Original Research Article

DOI: http://dx.doi.org/10.18203/2349-2902.isj20194032

Laser versus dermabrasion and split thickness skin graft for management of post burn leucoderma

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Received: 28 July 2019 Accepted: 21 August 2019

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ABSTRACT

Background: The aim of the study is to compare between dermabrasion and split thickness skin grafting and fractional CO_2 laser in management of post burn leucoderma. Deep burn can have serious aesthetic consequences as it often result in scar tissue and pigmentary changes in the skin. It is understood that skin pigmentation involves melanin. Leucoderma results from melanin loss at the basal layer of the epidermis. Fibrosis ultimately inhibits melanocyte migration and subsequent production of melanin in the injured area. Management of post burn leucoderma was either non-surgical or surgical treatment. Non-surgical therapies are make-up, tattooing and fractional CO_2 laser. The surgical treatments include dermabrasion with thin split thickness skin grafting, non-cultured keratinocyte-melanocyte suspensions, mini grafting, cultured epithelium, blister epidermal grafting, chip skin grafting and epidermal cell suspension spray.

Methods: A prospective study of 30 patients with post burn leucoderma between May 2018 and May 2019, at Ahmed Maher Teaching Hospital. Dermabrasion and split thickness skin grafting in 15 patients (group 1). Fractional CO₂ laser in another 15 patients (group 2).

Results: Group one: 13% of patients showed excellent colour match, 33% good colour match and 53% poor colour match. Group two: 27% of patients showed excellent colour match, 47% good colour match and 26% poor colour match (p value=0.311).

Conclusions: Fractional CO₂ laser is better than dermabrasion and STSG for management of post burn leucoderma.

Keywords: Dermabrasion, Graft, Laser, Leucoderma

INTRODUCTION

Burns often lead to physical deformity and changes in cutaneous pigmentation, which vary depending on the depth of injury. Hypopigmentation or depigmentation often results from partial or full-thickness burns, which is referred to as leucoderma after burn and is often found in the hands, head, and neck regions. The critical problem of post-burn leucoderma is the lacking normal melanocytes. Melanocytes are situated on the basal layer of epidermis. They are specialized melanin producing

cells and responsible for the pigmentation of skin, hair, and eye. They are contribute to the appearance of skin and provide protection from damage by ultraviolet radiation.²

Hypopigmentation is common in full-thickness burn injured darker-skinned patients and will involve a longer recovery period. In dark-skinned patients, particularly amongst Africans and Asians, post-burn skin hypopigmentation results in a strong colour contrast making it more distinct than in light-skinned races.³

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Current treatment modalities for post-burn leucoderma include non-surgical and surgical interventions. Non-surgical therapies are temporary, involving the use of make-up, tattooing and fractional CO₂ laser. The surgical treatments include dermabrasion with thin split thickness skin grafting, non-cultured keratinocyte-melanocyte suspensions, mini grafting, cultured epithelium, blister epidermal grafting, chip skin grafting and epidermal cell suspension spray.⁴

The aim of the study is to compare between dermabrasion and split thickness skin grafting and fractional CO₂ laser in management of post burn leucoderma.

METHODS

This work is a prospective randomized study of 30 patients with Post-burn leucoderma. Patients were randomly divided in to two equal groups;15 patients in group one were subjected to dermabrasion and split thickness skin graft and 15 patients in group two were subjected to fractional CO_2 laser at Ahmed Maher Teaching Hospital at the period between May 2018 to May 2019.

Inclusion and exclusions criteria

Patients associated with leucoderma secondary to burns were included. Pregnant women and patients with history of bleeding or connective tissue disorders were excluded from the study.

Dermabrasion and STSG (15 patients)

The procedure begins by superficially stripping the hypopigmented area using a diamond fraise until uniform punctate bleeding is noted which signifies penetrating to a depth of the papillary dermis. Saline soaked gauze is applied for haemostasis until graft harvested. Lidocaine with adrenaline injected at the donor site (medial aspect of thigh) to reduce blood loss and to provide greater tissue that assists in harvesting. Lubrication of donor skin

with K-Y gel allows easy gliding of the dermatome. Ultra-thin skin graft is harvested using electric dermatome at a 30-45 angle from the donor skin surface. With the non-operating hand providing traction behind the dermatome, the assistant provides traction in front of dermatome to help stretch and flatten the skin. Harvested graft may get washed with saline and then used with meshing. Ultra-thin skin graft is placed over dermabraded area with sutures.

