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CHATTANOOGA®

From Research to Relief:

Applying Shockwave and Laser Therapy to Common Conditions

Current Research Supporting Extracorporeal Shockwave and Laser Therapy

TABLE OF CONTENTS

ABOUT THE GUIDE

This guide contains a summary of recent research and common terminology associated with extracorporeal shockwave therapy and photobiomodulation therapy (laser therapy). Each research summary contains the highlights of the research and a link to view the full study.

Also included is data collected by Enovis through post-market clinical follow-up studies assessing the performance of its extracorporeal shockwave and laser therapy devices.

SHOCKWAVE THERAPY TERMINOLOGY

Shockwave therapy made its medical debut in the 1980s in the form of lithotripsy, a technology that uses high intensity shockwaves to break up kidney stones. Now, similar technology that utilizes lower intensity shockwave energy is making a significant impact in treating musculoskeletal conditions. Unfortunately, there can be confusion surrounding the treatment because various terms are used in the clinical space and the scientific literature to describe shockwave therapy. Some examples are:

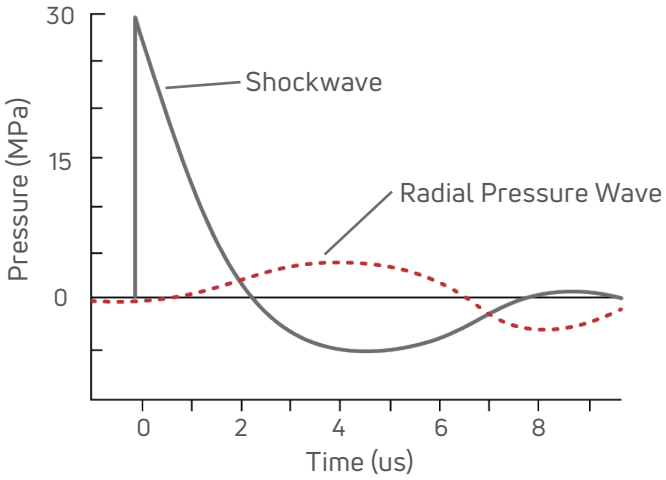
ESWT: Extracorporeal Shockwave Therapy
FSW: Focused Shockwave
EPAT: Extracorporeal Pulsed Activation Therapy
RPW: Radial Pressure Wave
AWT: Acoustic Wave Therapy

The list grows as companies continue to develop specific names for the technology in an attempt to differentiate their products.

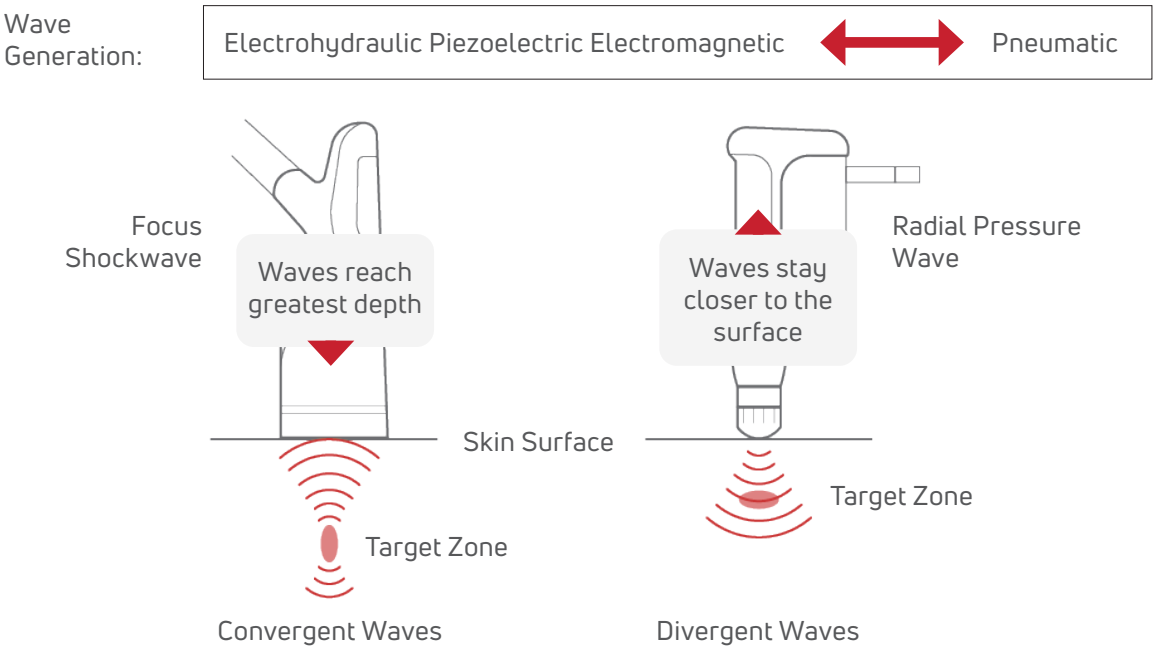
Regardless of how many names are coined, the important thing to know is that ESWT is the general term used for shockwave therapy and there are two primary families of devices under this umbrella: FSW and RPW.

