



# ***IADVL***

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## MEMBERS



**Dr. David Pudukadan**  
Coordinator



**Dr. Rahul Pillai**  
Convenor



**Dr. Sachin Dhawan**  
Member



**Dr. A.V. Kaleeswaran**  
Member



**Dr. Sachin Verma**  
Member



**Dr. Bhavesh Swarnkar**  
Member



**Dr. Shweta Rambia**  
Member



**Dr. Manjeet Ramteke**  
Member



**Dr. Sendhil Kumar**  
Member



**Dr. Namita Chathra**  
Member



**Dr. Dipali Malvankar**  
Member

**Contents**

S.No.	Topic	Author	Page No
1.	MNRF for Scar Management	Dr. A.V. Kaleeswaran	5
2.	Fractional CO2 Laser for the Management of Scars	Dr. Rahul Pillai	8
3.	Scar Management With ER : Glass Lasers	Dr. Sachin Dhawan Dr. Komal Sharma	12
4.	Whats New in Scar Treatment	Dr. Sweta Rambhia	19
6.	SIG Laser - QUIZ	Dr. Dipali Malvankar	23

# MNRF FOR SCAR MANAGEMENT



**DR. A.V. KALEESWARAN**

M.D. (DERM),

Consultant Dermatologist,  
AVM Skin, Hair Care and Laser  
Centre, Dindigul.

Member, SIG Lasers  
kaleesderm@gmail.com

Scar management is one of the most frequently sought procedural dermatology treatment. Acne scar tops the list followed by surgical, Traumatic and keloidal scar. Ablative and nonablative fractional lasers, MNRF, Sublative RF devices are commonly used for scar management .

**MNRF :** MNRF is mainly used for treatment of acne scar. It combines both microneedling and RF energy delivery. MNRF device works by creating radiofrequency thermal zones without much of epidermal injury. After damage to reticular dermis, long term dermal remodelling , ne elastogenesis and neocollagenogenesis results in dermal thickening.

In contrast to ablative and nonablative lasers, treatment with MNRF can be controlled by varying the depth. The use of microneedle radiofrequency is based on the ability to selectively heat the tissue at a specific depth. The device also uses micro-needles through which a beam of radio waves is emitted directly into the tissue. Additionally, the needles only heat up at their tips (insulated needle), which allows precise control of the depth at which the tissue is heated. Such a feature of this technique is unique and important for final effects. The needle depth can be adjusted to 0.5 to 3.5 mm. some of the devices have needle depth upto 8 mm. but beyond 3.5 mm depth is mainly used for body treatment.

In MNRF, insulated and non insulated needles are used. The insulated needles prevent electrothermal damage from occurring anywhere in the dermis but at the very tip of the needle and never in the epidermis.

Kim et al. used a fractional radiofrequency microneedle treatment in 52 patients with atrophic acne scars located on the face. Each of the patients received 4-treatment series. The Goodman and Baron's Global Acne Scarring System evaluated treatment results. Overall, 73.1% of patients improved according to the grading system. Five patients experienced post-inflammatory

hyperpigmentation. The authors concluded that this method is effective with minimal risk of complications.

Chandrashekar et al. used microneedle radiofrequency to treat 31 patients with moderate and severe acne scars. The study protocol was based on 4 treatments conducted over 6 months every 6 weeks. After the treatments, the scars improved. Of grade 3 and 4 acne scars, 80.64% improved by 2 grades, and 19.35% improved by 1 grade, according to the Goodman and Baron's Global Acne Scarring System. The transient adverse effects reported by the patients were pain, erythema, edema, and hyperpigmentation.

Elawar et al. recruited 19 patients to evaluate the improvement in acne scars and skin, as well as the reduction of skin pores after 2 to 4 microneedle fractional radiofrequency treatments conducted at intervals of 1 month. The authors concluded that this method effectively treats acne scars, as it improves skin texture, reduces pore size, and increases patient satisfaction. Furthermore, none of the patients experienced hyper/hypopigmentation.

For their randomized, split-face trial, published in Lasers in Surgery and Medicine (December 16, 2020), Ting Lan, et al, treated 60 patients with facial atrophic acne scars. The subjects underwent three sessions (spaced two months apart) using fractional micro-plasma RF on one side of the face and fractional microneedle RF on the other.

The authors concluded, "Both fractional micro-plasma RF and fractional microneedle RF are effective and safe methods for improving atrophic acne scars. Fractional micro-plasma RF is

significantly more effective for atrophic acne scars, especially for rolling scars. However, fractional microneedle RF has fewer side effects plus shorter downtime, and patients are more comfortable.

**Sublative bi-polar RF**

Causes minimal epidermal damage just beneath the electrodes. The RF current then reaches the dermis, which is a conductive medium.

