

Thermal Imaging Guided Laser Therapy—Part 2

An Innovative Method for Determining Optimal Treatment Location and Effectiveness

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In part one of this two part series, I reviewed some of the basic principles of infrared thermography. I previously discussed the physiological effects of laser therapy in the November/December 2006 issue of *Practical Pain Management*.¹ In this second part of the series, I will briefly review some of the literature related to thermographic monitoring of the effects of laser therapy as well as describe the Thermal Imaging Guided Laser Therapy procedure and provide examples of pre and post thermograms.

I have been utilizing thermography to obtain real time scans of the area of pain in patients with various kinds of back pain. This allows me to observe their thermal pattern before, during and immediately after laser therapy application. Leonard Saputo, MD, the former medical director at the Health Medicine Institute, first exposed me to this approach during my time on staff there from 2000 through 2007. It is a simple procedure to perform and can serve as a guide to laser application.

Thermography Research

Some researchers have used thermography (thermal imaging) to observe skin temperature changes in response to laser

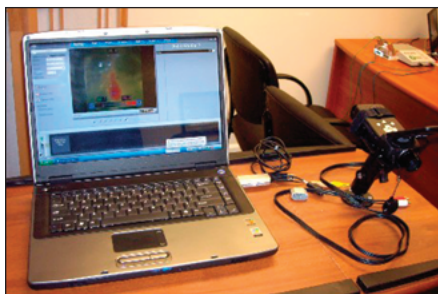


FIGURE 1. Thermal camera is mounted on the cart next to the laptop computer.

therapy. Kamikawa used thermography to monitor changes in the area of complaint from direct stimulation, as well as acupoint stimulation by three different kinds of laser. He found that the treated areas heated up quickly and cooled down again immediately after treatment.²

Obata used thermography to study the effect of laser therapy on patients with rheumatoid arthritis. He observed that the patients that had the most rapid decrease in temperature patterns had the best pain relief.³

Yoshimi found that skin temperature in the area of acute phase injury—which is typically several degrees hotter than the periphery—decreased by three degrees during treatment with low level laser therapy while the peripheral area increased.⁴

Makihara found that low level laser therapy resulted in an increase in skin temperature over the effected side as compared with the opposite side ten minutes after treatment.⁵ Hagguder found predictable changes in thermal symmetry, as well as other parameters, in patients with myofascial pain syndromes in the neck and upper back.⁶

Al Awami found that there was significant improvement in digital circulation as evidenced by thermography, along with a standardized cold challenge test, in Raynaud's patients.⁷

Tuner and Hode have observed that the macroscopic thermal changes observed in tissues was a photobiostimulative effect involving the autonomic nervous system.⁸

Tasaki utilized thermography to evaluate the analgesic effects of low level laser therapy in low back pain patients. He observed an increase in the skin's micro-circulation after laser therapy using thermography.⁹

Thermographic Procedure

The equipment required is relatively low cost. It consists of a laptop computer with thermal image processing and reporting software, a thermographic camera and a mobile cart (see Figure 1). (Note that Figures 1-6 are photos from the author's office and patients' files.)

The procedure is performed with the patient seated in front of the operator facing in the opposite direction. This allows the operator to see the real time image on the computer screen and still directly view the patient's back in this case (see Figure 2).

Placement of the laser emitter is determined by the local and regional visual thermal response (see Figure 3). Treatment is initiated by irradiating the area registering the highest temperature.

There appear to be body areas that respond much more quickly and have more significant thermal normalizing effects compared to other areas. Thermal skin changes should usually occur within one or two minutes after initiating therapy. If there is no thermal pattern change after a couple of minutes, the emitter position should be moved to another position.



FIGURE 2. Patient placement for thermal imaging guided laser therapy of the back.

