

USE OF CO₂ LASER IN THE REPIGMENTATION OF VITILIGO PATCHES; A PILOT STUDY

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ABSTRACT

Background: Objective of the Study: To evaluate the efficacy of 10,600 nm fractional carbon dioxide laser in the treatment of vitiligo. **Patients and Methods:** This is a prospective randomized controlled bilateral left-right comparison trial. It was performed in accordance with Good Clinical Practice. The treatment protocol has been reviewed with each patient who then signed the informed consent. The research was accomplished at Mae Fah Luang University Hospital, Bangkok (Outpatient department). **Population and sampling:** Six patients were recruited in this study, all were of Thai nationality. **Results:** Six patients (3 males and 3 females) were included in this study with mean age of 40±14yr (minimum 25 yr and maximum 65 yr), all are Thai nationality, 17 vitiligo lesions (50% generalized, 23% acrofacial, 17% segmental and 5% focal type of vitiligo) were treated by laser. All patients completed the study. One month follow up visit after last laser session, patient satisfaction score were taken which showed 16.7% (1 patient) were really satisfied, 66.7% (4 patients) were slightly satisfied and 16.7% (1 patient) with poor satisfaction. One female patient (16.7%) with generalized vitiligo detected repigmentation in vitiligo patches in areas like the neck and chest (not treated by laser). **Conclusion:** Carbon dioxide laser has achieved mild repigmentation effect in vitiligo patches.

KEYWORDS: Co₂ laser, Repigmentation, Vitiligo.

INTRODUCTION

Vitiligo is an idiopathic depigmentary skin disorder characterized by selective destruction of melanocyte. The estimated mass of all pigment cells within the body is about 1.5 g. Most of these are melanocyte within the epidermis.^[1]

Millions of men and women worldwide have vitiligo, the most common clinical variety the so called non-segmental or generalized vitiligo. In which milky-white skin patches may appear all over the body because of the loss of functional melanocyte. Many patients with vitiligo experience psychological distress and social stigmatization.^[2-4]

Because skin color plays a major role in individual's perception of health, wealth, worth and desirability, pigmentary disfigurements may influence social interactions⁽⁵⁾, vitiligo even may lead to social exclusion in certain societies, therefore vitiligo is considered to be one of the major medical problems in India.^[6,7]

Vitiligo is a common skin disease reported to affect approximately 1% of the population worldwide, irrespective of skin color or ethnic origin.^[8] The cause of this condition is uncertain but seems to be dependent on the interaction of genetic, immunologic and neurogenic factors.^[9] Recent observations support the role of altered cellular immunity, and a role for cytokines in the pathogenesis of vitiligo.^[10] Although neither life threatening nor symptomatic (except that depigmented patches burn easily when exposed to sun) the effects of vitiligo can be cosmetically devastating resulting in low self-esteem, poor body image and difficulties in sexual relationships.^[2,11,12] Because the disease is still not understood, there is a plethora of different treatments including topical corticosteroids, calcineurin inhibitors, vitamin-D derivatives, Phototherapy (ultraviolet A, narrow band UVB), photochemotherapy (psoralen plus UVA {PUVA}), psoralen with sunlight (PUVA-sol), surgical techniques and combination of topical therapies and light treatment.^[13] All Approaches have advantages and disadvantages and none is appropriate for every patient with vitiligo.^[14] There is 30% to 40% response rate with 6 months of corticosteroid use. Long term

treatment with UVB induces accelerated photo aging.^[15] cutaneous and systemic immune-suppression.^[16,17] and an increased risk of skin carcinoma.^[18,19]

Carbon dioxide laser ablative fractional resurfacing produces skin damage with removal of the epidermis and variable portions of the dermis as, well as, associated residual heating, resulting in new collagen formation and skin tightening. The non resurfaced epidermis helps tissue to heal rapidly with shorter post-operative erythema.

