

Skin Grafting Compared with Conservative Treatment in Patients with Deep Second-Degree Burn Wounds of the Trunk and Buttocks

Mahdi Zanganeh¹, Abdolkhalegh Keshavarzi^{2*}, Mostafa Dahmardehei¹,
Tayyeb Ghadimi¹, Arvin Abdalkhani², Ali Dehghani³

1. Burn Research Center, Department of General Surgery, Iran University of Medical Science, Tehran, Iran
2. Department of General Surgery, Shiraz University of Medical Sciences, Shiraz, Iran.
3. Department of Community Health Nursing, School of Nursing, Jahrom University of Medical Sciences, Jahrom, Iran.

***Corresponding Author:**

Abdolkhalegh Keshavarzi

Assistant Professor of General Surgery Ward, Shiraz University of Medical Sciences, Burn and Wound Healing Research Center, Amiralmomenin Burn and Plastic Hospital, Beginning of Sadra Town, Shiraz Iran.

Tel./Fax: +98-71-36223418

Email: iliakeshavarzi@yahoo.com

Received: 02 Sep 2021

Accepted: 26 Dec 2021

ABSTRACT

BACKGROUND

Burns are among the most common causes of injury and result in long-term morbidity, psychological complications, and reduced quality of life. We aimed to evaluate and compare the results of skin grafting versus nonsurgical treatment in patients with deep second-degree burn wounds of the back and posterior trunk.

METHODS

This is a descriptive-analytical cross-sectional study of patients with trunk and buttock burns admitted to Burn Hospital in Shiraz, Iran from 2017 to 2019. The skin surface with burns and the final repaired tissue was measured. The Vancouver Scar Score (VSS) and pigmentation, vascularity, thickness, and pliability were assessed. VSS, pigmentation, vascularity, thickness and pliability were considered as outcomes.

RESULTS

Seventy-five patients met the criteria for participation; thirty-two patients had skin grafts. The mean age was 27.79 ± 20.03 yr and 53 patients (70.7%) were male. Scars were compared based on pigmentation, vascularity, thickness, and pliability, which was also statistically significant ($P < 0.001$). The mean of VSS was higher in patients with skin graft than those without graft ($P < 0.001$).

CONCLUSION

The mean VSS was significantly higher in patients with grade 2 deep burns who received skin grafting than in patients without skin grafting. Due to the lack of donor sites and the need to prioritize skin grafts in burn patients with high total body surface area, it is better to perform skin grafts on the posterior trunk and buttocks in areas with deep grade 2 burns as a last priority and treat this wound with conservative therapy.

KEYWORDS

Skin grafting; Burn; Wounds; Trunk; Buttocks

Please cite this paper as:

Zanganeh M, Keshavarzi A, Dahmardehei M, Ghadimi T, Abdalkhani A, Dehghani A. Skin Grafting Compared with Conservative Treatment in Patients with Deep Second-Degree Burn Wounds of the Trunk and Buttocks. *World J Plast Surg.* 2022;11(1):81-85.

doi: 10.52547/wjps.11.1.81

INTRODUCTION

Burns are tissue damage caused by heat, excessive sunlight, and other radiation, chemical or electrical contact. Burns can be minor therapeutic problems or life-threatening crises (1). Burns are among the most common causes of injury and result in long-term morbidity, psychological complications, and reduced quality of life (2).

According to the WHO, there are an estimated 180,000 burn injuries per year, most of which occur in low- and middle-income countries (3). Burns affect 129.85 people per 1,000 population annually in Iran (4).

Burns are classified into first, second and third degree burns depending on how deep and severe they penetrate the skin surface (5). Burn lesions in first-degree burns include red skin without blistering, second-degree burns with blistering and some thickening of the skin, and third-degree burns with extensive thickening and a white and leathery appearance (6).

Despite advances in the care of burn patients in recent decades, the treatment of burn patients, especially grade 2 and 3 burns, is still fraught with difficulties (7). Skin grafting is one of the most commonly used strategies in burn surgery (8). Several studies have proposed and used skin grafting as a treatment option for selected chronic leg ulcers (9) such as chronic venous leg ulcers, arterial leg ulcers, diabetic ulcers, rheumatic ulcers, and traumatic ulcers (10). According to the American Society Classification of Anesthesiology, patients who are not candidates for surgical treatment are treated with nonsurgical methods such as chemotherapy with collagenase or hydrocolloids that prepare the wound bed, or intravenous administration (IV) of fluids and daily dressings with antimicrobial ointments (11, 12). However, little is known about which treatments are most effective in treating deep burn wounds.

