the art of shock wave

Shock Waves Today

The Journal for Shock Wave Users

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Debate – The »Shock Wave of Choice«: Focused or Radial?

Shock waves have been used for orthopaedic pain management for over 20 years. Initially, focused shock waves were used for indications such as plantar fasciitis, calcific tendonitis of the shoulder and epicondylitis. Then, around 15 years ago, radial shock waves were developed, due mainly to economic factors. Thanks to their easy application – along with the good results – radial shock waves now cover around 80% of the global market. But which of the two technologies is now »the shock wave of choice«? When is radial shock wave therapy more beneficial, and when is focused shock wave therapy the better choice? Or is it in fact the combination of radial and focused shock wave therapy that produces the best long-term therapy results for orthopaedic pain management, leading in turn to better patient care? One thing is certain: there are good reasons for using each type of technology. In the section below, the distinguished shock wave experts Prof. Karsten Knobloch and Dr Ulrich Dreisilker explain the advantages offered by the two technologies.

Prof. Karsten Knobloch: Focused Shock Wave Therapy

Prof. Karsten Knobloch, Hanover, Germany, is Vice President of the German-Speaking International Society for Shock Wave Treatment (DIGEST). He prefers focused shock wave therapy, which he frequently applies in the context of a multimodal treatment approach.

With focused shock waves (F-SW), the energy is generated via an electromagnetic cylindrical coil, which bundles the energy and forms a cigar-shaped focus with a maximum penetration depth of 6 cm. To regulate the penetration depth, two stand-offs are used that enable both superficial and deeper regions to be treated.

Advantages of F-SW

- Precise and pinpointed treatment of a trigger point or tendon insertion.
- The energy is applied exactly at the site where it is needed.
- The therapeutic efficacy reaches a depth of up to 12.5 cm.
- Thanks to the local pressure, trigger points dissolve in a long-lasting and effective manner.
- There is evidence-based proof of the stimulation of growth factors and stem cells.

Dr Ulrich Dreisilker: Radial Shock Wave Therapy

Dr Ulrich Dreisilker, Mettmann, Germany, values the advantages of radial shock wave therapy. In 2015, he published the book »Enthesiopathies II – Radial Shock Wave Therapy of Tendinopathies« (Level10 Publishing House).

In terms of physics, radial shock waves (R-SW) are pressure waves that spread in the body in a radial fashion and release their maximum energy on the surface of the skin. With the pressure wave, regions with a depth of up to 5 cm are reached, although the energy decreases in line with the increase in depth. It is assumed that the signals also reach deeper muscle layers via neuronal networking.

Advantages of R-SW

- The wide range of transmitters permits both local treatment and treatment of broad superficial areas.
- Muscle chains can be treated functionally in the course of the chain.
- The pressure wave mobilizes the tissue layers, which in turn breaks up adhesions and trigger points.
- The shifting of the tissue layers brings about »myofascial release«, which is the prerequisite for fascia therapy.

Combining focused and radial shock waves enables the overall symptom complex to be treated.

Based on a clinical example, the two users demonstrate the benefits of combining focused and radial shock waves.

Clinical Example
Plantar fasciitis on the right with heel pain upon exertion. Trigger points in the triceps surae, vastus lateralis and piriformis muscles (muscle chain); massive fascial adhesions in the calf, the tensor fasciae latae muscle and the muscles of the plantar sole (distal and proximal calcaneal spur).

Approach
Due to the deep location of some of the trigger points (triceps surae and piriformis muscles), focused shock waves are more suitable for the first step, since radial shock waves are limited by the depth. At the same time, focused shock waves can be used to locate the trigger points and insertional tendinosis. The insertion of the plantar fascia may also be located very deep down and can thus be reached very precisely using focused shock waves. In the second step, the trigger points of the quadriceps lateralis muscle, together with the myofascial structures, can be treated with radial shock waves. Here, due to time constraints, only one transmitter is used, ideally the D20-S, the PERI-ACTOR® »scraper« or the PERI-ACTOR® »knuckle«.

Protocol (in this order)
Step 1: Focused Shock Waves
- Plantar fascia: Stand-off I or II, approx. 800 pulses, 0.1 – 0.25mJ/mm², depending on pain level
- Trigger points triceps surae muscle: Stand-off I or no stand-off, 200 – 300 pulses per point, 0.1 – 0.25mJ/mm², depending on pain level
- Trigger points piriformis muscle: Stand-off I or no stand-off, 200 – 300 pulses per point, 0.1 – 0.25mJ/mm², depending on pain level

