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Original Article

Effect of combination of microneedling with tranexamic acid on modified MASI score in patients of melasma

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Abstract

Objective To determine the percentage reduction in modified MASI score with combination of microneedling and tranexamic acid in patients of melasma.

Methods This descriptive case series involved 66 patients of both genders aged 18-40 years having moderate to severe melasma. These patients were treated by microneedling with tranexamic acid at 0, 4 and 8 weeks. Baseline modified MASI scores at 0 weeks was calculated and outcome was evaluated after 12 weeks in the form of percentage reduction in the initial modified MASI scores, both clinically and photographically. Response was graded as excellent (>75% reduction), very good (50-74%), good (25-49%) and fair (<25%).

Results A total of 66 patients with moderate to severe melasma were enrolled. Majority of the patients (53%) showed very good response, 41% had good response, 4.5% had excellent response while only 1.5% patients showed fair response. No serious side effects were noted.

Conclusion Microneedling in conjunction with tranexamic acid showed very good response (50-74% improvement) in majority of the patients.

Key words
Melasma, Tranexamic Acid, Microneedling, Modified MASI Score.

Introduction

Melasma is a common pigmentary disorder of Asian skin[1] which is characterized by medium to dark brown macules and patches predominantly involving the sun exposed areas of the skin.[2] It is more prevalent in women of child-bearing age especially among those with exposure to intense UV radiation. The exact cause is unclear but multiple factors are involved including sun exposure, pregnancy, oral contraceptives, hormone therapy, cosmetics, and racial or genetic effects. Although melasma does not cause physical limitation but has a significant psychological impact on patients.[3]

Various treatment modalities have been used such as topical depigmenting agents,[4] chemical peels,[5] dermabrasion, LASER therapies[6] but none has produced long lasting and satisfactory outcomes and have a number of side effects plus are very costly. Microneedling is a minimally invasive procedure using an automated Dermapen that causes superficial and controlled puncturing of the skin, leading to release of various growth factors and matrix metalloproteinases that reduce hyperpigmentation.[6,7] It also creates micro channels for effective transdermal delivery of various topically applied agents like tranexamic

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acid.[8] Microneedling has been used both alone and in conjunction with topical depigmenting agents for the treatment of melasma. Lima *et al.* showed microneedling to cause lightening of melasma without the addition of any active medication.[9]

Tranexamic acid or trans-4-(aminomethyl) cyclohexanecarboxylic acid, is a plasmin inhibitor that ultimately inhibits melanocyte tyrosinase activity, thus causing reduced hyperpigmentation,[11] accelerated recovery of impaired skin barrier function[12] and reduced number of blood vessels and mast cells in the dermis.[13] It has been used for treatment of melasma in both oral and topical forms.[14,15] Recent clinical trials using microneedling and tranexamic acid showed promising results.[1,10] In a study by Budamakuntla *et al*. effectiveness of tranexamic acid microinjections and microneedling was assessed which showed 35.72% and 44.41% improvement respectively.[1]

The objective of the present study was to assess the efficacy of microneedling with topical tranexamic acid in patients of melasma. Melasma is a complex problem having much psychosocial impact. The need for an inexpensive and effective treatment remains. Microneedling along with tranexamic acid has shown promising results.[1,16]

Methods

This study was conducted at dermatology Unit 1, Jinnah Hospital Lahore from August 2017 to February 2018. After approval from the Ethical Review Board, a total of 66 patients of both genders with moderate to severe melasma, between 18-40 years of age were enrolled after taking informed consent. Patients with anemia (hemoglobin <10g/dl), positive serology for hepatitis B and C, bleeding diathesis, diabetes, or those taking aspirin or any other anticoagulant or hormonal therapy were excluded from the study. Similarly pregnant and lactating mothers and patients with personal or family history of keloidal tendency were also excluded from the study.

Patients were examined in good light and modified MASI score was calculated at baseline. Photographs of the patients were also taken by digital camera.

Tranexamic acid was prepared in a concentration of 4mg/ml by taking 4 units of tranexamic acid (injection Transamine®) 500mg/5ml of the drug) in insulin syringe and diluting it with normal saline upto 100 units.

After cleansing, microneedling was done using an automated Dermapen that uses a disposable needle comprising 36 microneedles arranged circumferentially whose length can be adjusted (0.25mm to 2.0mm), and with variable speed (412-700 cycles per minute). Affected areas were divided in small squares, and microneedling was done in vertical, horizontal and both diagonal directions (total 32 passes each) before and after application of 0.5 to 1 ml of the prepared tranexamic acid (4mg/ml) over the target area until diffuse erythema or punctate bleeding was noted. The procedure was done 3 times on each patient at 0, 4 and 8 weeks. Patients were instructed about sun avoidance and strict use of daily sunscreen.

