

ORIGINAL ARTICLE

A comparative study of early-delayed skin grafting and late or non-grafting of deep partial thickness burns at the University Teaching Hospital

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ABSTRACT

Objectives: To demonstrate the benefits of performing a split skin graft within 15 days post burn and explore the differences in duration of hospital stay, occurrence of infection and contracture formation in comparison to standard care currently provided at U.T.H (late or non split skin graft).

Design: This was a prospective, non-randomized, interventional study involving patients with deep partial thickness burn wounds at UTH. Study subjects were to either receive an early-delayed skin graft, or the standard treatment at the time based on the surgical firm to which they were admitted.

Results: Forty-three (55.1%) patients allocated to receive an early-delayed ssg while 35 (44.9%) were assigned to the late or non-ssg group. The proportion of males was 23 (29.5%) in the early-delayed group and 22 (28.2%) in the late or non ssg group while the proportion of females was 20 (25.6%) in the early-delayed group and 13 (16.7%) in the late or non ssg group. The participants' age range was 2 months to 84 years. Forty-nine (62.8%) were 5 years and below, eight (10.3%) were aged 6-10 years, ten (12.8%) were aged 11-20 years, and eleven (14.1%) were aged 21 and above years. The following were the main causes of burns, in their order of frequency, hot water (57%), flames (27%), hot food (i.e. cooking oil, porridge, beans [14%]), and chemicals (1%). In both groups the most common

cause for burns was hot water, 19 (24%) in the early-delayed skin graft group and 26 (33%) in the late or non ssg group. In forty seven (60%) patients burns were observed to affect multiple regions of the body. Mean total body surface area burn was 14%. Overall, 73 patients (93.6%) came from within Lusaka. It was also noted that 39(50%) were self referrals. Overall, 86% presented to the hospital within 24 hrs but despite early presentation participants were reluctant to receive an early skin graft due to lack of understanding of the procedure. Findings of this study found that at significance levels of 0.05 in the late or non SSG group hospital stay was significantly longer, ($U = 305.500; p = 0.001$) and infection higher (Chi Square = 4.510; $p = 0.034$). No significant difference was noted in contracture formation in the two groups (Chi square = 0.999; $p = 0.258$).

Conclusions: Early-delayed split skin graft was found to statistically significantly reduce length of stay and occurrence of infection as opposed to late or non ssg. No statistically significant relation could be established for occurrence of contractures due to loss in follow up of patient valuable information was lost. This study shows that even if early delayed SSG were to be offered at UTH there is need to carry out awareness campaigns to change peoples attitudes towards the surgical procedure (SSG). This is an approved treatment world-wide which has not gained wide acceptance amongst patients presenting to U.T.H that participated in this study. Patient attitudes and perceptions need to be changed as SSG currently is not seen as a curative treatment but as added injury to an already injured patient. This study showed that SSG is possible and the few patients who underwent early grafting showed good outcomes, shorter hospital stay and

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lower infection rates. Reduction in contracture formation may have been determined if follow up was achieved.

INTRODUCTION

In 2002, the World Health Organization (WHO) reported that burns are a serious global health threat which is disproportionately concentrated in Southeast Asia and Africa. In sub-Saharan Africa it is estimated that 18,000–30,000 children younger than the age of five die annually as a result of fire related injuries¹. Burn injuries are among the common reasons for admission to the surgical unit at the University Teaching Hospital (UTH) in Lusaka, Zambia. A review of records in the female and male surgical admission wards over an eight month period from January - August 2008 indicate a total of 10,152 admissions; 682 (6.7%) of these were burn patients. Four hundred forty three out of 682 (65%) were under the age of 5 years. Skin grafting is surgical procedure to manage burns in which skin or a skin substitute is placed to cover a burn wound¹. The aim is to protect the body from fluid loss, to aid in temperature regulation, and to avoid infections. The skin graft also prevents the development of severe contractures and plays a major role in the management of burns. Deep partial thickness burns (II degree B) show loss of key dermal elements that are critical for normal healing². This burn type will require skin grafting because when left to heal without any intervention they lead to scarring and contracture formation. Early grafting (< 5 days post burn) is recommended treatment in developed countries however in resource constrained countries the alternative is to perform the skin graft within 12 days^{4, 5}. In further research outcomes of burn patients were noted to be improved when split skin graft was performed within 15 days^{3,6,7}. A comparative study of early-delayed skin grafting and late or non-grafting of deep partial thickness burns at the University Teaching Hospital (UTH) was carried out over a period of 18 months (May 2010 to December 2012.). This was after an observation that skin grafting is performed at UTH, however the optimal time between injury and skin grafting has not been defined. Reasons for this are not clear, and the result is that either skin grafting is delayed or not performed at all. In this prospective study, early-delayed (within 15 days post burn injury) skin grafting of deep partial thickness burn

wounds in patients was performed and outcomes were compared with patients receiving current practice.