Both FSW and RPW are mechanical energy in the form of an acoustic wave that is transmitted into the body and creates a phenomenon known as mechanotransduction. In simple terms, it is the process of imparting brief, physical deformation to cells that lead to biochemical changes. These changes have the potential to positively affect pain and tissue repair.[1]

While FSW and RPW both impact tissue via acoustic waves, they are generated by different mechanisms and have unique physical characteristics. FSW machines generate shock waves using either electrohydraulic, electromagnetic, or piezoelectric technology. The waves are focused through a lens and transmitted into the tissue via the handpiece. The focused waves allow for targeted application and for deep tissues to be reached up to about 4.7". Focused shockwaves are characterized by a single positive pressure pulse (usually in the range of 10-100 MPa) and then followed by a small negative tensile wave.[2]



Radial pressure waves, on the other hand, have a significantly lower peak pressure pulse (usually 0.1 to 1 MPa) so they are not technically a shockwave in physics terms.[2] Most RPW machines generate radial pressure waves using a pneumatic system. During use, compressed air is released via a valve into the barrel of a hand-held applicator which contains a small projectile. The projectile is driven by the compressed air into a transmitter at the end of the applicator where the kinetic energy is converted into acoustic waves at the skin surface. The waves then travel radially into the adjacent tissue, hence the name radial pressure wave. Because these waves propagate outward from the transmitter, they stay closer to the surface of the skin affecting more superficial tissues.



It can be confusing that RPW falls under the umbrella term of ESWT since it is not an actual shockwave. However, since FSW and RPW affect tissue in the same way, and they can produce similar results when used at the same dose for musculoskeletal conditions,[3] both waveforms are commonly referred to as shockwaves. Regardless of terminology, the critical point to understand is that both FSW and RPW have a wealth of studies demonstrating their effectiveness in treating multiple musculoskeletal conditions,[3,4] and they have made a name for themselves in the rehabilitation, physical therapy, and chiropractic fields.

Read on for summaries of recent research supporting the use of shockwave therapy for common clinical conditions.

Effect of Radial Extracorporeal Shock Wave Therapy on Pain Intensity, Functional Efficiency, and Postural Control Parameters in Patients with Chronic Low Back Pain: a Randomized Clinical Trial

Karolina Walewicz, Jakub Taradaj, Maciej Dobrzyński , Mirosław Sopel, Mateusz Kowal, Kuba Ptaszkowski and Robert Dymarek

Published in: Journal of Clinical Medicine, 2020 https://doi.org/10.3390/jcm9020568

This study was conducted to determine whether radial extracorporeal shockwave therapy (rESWT) can reduce pain and improve function in patients with chronic low back pain.

Forty patients with low back pain for at least 3 months were included in the study. Patients were randomized to receive either:

- ESWT + core stability exercises
- sham rESWT + core stability exercises

rESWT treatment was given twice a week for 5 weeks. Each session lasted for 7 minutes and rESWT parameters were set at 2.5 bar, 2000 pulses, 5 Hz. Patients in the sham group went through the same rESWT protocol as those in the active treatment group except the radial pressure waves were inhibited by a polyethylene cap on the handpiece.

The main outcome measures included the Laitinen Pain Scale (LPS), Roland-Morris Questionnaire (RMQ) to evaluate function, and the original Schober Test (OST) to assess range of motion. Measurements were taken at baseline, once treatment was completed, and at 1 and 3 months follow-up.

While both groups had some improvement in pain during treatment, the group that received rESWT had significantly lower pain scores at the 1 and 3 month follow-up compared to the sham group. The pain scores increased for the sham group during the follow-up period.

Both groups also showed an increase in function and range of motion during treatment. However, the group that received rESWT had significantly better function and range of motion at the 3 month follow-up compared to the sham group.

This paper concludes that incorporating rESWT into a conventional core stability exercise program can significantly improve the pain and function of patients with chronic low back pain. These improvements continued out to 3 months post-treatment indicating that rESWT can have long-term therapeutic effects.

Adding rESWT to the physical therapy protocol can significantly improve outcomes for patients with chronic low back pain and give them relief long-term.

Comparison of Radial Extracorporeal Shock Wave Therapy and Traditional Physiotherapy in Rotator Cuff Calcific Tendinitis Treatment

Tomris Duymaz and Dilşad Sindel

Published in: Archives of Rheumatology, 2019
DOI: 10.5606/ArchRheumatol.2019.7081

This study was conducted to determine whether adding radial extracorporeal shockwave therapy (rESWT) to a conventional physiotherapy program would be more effective at improving pain and function in patients with chronic rotator cuff calcific tendinitis (RCCT) than conventional physiotherapy alone.

Eighty patients with RCCT were randomized to one of the following 2 groups:

- **Conventional physiotherapy (PT):** consisted of ultrasound, transcutaneous electrical nerve stimulation, ice, range of motion (ROM) exercises, and stretching. PT occurred 5 days a week for 4 weeks.
- **rESWT + PT:** consisted of conventional PT plus rESWT once per week for 4 weeks. Each treatment session included 1500 pulses, 150 pulses/min. Treatments started with a low energy density of 0.03 mJ/mm^2 and increased to 0.28 mJ/mm^2 as tolerated. The supraspinatus, infraspinatus, teres minor, and subscapularis tendons were treated.

Shoulder pain was assessed using the Visual Analog Scale (VAS) pre and post-treatment. After 4 weeks of treatment, all patients had a significant reduction in pain. However, the rESWT group improved significantly more than the PT only group. The rESWT group pain scores decreased by 82% while the PT group pain scores decreased by 66%.

Shoulder function was evaluated pre and post-treatment with ROM measurements and an abbreviated version of the Disabilities of the Arm, Shoulder and Hand questionnaire (QuickDASH). All patients had improved function after treatment, but only the rESWT group had statistically significant changes in all ROM tests and the QuickDASH.

