Fractional laser or light-based technologies

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Disclosure

- Syneron: stock option
- Cutera: support for clinical trial
- Cynosure: consultant agreement
Areas to cover

- PIH and fractional technologies
- Non-ablative FR in skin of color
- Low energy low density NR-FR in skin of color
- Ablative fractional FR in skin of color
- Complication of ablative FR
- Fractional RF and laser for treatment of acne scar
- Picosecond focus lens

Prevention of PIH

Occurrence of PIH will be determined by:

- Degree of disruption of epidermo-dermal junction
- Degree of inflammation especially at the E-D junction
- Skin type
Prevention of PIH

Factors that may lead to PIH when using any fractional lasers on Asians:

- Density
- Energy
- Bulk tissue heating
- Cooling

Prevention of PIH


“Retrospective and prospective study suggested that while both energy and density are important in causing PIH in Asians, density is of particular important.”
The use of NA Fractional resurfacing in Asian that I consider to be the first line

- Dermal collagen re-modeling
  1. Acne scarring/other atrophic scarring
  2. Wrinkle improvement

THE USE OF NON-ABLATIVE FRACTIONAL RESURFACING IN ASIAN ACNE SCAR PATIENTS

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² Wellman Center of Photomedicine, Department of Dermatology, Harvard Medical School, USA.
Results: efficacy

- 47 Patients
- Last follow-up vs baseline photo
  - skin texture ($p < 0.001$)
  - acne scarring ($p < 0.001$)
  - enlarged pores ($p < 0.001$)
  - overall pigmentation irregularity ($p < 0.001$)

3 full-NAFR vs 6 mini-NAFR: efficacy comparison

- No statistically significant difference in improvement in
  - skin texture ($p = 0.176$)
  - facial acne ($p = 0.45$)
  - acne scarring ($p = 0.51$)
  - enlarged pores ($p = 0.566$)
  - overall pigment irregularity ($p = 0.446$)
Adverse effects

- Hyperpigmentation after full-NAFR (cross-polarized, assessed after each treatment)
  - Absent: 81 (81.8%)
  - Mild: 14 (14.2%)
  - Moderate: 4 (4.0%)
  - Severe: 0 (0%)

PIH rate for full-NAFR 18.2%
Hyperpigmentation after mini-NAFR (cross-polarized, assessed after each treatment)

<table>
<thead>
<tr>
<th>No. of treatment session (%)</th>
<th>Absent</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>172(94%)</td>
<td>10(5.5%)</td>
<td>1(0.5%)</td>
<td>0(0%)</td>
</tr>
</tbody>
</table>

(n=183)

PIH rate for mini-NAFR 6.0%

Conclusions

- Non-ablative fractional resurfacing is effective for improving skin texture, facial acne, acne scarring, enlarged pores and overall pigment irregularity in Asians.
- No statistically significant difference in efficacy between 3 full NA-FR vs 6 mini NA-FR
- PIH rate: 18.2% for NA-FR, 6% for mini NA-FR
- By reducing the number of passes (density) and increasing the number of treatment sessions, non-ablative fractional resurfacing can be used effectively and safely among Asians.
Evaluating the Safety and Efficacy of the 1440-nm Laser in the Treatment of Photodamage in Asian Skin

Shoshana Marmon, MD, PhD, Samantha Y. N. Shek, MBBS, Chi K. Yeung, MD, MBBS, Nicola P.Y. Chan, MRCP, Johnny CY Chan, MBBS, and Henry H.L. Chan, MD, PhD, FRCP

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2 Division of Dermatology, Department of Medicine, University of Hong Kong, Hong Kong SAR, China
3 Wellman Center for Photomedicine, Massachusetts General Hospital, Boston, USA


Results:

Combined Independent Physician Evaluations

<table>
<thead>
<tr>
<th></th>
<th>Baseline Evaluation (Mean±SD)</th>
<th>Final Evaluation (Mean±SD)</th>
<th>P-value *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roughness</td>
<td>3.45±0.76</td>
<td>2.85±0.85</td>
<td>0.006**</td>
</tr>
<tr>
<td>Wrinkles</td>
<td>2.00±0.71</td>
<td>1.80±0.71</td>
<td>0.046**</td>
</tr>
<tr>
<td>Pigment</td>
<td>3.30±1.44</td>
<td>2.55±0.86</td>
<td>0.010**</td>
</tr>
<tr>
<td>Laxity</td>
<td>1.60±0.77</td>
<td>1.60±0.77</td>
<td>1.000</td>
</tr>
<tr>
<td>Pore size</td>
<td>3.35±1.03</td>
<td>3.05±0.93</td>
<td>0.086</td>
</tr>
</tbody>
</table>

*P-value calculated by Wilcoxon signed-rank test
** P-value <.05 indicates statistical significance

Significant improvement in roughness, wrinkles and pigmentation at conclusion of trial. Changes in laxity and pore size failed to reach statistical significance.
Improvement in Pigmentation

(a) Facial skin of a thirty-five-year-old Asian woman. Before (left) and one month after four treatments with the fractional 1440-nm laser (right). (b) Mean decrease in pigment over trial period.

Immediate post-treatment response:

- **Erythema:**
  90% mild to moderate
  10% severe

- **Facial edema:**
  95% mild to moderate
### Patient Reported Treatment-Associated Discomfort

<table>
<thead>
<tr>
<th></th>
<th>None n(%)</th>
<th>Mild n(%)</th>
<th>Moderate n(%)</th>
<th>Severe n(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pain Level</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st treatment</td>
<td>0(%)</td>
<td>2 (20%)</td>
<td>3 (30%)</td>
<td>5 (50%)</td>
</tr>
<tr>
<td>2nd treatment</td>
<td>0(%)</td>
<td>2 (20%)</td>
<td>3 (30%)</td>
<td>5 (50%)</td>
</tr>
<tr>
<td>3rd treatment</td>
<td>0(%)</td>
<td>3 (30%)</td>
<td>4 (40%)</td>
<td>3 (30%)</td>
</tr>
<tr>
<td>4th treatment</td>
<td>0(%)</td>
<td>2 (20%)</td>
<td>7 (70%)</td>
<td>1 (10%)</td>
</tr>
<tr>
<td><strong>Heat Sensation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st treatment</td>
<td>0(%)</td>
<td>2 (20%)</td>
<td>6 (60%)</td>
<td>2 (20%)</td>
</tr>
<tr>
<td>2nd treatment</td>
<td>0(%)</td>
<td>3 (30%)</td>
<td>6 (60%)</td>
<td>1 (10%)</td>
</tr>
<tr>
<td>3rd treatment</td>
<td>0(%)</td>
<td>8 (80%)</td>
<td>1 (10%)</td>
<td>1 (10%)</td>
</tr>
<tr>
<td>4th treatment</td>
<td>0(%)</td>
<td>4 (40%)</td>
<td>6 (60%)</td>
<td>0(%)</td>
</tr>
</tbody>
</table>

*Patient reported subjective assessment immediately following treatment

**Both pain & heat sensation experienced significantly decreased as the trial progressed**

### Adverse Event: One Case of Isolated PIHP Noted which Completely Resolved

Facial skin of a thirty two year old Asian woman. (a) Before and (b) Two weeks after the third treatment. A localized area of hyperpigmentation is evident on the forehead (arrow). (c) One month after the final treatment.
Conclusion:

- The low energy, low density nonablative 1440-nm fractional laser produces a mild improvement in select signs of photodamage after four treatments without any long-term adverse effects.
- The favorable side effect profile and short recovery window may hold particular appeal to patients with pigmented skin and early signs of photoaging.

