Comparison of Fractional Er:YAG and CO_2 Lasers in Resurfacing of Atrophic Scars in Asians

Woraphong Manuskiatti, M.D.

Professor of Dermatology
Siriraj Skin Laser Center
Mahidol University
Bangkok, THAILAND

MAY 20, 2011

One family, together

Disclosure

- Research grant and equipment loan
- Fotona dd (Slovenia)
- Lumenis Inc (USA)
- Syneron Medical Ltd (Israel)
- Pollgen (Israel)
- Laser Engineer (Thailand)

Milestone of laser resurfacing

1995

Ablative

Fitzpatrick RE et al. Arch Dermatol 1996;132:395-402

Before

After

Ablative CO_2 Resurfacing: Downtime

Hyperpigmentation: Skin type IV

Milestone of laser resurfacing

Milestone of laser resurfacing

2002 **Fractional resurfacing**

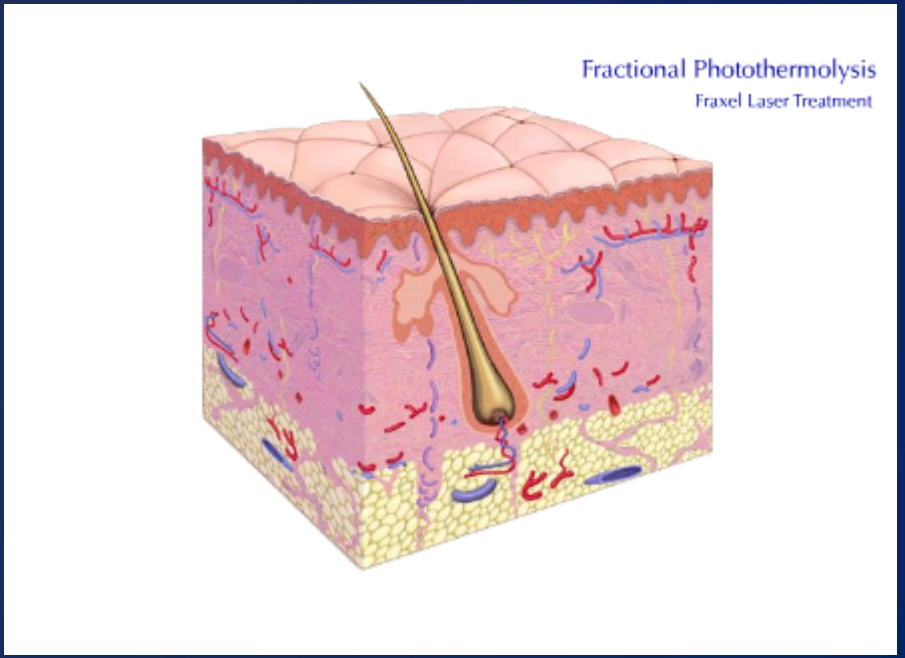
1997 **Nonablative**

1995 **Ablative**

Manstein D et al. Lasers Surg Med 2004;34:426-38

Fractional Resurfacing

- Technique which only a fraction of the skin is treated
  - Faster wound healing
  - Shorter downtime
  - Lesser side effects



Manstein D et al. Lasers Surg Med 2004;34:426-38.

Classification of fractional resurfacing

Nonablative

- Erbium fiber
- Er glass
- Nd:YAG
- IPL powered laser
- IPL powered infrared

Ablative

- CO_2
- Erbium:YAG
- YSGG

Classification of fractional resurfacing

Nonablative

- Erbium fiber
- Er glass
- Nd:YAG
- IPL powered laser
- IPL powered infrared

Ablative

- CO_2
- Erbium:YAG
- YSGG

Fractional CO_2 laser resurfacing in White

Clementoni MT et al. J Cosmet Laser Ther 2007;9:218-225.

Treatment of acneiform scarring: Skin type II

Before

After 3 Tx

Chapas AM et al. Lasers Surg Med 2008;40:381-386.

What about in dark-skinned patient?

Efficacy and safety of a carbon-dioxide ablative fractional resurfacing device for treatment of atrophic acne scars in Asians

Woraphong Manuskiatti, MD, Daranporn Triwongwaranat, MD, Supenya Varothai, MD, Sasima Eimpunth, MD, and Rungsima Wanitphakdeedecha, MD
Bangkok, Thailand

Background: Treatment of atrophic scars with a fractional laser resurfacing technique has demonstrated favorable outcomes, although data on the efficacy and adverse effects of this procedure in persons with dark-skinned phototypes are limited.

Objective: This study was conducted to evaluate the efficacy and safety of carbon-dioxide ablative fractional resurfacing on atrophic acne scars in Asian individuals.

Methods: Thirteen subjects (8 female and 5 male, aged 25-52 years) with skin phototype IV and atrophic acne scars were treated with 3 sessions of carbon-dioxide ablative fractional resurfacing laser on an average of 7-week interval. Objective (ultraviolet A-light video camera) and subjective (clinical evaluation by two blinded dermatologists) assessments were obtained at baseline and at 1, 3, and 6 months after the final treatment.

Results: At the 6-month follow-up, 85% of the subjects were rated as having at least 25% to 50% improvement of scars. Improvement significantly progressed from the 1-month follow-up to the 6-month follow-up ($P = .002$). At 1 month after 3 treatments, surface smoothness ($P = .03$) and scar volume ($P < .001$) significantly improved, compared with baseline measurements. Of the subjects, 62% rated themselves as having at least 50% improvement in their scars. Mild postinflammatory hyperpigmentation was the most common adverse effect observed in 92% of the subjects or 51% of treatment sessions, and was completely resolved in an average of 5 weeks.

Limitation: The small sample size was a study limitation.

Conclusions: Carbon-dioxide ablative fractional resurfacing appears to be effective and well tolerated for the treatment of atrophic acne scars in Asians. (J Am Acad Dermatol 2010;63:274-83.)

Key words: ablative fractional resurfacing; Asians; atrophic acne scars; carbon dioxide; fractional photothermolysis.