The take-home message from the study is that while conventional PT helped improve pain, ROM, and functional outcome scores for RCCT patients, adding rESWT to conventional PT resulted in even greater improvements in all outcome measures.

Short-and Intermediate-Term Results of Extracorporeal Shockwave Therapy for Noninsertional Achilles Tendinopathy

Nasr Awad Abdelkader, Mohamed Nasser Kise Helmy, Nadia Abdelazem Fayaz, Emad S. B. Saweeres

Published in: Foot & Ankle International, 2021, http://doi.org/10.1177/1071100720982613

This study was conducted to determine the effectiveness of adding extracorporeal shockwave therapy (ESWT) to conventional conservative physical therapy for treating chronic noninsertional Achilles tendinopathy (NAT).

Fifty patients with a diagnosis of chronic NAT were enrolled in the study. Patients were randomized into 2 groups:

- ESWT + Conservative Physical Therapy
- Sham ESWT + Conservative Physical Therapy

Conservative physical therapy consisted of eccentric training and stretching for 4 weeks. During the same 4 weeks, patients received ESWT or sham ESWT once per week.

ESWT was performed with a radial pressure wave device. Parameters for each session were 2000 pulses, 3 bar, 8 Hz. Sham ESWT was conducted in a similar fashion but no energy was emitted from the device.

Patient function and pain were assessed using the Victorian Institute of Sport Assessment-Achilles questionnaire (VISA-A) and the visual analog scale (VAS), respectively. Patients completed he VISA-A and VAS at baseline, 1 day after treatment ended, and then approximately 16 months after baseline for a long-term outcome assessment.

Both groups had significant improvement in function and pain after 4 weeks of treatment. However, the ESWT group had significantly more improvement compared to the sham group. The median pain score decreased by 87.5% in the ESWT group and by only 12.5% in the sham group.

Both groups also had significant improvement in function and pain at the long-term follow-up. Despite an increase in pain score and decrease in functional score compared to post-treatment, the ESWT group continued to have significantly better outcomes compared to the sham group at 16 months.

The study concludes that combining ESWT with eccentric training and stretching results in significantly better outcomes for patients in the short term. This is demonstrated by the median pain score for the ESWT group decreasing by 75% more than the sham group post-treatment.

This study also demonstrates that the positive clinical effects of ESWT continue to be seen out to 16 months.

The authors strongly recommend adding ESWT to the treatment plan for patients with NAT.

HOW EFFECTIVE IS THE INTELECT® RPW 2 DEVICE AT IMPROVING PATIENTS' PAIN?

WHAT WE DID:

Global survey of **36** HCPs experienced with the Intelect® RPW 2.

We analyzed data from **385** patient cases

Patients had a minimum of **3** completed treatment sessions

Reviewed data from **April 2020 – September 2023**

WHAT WE FOUND:

HCPs treated:
- Tendon Disorders
- Myofascial Trigger Points
- Activation of Muscle & Connective Tissue

RPW 2 was used by healthcare providers to treat over 20 anatomical locations

Per data from validated pain scales
87%
of patients showed improvement in pain

Healthcare providers reported :

96.2% of patients showed Improvement in Activation of muscle and connective tissue after treatment

99% of patients experienced relief from their muscle aches and pains

99.6% of patients showed improvement in disorders of tendon insertion

100% of patients showed improvement in myofascial trigger points

CONCLUSION

RPW 2 IS EFFECTIVE AT REDUCING PAIN AND IMPROVING PATIENT OUTCOMES ACROSS A VARIETY OF MUSCULOSKELETAL CONDITIONS IN REAL-WORLD CLINICAL PRACTICE.

Enovis. (2023). Post-Market Clinical Follow-Up Retrospective Study Report: Intelect® Radial Pressure Wave (RPW) 2. Internal Enovis report. Unpublished.

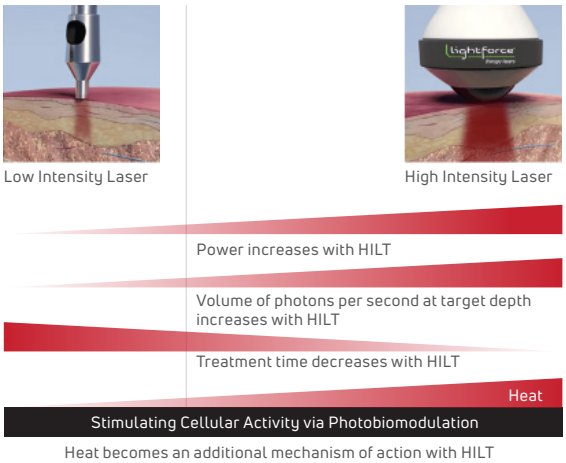
LASER THERAPY TERMINOLOGY

"Cold Laser", "Low-Level Laser Therapy (LLLT)", and "Low-Intensity Laser Therapy (LILT)" are all terms commonly used in the laser therapy field.[5] In general, these terms refer to "treatment using irradiation with light of low power intensity so that the effects are a response to the light and not due to heat."[6] With the recent advancement of laser technology producing higher power devices (>0.5 W), another term, "High-Intensity Laser Therapy (HILT)," has entered the scientific literature and clinical space. HILT can create warmth on the surface of the skin during treatment but the main mechanism of action, like with the lower power lasers, is biochemical effects from light rather than heat.

