

## Original Research Article

DOI: <http://dx.doi.org/10.18203/2349-2902.ijssj20194404>

# Early excision and grafting versus delayed grafting in deep burns of the hand

Mohammed Leithy Ahmed Badr<sup>1</sup>, Tarek Fouad Keshk<sup>2</sup>, Yahia Mohammed Alkhateeb<sup>1</sup>,  
Ashraf Moustafa Esmail El Refaai<sup>3\*</sup>

<sup>1</sup>Department of General Surgery, <sup>2</sup>Department of Plastic Surgery, Faculty of Medicine, Menoufia University, Egypt  
<sup>3</sup>MBBCH, Faculty of Medicine, Alexandria University, Egypt

**Received:** 08 February 2019

**Revised:** 26 July 2019

**Accepted:** 31 July 2019

**\*Correspondence:**

Dr. Ashraf Moustafa Esmail El Refaai,  
E-mail: d-ashraf@hotmail.com

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

## ABSTRACT

**Background:** Deep burns of the hand are considered severe, because even a small wound may cause profound functional disability, ugly scar and psychosocial problems. The aim of the study is to compare early excision and grafting versus delayed grafting in deep burns of the hand.

**Methods:** This study was conducted on 30 patients with deep burns of the hand. Patients were randomly divided into two equal groups. Group I included 15 patients who were subjected to early excision and grafting within the first week after injury while group II included 15 patients who were subjected to delayed excision and grafting two weeks after injury. The study was conducted on patients presented to Plastic and Reconstructive Surgery Department of Abou Qir General Hospital in the period from December 2016 to December 2017.

**Results:** The results of early excision and grafting were better than delayed grafting regarding the intake, infection and post-burn contraction (mean  $91.33 \pm 7.67$  in group I and  $83.67 \pm 10.08$  in group II with  $p$  value=0.026).

**Conclusions:** Early excision and grafting of the hand is a better alternative than delayed excision and grafting as regards better graft intake, less wound infection, less contractures, less risk of regrafting, less hospital stay, less 5D-itching scale and Vancouver score and more cost effectiveness.

**Keywords:** Early excision and grafting, Delayed excision and grafting, Hand, 5D-itching scale, Vancouver score

## INTRODUCTION

Burns are amongst the most devastating injuries that leave not only physical deformity but also psychosocial harm, especially in places like the face and the hand. Scar formation and itching are two of the most important complications which are difficult to manage in patients with deep burns.<sup>1</sup>

Several factors affect the outcome of the patients, including the age, the total body surface area (TBSA), the depth of burn wound, whether there is inhalation injury,

previous medical conditions, infections, pneumonia, and septicemia.<sup>2</sup>

The upper extremity especially the hands are amongst the most commonly affected areas of the body with burn injuries. Burns of these 'special areas' are considered severe, because even a small wound may cause profound functional disability.

The aim of surgical procedures in burnt patients is prevention or control of infection, conservation of all viable tissues, maintenance of form and function, timely

closure of all wounds, early return to rehabilitative therapy, and decrease in mortality.<sup>3</sup>

Burn management is done by one of two methods; excision and then skin graft after the formation of granulation tissue (delayed); and excision and graft simultaneously (early).<sup>4</sup>

In the first and oldest technique a more conservative approach is implemented by routine wound care until the shedding of the scar and the formation of granulation tissue, after which skin grafting of the burned and unhealed area can be applied. This technique consumes more time for the granulation tissue that is appropriate for skin grafting to form. In this chronic process patients were expected to be more susceptible to scar formation. In the second technique, scar tissue is excised during the first days post burn (preferably in the first 2 weeks) and auto grafted simultaneously when the patient becomes stable [early excision and grafting (EEG)].<sup>3</sup>

The aim of the study is to compare between early and delayed excision and grafting in deep burns of the hand.

## METHODS

This study was conducted on patients presented to Plastic and Reconstructive Surgery Department of Abou Qir General Hospital in the period from December 2016 to December 2017. The study was conducted on 30 patients with deep burns of the hand. Patients were randomly divided in to two equal groups. 15 patients as group I were subjected to early excision and grafting within first week versus 15 patients as group II were subjected to delayed excision and grafting.

### ***Inclusion criteria***

Any patients associated with second and third degree burns in hand, with age limitation of 6 months-65 years. All injuries under study were caused by flame burn.

### ***Exclusion criteria***

Any patients associated with other diseases like diabetes and cardiac diseases, and scars from previous burn injuries which have connective tissue disorders.

All cases included in this study will be subjected to the history and personal data, age, gender, date of admission, and associated medical illness.

Investigations was done like complete blood count, random blood sugar, bleeding profile (PT, PC, INR), and liver and kidney function tests.

In the post-operative visits, progression of graft intake, infections, contracture and deformities were monitored and managed.

