

# Deep Inferior Epigastric Artery Perforator Flap Reconstruction for Breast Burn Deformities

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**Summary:** The anterior chest wall is commonly involved in pediatric burn injuries. In women, deep thermal injuries may result in damage to the breast bud and breast skin, which can disrupt breast development and result in long-term deformities. In adulthood, the techniques frequently applied to correct these deformities focus on scar release in combination with skin grafting and implant-based procedures; however, these techniques often result in suboptimal aesthetic outcomes. In this report, we present superior outcomes from applying an autologous breast reconstruction technique to this challenging problem. (*Plast Reconstr Surg Glob Open* 2020;8:e2981; doi: [10.1097/GOX.0000000000002981](https://doi.org/10.1097/GOX.0000000000002981); Published online 14 July 2020.)

## INTRODUCTION

Modern advances in treating acute burn injuries have led to increased survival; however, the long-term morbidity of such injuries remains a challenge. Anterior chest and breast burns are a common site of injury, either from ascending flame burns from clothing or from descending hot fluid pulled from above.<sup>1</sup> In pediatric female patients, deep chest burns can cause injury to the breast bud, leading to long-term breast disfigurement, hypoplasia, or amastia. This can be further exacerbated by scar formation, which restricts breast development. While extensive studies exist on oncologic breast reconstruction, literature on breast reconstruction in the setting of previous pediatric burn injuries is limited. Conventional treatment has involved scar releases, skin grafting, placement of tissue expanders, and implant reconstruction.<sup>2-4</sup> However, prosthetic-based procedures for burn injuries place significant limitations on the quality of the reconstruction, as the overlying burned skin is thick and inelastic akin to radiated skin.<sup>5,6</sup> Comparatively, autologous reconstruction provides the advantage of providing not only volume but also additional skin surface area to replace burned skin.

## CASE REPORT

We report the case of a 38-year-old patient who sustained a hot water scald burn injury to her right chest and shoulder at the age of 6 years. She was subsequently treated with burn excision and skin grafting from which she healed uneventfully but suffered right breast constriction,

while her left breast developed normally. At age 20 years, she underwent reconstruction of the burned breast with placement of a breast implant, followed by a revision at age 28 years with a larger breast implant (Fig. 1A). Despite these interventions, she suffered from right breast deformity and asymmetry.

At age 38 years, she underwent removal of the breast implant, resection of the lower breast burn scar, and delayed breast reconstruction with a 1173 g deep inferior epigastric artery perforator flap (Fig. 1B). The technique for flap inset is identical to that used in oncologic delayed breast reconstruction in patients who have been previously treated with radiation.<sup>7</sup> She subsequently underwent a second procedure for nipple reconstruction (Fig. 1C).

## DISCUSSION

While extensive studies exist for oncologic breast reconstruction, literature on breast reconstruction following pediatric burn injuries is limited, fraught with complications, and largely skewed toward scar release, skin grafting, and implant-based reconstruction. The breast deformities observed in burn patients are analogous to unreconstructed and radiated oncologic mastectomy defects and may benefit from being approached with a similar reconstructive algorithm, especially in cases of unsatisfactory outcomes following conventional reconstructive attempts.

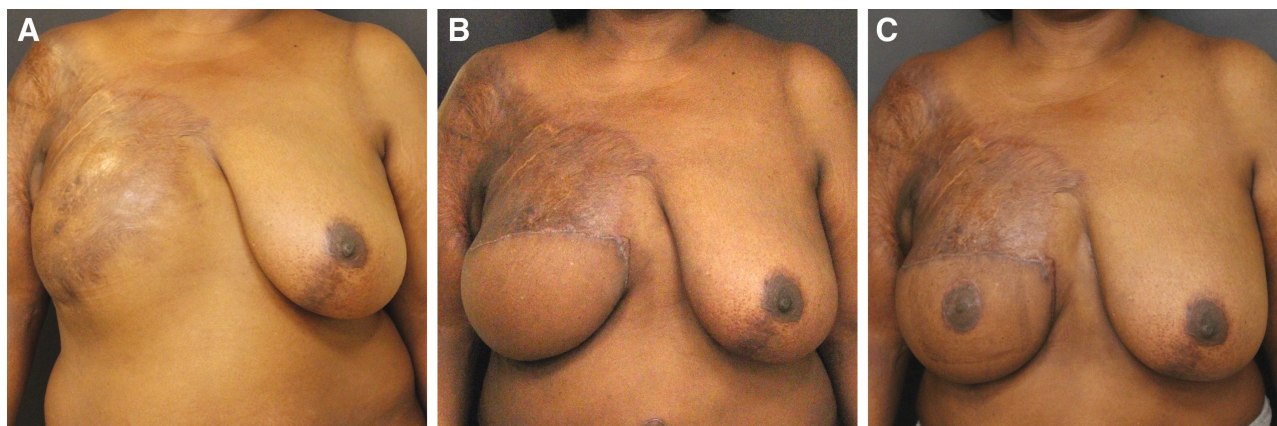
The application of an autologous tissue flap with a large skin paddle accomplishes the goals of restoring breast volume, allows for removal of a portion of the burned breast skin, and increases breast surface area to simulate natural ptosis. Furthermore, achieving pliable and high-quality skin in the reconstructed breast is more predictably accomplished with a large flap skin island compared with more conservative modalities like scar release and skin grafting, laser resurfacing, and