We aimed to evaluate and compare the results of skin grafting versus nonsurgical treatment in patients with deep second-degree burn wounds of the back and posterior trunk.

MATERIALS AND METHODS

Study design

This is a descriptive-analytical cross-sectional study of patients with trunk and buttock burns admitted to Burn Hospital in Shiraz, Iran from 2017 to 2019.

This study was conducted after approval by the Vice-Chancellor for Research and Technology of Shiraz University of Medical Sciences and approval by the Ethics Committee in Biomedical Research (Code: IR.SUMS.MED.REC.1398.201).

Participants and eligibility criteria

All patients with deep second-degree burns of the posterior trunk (behind the chest and buttocks) were included in the study by the census method. Individuals who underwent conservative treatment (due to lack of suitable skin for grafting because of extensive body trauma, burns greater than 50%, and patient dissatisfaction with skin grafting) were compared with individuals who underwent surgery and skin grafting. Individuals with incomplete clinical records, grade 3 and superficial grade 2 burns, chemical and electrical burns, diabetes, coagulation disorders, age over 70, and burns with acidic substances were excluded. Selection of suitable patients for the study (determination of burn grade) was done by a burn surgeon with sufficient experience in the field of burns. Randomization into two equal groups was performed using Randlist software (ver. 1.2). Since both treatment procedures were in favor of the patient and according to the treatment protocol, the patient was informed about the study procedure after selection by the randomization software according to the research ethics and participated in the study after giving written consent.

Setting

Skin tissue from the thigh area was primarily used for skin grafting. The purpose of conservative treatment in the present study is daily dressing with topical antimicrobial ointment (silver sulfadiazine or mupirocin) in combination with fibrinolysin ointment on the trunk and buttocks, and application of mechanical pressure (resulting from the patient's weight and resting position during hospitalization) to the burn area. Some patients underwent superficial debridement to clean the wound. To control patients' follow-up, similar treatments were used after discharge.

Data collection

The skin surface with burns and the final repaired tissue (after six months) were photographed with a digital camera, and the respective area was measured with Photoshop software. The Vancouver scar score

Table 1: Baseline demographic and clinical characteristics.

Variables	Skin graft		P-value
	Yes	No	
Age, years, mean (SD)	26.41 (22.87)	29.29 (16.63)	0.00*
Gender, male, N (%)	27 (59.23)	26 (72.22)	0.805**
Number of hospitalizations, N (%)			
• Once	24 (61.54)	28 (77.78)	0.293***
• Twice	10 (25.64)	7 (19.44)	
• 3 times	3 (7.69)	1 (2.78)	
• 4 times	2 (5.13)	0	
Cause of burns, N (%)			
• Hot liquid	7 (17.9)	10 (27.8)	0.637***
• Contact with a hot object	2 (5.1)	1 (2.8)	
• Fire	18 (46.2)	15 (41.7)	
• Explosion	8 (20.5)	9 (25.0)	
• Unknown	4 (10.2)	1 (2.8)	
Burn area, percentage, mean (SD)	26.90 (12.49)	29.43 (12.97)	0.404*

N: Number; SD: Standard Deviation. P-value of less than 0.05 is considered significant. *One sample t-test. **Chi-square ***Fisher exact test

(VSS) and pigmentation, vascularity, thickness, and pliability were assessed. The Fitzpatrick scale was used to assess the change in pigmentation of the skin tissue after repair. Skin assessment, VSS, and the Fitzpatrick scale were performed by a specialist outside the study who was blinded to the study.

Outcomes

VSS, pigmentation, vascularity, thickness and pliability were considered as outcomes and compared between the two groups.

Statistical analysis

Kolmogorov-Smirnov and Shapiro-Wilk tests were used to check the normality of quantitative data. Quantitative data were described with mean and standard deviation (SD) and qualitative data with frequency (percentage). Chi-square and one-sample T-tests were used for analysis between variables. Data were analyzed using Statistical Package for the Social Sciences (SPSS) ver. 24 (IBM Corp., Armonk, NY, USA).

RESULTS

Overall, 82 patients were studied, of whom 7 died and were excluded. Seventy-five patients met the criteria for participation; thirty-two patients had skin grafts. The mean age of the patients was 27.79 ± 20.03 yr and 53 patients (70.7%) were male. The mean hospital stay was 19.99 ± 12.05 days. Most

patients (69.33%) were hospitalized once, and the most common cause of burns was fire (44%). The mean percentage of burn area of the patients was 28.13 ± 12.70 . Demographic information and clinical characteristics of the patients are shown in Table 1.

