

ORIGINAL RESEARCH

Efficacy of fractional CO₂ laser, NB-UVB and .05% clobetasol propionate vs NB-UVB and .05% clobetasol propionate in patients with vitiligo: A comparative study

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ABSTRACT

Background: Conventional vitiligo treatment on the hands and feet frequently yields disappointing results. In the face, neck, and truncal areas, various ablative therapy approaches were tested with positive results.

Material and methods: On 44 individual patients in each group with 44 pair-lesions of non-segmental vitiligo on both hands, a prospective randomized study was done. In (Group A) treatment with fractional CO₂ laser, NB-UVB phototherapy, and 0.05 % clobetasol propionate cream and NB-UVB phototherapy and 0.05 % clobetasol propionate cream was given (Group B). For ten sessions, fractional CO₂ laser was used at four week intervals. NB-UVB phototherapy was given twice a week for a total of 20 sessions. Twelve weeks following the last therapy, the patients were assessed. Standard digital pictures, patient satisfaction, and adverse events were used to assess the outcomes.

Results: Patients' satisfaction with lesions in group A was much higher than that of group B. Lesions on dorsal surfaces of hands responded more quickly than those on ventral surfaces.

Conclusion: In some individuals, combining fractional CO₂ laser treatment with NB-UVB phototherapy and topical steroids enhances repigmentation in vitiliginous lesions on the hands. Patients with vitiligo who have not responded to conventional therapies may be offered this procedure.

Keywords: CO₂; Laser; Phototherapy; Vitiligo

INTRODUCTION

Vitiligo is a skin condition that affects people of all ethnicities and has been recognised for millennia due to its distinct phenotypic [1–4]. It is a skin and mucous membrane condition characterised by well-defined depigmented macules and patches that develop as a result of selective loss of melanocytes [5,6]. Vitiligo can afflict anyone at any age, with a prevalence of 0.5–1% of the general population and 50% of patients affected before they reach the age of 20. Skin type, race, and sex have no bearing on the probability of having the condition [5–9]. Despite several traditional and new treatments such as Excimer laser, dermabrasion, and others, many people with vitiligo have a resistant condition [10]. As a result, novel therapeutic approaches are needed. The clinical benefits of the Erbium-YAG (Er:YAG) laser,

which is routinely used for skin resurfacing, have been published. Resurfacing lasers (either Er:YAG or CO₂), on the other hand, cause long-term wounds. Fractionated lasers are a new skin resurfacing method based on the fractional photothermolysis theory proposed by Manstein et al. [11]. These lasers have been found to be effective in treating photoaging alterations and scars on the face, as well as having a better safety and recovery profile than standard CO₂ laser resurfacing [12,13].

Fractionated lasers do not ablate the entire epidermis, leaving undamaged skin between coagulated necrotic columns afterward. This trait aids in the healing of the skin. In sunny areas, sun exposure is a practical alternative that may save patients from repeated hospital visits.

Material and Methods

The study was conducted at Vitiligo Clinic of the Dermatology Outpatient Department, Jawahar Lal Nehru Medical College, Ajmer. In this study, 40 adult patients with NSV were included. Patients had to be over the age of 18 and have stable, non-segmental vitiligo on both hands, as well as be willing to follow the study procedures. They were ruled out if they had undergone treatment during the previous month (with topical medicine, laser, phototherapy, systemic corticosteroids, or immunosuppressants), were pregnant or lactating, or had a history of photosensitivity, hypertrophic scars, or keloids. If the Koebner phenomenon was present, they were also ruled out.

Before the treatment, the skin was washed with a gentle cleanser. One hand was randomly assigned to receive fractional CO₂ Laser 10,600 nm therapy for ten weeks. Under occlusion, a local anesthetic cream was applied to the entire area to be treated with laser for 30 minutes. In addition, for all participants, a cold air cooling device was utilized to cool the skin during laser irradiation at a cooling level of 4 to relieve pain.

For ten weeks, the laser-treated side was treated with fractional CO₂ Laser 10,600 nm at 4 week intervals. The treatment parameters were as follows: in the static mode, a pulse energy of 100 mJ and a spot density of 150 spots cm² were used, with two passes utilising a 300-density tip. The whole vitiliginous lesions were irradiated with the laser, plus a 2-mm zone beyond the lesional border. Both hands were treated with NB-UVB using a phototherapy equipment developed for hands immediately after the laser treatment (M-series, Bryan, OH). The light source is made up of ten NB-UVB fluorescent tubes that emit a spectrum of wavelengths ranging from 310 to 315 nanometers. The phototherapy was initiated at a dose of 500 mJ/cm² regardless of skin type, with a 20 percent increase per session until a mild degree of erythema was achieved, which vanished the next day. If the erythema persisted for more than 48 hours, the dose was reduced to the lowest level that had no effect. NB-UVB dosages were given to both hands at the same time. On non-consecutive days, phototherapy sessions were delivered twice weekly for a total of 20 sessions. On the day of the procedure, a topical 0.05 percent clobetasol propionate cream was administered to all lesions and continued twice daily for the duration of the study. "Group A" vitiliginous lesions were treated with fractional CO₂ laser, NB-UVB phototherapy, and 0.05 percent clobetasol propionate cream. "Group B" vitiligo lesions were treated with NB-UVB phototherapy and 0.05 percent clobetasol propionate cream. The patients were followed up on every four weeks for the next 12 weeks after the final therapy.