Carbon dioxide laser resurfacing produces controlled skin damage with removal of the epidermis and variable portions of the dermis. Associated dermal heating results in collagen shrinkage and collagen remodeling. The dermal tightening achieved and the associated new epithelium gives a youthful appearance to the skin with Improved texture and reduced lines and wrinkles, Fractional ablative laser therapy is a new method of skin resurfacing which when practiced with CO₂ laser offers an interesting alternative to the typical conventional procedure of eliminating the full layer of skin. The remaining epidermis that has not been resurfaced helps tissue to repair more rapidly which translates into speedy recovery time and a shorter postoperative period of erythema. The efficacy of the CO₂ laser thermal effect is kept within a limited side-effect profile. During ablative fractional resurfacing treatment tiny microscopic pieces of skin are vaporized and a thermal deposit occurs in the dermis. At the time of repair tissue is restored with active fiber formation which products a tightening effect and the external aspect of the skin is improved. The degree of improvement in the results of fractional CO₂ laser resurfacing is related to the density of superficial micro tissue elimination and the thermal deposit left in the dermis which to a large extent is related to laser power, pulse width and the density of microzones of tissue elimination determined by the number of passes over the treated area.^[20] Recently the 308 nm excimer laser, a new technique allowing for targeted phototherapy, was used to treat localized plaques of vitiligo.^[21] Two hundred and twenty-one patches of vitiligo in 97 patients were treated with this laser; 50.6% of patients achieved 75% pigmentation or more, 64.3% achieved 50% pigmentation or more.^[22]

Operational definitions

Fractional CO₂ laser: It means the destruction or removal of a fraction of the skin including the full thickness of the epidermis and portions of the dermis where the depth of the injury is greater than the width and ratios of treated to non treated tissue >10% and <90%. The principle behind fractional photothermolysis is the formation of isolated and microscopic thermal wounds that are surrounded by zones of spared, viable tissue in a geometrical pattern that does not depend on chromophore distribution.^[23,24]

Non ablative fractional resurfacing works three fold: (1) by non ablative mode of tissue Coagulation with the stratum corneum remain" 6itl tact with no tissue vaporization (2) by the creation of multiple micro-thermal zones surrounded by islands of viable tissue and (3) by the extrusion and replacement of damaged tissue with re-epithelization within 24h. The use of appropriate wavelengths and depths of penetration enable collagen remodeling and creation of micro-thermal zones of rapid re-epithelization. The chromophore for fractional photothermolysis is tissue water with targets being epidermal keratinocytes, dermal collagen, and dermal vascular structures.^[25] Population and sample: Six patients were recruited in the study, all of Thai nationality. Three were males and three were females.

Fractional Carbon Dioxide Laser (10,600 nm). The novel concept of non- ablative fractional photothermolysis was introduced to the market in 2003. Unlike conventional ablative and non-ablative photothermolysis, fractional ablative and non-ablative photothermolysis treats only a fraction of the skin, leaving up to a maximum of 95% of the skin uninvolved. The undamaged skin surrounding tissue allows for a reservoir of viable tissue, permitting rapid epidermal repair.

Objective of the Study

To evaluate the efficacy of 10,600 nm fractional carbon dioxide laser in the treatment of vitiligo.

PATIENTS AND METHODS

Study Design

This is a prospective randomized controlled bilateral left-right comparison trial. It was performed in accordance with Good Clinical Practice. The treatment protocol has been reviewed with each patient who then signed the informed consent. The research was accomplished at MaeFahLuang University Hospital, Bangkok (Outpatient department). Population and sampling: Six patients were recruited in this study, all were of Thai nationality.

Table (1): Characteristics of the participants in the study.

Item	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6
Age (yr.)	35	50	25	36	34	65
Sex	Male	Male	Female	Female	Female	Male
Age of onset of vitiligo (yr)	5-6	10	11	11-12	32	64
Type of vitiligo	Focal	Generalized	Generalized	Acrofacial	Generalized	Segmental
Skin photo type	III	III	IV-V	III-IV	III	IV
Duration of vitiligo (yr.)	30	40	14	25	2	1
Number of treated Patches	1	1	3	4	5	3
vitiligo Race	Thai	Thai	Thai	Thai	Thai	Thai

Inclusion criteria: Male and female patients, aged 18-65 years with depigmented vitiligo-patches.

Any type of distribution of vitiligo. Any skin photo-type. Depigmented patch appeared before six months or more.

