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CASE REPORT
Breast

Red Breast Syndrome and Acellular Dermal Matrix

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Summary: Increasingly popular for use in breast reconstruction, acellular dermal matrix (ADM) can provide support and protection to implants. However, use of ADM may be associated with infection and complications, including red breast syndrome (RBS). RBS is an inflammatory event that typically presents with cutaneous erythema over the domain where the ADM is surgically implanted. As ADM use increases, presumably, more cases of RBS will occur. Thus, techniques and tools to mitigate or manage RBS are needed to improve patient outcomes. Here, we describe a case where RBS was diagnosed and interestingly resolved after exchange for a different brand of dermal matrix. This surgical resolution maintained excellent reconstructive results with no recurrent erythema over a follow-up period of 7 months. Although we cannot rule out RBS due to other variables, RBS due to patient hypersensitivity to certain ADMs has been documented in the literature. In this instance, our results suggest that revision with an alternate ADM brand may serve as a potential solution. *(Plast Reconstr Surg Glob Open 2023; 11:e5062; doi: 10.1097/GOX.0000000000005062; Published online 12 June 2023.)*

Acellular dermal matrix (ADM) is derived from dermal allograft or xenograft and processed to remove native cells. Conjunctive use with expanders or implants during breast reconstruction assists with positioning, lessens capsular contracture, eliminates autograft harvesting, decreases implant exposure, adds thickness to decrease ripples, and may enhance aesthetic results compared to muscular coverage.[1–3] As with many surgical procedures, ADM use may result in overall complications, infection, hematoma/seroma, and red breast syndrome (RBS), which has a reported incidence rate of 0%–27% (mean 6.4%).[1,4,5]

Although etiology is poorly understood, RBS is potentially linked to ADM implantation: (1) allergic reaction to packaging additives, (2) basement membrane orientation, (3) residual donor DNA, (4) neovascularization and/or lymphatic obstruction, (5) hypersensitivity, (6) processing agents, and/or (7) sterility.[4] Often, it is self-limiting, yet some treat with steroids or complete ADM removal for persistent cases. We present a case of RBS treated by exchange of ADM with another brand while maintaining successful reconstructive results.

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CASE DESCRIPTION

A 39-year-old Hispanic woman was diagnosed with left breast mucinous carcinoma after incidental findings at our institution during cosmetic bilateral inferior pedicle Wise pattern mastopexy in 2021. At follow-up, the incisions were well approximated without signs of infection, and she was referred to breast oncology and hematology/oncology to address biopsy findings.

The patient underwent bilateral nipple-sparing mastectomy at an outside institution with delayed-immediate reconstruction involving bilateral placement of prepectoral textured tissue expanders and allograft ADM (AlloDerm SELECT RTM, Allergan). She received adjuvant chemotherapy based on her Oncotype DX score. She presented to our emergency department ~2.5 months after the mastectomies for intermittent left breast pain, redness, and swelling. Her medical reports showed hospitalization with IV antibiotics 19 days prior for apparent expander infection. Because the treating physician noted no effect to the erythema, the patient was discharged with no additional antibiotic course. In our emergency department, she was afebrile with normal lymphocyte counts but had significant skin erythema and warmth with a moderate amount of pericapsular fluid, which was percutaneously aspirated. Cultures from both aspirate and blood were negative for bacterial and fungal microorganisms. Outpatient follow-up continued with persisting isolated erythema and warmth along the left breast medial

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

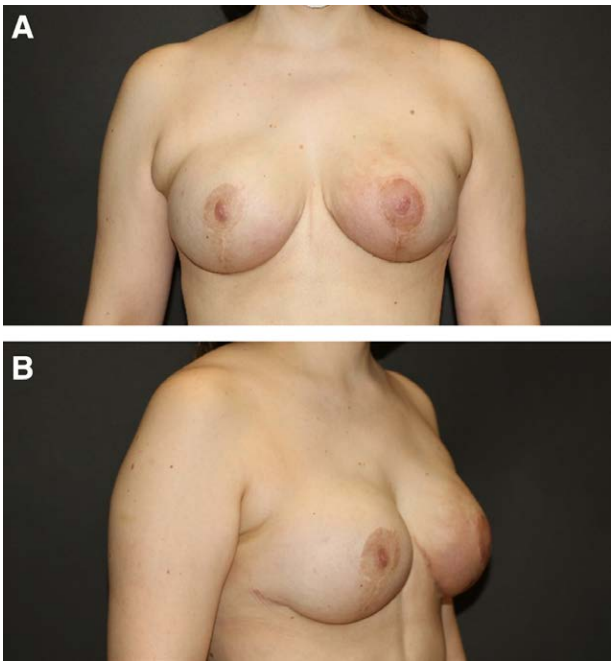

Fig. 1. A, Frontal preoperative photograph. Left breast erythema can be appreciated, especially on the medial border. B, Oblique preoperative photograph.

