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Evaluation of Minced Skin Grafts in the Treatment of Post Burn Leukoderma

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ABSTRACT

Background: Post burn leukoderma had been characterized by chalk white depigmented areas of variable sizes and shapes. Re-pigmentation of the hypopigmented lesion is still a big challenge, current treatment modalities for post burn leukoderma include non-surgical techniques and many surgical interventions.

Objective: To evaluate the efficacy of minced skin graft in the treatment of post burn leukoderma.

Material and Methods: Twenty Patients (18 female & 2 males) with post burn leukoderma were included. Patients' age ranging from 10 to 50 years. The minimum leukoderma surface area was 0.5% whereas the maximum was 3%. Patients were assessmed one year post operatively using Vancouver Scar Scale and Patient Observer Scar Assessment Scale (POSAS).

Results: Vancouver scar scale results were; Good pigmentation were obtained in 75%, Hyperpigmentation in 20% and Partial pigmentation was in 5%. For POSAS The overall patient opinion scale was 1 (which denote best skin colour) in 80%, score 2 in 10%, score 3 in 5%, score 4 in 5% of patients.

Conclusion: Minced skin graft can be used safely for the treatment of post burn leukoderma. It is a simple reliable technique that can be easily integrated in our daily practice, no need for special instruments or laboratory preparations, gives a satisfactory result for patients with minimal donor morbidity.

Key Words: *Leukderma – Minced grafts – Post burn.*

Ethical Committee Approval: This study had been approved by the Institutional Research Ethics Committee of Faculty of Medicine, Cairo University. An informed consent had been obtained from all patients included in this study.

Disclosure: No conflict of interest.

INTRODUCTION

Post burn leukoderma is a common aesthetic problem that is frequently encountered following deep partial or full-thickness burns, particularly in burned dark-skinned patients. Especially, when their wounds took longer healing period. In those patients; this hypopigmentation result in a strong colour contrast which makes leukoderma more distinct than in light-skinned patients **[1]**.

Re-pigmentation of the hypopigmented lesion is still a big challenge for plastic surgeons, current treatment modalities for post burn leukoderma include non-surgical techniques and many surgical interventions **[2,3]**. Both are always aim to either restore the melanocytes in the affected areas or to camouflage it **[4]**.

Although dermabrasion and sheet split thickness skin grafting give the best color and texture matching, donor site morbidity is considered the main drawback for this technique particularly in treating large lesions, as the size of the graft should be equal to or slightly larger than the size of the affected area, also it should be harvested from a new donor site **[5,6,7]**.

In our current study, we aimed to evaluate the efficacy of minced skin graft in the treatment of post-burn leukoderma.

MATERIAL AND METHODS

Following ethical committee approval, patients with post burn leukoderma were included. However, exclusion criteria extended to include; patients younger than 10 years and patients older than 50 years. Patients with electrical or chemical burns were excluded, as their management plan usually include early surgical excision & grafting. Also, patients with post burn leukoderma who had been previously treated; either by camouflage procedure, medical or surgical treatment modalities. In this study, we tended to select patients will small leukdermal patches to standardize our technique to be applied on larger patches later on.

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Following obtaining written consent. Preoperative preparation & photos were obtained. Intraoperatively, a very thin split thickness skin grafts (about 0.1-0.15mm thick) were harvested from previous donor or from the medial aspect of the thigh if there was no previous donor. Then, grafts were minced with sharp iris scissors into tiny particles on the flat side of a disposable carrier for a skin graft mesher or the bottom side of a petri dish until it was pasty. (Fig. 1).

The depigmented skin layer until uniform pin-point capillary bleeding was seen that denotes reaching a vascular bed and ensure removing of all the fibrous tissue using electrical driven high speed dermabrader fitted with a diamond fraise wheel. Usually, the dermabrasion was extended beyond the edges of the depigmented area for few millimeters to ensure complete excision of all depigmented lesion. (Fig. 2).

Following dermabrasion, the pasty minced grafts was mixed with a small amount of normal saline to allow uniform spread of the pasty mix over the entire raw surface of the recipient site, ensuring that the mix is as flat as possible. (Fig. 3).