The dermis' natural resistance to the electrical current results in a unique current distribution a strong focal heating effect just below the pins, with minimal epidermal damage after the treatment."



FIG 1&2



ACNE SCAR TREATMENT

FIG 1-4 SHOWS TREATMENT RESULTS OF ACNE SCAR, TRAUMATIC SCAR AND KELOID. TREATMENT SESSIONS 4 TO 5 SESSIONS IN 4-6 WEEKS INTERVAL. INTRALESIONAL TRIAMCINOLONE HAS BEEN ADDITIONALLY USED IN KELOID TREATMENT.



FIG 3. TRAUMATIC SCAR TREATMENT



FIG 4. KELOID TREATMENT

To conclude MNRF is wonderful device in the treatment of acne scar . it targets dermal remodelling with minimal epidermal injury. Sublative bipolar RF can be used in all types of scar including traumatic, surgical and keloidal scars.

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# FRACTIONAL CO2 LASER FOR THE MANAGEMENT OF SCARS



**DR. RAHUL PILLAI**

MD-DVL, MD-Physician,  
MRCPS (Glasgow), IFAAD.  
Convenor-SIG Laser  
Kkris skin care center and  
laser clinic, Kerala  
[Dr.rahul@kkris skincare.com](mailto:Dr.rahul@kkris skincare.com)

**M**anagement of scars is one of the common problems that we treat as a Dermatologist. In terms of frequency of procedure I would rate it just behind Laser hair removal. Hence its essential for every Dermatologist practising Aesthetic Dermatology to be well versed in the various modalities of management. Acne scars, the most common reason for scars on the face happen as a result of skin damage following the inflammation, damage and at healing. Acne scars can be broadly classified as types depending on whether there is a loss or accumulation of collagen: atrophic and hypertrophic. 80-90% cases there is loss of collagen compared to hypertrophic scars and keloids.

Atrophic scars are classified into ice pick, rolling and boxcar type. Dotted, ice pick represents 65-70% of atrophic scars, rolling type 20-30% and boxcar type 15-25%.

Lasers used for management and resurfacing of scars are divided into ablative and nonablative lasers. Laser resurfacing is supposed to work by stimulating collagen production in the dermis and by dermal remodeling of collagen fibers.

This article is about the use of Fractional CO2 which is an ablative laser for the management of scars, predominately acne scars. Carbon dioxide (CO2) laser is an ablative laser device that produces energy in the far-infrared region at a wavelength of 10,600 nm. Resurfacing with CO2 laser is highly effective in treating scars and ageing skin. Due to the relatively long downtime and chances of PIH on skin of colour, one has to be well trained before using this laser and also it has to be noted that there is a reasonably long learning curve. However the results are usually gratifying and results are seen few months after treatment.

Fractional photothermolysis was first described by Anderson

and Parrish in 1983 in the journal Science. However it was introduced by Manstein et al in 2004 and the application of fractional carbon dioxide laser in the treatment of acne blemishes was approved by the FDA in 2007.

With FP, only a fraction of the whole skin is treated in a pixelated pattern while the intervening skin remains intact. Treatment with FP leads to formation of longitudinal microthermal zones (MTZs) in the skin which are separated by healthy, untreated skin with an intact epidermis. This allows the treating physicians to go for much deeper treatment than with traditional laser resurfacing. Additionally, the adverse effects encountered with FP are transient and less severe than with full skin resurfacing and the technology has become more popular since the adverse events which is mainly hypo or hyperpigmentation or permanent scarring has been largely reduced.

eCO<sub>2</sub> laser is the latest generation of carbon dioxide fractional lasers, with combined fractional technology and deep ablative effect of CO<sub>2</sub> laser. Micro-ablative columns of laser penetrate deep into the skin with a maximum depth of 4 mm. The wavelength of 10600 nm has a high rate of water absorption. Thus greater epidermal damage is avoided, while lateral thermal damage is reduced. In comparison to similar CO<sub>2</sub> laser systems it causes less damage and also affect the remodelling of collagen fibers in the reticular dermis.

CO<sub>2</sub> lasers have a double effect – they encourage renewable processes of the wound and incite increased production of myofibroblasts and matrix proteins such as the hyaluronic acid.

Fractional CO<sub>2</sub> laser resurfacing has been successfully used in the treatment of both hypertrophic and atrophic acne scars for skin rejuvenation and scar reduction and in my opinion remains the gold standard in the management of Acne scars. Offcourse patient selection is an important factor and sometimes multimodality treatment methods yield better results that single modality treatment. When it comes to Acne scars its advised to start treatment as early as possible.