At baseline, before each treatment session, and 12 weeks after the final treatment, standard digital pictures of the dorsal side of both hands were obtained. We used a quartile grading scale to assess vitiligo improvement (grade 0: no improvement; grade 1, 1–25 percent repigmentation: minimal; grade 2, 26–50 percent repigmentation: moderate; grade 3, 51–75 percent repigmentation: good; and grade 4, > 75 percent repigmentation: excellent). In the analysis, the mean of the two dermatologists' assessments was employed. Patients were also

asked to rate their overall happiness on a 10-point visual analogue scale (VAS; 0 14% dissatisfied, 10 14% extremely delighted). At each follow-up appointment, adverse events and complications were noted.

STATISTICAL ANALYSIS

Continuous variables (i.e., age, physician grading score, VAS) were expressed in terms of mean standard deviation, whereas categorical variables (i.e., age, physician grading score, VAS) were expressed in terms of mean standard deviation. The Wilcoxon rank sum test was used to compare the physician grading score and VAS between two groups. The Fisher exact test was used to compare the number of patients who attained various degrees of repigmentation. Statistical significance was defined as a P-value of 0.05 or less.

RESULTS

A total of 44 non-segmental vitiligo patients with symmetrical vitiliginous lesions on both hands or fingers were included in the study. The 12-week follow-up period was completed by 40 patients (25 females and 15 males). Due to the inconvenient follow-up schedule, four patients dropped out during the follow-up period. The average age of the participants in the study was 51.2 (8.5) years. The average illness lasted 70.58 (25.69) months. III (n= 6), IV (n =18), and V (n = 16) were the skin types. There were a total of 26 paired lesions treated (26 lesions in group A and 26 lesions in group B). Each pair is symmetrical in some way.

Follicular, diffuse, marginal, and mixed patterns of repigmentation were identified in our study. A mixed pattern of repigmentation was detected in 17 of the 40 respondents in group A

Table 1: Response to Therapy in Group A and Group B

Response	Group A n(%)	Group B n(%)
No response	17 (42.5%)	23(57.5%)
Minimal response (1–25% improvement)	5 (12.5%)	8 (20%)
Moderate response (26–50% improvement)	9(22.5%)	4(10%)
Good response (51–75% improvement)	6(15%)	1(2.5%)
Excellent response (>75% improvement)	3(7.5%)	4 (10%)

DISCUSSION

In vitiligo patients, a combination of several ablative and conventional treatment were tested, and the results were positive. Combination of Er:YAG laser ablation followed by 5-fluorouracil application and NB-UVB phototherapy [14], combined dermabrasion with 5-fluorouracil [15], combined Er:YAG laser ablation plus topical steroids and NB-UVB phototherapy [16], combined microdermabrasion and pimecrolimus cream [17], and combined fractional ablative CO2 laser and NB-UVB [18] are among them.

Despite the positive results of the previous ablative treatments, the depth created by laser resurfacing and dermabrasion can be difficult to control at times. Following these techniques, delayed healing and scarring are likely, especially in places with atrophic skin, such as lesions previously treated with topical corticosteroids. Fractional laser systems apply the fractional photothermolysis hypothesis, which was first proposed in 2004 [19], for laser skin resurfacing. Multiple coagulated necrotic columns or microscopic thermal damage zones are created by the modality, which are surrounded by an intact area of spared epidermis and

dermis. When compared to typical laser resurfacing, this technology provides for quick repair of laser-induced thermal injury and improves the skin healing process, resulting in an enhanced safety profile [20,21].

Pain is the most common adverse event in fractional CO₂ laser treatment in terms of side effects. Our study's mean pain score was 4.49 out of ten, which is much lower than Er: YAG resurfacing's pain score of 6.2 out of ten. In our investigation, no hypertrophic scar was detected, which is consistent with prior fractional CO₂ laser studies [13,14]. Hypertrophic scars, on the other hand, appeared in two of the 24 Er:YAG resurfaced lesions [12]. The occurrence of hypertrophic scars, on the other hand, is dependent not only on the type of laser used, but also on the parameter used, which reflects the degree of injury as well as the patient's proclivity to form hypertrophic scars. When using a fractional CO₂ laser with an aggressive setting, we felt that hypertrophic scars may still arise in patients who are prone to scarring.

To further confirm the efficacy of fractional CO₂ laser more studies with larger sample size are needed.