Exclusion criteria

1. Pregnant or breast feeding women.
2. Personal history of hypertrophic scar.

3. Personal history of melanoma or any skin cancer.
4. Patients taking immunosuppressive or photosensitizing drugs. Undergoing phototherapy past three months.
5. Patients taking drugs to treat vitiligo past three months.

Devices and Tools

CICU RF CO2 Laser Device.

Table (2): The features of the CICU RF laser device.

Item	Feature
Laser type	RF CO2 ALL METAL SEALED TYP
Laser power	up to 30 watt
Laser mode	TEM ₀₀ (10.6µm)
Pulse duration	100-5000µs
Repetition	0.2-1s/single
Overlap	1-10TH
Distance	0.1-2mm
Treatment area	1*1-20*20mm
Pixel quantity	up to 40,401
Pixel size	>100micron
Cooling	Air Cooling
Optical guide	Articulated arm

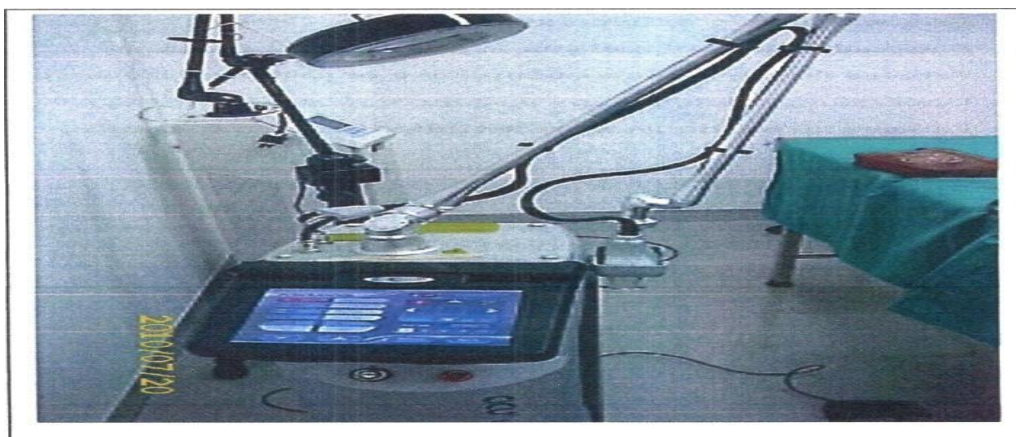


Figure (1): CICURF CO2 laser device. Treatment Protocol.

It included clinical assessment of each patient at each study entry and diagnosis of vitiligo by a dermatologist at the outpatient clinic, then choosing eligible patients who met the inclusion criteria, together with reviewing the treatment protocol and signing the informed consent. There were (3) sessions of laser treatment at one month

interval (month 0, 1, 2) with two weekly follow up after each laser session. Choosing the treatment side was random and the other side was left without treatment as a control (only in case of multiple lesions but if single lesion no control is available). Seventeen vitiligo patches were selected for treatment with laser in the study.

Table (3): Number of vitiligo patches treated with laser in the study.

Patients	Number of vitiligo patches treated with laser
Patient 1	1
Patient 2	1
Patient 3	3
Patient 4	4
Patient 5	5
Patient 6	3

At each treatment session, the treatment areas were cleansed of debris using mild cleanser and 70% isopropyl alcohol, lidocaine 2.5% and prilocaine 2.5% cream were applied under occlusion to the chosen

patches of the treatment side, after an hour of application, occlusion was gently removed and left for drying the skin patches by alcohol. Protection of the patient's eyes by special goggles, and mask use together with all protective measures were performed then treatment of the vitiligo patches by using a fractional carbon dioxide laser of (10600nm) wave length of CO₂ laser. After each laser session topical antibiotic was applied to the treated areas for five to seven days. All patients were given instructions not to use any vitiligo treatment during the period of the study.

The parameters

The parameters of laser treatment used in the study are shown in details in the following tables.

Table (4): Parameters of laser used in patient no.1 during the three treatmentsessions.

Parameters	Session		
	1	2	3
Duration(μs)	1500	2000	2500
Duration(mJ/cm ²)	17.9	23.8	29.8
Repeat(s)	Single	Single	Single
Overlap(TH)	1	1	1
Distance(mm)	0.9	0.8	1
Shape	Circle	Circle	Circle
Dots	120	56	56

Table (5): Parameters of laser used in patient no.2 during the three treatmentsessions.