Unfortunately, these terms do not comprehensively describe the mechanisms related to therapy lasers, nor do they adequately distinguish them from other light-based therapies. This lack of clarity has led to significant confusion about the laser modality and a need for better nomenclature.[5] In September 2014, the North American Association for Light Therapy (NAALT) and the World Association for Laser Therapy (WALT) convened and agreed upon the term "Photobiomodulation Therapy" as the preferred nomenclature. Photobiomodulation Therapy (PBM) was added to the MeSH database in November 2015 and is the preferred name for researchers and key opinion leaders in the field because it more clearly characterizes the modality.[5]

Even with this declaration from the laser therapy organizations, a variety of terms continue to be used and confusion remains. The key point is that laser therapy, no matter the terminology used, affects the body through a process called photobiomodulation (PBM). "PBM is the mechanism by which nonionizing optical radiation in the visible and near-infrared spectral range is absorbed by endogenous chromophores to elicit photophysical and photochemical events at various biological scales without eliciting thermal damage."[7] It is a mechanism that leads to "physiological changes and therapeutic benefits,"[7]such as relief from muscle pain, arthritis, joint stiffness, and muscle spasm.

While both high and low power lasers can deliver photobiomodulation therapy, it is important to note that high power lasers differentiate themselves from their low power counterparts. HILT not only provides photobiomodulation therapy, but it also alleviates pain and stiffness through heat. HILT can reach deeper target tissues and reduce treatment times due to the higher power, and recent studies demonstrate that HILT can give patients better results than those treated with a low power laser.[7,8,9]



Heat becomes an additional mechanism of action with HILT

Read on for summaries of recent research supporting the use of photobiomodulation therapy for common clinical conditions.

Photobiomodulation Therapy Plus Usual Care is Better than Usual Care Alone for Plantar Fasciitis: A Randomized Controlled Trial

Ann K Ketz, Juanita Anders, Judy Orina, Betty Garner, Misty Hull, Nicholas Koreerat, Jeff Sorensen, Candice Turner, James Johnson

Published in: International Journal of Sports Physical Therapy, 2024, 19(1); DOI: 10.26603/001c.90589

The purpose of this study was to assess the clinical impact of photobiomodulation therapy (PBMT) on pain and function in people with plantar fasciitis (PF). Specifically, the authors wanted to compare a standardized dose (10 J/cm^2) with different output power to see if outcomes were different.

Design
Prospective, randomized controlled clinical trial

Participants

114 patients who were between 18-65 with symptoms of PF for at least 3 months were included and randomized into 3 groups.

- Usual Care (UC) – 6 week exercise program completed daily
- UC + PBMT delivered at 10W
- UC + PBMT delivered at 25W
- PBMT treatments were delivered 3x/week for 3 weeks using a 25 W high power LightForce® therapy laser

Results

Pain and function were measured over a short term (6 weeks) for all groups and long term (6 months) for the PBMT groups.

Pain

After the 3 weeks of treatment, participants treated with PBMT (10W or 25W) had reductions in pain compared to the usual care group. The pain reduction was greater than 2 points on the visual analogue scale, meaning that the reduction was CLINICALLY meaningful as well as statistically significant. This reduction in pain was maintained out to 6 weeks. There were no differences between the 10W and 25W PBMT groups. It was also found that participants in the PBMT groups used less pain medication (non-steroidal anti-inflammatory drugs) over time than the usual care group. Long-term follow-up showed stable pain scores in both PBMT groups.

Function

Both PBMT groups had clinically significant changes in the sports subscale of the Foot and Ankle Ability Measure compared to the usual care group.

Tolerance

No adverse events were reported for PBMT treatment indicating that treatment is safe. All participants tolerated treatment well, regardless of Fitzpatrick skin scale.

Take Home Message

PBMT added to usual care resulted in significant improvement of pain compared to usual care only and the improvement was maintained for up to six months.

Dosing is key! 10 J/cm^2 is a safe and effective dose for treating patients with plantar fasciitis. Increasing output power allows for safe and effective treatment at a faster rate of delivery.

Why were the outcomes similar for 10W and 25W?

It makes sense that since plantar fascia is not a deep tissue, higher power/irradiance is not required to provide effective treatment. Additional studies should be done in deeper tissues to reinforce the benefits of higher power.

It is important to note the benefit in this study of using the higher power 25W laser which allowed clinicians to treat 2.5x faster than when using 10W.

Clinical effectiveness of multi-wavelength photobiomodulation therapy as an adjunct to extracorporeal shock wave therapy in the management of plantar fasciitis: a randomized controlled trial

Mary Kamal Nassif Takla and Soheir Shethata Rezk-Allah Rezk

Published in: Lasers in Medical Science, 2019 https://doi.org/10.1007/s10103-018-2632-4

This clinical trial evaluated the effectiveness of combining extracorporeal shockwave therapy (ESWT) with photobiomodulation therapy (PBMT) to treat pain and disability in patients with plantar fasciitis.

One hundred twenty patients with plantar fasciitis for more than 6 months and unresponsive to conservative treatment were enrolled in the trial. Patients were randomized to one of the following groups:

- **ESWT:** Patients in this group were treated with the Chattanooga® Intelect® Focus Shockwave. Treatment sessions were completed once a week for 3 weeks and consisted of 2000 pulses at an energy level between 0.22 and 0.28 mJ/mm^2.
- **PBMT:** Patients in this group received photobiomodulation therapy at a dose of 2.8 J/cm^2 for 60 seconds at each session. Treatments were completed 3 times a week for 3 weeks.
- **ESWT + PBMT:** Treatment parameters for this group were the same as described for each of the single therapy groups. Patients received one ESWT and 3 PBMT treatments per week. Once per week, ESWT and PBMT were given consecutively with ESWT being administered prior to PBMT.
- **Sham PBMT:** Patients in this group received sham PBMT 3 times a week for 3 weeks where no power was emitted from the device.

