

Derma roller as an inexpensive and excellent therapeutic modality in the treatment of acne scars along with subcision and punch floatation

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Abstract

In the present times microneedling using derma roller is a less well known method. Here the emphasis has been mainly laid on the efficacy of combining microneedling with subcision & punch floatation for effective scar reduction. Acne scars are largely preventable complications of acne. 95% of the scars occur over the face thus impacting the quality of life. Treatment with derma roller is known by many names like microneedling therapy, collagen induction therapy or derma roller therapy. The present study focuses at ascertaining the efficacy of derma roller treatment objectively in the management of atrophic facial scars when combined with subcision and punch floatation.

Keywords: Derma roller, Microneedling, Acne scars, Subcision, Punch floatation.

Introduction

Acne scars are largely preventable complications of acne. 95% of the scars occur over the face thus impacting the quality of life and thereby lowering confidence of the patients. Correction of scars is the priority for acne patients.¹

Facial scarring has always been a challenge to treat and there are different treatment options. Like Laser resurfacing or Dermabrasion that offer significant improvement in facial scars, but are invariably associated with considerable morbidity & downtime interference with daily activities of the patient in post procedure period. On the other hand, treatments like microdermabrasion & non ablative resurfacing with Lasers do not give same efficacy as traditional ablative resurfacing techniques. New treatments are emerging to overcome the limitation. One such treatment is microneedling with derma roller. Acne scars can be classified into three different types—atrophic, hypertrophic, or keloidal. Atrophic acne scars are by far the most common type. The pathogenesis of atrophic acne scarring is not completely understood, but is most likely related to inflammatory mediators and enzymatic degradation of collagen fibers and subcutaneous fat.⁴

Skin needling, also referred to as collagen induction therapy, utilises vertical needle punctures rather than the horizontally directed punctures that are used in subcision and can be used to treat rolling and boxcar scars. Traditionally, a small roller equipped with rows of small needles typically ranging in size from 0.5 to 3.0 mm in length is passed over the skin using gentle pressure, puncturing the superficial layers of the skin to loosen fibrotic adhesions and induce collagen synthesis. This technique has been reported to reduce scar depth by upto 25% after 2 sessions.⁵

Acne has a prevalence of over 90% among

adolescents and persists into adulthood in approximately 12%–14% of cases with psychological and social implications.⁷

Microdermabrasion and non-ablative resurfacing with lasers do not show the same level of efficacy as the traditional, ablative resurfacing techniques. New treatments and techniques such as derma roller or microneedling therapy are being added over the last few years to overcome these limitations. There are some clinical studies in the world literature that have documented a favourable clinical and histopathological response in the skin after derma roller treatment.¹⁰

About the instrument: The standard derma roller used for acne scars is a drum-shaped roller studded with 192 fine microneedles in eight rows, 0.5-1.5 mm in length and 0.1 mm in diameter, as shown in figure 1. The number of needles on the rolling barrel may range from 192-540. The microneedles are synthesized by reactive ion etching techniques on silicon or medical-grade stainless steel. Some of them are made of titanium and those with gold coating are claimed to be less traumatic than conventional needles. The instrument is presterilized by gamma irradiation.²

Derma roller can also be used for stretch marks, wrinkles, facial rejuvenation & transdermal drug delivery.²

Materials and Methods

A total of 20 patients were selected for the study [11 males & 9 females] in the age group of 20-35 years. 2 patients did not continue the study.

All the patients willing to undergo the study were included in the study. A written and informed consent was obtained from all the patients. Appropriate grades were assigned to all the patients according to Table 1.

Then patients were subjected to all the 3 under mentioned procedures once every 4 weeks:

1. **Microneedling:** Derma-roller of size 2.5 mm was used for all the patients. A topical anesthetic was applied over the face for a duration of 45 minutes. The face was divided into 9 segments on each side for convenience of the treating dermatologist so as not miss any scarred part of the face and as well as for uniformity. In each segment derma-roller was rolled horizontally, vertically & obliquely for 8-10 times till bleeding points appeared. Bleeding was controlled with a wet saline mop. It has been shown that rolling with a derma-roller (192 needles, 250 µm length and 70 µm diameter) over an area for 15 times will result in approximately 250 holes/cm².
2. **Subcision:** 4-5 sites on each side of the face are chosen and local anesthetic is given subcutaneously using a 26G needle. Then a 20G needle is inserted into the face with the bevelled edge facing upwards & holding the needle in a horizontal position. At the point of needle insertion, blanching occurs which indicates that needle is in the dermal plane. Then slowly fanning movements are done and while doing this breaking of fibrous strands and adhesions produces a snapping sound. The needle is removed and squeezed circumferentially around exit point to evacuate excess blood and prevent large haematoma formation. A small haematoma is allowed to be formed, which supports the released scar. Haemostasis is maintained with pressure and ice application. The entire procedure lasts for 15 to 20 minutes, depending on the extent of the area to be treated. Care is taken to avoid the preauricular, temporal and mandibular areas in order to avoid injury to branches of the facial nerve and major vessels.
3. **Punch floatation:** Is used for shallow and deep boxcar scars. The scars are selected and local anesthesia is given. A 3mm or 2mm punch (depending on the size of scar) is used to isolate the scar from the surrounding skin. Then it is elevated enough to be slightly raised against the bordering tissue. Retraction of this raised tissue occurs during the healing phase, resulting in a levelled surface. On each side of the face 3-4 sites were punch floated every time.