The variables that were measured and compared amongst the two groups included: degree of scar formation, graft intake and the hospitalization time.

Itch score the 5-D itch scale was used. ( According to this scale, each patient is given a score from 1 to 5 for each of the five following parameters as duration, degree, direction, disability and distribution. The overall score of each patient can range from 5 (no pruritus) to 25 (severe pruritus).<sup>5</sup>

Scar evaluation was done using the Vancouver scale. This index scores the scars based on four parameters which included vascularity, pigmentation, pliability and height of scar tissue. Each patient receives a score ranging from 0 to 13, 0 indicating complete recovery and 13 indicating severe scarring.<sup>6</sup>

Patients were divided randomly into two groups; group I: early excision and autografting and group II: conservative treatment with late autografting.

### ***Group I***

#### ***Early excision and autografting***

This group included 15 patients (21 hands). The ages of the patients ranged from (7-56) years with a mean of  $29.20 \pm 12.84$  years, 11 males and 4 females. Early tangential excision and skin grafting was carried out within 7 days of admission.

#### ***Dressing***

On admission, the burned hand was irrigated with ample amount of sterile normal saline. Careful inspection for debris or foreign bodies as well as to judge the depth of the burn was performed. Careful debridement of bullae and devitalized tissue was done. Betadine 10% solution was used for sterilization. Non-occlusive dressing was applied in the form of Sufra tull impregnated with Nitroufrazone and covered with sterile gauzes. Static splint was applied with overlying crepe bandage.

#### ***Operative procedure***

All patients were operated upon under general anesthesia. While the hands were stretched by the assistant, tangential excision by the surgeon was carried out using the humpy knife. Escharectomy was continued until uniform punctuate bleeding points were achieved. Small burn eschars on the dorsum of the fingers were difficult to be excised by the humpy knife. They were excised by sharp scissor. The hand was then wrapped in wet gauze impregnated with 1: 200.000 saline: adrenaline. Split thickness skin graft of the same size of the raw surface of the dorsum of the hand was harvested from the thighs.

Multiple holes were created into the graft and applied over the wound. Multiple 3/0 silk sutures were taken at

the edge to fix the graft and some stitches were also taken at the center of the graft to fix it into the bed of the wound. Staples were used as well to fix the grafts. The graft was covered with sufra tull impregnated with antibiotic ointment. Small gauze with padding cotton was applied and tie over stitches were taken. Dorsal splint was applied. The operative time for the surgical procedure for a single hand ranged from 30 to 45 minutes with an average of 35 minutes.

### **Postoperative management**

All patients received postoperative analgesics in the form of non-steroidal anti-inflammatory drugs or pethidine. One gram third generation cephalosporin was administered twice daily. The first postoperative dressing was performed after three days. Half of the stitches were removed and the other half of stitches was removed at the second postoperative dressing. The patient was discharged when complete take of the graft was guaranteed. Physiotherapy was resumed one week after surgery.

### **Re-evaluation**

In this study the patients were evaluated by the measurement of the active ROM and hand grip strength. The patients were followed up in the department or outpatient clinic after their discharge. A file was made for every patient including his or her data. The schedule of postoperative visits was

#### *First evaluation*

First evaluation was done two weeks postoperatively; measurement of graft intake, infection and itching was reported.

#### *Second evaluation*

Second evaluation was done two months postoperatively. Measurement of the graft intake, infection, contracture, scar, need regrafting and itching was reported.

### **Group II**

#### *Late excision and grafting*

This group included 15 patients; 8 males and 7 females (25 hands). The age of patients ranged from 3 to 62 years with a mean of 30.60 years.

Conservative management was applied for this group in the form of regular dressing, debridement, and skin grafting when healthy granulation tissue was formed. The burned hand was subjected to vigorous irrigation by saline and application of antimicrobial ointments in the form of nitrofurazone. Skin grafting was done when healthy granulation tissue took place. Escharectomy or spontaneous separation of burn eschar and formation of

healthy granulation tissue occurred within a range of 15 to 22 days post-burn with an average of 16 days. Following skin grafting, the hand was splinted in the antideformity position. Physiotherapy was continued again one week after the skin graft application.

#### *First evaluation*

2 weeks postoperatively; measurement of graft intake, infection and itching was reported.

#### *Second evaluation*

2 months postoperatively; measurement of graft intake, infection, contracture, scar, need regrafting and itching was reported. Measurements and readings were taken as in group I after 2 days, after 2 weeks postoperatively and after 2 months postoperatively.

#### *Statistical analysis*

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0. (Armonk, NY: IBM Corp).<sup>2</sup> Qualitative data were described using number and percent. The Kolmogorov-Smirnov test was used to verify the normality of distribution quantitative data were described using range (minimum and maximum), mean, standard deviation and median. Significance of the obtained results was judged at the 5% level.

