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Scar outcome of children with partial thickness burns: A 3 and 6 month follow up

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ARTICLE INFO

Article history:
Accepted 26 June 2015

Keywords:
Child
Partial thickness burn
Scar outcome
Skin thickness

ABSTRACT

Introduction: There is a paucity of research investigating the scar outcome of children with partial thickness burns. The aim of this study was to assess the scar outcome of children with partial thickness burns who received a silver dressing acutely.

Method: Children aged 0–15 years with an acute partial thickness burn, ≤10% TBSA were included. Children were originally recruited for an RCT investigating three dressings for partial thickness burns. Children were assessed at 3 and 6 months after re-epithelialization. 3D photographs were taken of the burn site, POSAS was completed and skin thickness was measured using ultrasound imaging.

Results: Forty-three children returned for 3 and 6 month follow-ups or returned a photo. Days to re-epithelialization was a significant predictor of skin/scar quality at 3 and 6 months ($p < 0.01$). Patient-rated color and observer-rated vascularity and pigmentation POSAS scores were comparable at 3 months (color vs. vascularity 0.88, $p < 0.001$; color vs. pigmentation 0.64, $p < 0.001$), but patients scored higher than the observer at 6 months (color vs. vascularity 0.57, $p < 0.05$; color vs. pigmentation 0.15, $p = 0.60$). Burn depth was significantly correlated with skin thickness ($r = 0.51$, $p < 0.01$). Hypopigmentation of the burn site was present in 25.8% of children who re-epithelialized in ≤2 weeks.

Conclusion: This study has provided information on outcomes for children with partial thickness burns and highlighted a need for further education of this population.

1. Introduction

Small, but significant partial thickness burns in children are common injuries in high-income countries [1]. It is well known that partial thickness burns in children which take longer than two weeks to re-epithelialize are at a greater risk of hypertrophic scarring [2–4] and that clinically, a normal skin appearance is expected within six months for partial thickness burns which re-epithelialize in two weeks or less.

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http://dx.doi.org/10.1016/j.burns.2015.06.019
0305-4179/

A comprehensive observational study by van der Wal and colleagues [5] compared the long-term scar outcomes in a representative group of children and adults with partial and full thickness burns. Partial thickness wounds were shown to result in a better scar quality than full thickness wound and that in children with scald burns, the scar maturation patterns between partial and full thickness wounds were different. However despite these demonstrated differences in scar maturation and clinical knowledge of partial thickness burn outcome, high-level research solely focusing on the outcomes of children with partial thickness burns is severely lacking.

Partial thickness burns in children are often treated acutely with conservative treatments such as recently developed silver-containing dressings. As acute treatment can have an effect on long-term scar quality, it is essential for comprehensive long-term studies of scar outcome following clinical trials of burn dressings to be completed in order to determine the impact of dressings on scar outcome. A recent systematic review by Vloemans et al. [6] investigating acute dressings and topical treatments for children with partial thickness burns, noted that only one randomized controlled trial (RCT) included a scar follow-up of its participants. The follow-up phase of this RCT however only consisted of the review of a very small number of children (exact number not stated) at 3 months after re-epithelialization [7]. Furthermore, external to the systematic review, Mabrouk et al. [8] compared Aquacel Ag to the moist, open dressing MEBO and conducted 3 and 6 month follow-ups, however age range was broad (children and adults) only partial thickness facial burns were included and follow-up numbers were again not stated.

Therefore the aim of this study was to assess the scar outcome of children aged 0–15 years with partial thickness burns <10% TBSA who were originally recruited into an RCT comparing silver dressings in the acute phase of treatment [9].

2. Method

This study was an extension of the prospective, randomized controlled trial '*Randomized controlled trial of three dressings for partial thickness burns in children*' [9]. The study is registered with the Australian New Zealand Clinical Trials Registry (ACTRN12613000105741) and was approved by the Queensland Children's Health Services (Royal Children's Hospital) Human Research Ethics Committee and The University of Queensland Ethics Committee.

2.1. Participants

Children aged 0–15 years with an acute partial thickness (superficial partial to deep partial thickness inclusive) burn and a burn total body surface area (TBSA) of ≤10%.

2.2. Recruitment

Eligible patients were originally recruited from the Stuart Pegg Paediatric Burns Centre (SPPBC) at the Royal Children's Hospital, Brisbane, Australia between March 2013 and January 2014 as part of the RCT. For the RCT, children were randomized to one of three burns dressings (Acticoat™, Acticoat™ with Mepitel™ or Mepilex Ag™) and received this dressing until re-epithelialization or grafting occurred. Children and their families were informed prior to consent that participation in the RCT would require long-term follow-up appointments at 3 and 6 months after wound re-epithelialization.

2.3. Procedure

Children who completed the randomized dressing treatment until re-epithelialization of the burn wound or received skin grafting were brought in for follow-up appointments in the burns clinic at 3 and 6 months after burn wound re-epithelialization. Parents were phoned to organize a meeting time and if unable to attend follow-up appointments (e.g. due to living in a regional or rural center), were given the option of sending in a photo of the child's original burn wound site via email.

At the 3 month appointment, children had a 3D photograph (3D LifeViz™ Camera, Quantificare, Cedex, France) taken of the burn wound site, the Patient and Observer Scar Assessment Scale (POSAS) was completed and an ultrasound scan was taken of the burn site and an unaffected contralateral site. Where a child had multiple sites, this process was completed for each site. This process was then replicated at the 6 month follow-up appointment.

2.4. Outcome measures

2.4.1. The Patient and Observer Scar Assessment Scale

The Patient and Observer Scar Assessment Scale (POSAS) was completed on participants at both 3 and 6 month follow-ups. The *observer* section was completed by the study investigator and the *patient* section was completed by the child (if over the age of 8) or the caregiver. A total score and overall opinion score were generated from both the patient and observer assessments. For total scores, a score of 6 is equal to normal skin. For overall opinion scores, a score of 1 is equal to normal skin.

2.4.2. 3D photography

All children had a 3D photograph taken of their original burn wound site using the 3D LifeViz™ Camera (Quantificare, Cedex, France). The 3D photographs were analyzed by the primary investigator on the Dermapix™ software program (Quantificare, Cedex, France) to calculate scar height (if present). A ruler was included in all 3D photographs for measurement calibration in the associated software package Dermapix™.

2.4.3. Ultrasound

An ultrasound scan using the BT12 Venue 40 MSK with an 8–18 MHz hockey stick probe (GE Healthcare) was taken of the original burn wound site to measure skin thickness. The probe was placed in the center of the original burn site when there was no evidence of scar. If scar tissue was present, the probe was placed on the area originally classified as having the deepest wound depth. An additional measurement was taken of an unaffected contralateral site to the burn. Where a contralateral site was not available (e.g. bilateral burn sites), the closest, unaffected adjacent site was used. Measurements were taken from the top border of the epidermis to the lower border of the dermis (see Fig. 1). The direction of the