

Infrared Thermal Imaging Allows Precise Administration of Photobiomodulation Therapy

Laser therapy or photobiomodulation therapy (PBMT) in veterinary medicine is a non-invasive electrophysical agent that utilizes non-ionizing light energy to promote healing and alleviate pain in animals. PBMT is a scientific evidence-based modality.¹ PBMT is used to manage conditions such as musculoskeletal injuries, wound healing, inflammation, arthritis, and post-surgical pain.²

To effectively utilize PBMT, it is crucial to ensure optimal energy delivery by properly identifying and

targeting the affected tissues. Emerging technologies, such as real-time infrared thermal imaging (IRTI), allow for visualization of symptoms and provide a roadmap to guide the most effective application of PBMT.³

When IRTI is added to the practice, veterinarians can gain valuable insights into the health, wellness, and potential issues affecting their patients. IRTI measures the non-ionizing infrared radiation being emitted from the patient and converts that temperature data into a visible image portraying the physiological status of the patient's body.

The initial IRTI scan, often referred to as the baseline visualization, provides a roadmap or reference point for assessing the effectiveness of therapy.

Successive IRTI scans can be captured and then compared to the baseline visualization. These follow-up images objectively measure patient response to the therapy by identifying changes in temperature patterns. These temperature variations are directly correlated to underlying physiological changes or conditions. These temperature variations are directly correlated to underlying physiological changes or conditions.⁴

The synergy between IRTI and the administration of PBMT can be seen in this case that highlights a clinical scenario in which IRTI played a crucial role in the diagnosis, treatment, and monitoring of a patient.

Patient Presentation

11-year-old, mixed breed, female, spayed.

History:

Owner reports patient is reluctant to rise and walk and is not comfortable when resting. The patient exhibited pain during grooming.

Physical Exam:

Normal for age, except palpation of periarticular muscles from L₂ – S₂ and musculature surrounding lumbosacral joint. ROM of all joints was within normal limits. Walked with a slight lameness in the left hind (LH). CSU Pain Score: 1.75.

IRTI Exam Findings

Presence of asymmetrical hyperthermia throughout paravertebral and epaxial musculature from last few thoracic, all lumbar vertebrae, and continuing bilaterally throughout the sacrum (Figure 1). There are more focal and diffuse areas of hyperthermia along the right when compared to the left. Average temperature data within the paravertebral musculature: Right (Zone B): 83.6° F. Left (Zone A): 81.4° F.

Visualization of dorsal IRTI reinforced clinical findings, and client was compliant with recommended radiographic study of lumbosacral spine (Figure 2). Routine bloodwork normal.

Diagnosis: Spondylosis deformans and osteoarthritis of the lumbosacral spine.

Treatment Plan:

PBMT, NSAIDs, exercise program, and nutraceuticals (Dasuquin®). Elected to pursue PBMT, exercise and nutraceuticals. PBMT administered at a dose of 10 J/cm² on contact with the musculature evenly bilaterally throughout delineated areas.

Exercise: walking 30 minutes/day until recheck in 48 hours.

48 Hours Recheck

A second IRTI exam revealed contralateral anatomical areas were thermally symmetrical except the dorsal view of the spine.

IRTI Findings:

Comparative temperature data within each zone measured lesser focal and diffuse areas of hyperthermia when compared to initial image. Average temperature data: Zone B: 82.8° F. Zone A: 80.2° F (Figure 3).

Physical Exam:

Patient is less sensitive to palpation within the paravertebral musculature from L₂ – S₂ and the musculature surrounding the lumbosacral joint. There is still a slight lameness in the LH. CSU Pain Score: 1.50.

Treatment Plan:

Using IRTI as a roadmap for continued administration of PBMT, the photonic energy was administered to the remaining hyperthermic areas, on the right paravertebral area (Zone B) and bilaterally over the sacral area.

96 Hours Recheck

IRTI Findings:

The contralateral asymmetrical areas of hyperthermia are normalizing. The right paravertebral musculature has more diffuse areas than the left. Average temperatures within the paravertebral musculature: Zone B: 81.4° F. Zone A: 79.3° F (Figure 4).

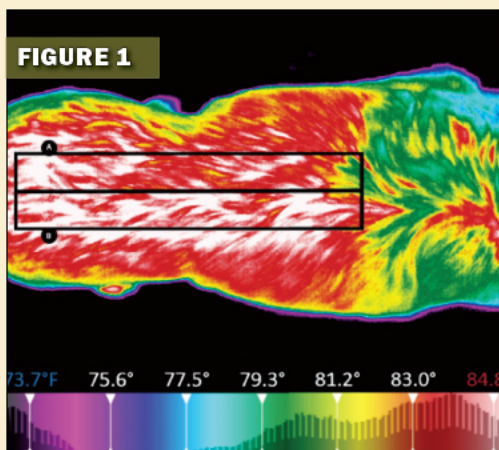
Physical Exam:

Patient is sensitive to palpation over lumbosacral joint and the surrounding musculature. Slight lameness detected in LH albeit less than the previous visit. The goal of the patient being pain free and more comfortable has not yet been achieved. CSU Pain Score: 1.25.

Treatment Plan:

PBMT was administered in the hospital using the IRTI to target the hyperthermic areas.

