Use Of Transcyte And Dermabrasion To Treat Burns Reduces Length Of Stay In Burns Of All Size And Etiology

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Use of Transcyte® and dermabrasion to treat burns reduces length of stay in burns of all size and etiology

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Abstract

Background: With the cost of healthcare increasing, greater emphasis is placed on finding better ways to manage burn patients by increasing the quality of care while reducing length of hospital stay (LOS), thereby reducing overall cost. To date, this is the largest study to determine if Transcyte® reduces LOS for partial thickness burns of any size or etiology.
Methods: All consecutive patients with deep partial thickness burns from April 2002 to December 2002 were reviewed ($n = 110$) with IRB approval. Ninety-two patients were treated with dermabrasion and Transcyte® only. Eighteen patients were treated with a combination of STSG and dermabrasion and Transcyte® where appropriate. Our data was compared to the American Burn Association Patient Registry, as reported by Saffle et al. 1995.
Results: The data for percent TBSA and LOS are reported as mean ± S.E.M. One-tailed *t*-test was used to analyze the data. Significant difference was found in patients who were treated with dermabrasion and Transcyte® compared to the population reported by Saffle et al. Patients with 0–19.9% TBSA burn treated with dermabrasion and Transcyte® had LOS of 6.1 days versus 9.0 days ($p < 0.001$). Those with 20–39.9% TBSA burn had length of stay of 17.5 days versus 25.5 days. Patients treated with STSG and Transcyte® who had 40–59.9% TBSA burn had length of stay of 39.7 days versus 44.6 days. Those treated with dermabrasion and Transcyte® alone had length of stay of 31 days.
Conclusion: This is the first study comparing burns of all sizes treated with dermabrasion and Transcyte® with a known population receiving standard therapy. The authors found this new method of managing patients with partial thickness burns to be more efficacious and significantly reduces length of stay compared to traditional management.

Keywords: Partial thickness burn; Transcyte; Dermabrasion; Length of stay

Over the past 50 years of burn wound management, a progressively decreasing mortality from severe burns is seen [1]. However, increasing healthcare costs have forced health care providers to not only provide quality burn care, but also reduce the costs associated with burn wound management [2]. Traditionally, partial thickness burns have been treated with topical antibiotics, serial wound debridement and dressing changes. This method still utilizes mostly silver sulfadiazine and dressing changes twice daily [3]. However, the cost of this treatment to a burn unit is substantial [1–3].

Recently, the use of bio-engineered skin substitutes has been employed in treatment of partial thickness burns with encouraging results. Noordenbos et al. reported safety and efficacy of Transcyte® a laboratory-grown extracellular matrix of allogeneic human dermal fibroblasts, for treatment of partial thickness burns in 1999 [3,6]. That same year, Demling and DeSanti reported using Transcyte® for treatment of partial thickness burns of the face [4]. Both reported superior healing rates and improved management including a decreased level of pain compared with the control groups [3,4]. Two years later, Lukish et al. reported that the use of Transcyte® decreased length of stay in pediatric patients [5]. However, these reports are limited by

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the number of patients in their samples and narrowness of their inclusion criteria.

We present the largest retrospective study to date, in an attempt to determine if use of dermabrasion and Transcyte® reduces length of hospital stay for burns of any size or etiology compared with conventional burn management. We compare our sample data with population data available from the American Burn Association Patient Registry, as reported by Saffle et al. [1].

1. Materials and methods

The charts of all patients with burns receiving treatment at our burn center between April 2002 and December 2002 were reviewed. The 110 patients identified as having received dermabrasion and Transcyte® treatment ranged from 2 months to 60 years of age, with a mean age of 18.5 years (S.D. = 18.35 years). Of these patients, 63 were less than 18 years old and 47 were greater than 18 years old. Ninety-five patients had burns to one or more extremity, including, but not limited to the hands and feet. Forty-four patients also had facial burns. The burn sizes ranged from 1% total body surface area (TBSA) to 60%, with a mean of 10.6% (S.D. = 11.78%). No patients were excluded due to the site of the burn, burn mechanism or because of inhalation injury.

All patients underwent debridement of devitalized tissue using systemic analgesia. Patients were then taken to the operating room for definitive debridement of the burn wound and closure according to the following protocol: patients were taken to the operating room 0–7 days post injury (mean 1.7 days). The affected area was prepped and draped in sterile manner using chlorhexidine or hexachlorophene. Under general anesthesia, any remaining devitalized tissue was removed bluntly using moist sponge and/or tissue forceps. Wounds were dermabraded using a Hall 100 Micro-drill hand piece with a diamond dermabrasion bit. Dermabrasion was considered complete when punctate bleeding was observed. Hemostasis was achieved using epinephrine (1:1000 solution) soaked sponges. Blood loss per 5% burn wound treated was, less than 10 cc. No adult patient with less than 20% TBSA was transfused. No infant with burn of less than 10% TBSA and child with burn of less than 15% TBSA was transfused.

