

INNOVATIVE TECHNOLOGIES IN SPORTS AND GENERAL REHABILITATION

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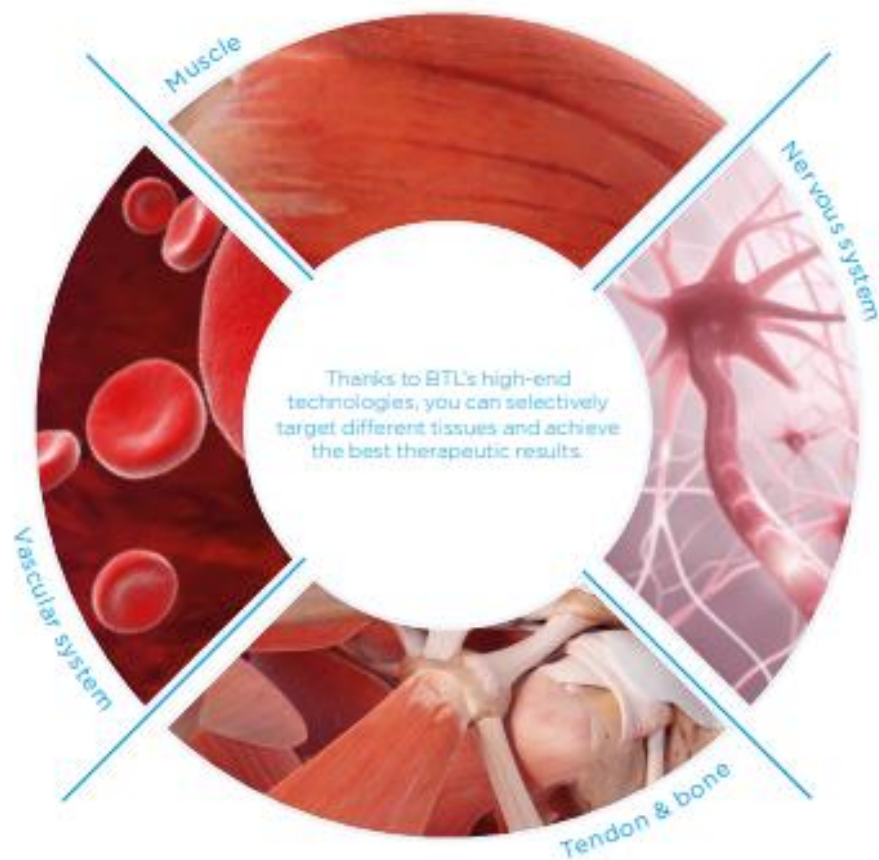
Smart Growth

INNOVATIVE TECHNOLOGIES IN REHABILITATION

TR-THERAPY



HIGH INTENSITY LASER



SUPER INDUCTIVE SYSTEM



SHOCKWAVE THERAPY



WHAT YOU WILL LEARN

- **What** each technology targets (how it works)?
- **Why** combining therapies can enhance rehabilitation?
- **How** clinical cases highlight successful treatment strategies? Who of famous athletes use advanced methods?

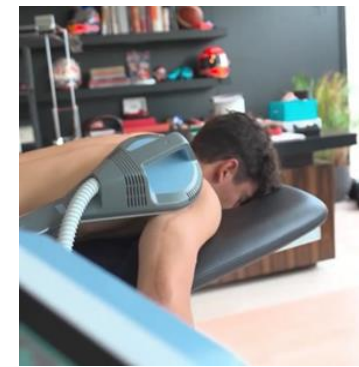
1) Therapy combinations



2) Clinical evidence and cases



3) Real-world experience



THERAPY COMBINATIONS – EXAMPLE (CARPAL TUNNEL SYNDROME)

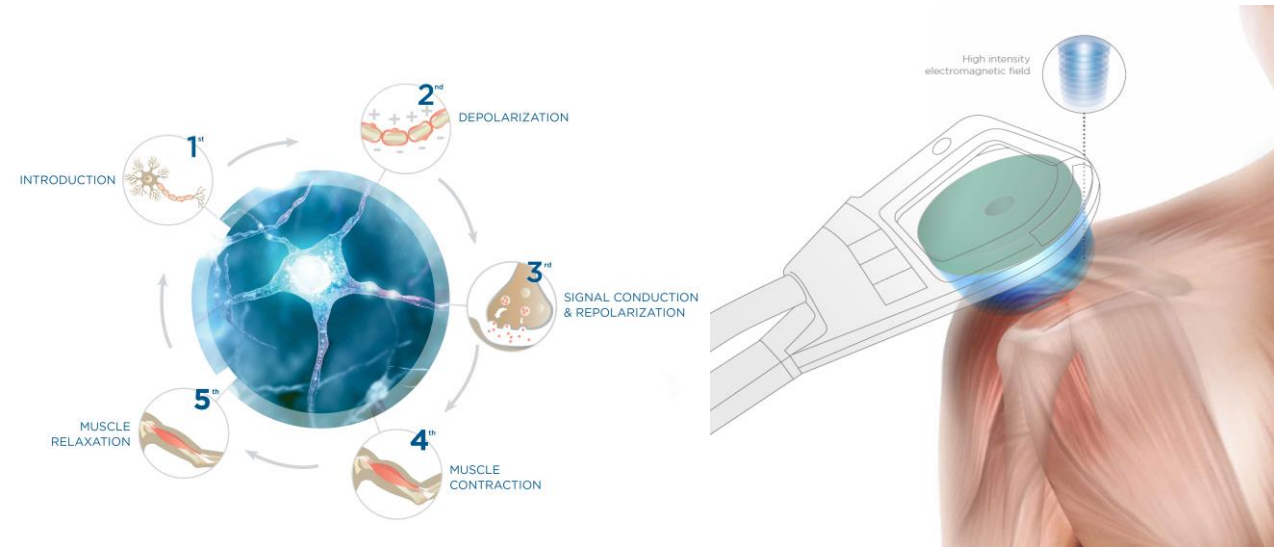


PULSED ELECTROMAGNETIC FIELD SUPER INDUCTIVE SYSTEM



SUPER INDUCTIVE SYSTEM

- Advanced **electromagnetic therapy device** primarily used for musculoskeletal pain, soft tissue injuries
- **Mechanism:** depolarization of the nerve and muscle
- **Indications:** Neuromuscular and joint skeletal problems
- **Used for:**
 - **Pain management** (acute and chronic conditions)
 - Muscle stimulation
 - Joint mobilization
 - Fracture healing
 - Spasticity reduction

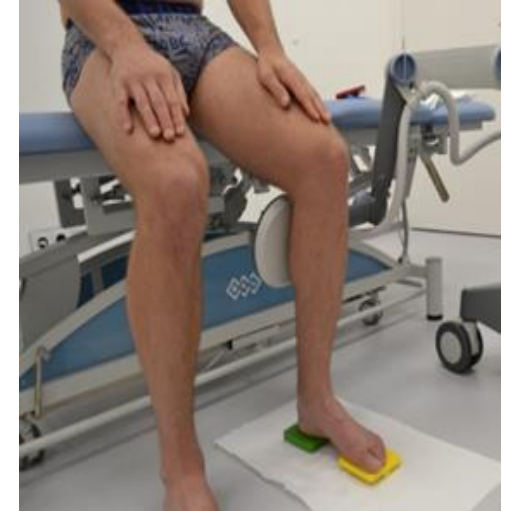


SUPER INDUCTIVE SYSTEM

- Penetrates completely through **all types of tissues**, from **skin to bone**
- Capable of inducing cellular and tissue responses - **depolarization of the nerve and muscle**
- Effects - **myostimulation**, tissue healing, suppressing inflammation, relieving pain
- Widely used in **sports medicine** (*Luigi C, Tiziano P., 2020*)

CLINICAL CASE - SIS IN ACHILLES TENDON RUPTURE

- A handball player after **Achilles tendon** rupture
- Applied for muscle strength improvement and to regain **physiological gait stereotype**
- Expected recovery time: 9 months, real recovery time: **6,5 months**



CLINICAL CASE – SUPER INDUCTIVE SYSTEM IN AMPUTATION

- Clinical case – patient after **below-knee amputation**
- Training muscles in **amputated leg**
- Challenges – discomfort of phantom pain
- Super Inductive System used for:
 - **Modulating pain sensation**
 - **Strengthening entire thigh**
 - Swelling reduction
 - Improved circulation
 - Trophic enhancement



CLINICAL CASE – SUPER INDUCTIVE SYSTEM IN ONGOING FRACTURE

- Clinical case – patient after fracture of distal fibula
- Electromagnetic field applied in fractures – supports **vascular and cartilage callus formation**
- SIS – applied for fracture healing
 - Applied the first day after fracture
 - Goal of the therapy: reduce pain, swelling and support fracture healing



CLINICAL EVIDENCE – SUPER INDUCTIVE SYSTEM IN FRACTURE MANAGEMENT

- **Aim:** Assess high-intensity electromagnetic stimulation for pain and edema after a phalanx fracture.
- **Methods:** 15 sessions with **BTL-6000**, pain (VNRS) and mobility measured.
- **Results:**
 - **Pain:** Reduced from 7 to 0.
 - **Edema:** Reduced from 8.2 cm to 7.0 cm.
 - **Mobility:** Significant improvement.
 - **Conclusion:** SIS effectively reduced pain and edema, supporting early fracture

Fracture Management with High-intensity Electromagnetic Stimulation: A Case Study

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ABSTRACT

Background: Cast immobilization is a common practice in the treatment of fractures. It helps to reduce pain and allows for protection and proper alignment of the segment. However, physical therapy is very limited during this inevitable conservative treatment. New treatment options, such as high-intensity electromagnetic stimulation, can be incorporated meanwhile to enhance the healing process and reduce the side effects of immobilization.

Objective: The aim was to reduce pain and edema following a phalanx fracture with the use of high-intensity electromagnetic stimulation.

Methods: The treatment consisted of 15 sessions scheduled every other day with high-intensity electromagnetic stimulation device - BTL-6000 Super Inductive System (BTL Industries Ltd.). We used the Verbal Numerical Rating Scale (VNRS) to evaluate pain, the posttraumatic edema was measured with a tape measure. We evaluated the active and passive range of motion using a goniometer.

Results: Both the pain at rest and during movement were significantly reduced, the posttraumatic edema diminished. The active and passive range of motion at the end of the therapy improved comparing to the baseline measures.

Conclusions: The high-intensity electromagnetic stimulation provides one of the few treatment options in the early management of post-fracture symptoms such as pain and edema.