MATERIALS AND METHODS

Patients with deep partial thickness burns presenting to U.T.H were recruited using convenience sampling. Patients that presented to the two surgical firms were admitted on their call days were admitted to their care. The two general surgical firms were selected based on their similarity in management of the burns patients under their care. These two firms at the time of the research used wet soaks to dress the wounds and did not use flazamine as used by the other firms. Patients of all ages, sustaining burn of less than 50% total body surface area that provided informed consent were included. Patients with concomitant inhalation burns, electrical, chemical or infected burns or who have co-morbidity such as malnutrition, anaemia) were not included in the study. Ethics approval was obtained from the University of Zambia Ethics Committee. The purpose, procedures benefits and risks of the study were fully explained to patients, guardians and parents prior to obtaining consent. It was made clear to the patients that their participation in the study was purely voluntary and that they were able to withdraw from the study at any time, without any prejudice to further medical care. Data was analyzed using Statistical Package for the Social Sciences (SPSS) 20.0. Chi square and Mann Whitney U test at significance levels of 0.05 were used to evaluate differences in infection, contractures and hospital stay in the two groups.

RESULTS

A total of 78 patients were recruited for the study. Forty-three (55.1%) patients allocated to receive an early-delayed ssg while 35 (44.9%) were assigned to the late or non-ssg group (receiving current standard treatment provided at U.T.H.) The proportion of males was 23 (29.5%) in the early-delayed group and 22 (28.2%) in the late or non ssg group while the proportion of females was 20 (25.6%) in the early-delayed group and 13 (16.7%) in the late or non ssg group. The participants' age range was 2 months to 84 years. Forty-nine (62.8%) were 5 years and below, eight (10.3%) were aged 6-10 years, ten (12.8%) were aged 11-20 years, and eleven (14.1%) were aged 21 and above years (Table 1).

Table 1 Shows the characteristics of study participants in the early delayed split skin group(EDSG) and late or non split skin graft group (LNSG); n = 78

Variable	Mean/percentage	
	EDSG	LNSG
Age	7 years	11 years
Gender	male – 29.5% Female – 25.6%	male – 28.2% Female – 16.7%
Commonest cause of burn	Hot water – 24%	Hot water –33%
Site of burn	Multiple regions – 58.1%	Multiple regions– 62.9%
Total body surface area	Mean -14% Range 5% -30%	Mean – 13% Range 5%-36%
Time to presentation to the hospital	< 24 hrs – 86%	<24 Hrs – 85.7%
region	93.6% from within Lusaka	93.6 % from outside Lusaka

A Mann-Whitney U test was performed to establish whether hospital stay, measured using a continuous scale, differed in the two categories of patients A Chi Square test was performed to evaluate whether there were any differences in the occurrence of infection and contracture at burn site between patients who received early-delayed skin graft and those who did not (i.e. based on whether patients were treated within 15 days or after 15 of presentation at the hospital). This test was conducted at significance levels of 0.05; with H₀: there were no differences in hospital stay, infection or contractures at the burn sites of both groups of patients. The results indicated that hospital stay and occurrence of infection was significantly reduced in the early delayed ssg .No statistically significant difference was observed in the group as pertains to contracture formation this may be attributed to loss in follow up of patients (Table 2)

Table 2: Findings* length of stay, infection and contracture formation

Objective		Length of hospital stay (days)	Infection (%)	Contracture formation (5)
Mean	EDSG n=43	Range - 11 to 20 Mean 16	27.9%	63.8%
	LNSG N= 35	Range -21-30 - - -	51.4%	78.6%
Test		Mann-Whitney U	Pearson chi square	Fischer exact test
Results		U= 305.500 Z= -4.497	Chi square =4.510	Chi-square =0.999
P-value		0.001	0.034	0.258