Once all wounds have been dermabraded, Transcyte® was applied to the wound. Dermabond adhesive was used to hold the Transcyte® in place to the surrounding skin and seams. Dry acticoat and tegaderm were used to dress the wounds. If the wound, or any part of it, was determined to be full thickness, autograft was used for closure of the full thickness portion.

Dressings were removed on postoperative day two. Any fluid collection under the Transcyte® was drained. If no significant fluid collections were found and the Transcyte® was well adhered to the wound, the patient was sent home. However, if significant fluid collection was observed and/or the patient's pain was not controlled with oral analgesics, the wound was dressed with sterile Acticoat dressing and the patient was kept in the hospital for an additional 48 h. Forty-eight hours after the first dressing change, the dressing change was repeated. Once all of the Transcyte® had adhered to the wound, dressings were removed and the wound was left open to air. As the wound healed the Transcyte® pealed off and was slowly removed.

2. Results

Although our sample of 110 burn patients is large for Transcyte® literature, we sought a comparison with population-based data. We used the American Burn Association Patient Registry data presented by Saffle et al. [1] as a normative comparison for our sample data. The limited number of patients in categories larger than 0–19% TBSA that we found in our sample is also reflected in

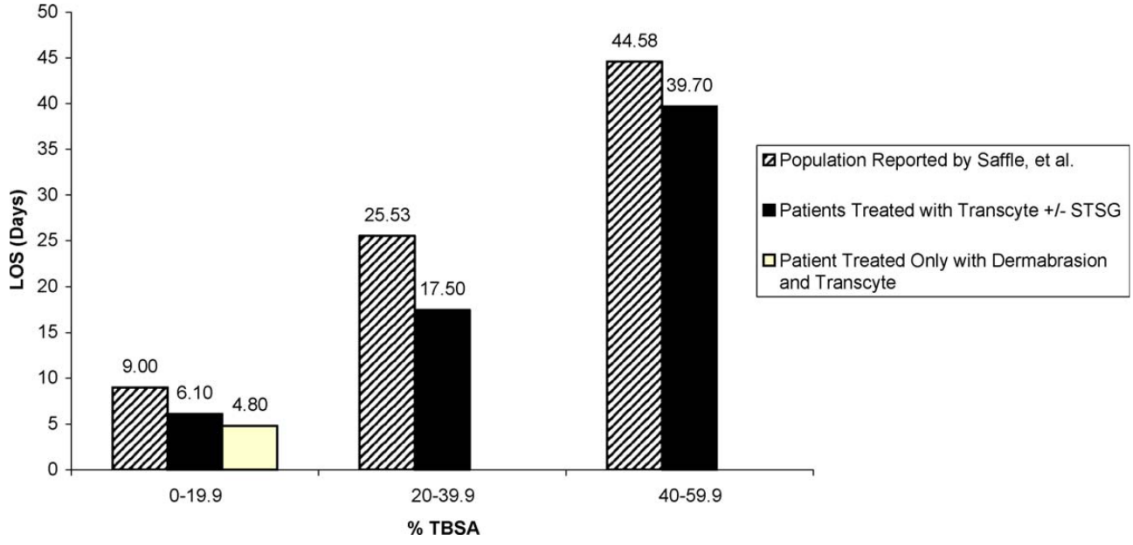

Fig. 1. Length of stay for patients treated with transcyte compared with conventional therapy.