### Patient selection

All ablative lasers have a risk of complications and adverse effects which has to be told and patient has to be counselled regarding the post procedure care ,do's and don't's. Candidates for lasertreatment should not have active herpesviral infection nor a history of keloids and hypertrophic scars. Patients with a higher skin phenotype are at higher risk of hyperpigmentation than patients with a lower phenotype. It is essential to set realistic expectation with the patient as every individual has its own individual variation in response and similarly all scars don't respond the same way to the treatment as its depends on various factors such as type of the scar, duration of the scar, area of the scar, depth of the scar, amount of scar tissue present, etc. Usually multiple sittings is required and that again depends on these factors mentioned above. Its never possible to 100% rectify the scar, however in time and in multiple sittings satisfactory to good results can be attained.

Contraindications would be active infection, neoplastic skin conditions, history of keloid and scarring, pregnancy and nursing, any





other procedures performed recently like peels, laser hair removal, electrolysis in the last 1-2 weeks and badly tanned skin.

Other usual contraindications for general laser procedures also have to be considered.

### Pre-treatment Regime

If history of Herpes Labialis is there than a course of Antiviral therapy is given. Patients prone for post inflammatory hyperpigmentation are started on sunscreens and skin lightening agents like hydroquinone, kojic acid, arbutic, niacinamide or azelaic acid 4-6 weeks prior to the procedure and asked to stop 1 week prior to the procedure except the sunscreens.

For an ablative procedure after cleansing the area, a numbing cream is applied for 45 minutes to 1 hour. It is of foremost importance to wear protective eye shields both the patient and treating physician and all personnel in the treatment room. Intraocular eye shields are to be used if you choose to treat over the eyelids, however unless experienced it is advisable to start off with procedures restricting the treatment to outside the orbital rim.

### Procedure

The protocol for various laser procedures is beyond the scope of this article however certain important points are mentioned below.

A topical anesthesia cream is applied 45 minutes before the procedure.

A single test pass is first done to assess the patient tolerance and clinical endpoints. The ideal clinical endpoints should include white dots in the shape selected and background erythema. Pain level should not exceed 6 on a scale of 1 to

10. Pin point bleeding spots are usually evident.

Fluence and Density should be increased or decreased inversely.

Avoid repeated stamping or overlap as this may lead to bulk heating which may not be immediately visible but may result in PIH later.

It is advised to feather or shoulder the rim of the scar for a more even healing.

Beyond 4 passes in the same area is futile and only causes further thermal damage. A cool air blowing device is advisable to blow chill cold air for the comfort of the patient. Throughout the laser procedure adjust the laser settings based on the observation of laser/tissue interaction, clinical endpoints and patient discomfort. Always take pre and post procedure photos of patients treated along with patient consent for the procedure.

### Post procedure care

It is extremely important that the patients follow the post procedure care judiciously as to avoid PIH and unwanted complications like delayed healing, infection, etc. Sunscreens is mandatory three times a day throughout the treatment and post procedure for a week a good moisturization is advised. This helps in faster healing and repair. A hyaluronic gel preparation is advised and sometimes we may need to prescribe a mild topical steroid cream for application for few days. After 7-10 days the treating dermatologist can suggest other creams according to patients requirements and response.

### Results

Ablative CO2 lasers are ideal for the treatment of grade 3 & 4 scars caused by acne, especially atrophic scars of varied morphology. Also in the

treatment of scars, the longer time has passed since the appearance of a certain cicatrix it is more severe and refractory for therapy. Similar therapeutic benefit can be expected in post-traumatic and post-burn scarring because the process underlying all these aetiological types of scars is fundamentally the same.

### Conclusion

Although ablative lasers like Fractional CO<sub>2</sub> have a longer learning curve, in properly selected

patients, fractional ablative laser resurfacing for the treatment of all kinds of scars is considered gold standard. Fractionated methods of delivering the laser energy to the skin has resulted in dramatically reduced recovery times and minimal post procedure complications. With the evolution of technologies and with the availability of combination technologies, the management of scars has become more efficient delivering the desired results with minimal complications.

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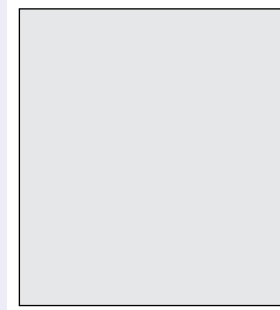
# SCAR MANAGEMENT WITH ER : GLASS LASERS



**DR. SACHIN DHAWAN**

(MD, DVD Dermatology)

Senior consultant Dermatologist at Fortis Memorial Research Institute  
Skin n Smiles clinic at Gurgaon (Haryana)  
Skin n Smiles, A 239, Supermart 1,  
DLF phase 4, Gurgaon, Haryana.



