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Healing time and incidence of hypertrophic scarring in paediatric scalds

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ABSTRACT

Introduction: Scald burns, which heal in less than 14 days, are seen to be at low risk of hypertrophic scar (HTS) formation. Consequently surgery is usually reserved for scalds likely to take more than 14 days to heal. With the use of silver based dressings over the past few years, anecdotally, we have observed a tendency to improved healing of scalds with conservative management and reduced need for surgical intervention. We aimed to investigate the effect of overall healing time of paediatric scalds on HTS formation over a five-year period (2011–15).

Methods: We retrospectively identified all new patients attending the Royal Children's Hospital (RCH) burns clinic from 31st January 2011–31st July 2015. Medical histories were reviewed for burns caused by scalds. Scar quality was determined from written records or clinical photographs. Patients were compared in groups based on healing time of <10 days, 10–14 days, 15–21 days, 22–30 days or >30 days.

Results: We studied 322 children, of which 52 (16.1%) developed HTS. There was a significantly higher incidence of HTS with increased time to healing (mean 34.5 days compared to 12.1 days, $p < 0.01$). There were 25 patients that underwent surgical treatment with excision or debridement and split thickness skin graft of which 21 (84%) developed HTS. Grafting offered no benefit in HTS rate in the 22–30 days to heal group.

Conclusions: Our study confirms that there is a link between prolonged healing time of scald wounds and HTS. The danger of slow healing for scarring despite grafting, suggests this operation should be performed earlier than current practice to allow complete healing in less than 3 weeks.

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1. Background

The relationship between burn depth, healing time and the development of hypertrophic scarring (HTS) is well recognised in burn surgery. Current practice aims to minimise healing

time and thus scarring with use of dressings that provide ideal healing environment, and by early excision and grafting of deeper burns. Clinical assessment of burn depth is notoriously difficult and management of less extensive burns and those of intermediate depth is controversial. Recent adjuncts introduced to aid clinical judgment are the use of laser imaging for

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assessment of tissue perfusion of the burnt region to aid burn depth assessment and earlier prediction of need for surgical intervention, and other modalities, such as infrared thermography and spectrophotometric intracutaneous analysis. [1-3]

There are three principle ways to manage scald burns:

- early excision and skin grafting of deep partial thickness or full thickness scalds with the aim of excising non-viable tissues and achieving early wound closure
- dermal preservation strategies allowing the burn to heal with conservative management, most commonly silver based dressings, and scar management
- initial conservative treatment of the scald with delayed grafting of areas not healed at 2-3 weeks

There is good evidence that there is a low risk of HTS formation in scalds when healing is complete before 14 days. HTS affects one third of the patients achieving healing between 14 and 21 days and it is suggested that surgery should be reserved for scalds likely to take more than 21 days to heal [4]. Similar findings have been shown in the paediatric scald population [5]. Meanwhile, conservative management accepts that any HTS that occurs will receive further scar management techniques (pressure garments, silicone, steroid injection, surgical revision) [6]. However, the impact of HTS on the patients' quality of life and the health care burden of its management has not been well elucidated. In addition, some patients may also need secondary reconstructive burn surgery to achieve satisfactory functional and aesthetic outcomes.

With the use of silver impregnated dressings over the past few years, anecdotally, we have observed a tendency to improved healing of scalds with conservative management and reduced need for surgical intervention. We aimed to investigate children with scald burns managed at RCH over a five-year period (2011-15), since the advent of silver dressings, irrespective of their treatment:

1. the effect of overall healing time on incidence of hypertrophic scarring from paediatric scalds
2. the effect of factors including skin grafting, mechanism of injury and location on the development of HTS.

2. Methods

We retrospectively identified all new patients attending the Royal Children's Hospital (RCH) burns clinic from 31st January 2011 to 31st July 2015. Medical histories were reviewed for burns caused by scalds, including all hot liquids (water, beverages, oil, foods such as soups and noodles). Data collected for each case included: demographics, mechanism and location of scald, treatment (first aid, dressings, surgical), healing time, HTS and scar management.

The burns clinic operates 3 days per week to allow regular review and dressing changes as indicated. Routine treatment of scalds in our clinic, if not full thickness, is initial conservative treatment, using Acticoat (Smith & Nephew, Florida, United States) dressings and grafting of areas not healed at 2-3 weeks. The burn assessment and decision of

grafting is made on clinical grounds by experienced burns specialist consultant general paediatric or plastic surgeons who are always present in the burns clinic.

Healing time was taken from the burns clinic records from date of injury to the point where the scald was either described as fully healed or dressings were discontinued, including if skin grafting occurred during this time period.

Healing time was classified as:

1. <10 days
2. 10-14 days
3. 15-21 days
4. 22-30 days
5. > 30 days

The quality of scar was determined primarily from the outpatient clinic written records and classified as either hypertrophic scar (HTS) or never hypertrophic scar (NHTS). Inclusion criteria for HTS were any clinical documentation of hypertrophy or the therapeutic use of silicone, pressure garments or steroid injections. Clinical photographs, which are routinely taken in the outpatient burn clinic, were used to clarify if the scar was hypertrophic if not clear from written records. Pigment change alone was allocated to the never hypertrophic group. Scar management advice is given to all patients and additional follow-up is indicated for patients with scald burns that take more than three weeks to heal. At this time, as soon as healing has occurred, these patients are seen by physiotherapists and occupational therapists, who attend the burns clinic, to start scar management and follow a therapy protocol based on a ladder of complexity. In addition, surgical review appointments will be undertaken when necessary. A minimum follow-up time of 4 months from healing was used to reflect the time that it takes for HTS to develop [5,7].

This research project was approved by the Royal Children's Hospital Ethics' Committee and consent was obtained for publication of photographic records.

2.1. Statistical analysis

Analyses were performed using STATA (version 12, Stata Corp LP, College Station, TX) software. ANOVA (Analysis of Variance) Fisher and chi-square tests were used to compare groups. A value of $p < 0.05$ was considered to indicate significant differences between groups.

3. Results

818 new patients attended the RCH burns clinic from 31st January 2011 to 31st July 2015, of which 322 (39.4%) presented due to scald injuries. The most common cause was hot water (43.8%), followed by tea (22.2%) (Fig. 1). The mean age at presentation was 3.4 years (median 1.8 years, range 4 months to 17 years). Silver based dressings were the primary dressing in 92.9% of cases while 4.9% of cases were facial burns dressed with ointments.

The mean number of days for scalds to heal was 15.4. The overall incidence of HTS, irrespective of management, was

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