Ablative laser resurfacing (ALR) using standard, pulsed carbon-dioxide (CO_2), and erbium:yttrium-aluminum-garnet lasers has been proven effective for treatment of atrophic scars.[1] Removing the epidermis and varying thickness of underlying dermis by this approach smoothes the skin's surface, stimulates collagen remodeling, and subsequently improves scar appearance. Although significant clinical improvements can be

Abbreviations used:

AFR:	ablative fractional resurfacing
ALR:	ablative laser resurfacing
CO_2:	carbon dioxide
FP:	fractional photothermolysis
MTZ:	microthermal zone
NAFR:	nonablative fractional resurfacing
PIH:	postinflammatory hyperpigmentation

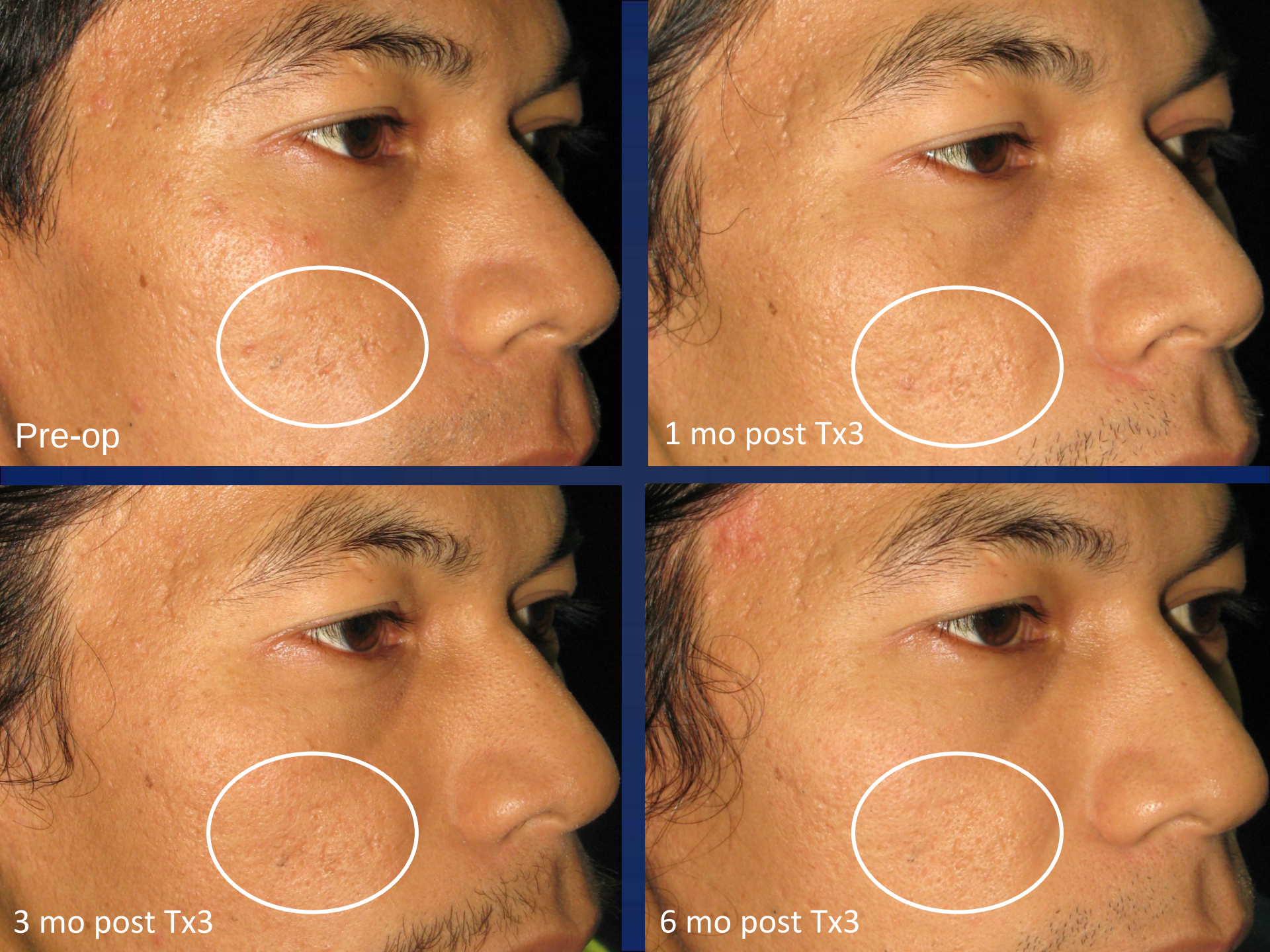
From the Department of Dermatology, Faculty of Medicine Siriraj Hospital, Mahidol University.
Supported by a research grant from Bilpse A/S, Hørsholm, Denmark.
Conflicts of interest: None declared.
Reprint requests: Woraphong Manuskiatti, MD, Department of Dermatology, Faculty of Medicine Siriraj Hospital, Mahidol University, 2 Prannok Road, Bangkok 10700, Thailand. E-mail: siwmn@mahidol.ac.th.
0190-9622/$36.00

doi:10.1016/j.jaad.2009.08.051

Manuskiatti W et al. J Am Acad Dermatol 2010;63:274-83

Key messages

- PIH remains the most common side effect found in dark-skinned patient.
- Improvement of FP can be observed up to 6 months after Tx


Pre-op
1 mo post Tx3
3 mo post Tx3
6 mo post Tx3

Adverse effects

Adverse effect	No. of affected pt/ Total no. of pt
PIH	**12/13 (92.3%)**
Acneiform eruption	4/13 (30.8%)
Contact dermatitis	2/13 (15.4%)
HSV infection	1/13 (7.7%)

Risk of PIH

Report source	Skin type	Incidence of PIH
Goldman MP et al. *ASDS Annual Meeting 2008, USA*	I-III	0%
Gold MH et al. *J Drugs Dermatol 2008;7:774-7*	IV-V	0%
Manuskiatti W et al. *J Am Acad Dermatol 2010;63:274-83*	IV	92%