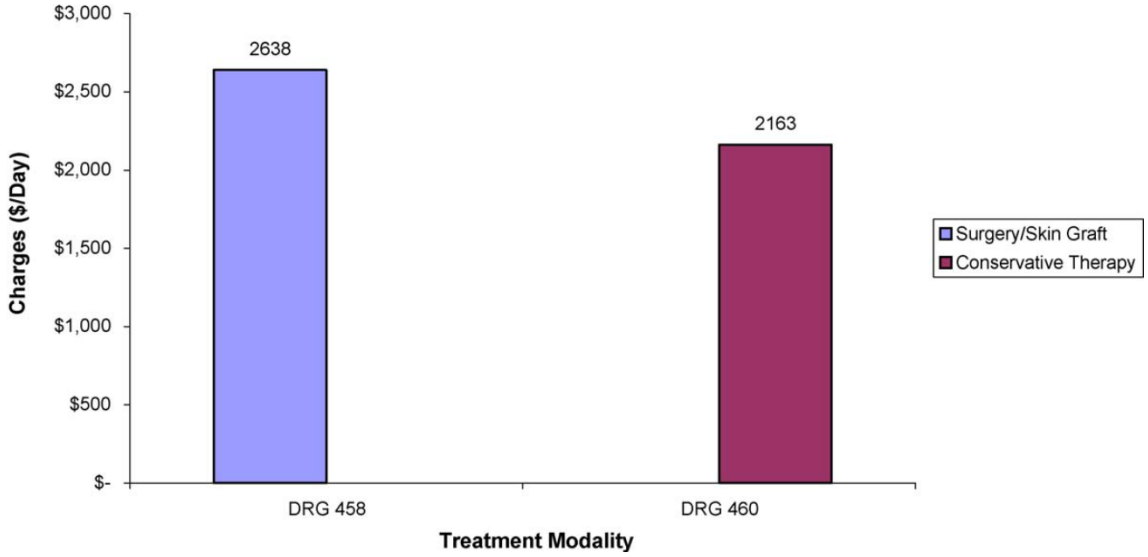

Fig. 2. Charges in 1993.

the population reported by the Registry. For example, 0–19% TBSA burns reflect 80% of the population reported by the Registry. In our sample, 84% of the patients fall within the category of 0–19% TBSA.

Fig. 1 compares the American Burn Association Patient Registry data with our data on length of stay (LOS). Patients sustaining 0–19.9% TBSA burns had a LOS of 6.1 days ($p < 0.0001$) compared to the average of 9 days as reported in the registry. Our data includes patients with wounds treated with dermabrasion and Transcyte® alone and wounds treated with a combination of dermabrasion and Transcyte® for partial thickness burns and autograft for full thickness burns. If patients with only partial thickness burns are considered, the mean LOS decreased to 4.8 days ($p < 0.0001$).

Patients with 20–39.9% TBSA burns had an average LOS of 17.5 days compared to 25.5 days as reported by the registry. Only eight patients in our sample were treated in this category of burn. Although the number of patients in this category is small, there is a reduction in LOS and the data

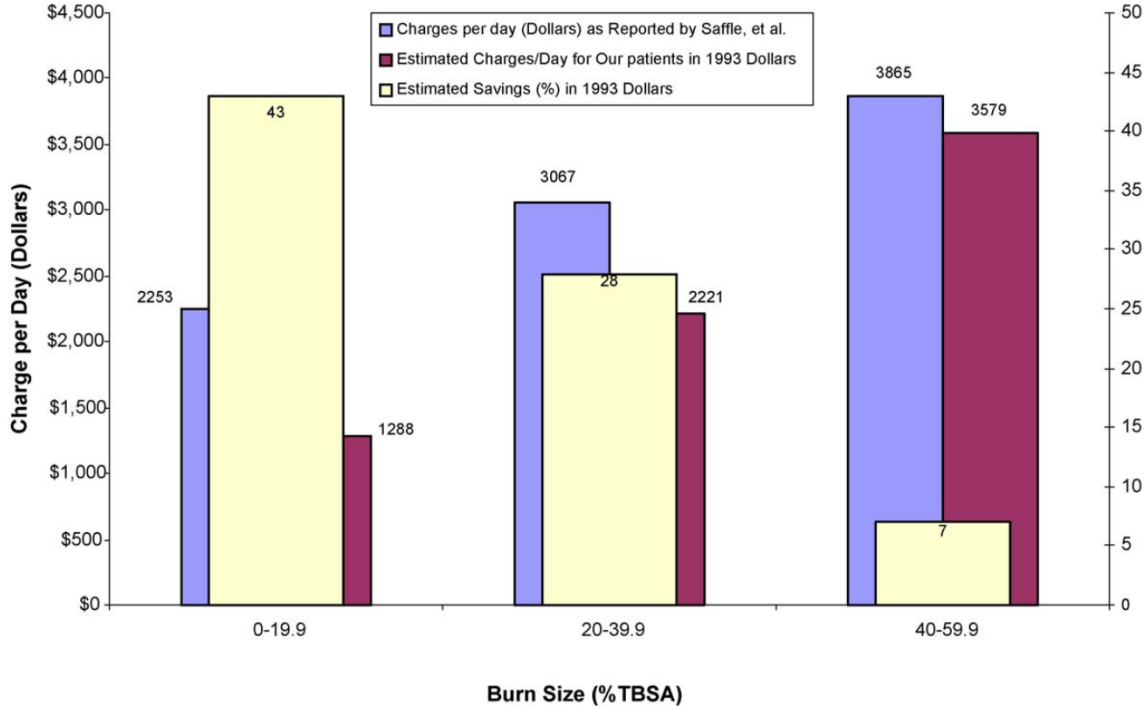

Fig. 3. Cost Savings Analysis in 1993 dollars.