Parameters	Session		
	1	2	3
Duration(μs)	1500	2000	2500
Duration(mJ/cm ²)	17.9	23.8	29.8
Repeat(s)	Single	Single	Single
Overlap(TH)	1	1	1
Distance(mm)	1	0.8	1
Shape	Square	Circle	Square
Dots	360	204	85

Table (7): Parameters of laser used in patient no.3 (lesion no.2) during the threetreatment session.

Parameters	Session		
	1	2	3
Duration(μs)	1500	1500	1600
Duration(mJ/cm ²)	17.9	17.9	19
Repeat(s)	Single	Single	Single
Overlap(TH)	1	1	1
Distance(mm)	1	1	1
Shape	Square	Square	circle
Dots	420	420	296

Table (8): Parameters of laser used in patient no.3 (lesion no.3) during the threetreatment sessions.

Parameters	Session		
	1	2	3
Duration(μs)	2000	2000	1600
Duration(mJ/cm ²)	23.8	23.8	19
Repeat(s)	2	Single	Single
Overlap(TH)	1	1	1
Distance(mm)	0.8	1	1

Shape	Square	Square	circle
Dots	420	420	216

Table (9): Parameters of laser used in patient no.3 (lesion no.3) during the threetreatment sessions.

Parameters	Session		
	1	2	3
Duration(μs)	1200	1200	1500
Duration(mJ/cm ²)	14.3	14.3	17.9
Repeat(s)	Single	Single	Single
Overlap(TH)	2	1	1
Distance(mm)	1	1	1
Shape	Square	Square	circle
Dots	420	420	216

Table (10): Parameters of laser used in patient 4 (lesion no.1) during the threetreatment sessions.

Parameters	Session		
	1	2	3
Duration(μs)	3000	3100	3200
Duration(mJ/cm ²)	35.7	36.9	38.1
Repeat(s)	Single	Single	Single
Overlap(TH)	1	1	1
Distance(mm)	1	1	1
Shape	Square	Square	circle
Dots	420	420	217

Table (11): Parameters of laser used in patient 4 (lesion no.2) during the threetreatment sessions.

Parameters	Session		
	1	2	3
Duration(μs)	3000	3100	3200
Duration(mJ/cm ²)	35.7	36.9	38.1
Repeat(s)	Single	Single	Single
Overlap(TH)	1	1	1
Distance(mm)	1	1	1
Shape	Square	Square	circle
Dots	420	420	217

Table (12): Parameters of laser used in patient 4 (lesion no.3) during the threetreatment sessions.

Parameters	Session		
	1	2	3
Duration(μs)	1500	2500	2500
Duration(mJ/cm ²)	17.9	23.8	29.8
Repeat(s)	Single	Single	Single
Overlap(TH)	1	1	1
Distance(mm)	1	1	1
Shape	Square	Square	circle
Dots	270	420	217

Table (13): Parameters of laser used in patient 4 (lesion no.4) during the threetreatment sessions.

Parameters	Session		
	1	2	3
Duration(μs)	non	1500	1000
Duration(mJ/cm ²)		17.9	11.9
Repeat(s)		Single	Single
Overlap(TH)		1	1
Distance(mm)		1	1

Shape		Square	Square
Dots		420	420

Table (14): Parameters of laser used in patient 5 (lesion no.1) during the threetreatment sessions.

Parameters	Session		
	1	2	3
Duration(μ s)	1400	2100	2700
Duration(mJ/cm^2)	16.7	25	32.1
Repeat(s)	Single	Single	Single
Overlap(TH)	1	1	1
Distance(mm)	0.8	1	1
Shape	Circle	Circle	Circle
Dots	40	125	40

Table (15): Parameters of laser used in patient 5 (lesion no.2) during the threetreatment sessions.

Parameters	Session		
	1	2	3
Duration(μ s)	1300	2000	2500
Duration(mJ/cm^2)	15.5	23.8	29.8
Repeat(s)	Single	Single	Single
Overlap(TH)	1	1	1
Distance(mm)	1	1	1
Shape	Circle	Circle	Circle
Dots	40	125	40

Table (16): Parameters of laser used in patient 5 (lesion no.3) during the threetreatment sessions.