## **RESULTS**

The present study was conducted in the Plastic and Reconstructive Surgery Department of Abou Qir General Hospital, Alexandria, Egypt and the findings are tabulated as below. The study was done over one year from December 2016 to December 2017, 30 patients (19 males and 11 females) with deep burns of the hand were randomized into study (early and late excision and grafting). These groups were studied for graft intake, infection, contracture, scarring, itching and the need for regrafting.



**Figure 1: Delayed excision and grafting.**

There was no statistically significant difference between the two groups regarding demographic distribution, age,

the risk of infection, the risk of contracture or the probability of having an operation of regrafting.

In group I; complete take of the skin graft was reported in 13 patients and partial loss of the skin graft occurred at the periphery of the graft in 2 patients which did not need regrafting and healed spontaneously while in group II; complete take of the skin graft was reported in 11 patients and partial loss of skin graft developed in 4 patients and needed regrafting.



**Figure 2: Early excision and grafting.**



**Figure 3: After 3 month of delayed grafting.**

Both groups ranged from 70-100% intake of graft, but with mean  $91.33 \pm 7.67$  in group I and  $83.67 \pm 10.08$  in group II with  $p$  value=0.026 which is statistically significant.

**Table 1: Comparison between the two studied groups according to demographic data.**

	Early excision (n=15)		Late excision (n=15)		Test of Sig.	P
	No.	%	No.	%		
<b>Gender</b>						
Male	11	73.3	8	53.3		
Female	4	26.7	7	46.7	$\chi^2=1.292$	0.256
<b>Age (years)</b>						
Min.- Max.	7.0-56.0		3.0-62.0		$U=111.50$	
Mean $\pm$ SD.	$29.20 \pm 12.84$		$30.60 \pm 17.96$			
Median	29.0		28.0			

$\chi^2$ , p:  $\chi^2$  and p values for Chi-square test for comparing between the two groups; U, p: U and p values for Mann Whitney test for comparing between the two groups.

**Table 2: Comparison between the two studied groups according to different parameters**

	Early excision (n=15)		Late excision (n=15)		$\chi^2$	P
	No.	%	No.	%		
<b>Infection</b>						
No	9	60.0	3	20.0		
Minimal	3	20.0	5	33.3	$5.540^*$	$^{MC}p=0.126$
Moderate	3	20.0	5	33.3		
Severe	0	0.0	2	13.3		
<b>Contraction</b>						
No	15	100.0	12	80.0	3.333	$^{FE}p=0.224$
Yes	0	0.0	3	20.0		
<b>Second operation</b>						
No	13	86.7	11	73.3	0.833	$^{MC}p=0.651$
Graft	2	13.3	4	26.7		

$\chi^2$ : Chi-square test for comparing between the two groups;  $^{MC}p$ : p value for Monte Carlo for Chi-square test for comparing between the two groups;  $^{FE}p$ : p value for Fisher exact for Chi-square test for comparing between the two groups; \*: Statistically significant at  $p \leq 0.05$ .

The 5-d itching scale in group I ranged from 5.0-18.0 with mean  $7.60 \pm 4.21$ , and in group II ranged from 7.0-

22.0 with mean  $12.80 \pm 4.72$  and p value was 0.002 which is statistically significant.

**Table 3: Comparison between the two studied groups according to 5-d itching scale.**

	Early excision (n=15)	Late excision (n=15)	U	P
<b>5-d itching scale</b>				
Min.-Max.	5.0-18.0	7.0-22.0		
Mean±SD.	7.60±4.21	12.80±4.72	40.0*	0.002*
Median	5.0	12.0		

$\chi^2$ : Chi square test for comparing between the two groups; <sup>MC</sup>p: p value for Monte Carlo for Chi square test for comparing between the two groups; U, p: U and p values for Mann Whitney test for comparing between the two groups; \*: Statistically significant at  $p \leq 0.05$ .

**Table 4: Comparison between the two studied groups according to vancouver scale.**

	Early excision (n=15)	Late excision (n=15)	U	P
<b>Vancouver scale</b>				
Min.-Max.	2.0-9.0	3.0-10.0		
Mean±SD.	4.13±1.96	6.87±2.23	41.0*	0.003*
Median	3.0	7.0		

U, p: U and p values for Mann Whitney test for comparing between the two groups; \*: Statistically significant at  $p \leq 0.05$ .

Vancouver scale in group I ranged between 2.0-9.0 with mean  $4.13 \pm 1.96$ , and in group II range 3.0-10.0 with mean  $6.87 \pm 2.23$  and p value was 0.003 which was statistically significant.