**DR. KOMAL SHARMA**

(MD Dermatology)

Consultant Dermatologist  
Radian Scan and Skin Care Centre,  
Khumanon. Punjab  
Email : sac\_dhawan77@yahoo.co.in

**F**ractional photothermolysis (FP) is a concept of producing arrays of microscopic thermal wounds called microscopic thermal zones (MTZs) at a specific depth in the skin without injuring the surrounding tissue (Figure 1). As compared to the ablative and non-ablative lasers available prior to introduction of FP in 2003, this concept gave a safe and effective technique for skin resurfacing and scar management. Non-ablative and ablative fractional erbium lasers are among the most frequently used and safe lasers for facial rejuvenation and scar management. The erbium lasers with a wavelength of 2940 nanometres are ablative erbium yttrium-aluminium-garnet (Er:YAG) lasers, and the erbium lasers with a wavelength of 1550 nm & 1927 nm thulium (Fraxel Duel), 1540 nm (Palomar starlux), 1565

nm (Lumenis ResurFx) are classified as non-ablative erbium glass lasers.

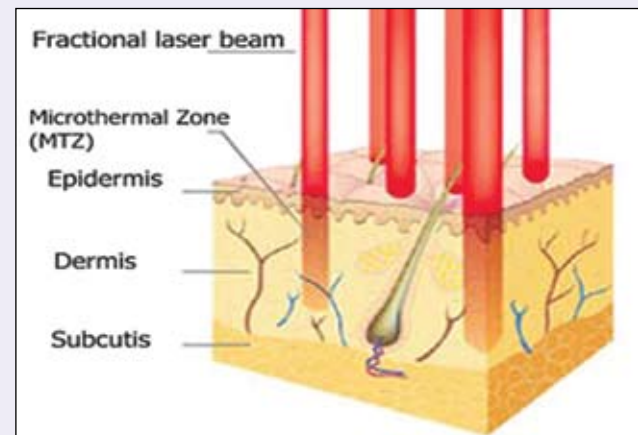


Figure 1: the laser microbeams heat the tissue in a controlled manner forming columns of alternating micro-thermal coagulation zones (MTZ) and healthy tissue to preserve healthy keratinocytes for repair.  
[<https://www.kaimedicalclinic.com/multixel-co2-fractional-laser>]

**MECHANISM OF ACTION**

An erbium glass (Er:Glass) laser has a core of erbium doped oxyfluoride silicate glass substrate, with a flash lamp that pumps the core to produce mid-infrared wavelengths between 1540nm to 1565nm. It is a non-invasive and non-ablative laser that targets intracellular water to a depth of 0.4 mm to 2 mm, sebaceous glands and surrounding dermal matrix [1].

**LASER OPTICS**

A 940 nm fiber-coupled laser diode (LD) pump source is supplied by a quasi-continuous power source. Passing through two uncoated lenses, the pump light(25W) is focused into an Er,Yb:Glass (erbium, ytterbium phosphate glass)

. The front surface of the glass microchip is anti-reflective (AR) coated at 940 nm and high-reflective (HR) coated at 1535 nm while the end surface is HR coated at 940 nm and AR at 1535 nm. A flat output coupler (OC) with reflectivity of 91% around 1550 nm is positioned less than 2 mm away from the end surface of the Er,Yb:glass. A 0.42mm-thick Co<sup>2+</sup>:spinel (MgAl<sub>2</sub>O<sub>4</sub>) crystal with an initial transition of 97.5% is bonded at the inner surface of OC as a saturable absorber. The glass is wrapped in a copper fixture and the whole laser system operated at room temperature without auxiliary cooling device when the highest incident power of pulsed pump reaches more than 1W (Figure 2) [3].

