Summary of Peer-reviewed Articles for Hair Removal and Vascular and Pigmented Lesion Treatment
Efficacy of the long-pulsed 1064-nm neodymium:yttrium-
aluminum-garnet laser (LPND) (rejuvenation mode) in the
treatment of papulopustular rosacea (PPR): A pilot study
of clinical outcomes and patient satisfaction in 30 cases

STUDY DETAILS

• 30 Korean subjects (24 females, 6 males) with Fitzpatrick Skin Types IV-V and
papulopustular rosacea (PPR)
  • Group A: 22 patients with mild-to-moderate PPR treated with laser alone
  • Group B: 8 patients with severe PPR treated with laser + doxycycline (100 mg
twice daily)
• 3 full-face Nd: YAG GentleMax treatments (40 to 50 J/cm², 50 msec pulse duration
and a 10-mm spot size, DCD cooling) at 4-week intervals
• Blinded evaluation (3 dermatologists) at 4 weeks after the last treatment, using a 4-
point severity grading system for rosacea.

RESULTS AT 1 MONTH AFTER TREATMENT

• Excellent to good overall improvement was seen in 77.3% (17 of 22) of patients in
  Group A and 87.5% (7 of 8) of patients in Group B
• Significant decrease in papule/pustule activity and improvement in erythema score.
Fig 2. Papulopustular rosacea. Clinical photographs of 2 female patients with severe (A) and moderate (B) grade demonstrating excellent clinical improvement after 3 treatment sessions with the long-pulsed neodymium:yttrium-aluminum-garnet laser.
Therapeutic efficacy of long-pulsed 755-nm alexandrite laser for seborrheic keratoses


STUDY DETAILS
- 13 Korean patients (11 males, 2 females, mean age 59.3 years, range 33–77; Fitzpatrick skin types III and IV) with 216 seborrheic keratoses
- 1 or 3 sessions of long-pulsed 755-nm alexandrite laser (GentleMax) with 35 J/cm², 6-mm spot size, a 3-msec pulse width and 1-2 passes, DCD cooling
- Blinded evaluation (3 dermatologists) at 2 months after the last treatment, using a 1-4 severity grading score.

RESULTS AT 2 MONTHS AFTER TREATMENT
- Mean objective improvement score of 3.4±0.7 (Grade 3=Marked Improvement)
- Type of lesion impacted number of treatment sessions needed, in particular, popular lesions needed more treatment than macular lesions (Table 1)
- Objective improvement score was not affected by the type of the seborrheic keratosis (Table 1)
- Most of the lesions became crusted within a few days after the laser treatment and spontaneously peeled off within 7 days.

Table 1: Morphologic characteristics of seborrheic keratoses and treatment response

<table>
<thead>
<tr>
<th>Type</th>
<th>No. of lesions</th>
<th>Mean treatment sessions</th>
<th>Mean grade of improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macular</td>
<td>108</td>
<td>1.1 ± 0.2</td>
<td>3.3 ± 0.8</td>
</tr>
<tr>
<td>Papular</td>
<td>97</td>
<td>1.2 ± 0.4</td>
<td>3.5 ± 0.7</td>
</tr>
<tr>
<td>Verrucous</td>
<td>11</td>
<td>1.3 ± 0.6</td>
<td>3.4 ± 0.7</td>
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</tbody>
</table>

Figure 1: (a) Seborrheic keratosis in a 49-year-old man before long-pulsed 755-nm alexandrite laser treatment. (b) Crusted seborrheic keratoses 3 days after laser treatment. (c) Spontaneously peeled crusts and near completely cleared seborrheic keratoses 7 days after treatment.
Treatment of Compound Melanocytic Nevus Using a Long-pulsed 755-nm Alexandrite Laser


STUDY DETAILS

- 16-year-old Korean male with darkly pigmented mammillated compound melanocytic nevus
- 4 sessions of long-pulsed 755-nm alexandrite laser (GentleMax) with 35 J/cm², 6-mm spot size, a 3-msec pulse width and 2 passes
- Global Aesthetic Improvement Scale and physician assessments using a 4-point severity scale.