Parameters	Session		
	1	2	3
Duration(μ s)	1200	1700	2200
Duration(mJ/cm^2)	14.3	20.2	26.2
Repeat(s)	Single	Single	Single
Overlap(TH)	1	1	1
Distance(mm)	0.8	1	1
Shape	Circle	Circle	Circle
Dots	40	125	40

Table (17): Parameters of laser used in patient 5 (lesion no.4) during the threetreatment sessions.

Parameters	Session		
	1	2	3
Duration(μ s)	1000	1500	2000
Duration(mJ/cm^2)	11.9	17.9	23.8
Repeat(s)	Single	Single	Single
Overlap(TH)	1	1	1
Distance(mm)	0.8	1	1
Shape	Circle	Circle	Circle
Dots	40	125	40

Table (18): Parameters of laser used in patient 5 (lesion no.5) during the threetreatment sessions.

Parameters	Session		
	1	2	3
Duration(μ s)	2000	2500	3000
Duration(mJ/cm^2)	23.8	29.8	35.7
Repeat(s)	Single	Single	Single
Overlap(TH)	1	1	1
Distance(mm)	0.8	1	1
Shape	Circle	Circle	Circle

Dots	40	125	40
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Table (19): Parameters of laser used in patient 6 (lesion no.1) during the threetreatment sessions.

Parameters	Session		
	1	2	3
Duration(μs)	1500	2000	2100
Duration(mJ/cm ²)	17.9	23.8	25
Repeat(s)	Single	Single	Single
Overlap(TH)	1	1	1
Distance(mm)	0.8	1	1
Shape	Circle	Circle	Circle
Dots	296	277	277

Table (20): Parameters of laser used in patient 6 (lesion no.2) during the threetreatment sessions.

Parameters	Session		
	1	2	3
Duration(μs)	2000	2500	2600
Duration(mJ/cm ²)	23.8	20.8	30.9
Repeat(s)	Single	Single	Single
Overlap(TH)	1	1	1
Distance(mm)	1	1	1
Shape	Circle	Circle	Circle
Dots	296	277	296

Table (21): Parameters of laser used in patient 6 (lesion no.3) during the threetreatment sessions.

Parameters	Session		
	1	2	3
Duration(μs)	2000	3000	3000
Duration(mJ/cm ²)	29.8	35.7	35.7
Repeat(s)	Single	Single	Single
Overlap(TH)	1	1	1
Distance(mm)	1	1	1
Shape	Circle	Circle	Circle
Dots	296	277	296

All the patients completed the three sessions of laser therapy. They visited the clinic every two weeks after each laser session for follow up and photography. One month after the last laser session, photographs were taken to all treated patches to be used in the assessment.

It is accomplished by Patient Satisfaction Score (PSS), where all participants in the study are given questionnaire to evaluate their response after one month of the last laser session, they have been asked to choose one of four choices to answer the appreciation question. After self assessment sheet filled, a (4) point system is used in the analysis of Patient Satisfaction Score.

Evaluation Criteria

Subjective Evaluation

Table (22): Patient Satisfaction Score (PSS).

After you have been treated with three sessions of laser therapy, how do you find your response to the laser treatment?		
Choice	Put (X) to indicate your choice	Point
1-Poor response (no change in my lesion)	()	1
2-Slightly satisfied	()	2
3-Really satisfied	()	3
4-Excellent response	()	4

Objective Evaluation

It is represented by Clinical Assessment of Repigmentation (CAR), where Clinical assessment of the degree of repigmentation was performed by three unbiased dermatologists, using comparative photographs

taken by Ben Q camera of the laser-treated lesions between baseline photographs and photographs taken one month after last laser therapy. The photos were defined and not blinded for the assessors.

The three dermatologists assess the photos individually by choosing one of percentages (0-100%) to indicate the rate of repigmentation for each lesion for all of the participants. After all assessors completed their assessment, results taken and were scored into numbers to be analyzed statistically.