Post procedure care: Immediately following the procedure a topical antibiotic is applied all over the face. Then a short course of systemic antibiotics & analgesics are given. In this study we also gave vit C 500 mg for 10 days to fasten the wound healing as well as for neocollagen formation. Patients were advised about the importance of sun protection using sunscreen, so as to prevent photodamage to the newly forming collagen tissue. A minimum of four weeks is recommended between two treatments as it takes that duration for new natural collagen to form.¹¹

At the completion of final session of the procedure, patients were asked to come after a month for final assessment of the grading. Photographs were taken which were compared with those of pre treatment photographs, and based on the comparison findings appropriate grades of improvement were assigned to these patients.

Results

All the 20 patients selected for study were suffering from post acne scarring, 2 of the patients discontinued the study. So there were 11 males and 7 females. The age of patients ranged from 17 to 29 years, with the mean age of 23.6 years. Most of the patients were in the third decade of their life. Youngest patient was a 17 year old male and oldest was 29 year old female.

As such no significant adverse effects were noted in any of the patients except for minimal pain and stinging sensation immediately following the procedure in few of the patients. All the patients were able to carry out their routine activities without any hindrance. Only a mild crusting was noticed after 24-48 hours at the site where microneedling was performed. All the patients strictly adhered to the 4 weeks interval between subsequent sessions for a total of 8 sessions. 2 patients were lost for follow up after third session. Hence rest of the 18 patients were available for evaluation of results at the end of study period.

All the patients who were subjects for the study filled a questionnaire in the local language. 12 patients responded as 'excellent' (7-10 on the 10-point scale), 4 patients responded as 'good' (score of 4-6) and only 2 patients responded as poor (score of <4)

Goodman and Baron for the first time introduced a grading system which includes the various morphological types of post acne scarring purely based on clinical examination.⁸ [Table 1]

Table 1: Goodman baron grading

Grade of atrophic scars	Clinical picture
Grade 1	Macular erythematous, hypo or hyperpigmented scars
Grade 2	Mild atrophy not obvious social distances of >50cm or easily covered by facial makeup or bread hair.
Grade 3	Moderate atrophy obvious at social distances of >50cm; not easily covered by makeup or bread hair, but able to be flattened by manual stretching.
Grade 4	Severe atrophy not flattened by manual stretching of skin.

Objective evaluation of the patients' acne scarring by clinical examination at the start of the study (Table 2).

According to Table 2 there were 10 patients with grade 3 acne, 6 patients with grade 2 & 2 of them had grade 4 acne.

Table 2: Acne scar grading

Grade of acne	No. of Patients
Grade 1	-
Grade 2	6
Grade 3	10
Grade 4	2

Out of the 10 patients with grade 3 scarring, an excellent response was seen in 7 patients (reduction to grade 1 or less), while rest of 3 patients with grade 3 achieved a good response (reduction to grade 2).

All the 6 patients with grade 2 scarring showed an excellent response to treatment.

Out of the 2 patients with grade 4, only one patient achieved an 'excellent' response on objective assessment. At the end of treatment for this patient acne scars were reduced to grade 2. In the other patient with grade 4 acne, scars were reduced to grade 3 and hence labelled as 'good' response.

At the end of study 14 out of 18 patients (77.7%) showed an excellent response to the treatment & the remaining 4 patients (22.2%) showed a good response.

As shown in Fig. 2, a patient with grade 3 acne who had a good response to treatment.

When acne grading of the patients were correlated with their responses according to their degree of satisfaction, we observed that maximum number of patients with grade 2 & 3 responded as excellent.

Morphological correlation of scars lead us to arrive at the opinion that rolling and boxcar scars responded excellently, whereas icepick scars improved only partially. Poor response was seen in deep tunnels and other types of complex scars.