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**Fig. 1.** A, 28-year-old woman with hot water scald burn sustained before right breast development. The patient has already undergone multiple breast reconstruction surgeries with skin grafts and breast implants. B, Postoperative photograph following right breast implant removal and delayed breast reconstruction with a DIEP (deep inferior epigastric artery perforator) flap. C, Completed right breast reconstruction following second-stage nipple reconstruction and areola tattoo. Breast symmetry and natural breast ptosis are restored.

fat grafting. Although individual patients may benefit from these treatments following a burn injury, they are not required for completing the definitive autologous breast reconstruction. The optimal timing for delayed autologous oncologic breast reconstruction has been characterized by Baumann et al<sup>8</sup> as >12 months following completion of radiation therapy. This finding is guided by the quality of and extent of fibrosis around recipient internal mammary vessels as it pertains to free flap survival. This is less relevant in burn patients seeking breast reconstruction who are unlikely to have injured internal mammary vessels. Perhaps, the only prerequisites for completing an autologous breast reconstruction in a burn patient are a good general state of health, maturity and motivation to undergo a complex surgical procedure, and an age at which natural breast development would have been complete. This may delay the definitive reconstruction by a period of years or even decades from the time of the burn injury.

Availability of flap donor sites is an important consideration in burn patients as conventional donor areas may be unavailable due to other burn scars. The authors' preferred donor sites for autologous breast reconstructions include the deep inferior epigastric artery perforator and profunda artery perforator (PAP) flaps, which can yield large volume flaps with a broad skin surface area, but other donor sites can be considered. The disparate anatomic location of these two flaps make it such that at least one of the flaps is likely to be available even in fairly large surface area burns. In selecting a donor site, the reconstructive surgeon must be aware that abdominal donor site closure in nulliparous young women who have sustained burn may be more difficult than in the typically encountered parous adults who have not sustained burns.

Another consideration is future breast cancer screening. Despite having the appearance of a hypoplastic or aplastic breast, significant breast tissue can be observed during recipient site preparation of the burned breast. The presence of an autologous breast reconstruction may lead the patient's future physicians to think that a mastectomy

had been performed, which may alter the screening protocol. The patients should therefore be explicitly counseled that native breast tissue is still present in the reconstructed breast and on the need for future routine breast cancer screening. In a large retrospective review of surveillance mammography in patients with postmastectomy autologous breast reconstruction, Noroozian et al<sup>9</sup> found that continued screening was useful in detecting occult malignancy. MRI was found to be more specific in its ability to detect recurrence before clinical appearance and differentiate between malignant and benign findings.<sup>10</sup> The conclusions of these studies may be relevant to burn patients.

The current study focuses on improving aesthetic outcomes in breast reconstructions of patients who suffer from breast aplasia and deformities following chest burns sustained before breast development. A single-patient photograph series is used to illustrate the benefits of autologous reconstruction in this group. A review of the patient-reported outcomes from a larger series would be helpful for establishing an algorithm to help guide management in burn patients in the future.

## CONCLUSIONS

Autologous tissue reconstruction is well-suited for breast reconstruction in patients whose breast development was stunted by a chest burn. Although this technique is well described for breast reconstruction after mastectomy, very little is reported about applying it to burn patients who present with deformities that share characteristics with radiated oncologic defects. Patient characteristics and flap donor site availability must be carefully considered when formulating the reconstructive plan. Patients should continue with age-appropriate breast cancer screening following completion of breast reconstruction.

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