Pre-operation

Day 12

Pre-operation

2nd week

SIRIRAJ SKIN LASER CENTER

Pre-operation

3rd week

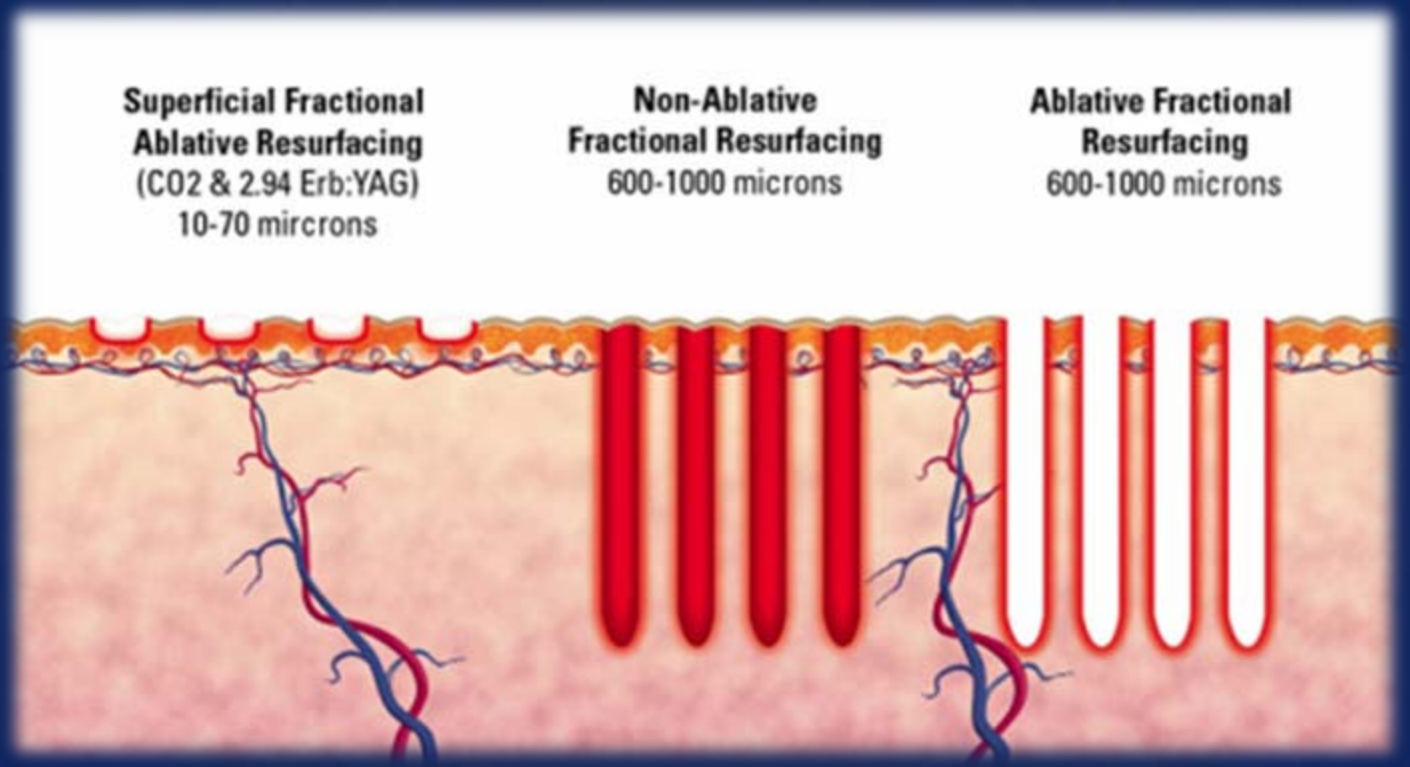
Pre-operation

6th week

Pre-operation

8th week

Spectrum of Fractional Resurfacing



Comparison of Fractional Erbium: YAG and Carbon Dioxide Lasers in Resurfacing of atrophic scars in Asians

Woraphong Manuskiatti, M.D.
Thanawan Iamphonrat, M.D.
Sasima Eimpunth, M.D.
Rungsima Wanitphakdeedecha, M.D.

Methods

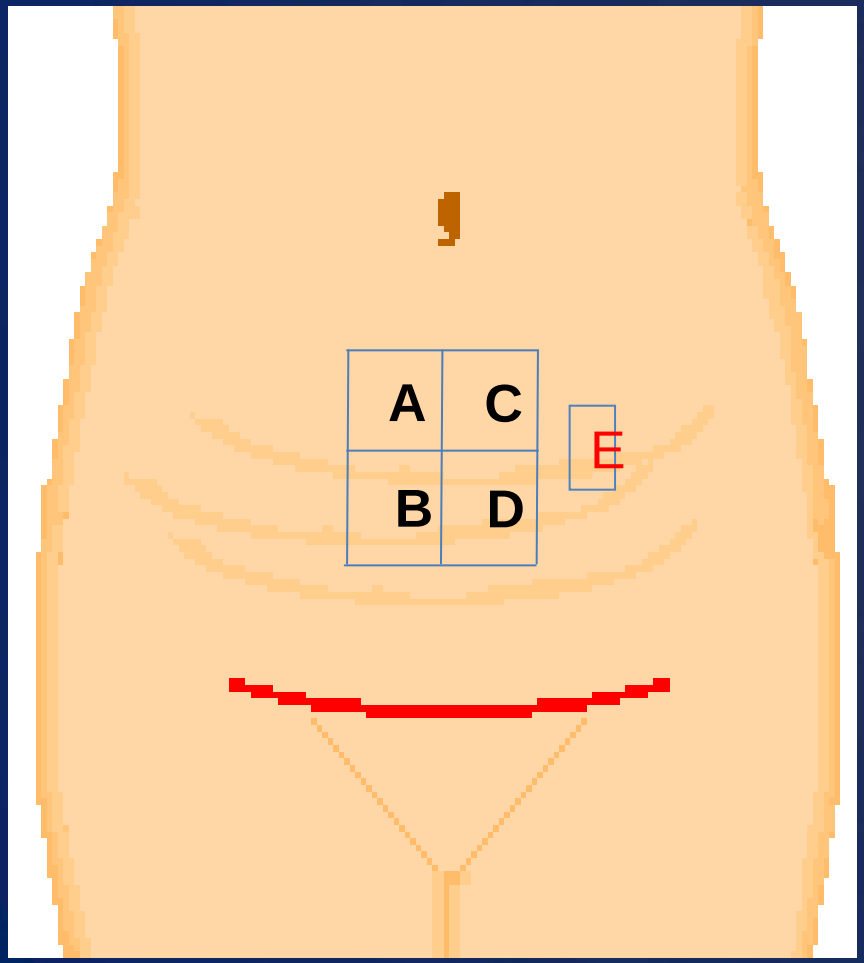
Er:YAG laser
(Fotona dd, Slovenia)

Parameter
-Fluence: 14 mJ
-Pulse duration: 350 µsec
-5% coverage

CO_2 laser
(Lumenis, USA)

Parameter
-Fluence: 10-15 mJ
-Pulse duration: 950 µsec
-5% coverage

Histologic Study

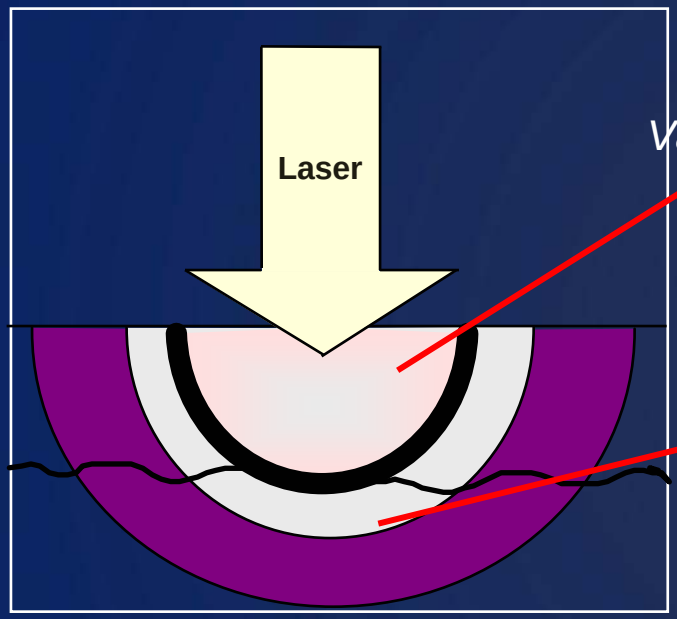


- Interventions:
  - A/C: Er:YAG laser
  - B/D: CO_2 laser
  - E: untreated control
- Timing
  - A/B: 3-mo before Sx
  - C/D: immediate before Sx

