

Discussion: Applications of Acellular Dermal Matrix in Revision Breast Reconstruction Surgery

Gregory A. Dumanian,
M.D.
Chicago, Ill.

The results by Spear et al. in their article “Applications of Acellular Dermal Matrix in Revision Breast Reconstruction Surgery” are excellent and worthy of critical analysis. Having some experience using acellular dermal matrices in both breast and abdominal wall reconstruction,¹ I may view these products from a different vantage point.

The largest group of patients in the article were treated for a suboptimal position of the inferior aspect of the reconstructed breast mound. The Patients and Methods section of the article could be more illuminative. From Table 2, all 57 breasts treated for malposition were evaluated as having successful procedures, although from Table 4 it is clear that at least one implant was removed for infection. We do not know who evaluated these lifted or lowered folds in the postoperative period, what criteria were used to define success, or the average time until evaluation in this subgroup. It is not known from the article how many folds were lifted, how many were lowered, and what number of procedures were performed at the tissue expander stage as opposed to a revision of the final implant. We know that two-thirds of the total patients were originally treated by the senior author before this revision. However, we do not know how many patients were treated with acellular dermal matrix at the stage before this surgical revision, nor are any thoughts provided as to why these patients developed fold malposition to begin with.

The stated reason for placement of acellular dermal matrix was to “reinforce the repair, with the intent of reducing the risk of recurrence.” At least for fold elevation, reinforcement of the fold suture line with acellular dermal matrix sounds analogous to direct hernia repairs reinforced with bioprosthetic mesh. In these hernia repairs, mesh initially acts to distribute forces across a suture line and to decrease suture pull-through by lowering

the forces felt at the suture-tissue interface. With integration, the acellular dermal matrix acts to further strengthen the repair, as neovascularization and collagen deposition occur over a broader area than just at the suture repair line. However, pending new experimental observations, acellular dermal matrix heals through a scar process rather than by means of tissue regeneration as originally touted. Therefore, the length of follow-up is critical. The literature and my personal experience of the durability of acellular dermal matrix–supported hernia constructs point to an ineffectual product that remodels and weakens over time. Acellular dermal matrix that spans a hernia defect has a high chance of long-term failure—16 of 16 cases treated with non–cross-linked porcine acellular dermis in my hands had a repeated hernia within 2 years, and others have reported similar failure rates.² As opposed to a spanning bioprosthetic mesh when forces are experienced by the material without additional support from the patient, in direct supported repairs, the mesh is used to buttress or reinforce a primary suture line that may have done fine without any additional material. In this article, a control group of patients treated without acellular dermal matrix by the same surgical team and for the same types of problems would have dramatically strengthened the conclusions. When the literature is used for a control group, some comparisons can be drawn, but the reader is left wondering whether apples are truly being compared with apples and whether the patient groups are similar. For instance, direct supported midline hernia repairs using non–cross-linked porcine products have recurrence rates of 28 percent at 2 years,³ whereas similar repairs *without* acellular dermal matrix fail at a 23 percent rate.⁴ Were the patient groups similar enough to draw a reasonable comparison? The duration of follow-up is critical for evaluating the efficacy of a buttressed suture

From Northwestern Memorial Hospital

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line. For illustration, a randomized prospective trial compared bioprosthetic mesh as a buttressing material to simple suture repair of paraesophageal hernias. At 6 months, the buttressed repair showed a significantly lower recurrence rate of 9 percent at 6 months in comparison with sutures alone.⁵ However, long-term follow-up at 5 years showed the buttressed and the unsupported failure rates to be statistically equal at approximately 55 percent.⁶ To justify use of these expensive products, users of biological materials need to demonstrate efficacy either as a bridged material, or with improved efficacy as a direct support repair. Adequate follow-up is critical. Because the products require time to integrate and remodel, follow-up time should be extended to adequately capture the delays in healing times engendered by biological materials. During this extended healing time, patients may indeed have improved short-term results. As concluded by Zienowicz in his discussion on acellular dermal matrix, “I am sure that many of our dermal matrix-assisted patients *are enjoying the wait* [italics mine] considerably more than they otherwise might have.”⁷ Although I cannot define what the appropriate follow-up should be for a breast revision, 207 days’ average follow-up seems too short considering the durability I have seen for bioprosthetic mesh in hernia repair. From personal nonscientific observations, I would judge human acellular dermal matrix to have some persistence for 6 to 9 months and porcine acellular dermal matrix to last double that length of time. To me, a reasonable follow-up should be some multiplier

(two to four times?) of the expected duration of the products.

Although the outcome “fold position” is extremely important, there are at least two other reasons to use acellular dermal matrix for revision breast reconstruction that were not mentioned for this first subgroup. Direct supported repairs of the fold with acellular dermal matrix are easier to perform in comparison with more standard suture techniques approximating deep dermis to periosteum and perichondrium. Perhaps this is one of the main reasons to use acellular dermal matrix for the occasional breast surgeon. Spear et al. do not mention improved cosmetics with avoidance of significant skin scalloping or dimpling that occurs with suture elevation of the fold. Both of these would be relative indications for using acellular dermal matrix in revision of the inframammary fold.