Post-operatively, the recipient site was closed by tie over for 7 days to ensure adequate grafts take. On the 7th day post-operatively, the tie over was removed, then the dressing was done every other day. On the 14th day post operatively, the graft take was assessed. Once healing is completed, Anti-scar silicone gels were used twice daily for 6 months. Follow-up visits were scheduled every two months for the next year. Serial photos were obtained each visit to assess the pigmentation of the skin according to the evaluation protocols.

Patients were subjected to the post operative assessment one year post operatively using Vancouver Scar Scale and Patient Observer Scar Assessment Scale (POSAS) and compare the results with the preoperative photos.

Fig. (1): The Skin Graft is minced by a scissor on a flat side of the bottom side of a petri dish till it resembles a paste.

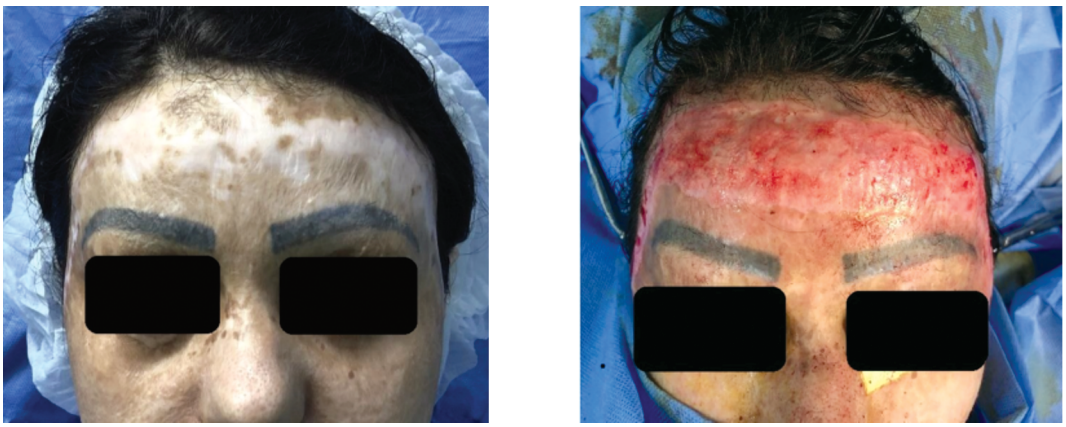

Fig. (2): Preparation of the recipient (depigmented) area by dermabration until pin-point capillary bleeding was seen.

Fig. (3): The process of spreading minced grafts on the dermabraded recipient area uniformly.

RESULTS

Between January 2019 and October 2021, A total of 20 Patients who met our inclusion criteria were included. Patients' age ranging from 10 to 50 years old (mean=25.60). They were 18 females and 2 males. Flame burn was the main cause of burn in 18 patients, while scald burn was the cause of burn in 2 patients only. Originally, the degree of burns was superficial partial thickness in 7 patients (35%), while in 13 patients (65%) it was deep partial thickness. Those patients presented 12 to 84 months post burn (mean=14.35) for leukoderma treatment. The total burn surface area ranging from 1% to 12% (mean=6.35), the minimum leukoderma surface area was 0.5 % whereas the maximum was 3%. Regarding the site of leukdermal patches, the chest was noticed to be the most frequently operated; 40% (8 patients), whereas it was 20% in hands (4 patients), 20% in feet (4 patients), 10% in arms (2 patients), one patient in the forehead (5%), and one patient in the leg (5%).

Patients were assessed one year postoperatively according to Vancouver scar scale as follow; Good pigmentation were obtained in 75% (15 patients) (Figs. 6,7,8), Hyperpigmentation in 20% (4 patients) and Partial pigmentation was in 5% (one patient) due to partial graft loss. (Table 1).

For POSAS, the results were as follow; The overall patient opinion scale was 1 (which denote best skin colour) in 80% (sixteen Patients), score 2 in 10% (two patients), score 3 in 5% (one patients), score 4 in 5% (one patients). (Fig. 4).