Study outcomes included pressure pain threshold (PPT), VAS pain score, and the functional foot index disability subscale (FFI-d). The ESWT, PBMT, and ESWT + PMBT groups showed improvement in all outcome scores after 3 weeks of treatment, with further improvement at the 12 week follow-up. The ESWT + PBMT group was superior to either treatment alone in reducing pain and disability.

VAS pain scores for the ESWT + PBMT group decreased by 90.5% at the 12 week follow-up and the FFI-d scores decreased by 56.2%! In comparison, the Sham PBMT group VAS pain scores increased by 3.8% and the FFI-d scores increased by 0.6%.

The authors concluded that both ESWT and PBMT are effective treatments for reducing pain and improving function in patients with plantar fasciitis. However, combining the two treatments gives the best results.

Effectiveness of High Power Laser Therapy on Pain and Isokinetic Peak Torque in Athletes with Proximal Hamstring Tendinopathy: a Randomized Trial

Sachin Verma, Vandana Esht, Aksh Chahal, Gaurav Kapoor, Sorabh Sharma, Ahmad H. Alghadir, Masood Khan , Faizan Z. Kashoo , and Mohammad A. Shaphe

Published in: BioMed Research International, 2022, https://doi.org/10.1155/2022/4133883

This study was conducted to determine whether high power laser therapy (HPLT), also referred to as Photobiomodulation Therapy (PBMT), has an effect on proximal hamstring tendinopathy (PHT) symptoms.

Forty athletes with PHT were randomized to one of the following 2 groups:

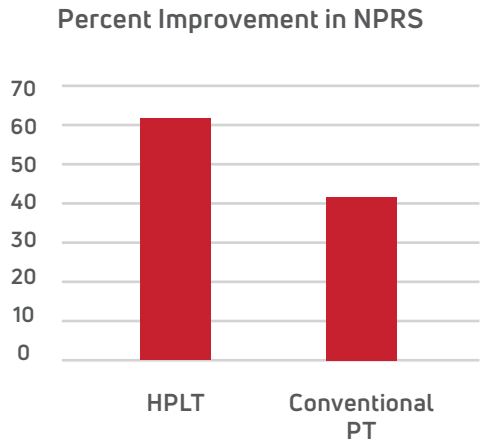
- **Conventional therapy:** The athletes completed ultrasound therapy, moist heat treatments, and home exercises.
- **HPLT/PBMT:** Athletes received treatment with a 10W high power LightForce® therapy laser at 5W, 50 J/cm^2 for a total energy dose of 1800 J per session. Treatment was focused on the hamstring tendon near the ischial tuberosity. Each session lasted for 6 minutes.

Both groups completed their designated treatments 3 days a week for 3 weeks.

Pain was assessed using the Numeric Pain Rating Scale (NPRS). The study also used an isokinetic dynamometer to measure isokinetic peak torque (IPT) of the hamstring muscle. The authors suggest that a change in IPT could be another indication of pain relief because athletes experiencing less pain will be able to apply more force on the muscle.

Pain scores and IPT measurements were taken prior to treatment and at the end of 3 weeks of treatment.

After treatment, both the HPLT/PBMT group and the conventional therapy group had a clinically significant reduction in pain score. However, the HPLT/PBMT group improved more than the conventional therapy group with the average pain score decreasing to a mild level.



**statistically significant difference between the groups*

While there was not a significant difference between the groups in IPT, the HPLT/PBMT group did have more improvement in IPT compared to the conventional therapy group. The lack of statistical difference between groups could be due to the HPLT/PBMT group not completing any exercise treatments.

This study demonstrated that HPLT/PBMT is more effective than a conventional therapy program at reducing pain from PHT. HPLT/PBMT reduced the average pain score to a mild level, and this decrease in pain may also have resulted in functional improvements for the athlete

Efficacy of Low-level Laser Versus High-intensity Laser Therapy in the Management of Adhesive Capsulitis: A Randomized Clinical Trial

Banu Ordahan, Fatih Yigit, Cevriye Mülkoglu

Published in: Saudi Journal of Medicine & Medical Sciences, 2023 doi.org/10.4103/sjmms.sjmms_626_22

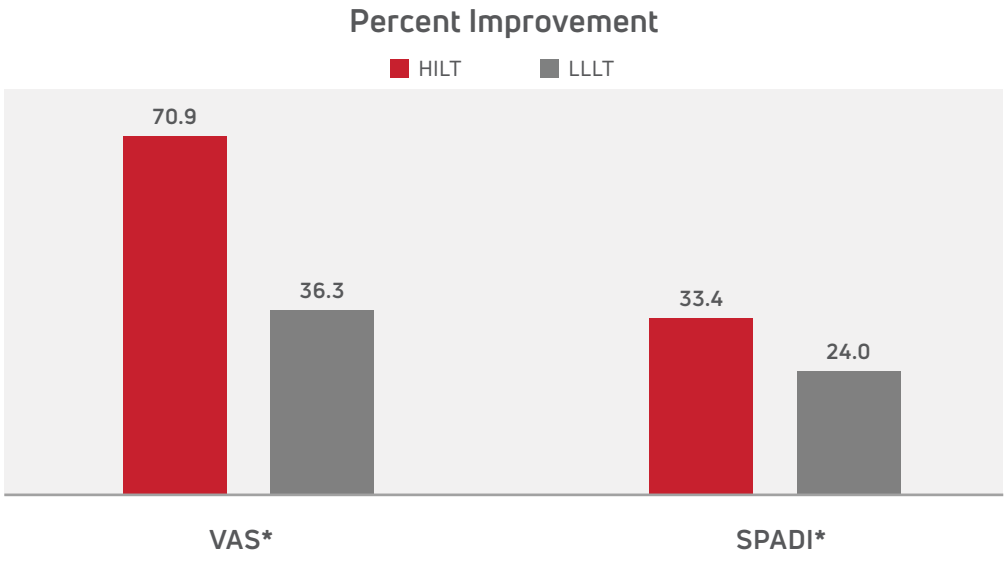
Previous studies have demonstrated that both low-level laser therapy (LLLT) and high-intensity laser therapy (HILT) are effective at reducing pain and improving function in patients with adhesive capsulitis (AC). This study was conducted to compare LLLT and HILT to determine which laser modality is the most effective treatment option for AC.