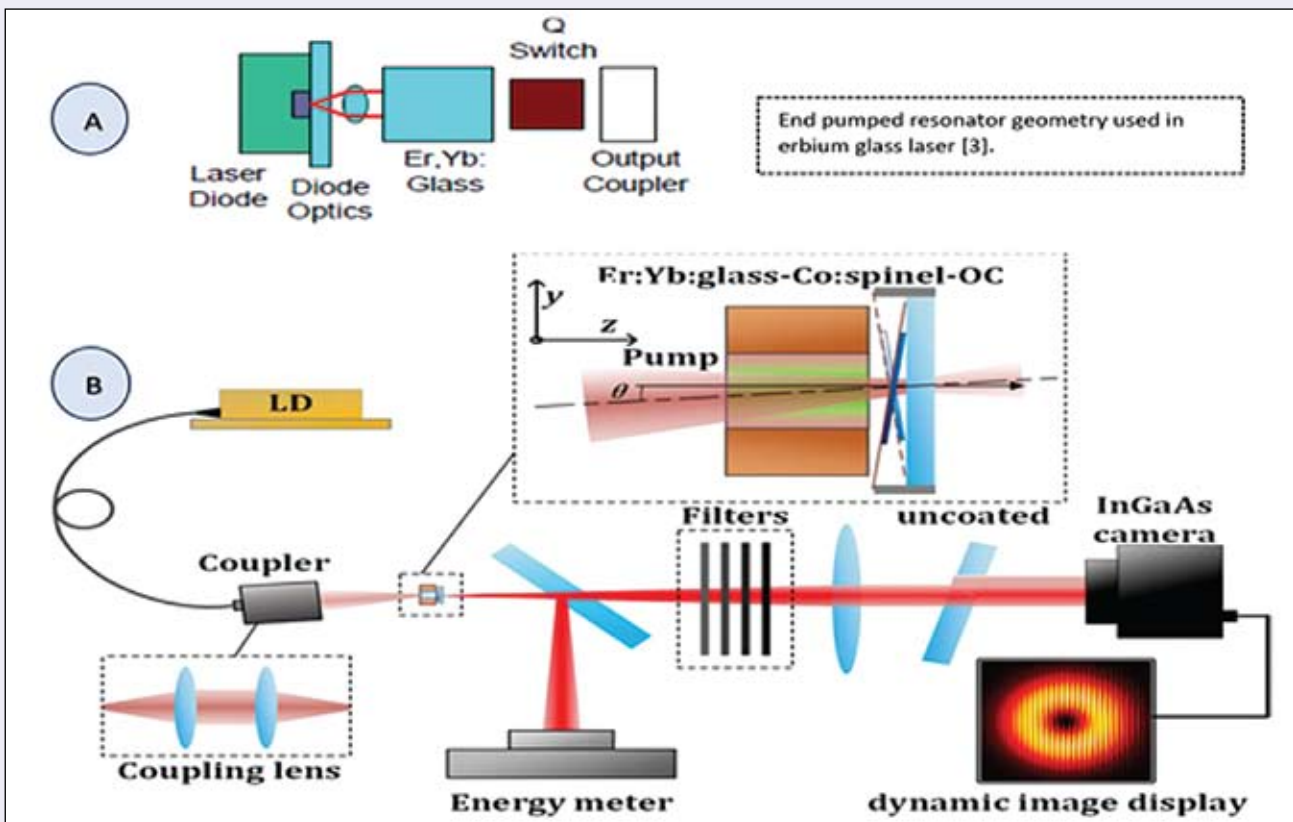


Figure 2 (B): Two cylindrical lenses are used to collimate the laser diode’s output into a beam. The pump side of the erbium:Yb glass is coated highly reflective at 1535nm and high transmission at pump wavelength of 920-960nm [3].

The wavelength of erbium glass laser does not cause water in the tissue to evaporate due to higher water absorption coefficient and poor tissue penetration. This heats the tissue in a controlled manner and the viable keratinocytes are preserved [4]. Multiple small coagulation zones separated by surrounding untreated tissue are formed [5] (Figure 1). The effect thus produced is gentle which keeps the epidermis intact and produces a controlled injury to the

dermis. This activates fibroblasts and stimulates dermal remodelling and collagen production.

Some machines have thermokinetically cooled sapphire crystal tip in the handpiece to increase epidermal protection and reduce intraoperative discomfort [6]. The laser has an option of multiple beam shapes, sizes and densities to create different treatment combinations according to indication (Figure 3).