Fractional CO₂ laser (15 patients)

Selected lesion is wiped with alcohol swabs. Topical anaesthetic cream was applied 30 min. before session. Protecting eyewear were applied to patient. Laser set parameters were adjusted as following: Power: 15-20 W, Mode: Smart Pulse, Frequency: 10-15 Hz and Stack: 1-5. LASER was applied to lesion. Cooling of skin with saline soaked gauze after finishing. Topical soothing cream is applied. Patient is advised to avoid sun exposure. Repeated sessions were required (4 sessions) with 1 month interval. Patients needed 3-6 months follow up period after last session of treatment.

Statistical analysis

The collected data were organized, tabulated, and statistically analysed using IBM SPSS (statistical package for social science) Software for Windows, Version 19.0. Armonk, NY: IBM Cor. For quantitative data, the range, mean, and SD (standard deviation) were calculated. For qualitative data, which describe a categorical set of data by frequency, percentage of each category, comparison between two groups and more was done using the χ 2-test. For comparison between means of two groups of parametric data of independent samples, Student t. test was used. Significance was adopted at P less than 0.05. for the interpretation of results of tests of significance.

RESULTS

The age of our patients in group (1) ranged between 20-44 years with a mean age of 32.40±8.13 years.

Table 1: Comparison between CO₂ laser and dermabrasion and STSG as regard age.

		Range	Mean±SD	t test	P value
Age (years)	Co2 Laser	4–45	21.67±13.31	7.101	0.013*
	Dermabrasion and STSG	20–44	32.40±8.13	7.101	0.013

Table 2: Comparison between CO2 LASER and dermabrasion and STSG as regard colour match.

Colour match		CO ₂ laser N (%)	Dermabrasion and STSG N (%)	Total N (%)
Poor		4 (26.7)	8 (53.3)	12 (40.0)
Good		7 (46.7)	5 (33.3)	12 (40.0)
Excellent		4 (26.7)	2 (13.3)	6 (20.0)
Total		15	15 (100)	30 (100)
Chi-square	χ^2	2.333		
	P value	0.311		

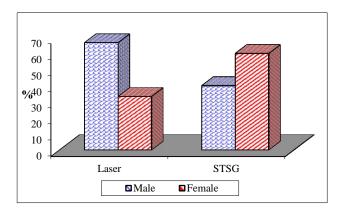


Figure 1: Comparison between Co₂ laser and dermabrasion and STSG as regard sex.

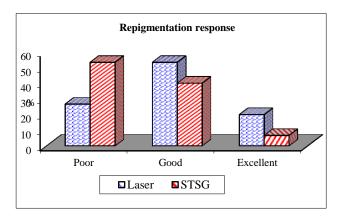


Figure 2: Comparison between Co₂ laser and dermabrasion and STSG as regard repigmentation response.

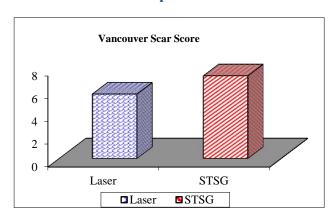


Figure 3: Comparison between Co₂ laser and dermabrasion and STSG as regard Vancouver scar score.

The age of our patients in group (2) ranged between 4-45 years with a mean age of 21.67±13.31 years (p value=0.013) (Table 1).

In our study, 14 patients were females (47%) and 16 patients were males (53 %). 10 males and 5 females were randomly subjected to Co_2 laser. 6 males and 9 females

were randomly subjected to dermabrasion and STSG (p value=0.143) (Figure 1).

In group (1), 15 patients were subjected to dermabrasion and STSG. 2 patients showed excellent colour match, 5 patients showed good colour match, 8 patients showed poor colour match. In group (2), 15 patients were subjected to fractional Co₂ laser. 4 patients showed excellent colour match, 7 patients showed good colour match, 4 patients showed poor colour (Table 2).

