

Use of Close Relative (Family) Skin Allograft in Major Burns

Kaan Gideroğlu,¹ Murat Yaman,¹ Erhan Tunçay,¹ İrfan Taşdelen,¹
Ömer Halim Kaşıkçı,² Gaye Taylan Filinte³

¹Burn and Wound Care Centre,
University of Medical Sciences,
Kartal Dr. Lütfi Kırdar Training and
Research Hospital,

²Department of Family Physician,
University of Medical Sciences,
Kartal Dr. Lütfi Kırdar Training and
Research Hospital,

³Department of Plastic Surgery,
University of Medical Sciences,
Kartal Dr. Lütfi Kırdar Training and
Research Hospital;
all İstanbul, Turkey

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Correspondence: Kaan Gideroğlu,
SBÜ, Kartal Dr. Lütfi Kırdar Eğitim ve
Araştırma Hastanesi, Yara ve Yanık Tedavi Kliniği,
Kartal, İstanbul, Turkey
E-mail: drkaang@gmail.com



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ABSTRACT

Objective: The aim of this study was to retrospectively evaluate results of treatment using close relative (family) skin allograft at our burn center for patients with major burns.

Methods: Files of 13 patients who had severe burns and were treated with close relative (family) skin allograft at our burn center between January 1, 2016 and August 1, 2016 were examined retrospectively for age, sex, total burn surface area (TBSA), Abbreviated Burn Severity Index (ABSI) score, length of hospital stay, and mortality, as well as to obtain donor data of total count, sex, age, complications and length of stay in hospital.

Results: Mean burn patient age was 24.46 (± 12.65 SD) years and mean donor patient age was 35.64 (± 9.34 SD). Ten of the patients were male (76%) and 3 were female (24%). Mean TBSA was 57.61% (± 13.13 SD) and mean ABSI score was 9.07 (± 2.25 SD). Mean length of hospital stay for burn patients was 53.46 (± 38.62 SD) days, and 1.23 (± 0.43 SD) days for donor patients. Four of the 13 burn patients (30%) died in hospital as result of burn injuries. Skin allografts were taken from just 1 close relative donor in 1 session in all cases but 1, in which skin allografts were taken from 2 close relatives in 2 sessions. Only 1 of the 14 donors was female (8%). No donor site complications were observed.

Conclusion: Especially in major burn patients without sufficient autologous donor site skin graft, close relative (family) skin grafting is an easy and cost-effective treatment method when skin banks and keratinocyte cultures are not available.

INTRODUCTION

Major burns are life-threatening trauma. Since critical amounts of fluids and electrolytes are lost in event of major burns, effective fluid-electrolyte replacement must be planned and implemented urgently. Early and effective fluid-electrolyte treatment is the first priority for decreasing morbidity and mortality in cases with major burns.^[1-3] Early excision of burn wound and repair with skin graft is another important treatment modality to be applied in cases with partial- or full-thickness major burns.^[4] In cases with second- and third-degree burns covering more than 30% to

40% of total body surface area (TBSA), adequately sized autologous skin graft is not available. In these cases, use of skin allograft is an important and life-saving treatment alternative. Use of cultivated keratinocyte is another alternative treatment modality.^[3] In many countries, especially in North America and Europe, skin banks have been established. However, at present no skin bank exists in our country. Therefore, rather than using banked skin allografts, application of fresh, close relative skin grafts has been recommended as life-saving method of treatment.^[3] In the present study, we aimed to share our data and

Table 1. Patient data

Patient	Gender	Age	Etiology	Percentage of burn area (%)	Hospital stay (days)	ABSI score	Age of donor	Donor sex	Donor hospital stay (days)	Health status of the patient at discharge
1	Male	27	Flame	75	50	11	26	Male	2	Salah
2	Male	15	Flame	49	38	7	39	Male	1	Salah
3	Female	3	Scald	28	30	6	42	Male	1	Salah
4	Male	2	Scald	39	108	6	29	Male	1	Salah
5	Male	35	Flame	62	42	10	39	Male	1	Exitus
6	Male	28	Scald	91	155*	12	30, 57	Male, male	1	Salah*
7	Female	40	Flame	53	42	11	43	Male	1	Exitus
8	Male	37	Flame	66	13	10	29	Male	1	Exitus
9	Male	16	Flame	64	67	9	41	Male	2	Salah
10	Male	24	Flame	33	50	6	28	Male	1	Salah
11	Female	39	Flame	72	42	12	31	Male	1	Salah
12	Male	31	Flame	70	15	10	43	Female	1	Exitus
13	Male	21	Flame	47	43	8	22	Male	2	Salah

*Although burn areas of the patient had healed at 155th postoperative day, inpatient treatment of sacral decubitus wound continued during file screening. ABSI: Abbreviated Burn Severity Index.

experience gained using retrospective screening of files of patients who underwent repair of major burn wounds using close relative skin allografts between January 1, 2016, and August 1, 2016.

