

Heat dermabrasion as an effective innovative technique for treatment of different types of scars

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Abstract

Background There are different morphological types of scars like linear, rounded with regular linear or irregular surface according to the cause could be induced by trauma or skin disorders like cutaneous leishmaniasis.

Objective To modify scars by heat dermabrasion, to have a better appearance with good cosmetic look.

Methods This is a prospective study where 74 patients included, 39(52.7%) females and 35(47.29%) males, their ages ranged from 5-40 years with a median age of 25 years. According to the shape, nature and color, there were linear, rounded, pigmented, atrophic or non-atrophic scars, with irregular or smooth surface. The scoring system was adjusted according to the type of scar including a reduction in surface area, normalize the texture, suture lines, atrophy and pigmentation. So the estimation of the reduction rates in all these points was as follow: mild reduction: 1-25%, moderate reduction: >25-50%, marked reduction: >50-75%, and excellent reduction: >75-100%. Diathermy was applied directly to scar to induce destruction of old scar.

Results The cause of the scar was traumatic in 60(81%) patients while by disease process commonly leishmaniasis in 14(18.9%) cases. There was gradual healing, remodelly and improvement of all types of scar during six months follow up. The scoring reduction rate showed moderate in 30(40.54%) patients while marked in 35(47.2%) cases and 9(12.16%) cases had excellent improvement.

Conclusion Heat dermabrasion is an innovative good cosmetic cost effective therapy for different types of scars without need for surgical excision and suturing.

Key words

Heat dermabrasion, diathermy, scar.

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Introduction

Skin scars are the normal and unavoidable outcome of mammalian tissue repair. They usually form after trauma, skin surgery, burns or infections.^{1,2}

A cutaneous scar is defined as dermal fibrous replacement tissue and results from a wound that has healed by resolution rather than regeneration.³

Types of skin scars

Widespread (stretched) scars develop when the fine lines of surgical scars progressively become stretched and widened, which commonly occurs in the three weeks after surgery.⁴

Hypertrophic immoderate tissue production at the site of a physical injury to the skin which stays within the borderlines of the original defect.¹

Keloids excessive scarring that extends beyond the borderlines of the original defect.¹

Atrophic it is frequently associated with acne,⁵ chickenpox, other diseases (especially Staphylococcus infections), surgery, certain insect and spider bites, or accidents.

Phases of wound healing

The formation of pathological scars is regarded as a result of dysregulation in the process of wound healing that is characterized by an inflammatory phase, a proliferative phase, and a remodeling phase.^{6,7} The early stage scars have extreme abnormally arranged collagen fibers and diffuse capillaries in histology, whereas the late stage of scars has excessive fiber deposition and blocked vessels, which manifest as normal color or altered color scars with elevation, flattening or atrophy in morphology.⁸

Treatment

Non-invasive options Which include use of compression treatment (such as pressure garments with or without gel sheeting); static and dynamic splints; acrylic casts; masks and clips; application of a variety of creams, oils and lotions; silicon sheeting, with or without adhesive; hydrotherapy.^{1,9-11}

Invasive treatments include surgical excision and resuture.⁶ Intralesional steroid injection¹² is commonly used but is prone to complications (dermal thinning, fat atrophy and pigment changes). Other therapies that have been recommended with variable outcomes include injections of 5-fluorouracil¹³ and bleomycin,¹⁴ laser therapy,¹⁵ radiotherapy,¹⁶ cryosurgery¹⁷ and debulking with intralesional injection of methotrexate.¹⁸

Atrophic scars have been improved with dermabrasion, chemical peels, punch excisions, cutaneous laser resurfacing and the use of soft tissue fillers.¹⁹

A novel and safe technique called heat dermabrasion has been introduced by Sharquie KE in the treatment of different types of acne scarring and nose volumeplasty for bulky nose under local anesthesia in one session with minimal or no adverse effects.²⁰⁻²⁵

Therefore, the aim of this study is to find new therapy, easy to perform with no complications and good cosmetic results by doing heat dermabrasion.

