Prospective Comparison of the Dual Wavelength Long-pulsed 755-nm Alexandrite/1064-nm Neodymium:YAG Laser versus 585-nm Pulsed Dye Laser Treatment for Rosacea

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Conflict of interest

The authors declare that there are no conflicts of interest
Background

Rosacea

- A common cutaneous disorder presenting with erythema, flushing, telangiectasia, papules and pustules

Treatment

- Oral/topical agent, laser therapy, and surgery → not satisfactory
- Besides, the telangiectasia, facial flushing, and persistent redness are not relieved with only medical treatment.
Background

Previous studies

- **585-nm pulsed dye laser (PDL)**
  - At present, the PDL is most typically used to address facial erythema.
  - Diffuse redness can be treated with nonpurpuragenic PDL, which is very tolerable to patients.

- **Dual wavelength long-pulsed 755-nm alexandrite/1064-nm Nd:YAG laser (LPAN)**
  - Microsecond Nd:YAG is potentially less painful and risky than traditional millisecond Nd:YAG devices, and known to be effective for various cutaneous vascular lesions.
  - Microsecond alexandrite device is effective for various cutaneous vascular lesions.
Objective

Our purpose of this study

- To compare the effectiveness of the dual wavelength long-pulsed 755-nm alexandrite/1064-nm Nd:YAG laser (LPAN) with 585-nm pulsed dye laser (PDL) for rosacea.
Methods

Treatments

- Single-blind, Randomized controlled trial
- Whole face received 4 consecutive monthly treatments
  - 585-nm pulsed dye laser (PDL)
    - 10-mm spot size, 7 J/cm², 6 milliseconds pulse duration
      with a dynamic cooling device
  - Dual wavelength long-pulsed 755-nm alexandrite/1064-nm Nd:YAG laser (LPAN)
    - Long-pulsed 755-nm alexandrite laser
      : 10-mm spot size, 30 J/cm², 12 milliseconds pulse duration
    - Long-pulsed 1064-nm Nd:YAG laser
      : 10-mm spot size, 3 J/cm², 0.5 milliseconds pulse duration
Methods

The protocol of this clinical study

- Approved by the institutional review boards (2013-01-200)
  at the Kangbuk Samsung Hospital

![Figure 1. Treatment protocol.]

V  Visit
T  Treatment
▲ Clinical assessment for the severity of rosacea
△ Photographic assessment
↑ Subjective assessment for the treatment
Methods

➢ Inclusion criteria

1. Erythematotelangiectatic / Papulopustular rosacea
2. Aged 18-65 years

➢ Exclusion criteria

1. Severe phymatous or ocular rosacea
2. Any other concurrent skin condition affecting face
3. History of keloid scarring, Photosensitive disease
4. Treatment with oral isotretinoin during the 6 months prior to the study
5. Any oral medication or treatment that could affect facial erythema during the 1 month prior to the study
6. History of alcohol abuse, and pregnant or lactating women
Methods

Objective assessment

- Erythema index (EI)
  - Spectrophotometer (Dermatospectrometer II, Cortex Technology, Denmark)
  - 4 sites per facial cheek side at each visit

- Clinical assessment
  - Digital photographs (Dermavision, Optobiomed, Rep. of Korea)
  - By two external blinded consultant dermatologist

Subjective assessment

- A questionnaire for assessing subjective satisfaction
  - 0 = No change / 1 = Poor / 2 = Fair / 3 = Good / 4 = Excellent
Methods

Safety assessment and adverse effects

- Pain (during treatment)
  - Numeric pain rating scale (0-10)
- Erythema
- Crust
- Hyperpigmentation
- Vesicle
- Dryness
- Itching
- Tightening
Results

PDL group vs. LPAN group

- Total 31 patients enrolled.
- Both group had no differences.

Table 1. Epidemiologic data of study population

<table>
<thead>
<tr>
<th></th>
<th>Laser treatment</th>
<th>PDL (N=14)</th>
<th>LPAN (N=17)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean ± SD</td>
<td></td>
<td>46.6±12.4</td>
<td>49.2±12.8</td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td>7 (50.0)</td>
<td>7 (41.2)</td>
</tr>
<tr>
<td>Rosacea duration, year</td>
<td></td>
<td>6.8±10.9</td>
<td>7.9±9.9</td>
</tr>
<tr>
<td>Rosacea severity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild</td>
<td></td>
<td>2 (14.3)</td>
<td>8 (47.1)</td>
</tr>
<tr>
<td>Moderate</td>
<td></td>
<td>10 (71.4)</td>
<td>7 (41.2)</td>
</tr>
<tr>
<td>Severe</td>
<td></td>
<td>2 (14.3)</td>
<td>2 (11.8)</td>
</tr>
<tr>
<td>Baseline Erythema Index</td>
<td></td>
<td>14.7±3.8</td>
<td>14.8±2.4</td>
</tr>
</tbody>
</table>

All data are No. (%) unless otherwise specified.

LPAN, dual wavelength long-pulsed 755-nm alexandrite/1064-nm Nd:YAG laser; PDL, 585-nm pulsed dye laser;
Results

Evaluation of EI

- After four treatment session, EI was significantly reduced.
- Both laser treatments: no difference in EI evaluation
  - Between V1 and V5: no difference between both treatment ($P = 0.544$)
  - Between V1 and V6: no difference between both treatment ($P = 0.723$)

Table 2. Facial erythema index evaluation outcomes.