RESULTS AT 1 MONTH AFTER TREATMENT

- Marked clinical improvement after 2nd treatment (Fig. 1)
- Compound nevus disappeared at 1 month after 4 treatments
- Crusting for 5-7 days after treatment
- No side effects of post-therapy blister formation, secondary bacterial or viral infection, post-therapy prolonged erythema, dyschromia, or scarring.
Fig. 1. A black mamillated compound nevus with centrally located thick hairs (A) before and (B) one month after the first session, (C) one month after the second session, (D) one month after the third session, and (E) one month after the final session of long-pulsed 755-nm alexandrite laser treatment.
Nd:YAG laser hair removal in Fitzpatrick skin types IV to VI


CLINICAL PRACTICE DETAILS

• Use of a 1,064-nm, long-pulsed Nd:YAG laser (GentleYAG) for darkly pigmented patients (Fitzpatrick skin types IV-VI)
• Start with a pulse duration of 3 msec, a 12-mm spot size, and fluences of 24 to 32 J/cm², depending on skin type, and DCD cooling device. Fluence can be increased.
• Hair reduction is noticeable after 1st treatment
• More significant after a series of treatments, depending on body area (3-6 for arms and legs). Typical response shown in Figure 1.
Alexandrite laser for the treatment of port wine stains refractory to pulsed dye laser


STUDY DETAILS
• 8 subjects (4 males, 4 females, mean age 36.4 years) with facial PWS refractory to PDL (mean of 25.9 treatment sessions with PDL over 8 years)
• 2-4 treatment sessions (mean 2.6), at 6- to 8-week intervals, with the GentleLase 755-nm ms pulsed Alexandrite laser (MSPAL)
• 40-60 J/cm², 8 to 12 mm spot size, a 3-msec pulse width, DCD cooling
• 2 blinded dermatologists evaluated degree of improvement in skin color, skin texture, and overall clinical outcome, using a quartile scale.

RESULTS 2 MONTHS AFTER TREATMENT
• Mean severity scores decreased significantly after treatment with 60.0% improvement in skin texture, 56.3% in skin color and 59.4% overall improvement
• Results were similar for hypertrophic and nodular PWS
• Postoperative purpura and edema resolved within 1 week of treatment
• No blister formation, crusting, dyspigmentation, or scarring.

Figure 3. Seventeen-year-old Caucasian man (A) before and (B) after four treatments using a 755-nm alexandrite laser (8-mm spot, 55 J/cm², 3 ms on the lateral right cheek; 12-mm spot, 40 J/cm², 3 ms on the medial right cheek).
Clinical experience in skin rejuvenation treatment in Asians using a long-pulse Nd:YAG laser


STUDY DETAILS

• 19 female Japanese patients (Fitzpatrick skin types III or IV) with wrinkles, skin texture, and skin laxity
• 2 to 7 long-pulse Nd:YAG laser (GentleYAG) treatments every 3-4 weeks
• 8-mm spot size, pulse duration of 0.3 msec, fluence of 13 J/cm², repetition rate of 7Hz, and no cryogen spray cooling, using a constant, painting motion technique
• 3 blinded dermatologists evaluated degree of improvement on a 5-point scale
• Histological findings in 1 patient.

RESULTS AT 1 MONTH AFTER FINAL TREATMENT

• 53% of the patients experienced either good or excellent (>50%) improvement
• Increase in density of collagen fibers at the treated sites in the papillary dermis
• No adverse effects such as purpura, hyperpigmentation, blistering or scarring.
Increase in collagen fibers at 3 weeks after 5 treatments

Figure 2. A histopathological finding (Masson’s Trichrome staining X200). Medial side of the arm in a 45-year-old female. (A) Non-treated site; (B) 3 weeks after five treatments. Increased collagen fibers were observed in the upper dermis, particularly the papillary dermis.

Figure 5. A 46-year-old female. (A) Before treatment (lower face); (B) 4 weeks after four treatments (lower face). Marked improvement was observed in the reduction of the depth of the nasolabial fold and marionette line laxity.
Treatment endpoints for resistant port wine stains with a 755 nm laser


CLINICAL OBSERVATION REPORT

- 5 examples of PWS tissue response endpoint
- Resistant PWS treated with a 755 nm laser at high fluences (40–100 J/cm²), 1.5-ms pulse duration, with dynamic cooling device (40msec spray/40msec delay)
- With increasing fluence, endpoints for sub-therapeutic to therapeutic to supra-therapeutic treatment are described.

