

Combining a Chest Wall Perforator Flap and Bioabsorbable Implant to Facilitate Oncoplastic Breast-conserving Surgery

Jean-Claude D. Schwartz, MD,
PhD

Summary: Oncoplastic breast conservation is classically divided into two approaches: volume displacement and volume replacement (VR). These approaches are important to use when more than 20% of the breast is removed to avoid deformity. Smaller, nonptotic breasts require VR strategies from flaps based off of local chest wall perforators. When larger volumes are required, a flap based off the thoracodorsal artery can be used. Although this flap can replace larger volumes, it usually requires a position change with increased operative time, patient morbidity, and longer recovery while also exhausting a major reconstructive modality. In an effort to avoid this increased operative complexity, we have found that combining a local chest wall perforator flap and bioabsorbable implant, which has been previously shown to be safe and effective in reconstructing partial mastectomy defects, allows for a simpler VR strategy in patients who might otherwise require a more extensive thoracodorsal artery-based flap surgery or a mastectomy. Here, we present 10 cases where we combined flaps based off the lateral, anterior or medial intercostal artery perforators or lateral thoracic artery perforator with a bioabsorbable implant to successfully perform oncoplastic breast conservation in patients who might otherwise be marginal candidates for VR using a local chest wall perforator flap. (*Plast Reconstr Surg Glob Open* 2023; 11:e4957; doi: 10.1097/GOX.0000000000004957; Published online 26 April 2023.)

INTRODUCTION

Small, nonptotic breasts require volume replacement (VR) for oncoplastic breast conservation when more than 20% of the breast is excised.¹ VR is performed with local chest wall perforator flaps (LCWPF) or thoracodorsal artery (TDA) flaps.² Although LCWPFs result in minimal patient morbidity compared with TDA-based flaps, they supply less tissue. LCWPFs also have difficulty reconstructing peripheral areas of the breast [eg, the upper inner quadrant (UIQ)], where the distal end of the flap must be used, which is often thin and lacks volume.³ In central areas of the breast, LCWPFs can be folded on themselves to reconstruct a defect, which is difficult in areas distant from the perforator, where the majority of the flap cannot reach.

Recently, surgeons have described a bioabsorbable implant composed of polylactic acid and six titanium clips, which is placed into the lumpectomy bed, facilitating fibrous tissue ingrowth and maintenance of breast contour.⁴ We reasoned that combining this implant with an LCWPF might allow us to reconstruct defects that might otherwise require a mastectomy or more extensive flap surgery.

PATIENTS AND METHODS

Ten patients underwent immediate reconstruction after partial mastectomy using LICAP, MICAP, AICAP, or LTAP flaps in combination with a BioZorb implant (Hologic, Inc., Marlborough, Mass.; Fig. 1). (See Video [online], which demonstrates the intraoperative details of our approach of combining a medial intercostal artery perforator flap and BioZorb implant to facilitate oncoplastic breast conservation. The woman presented here has a small, nonptotic breast with a 2.5 cm cancer in the

From the Gwinnett Surgical Specialists, LLC, Lawrenceville, Ga.
Received for publication January 13, 2023; accepted March 2, 2023.

Copyright © 2023 The Author. Published by Wolters Kluwer Health, Inc. on behalf of The American Society of Plastic Surgeons. This is an open-access article distributed under the terms of the [Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 \(CCBY-NC-ND\)](https://creativecommons.org/licenses/by-nc-nd/4.0/), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.
DOI: 10.1097/GOX.0000000000004957

Disclosure statements are at the end of this article, following the correspondence information.

Related Digital Media are available in the full-text version of the article on www.PRSGlobalOpen.com.

UIQ. Neither a BioZorb implant nor a local chest wall perforator flap alone would be sufficient to reconstruct this defect, but used together, we are able to obtain an excellent result.)