Table (23): Clinical Assessment of Repigmentation (CAR) and scores given for each rate.

	0%	1-24%	25-49%	50-74%	75-99%	100%
Rate of re-pigmentation Score	0	1	2	3	4	5

RESULTS

Six patients (3 males and 3 females) were included in this study with mean age of 40±14yr (minimum 25 yr and maximum 65 yr), all are Thai nationality, 17 vitiligo lesions (50% generalized, 23% acrofacial, 17% segmental and 5% focal type of vitiligo) were treated by laser. All patients completed the study. One month follow up visit after last laser session, patient satisfaction score were taken which showed 16.7% (1 patient) were really satisfied, 66.7% (4 patients) were slightly satisfied and 16.7% (1 patient) with poor satisfaction. One female patient (16.7%) with generalized vitiligo detected repigmentation in vitiligo patches in areas like the neck and chest (not treated by laser)

Table (24): Percentage results of Patient Satisfaction Score (PSS).

Response	Frequency	Percent
Poor response	1	16.7
Slight satisfaction	4	66.7
Real satisfaction	1	16.7
Excellent response	0	0
Total	6	100.0

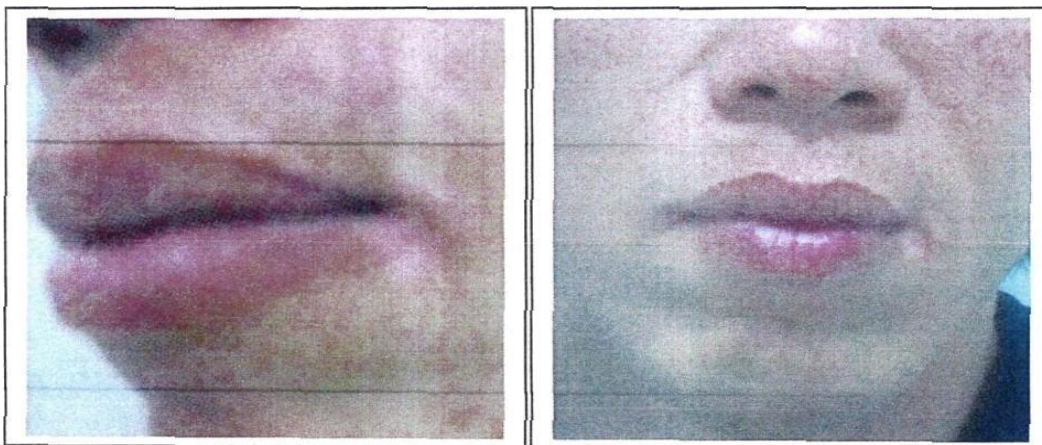


Figure (2): Patient (no.1) before (left) and after (right) laser treatment of a vitiligo patch near Left angle of the mouth.



Figure (3): Patient (no.3) before (left) and after (right) laser treatment of right forearm.



Figure (4): Patient (no.3) this female has noticed some repigmentation in her chest and neck areas during period of her recruitment in this study though these areas not treated by laser.

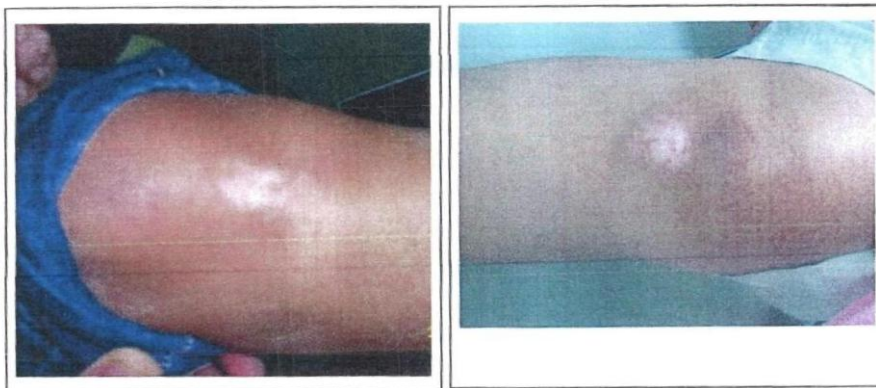


Figure (5): Patient (no.4) before (left) and after (right) laser treatment of vitiligopatches near knee area.