Use of NA-FR or A-FR in other pigmentary conditions
Fractional Carbon Dioxide Laser Resurfacing for skin rejuvenation, acne scar and facial scar in Asians


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¹ Division of Dermatology, The University of Hong Kong, Hong Kong SAR, China.
² Wellman Center of Photomedicine, Department of Dermatology, Harvard Medical School, USA.

Objective

- To evaluate the efficacy and safety of a new fractional CO₂ ablative device for skin rejuvenation, acne scar and facial scar in Asians.
Objective assessment of skin rejuvenation

Mean of skin texture level

<table>
<thead>
<tr>
<th>Mean level</th>
<th>Baseline</th>
<th>1mth follow-up</th>
<th>3mths follow-up</th>
<th>Last follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.86</td>
<td>5.30</td>
<td>5.00</td>
<td>5.43*</td>
<td></td>
</tr>
</tbody>
</table>

* p-value=0.020, significant improvement in skin texture at last follow-up

Objective assessment of skin rejuvenation

Mean of skin laxity level

<table>
<thead>
<tr>
<th>Mean level</th>
<th>Baseline</th>
<th>1mth follow-up</th>
<th>3mths follow-up</th>
<th>Last follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.71</td>
<td>5.50</td>
<td>6.00</td>
<td>5.14*</td>
<td></td>
</tr>
</tbody>
</table>

* p-value=0.023, significant improvement in skin laxity at last follow-up
Objective assessment of skin rejuvenation

* p-value=0.026, significant improvement in wrinkles at last follow-up

Objective assessment of skin rejuvenation

* p-value=0.024, significant improvement in enlarged pores at last follow-up
Objective assessment of acne scar

* p-value=0.038, significant improvement in scar score at last follow-up

Objective assessment of potential adverse effects of all cases

Post inflammatory hyperpigmentation: no. of cases (%)
- 1day follow-up: 8(66.7%)
- 7days follow-up: 6(50.0%)
- 1mth follow-up: 7(58.3%)
- Last follow-up: 7(58.3%)

Erythema: no. of cases (%)
- 1day follow-up: 9(75.0%)
- 7days follow-up: 7(58.3%)
- 1mth follow-up: 7(58.3%)
- Last follow-up: 5(41.7%)

Acneiform eruption: no. of cases (%)
- 1day follow-up: 0(0%)
- 4days follow-up: 1(8.3%)
- 1mth follow-up: 0(0%)
- Last follow-up: 0(0%)
Conclusion

- Fractional CO₂ ablative resurfacing is effective for skin rejuvenation, acne scar and facial scar in Asians.
- 58.3% post-inflammatory hyperpigmentation.
- Appropriate patient selection is important. Suitable candidates include elderly males and females, as well as males with acne scarring.

The Use of the Fractional CO₂ Laser Resurfacing in the Treatment of Photoaging in Asians: Five Years Long-Term Results

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1The People’s Hospital of Hunan Province, Department of Plastic & Laser Aesthetic Surgery, 1st Affiliated Hospital of Hunan Normal University, Changsha, Hunan 410005, P.R. China
2Attending Doctor of the People’s Hospital of Hunan Province
3Tennessee Clinical Research Center, Nashville, Tennessee
4Gold Skin Care Center, Department of Dermatology, Nashville, Tennessee

Conclusions: Fractional CO₂ laser resurfacing in the treatment of photoaging in Asians is a useful modality with results, for the first time, being shown to have continued efficacy for up to 5 years. Lasers Surg. Med 46:750–756, 2014. © 2014 Wiley Periodicals, Inc.
“PIH rate: 92% of treated subjects or 51% of treatment sessions”
Non-ablative 1550-nm erbium-glass and ablative 10 600-nm carbon dioxide fractional lasers for acne scars: a randomized split-face study with blinded response evaluation.


- a split face study examined the role of NA-FR and A-FR in the treatment of acne scar in Asians
- both similarly effective after a single treatment with PIH rate that was estimated to be about 10%.
- However, parameters of NA-FR used was conservative (40mJ, treatment level 6, 8 passes for a single treatment) most would consider multiple treatment sessions to be necessary
- observed lower rate of PIH on the A-FR side may be related to lower energy and density used in that study.