After partial mastectomy and nodal evaluation were performed, gross intraoperative margins were assessed to minimize the risk of positive margins. Perforators were identified using a handheld 8 megahertz Doppler. The MICAP, AICAP, LICAP, or LTAP flaps were then raised as previously described.⁵ After placement of the flaps into the lumpectomy bed and closing the donor site, patients were sat up for evaluation. If additional volume was necessary, different BioZorb sizes (ranging from 2 cm × 2 cm to 4 cm × 5 cm) were placed to fill the defect. The BioZorb was then secured to the pectoralis and lumpectomy bed, followed by mobilizing the perforator flap over the BioZorb or by creating a BioZorb-perforator flap construct and then securing this to the lumpectomy bed (Fig. 1). (See figure, Supplemental Digital Content 1, which displays a perforator flap-Biozorb construct that is delivered as a unit

Takeaways

Question: How can we reconstruct more extensive partial mastectomy defects in women with smaller, nonptotic breasts?

Findings: By combining a local chest wall perforator flap and a bioabsorbable implant, we can avoid more extensive flap surgery and mastectomy in women with smaller breasts.

Meaning: The combination of a local chest wall perforator flap and bioabsorbable implant offers smaller breasted women with larger breast cancers a simpler way to save their breasts, avoiding deformity and mastectomy.

into the lumpectomy bed and then secured to the residual tissues there. This is an approach different from the one demonstrated in the article, where the Biozorb is secured to the chest wall and breast tissue first followed by delivery of the flap into the breast for anterior coverage. In our

