

# Infectious Complications following Breast Reconstruction Using Tissue Expanders in Patients with Atopic Dermatitis

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**Summary:** Infectious complications represent one of the most prominent factors contributing to tissue expander (TE) loss in breast reconstruction procedures. Several patient characteristics that increase the risk for surgical-site infection or TE infection have been reported, but no study has focused on the relationship between atopic dermatitis (AD) and TE infection or surgical-site infection. Recently, we investigated 203 cases of breast reconstruction surgeries performed using TEs and noted that all 3 patients who had AD developed infectious complications that ultimately led to TE removal. Considering its pathophysiology, it is likely that patients with AD relatively easily develop infectious complications due to barrier dysfunction, abnormalities in innate immune responses, or colony formation by *Staphylococcus aureus*. Particular caution should be exercised for breast reconstruction using man-made materials in cases complicated by AD. (*Plast Reconstr Surg Glob Open* 2017;5:e1535; doi: 10.1097/GOX.0000000000001535; Published online 20 October 2017.)

Patient characteristics thought to increase the risk of surgical-site infection include diabetes, smoking, systemic steroid administration, obesity, and preoperative nasal carriage of *Staphylococcus aureus*.<sup>1</sup> Although it is well known that patients with atopic dermatitis (AD) can develop secondary bacterial infections from skin flora, particularly *Staphylococcus*,<sup>2</sup> no study to date has reported that surgical candidates with AD are at increased risk of surgical-site infection. A recent survey conducted at our institution on cases of breast reconstruction using tissue expanders (hereafter, TEs) found evidence of TE infection in 13 (6.4%) of 203 breasts and reported obesity and preoperative nasal carriage of methicillin-resistant *S. aureus* (MRSA) as significant risk factors.<sup>3</sup> Although that particular study did not list AD as a potential risk factor, the 3

patients with AD all developed TE infection. In this article, we report on our findings from these cases.

## CASE REPORTS

Patient cases are summarized in Table 1. All 3 patients with AD underwent immediate reconstruction in the presence of rash dermatitis on the surgical site. Case 2 showed nasal carriage of MRSA, but otherwise, no other risk factors were noted. Four breasts among the 3 patients developed TE infections on postoperative days 16, 8, and 41. Of these, we were able to salvage the TEs in 2 breasts by TE replacement and continuous irrigation, but lost them in the other 2 breasts. The irrigation protocol consisted of saline infusion at 40 ml/h for 1 week via a central catheter placed in the subpectoral pocket.

### Representative Case (Case 2)

The patient was a 36-year-old woman who had struggled with AD from early childhood and was undergoing topical treatment. Steroids were not being administered (Fig. 1).

To address bilateral breast cancer, bilateral skin-sparing mastectomy and left axillary node dissection were performed, and immediate TE placement under the pectoralis major was performed on both sides. Postoperatively, the patient was administered first-generation cephem antibiotics for 6 days.

On postoperative day 8, the patient developed a 38°C fever in addition to a bilateral surgical-site infection.

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**Table 1. Case Series**

	Case 1	Case 2	Case 3
Age	45	36	47
History and treatment of AD	Childhood, no treatment	Childhood, topical steroid ointments	Childhood, no treatment
Symptoms of AD on surgical site	Dry, hyperpigmentation	Erythematous papules, dry, scaly	Hyperpigmentation, dry, scaly
Clinical phase of AD	Chronic	Subacute	Chronic
Other comorbidities (e.g., diabetes or obesity)	None	None	None
Smoking	No	No	No
History of breast cancer	Local recurrence after breast—conservative surgery	Primary	Primary
Operation	Right, SSM + Ax + TE	Left, SSM + Ax + TE; right, SSM + SLNB + TE	Right, NSM + SLNB + TE
Mastectomy skin necrosis	No	No	No
Postmastectomy radiotherapy	No	Yes, postoperative month 6–8 on the left side	No
Timing of infection	Postoperative day 16	Postoperative day 8 (bilateral); postoperative month 8 (left)	Postoperative day 41
Phlogogenic bacterium	MSSA	Left, MSSA; right, MRSA	MSSA
Outcome	No reconstruction	Autologous reconstruction	Autologous reconstruction

SSM, skin-sparing mastectomy; NSM, nipple-sparing mastectomy; Ax, axillary node dissection; SLNB, sentinel lymph node biopsy; MRSA, methicillin-resistant *S. aureus*; MSSA, methicillin-susceptible *S. aureus*.



