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Scalp as a donor site in children: Is it really the best option?

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ABSTRACT

Background: Since 2003 we have used the scalp as a donor site for split skin grafts (SSGs) in major burns when there was a shortage of conventional donor areas. However, we seen a high incidence of complications, contrary to international experience.

Objective: The aim of this study was to analyze the results and complications related to the scalp as a donor site and to determine whether there is an association between our specific patient population and the complications encountered.

Methods: A retrospective review of our scalp donor site outcomes over a 12-year period was conducted. The cohort included 25 patients, 15 of black African descent, nine of mixed race and one Caucasian. The various hair types were identified based on ethnicity and classified into eight types. Most of our patients had hair types VI-VIII. None of these patients had scalp burns and all received standard burn treatment. The SSGs were taken with an electric dermatome with a standard micrometric setting of 0.2mm. Complications were categorized into short- or long-term, with a mean follow-up time of 1.59years.

Results: The mean age of the 25 children was 5.7 years. Nineteen sustained flame burns and 6 sustained hot water burns, with a mean total body surface area of 44.9%. A total of 43 scalp procurements were performed in the 25 patients studied. The group of 15 black African patients (hair types VI-VIII) had a total of 22 procurements, the nine patients of mixed race (hair types III-V) had 18 procurements and the single Caucasian patient (hair types II-III) had two procurements. The median healing time was 15 days, 11.8 days and 8.5 days, respectively, per group. Significant complications were encountered, including folliculitis 44%, non-healing wounds 52%, alopecia 16% and visible, hypopigmented scars 3%. One patient had a hypertrophic scar and no hair transfers to the recipient areas were observed. The various hair types correlated with the complications encountered. Five children, with an average burn size of 65.2% (range: 40-85%) died of sepsis. Due to the small sample size, the only statistically significant findings were related to the total body surface area of the burn and the number of times skin was harvested from the scalp, with a p-value of 0.005. The p-values for the healing times related to the first, second and third croppings, were p=0.022, p=0.00032 and p<0.001 respectively.

Conclusion: Our study suggests that in pediatric patients of black African descent (hair types VI-VIII) the scalp is not an ideal donor area, due to the unacceptably high incidence of

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complications. Hence, every precaution should be taken when it becomes necessary to harvest donor skin from the scalp.

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1. Introduction

Burn injuries, although mostly preventable, are a common occurrence in South Africa and are mostly associated with poverty [1–3]. Children under 4 years old are at highest risk of burns with an average annual rate of 6.0/10,000 child-years (c-y) [3,4]. The overall incidence of burn injuries is highest in children of black African origin of all ages (11.4/10,000 c-y) and burns occur more frequently during winter. The incidence decreases by approximately half with increasing age groups [2–4]. The pediatric mortality rate for burn victims in Africa is reported as four times higher than in developed countries and occur mostly in children under the age of 14 years [3,5].

The Red Cross War Memorial Children's Hospital (RCWMCH) in Cape Town, South Africa, is a tertiary hospital for children younger than 13 years. In the last decade the annual admission rate was 1187 (range: 1084–13910) with 3256 (range: 1509–5221) outpatient visits and 766 (range: 592–1046) operations. The average burn size was 15% (range: 1–100%) total body surface area (TBSA), with 30% of the admissions, exceeding 25% TBSA [1]. The current lethal median dose (LD₅₀) for children with burns >50% TBSA is 67.3% [6].

When the TBSA of a burn exceeds 40%, potential donor areas are limited and are often a restricting factor in achieving early wound cover. To overcome this deficiency, alternative methods, other than standard mesh grafting are required. Alternative wound cover methods while awaiting donor site healing, include the use of allograft and synthetic skin substitutes to temporize wound cover. Negative pressure wound therapy and xenografts have also been described as adjunctive methods [7]. In this instance, micrografting techniques have become invaluable when a large TBSA burn, with limited donor areas needs to be covered [6].

To overcome donor site deficiency, the scalp was proposed as a donor area for split skin grafts (SSGs) in 1964 by Crawford [8]. Subsequently international literature supported the scalp as a primary donor site, even for small burns [8–26]. The RCWMCH burn unit has used the scalp as a donor site in major burns, however major complications have been encountered and the experience does not support the enthusiasm displayed in many of the internationally published reports.

A retrospective review of patients who had their scalps used as donor areas was undertaken to define its role and to establish if the scalp should be used as a primary donor area for split skin grafts in burns. The aim was twofold: to determine whether there is an association between the hair types of the patient population, the complications noted when the scalp was used as a donor area, and to make recommendations for using the scalp as donor site in pediatric burns.

2. Material and methods

A retrospective study conducted at the RCWMCH in Cape Town, South Africa. All patients who presented with major burns (>30% TBSA) and all other patients known to have had their scalps used for SSG donor sites from 2003 to 2015 were included. The patient population comprised of children under the age of 13 years. Patients were excluded from this study if the scalp was not used as a donor site, if the scalp was burned or primarily affected by pre-existing skin or hair disorders [26].

Data collection was conducted by the author and analyzed using Microsoft Excel. Demographic characteristics of the patients and their burns were collected, including age, gender, ethnicity, etiology, extent and depth of the burn. The clinical course of the patient was recorded, with respect to factors pertaining to the scalp donor site, mechanism of procurement, healing time and complications (early and late) encountered.

To elucidate the high complication rate seen amongst the patients, a working classification of hair based on the paper published by De la Mettrie et al. was adopted [27]. Although there is a distinctive overlap between the various groups from this paper, it was clear that types VI–VIII hair pertains predominantly to people of black African origin. This ethnic group accounted for 60% of the patients in this study.

Complications were categorized as short- or long-term. Short-term complications were defined as delayed healing (>14 days), with crusting and folliculitis present up to 3 months post-surgery. Long-term complications were defined as delayed healing (>3 months), recurrent folliculitis, non-healing wounds, alopecia, visible scars, hypertrophic scars and pigmentation changes. Alopecia was defined as a visible hair defect persisting more than three months post-surgery.

Institutional research ethics permission was obtained from RCWMCH departmental research committee, the Human Research Ethics Committee of the Faculty of Health, University of Cape Town and the Provincial Government (HREC REF: 179/2015).

2.1. Preparation of the scalp donor site

All surgery was performed in a dedicated Burn theatre, with the patient under general anesthesia. Preparation of the scalp donor site included marking the hairline and shaving the hair by hand, care being taken not to cause any dermal damage.

After shaving, the periphery of the donor area was marked 1 cm behind the previously marked hairline [13], to limit visibility of the donor site. This was followed by a thorough chlorhexidine wash (4% Chlorhexidine Gluconate Solution B.P. and 4% v/v isopropyl alcohol as preservative) of the scalp and the topical application of warm 0.006% sodium hypochlorite solution for 20–30 minutes [28]. Corneas and tympanic membranes were protected by the topical application of

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