PATIENTS AND METHODS

Patients who underwent major burn wound repair at our burn centre between January 1, 2016, and August 1, 2016 with close skin allograft were included to the study, after local ethic committee approval. In order to include family members such as uncles, aunts, grandparents, and cousins, we thought that the term family allograft is a more appropriate term than close relative allograft. All donor candidates were evaluated before the procedure using general health and blood donation criteria, as well as testing for HIV, hepatitis, and syphilis. Ineligible candidates were not accepted as donors. Burn patient data regarding age, gender, cause of burn, TBSA percentage and depth, Abbreviated Burn Severity Index (ABSI)^[5,6] score, length of hospital stay, number of donors, donor site complications, and mortality was collected (Table 1).

RESULTS

Screening of patient files revealed that 13 patients

had undergone burn wound repair using close relative (family) skin allografts (Table 1). Mean age of patients (male: n=10, 76%; female: n=3, 24%) was 24.46 (± 12.65 SD) years. Scald (n=3) and flame (n=10) burns were found. Scald burns were partial-thickness burns and included diffuse, second-degree deep, and occasionally, third-degree burns. Flame burns were mixed-thickness burns consisting of patchy area of second-degree deep and multiple, third-degree, full-thickness burn wounds. According to Lund-Browder Chart, mean TBSA was determined to be 57.61% (± 13.13 SD). Mean ABSI score was 9.07 (± 2.25 SD). Mean hospital stay was 53.46 (± 38.62 SD) days. Four (30%) of 13 patients died in hospital. Only 1 patient received allografts from 2 donors in separate sessions. Allografts for remainder of patients were harvested from 1 donor in single session. Partial-thickness skin grafts from donors were enlarged (meshed grafts) when necessary. Burn areas were grafted after hydrosurgical debridement (Figure 1). Mean donor age (female: n=1, 8%; male: n=13, 92%) was 35.64 (± 9.34 SD) years. Mean length of donors' hospital stay was 1.23 (± 0.43 SD) days. Postoperative complications, such as infection, unhealed donor site wound, or similar problems were not observed in any of the donors. Skin donor site of all donors had healed in maximum of 15 days.



Figure 1. (a) Preoperative anterior view of the trunk of a patient with a flame burn covering 72% of TBSA. (b, c) 10, and 14 days after application of debridement using hydrosurgery, and repair with close relative (family) skin allograft. (d) Appearance of the repair site at postoperative 4. week.

Table 2. Predicted survival rate based on ABSI scores

ABSI Score	Threat to life	Probability of survival (%)
2–3	Very low	≥99
4–5	Moderate	98
6–7	Moderately severe	90–80
8–9	Serious	70–50
10–11	Severe	40–20
12	Very severe	≤10

ABSI: Abbreviated Burn Severity Index.

DISCUSSION

Use of autologous, partial-thickness skin grafts to close burn wounds is optimal treatment method. However, for patients with larger burn wounds, limited skin graft donor sites and related potential morbidities, as well as requirement for larger donor site may restrict ability to use autologous partial skin grafts. Especially in cases with severe, diffuse burns, or full-thickness, second-degree burns with lack of available autologous skin graft donor site, use of human skin allografts for temporary closure of burn wounds is still one of the most important treatment alternatives.^[3,7–9] Biological and non-biological skin substitutes may also be used in these cases. In a recent survey of burn surgeons from 36 countries conducted by Wurzer et al., 96% of study participants indicated that they used skin substitutes in their daily practice.^[9] Total of 51% stated that they had used skin allografts, and 28% had used skin xenografts on their patients. Study also revealed that 86% of the participating surgeons thought that biological dressings did not cons-

titute a risk for the patients. In our clinic, we both use biological and non-biological skin substitutes and especially in cases with severe and large burns we utilize close relative skin allografts as a life saving tool.

As far as we could determine, only a few studies on use of close relative (family) skin allografts are available in the literature. Most of these studies are related to pediatric cases; however, this set of research does include adult cases investigated by Coruh et al.^[3,10,11] Similar to cases studied by Coruh et al., present series also consisted of mixed burn cases. Mean percentage of burn area in our series and that of Coruh et al. was 57.6% and 55%, respectively. Nearly 30% percent of our major burn patients who received allograft died. This percentage was 41% in Coruh et al.'s study, since 7 of their 17 patients died.^[3] If ABSI score is 8–9 points, 30%–50% percent of patients are expected to die (Table 2).^[5,6] Since mean ABSI score of our patients was greater than 9, nearly 50% percent would be expected to die, or at least 40% percent, as seen in Table 2. Our success in keeping this percentage as low as 30% might be related to shorter time interval between burn incident and referral of the patients to our clinic, lower incidence of flame burns, and use of mostly hydrosurgery for debridement of burned areas, rather than classical surgical tangential excision. Although we think hydrosurgery is the least effective factor in the above mentioned success, debridement using hydrosurgery for removal of necrotic skin tissue ensures more clear-cut surgical margin compared with tangential debridement performed with conventional surgery. As a consequence, larger areas of living dermis remain after debridement, and depth of burn wound is reduced. In a prospective study conducted by Hyland et al., the authors reported that when debridement was performed using hydrotherapy, necrotic tissue was removed more precisely and

with greater preservation of living dermis compared with surgical debridement.^[12]