Depth of ablation + coagulation

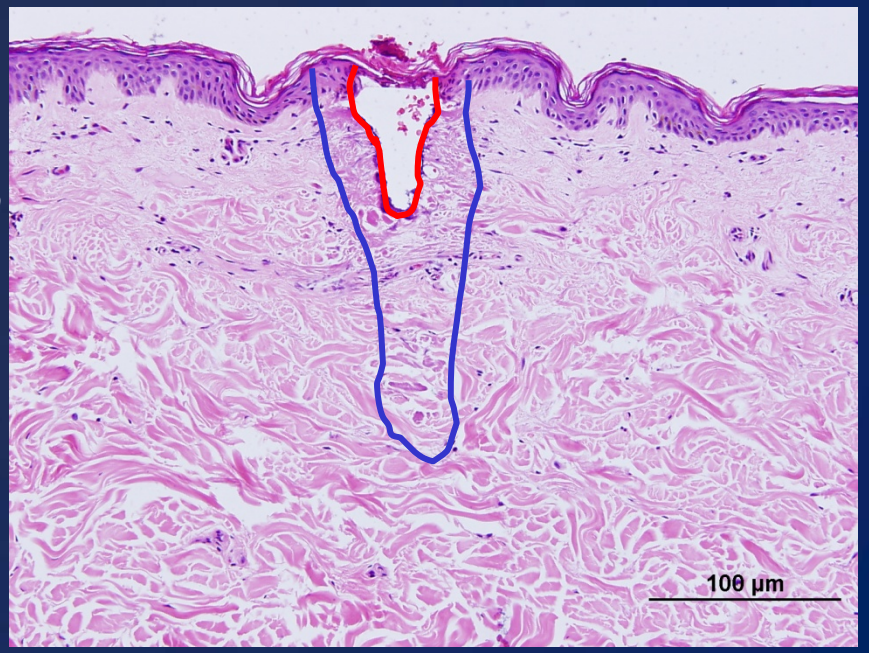
Laser/injury	MTZ Diameter (µm)	Vaporization depth (µm)	Coagulation depth (µm)
Er:YAG	120	65	100
CO_2	160	160	350