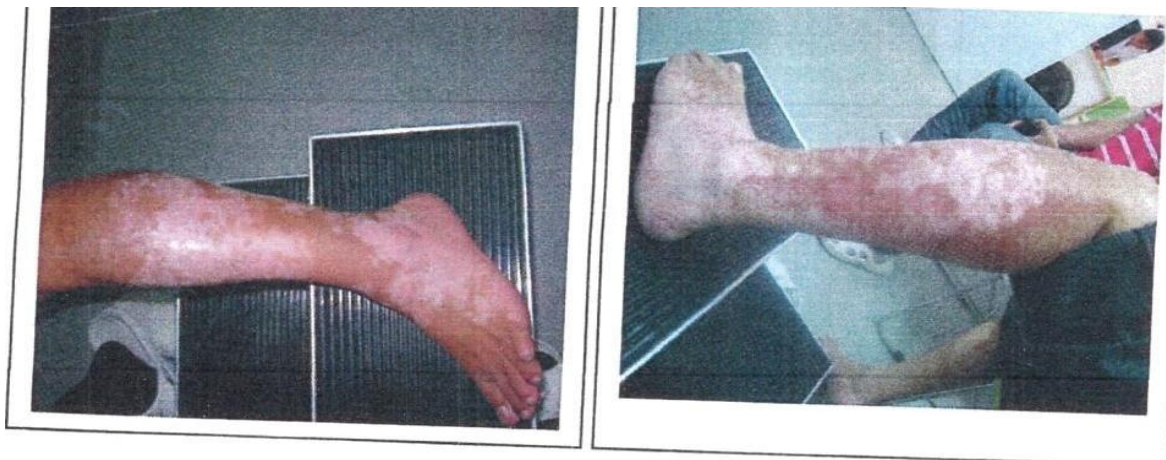


Figure (6): patient (no.6) before (left) and after (right) laser treatment of vitiligoskin in the foot and leg, note the fading erythematous areas in the calf which appeared two after last laser session.

Clinical Assessment of Repigmentation
According to the Clinical Assessment of Repigmentation

(CAR), The mean results of the three dermatologists assessments showed 14 patches (82%) out of the 17

patches were given score 1 which means 1%-24% repigmentation, while only 3 patches (18%) were given 0 score.

Table (25): Clinical Assessment of Repigmentation (CAR) of the patients accomplished by three dermatologists, with their mean values.

Patient	CAR1	CAR2	CAR3	Mean
Pt.No.1	1	1	1	1
Pt.No.2	1	2	0	1
Pt. No.3 lesion no.	1	1	1	1
Pt.No.3 lesion no.	1	1	1	1
Pt.No.3 lesion no.3	0	1	1	0.67
Pt.No.4 lesion no.1	1	2	0	1
Pt.No.4 lesion no.2	1	3	1	1.67
Pt.No.4 lesion no.3	0	2	0	0.67
Pt.No.4 lesion no.4	1	3	0	1.33
Pt.No.5 lesion no.1	0	2	0	0.67
Pt.No.5 lesion no.2	1	2	0	1
Pt.No.5 lesion no.3	0	3	2	1.67
Pt.No.5 lesion no.4	1	3	1	1.67
Pt. No.5 lesion no.5	1	2	1	1.33
Pt. No.6 lesion no.1	1	2	0	1
Pt.No.6 lesion no.2	1	1	2	1.33
Pt.No.6 lesion no.3	1	2	0	1

Side Effects

Only one patient, two days after the third laser session he came complaining of pain, erythema and blistering in the treated leg (lesion no.2). I treated him with antiviral, antibiotic and pain relieving tablets together with cleaning the lesion and application of fucidin cream, after five day she came without any pain, erythema or blistering.