<table>
<thead>
<tr>
<th></th>
<th>V1</th>
<th>V5</th>
<th>V6</th>
<th>Between V1 and V5</th>
<th>Between V1 and V6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before</td>
<td>2 weeks</td>
<td>6 months</td>
<td>Difference in means</td>
<td>Difference in means</td>
</tr>
<tr>
<td></td>
<td>treatment</td>
<td>after</td>
<td>after</td>
<td>P-value</td>
<td>P-value</td>
</tr>
<tr>
<td></td>
<td></td>
<td>four</td>
<td>four</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PDL</td>
<td>14.7±3.8</td>
<td>14.1±4.2</td>
<td>13.7±4.2</td>
<td>0.3 &lt;0.05</td>
<td>1.0 &lt;0.05</td>
</tr>
<tr>
<td>LPAN</td>
<td>14.8±2.4</td>
<td>14.2±2.8</td>
<td>13.6±2.6</td>
<td>0.6 &lt;0.05</td>
<td>1.2 &lt;0.05</td>
</tr>
</tbody>
</table>

LPAN, dual wavelength long-pulsed 755-nm alexandrite/1064-nm Nd:YAG laser; PDL, 585-nm pulsed dye laser; V1, visit1 (Before treatment); V5, visit5 (2 weeks after four treatment); V6, visit (6 months after four treatment).
Results

Evaluation of Digital photographs

- After four treatment session, >50% showed significant improvement
- Both laser treatments: no difference
  - PDL: All subjects showed improvement at V5 maintained during V6
  - LPAN: 1 of 9 subjects showed improvement at V5 got worse at V6

Table 3. Facial photography evaluation outcomes.

<table>
<thead>
<tr>
<th></th>
<th>PDL</th>
<th>LPAN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>V5</td>
<td>V6</td>
</tr>
<tr>
<td>Worse</td>
<td>5 (35.7)</td>
<td>5 (35.7)</td>
</tr>
<tr>
<td>No change</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Improved</td>
<td>6 (42.9)</td>
<td>6 (42.9)</td>
</tr>
<tr>
<td>Much improved</td>
<td>3 (21.4)</td>
<td>3 (21.4)</td>
</tr>
</tbody>
</table>

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LPAN, dual wavelength long-pulsed 755-nm alexandrite/1064-nm Nd:YAG laser; PDL, 585-nm pulsed dye laser; V1, visit1 (Before treatment); V5, visit5 (2 weeks after four treatment); V6, visit (6 months after four treatment).
**Results**

*Figure 2.* (a-c) Male patient. (a) Before treatment; (b) after four 585-nm pulsed dye laser (PDL) treatments; (c) at 6 months after last treatment. (d-f) Female patient. (d) Before treatment; (e) after four PDL treatments; (f) at 6 months after last treatment.
Figure 3. (a-c) Male patient. (a) Before treatment; (b) after four dual wavelength long-pulsed 755-nm alexandrite/1064-nm Nd:YAG laser (LPAN) treatments; (c) at 6 months after last treatment. (d-f) Female patient. (d) Before treatment; (e) after four LPAN treatments; (f) at 6 months after last treatment.
Results

Subjective assessment for the satisfaction

- More patients satisfied with the PDL treatment. \( (P<0.05) \)

Figure 4. Subjective satisfaction for the treatments.
LPAN, dual wavelength long-pulsed 755-nm alexandrite/1064-nm Nd:YAG laser; PDL, 585-nm pulsed dye laser.
Results

Safety and Adverse effects

- PDL showed less pain than LPAN
  - PDL vs. LPAN (2.2±2.1 vs. 3.7±2.9, respectively, \( P<0.05 \))

- Both laser treatments showed similar adverse effects
  - Completely resolved within 7 days after treatment

Table 3. Adverse effects

<table>
<thead>
<tr>
<th></th>
<th>PDL</th>
<th>LPAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erythema</td>
<td>9(64.3)</td>
<td>11(64.7)</td>
</tr>
<tr>
<td>Crust</td>
<td>4(28.6)</td>
<td>1(5.9)</td>
</tr>
<tr>
<td>Hyperpigmentation</td>
<td>1(7.1)</td>
<td>1(5.9)</td>
</tr>
<tr>
<td>Vesicle</td>
<td>1(7.1)</td>
<td>0(0.0)</td>
</tr>
<tr>
<td>Dryness</td>
<td>3(21.4)</td>
<td>4(23.5)</td>
</tr>
<tr>
<td>Itching</td>
<td>3(21.4)</td>
<td>5(29.4)</td>
</tr>
<tr>
<td>Tightening</td>
<td>5(35.7)</td>
<td>3(17.6)</td>
</tr>
</tbody>
</table>

All data are No. (%) unless otherwise specified.
Discussions

PDL vs. LPAN

- Both laser treatments have effect in treatment for rosacea.
- No difference in
  - EI reduction
  - Improvement of photographic evaluation
- Pain was not a limiting factor with either treatment, with mean values never exceeding 5 of 10.

LPAN showed similar effectiveness and safety with PDL
Discussions

Strength of this study

- Rosacea can be treated with PDL or LPAN laser treatments without medication treatments.

Advantage of LPAN for rosacea treatment

- LPAN would be the lower risk of inadvertent bruising.

LPAN can replace PDL for rosacea treatment.
Limitations

- As with all studies comparing 2 devices, there is no way to be absolutely certain that the settings were comparable.
  - Different parameters and laser settings
- Not split face randomized test
  - Because of the different parameters of two laser treatments
- EI is not absolute method for measuring rosacea severity
  - EI only reflect spots
  - Whole face evaluation is more absolute measuring method.
Conclusion

In this study, Both LPAN and PDL are effective in the treatment for rosacea.

