Low reactive level laser therapy (LLLT) has been described in different studies. The purpose of this study was to evaluate the anti-inflammatory effect of LLLT using 60 mW GaAlAs (830 nm) laser on damaged tissue induced by high reactive level laser treatment (HLLT). Two acquired pigmented nevi of a single person’s face were treated with high reactive level lasers (Ultra Pulse CO2 laser and Q-switched Alexandrite laser). After high reactive level lasers irradiation, one acquired pigmented nevus was exposed to 60 mW GaAlAs laser irradiation, whereas the other nevus was not irradiated and served as control. Both nevi were evaluated with digital photographs, thermography and a questionnaire survey. Compared to the nonirradiated control nevus, LLLT decreased the rubor and calor of the acute inflammation caused by HLLT. LLLT immediately after HLLT (Xenogeneous combined laser treatment) seems to be useful to control acute inflammation caused by HLLT.

Key words: HLLT (high reactive level laser treatment), LLLT (low reactive level laser therapy), acute inflammation, combined laser treatment

Materials and Methods

The treatment of acquired pigmented nevus was selected to evaluate the acute inflammation caused immediately after HLLT. Two acquired pigmented nevi on the same side of a 32-year old woman’s face were treated with high reactive level lasers without anesthesia. Those lasers were Ultra Pulse CO2 laser (ENCORE, LUMENIS corp. wavelength: 10600 nm, energy: 2W (200 mJ), spot size: 1 mm) and Q-switched Alexandrite laser (ALEXLAZR, CANDELA corp. wavelength: 755nm, pulse width: 50ns, fluence: 10 J/m², spot size: 2 mm). After high reactive level lasers irradiation, one acquired pigmented nevus was exposed to 60 mW GaAlAs laser irradiation (OhLase3DI, Japan Medical Laser Laboratory).
Laboratory, wavelength: 830nm, continuous wave, energy: 60 mW, irradiation time: 3 minutes), whereas the other nevus was not irradiated and served as control. Both nevi were evaluated objectively by digital photographs and thermography (TH5108ME, NEC corp.) which records body surface temperature distribution before HLLT, immediately after HLLT and immediately after LLLT (3 minutes after HLLT in the case of control). Questionnaire survey was done to evaluate subjective effect. Each main phenomenon of acute inflammation was evaluated according to the fivepoint-grading system. One is the same of the usual state, while five is the insufferable state.

**Results**

For both nevi, rubor was observed immediately after HLLT, and the thermographies showed increasing temperature area surrounding the high level laser irradiated nevi. After LLLT (3 minute after HLLT in the case of control), the rubor was reduced as for 60 mW GaAlAs laser irradiation nevus (Fig. 3), while the rubor was still observed as for the control nevus (Fig. 1). The thermography of 60 mW GaAlAs laser irradiation nevus showed the decreasing temperature area surrounding the high level laser irradiated nevus than that taken immediately after HLLT (Fig. 4), while the thermography of control nevus showed the increasing temperature area surrounding the high level laser irradiated nevus than that taken immediately after HLLT (Fig. 2). The woman felt rubor and dolor were reduced as for 60 mW GaAlAs laser irradiation nevus (Table 2), while felt anxious about rubor and dolor continuously as for the control nevus (Table 1).

**Discussion**

Acute inflammation is the nonspecific and first general reaction when tissue is damaged and destroyed. Acute inflammation takes part in induction of necrotic tissue removal, protection from local infection and immune response. The main phenomena of acute inflammation are rubor, dolor, calor, tumor. Rubor and calor are caused from vessel dilation and increased bloodflow at the afflicted site. Tumor is caused from pooling of exudates in extracellular space, and dolor is caused from nociceptor stimulation, by chemical mediators and other factors.

The tissue damage and continuous photothermal reactions caused by HLLT are strictly controlled, and the process of HLLT is done under disinfection. In the HLLT case the, necrotic tissue removal, protection from local infection and immune response seems to be less important, compared to usual traumatic damage cases. From this point, acute inflammation that causes rubor, dolor, calor, tumor seems to be more unfavorable than beneficial for the patients. If the inflammation phase is under control, patients are free from undesirable state. Recently Gal P et al. reported that laser stimulation shortened the inflammatory phase as well as accelerated the proliferative and maturation phase (2). Furthermore, the suppressive neutrophilic leukocytes wandering (3), the level of TNF-Éø as cytokine (4), and the participation of oxygen species (ROS) as chemokine (5) were reported.

In our case, LLLT is performed to reduce the acute inflammation reaction caused by HLLT. After LLLT the digital photographs showed reduction of rubor caused by HLLT. The patient noticed the reduction of rubor and dolor, and felt the low reactive level laser irradiation was effective subjectively. Using thermography, we measured the body surface temperature distribution and investigated the local fever and blood circulation. The thermography of 60 mW GaAlAs laser irradiation nevus showed the decreasing temperature area surrounding the high level laser irradiated nevus and increasing temperature area in the left cheek than that taken immediately after HLLT, while the thermography of control nevus showed the increasing temperature area surrounding the high level laser irradiated nevus and decreasing temperature area in the left cheek than that taken immediately after HLLT. We suggest these phenomena were caused by the following reasons. In control case, acute inflammation became

<table>
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<tr>
<td>Just after HLLT</td>
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<tr>
<td>Redness</td>
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worse. The blood circulation continued concentrating on the damaged tissue, while the blood circulation of the left cheek was reduced. In the LLLT case, blood circulation was promoted, and the concentrated bloodflow of the damaged tissue area was diffused to surrounding area. As a result the blood circulation of the damaged tissue was reduced, while the blood circulation of the left cheek was increased. The promoting blood circulation after LLLT may reduce the bloodflow at the afflicted site, as a result the reduction of rubol and calor may be occurred.

LLLT seems to be useful to shorten the acute inflammatory phase caused by HLLT. But there are still many points to be discussed about kinds of lasers and the various laser parameters.

References


**Fig. 1:** The control nevus  
- a: No acute inflammation phenomenon was seen before HLLT  
- b: Rubor and somewhat tumor were seen immediately after HLLT  
- c: Continuing rubor and tumor were seen 3 minutes after HLLT

**Fig. 3:** The 60 mW GaAlAs laser irradiation nevus  
- a: No acute inflammation phenomenon was seen before HLLT  
- b: Rubor and somewhat tumor were seen immediately after HLLT  
- c: Rubor and tumor were reduced immediately after LLLT
**Fig. 2:** Thermography of the control nevus

a: The location of the control nevus is unclear before HLLT
b: High temperature area was seen surrounding the control nevus immediately after HLLT
c: Compared with the temperature area showed after HLLT, increasing temperature area was seen surrounding the control nevus, and decreasing temperature area was seen in the left cheek 3 minutes after HLLT.

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**Fig. 4:** Thermography of the 60 mW GaAlAs laser irradiation nevus

a: High temperature area was seen surrounding the nevus immediately after HLLT
b: Compared with the temperature area showed after HLLT, decreasing temperature area was seen surrounding the nevus, and increasing temperature area was seen in the left cheek immediately after LLLT.