TREATMENT ENDPOINT OBSERVATIONS

Sub-optimal treatment

- 1st endpoint: immediate deep erythema or transient purpura that evolves into tissue erythema and edema
- 2nd endpoint: immediate slight gray color that immediately fades, produces deep erythema or faint purpura, but fails to produce deep purpura.
TREATMENT ENDPOINT OBSERVATIONS

Optimal treatment with correct response
- 3rd endpoint: transient gray color that gradually evolves into persistent deep purpura.

Supra-therapeutic treatment
- 4th endpoint: persistent gunmetal gray color (Figure 2E – circled area). This represents overtreatment: a dermal burn that could lead to scarring.

Figure 2. Examples of correct tissue response endpoints with the alexandrite 755 nm laser (A, B, C, D, E – upper left): transient gray color that evolves into deep purpura. Example of an incorrect endpoint (E – upper right): persistent gunmetal gray color. All lesions were treated with an 8-mm spot size, 1.5-ms pulse duration, DCD 40/40, and the following fluences: (A) 90 J/cm²; (B) 95 J/cm²; (C) 75 J/cm²; (D) 50-60 J/cm²; (E) 85 J/cm².
Optimal pulse durations for the treatment of leg telangiectasias with an alexandrite laser


STUDY DETAILS

- 15 patients (Fitzpatrick skin types I–III) with telangiectasia ranging from 0.2 to 1.0 mm in diameter (mean size of 0.4 mm)
- Radiant exposures: escalating doses of laser energy were applied in 5 J/cm² increments up to 97 J/cm² with the 6mm spot size and up to 221 J/cm² with the 3 mm spot size and DCD cooling (50 msec spray/20 msec delay).
- Closure was defined by the disappearance of the vessel, verified by a dermatoscope
- Treatment response evaluated by 10 independent, blinded physicians.

TEST SPOT TREATMENT RESULTS

- Mean pain scores for all treated test sites was 1.4±0.6 (mild to moderate pain)
- Lowest incidence of purpura was among vessels treated at 60 msec
- Optimal pulse duration, spot size, and radiant exposure results at the 3-week test site visit were determined to be 60 msec, 6 mm, and 89 J/cm².
RESULTS AT 12 WEEKS AFTER FULL TREATMENT

- **65% clearance of the vessels after 1 treatment** with optimal parameters
- Overall subjective improvement was 3.4 (some to significant improvement)
- Hyperpigmentation incidence (~30%) was not related to pulse duration
- No scarring.

Fig. 4. Representative before and after photograph at 12 weeks after treatment—40 milliseconds pulse duration was the optimal pulse duration in this subject.
Use of a long-pulse alexandrite laser in the treatment of superficial pigmented lesions


STUDY DETAILS

• 18 patients (mean age 53.8 years, range, 36–78 years) with Fitzpatrick skin types I to III treated for lentigines on their faces, chest, shoulders, arms, or hands
• Test-site session: 10-mm spot size with different pulse durations (3, 20, 40, or 60 ms) and fluences, according to skin type and pigmentation of lesion (Table 1)
• Single treatment session at 3 weeks after a test-site session, using optimal parameters from test spots
• Blinded evaluation of photographs at 6-week follow-up.

<table>
<thead>
<tr>
<th>No. of areas treated</th>
<th>Pulse duration (ms)</th>
<th>Fluence (J/cm²), mean (range)</th>
<th>Spot size (mm)</th>
<th>DCD spray (ms)</th>
<th>DCD delay (ms)</th>
<th>Pain, mean (range)</th>
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<tr>
<td>28</td>
<td>3</td>
<td>42.2 (16–76.5)</td>
<td>10</td>
<td>20, 30, 40</td>
<td>10</td>
<td>2.0 (0–9)</td>
</tr>
<tr>
<td>8</td>
<td>3</td>
<td>17 (9–28)</td>
<td>10</td>
<td>none</td>
<td>none</td>
<td>1.6 (0–8)</td>
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<tr>
<td>22</td>
<td>20</td>
<td>41.2 (18–75)</td>
<td>10</td>
<td>20, 30, 40</td>
<td>10</td>
<td>1.7 (0–6)</td>
</tr>
<tr>
<td>10</td>
<td>20</td>
<td>18.4 (12.8–26)</td>
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<td>none</td>
<td>1.1 (0–5)</td>
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<tr>
<td>22</td>
<td>40</td>
<td>48.1 (18.5–88)</td>
<td>10</td>
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<td>2.1 (0–9)</td>
</tr>
<tr>
<td>8</td>
<td>40</td>
<td>19.8 (10–35)</td>
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<td>21</td>
<td>60</td>
<td>40.9 (21–75)</td>
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<td>20, 30, 40</td>
<td>10</td>
<td>2.1 (0–8)</td>
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<tr>
<td>10</td>
<td>60</td>
<td>17.3 (9–26)</td>
<td>10</td>
<td>none</td>
<td>none</td>
<td>1.7 (0–8)</td>
</tr>
</tbody>
</table>