Step 2: Radial Shock Waves
- Plantar sole: In 3 – 5 passes from distal to proximal, 0.5 – 2.5 bar, depending on pain level, 16 Hz
- Fascia of the dorsal calf: In 3 – 5 passes from distal to proximal, 0.5 – 2.5 bar, depending on pain level, 16 Hz
- Trigger points vastus lateralis muscle: 300 pulses per point, 0.5 – 2.5 bar, depending on pain level, 16 Hz
- Tensor fasciae latae muscle: In 3 – 5 passes from distal to proximal, 0.5 – 2.5 bar, depending on pain level, 16 Hz
- Gluteal region: In 3 – 5 passes from distal to proximal, 0.5 – 2.5 bar, depending on pain level, 16 Hz

Conclusions:
Combination Improves Treatment
The clinical example demonstrates how combining focused and radial shock waves allows the advantages of the two technologies to be fully exploited. The overall symptoms can be treated precisely even though the treatment regions are located at different depths. Using focused shock waves alone would not have allowed for extensive superficial therapy, since the treatment would be too time-consuming. Nor would »myofascial release« be possible, which is required to counteract the fascial adhesions. While the use of radial shock waves alone is conceivable, it would mean that 80% of the trigger points could be reached only superficially due to their deep locations.

The D20-S, PERI-ACTOR® »scraper« and PERI-ACTOR® »knuckle« transmitters for the radial handpiece

At a Glance

- In practice, clinical presentations are often complex and can be treated with radial or focused shock waves with long-lasting results.
- Combining focused and radial shock waves unites the advantages of the two technologies and in so doing, contributes to better patient care.

Pre-release of Study Findings: Extracorporeal Shock Wave Therapy (ESWT) Can Heal Muscle Injuries Faster

MSc. Angela Zissler
Vascular & Exercise Biology Unit, Department of Cell Biology & Physiology, University of Salzburg, Austria

Muscle injuries play a central role for recreational athletes and for professional athletes, even more. For professional athletes in particular, it is essential for injuries to heal as quickly as possible so that they can return to their training schedule and prepare for competitions.

When it comes to sports medicine, efficient treatment and successful regeneration of skeletal muscle are fundamental. Despite a range of therapy options, healing of muscle injuries tends to be slow and in many cases, incomplete. Established therapy options are often ineffective, are sometimes controversial and are often difficult to implement in regular routine. In addition, side effects cannot always be fully prevented. Now, for the first time, a study conducted at the University of Salzburg has shown that extracorporeal shock wave therapy (ESWT) accelerates the regeneration of skeletal muscle tissue.

A study performed on rats investigated the effects of focused shock waves (DUOLITH® SD1) on muscle precursor cells and on the growth of newly formed muscle fibres. It documented that the therapy significantly accelerated the division rate of the muscle precursor cells and newly formed muscle fibres increase their size more quickly. The healing stage, which in untreated animals is exhibited after 7 days, is already reached after 4 days in treated animals after only a single approx. 15-minute ESWT session.

Handpiece with focused shock waves

This efficient therapy form is already used successfully in various medical disciplines, including orthopaedics, dermatology, cardiology and urology. However, the mechanisms of action at the cellular level have not yet been fully explained. The therapy is non-invasive, can be performed without a great deal of effort, is painless and thus can easily be combined with other treatment methods, such as physiotherapy. ESWT could therefore be highly significant in this area in future.

Source: Press release University of Salzburg, dated 26 July 2016, www.uni-salzburg.at

Case Study 1: Acute Calf Muscle Injury in a Professional Athlete

Dr Ulrich Piontkowski
Specialist for orthopaedics, chirotherapy, acupuncture and sports medicine, Centre for Orthopaedics in Bietigheim-Bissingen, Germany

In the following case study, we describe an acute calf muscle injury sustained by a professional athlete specializing in the 400-metre hurdles. The 24-year-old athlete injured her trail leg while practising the take-off into the hurdle. The injury manifested as a stabbing pain in the medial side of the calf, forcing her to discontinue training.

The pain extended across the Achilles' heel into the calcaneal region. A diagnostic MRI showed oedema in the distal plantaris tendon region.

An ultrasound with functional testing showed a partial rupture of the medial soleus muscle with oedema at the medial margin of the Achilles' tendon and fluid retention in the region of the distal plantaris tendon. The tear zone was classified as grade 3 and was treated with compression and with shock wave therapy.

With the patient supine, we initiated treatment with the fascia technique (radial shock wave therapy) and the V-ACTOR® technology (vibration therapy) for primary oedema reduction during lymph drainage. In further sessions, we combined the radial shock wave therapy (D20-S transmitter) with focused high-energy shock wave therapy in the region of the intermuscular fascia of the gastrocnemius muscle, in the plantar fascia region and focused in the area of the tear. In response to this therapy, which was performed 3 times a week, as well as wearing compression knee stockings, the patient's gait was quickly harmonized after 10 days. After 13 days, the patient was able to perform plantigrade heel strike and raise the forefoot adequately. She was able to resume easy running after 3 weeks and train at her former training level after 4 weeks. In our opinion, the athlete's clearly shorter »return to sport« period can be attributed to the combined shock wave therapy.