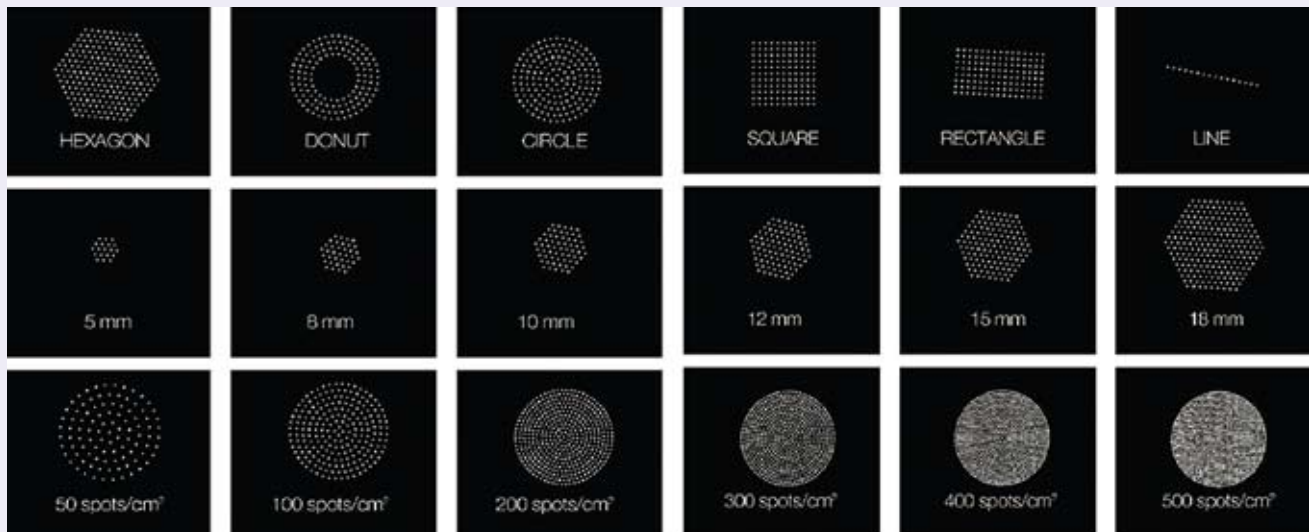


Figure 3: The laser beam has an option of various shapes, sizes and beam densities to form various combinations according to the area to be treated.

[<https://lumenis.com/aesthetics/products/resurf/technology/>]

### USES

Lesser downtime as compared to ablative CO<sub>2</sub> lasers, makes non ablative erbium glass laser a preferred choice for treatment of pores, acne pits and acne scars [7,8]. In a comparative study of 30 patients by Puri, fractional erbium glass laser showed almost equal improvement and patient satisfaction as compared to glycolic acid peel for melasma, though this has not been proven in practice [9]. In an observational study by Liu et al, 45 patients were treated with 1550nm erbium

glass laser for acne vulgaris. At a 2 year follow up, 75% mean percent reduction was seen by disruption of bacterial biofilms and decreasing sebum production [10]. Few studies also suggest efficacy of fractional erbium glass 1550nm laser in androgenetic alopecia at lower energies [11,12]. Fractional erbium glass laser is a good treatment modality for dyschromia, wrinkles, periorbital and perioral rhytides [13,14]. A moderate level of evidence suggests the effectiveness of fractional erbium glass laser on hypertrophic scarring and

keloids. The effectiveness can be enhanced by combining lasers with intralesional steroids or platelet rich plasma [15]. This laser is also efficacious in moderate to mild improvement in striae distensae by promoting collagen regeneration [15].

**USES OF ER:GLASS LASERS**

Acne scars, pits and pores [7, 8]	Acne vulgaris [10]
Post-burn hypertrophic scarring	Becker's nevus
Wrinkles and rhytides [13, 14]	Vitiligo
Post operative/traumatic keloids and hypertrophic scarring [15]	Androgenetic alopecia [11, 12]
Striae [15]	Dyschromias [13, 14]



**Image 4 (A and B):** Four sessions of Er:Glass laser for ice pick scars done once in a month at 50mJ, 150mB, 17mm spot size.

**Image 4D:** After 4 sessions of fractional Er:glass laser and intralesional triamcinolone + Hyaluronidase injections. Image 4E: 6 months after four sessions

**Image 4 (F and G):** Three sessions of combination of fractional Er:glass laser done 30 days apart. The treatment started 1 month post-op.



### SIDE EFFECTS

The downtime is minimal as compared to ablative lasers. Mild, transient edema and erythema are commonly seen in almost all patients. Mild pain and discomfort during treatment is common [13].

In a study by Graber et al, the most common side effect observed was acneiform eruptions, erosions, prolonged erythema and edema, post inflammatory hyperpigmentation and herpes simplex virus activation. A single case of impetigo and purpura was also reported [16]. Most of these side effects are seen more commonly in skin of colour [16,17].

### COMPARISON WITH ABLATIVE 2940NM ER:YAG LASER

In Asian skin or in skin of colour, non-ablative erbium glass laser is the laser of choice for treatment of wrinkles, rhytides, scars and stretch marks. Though the results are comparable to 2940nm Er:YAG lasers, the downtime and chances of post inflammatory hyperpigmentation are more than non-ablative Er glass lasers [18,19,20]

### COMPARISON WITH MICRONEEDLING RADIOFREQUENCY

MNRF and erbium glass laser have shown comparable improvement in atrophic scars without any significant side effects [21]. This improvement can be enhanced by combining both the modalities together [22].

### COMPARISON WITH FRACTIONAL ABLATIVE 10600NM CARBON DIOXIDE LASER

Both fractional ablative CO2 and fractional non-ablative erbium glass lasers are good

modalities for treating acne scars with a high efficacy and safety profile. The ablative CO2 laser showed higher efficacy while erbium glass laser offered less pain and shorter downtime [23].

### BASIC LASER CONSIDERATIONS

- The energy used should depend on the depth and thickness of target area: It should be less for pores and more for keloids.
- High fluences have more chances of post inflammatory hyperpigmentation due to disproportionate increase in MTZ width.
- Low to medium beam density reduces the chances of post inflammatory hyperpigmentation.
- Devices with smaller pulse width have a deeper penetration.