Tissue effect after CO_2 laser



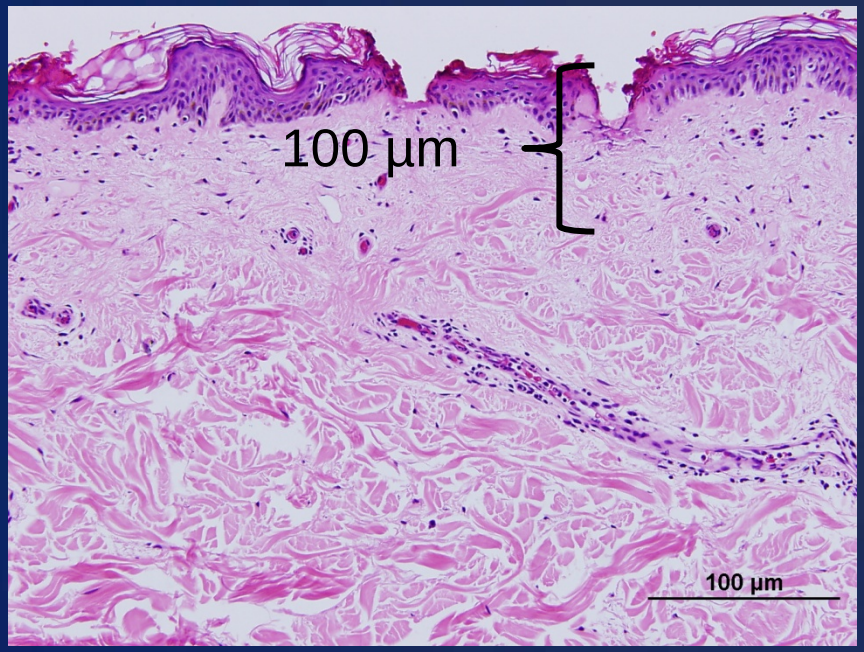
CO_2

CO_2 Laser

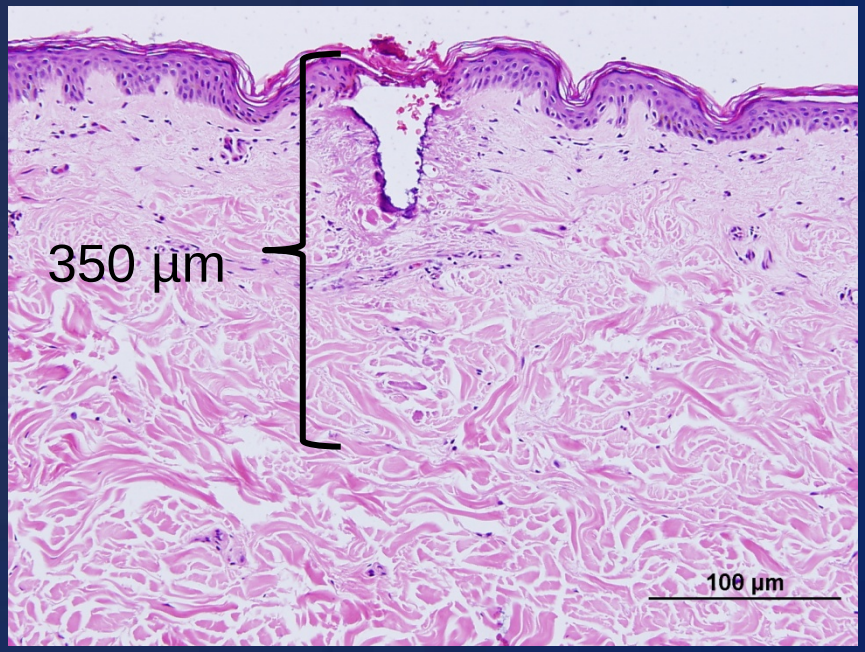


Histologic study

Er:YAG Laser

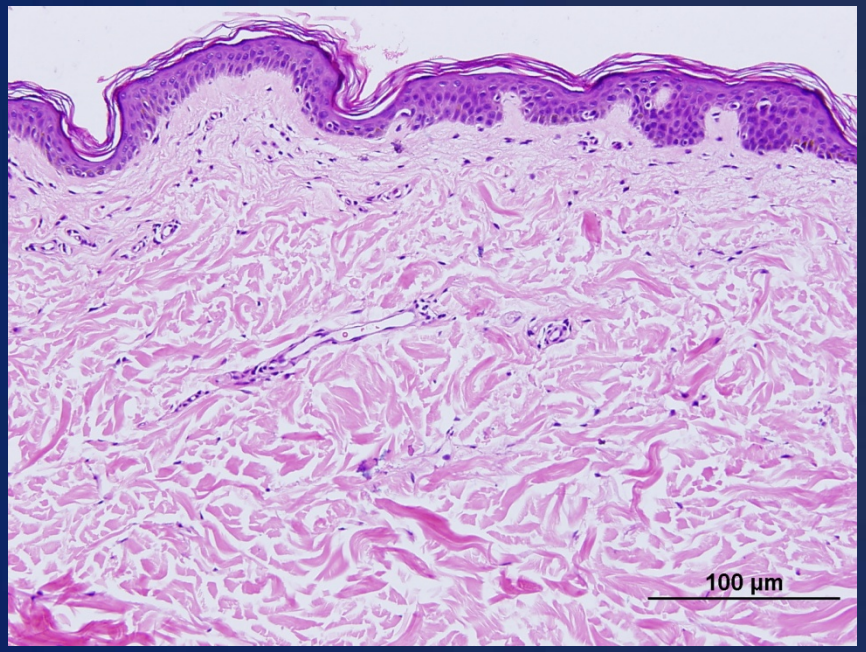


CO_2 Laser

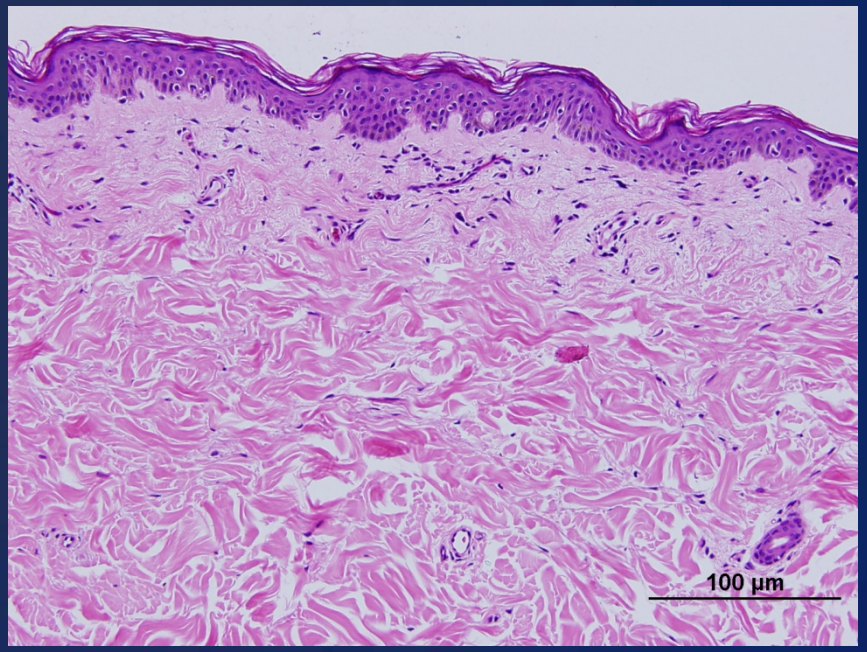


Histologic Study

Control

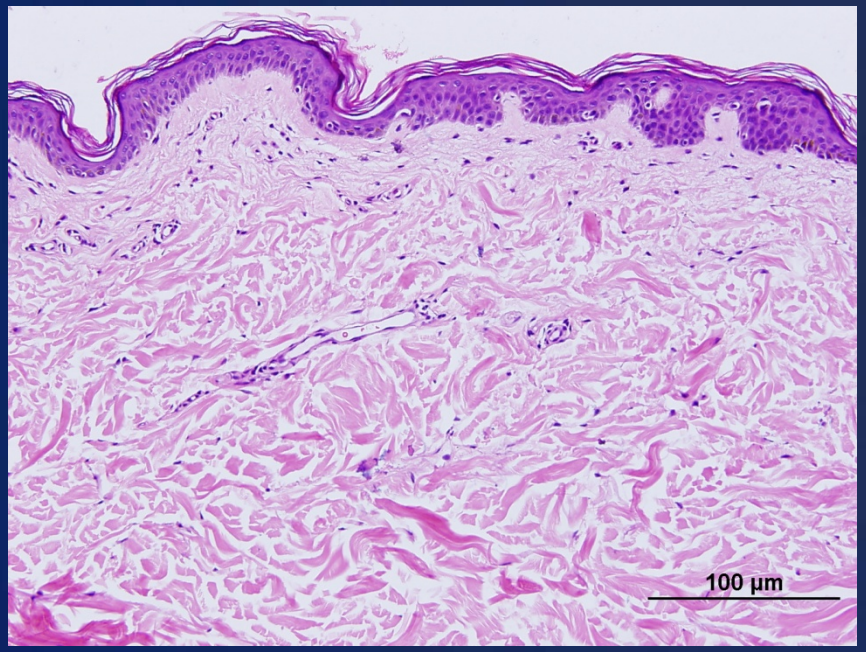


3 Months after Er:YAG Laser

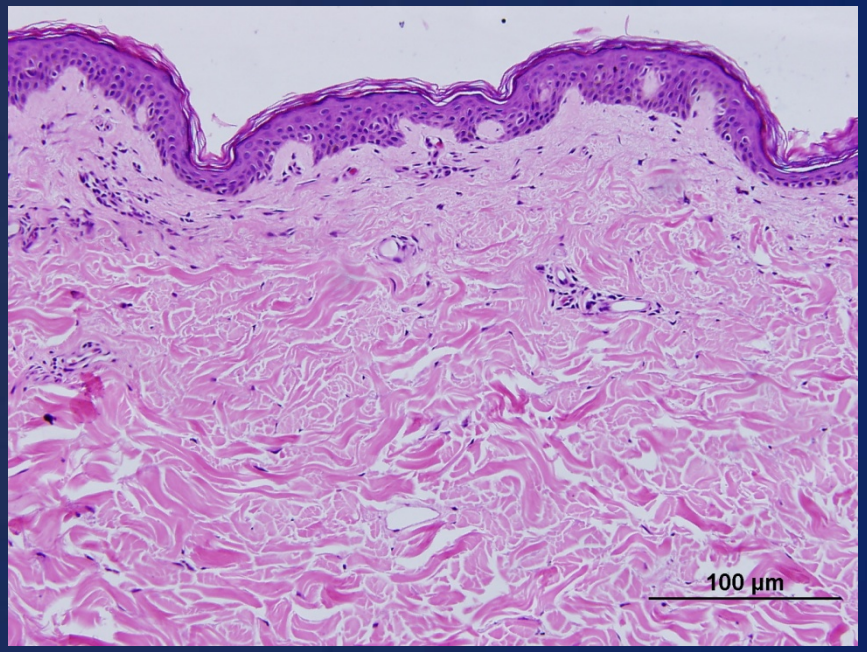


Histologic Study

Control



3 Months after CO_2 Laser



Method

- 24 subjects received 2 Tx at 2-mo interval
- EMLA cream was applied 1 hr prior to Tx
- No prophylactic antibiotic or antiviral was used
- Petrolatum jelly was applied post-op qid for 7 d

