New Combined Laser Therapy for Small Mass of Melanocytic Nevi on the Face

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Introduction

Although a surgical resection is the first choice of treatment for a small mass of melanocytic nevi in the face, it has cosmetic complications, such as scarring and scar contracture. To avoid these complications, CO₂ Laser treatment has been increasingly used. However, scarring or recurrence may still occur after CO₂ Laser treatment. To resolve these problems, we developed a new Combined Laser Therapy (CLT) protocol using three laser instruments.

Subjects and Methods: We used CO₂ Laser, Nd:YAG Laser and Q-Switched Ruby Laser. The first treatment was a minimal mass reduction using CO₂ Laser. The surface is covered with carbonized tissue. The second treatment with Nd:YAG Laser which removes the carbonized tissue, because the laser specifically absorbs black chromatophores. Finally, any surviving nevus cells containing melanin are destroyed with Q-Switched Ruby Laser.

Results: This method was used for 12 cases presenting with small masses of melanocytic nevi on the face. The maximum size of the mass was 20 mm. All cases resulted in a cosmetic improvement and there was no scarring or recurrence. Either satisfactory or greatly improved cosmetic results were obtained in all cases.

Conclusions: We think that the wound healing without scarring observed in all of our cases is related to the administration of both CLT and auto-simultaneous Low reactive Level Laser Therapy (LLLT) in these cases. Therefore, this method may provide the better treatment than surgical resection in the future.

Key words: Combined Laser Therapy (CLT), Melanocytic Nevi, Low reactive Level Laser Therapy (LLLT), Wound Healing
Fig. 1: A schematic representation of our CLT. We first irradiate the lesion using CO₂ Laser (Above, left). After completing the treatment, the surface is irregular and carbonized tissue cover the region (Above, right). For the next treatment, we irradiate the lesion with Nd:YAG Laser to trim the carbonized tissue (Center, left). There are still some surviving nevus cells containing melanin (A) after this procedure (Center, right). Finally, we irradiate the lesions with Q-Switched Ruby Laser, thereby removing the rest of the nevus cells (Below, left and right).
It is important not to shave the mass too much into the deep layer. After the treatment, the surface is irregular and carbonized tissue covers the convex tissue in the surface (Fig. 1, above, right).

For the next treatment, we use Nd:YAG Laser [Nd:YAG Laser Model LUXUS 60, LaserSonics Co. Ltd.] to remove the carbonized tissue. Nd:YAG Laser specially absorbs the black chromatophore. The power of this laser is set at 20 W×0.1 sec on the continuous mode, and the distance of the irradiation is 10~15 mm from the surface (Fig. 1, center, left). After the treatment, the surface is flat (Fig. 1, center, right).

Finally, we use Q-Switched Ruby Laser [RD-1200 Q-Switched Ruby Laser, Spectrum Co. Ltd.] to destroy any surviving nevus cells containing melanin (Fig. 1, below, left and right). The power of this laser is set at 6.0 J/cm².

After the three laser treatments have been performed, the area is treated with a gentamicin ointment until the skin has successfully epithelized.

### Results

This method was used on total of 12 cases. The mean of age of the patients was 32.4 years (range, 16 to 52 years). The mean size of the masses was 12.4 mm (range, 6~20 mm). The mean number of treatments was 2.0 (range, 1~4). The color of six cases faded completely (Excellent) and the others faded extensively (Good). There was no scarring or recurrence, and satisfactory or improved cosmetic results were obtained in all cases (Table 1).

### Case 1

A 40-year-old female presented with a melanocytic nevi measuring 7 mm in diameter on her upper lip (Fig. 2, left). The CLT method was performed at once, and the color of this case faded completely, and there was no scarring at 6 months after the treatment (Fig. 2, right).

### Table 1: The Results of Melanocytic Nevi After Using the New CLT Method

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age (yr)</th>
<th>Sex</th>
<th>Position</th>
<th>Size</th>
<th>Treatments</th>
<th>Color</th>
<th>Complications</th>
<th>Recurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>40</td>
<td>F</td>
<td>Upper Lip</td>
<td>7mm</td>
<td>1</td>
<td>Excellent</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>2</td>
<td>16</td>
<td>F</td>
<td>Lt. Cheek</td>
<td>15mm</td>
<td>3</td>
<td>Good</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>3</td>
<td>19</td>
<td>M</td>
<td>Lt. Cheek</td>
<td>15mm</td>
<td>3</td>
<td>Good</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>4</td>
<td>49</td>
<td>F</td>
<td>Rt. Outer Canthus</td>
<td>20mm</td>
<td>4</td>
<td>Good</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>5</td>
<td>28</td>
<td>F</td>
<td>Lt. Nostril Rim</td>
<td>15mm</td>
<td>2</td>
<td>Good</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>6</td>
<td>20</td>
<td>F</td>
<td>Upper Lip</td>
<td>6mm</td>
<td>1</td>
<td>Excellent</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>7</td>
<td>52</td>
<td>F</td>
<td>Forehead</td>
<td>6mm</td>
<td>1</td>
<td>Excellent</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>8</td>
<td>47</td>
<td>F</td>
<td>Forehead</td>
<td>12mm</td>
<td>1</td>
<td>Excellent</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>9</td>
<td>21</td>
<td>F</td>
<td>Lt. Eyelid</td>
<td>12mm</td>
<td>4</td>
<td>Good</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>10</td>
<td>18</td>
<td>M</td>
<td>Lt. Below Eyelid</td>
<td>10mm</td>
<td>2</td>
<td>Good</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>11</td>
<td>50</td>
<td>F</td>
<td>Rt. Cheek</td>
<td>12mm</td>
<td>1</td>
<td>Excellent</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>12</td>
<td>29</td>
<td>F</td>
<td>Upper Lip</td>
<td>12mm</td>
<td>1</td>
<td>Excellent</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