### ADVANTAGES

- Less downtime
- Useful superficial indications like pores and rhytides.
- High safety profile

### DISADVANTAGES

- More number of sessions are needed as compared to microneedling radio-frequency (MNRF) or fractional CO2 laser.
- Slightly less effective than ultra-pulse CO2 laser for deep scars, keloids and contractures.

### CONCLUSION

Due to controlled thermal injury promoting collagen regeneration, fractional erbium glass lasers are a safe and effective treatment modality for treatment of pores, acne scars, acne pits, post burn and post -traumatic hypertrophy and keloid formation.

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# WHATS NEW IN SCAR TREATMENT



**DR. SWETA RAMBHIA**

MBBS, DDVL,

Just care dental and skin clinic,  
Mumbai

**T**hree new devices ND YAG 1064 Picosecond Laser , Fractional 1550 Erbium fiber laser and Nonablative Red Touch Laser have been studied for scars.

The use of fractional resurfacing, specifically fractional picosecond lasers, has gained popularity due to their effectiveness and fewer side effects compared to non-ablative and ablative lasers. Picosecond lasers differ from traditional nanosecond lasers by delivering ultra-short pulse durations, which result in a more precise photoacoustic effect and less non-specific photothermal damage.

1) The safety and efficacy of fractional neodymium-doped yttrium aluminum garnet (Nd:YAG) 1064-nm picosecond laser and fractional 1550-nm erbium fiber laser in the treatment of acne scars. Thirty patients with acne scars on both sides of their faces were enrolled and treated four times at 4-week intervals. The efficacy was evaluated using digital photography and the ECCA grading scale. Patient satisfaction and self-rated improvement scores were also recorded. Adverse effects were monitored.

The study found that both lasers demonstrated significant improvement in acne scars, with no significant difference between the two in terms of efficacy, patient perception of scar improvement, and overall satisfaction. However, there were differences in adverse effects, with more pinpoint bleeding observed with the picosecond laser and more pain reported with the erbium laser. Both lasers were considered safe and effective for acne scar treatment, and the choice between them should consider factors such as cost.

**STUDY DETAILS:**

Treatment Modalities	Fractional Nd:YAG 1064-nm picosecond laser and Fractional 1550 erbium fiber
Study Design	Randomized, single-blinded, intra patient, left-to-right comparative study

Participants	30 subjects (16 males, 14 females)
Age Range	≥ 18 years
Skin Types	Fitzpatrick's skin types III and IV
Duration of Scarring	Median duration of 10 years (range: 3-37 years)
Scar Types	Majority had a mixture of icepick and boxcar scars; 19% had a combination of all three scar types
Treatment Protocol	Topical anesthetic cream applied prior to treatment; standardized parameters used for each side of the face
Treatment Frequency	Four treatments at 4-week intervals
Efficacy Assessment	ECCA grading scale used by a blinded dermatologist; patient's self-rated improvement and satisfaction scores
Results	Both lasers showed statistically significant improvement in acne scars; no significant difference between the two lasers in terms of improvement
Pore Count Reduction	Both lasers reduced pore counts, but erbium fiber laser showed a significantly higher reduction compared to the picosecond laser
Side Effects	Pinpoint bleeding more common with picosecond laser; higher pain scores with erbium fiber laser
Limitations	Small sample size, two-dimensional imaging assessment of scars

2) The use of a non-ablative laser system, specifically the 675 nm RedTouch laser, for scar remodeling, particularly in cases of atrophic acne scars. The RedTouch laser stimulates dermal fibroblasts to produce new collagen, resulting in the regeneration of skin tissue. The system emits red light with a wavelength of 675 nm and creates microzones of subablative and selective thermal damage on the skin. The study involved 24 female patients with residual acne scars who received three sessions of RedTouch laser treatment. The results showed significant improvement in acne scars based on quantitative grading systems and photographic evaluation. The treatment was well-tolerated with minimal side effects, primarily minor burns due to incorrect positioning of the handpiece. The RedTouch laser's ability to target collagen fibers and its non-invasive nature make it a promising treatment option for scar remodeling, including acne scars.

Laser	Key Points
Laser System	RedTouch laser system (Deka Me.La, Italy) is a non-ablative laser system used for scar remodeling.
Laser Specifications	- Emits a 675nm red light