Modified MASI score was calculated and pictures of the patients were taken from the same digital camera at the end of 12 weeks to assess the clinical response.

Percentage of reduction in modified MASI score from the baseline score was calculated as:

$$\frac{\text{Baseline modified MASI score} - \text{Modified MASI score after 12 weeks}}{\text{Baseline modified MASI score}} X100$$

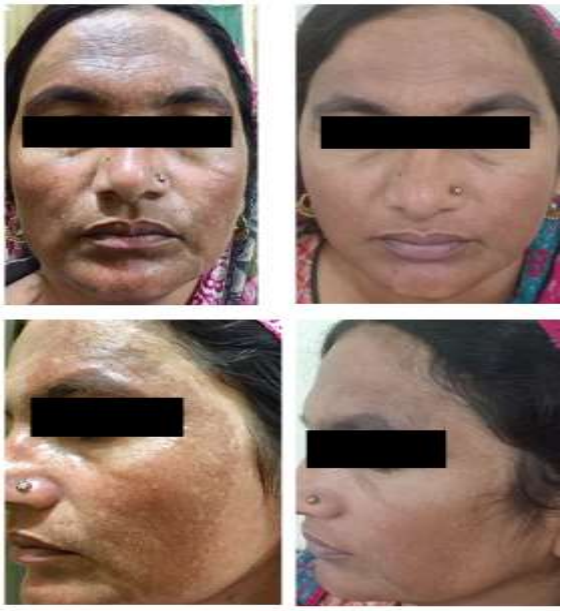

Figure 1 Photographs of patients; before and after treatment (Excellent Response).

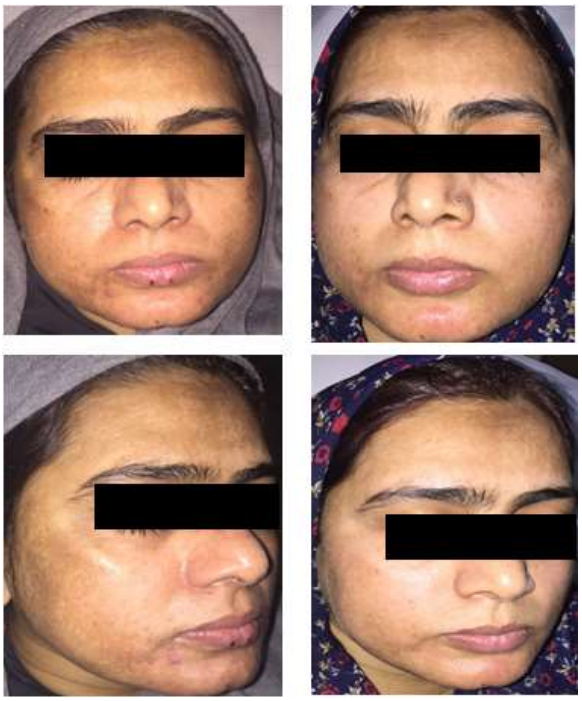

Figure 2 Pictures Before and after treatment (Very Good Response).

Results

A total of 66 patients completed the study. The ages of the patients ranged from 18 to 40 years with a mean of 30.2±6.1 years. Majority (n=34, 51.5%) of the patients were aged below 30 years. There was a female predominance with 57 (86.4%) female patients and 9 (13.6%) male and a male to female ratio of 1:6.3. The duration of melasma ranged from 6 months to 8 years with a mean of 3.9±1.8 years. Majority of the patients (77.3%) had melasma for less than 5 years. Family history was positive in 30 (45.5%). Fitz Patrick Type-IV was the most frequent skin type (75.8%) patients **(Table 1)**.

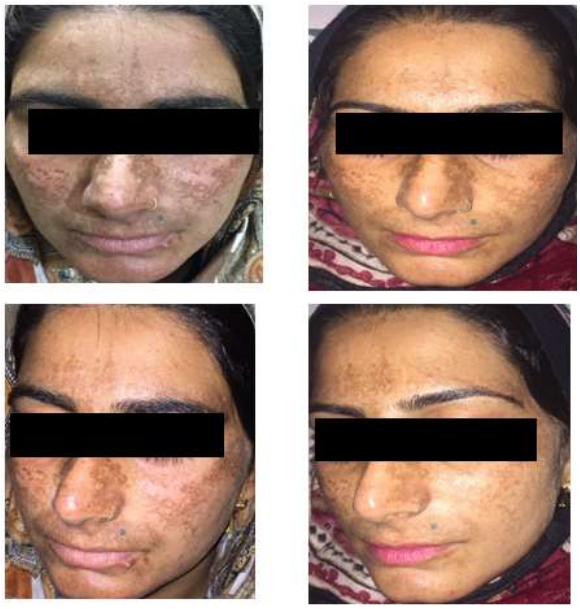

Figure 3 Pictures before and after treatment (Good response).