**Fig.2:** The patient described in Case 1, a 40-year-old female presenting with a melanocytic nevi on her upper lip measuring 7 mm in diameter (Left). The new method was used, and no scarring was observed at 6 months after the treatment (Right).
Case 4
A 49-year-old female presented with a melanocytic nevi measuring 20 mm on her right outer canthus (Fig. 3, left). The CLT method was used and the nevi became lighter by six months after the fourth treatment. Although still visible, the change in the color was good, and provided an improved appearance. There was no scarring or contracture (Fig. 3, right).

Case 9
A 21-year-old female presented with two masses of melanocytic nevi on her right upper and lower eyelids. Both measured 12 mm in diameter (Fig. 4, left).

Fig. 3: The patient described in Case 4, a 49-year-old female with a melanocytic nevi on her right outer canthus measuring 20 mm in diameter (Left). The nevus became lighter, and no scarring or contracture were observed at 6 months after the fourth treatment (Right).

Fig. 4: The patient described in Case 9, a 21-year-old female with two melanocytic nevi on her right upper and lower eyelids. Both measured 12 mm in diameter (Above, left and right). The new method was performed, while being careful not to damage the eyelashes. The nevi became lighter, and there was no deformity of the eyelid at 10 months after the fourth treatment (Below, left and right).
The CLT method was used, while be careful to target only the tissue, but not the eyelashes. Both nevi became dramatically lighter, and there was no deformity of the eyelid was observed at ten months after the fourth treatment. The changes in the color were also good (Fig. 4, right).

Discussion

CO2 Laser was invented in 1964. It was thereafter developed for medical treatment purposes by Patel in 1968. Since then, it has been used primarily as a laser scalpel or for the treatment of small skin tumors. Nd:YAG Laser was invented in 1962. Initially, continuous Nd:YAG Laser was used as a laser scalpel and now Q-Switched and long pulse Nd:YAG Laser is also used for pigmented skin lesions. Ruby Laser was invented in 1960 by Maiman. Previously, Long Pulse Ruby Laser was only considered to be useful only for superficial pigmented skin lesions. However, Ono et al. developed Q-Switched Ruby Laser, which can be used for the treatment of melanocytosis in the deep dermis.

The wavelength of CO2 laser is 10600 nm and it has a high degree of water absorption. The beam of CO2 Laser absorbs water in human tissue, and what is converted to thermal energy, thus leading to the instantaneous evaporation of human tissue. Dye Laser or Ruby Laser absorbs selective chromatophores, which CO2 Laser cannot do. Therefore, the use of CO2 Laser treatment alone is associated with scarring when there is excessive irradiation. To prevent scarring, we shave the bump made by the nevi using moderate irradiation.

After CO2 Laser treatment, the surface becomes irregular, and carbonized tissue covers the site of a prominent surface. In this state, if Q Switched Ruby laser is then used, it would thus be absorbed into the carbonized tissue, and thus be less likely to reach the nevus cells containing melanin in the deep layer. Therefore, before using Q-Switched Ruby Laser, we use Nd:YAG Laser to remove any carbonized tissue after CO2 laser treatment. The wavelength of Nd:YAG Laser is 1064 nm. Hayashi et al reported that 86% of Nd:YAG Laser beam is absorbed into black colored region. We therefore hypothesized that Nd:YAG Laser could be used to specifically remove carbonized tissue and trim the prominent surface of nevi. In addition, using this method, the irregular surface could be flattened, thereby facilitating smooth healing.

The wavelength of Q-Switched Ruby Laser used for on the last treatment is 694 nm. It specifically absorbs melanin when applied for 20 nsec. It can selectively destroy melanin without affecting the surrounding skin tissue. Based on these characteristics, it is able to selectively destroy the nevus cells containing melanin in the deep layer without damaging the surrounding normal tissue.

Oshiro et al. reported that High reactive Level Laser Therapy (HLLT) which destroys tissue, also induces some biological activity of the surrounding normal tissue as well. This has thus been called auto-simultaneous Low reactive Level Laser Therapy (LLLT). LLLT has been used for the treatment of many diseases, and promote wound healing. We think that the wound healing without scarring observed in all of our cases is related to the combined laser therapy and auto-simultaneous LLLT in these cases.

We were able to successfully treat melanocytic nevi measuring up to 20 mm in size. In the future, if melanocytic nevi are over 20 mm size and they pose some cosmetic risk when being treated, then they should be treated by a split method, such as either Zebra Method or Leopard Method. As a result, we believe that our CLT protocol can provide a successful treatment alternative that can be extended to the treatment of large lesions in the future.

Conclusions

We herein describe a new laser treatment for small masses of melanocytic nevi on the face. Considering the positive cosmetic results obtained in our initial cases, this method may therefore become a useful alternative to a surgical resection.

References

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