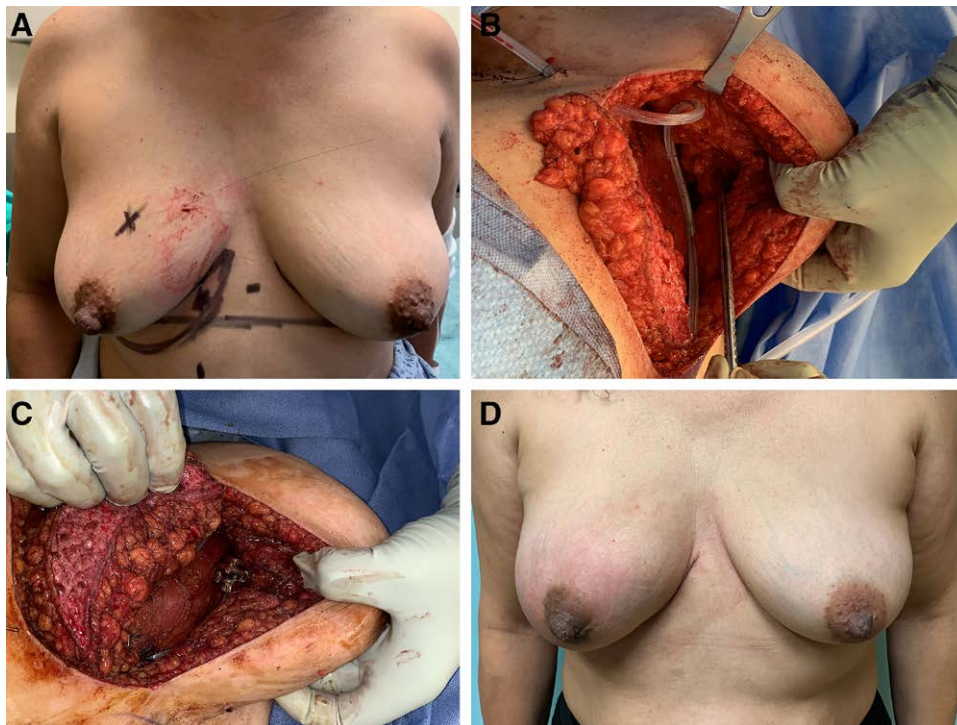


Fig. 1. Oncoplastic breast conservation with a local chest wall perforator flap and Biozorb implant. A, A 49-year-old woman with a 3.4 cm UIQ right breast cancer. She refuses both mammoplasty scars and contralateral surgery for symmetry. She desires breast conservation but would prefer to avoid the complexity of a thoracodorsal artery perforator flap. We offer her a medial intercostal artery perforator flap reconstruction and advise her that we may need to supplement the flap volume with a BioZorb, which we will determine intraoperatively. B, The perforator flap is harvested from tissue below the inframammary fold and the lumpectomy defect is demonstrated. This is a full-thickness excision from subcutaneous tissue down to chest wall, and placing a naked Biozorb here would be ill advised. C, Demonstration of the Biozorb implant sutured to the chest wall and surrounding breast tissue in preparation for anterior coverage by the perforator flap. Sometimes the Biozorb is sutured to the the perforator flap and then brought into the lumpectomy cavity as a perforator flap-Biozorb unit (see Supplemental Digital Content 1, <http://links.lww.com/PRSGO/C518>). The patient is then sat up, and minor adjustments to the BioZorb and perforator flap positioning can be made to optimize the result. D, Demonstration of her final result one year after the completion of radiotherapy. The reconstructed breast is slightly fuller than the contralateral breast, but overall demonstrates excellent symmetry with no evidence of deformity.

experience, fewer adjustments are necessary when the flap and BioZorb are delivered into the breast together as a unit to reconstruct the lumpectomy defect. <http://links.lww.com/PRSGO/C518>.)

We use the same protocol here to prevent biofilm contamination and infection as we do when performing implant-based postmastectomy reconstruction.⁵ Drains were placed into the lumpectomy bed and removed within 1 week. Patient satisfaction with outcomes was assessed using a five-point Likert scale at a minimum of 11 months after surgery (1 = strongly disagree, 2 = disagree, 3 = undecided, 4 = agree, 5 = strongly agree) for the following questions:

1. My breast looks and feels natural, without deformity.
2. My nipple and breast sensation are normal.
3. My breasts seem symmetrical.
4. If confronted with the same decision again, I would undergo the same reconstruction.

RESULTS

Patients' ages and body mass indexes ranged from 39 to 74 years (mean = 54.5, SD = 12.6) and 21.1 to 32.6 kg/m² (mean = 24.7, SD = 3.5), respectively. All patients underwent breast conservation and radiotherapy with at least 11 months follow-up. One patient underwent re-excision with preservation of the BioZorb-perforator construct. There were no infections, device removals, or flap failures. One LICAP flap donor site seroma was drained in the office. Consistent with previous reports, we haven't witnessed a loss of contour or volume in long-term follow-up.^{4,6} Tumor locations were UIQ (6), central (2), and upper-outer quadrant (2). Additional operative details, including BioZorb implant size, lumpectomy weight, tumor size, and chest wall perforator flap used for each patient, are provided. (See table, **Supplemental Digital Content 2**, which displays the demographics, intraoperative details and oncologic and reconstructive details for each patient. <http://links.lww.com/PRSGO/C519>.)

Nine of 10 patients responded to the questionnaire regarding outcomes, with most agreeing or strongly agreeing that their breast looked and felt natural (4.7 ± 0.33), nipple and breast sensation returned to normal (4.5 ± 0.46), breasts appeared symmetrical after surgery (4.6 ± 0.49) and they would agree to the same surgery again (4.8 ± 0.22).

DISCUSSION

LCWPFs have simplified VR for smaller, nonptotic breasts that were previously reconstructed with TDA-based flaps or recommended to undergo mastectomy.⁷ These flaps require less operative time, result in less patient morbidity and recovery, don't require a position change, and don't exhaust a major reconstructive modality. Despite these benefits, LCWPFs provide less volume, especially in thinner patients. This challenge is compounded when reconstructing peripheral breast defects, where only the distal end of the flap, which is typically thinner, can reach. To avoid a more complex TDA-based flap or mastectomy, we have found that combining a BioZorb implant with

an LCWPF often provides the necessary volume to reconstruct these defects.