The second largest group of patients in this study were treated for capsular contracture. Multiple authors have written about the beneficial results of preventing the implant from contacting the chest tissue with the use of acellular dermal matrix. Scientific studies, some funded by acellular dermal matrix manufacturers, have been published demonstrating decreased capsular thickness when acellular dermal matrices are used.⁸ Multiple authors have agreed clinically that acellular dermal matrix decreases the occurrence of capsular contracture. However, the time course of capsular contracture is a slow and progressive process over years and decades (Fig. 1).⁹ The acellular dermal matrix initially prevents the chest tissues from touching or

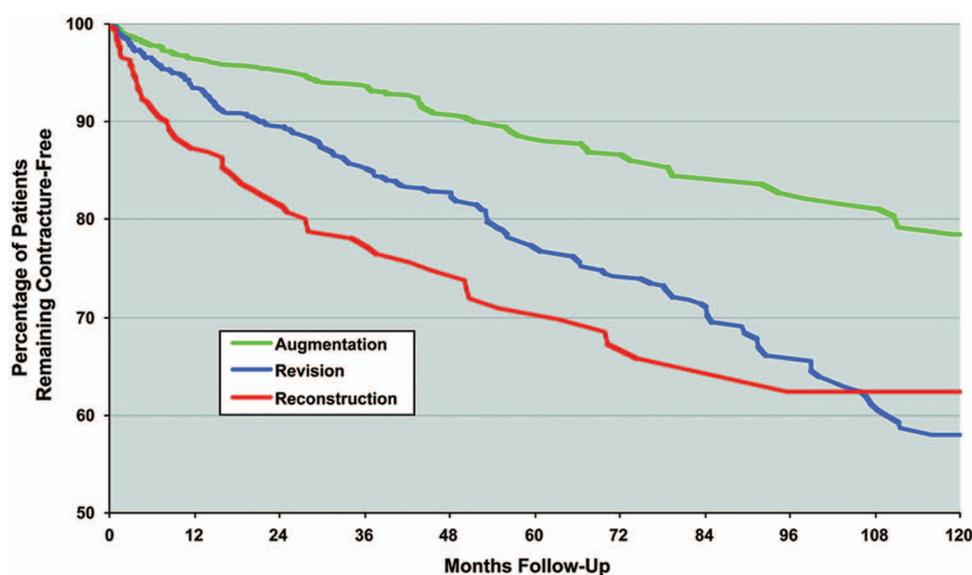


Fig. 1. Incidence of capsular contracture for three subgroups of breast surgery using implants. (From Handel N, Cordray T, Gutierrez J, Jensen JA. A long-term study of outcomes, complications, and patient satisfaction with breast implants. *Plast Reconstr Surg.* 2006;117:757–767.)

contacting the implant. With time and incorporation of the materials, unless the acellular dermal matrix has magical properties, the chest tissues will contact the implant and the scar encapsulation process will occur. In all likelihood, the acellular dermal matrix is simply delaying the onset of contracture by the length of time it is present and incorporating. Considering the published time course of capsular contracture in a large number of patients, 207 days' average follow-up would not be nearly enough time for a proper evaluation.

The authors make a case for inferior pole support using acellular dermal matrix. Despite an appropriate position of the inframammary fold, the authors felt a need to change the shape or position of the lower skin flap holding the implant in place. Here again, analogies to hernia formation may be illustrative. Acellular dermal matrix was initially skin, and skin expands with constant pressure over time. After all, a hernia acts as a tissue expander and stretches the overlying skin. AlloDerm (LifeCell Corp., Branchburg, N.J.) in particular has a characteristic stretch when placed under tension. The product insert for AlloDerm for abdominal wall reconstruction recommends placing the material under significant tension to stretch it 30 to 50 percent to take up this slack.¹⁰ No such recommendations to deal with acellular dermal matrix elasticity is found in this article. In fact, I am still not sure whether the authors want the acellular dermal matrix to create more or less total scar (the flip side of elasticity). For support of the inframammary fold and/or the inferior pole, they seem to use the acellular dermal matrix to create a permanent scar. For treatment of capsular contracture, the acellular dermal matrix is used to prevent the formation of scar. It is difficult to understand how a single product can create two opposite effects successfully.

The results in this series are excellent and the data are a meaningful addition to the literature. However, there are many unanswered questions. The senior author has been a champion of acellular dermal matrix use, and he has published extensively in the era before acellular dermal matrix for his own internal comparison group. In his hands and in his opinion, these products are beneficial to

patient outcomes. However, is it possible that other less expensive techniques or materials could have been used to achieve the same effects? The capsular contracture observations are encouraging—but still very early. Based on my own experience with these products, an analysis of the literature, and the very short follow-up of this article, I remain unconvinced of their widespread utility.

Gregory A. Dumanian, M.D.

Division of Plastic Surgery
Northwestern Memorial Hospital
675 North St. Clair Street
Chicago, Ill. 60611-4807
gdumania@nmh.org

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