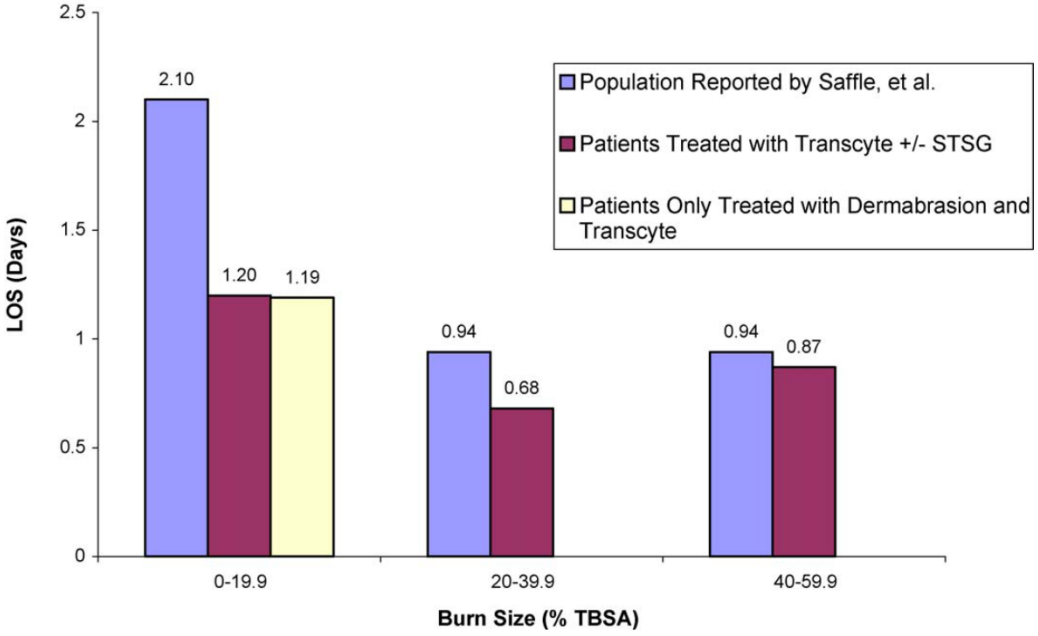

Fig. 4. Length of stay in days per percent burn.

shows a trend towards statistical significance ($p < 0.089$). Likewise, for the categories of 40–59.9% TBSA and 60–79.9% TBSA wounds, a decrease in LOS is seen. Due to small sample sizes in the larger TBSA categories, no statistical inferences can be made; however, the decrease in LOS in all categories appears as a trend that may yield statistical significance given a larger sample.

Saffle et al. [1] report in-hospital per day charges for patients treated conservatively and patients treated with operative debridement and grafting, as defined by DRG (Fig. 2). The difference between the two groups is an estimated $475 (in 1993 dollars). This reflects the notion that LOS charges are based on set charges (e.g. nursing, facility costs). Adding operative cost to the length of stay does not significantly increase the daily charge [1]. This is also demonstrated in our sample data (Fig. 3). Although we use early, aggressive therapy for all patients with burn wounds (namely operative dermabrasion of devitalized tissue and Transcyte® closure of the wounds, our length of stay is significantly lower than the population values (Figs. 1 and 4). This is despite the fact that in our sample the average burn size is larger than the average burn size reported by the Registry (4.28 versus 6.66) (Fig. 5).

In our sample the length of stay was not affected by patients requiring autograft for full thickness burns in addition to dermabrasion and Transcyte® closure for partial