DISCUSSION

The results obtained after using fractional carbon dioxide laser in the treatment of vitiligo showed that it may have a mild effect in achieving repigmentation and what is interesting finding that its use is associated with repigmentation in distant areas not treated by the laser, a finding seen after using CO2 laser in treatment of warts, in which ablation of warts using the CO2 laser at single site can stimulate spontaneous regression of warts at distant sites, the explanation was that it is possibly due to stimulation of the immune system following an acute inflammatory reaction.^[28] However, this finding in vitiligo needs more clarification to establish whether this distant repigmentation is real and it is due to laser effects on immunologic system or it is not real and as a part of unpredictable behavior of vitiligo. Researches were shown that vitiligo carries a psychosocial impact.^[26] studied the burden of vitiligo and tried to determine the socio-demographic variables that adversely affect the quality of life in adult patients with generalized vitiligo, they found that generalized vitiligo is a serious skin disorder with an adverse impact on the emotional state, comparable with that of other major skin diseases.

The classic treatments used always for vitiligo cannot give satisfaction for all patients and all cases.^[13] searched systematically a range of databases for randomized controlled trials they sought to report a Cochrane review of all interventions doc the treatment of vitiligo. Nineteen trials were included; they found short term benefit from topical steroids and various form of UV light with topical preparations. Recent discoveries of the role of the immunologic system in vitiligo are important.^[27] Assessed the role of major cytokines produced by T-helper I and 2 cells as well as T-helper 17 and regulatory T cells in the pathogenesis of vitiligo. They found reduced serum transforming growth factor-levels significantly which may contribute to enhanced cellular immunity, this may facilitate the occurrence of vitiligo by leading to diminished maturation of regulatory T cells, followed by impaired inhibition of inflammation.

Understanding vitiligo in cellular level may lead to some promising results in its management.⁽²⁴⁾ Studied the biological effects of fractional photothermolysis, they found an interesting histological changes ensue after mid-infrared fractional photothermolysis, columns of epidermal and dermal cell necrosis are seen immediately after treatment, with preservation of the stratum corneum. Each of the microscopic columns of thermal injury is surrounded by a heat-shock zone that releases cell mediators to signal the wound-healing cascade; specifically heat-shock protein (hsp) 70 expressions is increased, most prominently within the Epidermis in areas that underlie necrotic debris and in dermal tissues that surround the MTZ. Hop 70 causes up-regulation of transforming growth factor (TGF)-beta which increases collagen production, thereby stimulating dermal remodeling; Evidence of increased dermal collagen III production is seen after one week. Within an hour of treatment, keratinocytes begin to move to the deep and lateral margins of the epidermal wound. By 12 hours viable cells surround the neurotic debris and begin to form a plug containing this microscopic epidermal neurotic debris(also known as MENDs) this compact material ranges from (50-200) micrometer in diameter and has been found to contain both melanin and elastin. By 24 hours MENDs are found within the epidermis above each area of the dermal injury with intact stratum corneum. Stem cells located in basal layer appear to be temporarily activated and begin to replace the epidermal tissues.

Laser has entered in the management of vitiligo,^[28] reviewed the efficacy of narrowband ultraviolet B Phototherapy and 308-rimexcimer laser in the treatment of vitiligo. They found that the best results for NB-UVB efficacy have been reported in two studies from the same center in India with 71.4% and 75% of patients achieving cosmetically acceptable repigmentation. Two studies from the same center in the Netherlands also have reported high rates (53% and 63%) of cosmetically acceptable repigmentation. The lowest response rates

have been reported in Asian patients: 33% and 12.5% in studies from Thailand and Taiwan respectively.

CONCLUSION

After this relatively short period of follow up, the results, in conclusion, showed patient satisfaction score 16.7% (1 patient) were really satisfied, 66.7% (4 patients) were slightly satisfied and 16.7% (1 patient) with poor satisfaction.

According to the Clinical Assessment of Repigmentation degree, The mean results of the three dermatologists assessment showed 14 patches (82%) out of the 17 patches were given score 1 which means 1% - 24% repigmentation, while only 3 patches (18%) were given 0 score, this means that carbon dioxide laser has achieved mild repigmentation effect in vitiligo patches.

RECOMMENDATIONS

Owing to the fact that vitiligo follows unpredictable course, in some people the white patches can remain stable for many years but in others they can enlarge in size while new patches appear or disappear in large areas of the skin surface, so I suggest that, more treatment sessions of laser maybe needed together with longer period of follow up to reach a sound decision about any role of fractional carbon dioxide laser in the treatment of vitiligo.

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