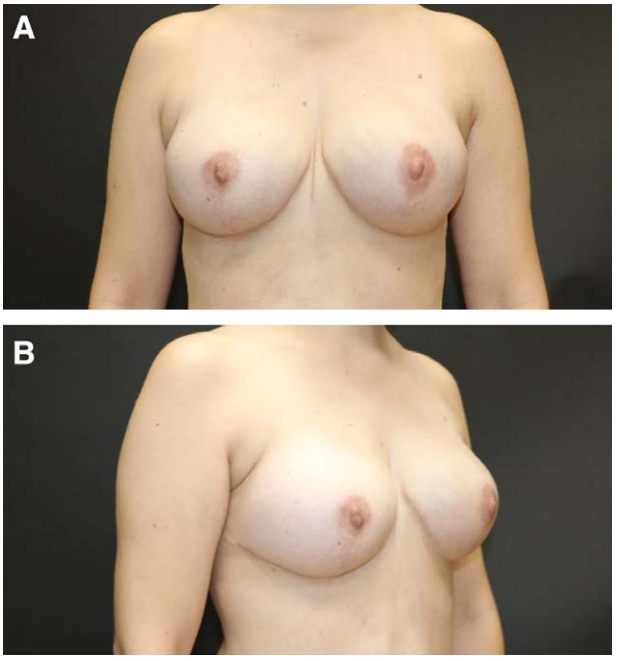

Fig. 2. A, Frontal 7-month postoperative photo. Left breast erythema has resolved without recurrence. B, Oblique 7-month postoperative photograph.

pole, extending from the T-vertex to two finger breaths below the clavicle with pericapsular fluid. A month later, 240 cm^3 was removed from both expanders to alleviate tension (originally 550 cm^3). After discussion with infectious disease specialists, a second percutaneous aspiration of breast fluid was sent for culture with sensitivities, which again resulted in no microorganism growth.

Two months after presentation to our emergency department, erythema persisted (Fig. 1). To address the erythema, complete reconstruction, and resolve asymmetry, we decided to remove bilateral expanders, perform allograft capsulectomy, place silicone implants with a different brand of allograft ADM (SimpliDerm, Aziyo Biologics), and perform bilateral mastopexy. Remarkably, inflammatory symptoms immediately subsided upon exchange of ADM. Her postoperative course was uneventful apart from contact dermatitis from Prineo Dermabond tape; the previous left breast erythema and pain were resolved. At 7-month follow-up, the erythema had not returned (Fig. 2).

DISCUSSION

RBS is difficult to distinguish from infection, yet differentiation is crucial, as untreated infection can progress to reconstructive failure. In this patient, presentation of erythema, warmth, and pain may have indicated infection. However, the combination of failed antibiotic treatment, persistent negative cultures, lack of leukocytosis/fever, erythema directly over the ADM, and complete resolution upon reoperation led us to believe this was not an infectious etiology. ADM biofilm growth can incite inflammatory reactions, like RBS, without classic signs of infection.[6] We did not culture explanted ADM; so biofilm formation cannot be excluded. However, unidentified organisms on the ADM do not negate the inflammatory symptoms without systemic signs of infection, which defines RBS.

Because we noted immediate subsidence of inflammatory symptoms upon exchange of ADM brands, this strongly suggested that the initially implanted ADM may have caused the reaction. Supporting this hypothesis, studies have linked AlloDerm with higher rates of RBS than other ADMs.[7,8] Based on proposed RBS etiologies, one can imagine how different ADM manufacturing processes could lead to varied risk of RBS. We chose to substitute ADMs instead of lipofilling to maintain reconstructive results, including support and decreased wrinkling and contour deformities granted by ADM coverage without risking multiple additional procedures often needed with fat grafting alone.[9]

Both ADMs in this report are derived from human dermis, packaged hydrated, and had similar positioning; however, processing methods differ. SimpliDerm is processed to a higher sterility assurance level (SAL 10^{-6}) than AlloDerm (10^{-3}). In comparative studies, patients implanted with lower SAL ADM had higher rates of RBS than patients implanted with higher SAL ADM.[8] Processing solutions also differ: SimpliDerm avoids use of polysorbate 20, which could potentially cause postoperative inflammation.[10] In fact, implantation of SimpliDerm led to decreased proinflammatory cytokine expression and inflammation compared with AlloDerm in a head-to-head animal model.[11] Further, detergent use may disrupt scaffold architecture and support biofilm formation, which may be a causal factor for RBS.[6,12] SimpliDerm has displayed conservation of native ADM extracellular matrix

architecture and tissue remodeling cytokines.[13] A combination of these factors may have contributed to successful use of ADM upon second attempt in our patient.

It is unknown why RBS presented unilaterally when AlloDerm was used bilaterally. However, a recent publication reported 83.3% of patients experience unilateral RBS, supporting our findings.[6] Because RBS presented in a previously malignant breast, investigating rates in oncologic versus prophylactic reconstructed breasts would be interesting, as the immune system plays a complicated, varied role in both promoting and decreasing inflammation in breast cancer.[14] Perhaps previous malignancy alters territorial immune cell function, as we observed two varieties of type IV sensitivity reactions (RBS, contact dermatitis) on the same breast. Regardless, we present an experience of resolved RBS after exchange of ADM brand. This is not the first time RBS has resolved after exchange of AlloDerm for another acellular matrix.[15] Although we cannot rule out RBS due to other clinical variables, our results suggest ADM brand exchange could serve as treatment for persistent RBS, especially when surgical intervention is necessitated.

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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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