Keywords: high-intensity electromagnetic stimulation, fracture

CLINICAL CASE – SUPER INDUCTIVE SYSTEM IN FRACTURES

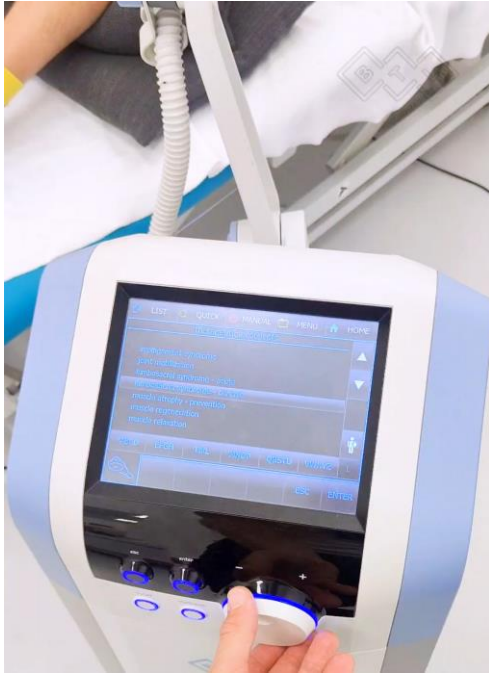
- 42-years-old volleyball player, left hallux fracture (11th of July 2022), Peru
- 20 sessions of **magnetotherapies** were applied afterward
 - Five weeks after the accident, no significant radiologic changes
- 22nd of July – 10 therapies with Super Inductive System began
- Protocol: fracture healing 10 sessions, 6 sessions oedema reduction
- 16th of September – significant radiologic **changes without pain**



CLINICAL CASES - SIS FOR STRENGTHENING IN ATHLETES

Clinical case I

- Patient, - ice-hockey player, 30 years old **after patellar subluxation**
- Therapy – alleviates pain, reduces swelling, improvement of circulation, trophic enhancement, muscle strengthening



- Exercise in close closed kinematic chain to provide stability, enhance joint proprioception, facilitate efficient muscle activation patterns



Clinical case II

- 32-yr-old football player, ACL reconstruction
- SIS – aiding to regaining muscle mass and strength through various exercises



CLINICAL CASE – SUPER INDUCTIVE SYSTEM IN UPPER LIMBS TREATMENT

Clinical case I

- Women immediately after immobilization because of fracture of humerus
- Therapy targeted to regaining muscle mass
 - Muscle activation and strengthening, circulation and healing enhancement, range of motion and flexibility improvement
- Goal: **muscle recovery and pain relief simultaneously**
- **Combination of active and passive mobilization**



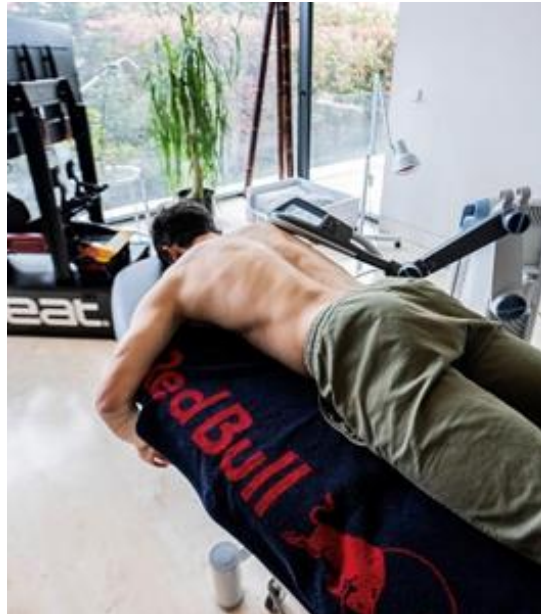
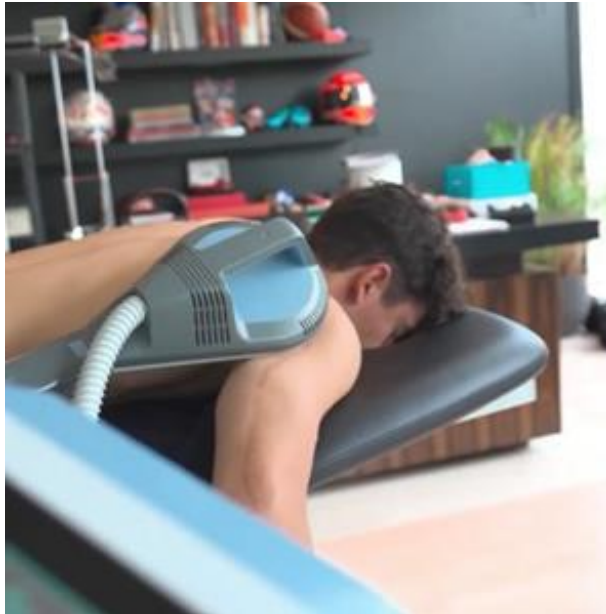
Clinical case II

- **Carpal tunnel syndrome**
- **Therapy goals:**
 - Reduce pain (numbness and discomfort in the wrist and hand) – acute/chronic
 - Alleviate pressure on the median nerve
 - Relieve tension in the flexor muscles of the forearm
 - Increase range of motion (restore wrist and finger mobility)



CLINICAL CASE - SIS AFTER ACL RECONSTRUCTION

- **Marc Marquéz** - Spanish professional motorcycle racer
- SIS applied for treatment of a shoulder



CLINICAL EVIDENCE – SUPER INDUCTIVE SYSTEM IN LOW BACK PAIN

Aim: To evaluate the effectiveness of **successive magnetic induction therapy** in reducing low back pain.

- **Subjects:** 30 patients (aged 25-40) with various low back pain conditions.
- **Methods:** **BTL 6000 Super Inductive System**, 20-minute daily sessions for 3-5 days; assessed using **Schober test** and **VAS**.
- **Results:** Significant **pain reduction** (6.44-7 points on VAS) and **mobility improvement** (2-2.66 cm increase).
- **Conclusion:** The therapy is **effective and fast**, with noticeable improvements in a short time without additional treatments.



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New therapeutic approaches in the treatment of low back pain

Marius NECULĂEȘ¹, Paul LUCACI²

Abstract

Medical recovery practices have welcomed more and more patients complaining about moderate or intense low back pain. *Aim:* This paper aims to demonstrate the efficiency of successive magnetic induction therapy on low back pain syndrome. We assume that the use of successive magnetic induction in the treatment of patients with low back pain will reduce significantly the pain manifestations at this level.

Methods: The study was conducted on 30 patients who displayed important low back pain and decreased lumbar spine mobility. The therapy applied - super inductive system - reduced significantly the pain threshold of these patients and improved the lumbar spine mobility, implicitly.

Results: In order to highlight the results, we interpreted graphically the values of the initial and final testing using the Microsoft Office Excel. There is no doubt that the mobility of the lumbar spine of patients improved considerably, some patients reported that their pain disappeared altogether, while others reported only a mild discomfort.

Conclusion: This study stands to highlight the efficiency of the Super Inductive System, a fact confirmed by the comparison between initial and final results.

Keywords: *herniated disc, successive magnetic induction, therapy.*

Rezumat

La cabinetele de recuperare medicală se prezintă un număr din ce în ce mai mare de persoane care acuză dureri lombare de intensitate medie sau mare.

Scop: Lucrarea de față își propune să demonstreze eficiența terapiei prin inducție magnetică succesivă asupra sindromului dureros lombar. Presupunem că folosirea inducției magnetice succesive în tratarea pacienților cu dureri lombare va reduce semnificativ manifestările dureroase de la acest nivel.

Metode: Studiul s-a realizat pe 30 de pacienți ce au prezentat dureri importante la nivel lombar și o diminuare semnificativă a gradului de mobilitate la nivelul coloanei vertebrale lombare. Terapia aplicată, Super Inductive System, a redus semnificativ pragul de durere al acestor pacienți și implicit a condus la îmbunătățirea mobilității coloanei lombare.

Rezultate: Pentru interpretarea rezultatelor am realizat reprezentarea grafică a valorilor obținute la testarea inițială și finală utilizând programul Microsoft Office Excel. Fără îndoială mobilitatea coloanei vertebrale lombare a pacienților s-a îmbunătățit considerabil, unii pacienți afirmând că durerea a dispărut în totalitate, în timp ce alții au afirmat că mai simt doar un mic disconfort.

Concluzie: Studiul evidențiază eficiența terapiei cu Super Inductive System, fapt confirmat prin compararea rezultatelor inițiale cu cele finale.

Cuvinte cheie: *hernie de disc, inducție magnetică succesivă, terapie.*

CLINICAL CASE – SIS and HIL IN CHRONIC BACK PAIN

- SIS – applied for management of **acute** and **chronic pain**
- Combination of Super Inductive System and High-Intensity Laser manage acute and chronic pain
- **Pain modulation, thermal effects, muscle relaxation, spinal mobilization**