Outcomes

Scars were compared based on pigmentation, vascularity, thickness, and pliability. In general, mean scores were higher in skin graft patients, which was also statistically significant ($P < 0.001$). The mean score of VSS was higher in patients with skin graft than those without graft ($P < 0.001$, Table 2).

DISCUSSION

In recent decades, great advances have been made in the treatment of burn wounds (13-15). However, deep burn wounds, in which all skin layers are destroyed and subcutaneous tissues may be damaged, are still very difficult to treat because donor sites are needed (16). Our results showed that the mean VSS in the studied patients with skin grafts was significantly higher than that in the patients without skin grafts and with grade 2 deep burns. Some studies have reported the efficacy of skin grafts in the treatment of deep burn wounds (7, 17).

In a Chinese clinical trial, the survival rate of the Meek skin graft (introduced by C. P. Meek in 1958 and further improved in 1993) was 91.76% (7). In

Table 2: Comparison of outcomes of patients with and without skins graft

	Skin graft		P-value
	Yes	No	
Evaluation of scars, score, mean (SD)			
• Pigmentation	1.83 (0.38)	1.11 (0.43)	<0.001
• Vascularity	2.10 (0.62)	0.35 (0.48)	<0.001
• Thickness	2.31 (0.71)	1.04 (0.19)	<0.001
• Pliability	2.93 (0.61)	0.61 (0.49)	<0.001
Vancouver scar score, mean (SD)	9.20 (1.65)	3.07 (0.96)	<0.001

SD: Standard Deviation. P-value of less than 0.05 was considered significant. *One sample t-test.

a study, the survival rate of the Meek skin graft was 90% (17). However, some studies reported a survival rate as low as 70% (18), which may be due to a small sample size and differences in the selection of the expansion ratio. Previous findings on skin convergence and wound healing time state that skin grafting in children with burn wounds takes an average of 9 days (19). In addition, recent studies have shown that wound healing time is significantly shorter in people with skin grafts (7).

Skin grafting for third-degree burn wounds was associated with excellent postoperative outcomes, such that using the Meek method and based on the VSS scoring system, 26, 6, and 3 patients had excellent, good, and poor outcomes, respectively. Moreover, the cure rate was 91.43% (7). However, in the present study, despite the short duration of hospitalization in patients with skin grafts, the mean VSS was significantly higher than in the nonsurgical group (debridement and dressing) (9.20 ± 1.65 vs. 3.07 ± 0.96 ; $P < 0.001$). Providing hydrocolloids in the dressing environment for debridement and creating the proper pH, temperature, and humidity for the wound provides an excellent opportunity for granulocyte migration, activation of endogenous enzymes, and epithelialization of the wound. The creation of these conditions leads to immediate healing of burn wounds with less likelihood of scarring (20). The presence of positive pressure is effective in healing burn wounds, and constant pressure is applied to wounds on the buttocks and trunk because of the weight of the body. This constant pressure on the wounds of the back, lower back, and buttocks, together with the abundant sweat glands in these areas, may be an appropriate factor for spontaneous debridement and wound healing and tissue formation. In addition, this pressure prevents scarring or thickening of the wound by playing a

role similar to that of a compression garment in the months to come.

Due to insufficient donor sites and the need to prioritize debridement and wound grafting, especially in patients with extensive burns with high total body surface area (TBSA), deep second-degree burns, due to the possibility of better healing without skin grafts on the trunk and buttocks, these areas could be candidates for nonsurgical therapy or the next priority for skin grafts (21).

LIMITATIONS

The presence of constant pressure on the wounds of the back and lumbar spine, together with the numerous sweat glands in this area, may be an appropriate factor for spontaneous debridement and wound healing as well as tissue formation. In addition, pressure prevents scarring or thickening by playing a role like a tourniquet in the months ahead. Because superficial debridement with dressing was generally compared to skin grafts in some patients because the treatments were used in combination, it was not possible to compare accurately the individual methods. This is because patients received the best possible treatment.

CONCLUSION

The mean VSS was significantly higher in patients with grade 2 deep burns who received skin grafting than in patients without skin grafting. Due to the lack of donor sites and the need to prioritize skin grafts in burn patients with high TBSA, it is better to perform skin grafts on the posterior trunk and buttocks in areas with deep grade 2 burns as a last priority and treat this wound with conservative therapy.

FINANCIAL SOURCE

This research was supported by the Research Department at Shiraz University of Medical Sciences, Shiraz, Iran.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interests.

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