Means to reduce PIH using ablative FR

- Reduce density but increase number of treatment session
- Short course of systemic steriod(10mg predisolone for 3 days)*
- topical steriod#
- Tranexamic Acid@

@ Kim MS et al. Ann Dermatol Vol. 27, No. 3, 2015
Other ablative fractional device

- Fractional YSGG for acne scar in Asians: 70% more than 50% improvement, 30% erythema post-operatively*
- Fractional 2940nm Er:YAG for acne scar: 75% more than 50% improvement, 3% PIH#


Major complication

- different ablative CO2 have different parameters
- 5% coverage of one device may be equal to 15% of another (depend upon the calculation method)
- inappropriate parameter can have major complication
Treatment of scar induced by ablative fractional resurfacing

Dimpling: uncommon complication of ablative fractional resurfacing
The FOCUS Lens Array:

- is comprised of hundreds of micro-lenses per square centimeter that redistribute the PicoSure pulse energy into:
  - concentrated micro-beams of higher fluence
  - lower background fluence
- allows skin to be safely treated with higher fluence
  - fluence at the focus of these lenses is up to 20 times greater than the rest of the area
  - this higher fluence is delivered to less than 10% of tissue in each pass
- provides meaningful results
  - including revitalized appearance of the skin
  - on various areas of the body: face, décolleté, hands, and arms

Focus Lens Array
Mechanism of Action (MOA)

The laser beam is fractionated into micro-beams that deliver 20X more fluence than is delivered to the surrounding low fluence areas.
Picolaser Focus Lens Array

A Prospective Split-Face Study of the Picosecond Alexandrite Laser With Specialized Lens Array for Facial Photoaging in Chinese


- 10 patients right face received picosecond Alex microarray, the other side served as control
- 4 treatments at 2 weekly interval and followed up to 2 months
- 2 observers found significant degree of improvement
- Adverse effect: pain and erythema
Efficacy and Safety of Picosecond 755-nm Alexandrite Laser With Diffractive Lens Array for Non-Ablative Rejuvenation in Chinese Skin

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1Division of Dermatology, Department of Medicine, University of Alberta, Edmonton, Alberta, Canada
2Division of Dermatology, Department of Medicine, The University of Hong Kong, Hong Kong SAR, China
3Wellman Center for Photomedicine, Massachusetts General Hospital, Harvard Medical School, Boston, Massachusetts

Method

- Prospective, evaluator-blinded trial skin type III–IV patients with mild to moderate photoaging.
- received six full face treatments at 4 week intervals
- Standardized photography at baseline and at 1, 2, and 3 month follow-up visits.
- Two independent blinded evaluators rated each of the five signs of photoaging on a 10-point.
Method

- visual analog scale (VAS), global aesthetic improvement score
- Secondary outcomes included patient-rated pain and heat sensation on a 10-point VAS, and overall satisfaction.
- Adverse events were noted after each treatment and at each follow-up

Result

- 18 Chinese patients age 35–59 completed the study.
- A statistically significant improvement in skin texture and dyspigmentation scores was noted at the 1 month follow-up that was sustained at 3 months.
- The mean pain score was 5.1 and mean heat sensation was 3.6.
- No PIH
Conclusion

The 755-nm picosecond laser with DLA is a safe and effective non-ablative modality for targeting facial skin texture irregularities and dyspigmentation in Chinese skin.

Conclusion

- Fractional resurfacing has revolutionized the treatment of skin rejuvenation in Asians
- Careful selection of laser setting reduce the risk of complication including PIH
- NA-FR require multiple treatment sessions but lower risk of complication
Conclusion

- Ablative laser resurfacing can achieve a more rapid response but more significant complication including scarring and dimpling can occur.
- Fractionated pico is a new modality for skin rejuvenation and treatment of pigmentary conditions.