Forty patients with a diagnosis of AC were randomized to either HILT or LLLT. Both groups had laser treatment sessions 3 times per week for 3 weeks. Both groups also received 25 minutes of exercise therapy 5 times per week for 3 weeks.

- Patients in the LLLT group received treatment with a low-level laser with an output power of 240 mW. At each session, 9 points around the glenohumeral joint were treated for 50 seconds each at 3 J/cm^2 for a total treatment time of 7.5 minutes.
- Patients in the HILT group, for the first 3 sessions, were treated along the glenohumeral joint with pulsed wave therapy for 75 seconds, 8W, 10 J/cm^2. The following 6 sessions used continuous wave therapy for 30 seconds, 12W, 120 J/cm^2.

The primary outcome of the study was pain reduction measured by the Visual Analog Scale (VAS). A secondary outcome of the study was assessing pain and functional limitations using the Shoulder Pain and Disability Index (SPADI). After 3 weeks of laser and exercise treatment, both groups had significant improvement in the 2 outcome measures, but the HILT group had significantly better results than the LLLT group.

The study concluded that HILT is the more effective treatment option when compared to LLLT to reduce pain and improve disability in AC.



**statistically significant difference between the groups*

The effect of high-intensity versus low-level laser laser therapy in the management of plantar fasciitis: a randomized clinical trial

Banu Ordahan, Ali Yavuz Karahan, Ercan Kaydok

Published in: Lasers in Medical Science, 2018 https://doi.org/10.1007/s10103-018-2497-6

This clinical trial compared high-intensity laser therapy (HILT) to low-level laser therapy (LLLT) in treating plantar fasciitis symptoms.

Seventy-five patients with plantar fasciitis unresponsive to conservative treatment were enrolled in the trial. Patients were randomized to receive HILT or LLLT. Both groups completed 3 treatment sessions per week for 3 weeks.

- **HILT group** Patients received treatment with a 12W laser. The first 3 sessions used pulsed wave therapy for 75 seconds, 8W, 6 J/cm^2. The following 6 sessions used continuous wave therapy for 30 seconds, 6W, 120-150 J/cm^2.
- **LLLT group** Patients received treatment from a laser with an output power of 240 mW. Treatment was given over the tendon insertion at 0.16W/cm^2 and over the medial border of the fascia at 0.08 W/cm^2. Each treatment session was for 157.5 seconds.

In addition to laser therapy, both groups were instructed to wear an insole and to complete home exercises twice daily.

Patients were assessed for pain using the visual analogue scale (VAS) and Heel Tenderness Index (HTI). They were evaluated for function and quality of life using the Foot and Ankle Outcomes Score (FAOS).

After 3 weeks of treatment, both the HILT and LLLT groups showed significant improvement in all of the outcome measures. However, the HILT group improved significantly more than the LLLT group. For example, VAS scores decreased by 33.4% for the LLLT group but the HILT group scores decreased by 69%.

It can be concluded from the study that HILT and LLLT improve patient pain, function, and quality of life. However, HILT gives plantar fasciitis patients even better outcomes than LLLT.

Effects of High-Intensity Laser in Treatment of Patients with Chronic Low Back Pain

Marija Gocevska, Erieta Nikolikj-Dimitrova, Cvetanka Gjerakaroska-Savevska

Published in: Macedonian Journal of Medical Sciences https://doi: 10.3889/oamjms.2019.117

This study was conducted to compare high-intensity laser therapy (HILT) to ultrasound therapy when used in combination with exercise in the treatment of chronic low back pain.

The study enrolled fifty-four patients who had back pain for at least 3 months. Patients were divided into 2 treatment groups.

- **HILT + Exercise** Patients received 5 sessions of laser therapy per week for 2 weeks. Dose was delivered at 4W, 1.5 J/cm^2 over L1-L5 and S1.
- **Ultrasound + Exercise** Patients received 5 sessions of ultrasound therapy per week for 2 weeks. Ultrasound was delivered at an intensity of 0.5 W/cm^2.

Patients in both groups completed at-home strengthening exercises 15 min/day for 3 months. Outcome measures for the study included the Numeric Pain Rating Scale, Schober's test for lumbar range of motion, and the Oswestry Disability Index to assess function. Outcome measures were assessed at baseline, after 2 weeks of treatment, and at 3 months follow-up.