Patients and Methods

This is clinical, interventional, prospective, therapeutic study that was carried out from May 2014 to July 2020 where 74 patients with Fitzpatrick skin type III and IV were included. There were 39(52.7%) females and 35(47.29%) males, their ages ranged from 5-40 years with a median age of 25 years. According to the shape, nature and color of the scar, there were linear, rounded, pigmented, atrophic or non-atrophic, with irregular or smooth surface.

Hypertrophic and keloid scars were excluded from this study. A full history was taken with emphasis on age, sex, duration and cause of the

scar, previous scar treatment and past medical and surgical history. A careful physical examination was carried out to identify the site, size, type, and color of the scars.

Photographs were taken using the camera of Samsung Galaxy Note 9 phone with 12 megapixels, at the same place with constant distance and illumination.

The scoring system for the reduction was adjusted to each type of scar, including reduction in surface area, to normalize the texture, suture lines, atrophy and pigmentation. So the estimation of the reduction rates in all these points was as follows: mild reduction: 1-25%, moderate reduction: >25-50%, marked reduction: >50-75%, and excellent reduction >75-100%.

Patient's satisfaction to response to the treatment was assessed as follows:

1) Full satisfaction. 2) Partial satisfaction. 3) No satisfaction.

Patients were prepared by cleansing the scar site by using 70% alcohol, and then wait few minutes until alcohol dry, then impregnated gauze with normal saline moved several times on the scar site in different directions for further cleaning and sterilization.

After local xylocaine anesthesia, a diathermy heated needle(RB Medical Heavy Duty set 708 with probe medical surgical theater, Nuneaten, United Kingdom) was applied directly to the scar to induce destruction of old scar, with resurfacing to induce new tissue formation. Topical antiseptic and oral antibiotics were used for two weeks. Follow up was done at 2 weeks, 1 month, 2 months, 4 months and 6 months after this interventional therapy.

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Then topical steroid was applied for one month to prevent post inflammatory hyperpigmentation

or possible hypertrophic scar or keloid formation.

Patients had been advised just to avoid sun light exposure but no need to use sunblock. Patients were also arranged to be seen again for follow up to evaluate the scar reduction ratio, color, texture, surface area, side effects and relapse.

Statistical analysis Data were statistically described in terms of range, mean, median, frequencies (no. of cases), percentage (%) disease duration and male to female ratio. All statistical calculations were done using statistical package for the social science (SPSS) version 22.

Ethical considerations The study followed the Declaration of Helsinki Principles and formal written consent was taken for each patient before starting the therapy, after full explaining about the nature of the disease, the method of treatment, complications, follow up, prognosis and the need for before and after treatment photographs. The study was approved by Ethics Committee of Fallujah Teaching Hospital (No. 7532).

Results

The cause of the scar was traumatic in 60(81%) patients while by disease process commonly leishmaniasis in 14(18.9%) cases. The sites were all on the face apart from one that was on forearm. No significant side effects apart from transient post-procedure erythema, mild pain and crust formation, were noticed at the end of treatment session.

There was gradual healing, remodeling and improvement of all types of scars during six months follow up. The scoring reduction rate showed moderate reduction in 30(40.54%) patients while 35(47.2%) had marked reduction



Figure (1): Twenty- two years old male with atrophic scar (post cutaneous leishmaniasis). Before treatment (a), at the end of session (b) and 6 months after heat dermabrasion(c).



Figure 2 Forty-eight years old male with irregular ugly scar at the root of the nose. Before treatment (a) and one month after heat dermabrasion (b).



Figure (3) Thirty years old female with starry shape atrophic scar (post cutaneous leishmaniasis). Before treatment (a) and 4 months after heat dermabrasion (b).

and 9(12.16%) cases had excellent reduction with improvement in color, texture, surface area of the scars and atrophy and these were noticed in all types of scar whether linear or rounded, pigmented or atrophic.

During the follow-up period the followings were observed:

1. Two weeks: erythema was still present, scar reduction was there and most patients showed transient post-inflammatory hyper-pigmentation.
2. One month: the scar reduction was the same as in 2 weeks but the erythema has almost gone.
3. Two months: the scar reduction was the same as above and no more pigmentary changes and the post-inflammatory hyper-pigmentation has vanished.