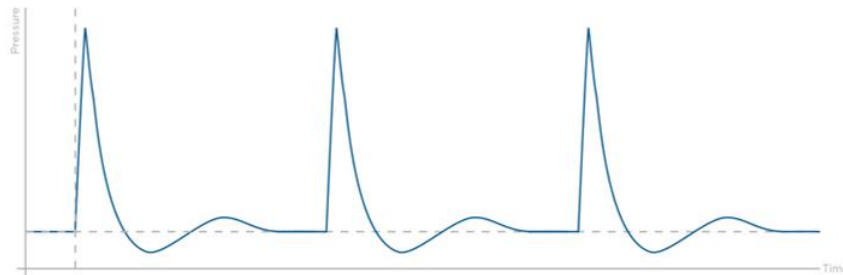
SHOCKWAVES

FOCUSED AND RADIAL SHOCKWAVE THERAPY

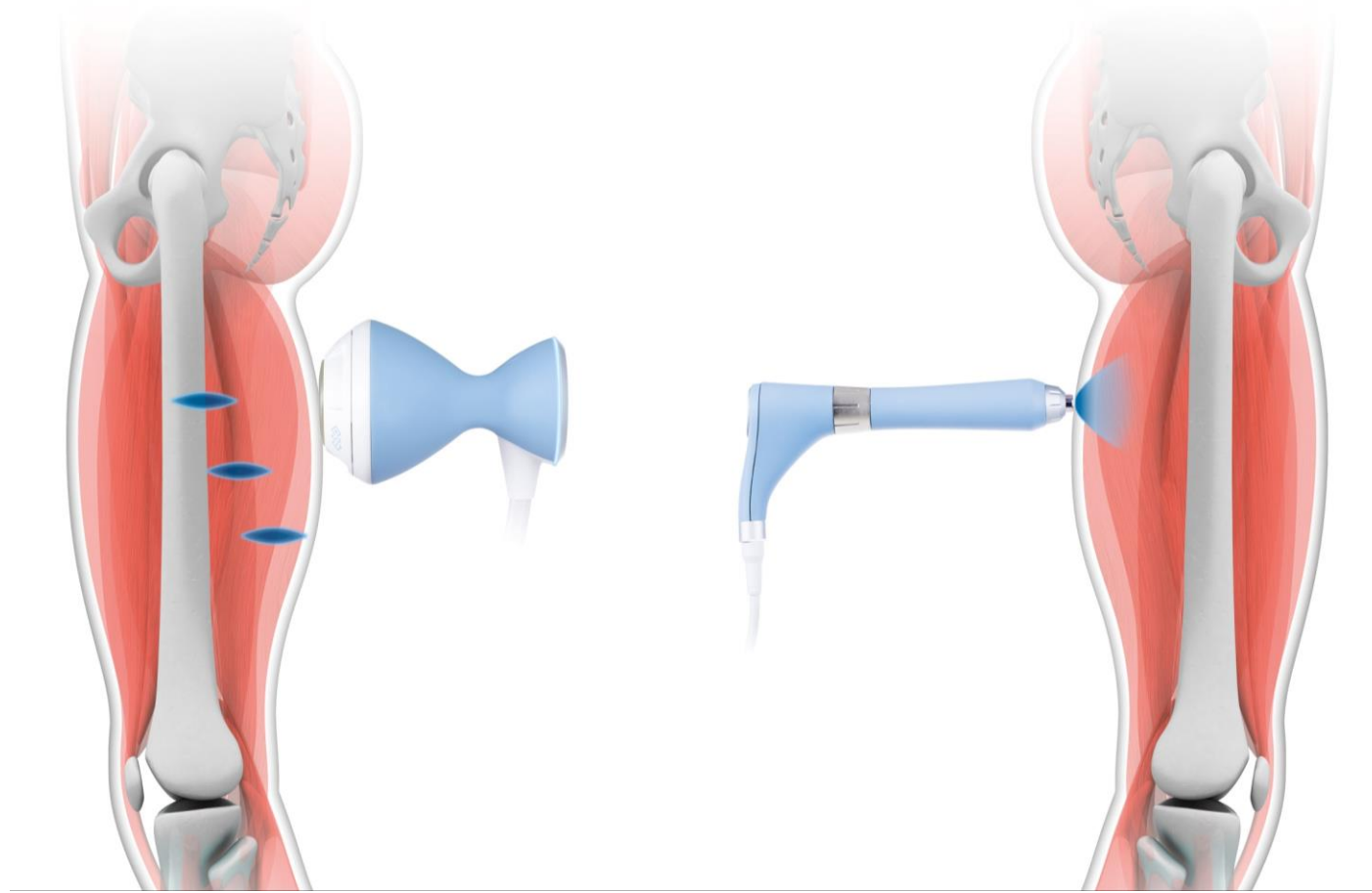


RADIAL AND FOCUSED SHOCKWAVE THERAPY

- Shock wave = **the fast and high rise of positive pressure** followed by a longer period of decreasing pressure.
- Shock waves are able to carry high energy into the patient's body.
- Used to **treat chronic disorders** of the musculoskeletal system and provoke **reparation processes**.



RADIAL AND FOCUSED SHOCKWAVE THERAPY



MOST COMMON INDICATIONS – RADIAL AND FOCUSED SHOCKWAVE THERAPY

Musculoskeletal Disorders

- Tendinopathies (e.g., rotator cuff, Achilles, patellar tendon), Plantar fasciitis, Tennis/Golfer's elbow (lateral/medial epicondylitis)

Calcifications

- Shoulder calcific tendinitis, Calcifications in other joints or soft tissues

Chronic Pain Conditions

- Myofascial pain syndrome, Trigger points

Bone-Related Conditions

- Delayed or non-union fractures, Bone marrow edema

Sports Injuries

- Muscle strains, Ligament sprains

Neurological Conditions (emerging use)

- Spasticity (e.g., post-stroke, cerebral palsy), Parkinson's-related rigidity

FSWT in TALAR HEAD FRACTURE

- **Objective:** To report the use of focused shock wave therapy in treating an acute talus fracture in a patient with risk factors for healing.
- **Methods:** Focused shock waves were applied to a patient with an acute talus fracture and bone marrow edema, who had risk factors affecting healing.
- **Results:** The case highlights the potential effectiveness of shock waves in promoting healing in talus fractures with complications.
- **Conclusion:** Focused shock wave therapy may be a beneficial treatment for acute talus fractures, especially in patients with healing risks.

Use of Focused Shock Waves in an Acute Talar Head Fracture

Osvaldo Valle¹

Abstract

Talus fractures are rare and can be difficult to manage. Even in the absence of complications, the treatment of this type of injury can be prolonged and uncomfortable for the patient. Focused shock waves have been shown to be effective in the treatment of delayed unions and non-unions. In this case report, we share our experience with the use of focused shock waves in an acute talus fracture in a patient with risk factors for healing.

Keywords: Talus, Talar fractures, Shock waves, Bone marrow edema

Introduction

Talus fractures represent only 0.85% of all body fractures [1]. Fractures localized in the talar head are even rarer and have been associated with high complication rates [1, 2]. About two-thirds of the talus is covered with cartilage limiting the periosteal blood supply. Another peculiarity is the absence of tendinous insertions. The anatomical characteristics of this bone can frequently lead to complications of its fractures such as avascular necrosis and non-unions [3, 4]. Even in the absence of complications, the treatment of this type of injury can be prolonged and uncomfortable for the patient. Focused shock waves have been shown to be effective in the treatment of delayed unions and non-unions due to their ability to generate upregulation and expression of various pro-angiogenic and pro-osteogenic growth factors, stimulating bone healing [5]. Although in most studies focused waves have been used in cases of fracture healing failure, their use has also been proposed in acute injuries [6]. In this case report, we share our experience with the use of focused shock waves in a talus head fracture in a patient with risk factors for healing.

Case Report

A 52-year-old female patient, with a history of

epilepsy and chronic arterial hypertension, both under treatment, height 153 cm and weight 85 kg (body mass index of 36.3), severe asthma with use of oral and inhaled corticosteroid therapy, hypovitaminosis D in supplementation, and no smoking habit, was received in consultation.

On April 01, 2024, she slipped on a wet surface, complaining pain on the medial aspect of the left ankle, and limitations in axial load. Inspection revealed edema and diffuse ecchymosis on the anterior and medial aspects of the ankle.

Initial ankle radiographs did not demonstrate any acute traumatic injury. Given the persistence of symptoms, it was decided to evaluate the area with magnetic resonance imaging (MRI) on April 17, 2024. MRI demonstrated extensive bone edema of the talus, with the presence of a trabecular subchondral fracture at the level of the talar head (Fig. 1).

Taking into consideration the patient's underlying pathologies: Grade II obesity according to the World Health Organization criteria, therapy with systemic corticosteroid and hypovitaminosis under treatment; extracorporeal focused shock waves application was decided to accelerate the healing process and reduce bone marrow edema.

A BTL 6000 piezoelectric device was used. Five sessions were carried out with a weekly interval, 3000 impacts per session, with an energy density flux of 0.31 mJ/mm² (70% level of energy in BTL devices) with a frequency of 10 Hz.

The following therapeutic measures were added: ambulation with total unload with the use of two Canadian canes and rehabilitation to maintain joint range of motion, proprioception exercises, and strengthening of extrinsic and intrinsic muscles, also without load.

A follow-up MRI was performed on June 03, 2024, which demonstrated complete resorption of the bone edema and total healing of the talar trabecular fracture (Fig. 2).

Discussion

Fractures of the talar head, including osteochondral fractures are rare, they account for 2.6–10% of all talus fractures [4]. The natural history of talar head fractures is largely unknown, as only case reports are published in the literature [4]. The literature on talar head fractures is limited [2]. Orthopedic treatment of talus fractures is prolonged over time: The non-displaced fractures of the head and body can be treated by casting the foot and ankle in a neutral position for 6 weeks.

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FSWT in TALAR HEAD FRACTURE

- 52-year-old woman with **talus head fracture**
- **Risk factors** for poor healing – obesity, chronic steroid use
- **FSWT** – applied for accelerate healing along with rehabilitation exercises
- 2 months later, follow up MRI showed complete healing and resolution of edema

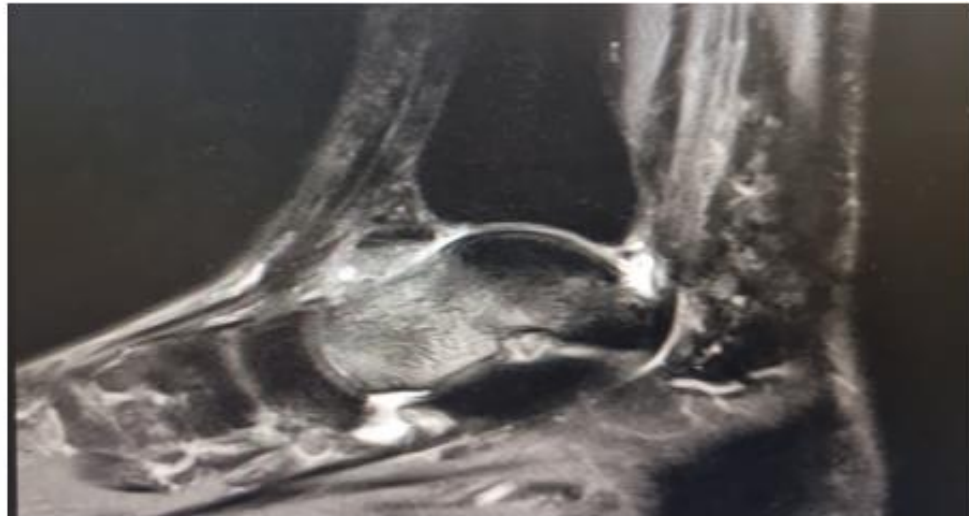


Figure 1: Subchondral fracture at the level of the talar head and extensive bone edema of the talus.

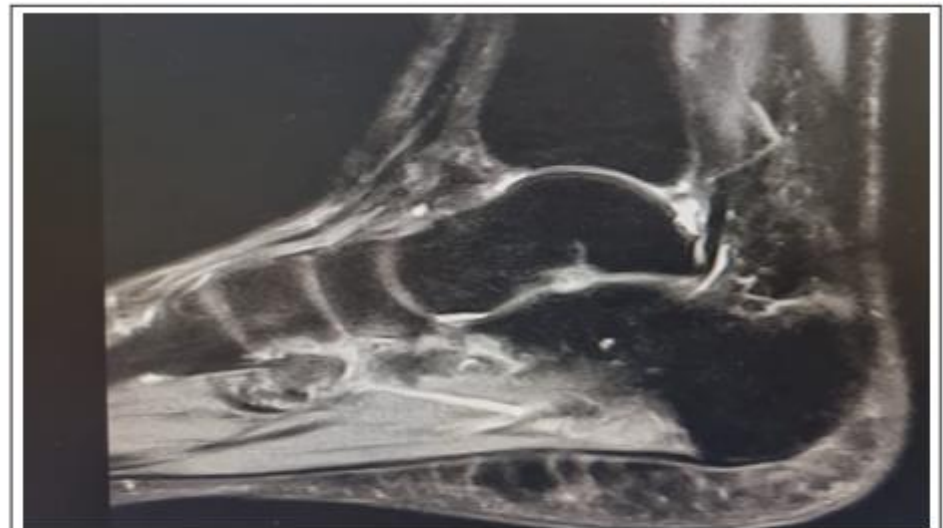


Figure 2: Resonance image after the application of focused shock waves.