- **Pain and Function** The HILT group had significantly greater improvement in pain and function compared to the ultrasound group after 2 weeks of treatment and at 3 months follow-up. The average pain score decreased by 74% in the HILT group at the 3 month follow-up while the ultrasound group pain score decreased by 30%.
- **Range of Motion** At 3 months follow-up, the HILT group had significantly increased lumbar flexion compared to the ultrasound group.

Take Home Message

- The study concluded that HILT significantly reduced patients' chronic low back pain and improved their range of motion and function. The positive results were maintained long-term out to 3 months.
- HILT can be used in combination with exercise to give patients better outcomes for their chronic low back pain.

Short-term Efficacy Comparison of High-intensity and Low-intensity Laser Therapy in the Treatment of Lateral Epicondylitis: A Randomized Double-blind Clinical Study

Ercan Kaydok, Banu Ordahan, Sezin Solum, Ali Yavuz Karahan

Published in: Archives of Rheumatology, 2020 https://doi.org/10.5606/ArchRheumatol.2020.7347

This clinical trial compared high-intensity laser therapy (HILT) to low-intensity laser therapy (LILT) in treating lateral epicondylitis symptoms.

Sixty patients with unilateral lateral epicondylitis were randomized to receive HILT or LILT. Patients were blinded to which treatment they received. Both groups completed 9 treatment sessions in 3 weeks.

- **HILT group** Patients received treatment with a 12W laser. The first 3 sessions used pulsed wave therapy for 75 seconds, 8W, 6 J/cm^2. The following 6 sessions used continuous wave therapy for 30 seconds, 6W, 120-150 J/cm^2.
- **LILT group** Patients received treatment from a laser with an output power of 240 mW. Treatment was given over 6 areas of the lateral epicondyle each about 0.5 cm^2. Power density was 2.4 J/cm^2 for 30 seconds per spot.

Study outcomes included pain assessment (VAS), upper extremity function (QDASH questionnaire), quality of life (SF-36), and grip strength.

After 3 weeks of treatment, both the HILT and LILT groups showed significant improvement in pain. Pain scores decreased by 59.7% and 53.5% for the HILT and LILT groups, respectively.

Both groups also showed significant improvement in grip strength, QDASH score, and the SF-36 physical component score. However, the HILT group had significantly better outcomes in these functional scores than the LILT group.

It can be concluded from the study that both HILT and LILT are effective treatment options for managing pain and disfunction in lateral epicondylitis, but HILT can give patients even better functional outcomes than LILT.

HOW EFFECTIVE ARE LIGHTFORCE® THERAPY LASERS AT IMPROVING PATIENTS' PAIN?

WHAT WE DID:

We surveyed **55** healthcare providers globally experienced with LightForce therapy lasers

We analyzed data from **374** patient cases

Patients had a minimum of **4 weeks** of treatment with either the LightForce FXi, XPi, or XLi

Reviewed data from **December 2020–December 2023**

WHAT WE FOUND:

87% clinically meaningful reduction in pain in tendinopathy

84% clinically meaningful pain reduction in arthritis

Healthcare providers reported:

88% relief in muscle pain

97% relief in joint stiffness

98% relief in muscle stiffness

Patients were treated with LightForce therapy lasers for muscle pain, joint pain, muscle stiffness, and joint stiffness

Healthcare providers participating in the study were pain specialists, physical medicine and rehabilitation (PM&R) specialists, and podiatrists

Laser was used by healthcare providers to treat over **15** anatomical locations

Per data from validated pain scales, 91% of patients had a clinically meaningful reduction in pain after treatment with laser