CONCLUSION

In conclusion, when comparing ablative fractional CO₂ laser, NB-UVB phototherapy, and 0.05 percent clobetasol propionate cream to NB-UVB and 0.05 percent clobetasol propionate cream, we found that combined ablative fractional CO₂ laser, NB-UVB phototherapy, and 0.05 percent clobetasol propionate cream produced significant improvement in recalcitrant vitiligo with no serious side effects. Patients who have not responded to prior therapy options may be offered this approach.

REFERENCES

1. Burns T, Breathnach S, Cox N, Griffiths C. Rook's textbook of dermatology, Vol. II, 7th edition. Oxford: Blackwell Science; 2004. 39:52–57.
2. Koranue RV, Sachdeva KG. Vitiligo. *Int J Dermatol* 1988;27:676–681.
3. Birlea SA, Fain PR, Spritz RA. A Romanian population isolate with high frequency of vitiligo and associated autoimmune diseases. *Arch Dermatol* 2008;144:310–316.
4. Howitz J, Brodthagen H, Schwartz M, Thomsen K. Prevalence of vitiligo. *Arch Dermatol* 1977;113:47–52.
5. Kyriakis KP, Palamaras I, Tsele E, Michailides C, Terzoudi S. Case detection rates of vitiligo by gender and age. *Int J Dermatol* 2009;48:328–329.
6. Zhang Z, Xu SX, Zhang FY, Yin XY, Yang S, Xiao FL, Du WH, Wang JF, Lv YM, Tang HY, Zhang XJ. The analysis of genetics and associated autoimmune diseases in Chinese vitiligo patients. *Arch Dermatol Res* 2009;301:167–173.
7. Porter JR, Beuf AH. Racial variation in reaction to physical stigma: a study of degree of disturbance by vitiligo among black and white patients. *J Health Soc Behav* 1991;32:192–204.
8. Nanda A, Kaur S, Bhakoo ON, Dhall K. Survey of cutaneous lesions in Indian newborns. *Pediatr Dermatol* 1989;6: 39–42.
9. Tamer E, Ilhan MN, Polat M, Lenk N, Alli N. Prevalence of skin diseases among pediatric patients in Turkey. *J Dermatol* 2008;35:413–418.
10. Patel NS, Paghдал KV, Cohen GF. Advanced treatment modalities for vitiligo. *Dermatol Surg* 2012;38:381–391.
11. Manstein D, Herron GS, Sink RK, Tanner H, Anderson RR. Fractional photothermolysis: A new concept for cutaneous remodeling using microscopic patterns of thermal injury. *Lasers Surg Med* 2004;34:426–438.

12. Geronemus RG. Fractional photothermolysis: Current and future applications. *Lasers Surg Med* 2006;38:169–176.
13. Bogdan Allemann I, Kaufman J. Fractional photothermolysis—An update. *Lasers Med Sci* 2010;25:137–144.
14. Anbar TS, Westerhof W, Abdel-Rahman AT, Ewis AA, El-Khayyat MA. Effect of one session of ER:YAG laser ablation plus topical 5-Fluorouracil on the outcome of short-term NB-UVB phototherapy in the treatment of nonsegmental vitiligo: A left-right comparative study. *Photodermatol Photoimmunol Photomed* 2008;24:322–329.
15. Sethi S, Mahajan BB, Gupta RR, Ohri A. Comparative evaluation of the therapeutic efficacy of dermabrasion, dermabrasion combined with topical 5% 5-fluorouracil cream, and dermabrasion combined with topical placentex gel in localized stable vitiligo. *Int J Dermatol* 2007;46:875–879.
16. Bayoumi W, Fontas E, Sillard L, Le Duff F, Ortonne JP, Bahadoran P, Lacour JP, Passeron T. Effect of a preceding laser dermabrasion on the outcome of combined therapy with narrowband ultraviolet B and potent topical steroids for treating nonsegmental vitiligo in resistant localizations. *Br J Dermatol* 2012;166:208–211.
17. Farajzadeh S, Daraei Z, Esfandiarpour I, Hosseini SH. The efficacy of pimecrolimus 1% cream combined with microdermabrasion in the treatment of nonsegmental childhood vitiligo: A randomized placebo-controlled study. *Pediatr Dermatol* 2009;26:286–291.
18. Li L, Wu Y, Li L, Sun Y, Qiu L, Gao XH, Chen HD. Triple combination treatment with fractional CO₂ laser plus topical betamethasone solution and narrowband ultraviolet B for refractory vitiligo: A prospective, randomized half-body, comparative study. *Dermatol Ther* 2015;28:131–134.
19. Manstein D, Herron GS, Sink RK, Tanner H, Anderson RR. Fractional photothermolysis: A new concept for cutaneous remodeling using microscopic patterns of thermal injury. *Lasers Surg Med* 2004;34:426–438.
20. Geronemus RG. Fractional photothermolysis: Current and future applications. *Lasers Surg Med* 2006;38:169–176.
21. Bogdan Allemann I, Kaufman J. Fractional photothermolysis—an update. *Lasers Med Sci* 2010;25:137–144.