NEW RESEARCH – ESWT ON PAIN LEVEL IN PATIENTS WITH PLANTAR FASCIITIS

Aim: To assess the effects of RSWT on pain reduction in chronic PF patients.

•**Methods:** 28 patients (mean age 53.68, BMI 30.56) underwent five RSWT sessions, with pain measured using VAS, NRS, and LPQ.

•**Results:** Significant pain reduction ($p < 0.001$) with effect sizes of 0.38 (VAS), 0.61 (NRS), and 0.59 (LPQ).

•**Conclusion:** RSWT effectively reduces pain in PF patients, even without weight loss.

A – Research concept and design
B – Collection and/or assembly of data
C – Data analysis and interpretation
D – Writing the article
E – Critical revision of the article
F – Final approval of article

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The long- and short-term effect of radial extracorporeal shockwave therapy on pain level in patients with plantar fasciitis – preliminary research

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Abstract:

Introduction: Plantar Fasciitis (PF), also known as plantar fasciitis, is a common worldwide condition connected with heel-related locomotion. It is often treated with Radial Shockwave Therapy (RSWT); however, its effectiveness currently remains uncertain. The goal of this study was to determine the short- and long-term effects of RSWT on pain reduction in a group of patients with chronic PF.

Material and methods: The study included 28 patients with PF (mean age 53.68 ± 9.69 yrs, mean BMI 30.56 ± 5.37). Radial shock wave therapy was administered in five sessions. In total, 2000 shocks were administered per session at 2.5 Ba pressure and 10 Hz. The shocks were performed with a 15 mm transducer head. Pain-related parameters were evaluated with the Visual Analogue Scale (VAS), Numerical Rating Scale (NRS), and Laitinen Pain Questionnaire (LPQ) at baseline, at each radial extracorporeal shockwave therapy (r-ESTW) session, and at a six-month follow-up.

Results: Statistically and clinically significant changes were observed in VAS, NRS and LPQ ($p < 0.001$) with respective effect sizes of 0.38, 0.61 and 0.59. Although improvements were observed between the first and fifth measurement and between the first and sixth measurement, some discrepancies were noted in the results obtained at consecutive timepoints.

Conclusions: RSWT is an effective tool that can provide considerable reduction in pain severity in patients with PF despite no reduction in body weight over the follow-up period.

Keywords: enthesopathy, extracorporeal shockwave therapy, plantar fasciitis, physical medicine, rehabilitation

ESWT IN PLANTAR FASCIITIS IN RUNNERS

- **Objective:** To assess the long-term effectiveness of extracorporeal shock wave therapy (ESWT) for treating plantar fasciitis in amateur runners.
- **Methods:** 39 participants with chronic plantar fasciitis were divided into two groups: ESWT-alone (23 participants) and ESWT-plus (16 participants). Pain and function were assessed before and five years after treatment using various scales.
- **Results:** ESWT reduced pain and improved activity levels. The ESWT-plus group showed better results, though effects appeared later than in the ESWT-alone group.
- **Conclusion:** ESWT is an effective treatment for pain and function improvement in amateur runners with plantar fasciitis.

Article

Long Term Effectiveness of ESWT in Plantar Fasciitis in Amateur Runners

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Abstract: Background: Shock wave therapy is one of the modern methods of treatment used to treat diseases of muscles, tendons, and entheses in orthopedics, as well as in sports medicine. The therapy is increasingly used in the treatment of plantar fasciitis—a disease that is very difficult and burdensome to treat. Where basic conservative treatment for heel spurs fails, the only alternative consists of excision of the bone outgrowth, and shock wave therapy: a modern, minimally invasive, and relatively safe method. The aim of the study was to determine the long-term effectiveness of extracorporeal shock wave therapy in the treatment of painful ailments occurring in the course of plantar fasciitis in amateur runners. **Materials and methods:** The study includes a group of 39 men and women, aged 34–64 (mean age 54.05 ± 8.16), suffering from chronic pain in one or both feet, occurring in the course of plantar fasciitis. The patients had to meet five criteria to qualify for the study. The group was divided into two subgroups: those who had not undergone other physiotherapeutic procedures prior to the extracorporeal shock wave therapy (ESWT-alone; 23 people), and those who had received other procedures (ESWT-plus; 16 people). The therapy was performed using extracorporeal shock wave (ESWT). No local anesthesia was used. The effectiveness of the extracorporeal shock wave therapy was evaluated using the visual analogue scale of pain (VAS), Modified Laitinen Pain Index Questionnaire, the AOFAS scale (American Orthopedic Foot and Ankle Society), and a survey questionnaire consisting of 10 questions concerning metrics and subjective assessment of the effects of therapy. The interview was conducted before ESWT, and again five years later. **Results:** The use of extracorporeal shock wave therapy reduced the intensity and frequency of pain, and improved daily and recreational activity. Moreover, a reduction in the level of pain sensation on the VAS scale and pain symptoms during walking was demonstrated. More favorable results were obtained in the ESWT-plus group; however, the first effects were observed later than in the ESWT-alone group. **Conclusions:** Extracorporeal shock wave therapy is an effective form of therapy for amateur runners. It reduces pain associated with plantar fasciitis that amateur runners may experience at rest, while walking, and during daily and recreational activity.

Keywords: extracorporeal shock wave; heel spur; plantar fascia; rehabilitation; sports medicine



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1. Introduction

Plantar fasciitis with an accompanying heel spur is very burdensome and difficult to treat disease [1–5]. It most often arises as a result of degenerative changes of the proximal plantar fascia and the tissues surrounding the aponeurosis, occurring due to continuous irritation of the area and resulting micro-injuries [6,7].

The main symptom of plantar fasciitis is pain in the heel area; this worsens over time, increasingly occurring upon loading and eventually, even at rest. Redness and swelling are also observed in the heel. The risk of the disease is increased by being overweight, working a job that requires long periods of standing, lifting heavy objects, intensive running, and practicing jumping sports [6–8].

FSWT in ACHILLES TENDINOPATHY

- 33-year-old professional runner with **Achilles tendinopathy for over 5 years**
- **Limitations in performance**
- **Therapy outcome: after 5 sessions in total** – running without any limits
- **Therapies:** 5 sessions, first 3 sessions scheduled weekly, followed by 2 sessions every second week
- **Therapy intensity:** 20 mJ/mm², 5 Hz



CLINICAL CASE – RSWT in FROZEN SHOULDER

Before treatment



1st treatment

- 4 Hz; 2,5 Bars,
1000 shocks



After 1st treatment

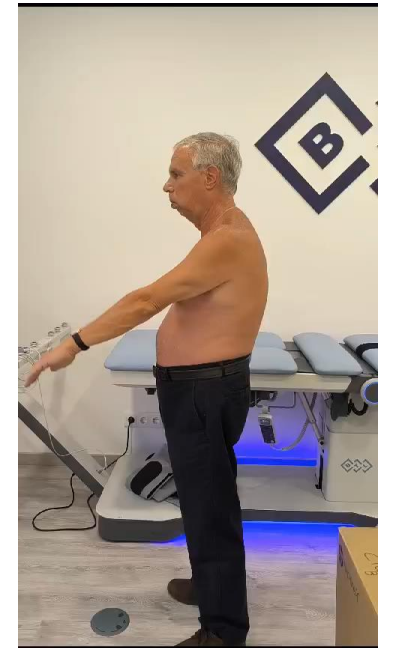


2nd treatment

-15 Hz; 2,5 Bars, 3000 shocks
- Applied to different region



After 2nd treatment



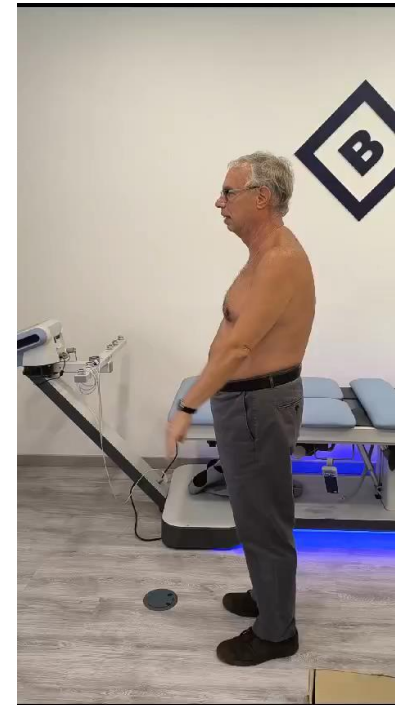
CLINICAL CASE – RSWT in FROZEN SHOULDER

- **Patient** – also suffered from diabetes – focus on Control of the pain and inflammatory behaviour/sign
- No anti-inflammatory drugs were taken

Before 3rd treatment

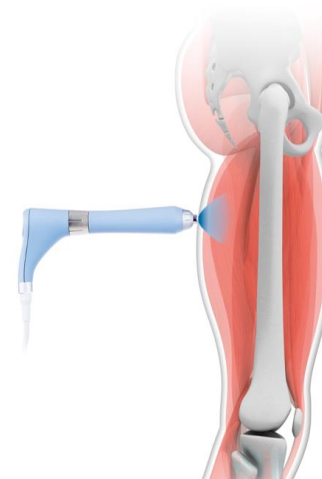
After 3rd treatment

- 4 Hz; 2,5 Bars, 1000 shocks



CLINICAL CASE – FAMOUS ICE HOCKEY PLAYER TREATED WITH RSWT

- Jaromír Jágr, Czech professional **ice hockey player**
- **Hip adductor tendinopathy**
- **ESWT** - stimulates repair processes, accelerated **tissue regeneration**



CLINICAL CASE – RSWT IN SHOULDER CALCIFICATION TREATMENT

- Dg.: calcification of the bursa of the shoulder

| Session | Number of shocks | Intensity (Bar) | Frequency (Hz) | Application area |
|---------|------------------|-----------------|----------------|---|
| 1 | 3000 | 2,5 | 6-8 | Work on deltoid and calcified bursa |
| 2 | 3000 | 2,3 | 10 | Rotator cuff, upper trapezius |
| 3 | 3000 | 2,7 | 6-8 | Work on calcification, deltoid muscle and rotator cuff) |
| 4 | 2000 | 2,5-3 | 4-5 | Work on calcification |
| 5 | 2000 | 2,8-3 | 4-10 | Calcification, rotator cuff |