	- Creates microzones of subablative and selective thermal damage on the skin
	- Depth reached in each emission can reach 300 $\mu\text{m}$
	- Equipped with a 5°C skin cooling system to protect the epidermis
Study Participants	- 24 female patients (21 to 42 years old) with Fitzpatrick skin type I-IV and residual acne scars
Treatment Protocol	- 3 sessions of RedTouch laser with one month between sessions
	- Power: 10 W; dwell time: 300,400 ms; distance: 11.5 mm; cooling: 5 °C
	- Topical anesthetic ointment used in three patients
Evaluation Methods	- Goodman and Barons Quantitative Global Acne Scarring Grading System
	- Digital photographs before and 3 months after treatment
	- Visual Analogue Scale (VAS) for pain assessment
Results	- Significant improvement in acne scars according to the grading system and photographic evaluation
	- Well-tolerated treatment (pain score: 2.9–2.3)
	- Minor burns experienced by three patients due to incorrect handpiece positioning
Discussion	- RedTouch laser system has high affinity for collagen fibers, making it promising for scar remodeling
	- Non-invasive treatment with minimal side effects
	- Ability to treat chronoaging, photoaging, and pigment disorders

### SUMMARY

The 675nm wavelength emitted by the RedTouch device has high affinity for collagen fibers and represents a promising treatment strategy for scar remodeling. Compared to those currently used to treat acne scars used systems that target water, the RedTouch system acts directly on the collagen component contained in the skin. Light in the spectral range of the optical window (650 to 950 nm) can reach deep structures of biological tissues, since NIR light is only weakly absorbed by water, hemoglobin, collagen and proteins. Light below 650 nm is mainly absorbed too much by hemoglobin and above 950 nm too much removed by water. In the spectral range of the optical window, various substances, including collagen, have a higher absorption coefficient than water . The treatment was easy to perform, non-invasive and associated with minimal side effects (redness, edema, minor burns).



Due to the preventive skin cooling, the procedure was painless. Red Touch creates micro-zones of thermal damage of about 1 mm, which, supported by the cooling and the selectivity of the skin layer, do not damage the epidermal layer. There is neither the formation of microscopic epidermal necrotic debris (MENDs) nor dermoepidermal detachment typical of the postoperative course of NIR systems and probably related to the increased focus on small patches (100–300  $\mu\text{m}$ ). The appearance of crusts and/or microcrusts during the operation . RedTouch's ability to act on both melanin and collagen fibers makes this device promising for the treatment of chronological aging, photoaging and pigment disorders. In summary, the results of this study indicate that the 675nm laser source system is an effective treatment method for acne scars.

#### FURTHER READING :

Chayavichitsilp, P., Limtong, P., Triyankulsri, K., & Pratumchart, N. (2019). Comparison of fractional neodymium-doped yttrium aluminum garnet (Nd:YAG) 1064-nm picosecond laser and fractional 1550-nm erbium fiber laser in facial acne scar treatment. *Lasers in Medical Science*. doi:10.1007/s10103-019-02891-5

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Cannarozzo, G., Silvestri, M., Tamburi, F. et al. A new 675-nm laser device in the treatment of acne scars: an observational study. *Lasers Med Sci* 36, 227–231 (2021). <https://doi.org/10.1007/s10103-020-03063-6>

# SIG LASER -QUIZ



**DR. DIPALI MALVANKAR**  
M.D.Dermatology,  
DNB, MRCP(UK), SCE(UK)  
Consultant Dermatologist,  
Lilavati Hospital, Mumbai

**1) Which of these are methods of skin resurfacing?**

- a) Ablative resurfacing      b) Ablative fractional resurfacing
- c) Non ablative fractional resurfacing      d) All of the above

**2) Which of these lasers is used in the treatment of keloids?**

- a) Pulsed dye laser      b) Diode laser
- c) Alexandrite laser      d) None of the above

**3) Which of the following laser is mainly used for ablative skin resurfacing?**

- a) Nd: YAG laser      b) Carbon dioxide laser
- c) Pulse dye laser      d) Diode laser

**4) What is the wavelength of Erbium: YAG laser**

- a) 1064 nm      b) 755 nm
- c) 2940 nm      d) 810 nm

**5) Which laser is used in non-ablative skin resurfacing?**

- a) Nd: YAG laser      b) Er: Glass
- c) Er: thallium      d) All of the above

**6) Which of the following is the main chromophore for laser skin resurfacing**

- a) Oxy-Hemoglobin      b) Water
- c) Melanin      d) All of the above

**7) Which of the following will work best for striae rubra**

- a) Nd: YAG laser      b) Er: YAG laser
- c) Pulse dye laser      d) Diode laser

**8) Which of these is not true of radiofrequency energy used in skin resurfacing**

- a) Colorblind (no specific chromophore)
- b) Can be used as fractionated and non-fractionated
- c) Acts by heating of dermal collagen
- d) Works well in severe photoageing

**9) Following is a feature of High frequency Ultrasound (HIFU)**

- a) Causes secondary generation of heat
- b) Higher frequency probes are used to treat thinner skin areas
- c) Cellular damage can range from necrosis to subtle cell damage
- d) All of the above

**10) Plasma skin resurfacing utilizes the following as a source of energy**

- a) Nitrogen gas      b) CO2
- c) Erbium      d) None of the above

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