Initially devised to more accurately direct radiotherapy,⁸ surgeons subsequently realized that BioZorb facilitated fibrous tissue ingrowth and helped maintain breast contour and reconstruct partial mastectomy defects, withstanding the effects of radiotherapy in follow-up.^{4,6} Although BioZorb implants are helpful in reconstructing lumpectomy defects, they have a limited size range and are reliant on soft tissue coverage to reduce palpability and prevent extrusion during and after radiotherapy.⁹ This soft tissue coverage is often sparse in thinner women or in those who undergo resection at the edge of the breast where there is minimal tissue. We previously described combining a BioZorb implant and an acellular dermal matrix¹⁰ when there was minimal residual soft tissue for coverage. We have now abandoned this approach in favor of LCWPF coverage, which better protects against extrusion of the device during radiotherapy, minimizes palpability of the BioZorb, and provides the necessary volume and improved breast contour compared with an initially avascular and thin layer of acellular dermal matrix. The added cost of the BioZorb (\$1280) must be taken into consideration, but we feel that its selective use to avoid more extensive flap surgery, mastectomy, or additional surgery for revision is warranted.

CONCLUSIONS

Extensive partial mastectomies in small, nonptotic breasts require VR to avoid deformity. Although LCWPFs often provide the volume to achieve this, larger resections in more peripheral breast locations may require additional volume. We have found that by combining a bioabsorbable implant and an LCWPF, we are able to avoid deformity without resorting to more complex TDA-based flap surgery or mastectomy.

Jean-Claude D. Schwartz, MD, PhD
Gwinnett Surgical Specialists, LLC
631 Professional Drive, Suite 300
Lawrenceville, GA 30046
E-mail: gabreastsurgery@gmail.com

DISCLOSURE

The author has no financial interest to declare in relation to the content of this article.

REFERENCES

1. Salibian AA, Olson B, Shauly O, et al. Oncoplastic breast reconstruction: principles, current techniques, and future directions. *J Surg Oncol*. 2022;126:450–459.
2. Rutherford CL, Barker S, Romics L. A systematic review of oncoplastic volume replacement breast surgery: oncological safety and cosmetic outcome. *Ann R Coll Surg Engl*. 2022;104:5–17.
3. Lin J, Chen DR, Wang YF, et al. Oncoplastic surgery for upper/upper inner quadrant breast cancer. *PLoS One*. 2016;11:e0168434.
4. Harman J, Govender S, Simpson J, et al. A new method for partial breast reconstruction: 3-year New Zealand experience. *Plast Reconstr Surg*. 2019;14:49–52.
5. Baker NF, Brown O, Hart AM, et al. Preventing infection in implant-based breast reconstruction: evaluating the evidence for

- common practices and standardized protocols. *Plast Reconstr Surg Glob Open*. 2022;10:e4208.
6. Kaufman CS, Cross MJ, BaroneDekhne NS, et al. A three-dimensional bioabsorbable tissue marker for volume replacement and radiation planning: a multicenter study of surgical and patient-reported outcomes for 818 patients with breast cancer. *Ann Surg Oncol*. 2021;28:2529–2542.
 7. Chartier C, Safran T, Alhalabi B, et al. Locoregional perforator flaps in breast reconstruction: an anatomic review & quadrant algorithm. *J Plast Reconstr Aesthet Surg*. 2022;75:1328–1341.
 8. Cross MJ, Lebovic GS, Ross J, et al. Impact of a novel bioabsorbable implant on radiation treatment planning for breast cancer. *World J Surg*. 2017;41:464–471.
 9. Kaufman CS. Breast conserving surgery with a 3d bioabsorbable marker (biozorb): a surgeon's 5-year experience. May 2019. Available at <https://hologiced.com/wp-content/uploads/2020/01/WP-00150-Rev-001-Breast-ConservingSurgery-6769r3p.pdf>. Published 2019. Accessed January 12, 2023.
 10. Schwartz JD. Use of a bioabsorbable implant-acellular dermal matrix construct to facilitate oncoplastic breast-conserving surgery. *Plast Reconstr Surg Glob Open*. 2021;9:e3356.