The overall observer opinion scale was 1 (which denote best skin colour) in 70% (fourteen cases), score 2 in 15% (three Patient), score 3 in 5% (one patient), score 4 in zero%, score 5 in 5% (one patient), score 6 in 5% (one patient). (Fig. 5).

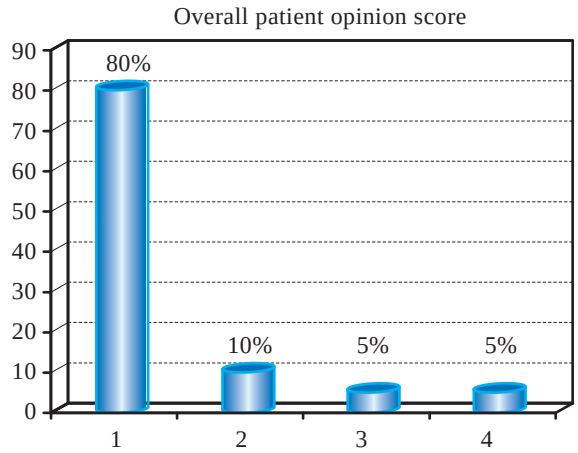

Fig. (4): A chart of POSAS showing the overall patient opinion scale.

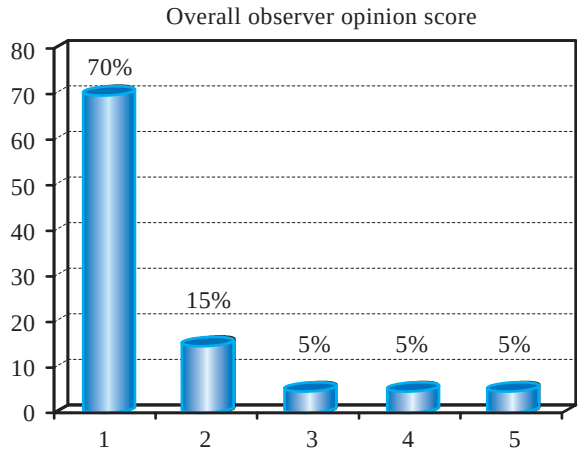

Fig. (5): A chart of POSAS showing the overall observer opinion scale.

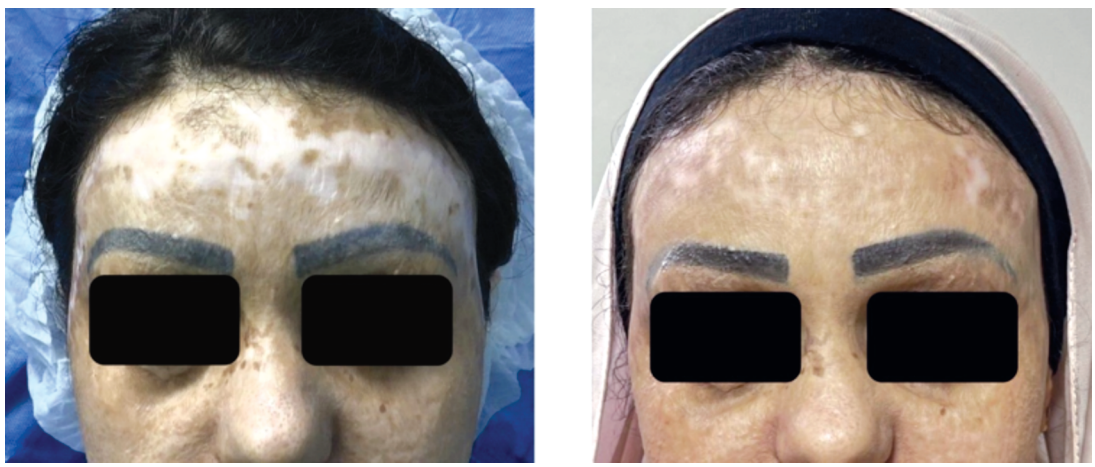

Fig. (6): Pre-operative post burn leukoderma of the forehead & six months post-operatively.

