Even Better Than the Real Thing? Xenografting in Pediatric Patients with Scald Injury

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KEYWORDS

• Scald injury • Pediatric burn • Xenograft • Infections

KEY POINTS

- Xenografting seems a reasonable option for patients with partial-thickness scald injuries.
- Although nonoperative management may be appropriate for small/superficial burns, and autografting may be required for large/deep burns, xenografting provides rapid wound closure.
- Xenografting also permits earlier hospital discharge, reduces need for reconstruction, and should strongly be considered as first-line therapy for intermediate-depth pediatric scald injuries.

INTRODUCTION

Scald injuries remain the most common type of burn in children. More than 250,000 children are burned each year in the United States, and 100,000 of these are scald burns.[1] These numbers reflect only children burned badly enough to need medical attention and do not include children whose caretakers do not seek help. The use of xenografting in burns was described as early as 1880,[2] followed by the report of split-thickness or intermediate-thickness skin grafts in 1929.[3] Best practices on treatment of these injuries continue to evolve as new therapies become available and as understanding of immune-mediated rejection of allografts and xenografts continues to improve.

In 2004, the authors developed a new approach to these scald burns, at their institution, based on the need to standardize a pathway for wound care. Patients with partial-thickness wounds were considered for early excision and xenografting to assist with wound closure, previously a far less common procedure done in their pediatric scald population. Xenografting has previously been shown to reduce pain, have some antibacterial action as a function of its adherence, protect against physical trauma, and provide appropriate head and moisture retention.[4]

Over the following years, the authors observed an anecdotal decrease in hospital stay and improved short-term outcomes; however, there continued to be a paucity of evidence in the literature to support these results. It was also evident

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that early operative intervention for wound closure with xenografting provided the opportunity for earlier discharge to home. Decreasing hospital stay has recently been shown to directly decrease costs, reduce incidence of health care–associated infections (HAIs), and provide earlier return to activities.[5,6] The authors, therefore, hypothesized that this institutionally novel therapeutic sequence might may provide similar results in a study population.

During this time, the authors also instituted a laser practice to treat hypertrophic scars that developed from burn injuries. Although the degree of scar formation is most likely related to the depth of injury, the authors also speculated that the type of closure—xenograft, autograft, or local wound care—might also influence the development of hypertrophic scar and the subsequent need for reconstruction. With a significant amount of psychosocial development occurring during childhood and adolescence, the authors wanted to determine which of the interventions would provide the best long-term outcomes, in the shortest time frame, with the fewest interventions, to restore form and function. Children are unique compared with their adult counterparts, in that they continue to grow, and even small, initially asymptomatic scars can become problematic by not lengthening while the surrounding tissue grows.

Despite the short-term success of biologic dressings, like xenografts and allografts, in the treatment of burn wounds,[7–10] there is a paucity of information regarding long-term follow-up of children with scald injury who receive this type of wound coverage. Furthermore, long-term outcomes related to need for reconstruction, with either lasers to treat hypertrophic scars or more invasive procedures to release contracture, are not well defined. In this article, the authors report a 10-year experience with pediatric scald burns, comparing 3 different techniques of wound closure: nonoperative management, xenografting, and autografting. In addition to reporting length of stay (LOS), complications, and costs of the initial admission, reconstructive outcomes are evaluated.

METHODS

After obtaining institutional review board approval, the authors queried the institutional American Burn Association database to identify all patients under the age of 18 years who were admitted with a scald injury to the North Carolina Jaycee Burn Center. The authors identified 1867 subjects who met the inclusion criteria. The timeframe for review was a 10-year period beginning in January 2004 and extending to December 2013. These patients were then stratified into 3 cohorts based on the wound closure method: (1) nonoperative treatment with local wound care only (although this included patients who had débridement under sedation), (2) operative débridement and xenografting of the scald injury, and (3) excisional preparation and autografting of the scald injury. Patients who underwent autografting at the primary site but also had xenografting of the donor site were assigned to the autografting category.

The data points from the American Burn Association national repository database are prospectively collected, and the initial set of variables included the following: medical record number, name, age, race, gender, county of residence, admission date, injury date, percentage total body surface area (%TBSA), *International Classification of Diseases, Ninth Revision* codes for that visit, number of operating room (OR) procedures during admission, admit status (floor, step-down, or ICU), ICU days, discharge date, LOS, hospital charges, and disposition at discharge.

After initial data receipt from the burn registrar, the authors proceed with review of individual charts, securely housed in an Epic electronic health record (Epic Systems, Verona, Wisconsin), to determine information on posthospital care, which included the following data points: length of outpatient follow-up, time to outpatient referral to a plastic surgeon, OR visits as an outpatient, time to first outpatient OR procedure, number of laser treatments, time to first laser treatment, number of outpatient skin grafts, number of outpatient tissue rearrangements (adjacent tissue rearrangement [ATRs]), and the number of outpatient nerve releases.

After obtaining these additional data points, the authors then investigated the total number of HAIs, by merging the list of patients with the institutional repository of HAIs, recorded in this same timeframe, by hospital epidemiology and infection control. This allowed comparing incidence and type of infections for the 3 different groups: autograft, xenograft, and nonoperative.

Categorical variables, such as gender, plastic surgeon referral, outpatient surgery, outpatient laser, outpatient skin grafts, and tissue rearrangements, were analyzed using 2 × 2 and 2 × 3 χ^2-square tables. Continuous/nominal variables, such as age, %TBSA, ICU days, LOS, hospital charges, length of follow-up, time to plastic surgeon consult, time to outpatient OR, time to first laser, and the number of laser treatments, were analyzed using a 2-tailed *t* test. Statistical significance was assigned for *P* values less than .05.