4. Four months: no change in scar reduction but there was an improvement in scar texture, shape and surface area.
5. Six months: no change in scar reduction with further improvement in scar texture and shape and the skin color was back to normal.

Photos of patients before treatment and during follow up period were shown in **Figures 1-5**.

The satisfaction rate ranged from partial in 20(27%) of patients while full satisfaction in 54(73%) of cases.

Discussion

Cutaneous scar is defined as dermal fibrous replacement tissue and results from a physical injury or infection that has healed by resolution



Figure 4 Eighteen years old male with linear scar on the right side of the face. Before treatment (a) and 2 weeks after heat dermabrasion (b).



Figure 5 Twenty-five years old male with disfiguring scar on the nose, Before treatment (a) and 4 months after heat dermabrasion (b).

rather than regeneration.³ Any wound in the human skin leaves a footprint in the form of a scar which can range in appearance from scarcely visible to extensively disfiguring. Cutaneous scars usually form after trauma, skin surgery, burns and infections.^{1,2}

Atrophic scars are dermal depressions that commonly occur from destruction of collagen during an inflammatory cutaneous disease such as cystic acne or varicella.²⁶ Skin surgery and trauma to the skin can also result in the formation of atrophic scars.²⁷

Heat dermabrasion using a directly heated needle is one of the novel treatment for different types of scar. There are no published data in the literatures that shed light on the effectiveness and safety of heat dermabrasion in the treatment of scars.

To the best of our knowledge, this is the first study regarding heat dermabrasion that had been performed for the treatment of different types of the scar. This treatment procedure was based on our previous experience using heat dermabrasion in the treatments for acne scars.^{20,21,23,24}

The objective of the present work is to do heat destruction of old scars and to be replaced by new cosmetically acceptable scars with better texture, color and resurfacing. The exact mechanism of improvement of atrophic scars

observed after heat dermabrasion is not well known, but injury induced by diathermy may enhance regeneration of new vessels and a new connective tissue formation especially in the depressed scar.

There are many methods and techniques to treat and correct scars. The early and the oldest technique is the mechanical dermabrasion.^{28,29} This technique could be effective but often needs general anesthesia. Also this procedure is messy, bloody as using the brush will cause blood contamination to the surrounding and this might even cause transmission of infection from the patients to medical staff. Also it is costly procedure and might be accompanied by complications.³⁰

Carbon dioxide (CO₂) and other lasers also have been used to treat scars, but this procedure is risky as a laser needs protection for doctor's and patient's eyes, is costly, needs good experience, and might need many sessions to achieve the final cosmetically acceptable outcome.³¹

In some cases the scar is too large to be corrected by surgical excision and resuturing and it may need skin graft after excision. So in these cases, heat dermabrasion may be a good choice to correct the scar with satisfactory results.

This present study showed moderate reduction

in 30(40.54%) patients while 35(47.2%) had marked reduction and 9(12.16%) cases had an excellent reduction. So heat dermabrasion is simple to perform and does not require the degree of clinical training when compared with mechanical dermabrasion.²⁹

The time required to plan and carry out this new procedure was minimal (about 10 min/scar) and patient discomfort during heat dermabrasion procedure for scar was also minimal. Also healing of the dermabraded area was fast (<2 weeks) and it was done in outpatient basis under local anesthesia and only one session was needed. It was effective for different types of scars whether smooth, irregular or atrophic. In other types of dermabrasion, the most important complication is longstanding hyperpigmentation.²⁹ While in the present work, there was no permanent hyperpigmentation but on contrary, patients usually had transient hypopigmentation of the dermabraded area although all our patients had Fitzpatrick's skin types III and IV.³²⁻³³

Conclusion

Heat dermabrasion is an innovative good cosmetic cost effective therapy for different types of scar without need for surgical excision and suturing. Also it is simple to perform and does not require much training when compared with other techniques. The better understanding of this procedure will promote the appropriate implementation of this method in clinical practice for different types of scar therapy. This procedure might be applied in a wide range of cases with different types of scars on different locations.

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