6 patients out of group (1) showed good repigmentation response, one patient showed excellent repigmentation response, 8 patients showed poor repigmentation response. 8 patients out of group (2) showed good repigmentation response, 3 patients showed excellent repigmentation response, 4 patients showed poor repigmentation response (p value=0.270) (Figure 2).

In this study, Vancouver scar score was ranged from 2 to 11. Vancouver scar score was found to be significantly higher in patients who subjected to dermabrasion and STSG which reflects severe scaring (p value=0.074) (Figure 3).

Statistical analysis of our results showed no significant difference between Co_2 laser and dermabrasion and STSG as regard age. There was no statistically difference between Co_2 laser and dermabrasion and STSG as regard sex. As regards the type of burn injury, no statistically significant difference was found between Co_2 laser and dermabrasion and STSG.

DISCUSSION

Post burn hypopigmentation is a complication of burning which is important regarding the cosmetic respect and its psychological effects on the patient Burn injury leads to damage of epidermal melanocytes and hair follicles. Scar tissue lay down after healing by secondary intention provides a barrier to both the transfer of melanin to keratinocytes and melanocyte migration.⁵

Post burn leucoderma was managed by different treatment modalities which include: non-surgical and surgical interventions. The surgical techniques aim to restore the melanocytes in the affected areas and address the two main challenges: depigmentation and textural changes.⁶

Small lesions can be peeled off and replaced with an epidermal graft or a conventional sheet skin graft. Such lesions are often extensive and a large donor site is needed. Falabella have treated post burn leucoderma by mini-grafting, achieving noticeable improvement and patient satisfaction. Mulekar et al treated 10 patients with post-burn leucoderma with a cell suspension formed of non-cultured Melanocyte-Keratinocyte transplantation taken from a donor skin sample and transplanted on to a dermabraded recipient area. This was followed by 18

sessions of excimer laser starting 1 month postoperatively. Of the 10 patients treated, 3 were lost to follow-up. The remaining 7 patients showed repigmentation ranging from 90 to 100% with good colour matching.⁸

Dermabrasion with thin split thickness skin grafting is a fairly simple and versatile approach. In a study by Kahn et al after grafts were placed on the target area, 60% of patients reported good colour match and 12 patients reported excellent colour match. The ability to couple this technique with other procedures, and its lack of scarring in donor and recipient sites are its greatest advantage. The size of the donor site is limited in its use for large areas of hypopigmentation.⁹

Acikel et al managed post-burn leucoderma by dermabrasion and thin split-thickness skin grafting. Repigmentation was occurred in 12 out of 13 patients. In their study, dermabrasion of hypo pigmented burn scar was done by using Co_2 laser to decrease the bleeding and scar formation. ¹⁰

Sobhy et al treated post burn leucoderma by dermabrasion and thin split thickness skin grafting in 10 patients. 40% of the patients showed good results, 20% excellent results, 20% fair results and 20% poor results. 11

In study by El melegy and ElSakka, 24 patients with post burn hypopigmentation were selected and E light was used, using different filters, according to the skin colour. 17 cases were evaluated as excellent, 4 cases were evaluated as good, and 3 cases were evaluated as fair. 12

In our study, colour match was found to be significantly higher in patients who subjected to fractional Co_2 laser. Vancouver scar score was found to be significantly higher in patients who subjected to dermabrasion and STSG which reflects severe scaring. Repigmentation response was found to be significantly higher in patients who subjected to fractional Co_2 laser.

In this study, dermabrasion and STSG showed hyperpigmentation in 4 patients leading to poor colour match to the surrounding skin. To minimize the hyperpigmentation, patients were advised to avoid graft exposure to the sun and to use sunscreens for at least 4 months.

CONCLUSION

We found that fractional Co_2 laser is one of non-surgical treatment of post burn leucoderma that showed good results. Dermabrasion and STSG are good, easy and simple surgical solution for management of post burn leucoderma. Fractional Co_2 laser is better than dermabrasion and STSG for management of post burn leucoderma.

Funding: No funding sources Conflict of interest: None declared

Ethical approval: The study was approved by the

Institutional Ethics Committee

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Cite this article as: Gad SS, Kishk TF, Taalab AA, El Gerza AI. Laser versus dermabrasion and split thickness skin graft for management of post burn leucoderma. Int Surg J 2019;6:3048-51.