotherapy,[8] may further help to preserve cosmesis and prevent local deformity.

We acknowledge that the benefits of ADM here are speculative and that increased costs (≈20 dollars/cm² and ≈1000 dollars per surgery) must be considered. These costs and risk of complications are less than for a mammaplasty with contralateral symmetry surgery, perforator flap reconstruction or mastectomy and reconstruction. Despite the speculative nature of this report, we believe that most would agree that placing a foreign body under a denuded skin flap that will undergo radiotherapy would be unwise. The author has removed 3 extruded BioZorb after radiotherapy likely secondary to insufficient soft tissue coverage which ultimately resulted in significant deformity (unpublished observations). Others have also found that the addition of ADM may prevent extrusion of an implant through radiated thin skin (Table 1).[9]

CONCLUSIONS

BioZorb is an absorbable implant placed into the lumpectomy bed, serving as a marker for radiotherapy. It also replaces volume, effectively avoiding deformity and preserving breast contour. This implant, unlike conventional prosthetics, is not at risk for capsular contracture, infection, extrusion or failure when soft tissue coverage is available. In situations where there is minimal soft tissue left after partial mastectomy, we have found that the use of ADM allows for efficient coverage of the device with minimal palpability and good long-term aesthetic outcomes after the completion of radiotherapy.

Jean-Claude D. Schwartz, MD, PhD
Department of Surgery
Northside Hospital Gwinnett
Northside Gwinnett Surgical Associates
631 Professional Drive, Suite 300
Lawrenceville, GA 30046
E-mail: gabreastsurgery@gmail.com

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