Even deep boxcar scars and pitted scars which are well known to respond poorly to any type of treatment, responded very well to dermaroller with subcision and punch floatation.

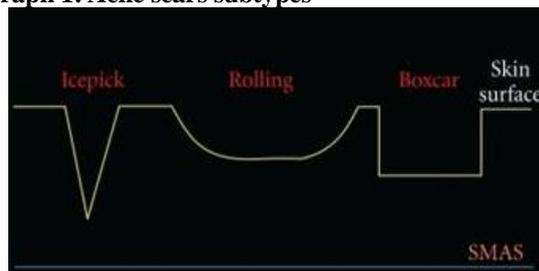


Fig. 1



Fig. 2

Graph 1: Acne scars subtypes



Discussion

Facial appearance of an individual has an influence on self-esteem, social and vocational abilities and opportunities. There are 4 types of acne scarring-ice pick, box car, rolling, hypertrophic [Fig. 3]. So for the early and effective management of acne scars newer therapeutic interventions have been developed. This includes dermabrasion, subcision, punch techniques, chemical peels, tissue augmentation, and laser.⁹ The various treatment modalities for different types of scars are as mentioned in Table 3.

Table 3: Modalities for the treatment of acne scars

Scar Type	Morphology	Treatment Modalities
Atrophic	Depressions in the skin, reduced collagen content	
Boxcar	Round to oval, sharply demarcated vertical edges with a wide base (1.5-4mm), may be shallow (0.1-0.5mm) or deep (≥ 0.5 mm)	Dermabrasion (shallow), dermal fillers (shallow), lasers (ablative, nonablative, fractional; shallow), punch techniques (deep), RF (shallow, deep), skin needling (shallow), subcision (shallow)
Ice pick	Narrow (<2mm), deep may extend into dermis or subcutaneous tissue, steep edges	Chemical peel (CROSS technique), punch techniques, RF
Rolling	Wide (4-5mm), shallow, undulating appearance	Dermabrasion, dermal fillers, lasers (ablative, nonablative, fractional), RF, skin needling, subcision
Hypertrophic	Raised firm lesions, confined to area of original acne lesion, increased collagen content.	Cryotherapy, intralesional therapy (corticosteroids, 5-fluorouracil, bleomycin, verapamil), PDL, silicone dressing

Abbreviations: RF, radiofrequency; CROSS, chemical reconstruction of skin scars; PDL, pulsed dye laser.

Dermalroller: Treatment with dermaroller is known by many names like microneedling therapy, collagen induction therapy or dermaroller therapy. The advantages with dermaroller include no epidermal injury, minimal downtime post procedure, cost effective and does not need any extensive special training or expensive instruments. The limitations of dermaroller is Grade 4 scars and linear scars or deep pitted scars do not respond well to treatment. These scars may require other modalities of management like surgical correction.⁸

Microneedling leads to the release of growth factors which stimulate the formation of new collagen and elastin in the papillary dermis along with new capillaries. This neovascularisation and neocollagenesis following treatment leads to reduction of scars.

The mechanisms of scar improvement are releasing fibrotic strands underlying scars, organization of blood in the induced dermal pocket and connective tissue formation in the area.⁹

In 1998, Desmond Fernandes, a plastic surgeon from South Africa, designed a hand-held device composed of a rolling barrel with multiple protruding needles and used it for a technique he termed "percutaneous collagen induction."¹²

Two observational studies by Fabbrocini et al., noted a statistically significant reduction in severity grading after treatment with dermaroller. An uncontrolled study by Dogra et al., in 2014 included 36 patients with acne scars. There was a remarkable improvement in the mean scar grading from 11.73 to 6.5. Treatment related complications including severe post-inflammatory hyperpigmentation and tram-track scarring was observed in 5 patients.¹²

Subcision, also called as subcutaneous incisionless surgery, a term coined by Orentreich and Orentreich in 1995 to describe the minor surgical procedure for treating depressed scars and wrinkles using a tri-beveled hypodermic needle inserted through a puncture in the skin surface (hence, "incisionless" surgery), and its sharp edges manoeuvred under the defect to make subcuticular cuts. The principle of this procedure is to break the fibrotic strands, which tether the scar to the underlying subcutaneous tissue. The depression is lifted by the releasing action of the procedure, as well as from connective tissue that forms during the course of normal wound healing. It is mainly useful for rolling scars.³