CLINICAL CASE – RSWT IN SHOULDER CALCIFICATION TREATMENT

- Before the first session – TR-Therapy to reduce the inflammation
- After 3rd session – movement in all directions with slight deficits
- After 4th session – significant improvement, pain 3/10
- After 5th session – pain 1/10



CLINICAL CASE – FSWT IN SHOULDER CALCIFICATION

- Patient suffering from shoulder calcification
- 10 therapies, protocol: calcification
- Clinical outcome:
 - **Pain reduction**
 - **Reabsorption of calcification** (visible in the picture)



CLINICAL CASE – RADIAL SHOCWAVE THERAPY IN PARKINSON’S DISEASE

- Clinical cases:
 - Patients, 46 years old and 81 years old
 - Parkinson’s disease, Functional Stage – II
 - Progress after 2 months, 10 therapies in total
- Therapy parameters: - 10 sessions, 10 Hz, 3 Bars, 2000 shocks
- Effects
 - **Reduces rigidity** (muscle stiffness and improves joint mobility, enhances muscle flexibility)
 - **Improves motor functions** (enhances postural control, improves overall mobility)
 - **Pain relief** (musculoskeletal pain)
 - **Enhances neuroplasticity** (promote nerve regeneration, improved communication between neurons)



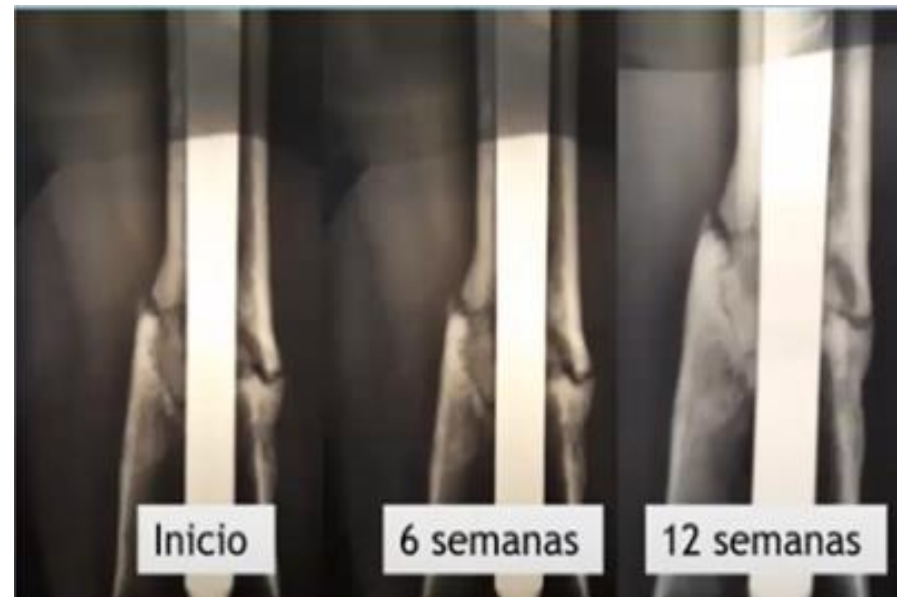
CLINICAL CASE – FSWT in TIBIAL FRACTURE (pseudoarthrosis)

- Skier after **tibial fracture**
- The recovery time was prolonged by pseudoarthrosis
- **5 months of FSWT** use supported the healing process



CLINICAL CASE – FSWT in FEMUR FRACTURE

- 30 years old baseball player after **femur fracture**
- Complicated fracture **associated with revision** surgery
- 1 year progress
- **Result:** the fracture has fused properly



SHOCKWAVE x CONVENTIONAL METHODS

- Faster pain relief
- Non-invasive, side-effects free
- Tissue regeneration stimulation (**neovascularization**)
- Reduction of inflammation and **calcification**
- Shorter treatment duration
- Improved mobility and functionality (Parkinson's disease)
- Wide range of **indications** (plantar fasciitis, tendinopathy, bone-nonunions, trigger points)

LASER

HIGH INTENSITY LASER THERAPY



HIGH INTENSITY LASER

- Non-invasive agent in the management of **musculoskeletal conditions**, mostly **acute**
- Great **depth of penetration**, targets the **cellular level** (*Arroyo-Fernández, R., Aceituno-Gómez et al., 2023. High-intensity laser therapy for musculoskeletal disorders: A systematic review and meta-analysis of randomized clinical trials.*)
- **Clinical effectiveness** described especially in **acute healing of the tissues**, decreasing **inflammation**
- Faster wound healing, reducing **recovery time for patients** (*Nazari, A., Moezy et. al. 2019. Efficacy of high-intensity laser therapy in comparison with conventional physiotherapy and exercise therapy on pain and function of patients with knee osteoarthritis: a randomized controlled trial with 12-week follow up.*)



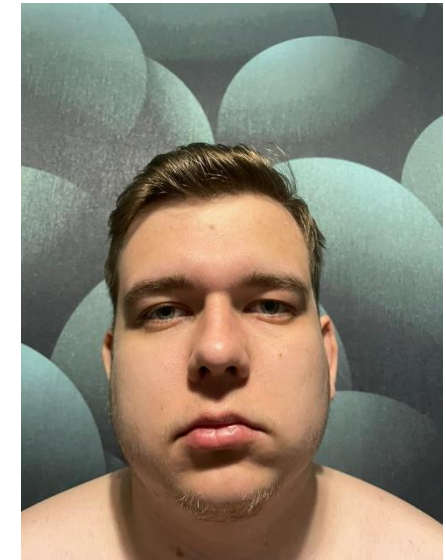
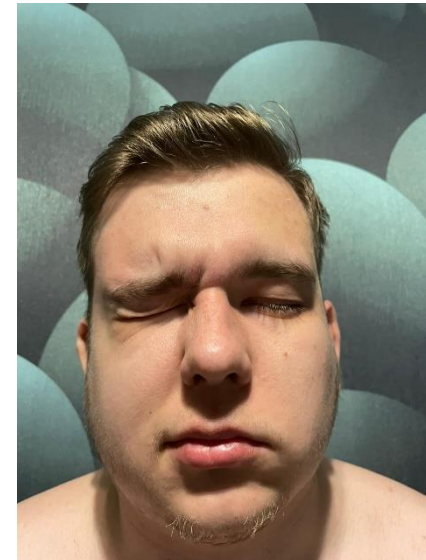
HIGH INTENSITY LASER

- Therapeutic effects of laser light
 - **Biostimulation**
 - **Acceleration of cellular processes** that contribute to pain reduction and **faster recovery after injury**
- The **photomechanical wave stimulates nerve endings**, which leads to **pain relief**.
- **Biostimulation** of the affected tissue increases oxygen uptake and **improves blood circulation**.
- High power and 1064 nm wavelength targets **deep-lying tissues**, **maximises pain relief**, and **delivers strong thermic therapies within a short time**.



HIGH INTENSITY LASER – CLINICAL CASE I

- Patient: male, 23 years old
 - Complaints about sudden asymmetry of the left half of the face 05/01/24 according to extreme hypothermia
 - Treatment: HIL, 9 therapies in total
 - Neurological symptoms:
 - No meningeal signs;
 - Full movement of the eyeballs;
 - Tongue in the midline;
 - Severe peripheral paresis of the facial nerve on the left
 - Bell's syndrome +
 - Muscle strength is preserved, muscle tone is preserved
 - No pathological signs



HIGH INTENSITY LASER – CLINICAL CASE I

- First 5 therapies setting

HIL

Manual settings: **PW therapy**

6 W **3 min.**,
then 2 W **4 min.** (25 J/cm²)
(3 procedures)

Manual settings: **CW therapy**

10 W **2 min.**,
then 5 W 2 min.,
then 2 W 2 min. (100 J/cm²)
(2 procedures)

HIGH INTENSITY LASER – CLINICAL CASE, RESULT AFTER 5 THERAPIES

- Sufficient dynamics persist
- Absence of Bell's syndrome
- Slight asymmetry of the left half of the face



HIGH INTENSITY LASER – CLINICAL CASE, RESULT AFTER FOLLOWING 4 PROCEDURES

- Manual setting for following 4 procedures
- Result after 4 therapies

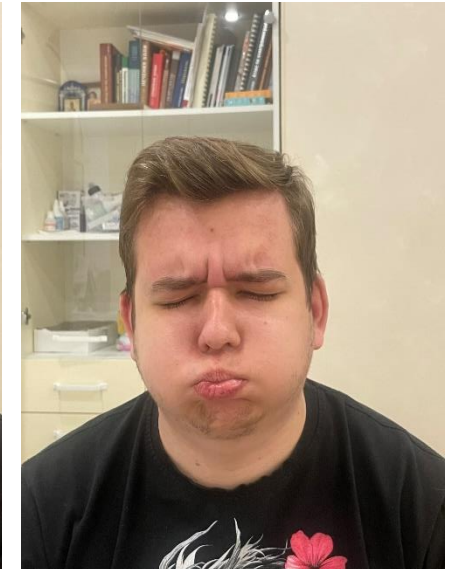
HIL

Manual settings: **PW therapy**

6 W 3 min.,
then 2 W 4 min. (25 J/cm²)
(3 procedures)

Manual settings: **CW therapy**

10 W 2 min.,
then 5 W 2 min.,
then 2 W 2 min. (100 J/cm²)
(2 procedures)



HIGH INTENSITY LASER – OPEN WOUNDS

- Open wounds protocol



HIGH INTENSITY LASER IN LACERATION – CLINICAL CASE

- Laceration in alpine ski racer caused by the sharp metal edge of the ski (January 11, 2024)
- January 12, tissue restoration and wound suturing, RHB started January 27, 2024
- 28 years old female patient
- HIL aimed to **healing of the scar, help in elasticity of the suture**
- **Clinical symptoms:**
 - Atrophy of the muscles of the anterior thigh
 - Limitation of knee extension
 - Limitation of dorsiflexion of the foot
 - Limitation of plantar flexion of the foot
 - Post-traumatic swelling of soft tissues



HIGH INTENSITY LASER IN LACERATION – CLINICAL CASE

- **HIL** - removal of swelling, creating elasticity of the suture, healing



HIGH INTENSITY LASER IN LACERATION – CLINICAL CASE

- **Result:** complete restoration of the functions of the injured limb



HILT IN OSTEOARTHRITIS MANAGEMENT

- **Objective:**
Compare the effectiveness of High-Intensity Laser Therapy (HILT), conventional physiotherapy (CPT), and exercise therapy (ET) in knee osteoarthritis (KOA).
- **Key Results:**
- **Pain & Function:** HILT + ET showed the greatest pain reduction and functional improvement.
- **Range of Motion:** HILT significantly enhanced knee flexibility.
- **Conclusion:**
HILT with ET is more effective for KOA than CPT or ET alone.