Fresh, close relative (family) skin allografts are easily available and do not require storage are cheaper option than skin substitutes or frozen skin allografts. They are an effective and reliable method for safe closure, particularly in cases of larger burn wounds, and do not expose recipient to bacterial contamination, or hepatitis and HIV viruses.^[3] Other advantages of this treatment modality have been also reported. For instance, human leukocyte antigen compatibility inherent in close relative allografts prolongs the time to graft failure and allows closure of burn wound with larger meshed autografts. Furthermore, intimate family members feel deeply happy about their important contribution to this challenging treatment process.^[3] As a known fact fresh use of allograft without their storage increase the chance of viability, and success of the graft.^[13,14] Therefore, we also think that use of fresh allografts is advantageous. In countries where there are skin banks, allografts stored in frozen glycerol are frequently used in clinical practice. However, cell death has been observed during allograft preservation and conservation procedures,^[13] and effect of antiviral agent glycerol on HIV is not fully known.^[3] Disadvantages of the use of close relative skin grafts include potential surgical complications as result of being transplanted from living donors and donor site healing problems. The first disadvantage can be minimized with meticulous preoperative examination of patients' health status. The second disadvantage can be minimized by selecting young volunteer donors without diabetes or any disease that would impair wound healing, and also by using thin or only moderately thick skin grafts. We were extremely attentive to these issues, and did not observe any postoperative systemic complication in our patients related to donor site.

In conclusion, use of autologous skin graft to repair deep burn wounds is optimal treatment modality. Especially for major burn patients with inadequate

autograft donor site, and when keratinocyte cultures cannot be used and skin banks are not available, use of close relative (family) skin allografts is a successful, readily accessible, and cost-effective method of treatment.

Conflict of interest

None declared.

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Geniř Yanıklı Hastalarda Yakın Akraba (Aile) Kaynaklı Deri Allogrefti Kullanımı

Amaç: Bu çalışmada yanık merkezimizde yakın akraba (aile) kaynaklı deri allogreft ile onarım uygulanan majör yanıklı hastaların geriye dönük olarak incelenmesi ve sonuçlarının değerlendirilmesi amaçlandı.

Gereç ve Yöntem: 1 Ocak 2016–1 Ağustos 2016 tarihleri arasında yanık merkezimizde yakın akraba kaynaklı deri allogreft uygulanan 13 hasta çalışmaya dahil edildi. Hasta dosyaları yaş, cinsiyet dağılımı, total yanık yüzey alanı, "Abbreviated Burn Severity Index" (ABSI) skoru, hastanede kalış süresi mortalite sayısı ile donör sayısı, donör yaşı, cinsiyeti, donör alan komplikasyonları ve yatış süresi açısından geriye dönük olarak tarandı.

Bulgular: Yanık hastaların yaş ortalaması 24.46 (± 12.65 SS) yıl, donör hastaların yaş ortalaması ise 35.64 (± 9.34 SS) yıl idi. Hastaların 10'u (%76) erkek, üçü (%24) kadındı. Total yanık yüzeyi alanı ortalaması %57.61 (± 13.13 SS) olarak saptandı. ABSI skoru ortalaması 9.07 (± 2.25 SS) olarak bulundu. Ortalama hastanede kalış süresi 53.4 (± 38.62 SS) gün idi. Allogreft uygulanan dört (%30) hastanın hayatını kaybettiği saptandı. Yalnızca bir hasta için farklı seanslarda iki ayrı donörden allogreft alınırken, diğer hastalar için ise sadece tek donörden allogreft alındı. Donörlerin biri kadın 13'ü (%92) erkek idi. Hiçbir donörde verci alanla ilgili bir komplikasyon saptanmadı.

Sonuç: Özellikle yeterli miktarda otogreft donör sahası bulunmayan majör yanıklı hastalarda deri bankası bulunmadığı ve keratinosit kültürlerinin yapılamadığı koşullarda yakın akraba (aile) kaynaklı deri allogrefti kullanımının ulaşılması kolay ve 'cost-effective' bir yöntem olduğunu düşünmekteyiz.

Anahtar Sözcükler: Yakın akraba; aile; majör yanık; deri allogrefti.