**Fig. 1.** Preoperative image. A subacute lesion due to AD is evident on the anterior chest.



**Fig. 2.** In the eighth postoperative month, TE infection developed immediately after the patient completed irradiation of the left chest wall.

Salvage was possible by TE replacement and continuous irrigation.

During the eighth postoperative month, immediately following completion of radiation therapy to the left chest wall, TE infection recurred on the left side (Fig. 2), and salvage was deemed impossible, leading to TE removal. Half a year after TE removal on the right side, bilateral deep inferior epigastric artery perforator flap breast reconstruction surgery was performed. The patient is recovering well with no other complications (Fig. 3).

### DISCUSSION

AD is a chronic, relapsing eczematous skin disease characterized by pruritus and inflammation with a prevalence of 1–3% in adults in most industrialized countries.<sup>4</sup> AD has a wide clinical spectrum of mild-to-severe disease. Acute phase AD presents with intensely pruritic erythematous papules with excoriation and serous exudate; subacute phase AD presents with dry, scaly erythematous papules; and chronic phase AD presents with lichenification, hyperpigmentation, and excoriations.<sup>2</sup>

As of 2013, the Japanese national health insurance has covered breast reconstruction through silicone breast implants (SBIs). Since then, the number of breast reconstruction cases has increased yearly, to over 6,000 cases in 2016 that were breast reconstruction procedures involving TEs. Given these data, the prevalence of those with AD cannot be ignored any longer.

Conventionally, keratin serves as a strong barrier that prevents the invasion of various disease agents, but in the skin of patients with AD, this barrier function is disabled. Due to the reduced expression of filaggrin, the moisture level is low in the cuticle and the pH of skin increases, because adhesion between keratinocytes is weakened.<sup>4</sup> In addition, certain innate immune system abnormalities occur, including decreased production of antimicrobial peptides that target *S. aureus*,<sup>5</sup> dysfunction in neutrophil migration to the skin and a lack of pathogen recognition receptors.<sup>6</sup> Moreover, colonization of *S. aureus* occurs at a high frequency on the skin of patients with AD, even in noninflamed areas.<sup>7</sup> Given this pathology, it has been



**Fig. 3.** Post reconstruction with bilateral deep inferior epigastric artery perforator flap. Revision surgery is anticipated.

speculated that patients with AD would be more susceptible to surgical-site infection.

Irradiation is considered a predictor for developing infection following implant-based reconstruction.<sup>8</sup> Radio-dermatitis compromises the integrity of the skin barrier and its immune function due to increased transepidermal water loss and infiltration of pathogens into the skin, resulting in an increased risk of infection. Skin damaged by radiation is somewhat similar to that of patients with AD.<sup>9</sup>

Case 2 in the present study also suffered from a recurrent infection after radiotherapy, suggesting that the AD-related pathologic state and irradiation together affected the infectious complication. Several case reports of deep infection, such as infective carditis, bacteremia, and osteomyelitis, in patients with AD have been published,<sup>10</sup> and it is thought that the transmission routes of bacteria were through the skin to bloodstream, so that, even following SBI procedures, residual risk may remain for late-onset infection. In our cases, the final TE salvage rate was 25%

(1 of 4 breasts). Among the 3 patients, autologous reconstruction was successfully performed in 2 patients, and no reconstruction was performed in 1 patient. With regard to the association between AD and TE/SBI infections, further studies are required. However, for breast reconstruction using man-made materials in cases complicated by AD, this application should be considered carefully, and patient informed consent should be obtained following a thorough explanation of the risks.

## CONCLUSIONS

Cases complicated by AD may face a higher risk for TE infection. Careful selection of reconstruction surgery is necessary, as is vigilance in obtaining the patient's informed consent.

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