Lasers in Medical Science
<https://doi.org/10.1007/s10103-018-2624-4>

ORIGINAL ARTICLE



Efficacy of high-intensity laser therapy in comparison with conventional physiotherapy and exercise therapy on pain and function of patients with knee osteoarthritis: a randomized controlled trial with 12-week follow up

Ahmad Nazari¹ · Azar Moezy¹ · Parisa Nejati¹ · Ali Mazaherinezhad¹

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Abstract

Knee osteoarthritis (KOA) is one of the most common musculoskeletal disorders causing pain and functional impairment. The purpose of the study is to compare the effects of high-intensity laser therapy (HILT), conventional physical therapy (CPT), and exercise therapy (ET) on pain and function in patients with KOA. The study was designed as an assessor-blind randomized controlled trial. Ninety-three patients (aged between 50 and 75 years) with proved KOA were included and randomly allocated into three groups, and received 12 sessions of HILT, CPT, or ET. The outcomes were pain intensity measured by visual analog scale (VAS), knee flexion range of motion (FROM), timed up and go test (TUG), 6-min walk test (6MWT), and functionality of knee measured by the Western Ontario and McMaster Universities Osteoarthritis (WOMAC) questionnaire. Statistical analyses were done to compare the amounts at the baseline, immediately after treatment and after 12 weeks. HILT was significantly more effective than the other groups in decreasing the VAS, increasing FROM and improving the scores of WOMAC (total and function subscale) both after treatment and after 12 weeks. The effect of HILT and CPT on the TUG, 6MWT, and WOMAC pain subscale was not significantly different after treatment, and both were better than ET. HILT was significantly better than the others after follow-up, particularly more effective on the stiffness subscale of WOMAC. HILT combined with exercise therapy, as a useful therapeutic approach, could have positive influences on KOA patients.

Keywords Exercise therapy · High-intensity laser therapy · Knee osteoarthritis · Pain · Physical therapy · RCT · WOMAC

Introduction

Knee osteoarthritis (KOA) is one of the most debilitating conditions associated with pain and functional impairment which

negatively affect quality of life [1]. It is characterized by deterioration of the articular cartilage and subchondral bone sclerosis [2] due to biomechanical and metabolic factors [3, 4]. The prevalence of KOA is increasing: Davatchi et al. have shown a high prevalence of KOA (41.9%) in Iran urban population over 40 years of age [5] which often leads to loss of dependence [6]. Current therapeutic strategies focus on improving function and relieving symptoms especially pain as the main symptom and the major cause of disability. Conservative management for KOA is aimed at the symptomatic relief including medication, intra-articular injection, physical modalities, exercise therapy, etc. [7–9].

Exercise therapy alone or with other modalities play an important role in improving symptoms and physical function in KOA [10, 11]. There are several pieces of evidence showing the positive effect of regular exercise therapy on increasing muscle strength and endurance, reducing joint stiffness, enhancing proprioceptive efficiency, improving balance, and

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Springer



Smart Growth

HIL in post-COVID patients

Objective:

- Evaluate post-COVID rehabilitation using the Six-Minute Walk Test (6MWT) and the impact of High-Intensity Laser Therapy (HILT).

Methods:

- 33 patients were divided into two groups: one with HILT and kinesiotherapy, the other with kinesiotherapy alone. Progress was measured using the 6MWT before and after 10 sessions.

Key Results:

- HILT improved walking distance and reduced exertion.
- 6MWT completion rate: 97%, with improvements up to 60%.

Conclusion:

- HILT enhances functional recovery in post-COVID patients. The 6MWT is a valuable tool for tracking rehabilitation progress.



Article

The Role of the Six-Minute Walk Test in the Functional Evaluation of the Efficacy of Rehabilitation Programs After COVID-19

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Abstract: Patients with COVID-19 suffering in the acute phase from both the sequelae of the disease and prolonged immobilization require a rehabilitation phase for functional recovery and a comprehensive functional evaluation. This study proposes using the 6-Minute Walk Test (6MWT) as a global functional assessment tool to quantify rehabilitation outcomes in post-COVID patients. Additionally, investigating the effect of High-Intensity Laser Therapy (HILT) on patients with musculoskeletal comorbidities was another key research question. Two post-COVID rehabilitation programs were retrospectively analyzed as follows: one consisting of kinesiotherapy combined with High-Intensity Laser Therapy for patients with musculoskeletal comorbidities and the other consisting of kinesiotherapy alone. Functional evaluation using 6MWT was conducted before and after 10 daily therapeutic sessions with 33 ambulatory patients divided into 2 groups (18 patients treated with HILT and kinesiotherapy vs. 15 patients treated with kinesiotherapy only). The 6MWT was successfully completed by 32 out of 33 patients (96.96%), with performance improvements ranging from 3% to 60% among patients. Statistical differences were also observed between the groups, suggesting that the 6MWT is a sensitive, objective, and valuable tool for functional assessment of post-COVID rehabilitation, supporting the potential benefits of HILT in enhancing functional recovery.

Keywords: post-COVID rehabilitation; respiratory recovery; Six-Minute Walk Test; physical therapy; kinesiotherapy; high-intensity laser; HILT

1. Introduction

The COVID-19 pandemic, caused by the SARS-CoV-2 virus, has impacted millions of people globally, with significant consequences for healthcare systems and populations alike. As of 2019, over 80% of the world's population has been affected by the virus through direct infection or by the overwhelming pressures on the healthcare infrastructure [1,2]. COVID-19 has demonstrated a wide range of effects on the human body, from mild respiratory symptoms to severe complications such as pneumonia [3], acute respiratory distress syndrome (ARDS) [4], and multi-organ failure [5]. Moreover, its long-term effects, now commonly referred to as post-COVID or "long COVID", have brought to light the necessity of comprehensive rehabilitation programs [6,7].

For patients with pre-existing chronic conditions, such as diabetes [6,8], polyneuropathies [9], stroke [5,10–13], and rheumatic [14], degenerative [15], or oncological diseases [16,17], the pandemic posed an additional challenge. Limited access to healthcare services during the lockdowns and restrictions significantly affected the continuity of



Citation: Tache-Codreanu, D.-L.; Bobocea, L.; David, I.; Burcea, C.-C.; Sporea, C. The Role of the Six-Minute Walk Test in the Functional Evaluation of the Efficacy of Rehabilitation Programs After COVID-19. *Life* **2024**, *14*, 1514. <https://doi.org/10.3390/141411514>

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Life **2024**, *14*, 1514. <https://doi.org/10.3390/141411514>

<https://www.mdpi.com/journal/life>



Smart Growth

HIL IN IMPROVING MOTOR DEFICITS

- **Objective:**
To evaluate the effectiveness of High-Intensity Laser (HIL) therapy in improving motor deficits in patients with Lumbar Disc Herniation (LDH).
- **Methods:**
133 patients were split into two groups: one received HIL therapy with standard rehabilitation, the other only standard rehabilitation.
- **Key Results:**
 - Muscle Strength: Greater improvement in the HIL group.
 - Walking Ability: Significant progress in 74% of the HIL group.
 - Fall Risk: Reduced more significantly in the HIL group.
- **Conclusion:**
HIL therapy effectively improves motor deficits in LDH patients, showing potential for broader clinical use.



Article

The Effectiveness of High Intensity Laser in Improving Motor Deficits in Patients with Lumbar Disc Herniation

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Abstract: Background: High-Intensity Laser (HIL) therapy, known for its biostimulatory effects on nerve cell growth and repair, shows promise for improving motor deficits caused by morphopathological changes. This research study aimed to comprehensively assess muscle strength changes through muscle testing, complemented by functional tests evaluating factors contributing to disability in patients with Lumbar Disc Herniation (LDH) and associated motor impairment, following a complex rehabilitation protocol incorporating HIL therapy. Methods: A total of 133 individuals with LDH and motor deficits were divided into two groups. Group 1 (n = 66) received HIL therapy followed by standard rehabilitation, while Group 2 (n = 67) underwent only the standard rehabilitation program. Functional parameters, including muscle strength, the ability to walk on tiptoes or heels, and self-assessed fall risk, were monitored. Results: Both groups showed statistically significant improvements in all monitored parameters. A comparative analysis revealed a significant result for the HIL therapy regimen across all indicators. Conclusions: The group undergoing a rehabilitation program with integrated HIL therapy displayed significantly greater improvement in motor deficits, affirming the positive impact of HIL therapy on functional parameters among LDH patients.



Citation: Tache-Codreanu, D.-L.; Trăistaru, M.R. The Effectiveness of High Intensity Laser in Improving Motor Deficits in Patients with Lumbar Disc Herniation. *Life* 2024, 14, 1302. <https://doi.org/10.3390/life14101302>

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Keywords: assessment; disability; high intensity laser therapy; motor deficit; disk herniation; neuronal recovery; rehabilitation program

1. Introduction

LDH resulting in nerve root compression stands as the leading cause of lumboradicular pain, prevailing in approximately 90% of cases [1]. The pathophysiology of LDH with radicular involvement encompasses morphopathological alterations in the intervertebral disk, vertebra, and adjacent radicular nervous structures. Paresis and other neurological motor symptoms are commonly observed, occurring in 30–50% of symptomatic patients with disk herniation [2]. The treatment approach for LDH with motor deficits typically involves specific pharmaceutical interventions, physical therapies, kinesiotherapy, orthotic devices, and, as a last resort option, lumbar decompressive surgery. However, while the effectiveness of such interventions is undeniable, not all patients may be suitable candidates, and the recurrence of symptoms remains between 3% and 43% of patients [3]. The manifestation of motor deficits in LDH can be viewed as a complication and a setback in the management of lumbo-radicular pain, contributing significantly to the escalating global costs associated with lumboscoliosis, including work-absence and impairment in socio-familial activities. Hence, the development of an efficacious, comprehensive rehabilitation program is desirable [4–6].

Lasers, particularly Low-Level Laser (LLL) and High-Intensity Laser (HIL), are commonly utilized in rehabilitation medicine. The therapeutic effects of LLL in mitigating pain, inflammation, edema, and promoting nerve healing have been recognized for nearly four decades [7,8]. Compared to LLL, HIL sources possess superior penetration capabilities,

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<https://www.mdpi.com/journal/life>



Smart Growth

LLLT vs. HIL IN KNEE OSTEOARTHRITIS

Article

Comparison between Low-Level and High-Intensity Laser Therapy as an Adjunctive Treatment for Knee Osteoarthritis: A Randomized, Double-Blind Clinical Trial

Mohd Azzuan Ahmad ^{1,2}, Mageswari Moganan ², Mohamad Shariff A Hamid ³, Norhuda Sulaiman ³, Ushantini Moorthy ³, Nazirah Hasnan ⁴ and Ashril Yusof ^{2,*}

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Abstract: Background: Low-level (LLLT) and high-intensity laser therapy (HILT) can be beneficial additions to knee osteoarthritis (KOA) rehabilitation exercises; however, it is still being determined which electrophysical agent is more effective. Aim: To compare the effects of LLLT and HILT as adjuncts to rehabilitation exercises (LL + EX and HL + EX) on clinical outcomes in KOA. Methods: Thirty-four adults with mild-to-moderate KOA were randomly allocated to either LL + EX or HL + EX ($n = 17$ each). Both groups underwent their respective intervention weekly for twelve weeks: LL + EX (400 mW, 830 nm, 10 to 12 J/cm², and 400 J per session) or HL + EX (5 W, 1064 nm, 19 to 150 J/cm², and 3190 J per session). The laser probe was placed vertically in contact with the knee and moved in a slow-scan manner on the antero-medial/lateral sides of the knee joint. Participants' Knee Injury and Osteoarthritis Outcome Score (KOOS), Numerical Pain Rating Scale (NPRS), active knee flexion, and Timed Up-and-Go test (TUG) were assessed. Results: Post intervention, both groups showed improvements in their KOOS, NPRS, active knee flexion, and TUG scores compared to baseline ($p < 0.01$). The mean difference of change in KOOS, NPRS, and active knee flexion scores for the HL + EX group surpassed the minimal clinically important difference threshold. In contrast, the LL + EX group only demonstrated clinical significance for the NPRS scores. Conclusions: Incorporating HILT as an adjunct to usual KOA rehabilitation led to significantly higher improvements in pain, physical function, and knee-related disability compared to LLLT applied in scanning mode.