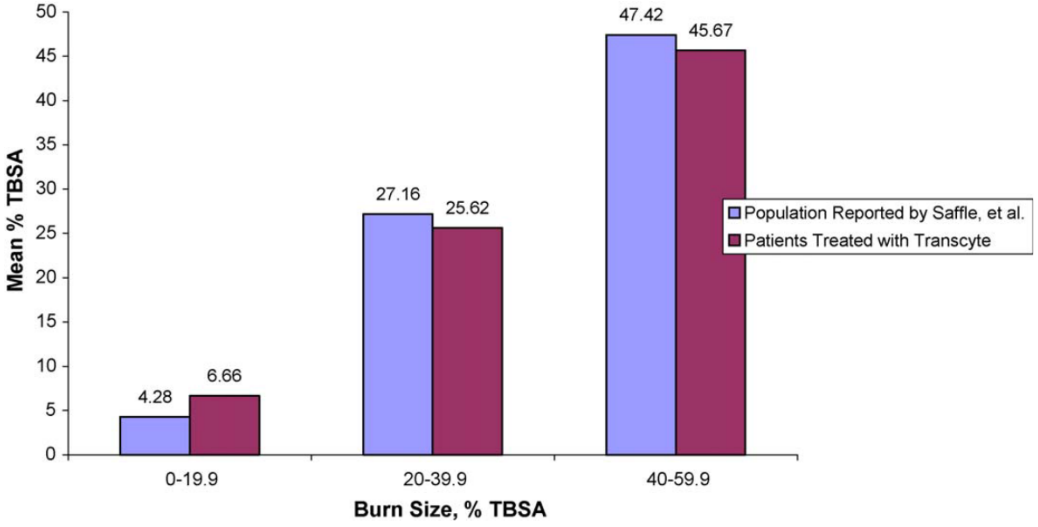

Fig. 5. Average percent burn.

thickness wounds of 0–19% TBSA. This is because in this category, only six of our patients required autograft in addition to dermabrasion and Transcyte® closure ($n = 95$) (Fig. 4). The lower length of stay translates into substantial cost savings of approximately 43% for 0–19% TBSA (Fig. 3). For larger burns of 20–39% TBSA and 40–59% TBSA the approximate cost savings is 28% and 7%, respectively. Although the savings are less impressive for the larger TBSA groups, this was largely due to the co-morbidities associated with larger burns (e.g. inhalation injury, need for ventilator support).

3. Discussion

The goal of partial thickness burn treatment is to decrease the associated sequelae of pain, infection, disability and high cost [2,5]. Traditionally, partial thickness burns are treated with topical antibiotics, dressing changes and STSG when wounds fail to heal within a reasonable amount of time. This traditional approach to burn care is resource intensive, often leading to an increased length of stay. With the cost of health care increasing, greater emphasis must be placed on finding novel approaches to burn wound care and treatment that are more effective, cheaper and result in less disability.

The use of Transcyte® in the management of partial thickness burns has been shown to be safe and effective [3,5]. Furthermore, Transcyte® has been shown to decrease the length of stay for pediatric patients with partial thickness burns [5]. However, to date the studies published have been limited by numerous exclusion criteria and small samples. The studies have been either limited according to the etiology of the burn or the age of the patient. The goal of this study was to evaluate efficacy of dermabrasion and Transcyte® in decreasing the length of stay for partial thickness burns of all etiology and size in all age groups, thereby decreasing the cost of treating all burn wounds.

In our experience, treatment failure and infectious complications have been 4.5%. We have had five total cases of infection under the Transcyte®. Four were salvaged with aggressive debridement of the Transcyte® and antibiotic use. One patient required total removal of the Transcyte® (0.9%). We feel that dermabrasion is the key step to prepare the wound surface for Transcyte® application. We theorize that by removing any devitalized tissue and potentially colonized layers of the wound we remove the zone of coagulation and limit, if not eliminate, the zone of stasis. Therefore, we transform an unpredictable ‘‘burn’’ wound into a more predictable ‘‘surgical’’ wound. The procedure stimulates fibroblasts and an increased Type 1 and Type 3 collagen synthesis have been noted [7]. Only few studies on dermabrasion and burns can be found in the literature, some have used human amnionic membrane for temporary coverage [8–11]. As Transcyte® amnionic membrane most likely donates growth factors to the open wound and thereby promotes epithelialization. This form of temporary wound closure harbors multiple infectious issues however, which makes its use prohibitive in children. Availability is another limiting factor for its widespread use in burns. Biochemical and pathologic studies are needed to clarify the exact mechanism by which dermabrasion and Transcyte® have their effects.

Patients who were treated with dermabrasion and Transcyte® were less likely to require autograft (6%). This is consistent with the result of 5% as reported by Lukish et al. [5]. This may be a result of removing the zone coagulation and/or stasis thereby reducing the progression of some areas of a burn from partial thickness to a full thickness. In our experience this treatment modality decreases pain, pruritis, time to heal, and incidence of hypertrophic scar formation (unpublished data).

We have found the combination of dermabrasion and Transcyte® a significant advance in treatment of partial thickness burns of all etiologies and age groups. Use of dermabrasion and Transcyte® decreases the length of stay significantly thereby decreasing the associated treatment cost in the acute setting. Painful dressing changes are eliminated, which makes the treatment especially desirable in small children. Further studies are under way to evaluate long term outcome of this combined approach to second degree burn wound treatment, including aesthetics, necessity for reconstructive procedures and patient assessment.

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