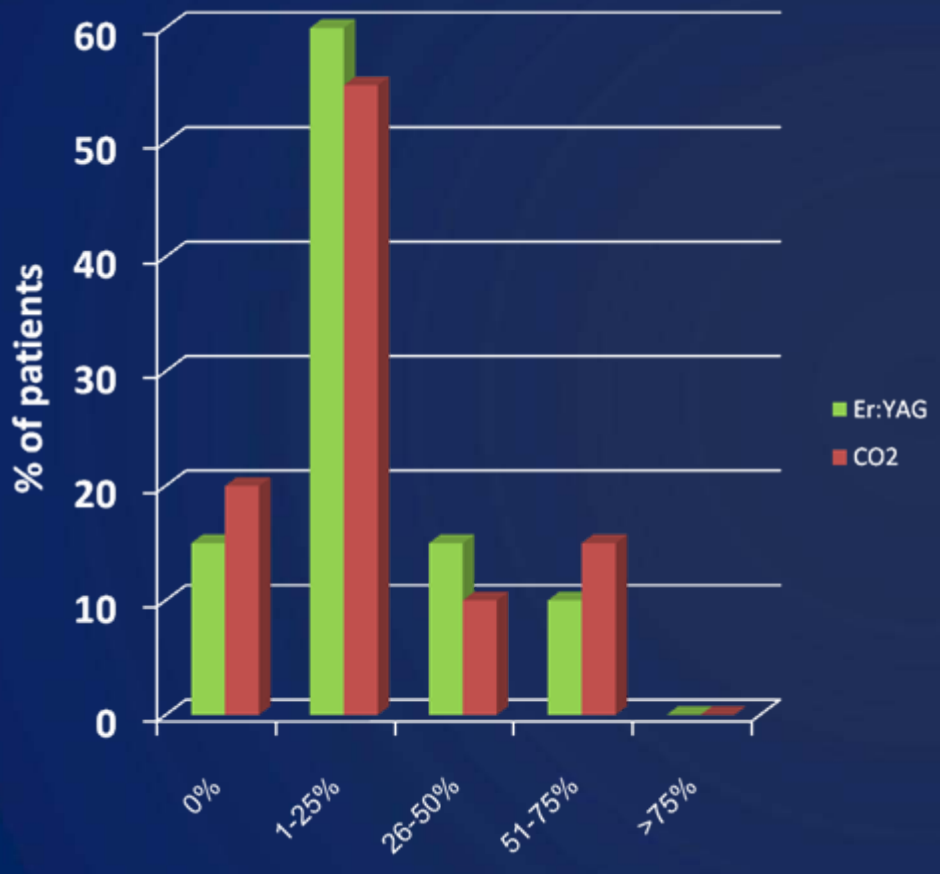
Evaluations

- Evaluations were done at
  - Month 1, 3 and 6 after the last (2^{nd}) Tx
- Assessments include
  - Photograph evaluation by 2 blinded dermatologists
  - Patient self-assessment
  - Scar volume measurement using UVA-light camera
  - Adverse effects

Results

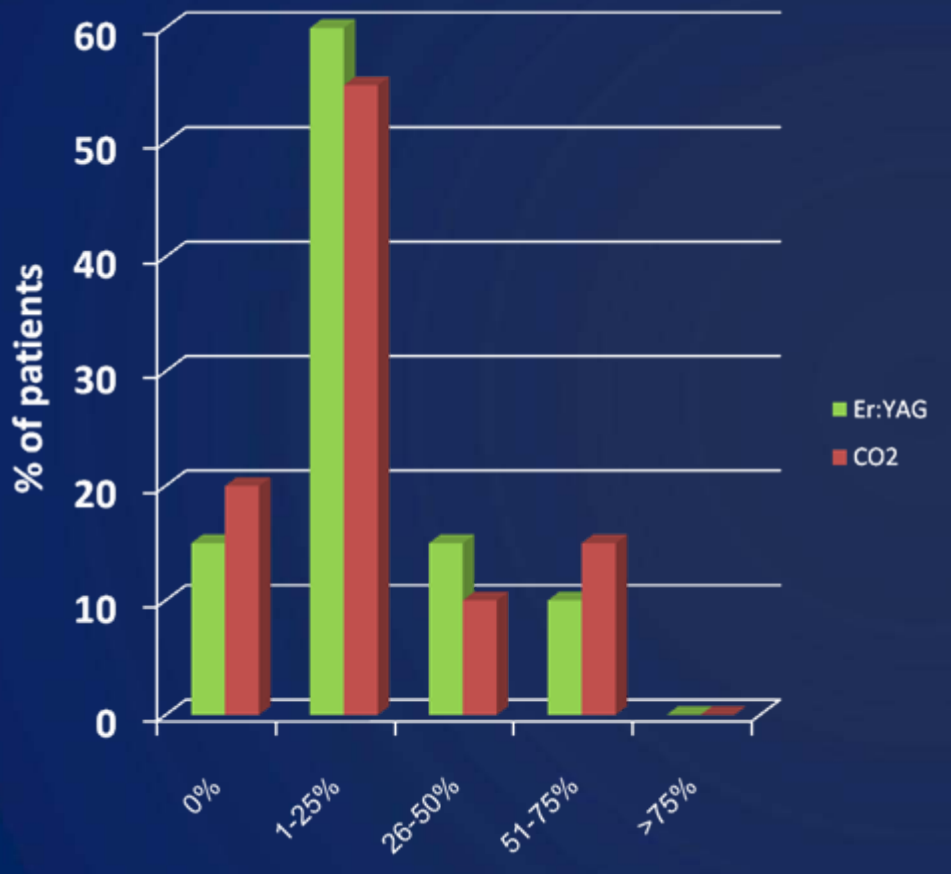
- 20/24 patients completed the study
- Mean age: 29 (20-51)
- Female/Male: 12/8
- All patients were skin type IV