Table 1 Baseline characteristics of study sample.

Characteristics	*Participants(n=66)*
Age (years)	30.3±6.2
18-30 years	30 (45.5%)
31-40 years	36 (54.5%)
Gender	
Male	9 (13.6%)
Female	57 (86.4%)
Duration of Melasma (years)	4.1±1.6
<5 years	42 (63.6%)
≥5 years	24 (36.4%)
Skin Type	
Fitz Patrick Type-IV	50 (75.8%)
Fitz Patrick Type-V	16 (24.2%)
Family History of Melasma	
Yes	26 (39.4%)
No	40 (60.6%)

Table 2 Modified mean MASI score in studied patients at presentation and after 12 weeks of treatment.

Modified MASI Score	*Range*	*Mean±SD*	*P-value*
Baseline	9-23	12.3±3.4	
After 12 Weeks	1-14	6.3±3.1	<0.001*
Percent Reduction	22.2-88.2	50.6±15.1	

Paired sample t-test, reduction in mean modified MASI score from baseline was significant with p-value <0.001.

Table 3 Outcome in patients after 12 weeks of treatment.

Grade (Response)	*Percent Reduction*	*Response*
Excellent	>75%	4.5%
Very Good	50% - <75%	53%
Good	25%-<50%	41%
Fair	<25%	1.5%

The mean modified MASI score was 12.3±3.4 at presentation which after 12 weeks of treatment became 6.3±3.1. This change was statistically significant (p-value<0.001). Percent reduction in MASI score from baseline ranged from 22.2% to 88.9% with a mean of 50.6±15.1%. (**Table2).** The **o**utcome was graded as excellent, very good, good and fair response. 53% showed very good response. (**Table3).** No serious side effects apart from mild discomfort, burning sensation and erythema were observed, which lasted for 1 or 2 days in most patients

Discussion

Treatment of melasma has always been challenging. The need for an inexpensive and effective treatment remains. Various combination treatments have been tried. The objective of the present study was to assess the efficacy of microneedling with topical tranexamic acid. Effect of combining microneedling with tranexamic acid was studied in 66 patients of melasma. The mean age of the patients was 30.2±6.1 years. This was similar to that reported by Ejaz *et al*.[17] and Desale *et al*.[18] Majority of our patients were females with a male to female ratio of 1:6.3 which was again comparable to other studies.[17,18]

In the present study, Fitz Patrick Type-IV was the most frequent skin type 50 (75.7%). Our observation is in line with that of Amir *et al*.[15] However, Budamakuntla *et al*. reported a frequency of 36.7% and 63.3% for Type-IV and Type-V skin respectively in Indian patients, which is likely to be due to difference in ethnic population.[1]

The modified MASI score of our patients ranged from 9 to 23 with a mean of 12.3±3.4 at presentation. After 12 weeks of treatment, modified MASI score ranged from 1 to 14 with a mean of 6.3±3.1. This change was statistically significant (p-value<0.001). Percent reduction from baseline ranged from 22.2% to 88.9% with a mean of 50.6±15.1%. Our observation is in line with that of Saleh *et al*. and Sharma *et al*. who reported similar decline in mean MASI score from baseline after 12 weeks of treatment with microneedling combined with tranexamic acid.[16,19] Our results are also comparable to those of Budamakuntla *et al*. who reported mean percent reduction in MASI score from baseline to be 44.4%.[1]

Majority of the patients in the present study i.e. 53% showed very good response (50-74% reduction in modified MASI score from baseline).This was also similar to other studies.[1,16,19] When data was stratified according to age, gender, duration of disease, skin type and family history there was no statistical significance across the various subgroups (p value>0.05).

A very important limitation to the present study was that there was no control group to compare our results with especially results of single treatment modalities with combination treatment. Secondly, we did not follow up our

patients after 12 weeks of treatment to look for the recurrence of melasma.

The present study is the first of its kind in local population and has found that microneedling with tranexamic acid significantly improved modified MASI score in patients presenting with melasma irrespective of patient's age, gender, duration of disease, positive family history and skin type.

Conclusion

Microneedling in conjunction with tranexamic acid has been found to be an effective, economical and safe addition to new treatment modalities for melasma.

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