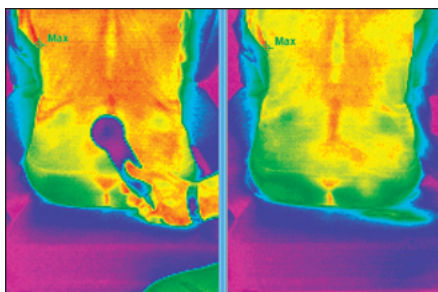


FIGURE 3. The GaAs emitter is placed over the central lumbosacral junction. The emitter was kept in that spot until the heat pattern dissipated in the right low back. This took about three minutes. This patient had right recurrent lumbosacral pain and reported considerable pain relief by the end of the treatment session.

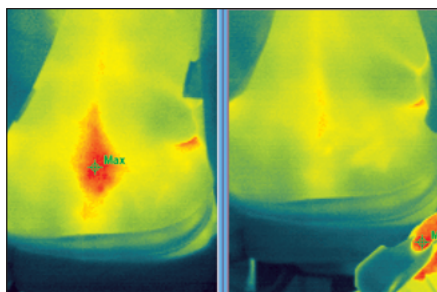


FIGURE 5. This is a pre and post set of images of the low back (lumbosacral) of a patient with chronic fibromyalgia of several years duration. She was treated with a GaAs laser for approximately 2 to 3 minutes. She reports noticeable relief by the end of the treatment sessions. This is a palliative procedure in her case but gives her days to weeks of relief between visits.

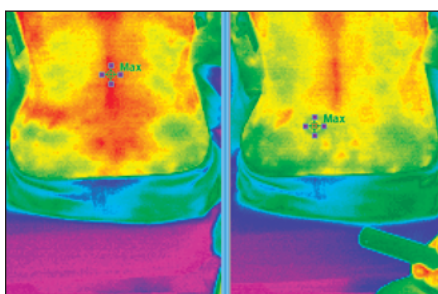


FIGURE 4. This patient complained of chronic left hip and low back pain of several month's duration. She was treated for approximately 3-4 minutes with a GaAs laser. The left picture is immediately before treatment is initiated and the right picture is immediately after laser therapy.

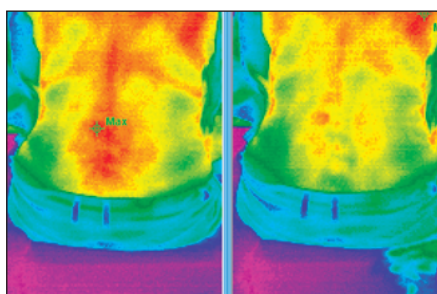


FIGURE 6. This patient presented with complaints of central lumbar pain of several months duration. A GaAs laser was utilized to treat over the mid lumbar region for approximately 3 minutes. This patient noticed a considerable decrease in pain by treatment's end.

Figures 4, 5, and 6 illustrate pre- and post-treatment thermography of GaAs laser therapy for various patient complaints. In these illustrated cases, the complaints ranged from chronic left hip and low back pain of several month's duration, low back (lumbosacral) of a patient with chronic fibromyalgia of several years duration, and central lumbar pain of several months duration, respectively.

The dramatic thermographic changes seen when comparing pre and post laser treatment sessions are temporary to a degree in that immediately after the end of the treatment session there is an increase in heat emission in the treated area. We expect to see a partial return of the initial thermographic pattern in the area of treatment on subsequent visits but the thermal pattern typically shows improvement with each subsequent visit and resolves more quickly.

Summary

Thermography is a non-invasive physiological monitoring process that helps to obtain real time scans of the area of pain for various patient complaints in order to direct low level laser therapy. The above illustrated procedures are appropriate for all body regions. The benefits of employing this procedure when using laser therapy are:

- Shorter treatment times. Only areas that are most responsive to the laser irradiation are treated.
- Faster and longer lasting relief between treatment sessions.
- Objective observation and tracking of treatment response. Treatment session to treatment session response can be compared and monitored.
- Patient motivation and education. Patients are very interested in observing the thermographic images of their bodies and the changes that

occur during the treatment session.

The ideal situation is to have a second TV monitor for their viewing.

Thermal Imaging Guided Laser Therapy is in its infancy at present but offers some exciting possibilities as it becomes more widely studied and utilized. ■

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