



## Effective Pain Reduction Following a Knee Injury, using PLLT for Photobiomodulation and Pain Management (ComfortLase™)

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### Introduction:

The ComfortLase™ protocol encompasses both cold and warm photobiomodulation laser therapy (PLLT) to achieve comprehensive therapeutic effects.

Cold PLLT, utilized for photobiomodulation, induces minimal temperature elevations (typically ranging from 0.1 to 0.5°C). Laser light causes photochemical interaction that activates Cytochrome C Oxidase in mitochondria, thereby enhancing ATP synthesis and promoting tissue regeneration. Conversely, warm PLLT (also known as High Intensity Laser Therapy – HILT), employed for pain management, induces a more substantial rise in tissue temperature of several degrees. This increase in temperature reduces pro-inflammatory cytokines and mediators, stimulates lymphatic drainage and enhances local blood circulation through vasodilation. Consequently, warm PLLT effectively reduces inflammation and local edema.

In cases of acute injury, the body initiates a localized inflammatory response. Inflammatory cytokines sensitize nociceptors, resulting in a lowered pain threshold, and increase capillary permeability, leading to local edema. One of the primary effects of ComfortLase™ is the reduction of pro-inflammatory cytokines, making this treatment a highly effective tool for alleviating pain and edema associated with acute injuries.

Laser	SP Dynamis			
	Session 1 & 2		Session 3	
	Step 1: Photobiomodulation	Step 2: Pain management	Step 1: Photobiomodulation	Step 2: Pain management
Wavelength	1064 nm	1064 nm	1064 nm	1064 nm
Handpiece	MarcCo L	MarcCo L	MarcCo L	MarcCo L
Energy density	0.2 W/cm <sup>2</sup>	0.5 W/cm <sup>2</sup>	0.2 W/cm <sup>2</sup>	0.7 W/cm <sup>2</sup>
Pulse duration	0.1 ms	0.1 ms	0.1 ms	0.1 ms
Frequency	10 Hz	10 Hz	10 Hz	10 Hz
Time per spot	60 s	60 s	60 s	60 s
Technique	Stamping	Stamping	Stamping	Stamping
Sessions	Three sessions with 1-week intervals			



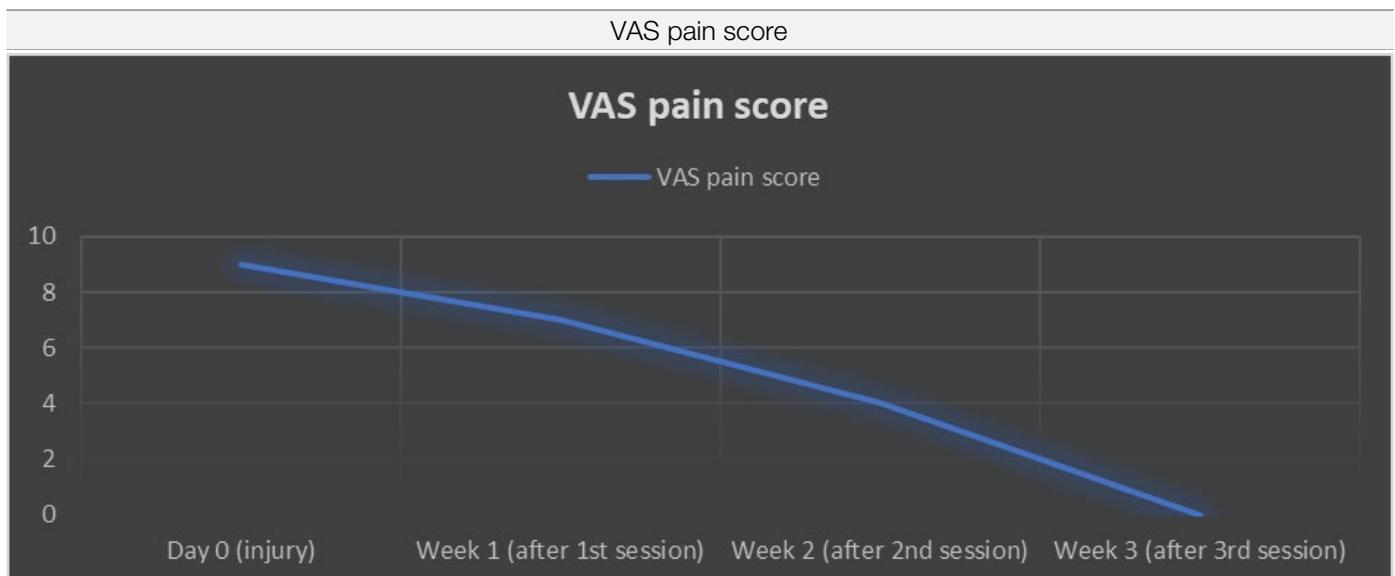
Tea Osterc Diwersy, MD, is an anesthesiology, reanimation and perioperative intensive care medicine specialist working in the field of laser medicine and pain management. She graduated with a Doctor of Medicine degree from the Faculty of Medicine, University of Ljubljana in 2015. After finishing her internship at the University Medical Centre Ljubljana, she pursued residency in anesthesiology and passed her board certification with distinction in November 2023. She has extensive experience in diverse international environments, among others she underwent further training in regional anesthesia and pain therapy in a renowned orthopedic hospital in Zürich, Switzerland. Currently she is working at Fotona d.o.o. and in a private practice setting as a lecturer and clinical expert in the field of laser medicine in aesthetics and pain management.

## CLINICAL CASE:

A 63-year-old female patient, with no history of chronic illnesses, presented for ComfortLase™ treatment two days post-injury to her right knee, sustained during basketball practice when she landed on an extended right foot. The patient exhibited significant swelling, a sensation of instability, restricted range of motion, and a positive anterior drawer test. The Visual Analog Scale (VAS) pain score was 9. I performed ComfortLase™ with the MarcCo L handpiece, utilizing the Nd:YAG wavelength with the stamping technique, holding the MarcCo L handpiece at each spot for 60 s, covering the whole knee area. For the first step (photobiomodulation) the energy density was 0.2 W/cm<sup>2</sup> and for the second step (pain management) I increased it to 0.5 W/cm<sup>2</sup>. The whole treatment took between 20-30 min. Immediately following the initial ComfortLase™ session, the patient experienced notable pain relief. Over the subsequent days, she reported a progressive alleviation of pain and a reduction in swelling, with the VAS pain score decreasing to 7. An MRI revealed an anterior cruciate ligament (ACL) rupture, a lateral meniscus tear, and chondromalacia.

A second ComfortLase™ session was done one week later, resulting in a further reduction in pain, with the VAS pain score dropping to 4, although some swelling persisted. Given the reduced inflammation, swelling, and pain, I opted to increase the irradiance to 0.7 W/cm<sup>2</sup> for the third session. Two days post the final session, the patient reported a complete resolution of knee pain and was able to undertake a light hike.

Photobiomodulation and pain management (HILT) are typically indicated for chronic pain management. However, this case demonstrates the efficacy of ComfortLase™ in the treatment of acute inflammatory pain following injury.



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