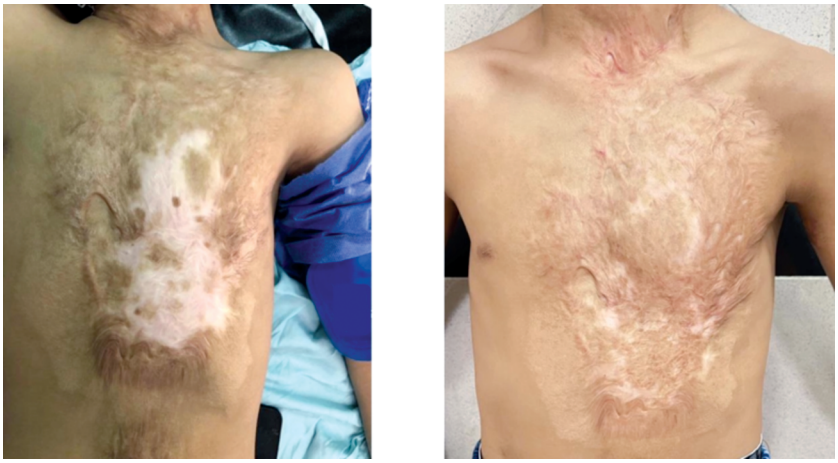

Fig. (7): Pre-operative post burn leukoderma of the anterior chest wall & six months post-operatively.

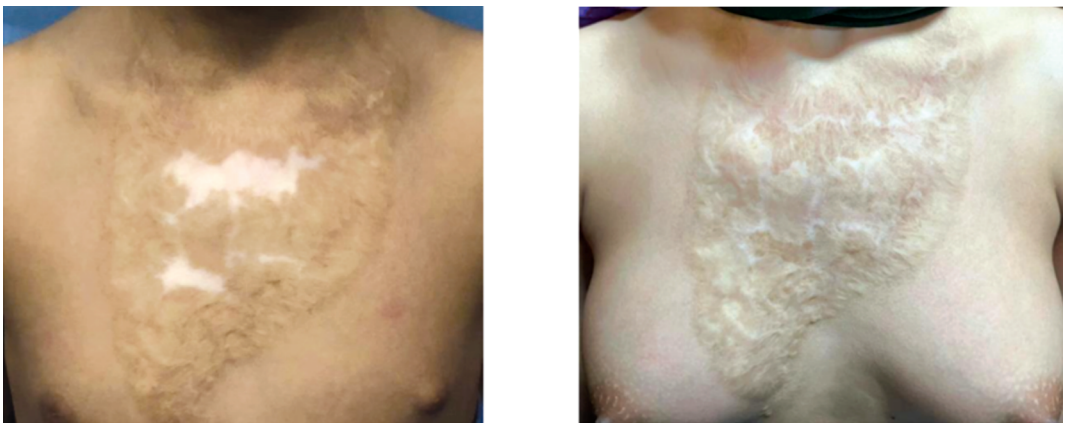

Fig. (8): Pre-operative post burn leukoderma of the anterior chest wall & 30 months post-operatively.

Table (1): Table showing comparison between pre and post operative pigmentation status according to Vancouver Scar Scale.

	Pre-operative		Post-operative		*p*-value
	Count	%	Count	%	
Pigmentation:					
Hyper-pigmentation	0	0	z	20	<0.001
Good pigmentation	0	0	15	75	
Hypo-pigmentation	20	100	1	5	

DISCUSSION

Burns are common devastating injuries, that might result in a significant amount of pain, disability and occasionally death. Burns can have serious functional and aesthetic consequences such as pigmentary changes and scar formation.

Post burn leukoderma had been characterized by chalk white depigmented areas of variable sizes and shapes. This is usually due to the scar tissue that was laid down following healing by secondary intention, which provides a barrier not only to the transfer of melanin by the dendritic processes but also to melanocyte migration **[8]**.