Keywords: high-intensity laser; knee osteoarthritis; low-level laser; pain; photobiomodulation; rehabilitation

1. Introduction

Knee osteoarthritis (KOA) is a global public health concern and one of the leading causes of physical impairment and disability worldwide [1,2]. As there are currently no single disease-modifying interventions for KOA [3], conservative treatments such as pharmacological therapy and rehabilitation exercises have often been accompanied by the use of electrophysical agents to optimize treatment outcomes [4]. These include low-level (LLLT) [5,6] and high-intensity laser therapy (HILT) [7,8], therapeutic ultrasound, and transcutaneous electrical nerve stimulation [9]. In recent years, photobiomodulation therapy specifically, LLLT and HILT have emerged as the most promising modalities [4,8,10], as both variants can reduce pain and inflammation [6,7], augment tissue repair [11,12], increase blood circulation [13], and improve physical function and performance [6,7]. Since



Citation: Ahmad, M.A.; Moganan, M.; A Hamid, M.S.; Sulaiman, N.; Moorthy, U.; Hasnan, N.; Yusof, A. Comparison between Low-Level and High-Intensity Laser Therapy as an Adjunctive Treatment for Knee Osteoarthritis: A Randomized, Double-Blind Clinical Trial. *Life* **2023**, *13*, 1519. <https://doi.org/10.3390/life13071519>

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- **Objective:** To compare the effects of LLLT and HILT with rehabilitation exercises in knee osteoarthritis (KOA).
- **Methods:** 34 adults with mild-to-moderate KOA were randomly assigned to LL + EX (LLLT) or HL + EX (HILT) for 12 weeks. Outcomes like KOOS, NPRS, knee flexion, and TUG were assessed.
- **Results:** Both groups improved, but the HL + EX group showed greater clinically significant improvements in pain, function, and knee flexion.
- **Conclusion:** HILT combined with rehabilitation exercises led to better outcomes than LLLT in treating KOA.

RADIOFREQUENCY

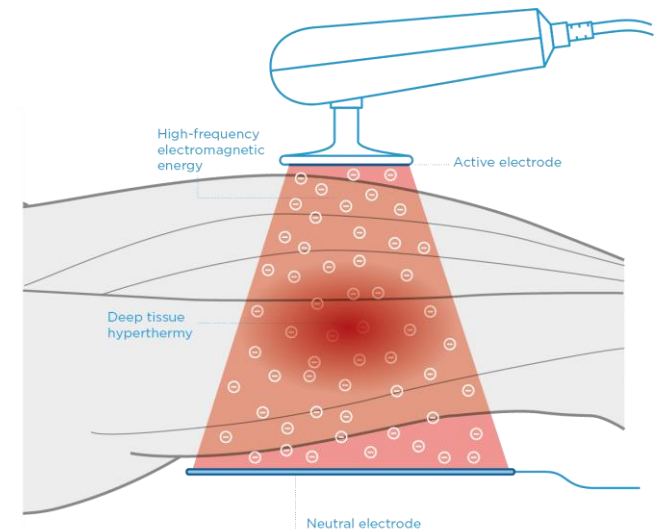
TR-THERAPY



Smart Growth

TR-THERAPY

- TR-Therapy uses **high-frequency electromagnetic energy** that penetrates the human body
- Promotes deep tissue hyperthermia
 - Relieves muscle pain
 - Relaxes trigger points
 - Regenerates muscles
- Allows athermic treatment
 - Post-traumatic swelling and hematomas
- Promotes **muscle regeneration** and **pain relief** through unique TR-Therapy concept techniques



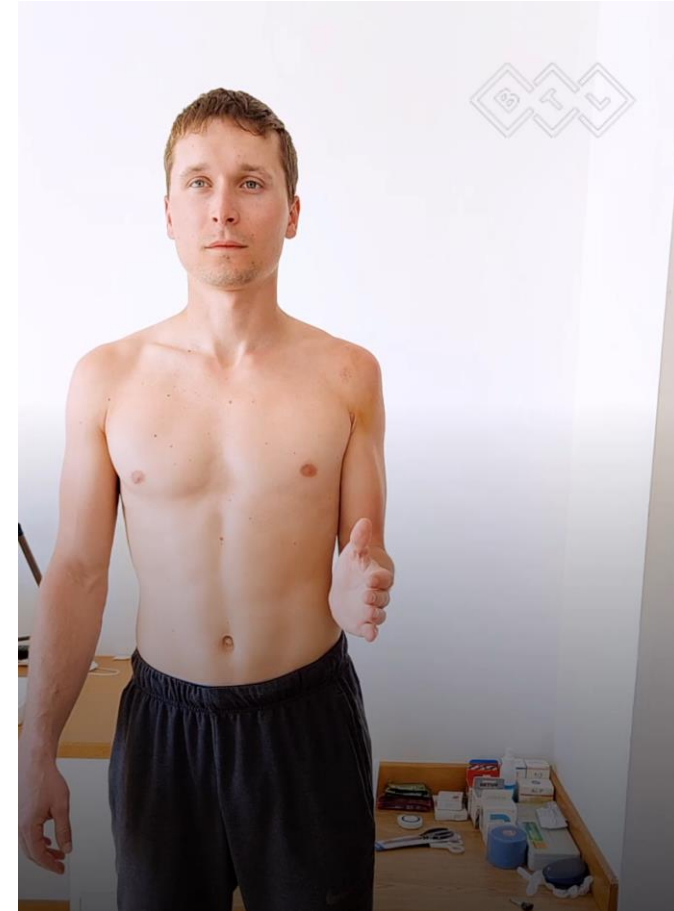
TR-THERAPY CONCEPT

- Combines therapists manual skills and **tissue-selective heating**
- **TR-Therapy concept –** massage, passive motion and muscle activation techniques



CLINICAL CASE - TR-THERAPY IN LABRAL TEAR

- Patient, **pole-vaulter** operated **6 weeks ago**
- Shoulder arthroscopy for a **labral tear**
- Clinical symptoms before the therapy:
 - Stiffness of the joint (according to immobilization)
 - Decreased range of motion
- Therapy outcome:
 - Feeling relaxed and released
 - Mobility improvement



CLINICAL CASE – ACUTE SPINAL BLOCKAGE

- Professional **athlete**, acute **spinal blockage**
- Clinical symptoms
 - Movement limited
 - Limits in breathing deeply
- Therapy applied: 10 minutes of therapy combined with active mobilization techniques



TR-THERAPY for TRAINING MUSCLE FATIGUE

- **Objective:** To assess the impact of Targeted Radiofrequency Therapy (TR-Therapy) on muscle strength, range of motion, and pain after training-induced muscle fatigue (TIMF).
- **Methods:** Seven athletes underwent overexertion of forearm flexors, followed by either TR-Therapy or rest. Muscle strength, range of motion (ROM), and pain were measured.
- **Results:** TR-Therapy increased muscle strength by 31%, compared to 12% in the control group ($p < 0.05$). No significant changes were found in ROM or pain ($p > 0.05$).
- **Conclusion:** TR-Therapy effectively restores muscle strength after TIMF but does not significantly affect ROM or pain.

ORIGINAL ARTICLE

IJPHY

TARGETED RADIOFREQUENCY THERAPY FOR TRAINING INDUCED MUSCLE FATIGUE – EFFECTIVE OR NOT?

¹Ondrej Prouza, M.Sc., PT

²Adrian Campos Gonzalez MD

ABSTRACT

Background: Training induced muscle fatigue (hereinafter also referred as TIMF) is leading to unwanted consequences among sportsmen and actively sporting people such as decreased muscle strength and additional painful discomfort and mobility issues. The knowledge about the mechanisms of influencing the fatigue induced processes in muscle tissue is not comprehensive. The conventional manual techniques, cold patches and conventional physiotherapy have some effect in improving these conditions, however, finding effective methods to influence these consequences appears beneficial in sports medicine. Such method could be Radiofrequency therapy up to 0.5 MHz, known as Targeted Radiofrequency Therapy (hereinafter also referred as TR-Therapy). Aim of this self-controlled study is to evaluate the effect of the TR-Therapy for over-exertion management including the effect on decreased muscle strength, limited range of motion and possible painful discomfort.

Materials: 7 healthy and actively sporting participants underwent through 2 stages (Active stage – including overexertion of the forearm flexors and subsequent TR-Therapy session; and Control stage - including overexertion of the forearm flexors and subsequent resting period). Data for muscle strength in kg, active Range of Motion (ROM) in (°) and Pain and discomfort perception by 10 point Visual Analog Scale (VAS) were obtained and evaluated.

Results: 31% increase in the muscle strength during the active stage was observed and respectively 12% during the control stage, with level of significance $p < 0.05$. ROM and pain and discomfort perception data did not show statistically significant results ($p > 0.05$).

Conclusions: The results of this study suggest TR-Therapy as effective solution for muscle strength restoration after TIME.

Keywords: muscle training, muscle fatigue, decreased muscle strength, radiofrequency therapy.