Subcision is indicated for the same types of scars that might be improved with fillers (i.e., rolling scars in which appearance is improved with manual stretching of the skin during examination). Subcision may yield longer term results than fillers.⁴ The advantages of subcision include easy application for various skin types (I–IV), inexpensive, short down-time, no significant complications, and remarkable and persistent improvement in short time without injury to the skin surface. The disadvantages include pain at the time of subcision in some cases, bruising, transient discoloration, hemorrhagic papule and pustule, hypertrophic scar,

necessity of frequent suctioning sessions, and recurrence.⁹

A study by Alam et al on 40 patients using subcision for rolling scars after 6 months of therapy revealed that 90% of patients reported improvement, whereas investigators reported improvement in 50% with no major side effects.¹³

Though in our study there were no major adverse effects, 5 to 10% of patients in other studies have developed hypertrophic scarring requiring treatment with intralesional steroids.¹⁴

Subcision releases fibrous anchoring of dermis and the resultant hematoma together are responsible for the immediate clinical improvement in rolling post-acne scars. About 15% to 30% correction is expected in one sitting. After 5 to 10 days post-subcision, wrinkling of scar surface is obvious as hematoma starts resolving with continuous healing process. Wrinkling of scar surface is a good sign, and further possibility of organized hematoma is rare. Area of scar that appears tense should be undermined on subsequent subcision treatment.¹⁵

Subcision not only has a releasing effect on rolling scar but also produces trauma at microscopic level within scar tissues. Newer matrix and collagen tissue is laid down, which is responsible for permanent clinical improvement in depressed rolling scars. Scar remodeling is a continuous process, and it cannot be considered to be in a steady state until at least 2 years post-wounding.¹⁵

Limitations of this technique as studied by Alsufyani include: First, the technique uses large bore needles, that is, 18 gauge needles, so the issue of stability of a needle when using this particular technique with a smaller gauge needle, for instance, a 23 gauge, cannot be assured. Second, this technique was specifically developed for subcutaneous scars. Using it for longer scars would be rather difficult, as the first created angle acts as a guard for the needle to limit its insertion beyond the bevel's length. Finally, since the technique involves twisting and turning of a needle that is not meant for this purpose, concern might rise regarding the strength of the needle at the created angles and whether or not there is risk of the tip breaking inside the skin.¹⁶ But so far no such needle breakages have been come across neither in literature nor in clinical practice.

Punch floatation is a technique used to treat perfectly circular boxcar scars without underlying fibrosis. A punch biopsy tool is used to incise the scar and allow it to float upward. It is then secured in place by sutures, tape, or cyanoacrylate skin glue.⁴

Punch techniques are useful for treatment of deeper atrophic acne scarring, for which most other treatment modalities are not particularly effective. A punch excision approximately equal to the scar size is first performed, then elevation of the already established scar tissue to the level of surrounding skin is done where it is then held in place by sutures or adhesive skin closure material. Success rates with this method are largely limited to case series, but punch techniques are reported

to be efficacious, especially for treatment of ice pick scars. Risks for this method include graft failure, graft depression, and formation of sinus tracts.⁵

Punch techniques remain the gold standard for large, deep boxcar, and icepick scars.

These punch techniques often entail punch excision of a single small acne scar with a punch biopsy instrument of equal or slightly greater diameter. This method is used on deep boxcar scars that have sharp edges and bases that appear normal. In the punch elevation procedure, the same tool used in punch excisions is used to remove only the base (not the walls) of the scar. This method reduces the risk of producing texture or color differences and additional scarring.¹⁷

The punch elevation method is better for improving deep acne scars than depth resurfacing is, and it can be combined with the shoulder technique or depth resurfacing depending on the type of acne scar. Therefore, punch elevation techniques have increased the efficacy of treatment of atrophic acne scars.¹⁷

Punch excision techniques in acne scars:¹⁸

1. Punch excision and closure: If the scar is >3.5 mm in size, it is excised and sutured after undermining.
2. Punch incision and elevation: If the depressed scar has a normal surface texture, it is incised up to the subcutaneous tissue and elevated to the level of the surrounding skin.
3. Punch excision and grafting: Depressed pitted ice pick scars up to 4 mm in diameter are excised and replaced with an autologous, full-thickness punch graft.

Conclusion

Patients who underwent this procedure had up to 70-80% of improvement in their overall appearance of the face and significant amount of scar reduction. These are minimally invasive techniques used for post acne scars, which augment extracellular matrix proteins in dermis without damaging the epidermis. Microneedling has established its place in management of scars & rejuvenation, as a simple affordable office procedure with no or minimal downtime. When combined with subcision & punch floatation further enhanced results are distinctively visible. With our observations this triple combination therapy is a safe and effective modality for patients with variety of atrophic acne scars.

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