Repigmentation of the hypopigmented lesion is still a big challenge, current treatment modalities for post burn leukoderma include non-surgical techniques and many surgical interventions **[3]**. Non-surgical modalities include; Medical Tattooing either utilizing natural dyes (Henna) or synthetic dyes. Non-surgical modalities also include Narrowband ultraviolet B (NB-UVB) phototherapy, Topical daylight Psoralen and Ultraviolet A (PUVA) therapy & Electrophoto-Biomodulation (intensive pulsed light + radiofrequency + cooling). Surgical techniques include excision and primary closure, Skin Grafting: Either split-thickness or full thickness skin grafts. In areas larger than donor sites, meshing of split skin graft, Modified Meek technique or Minced Skin Graft can be used as modification of split thickness skin grafts while punch grafting and Mini-punch grafting as modification of full thickness grafts. Recently suction blister epidermal mini-grafting was used with promising results. Also, Cellular Grafts either Non-cultured

Epidermal Cell Suspension (NCES) or Transplantation of Cultured Autologous Melanocytes are used with promising results.

Despite the temporary improvement that could be achieved by camouflage procedures or other non-surgical modalities **[8]**, Some patient still prefer those modalities over corrective surgeries. As many of these surgeries will eventually add more scars and usually needs longer follow-up.

Surgical techniques are always aim at restoring the melanocytes in the affected areas and addresses the two main challenges; depigmentation and textural changes **[4]**.

These surgical techniques include; dermabrasion with thin split thickness skin grafting, minigrafting, punch micrografting, chip skin grafting, cultured epithelium, noncultured keratinocyte-melanocyte suspensions, and epidermal cell suspension spray **[9]**.

In our current study, we studied the efficacy of minced skin graft in the treatment of post-burn leukoderma.

We adopted the technique published by Miyanaga in 2017. He described this technique to promote wound healing and improve donor site appearance following harvesting of split-thickness skin grafting **[10,11]**.

Literature review revealed similar concept regarding repigmentation of post burn leukoderma in 1985 by Harashina. He reported that chip skin grafting revealed adequate repigmentation in leukodermic areas in 12 patients. He also reported that chip skin grafting could result in less donor site disfigurement and was easier to prepare when compared to other surgical methods. Despite the differences between Harashina's technique and our technique for preparation of minced grafts, our results matched his results regarding the repigmentation, which where good pigmentation that had been obtained in 15 patients which represent 75% of the cases. However, mosaic appearance of the treated area was the main drawback in Harashina's publication **[12]**.

Although dermabrasion and sheet split thickness skin grafting give the best color and texture match, donor site morbidity is considered the main drawback for this technique particularly in treating large lesions, as the size of the graft should be equal to or slightly larger than the size of the lesion. Also, it should be harvested from a new donor site **[4,5]**.

One of the main advantages of our adopted technique is the limited donor site morbidity, as we harvested a graft size smaller than the lesion size. Also, we can harvest the graft from a previous donor site, since it will be minced into tiny particles and this has no effect on the appearance.

Despite the slight similarity between minced skin grafting and punch grafting regarding the graft type, many studies had reported that patients satisfaction was not good when punch grafts were used **[13,14]**. That's why a modifications were applied by MIKI FUJII in 2007 regarding the size and thickness of the punch graft; to be more smaller and thinner, the so called mini-punch graft **[15]**.

One of the main differences between punch graft and minced skin grafting is that the appearance of the pigmentation. Punch graft results in cobblestone appearance in both the donor and recipient sites **[13,14]**. The minced skin grafting technique that we adopted in this study gives a smooth and homogenous repigmentation in the recipient site.

In contrast with the epidermal suspension spray and cultured autologous melanocytes techniques, minced skin graft technique is simple technique that can be easily prepared without the need of special instruments nor laboratory preparations. The epidermal suspension spray and cultured autologous melanocytes techniques gives better skin color match, but they are expensive and difficult as it need much laboratory preparations **[16,17]**.

In the present study, we noticed a peri-graft halo of depigmentation around the graft and this problem was mentioned as a disadvantage of dermabrasion and sheet split-thickness skin grafting **[18,19]**. To overcome this problem, we extend the dermabrasion beyond the edges of the depigmented area for few millimeters beyond the original leukodermic patch and the minced graft had been spread over these areas as well.

Conclusions:

Minced skin graft can be used safely for the treatment of post burn leukoderma. It is simple reliable technique that can be easily integrated in our daily practice, no need for special instruments or laboratory preparations, gives a satisfactory result for the patients with minimal morbidity.

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