DISCUSSION

Burns are amongst the conditions that present to the (UTH) surgical department admission wards and are a source of concern in view of the fact that from this study it was found that 62.8% of those presenting are under the age of five years, a vulnerable age group. This finding is in line with data in Sub saharan africa where annually 18 000-30 000 children younger than the age of five die annually of fire related injuries¹ It has been noted that children in africa have very high rates of burn injury and can often comprise more than 50% of all burn admissions and more than half of the DALYs lost globally to burns are among children below the age of 14 years⁹ This research revealed the age range to be 2 months to 84yrs, exhibiting the extremes of age that are affected by burns. This vulnerable age group is most likely to sustain burn wounds; a possible explanation that has been given is their curious nature as soon as they are mobile and able to explore their surroundings makes them prone to burn injury¹⁰ Sex distribution overall was 57.7% male and 42.3% female. The two groups were assessed and it was observed that in both groups the common causative agent was hot water. It was found that amongst those burnt with hot water males were most affected in both groups. In Punjab, India, a clinic-epidemiologic study was done that included 892 patients with burn injuries at a tertiary care hospital. Fifty four % of patients were male; however the commonest causative agent was flame burns in 72% with a peak age group 15-45 yrs.⁸

Skin grafting of burn wounds within five days post burn is standard treatment in high income country burn units. In low income countries, a study carried out in Khoula hospital in Oman³ revealed that delayed primary closure was the alternative. One of the indications for delayed - primary closure that was cited in the research was delay in

transferring of patients to the hospital. The delay in patients presenting to the hospital made an SSG within five days post burn impossible. Delay in presentation at the hospital was not a factor that affected patients

presenting to UTH in reference to when the split skin graft was performed. In this study, the transport system to the hospital is adequate as noted in the high number of patients who arrive within the 24 hour post burn. This suggests that the early presentation of patients to the hospital actually makes it feasible to perform an early delayed ssg at U.T.H. Another important aspect is the fact that 93% of patients were from within Lusaka highlights that burns patients are being treated within their regions therefore there is need for further research to inform what outcomes after ssg occur in other health institutions around the country.

Amongst the enrolled participants at U.T.H, delay in providing consent for the procedure to be performed, was observed. Reasons given included waiting for consent from a spouse who was not in the hospital at the time. A prominent issue raised was the concern that the procedure involved harvesting skin from another site to place on the burn wound. The concept of a procedure meant to heal a burn wound involving the creation of another wound (donor site) was not well received. The delay in obtaining consent was also found in Khoula to be a contributing factor to the delay in performing an ssg³ Also observed was that patients' parents or guardians were more willing to give consent after seeing another child in the same ward who had undergone an ssg successfully. The observed reluctance of patients and families to consent to surgery within the first two weeks after burns could suggest that a deliberate protocol at U.T.H to support early grafting of burns would be poorly received with patients opting for grafting after two weeks duration unless awareness strategies are in place

The range of total body surface area burned in recruited patients in this study 5% to 36%. Biological skin substitutes are not available at UTH so patients with larger burns were excluded⁵ In developing countries where no skin substitute exists, an alternative treatment for larger burn sizes would be to do the skin graft in stages. This would not be classified as an early delayed SSG as the duration post burn would be longer to allow for the site where the skin was harvested to regenerate. The mean values for total body surface area burn in each group were comparably similar.

The mean length of stay was 16 days in the early delayed ssg group and 25.5 days in the late or non- ssg .Performing an early delayed SSG (within 15 days) showed a 37% reduction in mean hospital stay. These results seem to suggest that patients SSG done within 15 days required a shorter duration of in-patient care than patients SSG done after 15 days. The infection was noted to be lower in the early-delayed SSG group than the group that received current practice. The commonest causative organism was *pseudomonas aeruginosa*. The findings of hospital stay and infection rates in this study are similar to previous studies^{3,4,5} and can be recommended as a treatment option for burn wounds at .U.T.H to improve outcomes. The results from this study seem to suggest that there was no difference in the experience of contractures in patients SSG done within 15 days and SSG done after 15 days. There were participants who were lost to follow up and therefore the occurrence of contractures could not be conclusively determined this may explain the results obtained in the groups, therefore adequate follow up is necessary to define differences in contracture formation.

RECOMMENDATIONS

We recommended:

- The need for a burns centre where early and early delayed SSG can be performed and patients will be grafted within 15 days post burn to ensure shorter hospital stay, lower infections.
- Awareness campaigns to increase knowledge of the treatment options for burn wounds. This would ensure awareness of the benefits of a split skin graft within 15 days.
- Further research of burns patients with adequate follow up to include other regions in Zambia to inform on occurrence of contractures post ssg and determine if the perception towards an early- delayed ssg in a rural setting would differ from the urban findings.

ACKNOWLEDGEMENTS

Dr B Andrews (UNZA School of Medicine), Dr B Latenser & Dr M Peck (American Burn Association, USA), Dr N Mutalima.

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