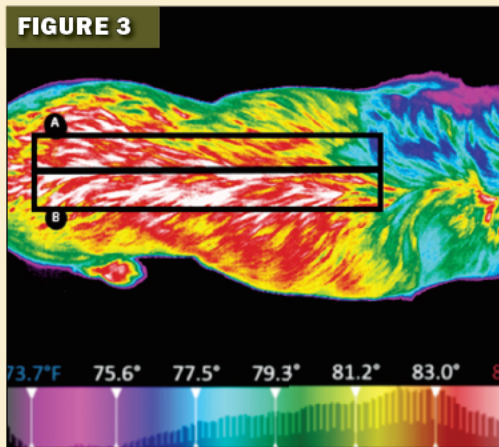
Owner consultation led to prescribing an at-home laser for continued PBMT administration. A My Pet Laser® was rented, demonstrated, and the dorsal visual and IRTI were printed to guide them in their treatments.



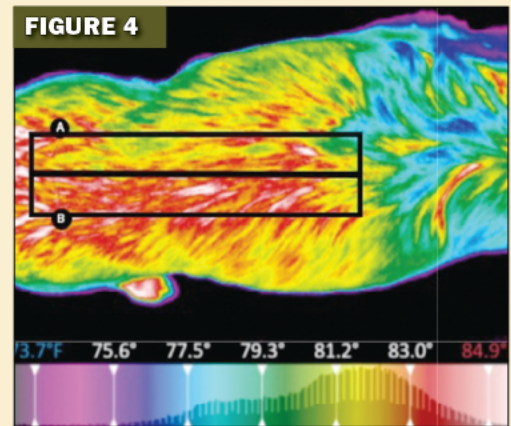
Initial Infrared Thermal Image.



Spondylosis deformans and OA of L/S spine.



IRTI 48 hours post initial PBMT.



IRTI 96 hours post initial PBMT and 48 hours post second PBMT session.

Rx: My Pet Laser

- A: Mode P3 - 36 J scanning entire area once/day
- B: Mode P3 - 36 J scanning entire area twice/day
- C: Mode P3 - 36 J scanning entire area twice/day

Day Seven Recheck

Owners report gradual daily improvement from at-home PBMT. The patient was reimaged.

IRTI Findings:

The contralateral anatomical areas along the spine and throughout the sacrum have thermally normalized. (See Figures 5 and 6)

Physical Exam:

The animal does not exhibit any lameness and is much more fluid during walk. CSU Pain Score: 0.00.

Treatment Plan:

Owner instructed to continue nutraceuticals and exercise program.

Discussion

IRTI Allowed:

- Identification of anatomical areas that would benefit from further evaluation and diagnostics.
- Client to understand the need for further diagnostics.
- Patient to be objectively monitored throughout the PBMT treatments.
- Guidance of PBMT application in the hospital and at home.
- A baseline for any future imaging performed on this patient.

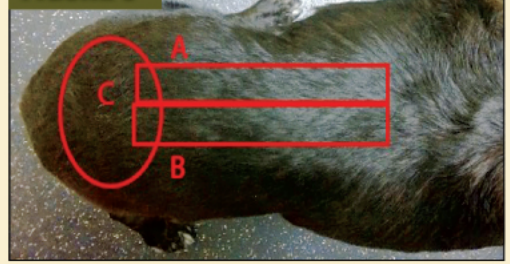
This example emphasizes the benefits of IRTI, such as its non-invasiveness, ability to detect subtle changes in temperature, and capacity to identify areas of inflammation, injury, or abnormal blood flow. The incorporation of advanced technologies such as IRTI and PBMT offers a non-invasive and efficient method for assessing, treating, and monitoring various conditions in veterinary practice. As technology continues to advance, thermography is expected to play an increasingly significant role in improving diagnostic accuracy, treatment outcomes, and overall animal welfare in veterinary medicine. ●

REFERENCES

- ¹ Hochman, Lindsay. (2018) Photobiomodulation Therapy in Veterinary Medicine: A Review. *Top Companion Anim Med.* Sept; 33(3):83-88.
- ² De Oliveira, MF. et al. (2022) Low-intensity LASER and LED (photobiomodulation therapy) for pain control of the most common musculoskeletal conditions. *Eur J Phys Rehabil Med.* April;58(2):282-289.
- ³ Ramirez-Garcia Lunda, JL. et al. (2022) Use of Infrared Thermal Imaging for Assessing Acute Inflammatory Changes: A Case Series. *Cureus.* Sept. 9;14(9):e2 8980
- ⁴ Díaz M, Becker DE. Thermoregulation: physiological and clinical considerations during sedation and general anesthesia. *Anesth Prog.* 2010 Spring;57(1):25-32; quiz 33-4. doi: 10.2344/0003-3006-57.1.25. PMID: 20331336; PMCID: PMC2844235

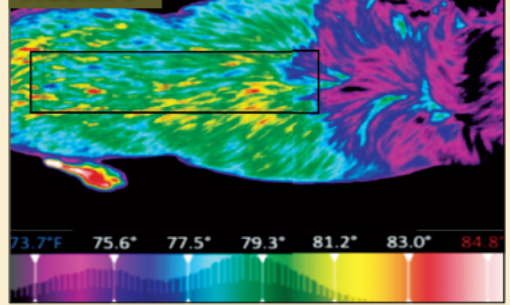
This Education Center article was underwritten by WellVu Thermal Imaging and Multi Radiance Laser Therapy

FIGURE 5



Visual image given to clients to guide them for administration of PBMT at home.

FIGURE 6



IRTI taken at 7 day recheck.

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