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COMBINATION THERAPY

SIS, TR-THERAPY, HIGH-INTENSITY LASER,
FOCUSED AND RADIAL SHOCKWAVE
THERAPY

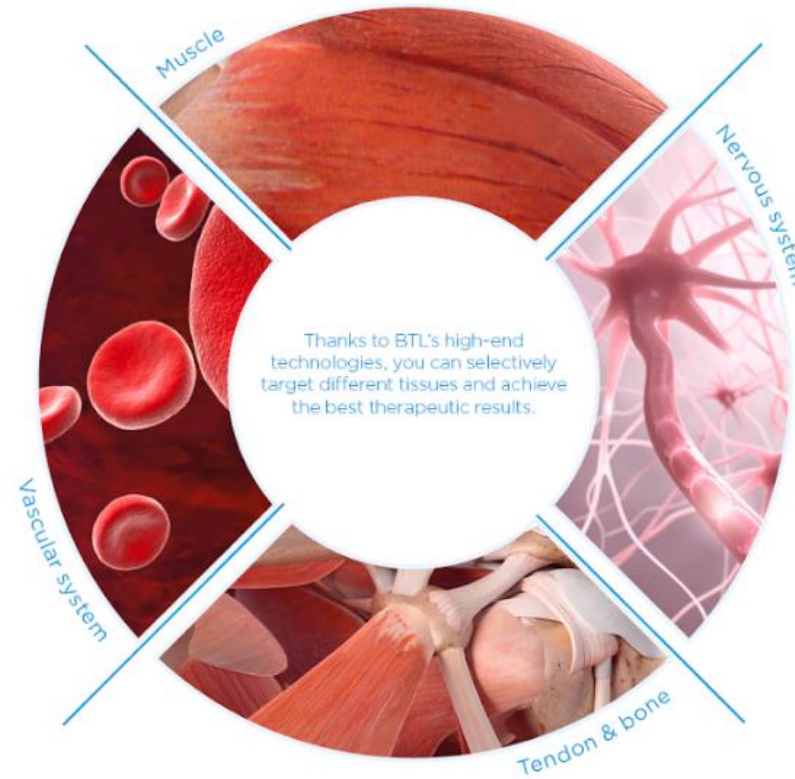


THERAPY COMBINATIONS

TR-THERAPY



HIGH INTENSITY LASER



SUPER INDUCTIVE SYSTEM



SHOCKWAVE THERAPY



CLINICAL CASE - SIS AFTER ACL RECONSTRUCTION

- 32-year old football player after **ACL reconstruction**
- 1 month after the surgery
- **Symptoms:** proprioceptive deficits in the knee, changes in muscle activation and strength
- **Therapy:** SIS - swelling reduction, trophic enhancement, muscle strengthening

CLINICAL CASE - SIS AFTER ACL RECONSTRUCTION

- **SIS** - post-surgery **swelling** (trophic improvement, enhancement of overall circulation)



CLINICAL CASE – SIS, HIL and FSWT AFTER ACL RECONSTRUCTION

- **High Intensity Electromagnetic Field** - applied for regaining muscle mass and strength



CLINICAL CASE - SIS AFTER ACL RECONSTRUCTION

- Combination of **SIS** and **HIL** in the therapy
- **SIS** - muscle stimulation
- **HIL** - tissue healing



CLINICAL CASE - SIS AFTER ACL RECONSTRUCTION

- Dg. distal fibular fracture (Weber A)
- Cast for **5 and half weeks**
- Let's have a look at **his day 0** after the cast has been removed.

- **Only 20% of the load was allowed for the next two weeks.**



DAVID'S CASE

DAY ZERO



90% support



90% support



10' TR-Therapy



Before

After



DAY ZERO

CLINICAL CASE - PROFESSIONAL ATHLETE USES PHYSICAL MODALITIES

- **Czech snowboarder**, Olympic champion in snowboard cross in 2014
- Fractures of heads of **both tibia bones** followed by long recovery process
- **Anterior ankle impingement** - pain, left ankle dorsiflexion limitation



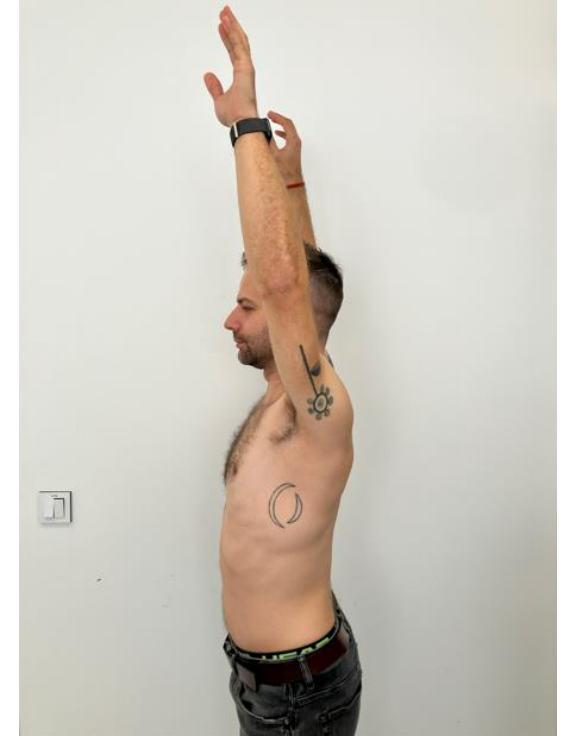
CLINICAL CASE - PROFESSIONAL ATHLETE USES PHYSICAL MODALITIES

- Therapy applied: **SIS, FSW, HIL**
- **Result:** range of motion improvement, pain reduction, full loading during the training



CLINICAL CASE – SIS AND FSWT IN M. BICEPS BRACHII TENDINOPATHY

- **Diagnose:** m. biceps brachii tendinopathy
- **Multiple shoulder subluxation** due to its instability
- 6 months in pain, limited range of motion



CLINICAL CASE – M. BICEPS BRACHII TENDINOPATHY

Therapy parameters

FSWT parameters

- Therapy: freq. 6 Hz, number of shocks 2000, int. 9%
- Therapy: freq. 6 Hz, number of shocks 2000, int. 14%
- Therapy: freq. 6 Hz, number of shocks 2000, int. 27%

SIS parameters

- Analgesia chronic protocol, int. 3%
- Analgesia chronic protocol, int. 4%
- Analgesia chronic protocol, int. 3%



CLINICAL CASE – M. BICEPS BRACHII TENDINOPATHY - RESULT

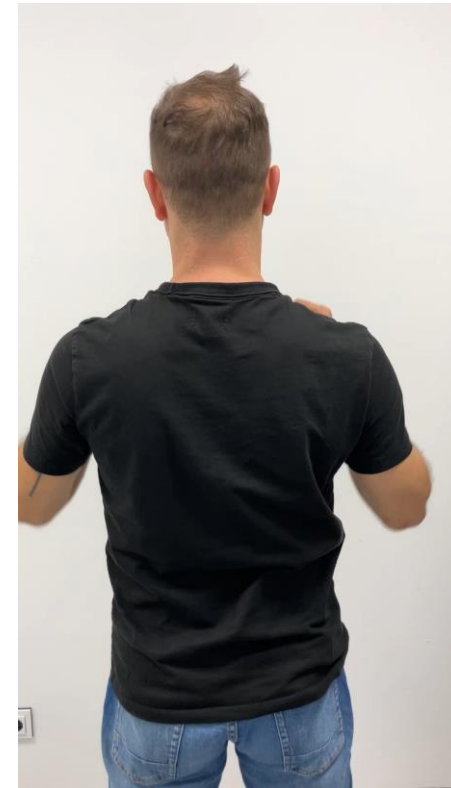
Before therapy

- Limited shoulder mobility, pain, functional impairment



After therapies

- Improved shoulder mobility and functionality



HILT and ESWT in QUERVAIN TENOSYNOVITIS

- **Objective:** To compare the effectiveness of ESWT and HILT in treating pain and improving function in de Quervain tenosynovitis (DQT).
- **Methods:** 60 DQT patients were treated with either ESWT (n=29) or HILT (n=31). Pain, function, and strength were assessed before and after treatment.
- **Results:** Both treatments improved pain, function, and strength (p<0.05). HILT showed better results in pressure pain threshold at three weeks (p<0.01).
- **Conclusion:** Both ESWT and HILT are effective for DQT, with HILT showing slightly better outcomes.

Original Article

The comparison of the efficacy of extracorporeal shockwave therapy and high-intensity laser therapy in the treatment of de Quervain tenosynovitis

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ABSTRACT

Objectives: This study aims to investigate and compare the treatment efficacy of extracorporeal shockwave therapy (ESWT) and high-intensity laser therapy (HILT) regarding pain management and functionality in patients with de Quervain tenosynovitis (DQT).

Patients and methods: Between May 2022 and November 2022, a total of 60 patients with DQT (16 males, 34 females; mean age: 43.3±7.7 years; range, 18 to 65 years) were included in this study. The patients were randomly divided into two groups as follows: Group A (ESWT, n=29) and Group B (HILT, n=31). The patients were asked to refrain from all types of exercise 24 h before the experiment. The pain level of the patients at the time of presentation was evaluated via Visual Analog Scale (VAS), and the function outcome was evaluated with Quick Disabilities of Arm, Shoulder and Hand (QDASH) before and after the treatment. Muscle strength was evaluated with a Jamar hand dynamometer, and an algometer was used to measure pressure pain threshold (PPT). The Global Assessment Scale (GAS) was used to measure the treatment success.

Results: The intragroup comparisons revealed significant improvements in all parameters after the treatment in both groups (p<0.05). The VAS-rest score, the VAS-movement score, the QDASH score, pain-free grip strength (PFGS), and PPT showed a significant difference before treatment at three weeks and three months (p<0.01). The difference between the PPT values of the groups at three weeks was significant (p<0.01). The third-week PPT value of Group B was higher than the PPT value of Group A. The difference between Global 1 and Global 2 scores of both groups was statistically significant at three weeks and three months (p<0.05).

Conclusion: Both ESWT and HILT treatments are safe and effective in DQT treatment. The ESWT is a recent, non-invasive therapeutic modality which is effective, convenient, and safe in DQT. On the other hand, HILT is a non-invasive, reliable method which has a greater effect on DQT.

Keywords: De Quervain tenosynovitis, extracorporeal shockwave therapy, high-intensity laser therapy.

De Quervain tenosynovitis (DQT) affects the first extensor compartment of the wrist, and it is not rare, with an incidence of 0.94 per 1,000 individuals annually.^[1] In general, the overuse or repetitive movements of the wrist or thumb constitutes the etiology. De Quervain tenosynovitis is usually diagnosed based on clinical findings.^[2] Women are affected four times more than men. The prevalence is elevated among individuals of non-white ethnicity and those aged 40 years and above.^[1] De Quervain tenosynovitis causes thickening in the first dorsal compartment and its tendons. The ability

to perform grasping, lifting, and twisting activities involving the thumb may be compromised in tasks where the extensor pollicis brevis (EPB) and abductor pollicis longus (APL) muscles are involved.^[3] De Quervain tenosynovitis is the inflammation of the tenosynovium surrounding the EPB and APL tendons. Typical findings of DQT include pain and swelling in the first dorsal compartment of the wrist. It can be diagnosed by using the Finkelstein test, and focal tenderness over the first compartment is apparent during physical examination.^[4] Recommended treatments are analgesics, thumb

PHYSICAL MODALITIES IN PROFESSIONAL SPORTS

- Brazil National Football Team - **Neymar**