## DISCUSSION

Over many decades, there was a conflict about prompt hand burn excision and skin grafting and a question was always raised, does it really benefit to graft early over the classic conservative treatment with delayed hand grafting in terms of better hand function? Tangential excision and immediate grafting for deep dermal burns were first used by Janzenovic 1970, as well as Jackson and Stone.<sup>2</sup> The authors stressed that the early closure of this type of wound would lead to decrease scarring and better function. They suggested the second to fifth post-burn days as the optimum time for the procedure.

A large body of evidence demonstrates that delayed reepithelialization increases the risk of scarring. Thus, a major focus of wound and burn care is the early removal of any necrotic tissue or eschar. Indeed, excision and grafting of deep partial-thickness and full-thickness burns has been shown to improve outcomes compared with nonoperative burn wound management.<sup>7</sup>

The timing of hand graft application is also controversial. For burn patients, the first goal of skin grafting is survival, the second is function and the third is cosmesis. This should be taken into consideration when planning skin grafting to the burned hand. The complete coverage of two burned hands with sheet grafts will likely require harvest of four to six autografts measuring  $4 \times 10$  inches each. On the other hand, it makes little sense to leave a burn survivor with nonfunctional hands because grafting was deferred until the remainder of the skin was healed. A balance between survival and function must be struck.<sup>8</sup>

Likewise, function is not affected by the choice of sheet graft over meshed graft, and some claim that cosmetic result is similar with meshed and unmeshed grafts to the hands.

In this study, showed that early escharectomy and skin grafting gave better results and less in infection, contraction, itching and Vancouver result than late excision and grafting. These results are in agreement with the results of.<sup>9</sup>

Moreover, with the early excision and grafting the average hospital stay and therefore the overall management cost was reduced compared with those patients treated by late skin grafting.<sup>10</sup>

This study have reached to the conclusion that early excision of burn of the hand and autografting is better than late grafting in terms of better results of the hand, avoiding the possible complications from tissue contracture. Itching score and the scar score, these results were not statistically significant.

## CONCLUSION

The early excision and grafting of deep burn of hand is better than delayed excision and grafting according to healing time and graft intake and harbors less complications as infection, contracture, graft rejection and reoperation (regrafting) with a lower score in both 5D itching and Vancouver scales denoting a better outcome.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

## REFERENCES

1. Ayaz M, Bahadoran H, Arasteh P, Keshavarzi A. Early excision and grafting versus delayed skin grafting in burns covering less than 15% of total body surface area; a non- randomized clinical trial. 2014;2(4):141-5.
2. Asmaa M, Fouad MG, Tarek FK, Sheikh YME, Ibrahim AH. Retrospective study of mortality and causes of death in Menofia University Burn Center. *Menoufia Med J.* 2014;27:290-5.
3. Rehim S, Singhal M, Chung K. Dermal skin substitutes for upper limb reconstruction: current status, indications and contraindications. *Hand Clin.* 2014;30(2):239.
4. Vinita P, Khare N, Chandramouli M, Shende N, Bharadwaj S. Comparative analysis of early excision and grafting vs delayed grafting in burn patients in a developing country. *J Burn Care Res.* 2016;37(5):278-82.
5. Enshaei A, Masoudi N. Survey of early complications of primary skin graft and secondary skin graft (delayed) surgery after resection of burn waste in hospitalized burn patients. 2014;6:98-102.
6. Joo SY, Cho YS, Cho SR, Kym D, Seo CH. Effects of pain Scrambler therapy for management of burn scar pruritus: a pilot study. *Burns.* 2017;43(3):514-9.
7. Schiefer JL, Rath R, Ahrens E, Grigutsch D, Graff I, Stromps JP, et al. Evaluation of scar quality after treatment of superficial burns of the hands and face with Dressilk or Biobrane-An intra-individual comparison. *Burns.* 2017;44(2):305-17.
8. Jackson DM. The diagnosis of the depth of burning. *Br J Surg.* 1953;40:588-96.
9. Tompkins RG, Burke JF, Schoenfeld DA, Quinby WC Jr, Behringer GC, Ackroyd FW. Prompt eschar excision: A treatment system contributing to reduced burn mortality. A statistical evaluation of burn care at the Massachusetts General Hospital (1974-1984). *Ann Surg.* 1986;204:272-81.
10. Winfree J, Barillo DJ. Burn management: nonthermal injury. *Nurs Clin North Am.* 1997;32:275-96.
11. Khadjibayev AM, Fayazov AD, Djabriyev DA, Kamilov UR. Surgical treatment of deep burns. *Ann Burns Fire Disasters.* 2008;21(3):150-2.

**Cite this article as:** Badr MLA, Keshk TF, Alkhateeb YM, Refaai AME. Early excision and grafting versus delayed grafting in deep burns of the hand. *Int Surg J* 2019;6:3530-5.