Physician Evaluation

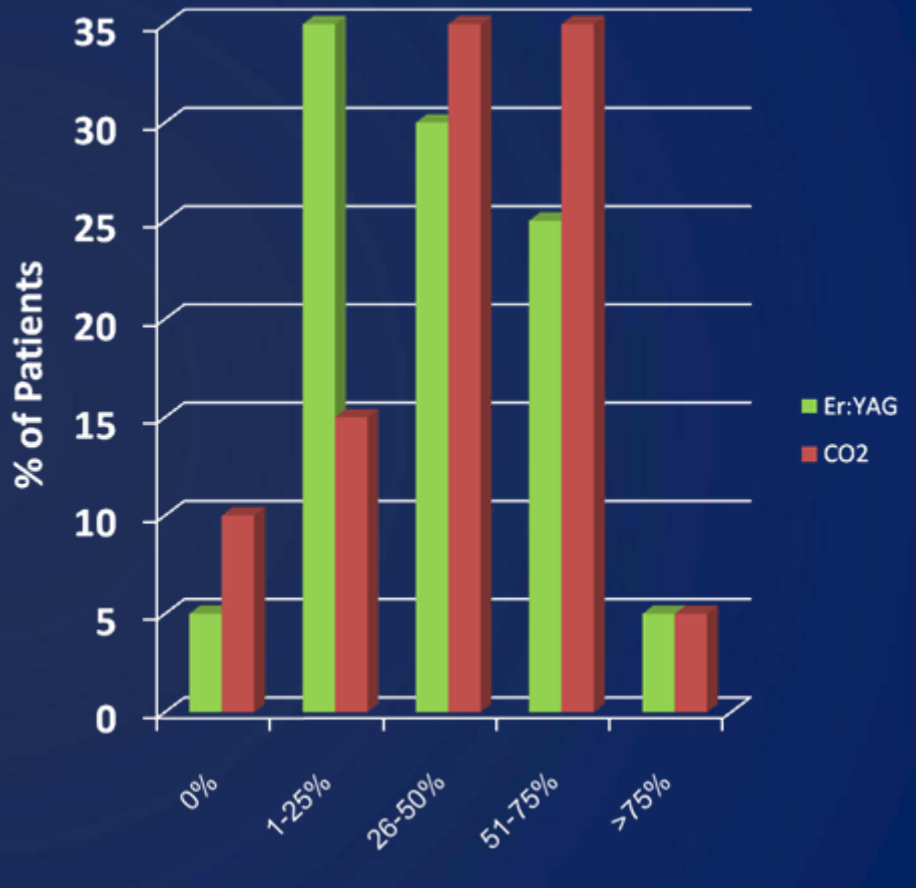


Month 1

Physician Evaluation

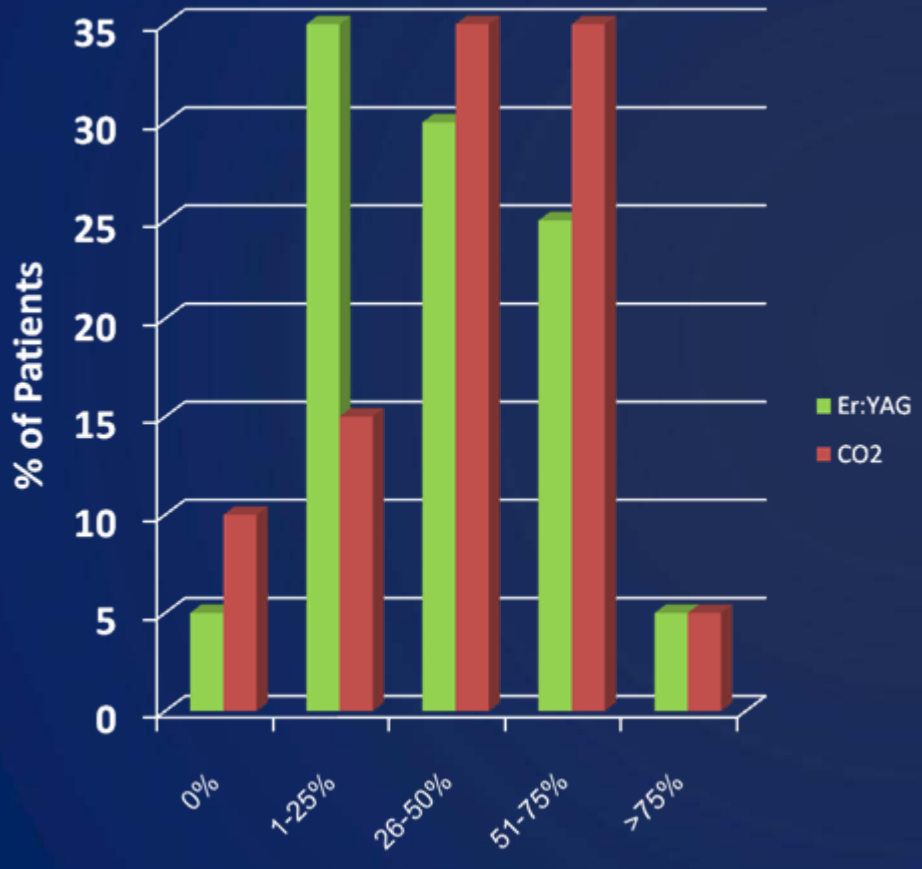


Month 1

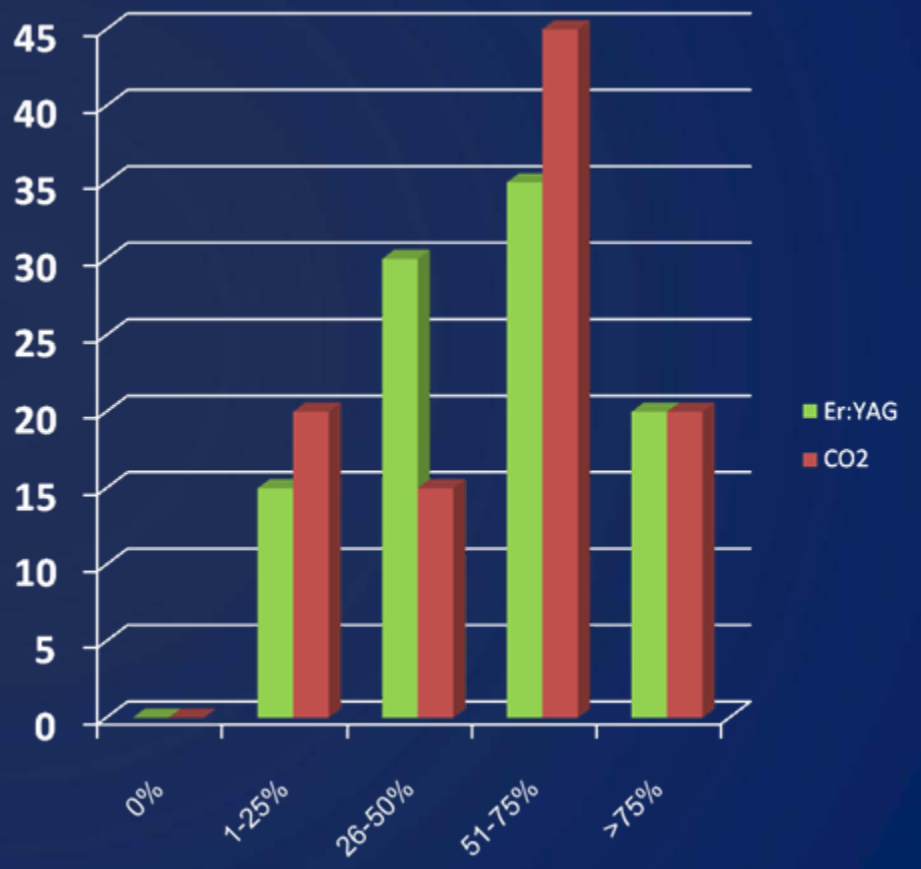


Month 3

Physician Evaluation

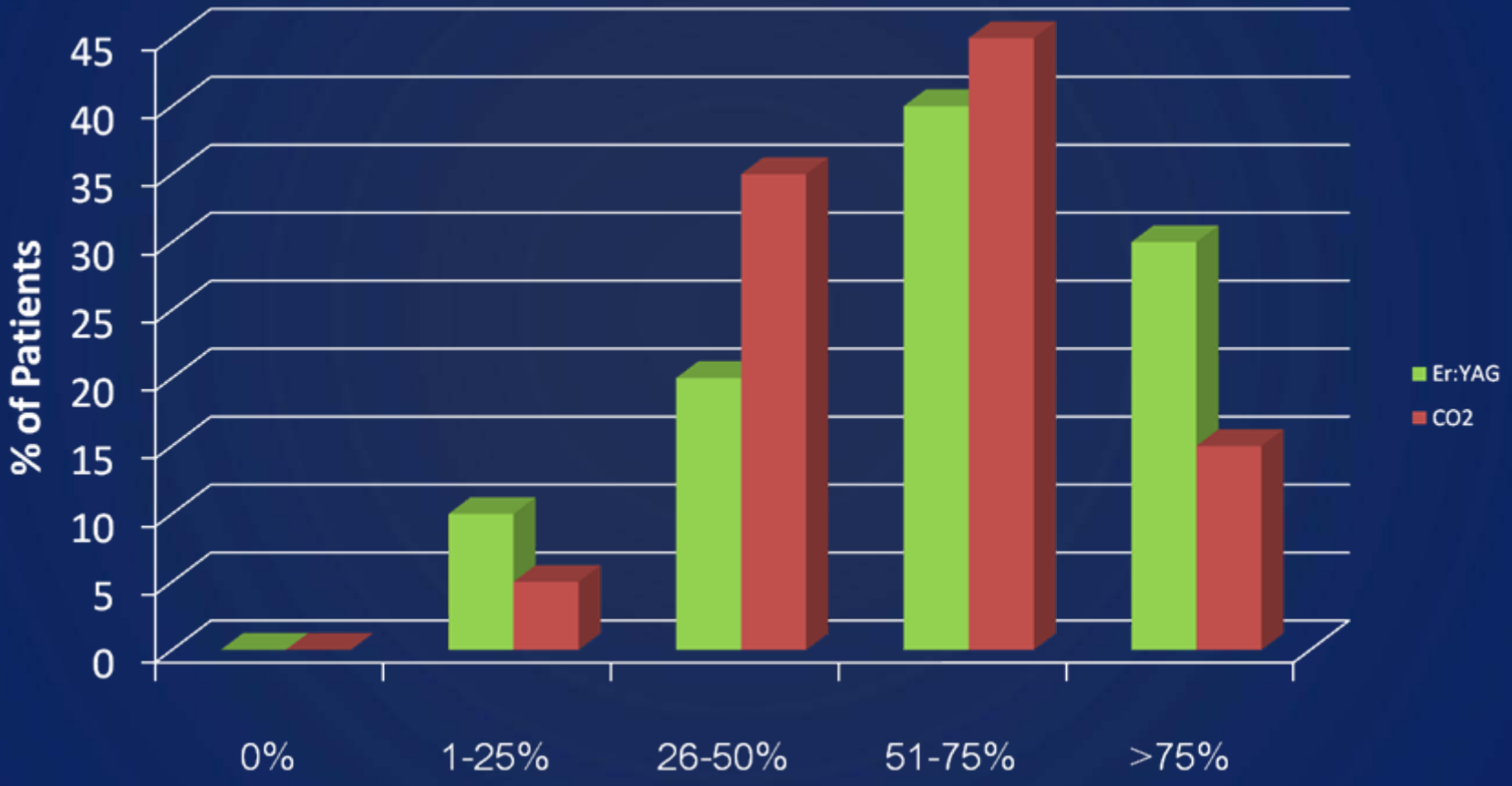


Month 3



Month 6

Patient Evaluation



Month 6

Scar Volume

Pain score

0 = no pain, 10 = excruciating pain

Laser/Tx#	Er:YAG	CO_2	P value
Tx I	3.5	6.2	0.001
Tx II	2.9	5.4	<0.001

Post inflammatory hyperpigmentation (PIH)

Laser	Er:YAG (%)	CO_2
Per #subject (N=20)	7/20 (35%)	10/20 (50%)

Hours of pain persistence