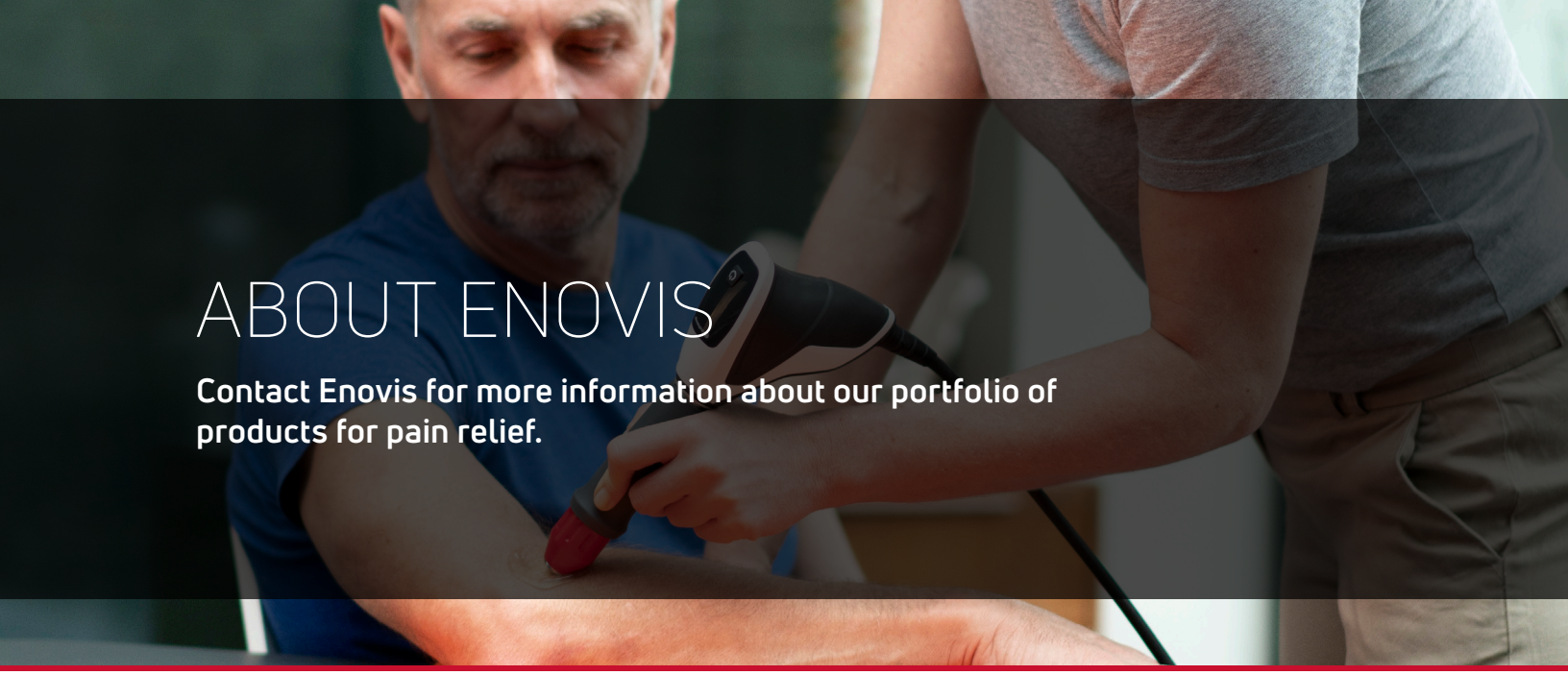
REAL RESULTS FOR REAL PAIN

LIGHTFORCE THERAPY LASERS EFFECTIVELY REDUCE PAIN AND STIFFNESS.

Enovis (2023). Post-Market Clinical Follow-Up Retrospective Study Report: LightForce® Therapy Lasers. Internal Enovis report. Unpublished.

2024 LASER THERAPY RESEARCH UPDATE

Watch an on-demand webinar review of recent research at lightforcemedical.com/2024-laser-research-update/



ABOUT ENOVIS

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FXi Therapy Laser

25W **LightForce®**
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ABOUT ENOVIS™

Enovis™ (NYSE: ENOV) is a medical technology company focused on developing clinically differentiated solutions that generate measurably better patient outcomes and transform workflows.

Powered by a culture of continuous improvement, extraordinary talent and innovation, we 'create better together' by partnering with healthcare professionals. Our extensive range of products, services and integrated technologies fuel active lifestyles.

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EGX is our unique business system that guides the way we operate. It provides the tools, techniques, and values that ensure we are continuously improving our ability to meet or exceed customer requirements each and every day.

LAUNCH	ASSOCIATES	MEDICAL DEVICES	2022 REVENUE
2022	7,000+	1,000+	$1.6B

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- Athletic Braces
- Muscle Stimulation

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- Off-loading Braces
- Back Braces
- Cold Therapy

SURGICAL
- Shoulder
- Knees
- Hips
- Foot / Ankle

RECOVERY
- Post-op Braces
- Walker Boots
- Cold Therapy

REHAB
- Electrotherapy
- Laser Therapy
- Heat / Cold Therapy
- Traction Devices

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MKT00-14196

References

1. d'Agostino MC, Craig K, Tibalt E, Respizzi S. Shock wave as biological therapeutic tool: From mechanical stimulation to recovery and healing, through mechanotransduction. Int J Surg. 2015;24(Pt B):147-153. doi:10.1016/j.ijsu.2015.11.030
2. What are shock waves? Storz Medical. Accessed February 28, 2025. https://www.storzmedical.com/us/physics-and-technology/.
3. Schmitz C, Császár NB, Milz S, et al. Efficacy and safety of extracorporeal shock wave therapy for orthopedic conditions: a systematic review on studies listed in the PEDro database. Br Med Bull. 2015;116(1):115-138. doi:10.1093/bmb/ldv047
4. Schroeder AN, Tenforde AS, Jelsing EJ. Extracorporeal Shockwave Therapy in the Management of Sports Medicine Injuries. Curr Sports Med Rep. 2021;20(6):298-305. doi:10.1249/JSR.0000000000000851
5. Anders JJ, Lanzafame RJ, Arany PR. Low-level light/laser therapy versus photobiomodulation therapy. Photomedicine and Laser Surgery. 2015; 33(4):183-184. doi:10.1089/pho.2015.9848
6. National Center for Biotechnology Information website. Ncbi.nlm.nih.gov. Low-Level Light Therapy – MeSH – NCBI. 2016. Available at: http://www.ncbi.nlm.nih.gov/mesh/?term=photobiomodulation
7. Anders JJ, Arany PR, Baxter GD, Lanzafame RJ. Light-Emitting Diode Therapy and Low-LevelLight Therapy Are Photobiomodulation Therapy. Photobiomodul Photomed Laser Surg. 2019;37(2):63-65. doi:10.1089/photob.2018.4600
8. Kaydok E, Ordahan B, Solum S, Karahan AY. Short-term Efficacy Comparison of High-intensity and Low-intensity Laser Therapy in the Treatment of Lateral Epicondylitis: A Randomized Double-blind Clinical Study. Arch Rheumatol. 2019;35(1):60-67. Published 2019 Apr 24. doi:10.5606/ArchRheumatol.2020.7347
9. Ordahan B, Karahan AY, Kaydok E. The effect of high-intensity versus low-level laser therapy in the management of plantar fasciitis: a randomized clinical trial. Lasers Med Sci. 2018;33(6):1363-1369. doi:10.1007/s10103-018-2497-6