DCD, dynamic cooling device.
RESULTS AT 6-WEEK FOLLOW-UPS AFTER FULL TREATMENT SESSION

- All patients (100%) showed some improvement in their lentigines, by blinded assessment
- Darker lentigines achieved the greatest lesion clearance (76% to 99% lesion clearance overall)
- 87% of subjects reported improvement (some to complete)
- Erythema and edema resolved spontaneously after 2 days
- No instances of postinflammatory hyperpigmentation or side effects at follow-up.
Optimal pulse durations for the treatment of leg telangiectasias with a neodymium YAG laser


STUDY DETAILS

- 21 females (Fitzpatrick skin types I–IV) with leg vessels ranging from 0.1 to 1.6 mm in diameter (mean size of 0.8 mm)
- Radiant exposures: 80-200 J/cm² with the 6mm spot size, 200-300 J/cm² with the 3 mm spot size, 280 to 580 J/cm² with the 1.5mm spot size
- Histology from 1 biopsied patient
- 3 blinded physicians evaluated treatment response at 13 weeks after full treatment.

IMMEDIATE RESULTS

- In very small vessels (0.1–0.6 mm): immediate stenosis with fluences ranging from 280 to 320 J/cm² (3 mm spot), pulse duration range 20–100 msec
- In the 0.6–1.6 mm vessels, a range of fluences (200–260 J/cm²) achieved vessel constriction. Higher fluences achieved complete stenosis in 80% of the vessels.
RESULTS AT 13 WEEKS AFTER FULL TREATMENT

• Blinded observers rated **complete clearance in 71% of treated vessels**
• Where there was permanent stenosis lasting beyond 1 day, vessels remained clear
• In smaller vessels where the lumen was only partially stenotic, partial clearance resulted
• Patient satisfaction mean score of 4.2 (5-point scale) with their treatment
• Hyperpigmentation was seen in 48% of patients following test sites (tended to fade by week 16 of the study).

**Clinical vessel thrombosis**

**Clinical vessel disappearance**

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*Fig. 2. Coagulum of denatured blood filling the vessel lumen with thermally damaged endothelial cells (1.5 mm spot, 0.8 mm vessel, 500 J/cm², 3 milliseconds pulse duration).*

*Fig. 3. Contraction of the vessel lumen with hyalinization of the endothelium and perivascular collagen. Superficially, there is histological evidence of thermal alteration of the basal layer with vertically elongated keratinocytes and melanocytes (1.5 mm spot, 0.8 mm vessel, 500 J/cm², 60 milliseconds pulse duration).*
Laser treatment of leg veins: Physical mechanisms and theoretical considerations

REVIEW PAPER
- Based on Monte Carlo model to examine volumetric heat production, fluence rate, and temperature profiles in blood vessels at 1,064 and 532 nm wavelengths, review of literature and clinical observations
- The 1,064-nm wavelength penetrates deeper in the skin than 532 nm (Fig. 1)
- Authors suggest that long pulses and long wavelengths are the best approach for side effect free clearance of leg veins 0.2–2 mm in diameter
- Of the two primary clearance mechanisms, vessel contraction is favored over thrombosis.
Use of the alexandrite laser for treatment of seborrheic keratoses


CASE REPORT

- Male patient treated for hundreds of seborrheic keratosis and areas of mild hypopigmentation due to previous liquid nitrogen therapy
- 4 test spots to lesions, using 755nm wavelength, 100 J/cm² fluence and 8 mm spot size
- After 12-day follow-up, same parameters were used to treat hundreds of sites in 3 sessions
- After 1 treatment, most lesions responded by turning black, becoming brittle and detaching within 2 weeks
- Some noticeable scarring and hypopigmentation occurred
- Patient was extremely satisfied with treatment.