Laser/ hr of pain	Er:YAG	CO_2	P value
	5.1 hours	4.0 hours	0.68

#days for clearing of crust

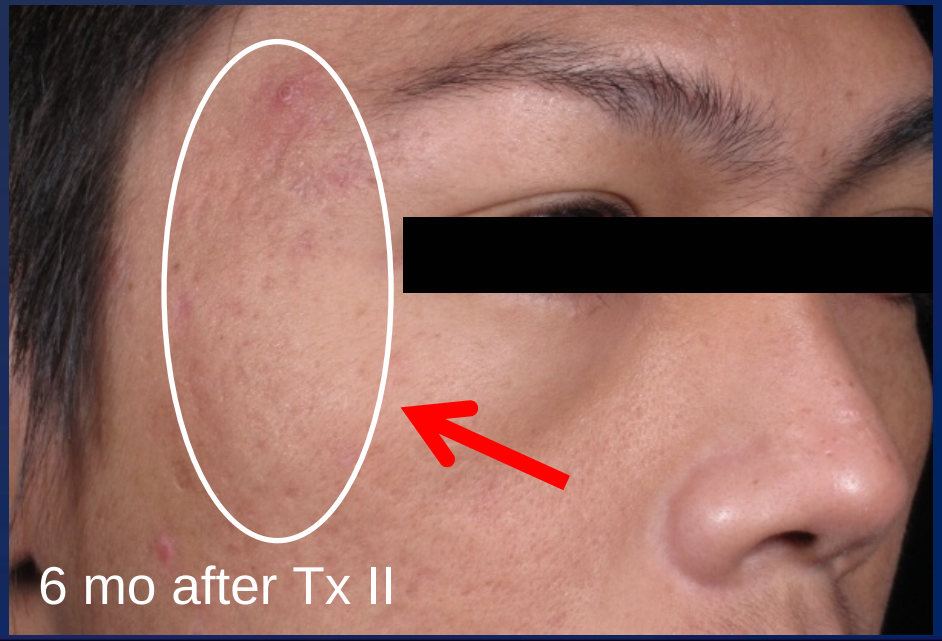
Laser	Er:YAG	CO_2	P value
#days	3.6	3.3	0.72

#days for clearing of redness

Laser	Er:YAG	CO_2	P value
#days	3.75	4.0	0.92

Fractional Er: YAG

Fractional CO_2



Fractional CO_2

Fractional Er: YAG

Conclusion

- As of 6-mo F/U, fractional Er: YAG and CO_2 lasers showed comparable cosmetic improvement
- Fractional CO_2 laser was associated with
  - higher degree of pain
  - higher incidence of PIH

Thank you for your attention

doctorlaser@gmail.com