Fundamentals: Instrumentation, Scar Type and Skin Type

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Options for Cutaneous Scarring

- 585-nm or 595-nm pulsed dye laser (PDL)
- 532-nm potassium titanyl phosphate lasers (KTP)
  - Intense pulsed light (alternative)
- 1,064/1,320 Nd:YAG, 1,450-nm diode
- Non-ablative fractional resurfacing (NAFR)
- Bipolar fractional radiofrequency microneedling (Insulated)
- Picosecond lasers with diffraction array or hologram
- Ablative fractional resurfacing (AFR)
- Laser-assisted drug delivery (LADD): AFL + 5-FU +/- TAC
- Conventional CO2/Er:YAG resurfacing
- Non-ablative fractional resurfacing (NAFR)
- Bipolar fractional radiofrequency microneedling (Insulated)
- Picosecond lasers with diffraction array or hologram

Laser Treatment of Scars

- Hypertrophic / Erythematous
- Atrophic
- Hyperpigmented
- Hypopigmented
- Surgical
- Burn or Traumatic

Laser Treatment of Erythematous Scars

- Low fluence (4 to 5 J/cm²), short pulse (45ns), large spot size 10-12mm, 30/30 DCD
  - May be initiated within 2-3 weeks of injury
- Treatment intervals of 4-6 weeks
- Easily combined with intralesional corticosteroids or antimetabolites if hypertrophy present

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References:


**Benefits of Intralesional 5-Fluorouracil for Hypertrophic Scars**

- Improve scar softness and pliability
- Reduce scar height
- Improve scar color
- Enhanced efficacy without side-effects associated with higher concentration TAC
- Easily combined with other modalities (laser)

Manuscript W. Fitzpatrick RE. Arch Dermatol. 2002 Sep; 138(9):1409-55

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**595-nm LPDL**

Traumatic Scar

After 3 Treatments

**595-nm LPDL + NAFR + IL TAC/5-FU**

Hypertrophic Scar

1-month after breast augmentation. 1-year after completing treatment.


**595-nm PDL +1450-nm Diode Laser**

Hypertrophic Scar

After

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**Laser Scar Revision**

**Scar Type**

- Hypertrophic / Erythematous
- Atrophic
- Hyperpigmented
- Hypopigmented
- Surgical
- Burn or Traumatic

**Treatment of Atrophic Acne Scars**

- Multi-modality approach achieves the best outcome
  - Filler injections for atrophic, distensible scars
  - Subcision for release of tethered scars
  - Punch elevations, punch excision, cross technique for ice pick scars
Lasers Options For Flat/Atrophic Scarring

- 595-nm Pulsed dye laser (PDL)
- Infrared (1,064/1,320 Nd:YAG, 1,450 nm diode)
- Non-ablative fractional resurfacing (NAFR)
  - ~25-50% improvement after 5 treatment sessions.
- Ablative fractional resurfacing (AFR)
  - ~50-75% improvement after 2-3 treatment sessions.
- Conventional CO2/Er:YAG resurfacing

Non-ablative Fractional Resurfacing (NAFR)

- Intact stratum corneum
- Thousands of microscopic wounds completely surrounded by viable tissue for rapid healing
- Immediate and delayed therapeutic results
  - Epidermal and dermal coagulation for resurfacing
  - Collagen denaturation for deep remodeling up to 1400µm
- Safe on neck, trunk, extremities and in darker skin types

Non-ablative Fractional Photothermolysis

- Treatment density (coverage) - 5% to 40% coverage
- Lower density in darker skin types
- Consider longer intervals between treatment sessions

Non-ablative Fractional Laser Treatment of Atrophic Scars

- Acne Scars and PIE
- After 6 treatments 20x30 ml, Tx level 8


Acne Scars and PIE After 6 treatments 20x30 ml, Tx level 8

NAFR

1 Month after 4 treatments
40 mJ, Tx level 5-7

Ablative Fractional Resurfacing

2 years after 1 treatment

Atrophic, Acne Scars

Ablative Fractional Resurfacing

Atrophic Scar
4 Months After
1 Treatment

Non-Ablative Fractional Photothermolysis

Striae Rubra
After 3 treatments
1550-nm, 25-70 mJ, tx level 8-10

Other Non-ablative Fractional Approaches for Atrophic Scars

- Picosecond lasers with diffraction array or hologram
- High intensity focused radiofrequency
- Microneedling +/- PRP


Laser Scar Revision
Scar Type
- Hypertrophic / Erythematous
- Atrophic
- Hyperpigmented
- Hypopigmented
- Surgical
- Burn or Traumatic

Hyperpigmented and Hypopigmented Scars
Hyperpigmented Scars:
- QS laser (pigment or tattoo)
- Picosecond laser (pigment or tattoo)
- 1927-nm Fractional Low-Power Diode
- 1550 or 1927-nm NAFR

Hypopigmented Scars:
- NAFR
- AFR

1064-nm QS Nd:YAG Laser
Traumatic Tattoo
After

Fractional Photothermolysis
Postinflammatory Hyperpigmentation
7 months after 3 treatments
1550-nm, 15 mJ, Tx level 6

1927-nm Fractional Low-Power Diode
Postinflammatory Hyperpigmentation
4 weeks after 3 treatments

Atrophic, Hypopigmented Scars


Non-ablative Fractional Photothermolysis

After 4 treatments

1550-nm, 20mJ, Tx Level 7

1550-nm, 20mJ, Tx Level 7

Non-ablative Fractional Photothermolysis

After 3 sessions

1550-nm, 4.50mJ, 7%-23% coverage


Ablative Fractional Photothermolysis

After 9/24/2015


Laser Scar Revision

Scar Type

• Hypertrophic / Erythematous
• Atrophic
• Hyperpigmented
• Hypopigmented
• Surgical
• Burn or Traumatic


Fractional Photothermolysis

After 3 treatments

1550-nm, 40 mL, tx level 9-10

1,550-nm Non-ablative Laser for Facial Surgical Scars


Facial Surgical Scars 2-weeks After 1 Treatment 1550-nm, 8mJ, density of 2000 MTZ/cm²

Prevention of Thyroidectomy Scar Using a New 1,550-nm Fractional Erbium-Glass Laser


2-3 weeks after surgery (Pre-treatment) 5 months after 4 treatments

Laser Scar Revision

- Mature hypertrophic, surgical scars
- Two arms: 10 subjects each
  - High density: 40 mJ/mb, 26% coverage
  - Low density: 40 mJ/mb, 14% coverage
  - Total 4 treatment sessions, every 2 weeks
- Low-density treatment as effective as high density
- Younger scars responded better


NAFR for Abdominoplasty Scar

- 6-months after 4 treatment sessions with 1550-nm, 20-30mj, 32% density starting 1-month after surgery


595-nm LPDL Early Burn Scar

- Early Burn Scar
- After

Fundamentals: Instrumentation, Scar Type and Skin Type
Paul M. Friedman, MD
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595-nm Long Pulsed-Dye Laser and 1450-nm diode laser

After 11 Treatments


595-nm LPDL + IL TAC

Burn Scar After


Burn Scars
1,550-nm NAFR

- 5 sessions at 4-week intervals
- 40-70 mJ/pulse, density 6-13*
- 90% had overall improvement
- 60% had moderate to excellent improvement
- Improved skin texture: 90%
- Improved dyschromia: 80%
- Improved hypertrophy/atrophy: 80%


1550-nm NAFR

Burn Scar After


1550-nm NAFR

Atrophic, Hypopigmented Burn Scar After

Traumatic Surgical Scar After 2 Treatments 1550-nm, 40 mJ, Tx level 10

595-nm PDL and Ablative Fractional Photothermolysis

Before

3-months After 1 Treatment

Fractional Ablative Lasers and Topical Drugs

- Fast uptake of many topical agents - large or small molecules
- Depth of uptake ≈ depth of laser holes (0.5-1.5 mm)
- Massaging made no difference
- Possible drug depot in each channel
- Drug uptake is strongly enhanced for ~3 days
- Future applications will include drug-device combinations


Laser Scar Revision: Summary

Pulsed Dye Laser (585-595-nm)
  - Hypertrophic & Erythematous Scars
  - Pre-Scars
  - Early striae

Fractional (ablative and non-ablative)
  - Atrophic scars
  - Burn or traumatic scars
    - Match depth laser to depth of scar with low density (optical coherence tomography)
    - Laser-assisted drug delivery
  - Early or late striae

Laser Scar Revision Summary

- Several laser techniques are available for the safe and effective treatment of various types of scars.
- Individualize and combine devices to customize the treatment to the characteristics and depth of the scar.
- Although long-standing scars will respond to laser therapy, new scars are more amenable to treatment; therefore, prompt treatment is recommended.
- Debate remains on the best timing for treatment initiation.

Thank you!

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