The acute calf muscle injury was treated with radial shock waves.

Case Study 2: Using Focused Shock Waves to Treat Craniomandibular Dysfunction (CMD)

The symptom complex referred to as craniomandibular dysfunction often encompasses myofascial trigger points in the masticatory muscles. These constitute a source of pain and at the same time, are key contributors to the coordination deficit of the masticatory muscles and can diminish or completely eliminate the benefits of an occlusal splint.

Treating the muscles of mastication with focused shock waves is a quick, effective and side-effect-free method of treating CMD.

The use of shock waves to treat CMD will be demonstrated in the case study presented below. A surface EMG (SinfoMed 8 channel) was used to record the effect of ESWT on the masticatory muscles.

Case Study

A 17-year-old patient with known bruxism for years reported increasing neck pain and frequent temple and frontal headaches persisting for days and showing limited response to analgesics. Treatment with an occlusal splint was indicated. While the patient was fitted with a splint, she reported that it was very unpleasant and ineffective.

Using focused shock waves to treat CMD

Initial Findings

Incomplete mouth opening (< 2 fingerbreadths), deviation of the mandible towards the left with clear subluxation of the right temporomandibular joint (TMJ). Pain on pressure in both TMJs, both masseter muscles, as well as the temporalis, sternocleidomastoid, trapezius and short neck muscles. Segmental dysfunction of C1 and C2, shortening of the left psoas muscle with the left posterior ilium; test for variable leg length discrepancy and ISG blockade on the left positive.

Therapy

Therapy comprised treatment with focused ESWT (DUOLITH® SD1) with 0.15 mJ/mm² and stand-off II at three sessions delivered at one-week intervals. At each session 2000 pulses were applied, with 500 pulses each on the two masseter muscles and 500 pulses each on the two temporal muscles. In so doing, the muscles were scanned and the trigger points detected were treated until there was a clear reduction of the transmission phenomenon. In the region of the masseter muscles, the shock waves radiated into the molars, the laryngeal region and the temporal region; during treatment of the temporal muscles, the shock waves radiated into the buccal region and for reproduction of the reported headache. No other treatments were performed during this period.

Results

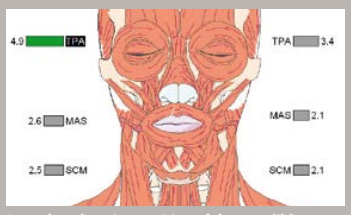
After 3 treatment sessions, the patient's headaches disappeared nearly completely. Mouth opening > 3 fingerbreadths was possible without deviation of the mandible from the midline. The blockades of C1, C2 and the ISG dissolved spontaneously and the test for variable leg length discrepancy was negative. The patient no longer perceived the use of the occlusal splint as unpleasant.

Conclusions

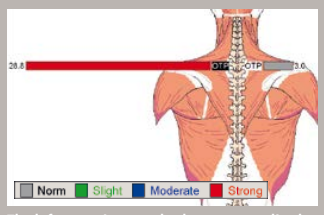
Treatment of CMD should also include the elimination of myofascial trigger points of the large muscles of mastication, which are (also) responsible for pain and functional disorders of the masticatory apparatus. Focused ESWT is an effective method for treating CMD. The positive effect of shock waves for treating CMD could already be observed after 3 therapy sessions using surface EMG. In the author's experience, in general, an average of 4 to 6 treatment sessions are required to achieve stable results. The results can be maintained using an occlusal splint. The therapy is combined with manual therapeutic/osteopathic methods, (auricular) acupuncture and physiotherapy.

Dr Klaus Hornig
Specialist for orthopaedics, chirotherapy, sports medicine and physiotherapy in Saarbrücken, Germany

Before treatment

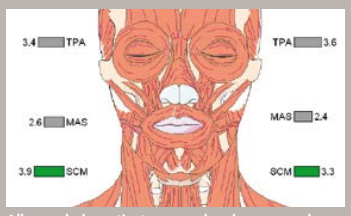


In a relaxed resting position of the mandible, the right temporalis muscle shows an amplitude elevated by 1S; the difference to the opposite side is significant.

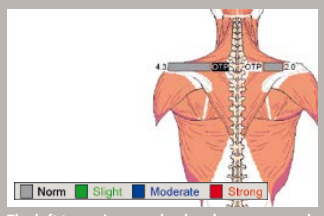


The left trapezius muscle shows an amplitude elevated by 3S; the right trapezius muscle shows a normal pattern.

After treatment



All recorded masticatory muscles show normal resting amplitude without significant discrepancy between sides.

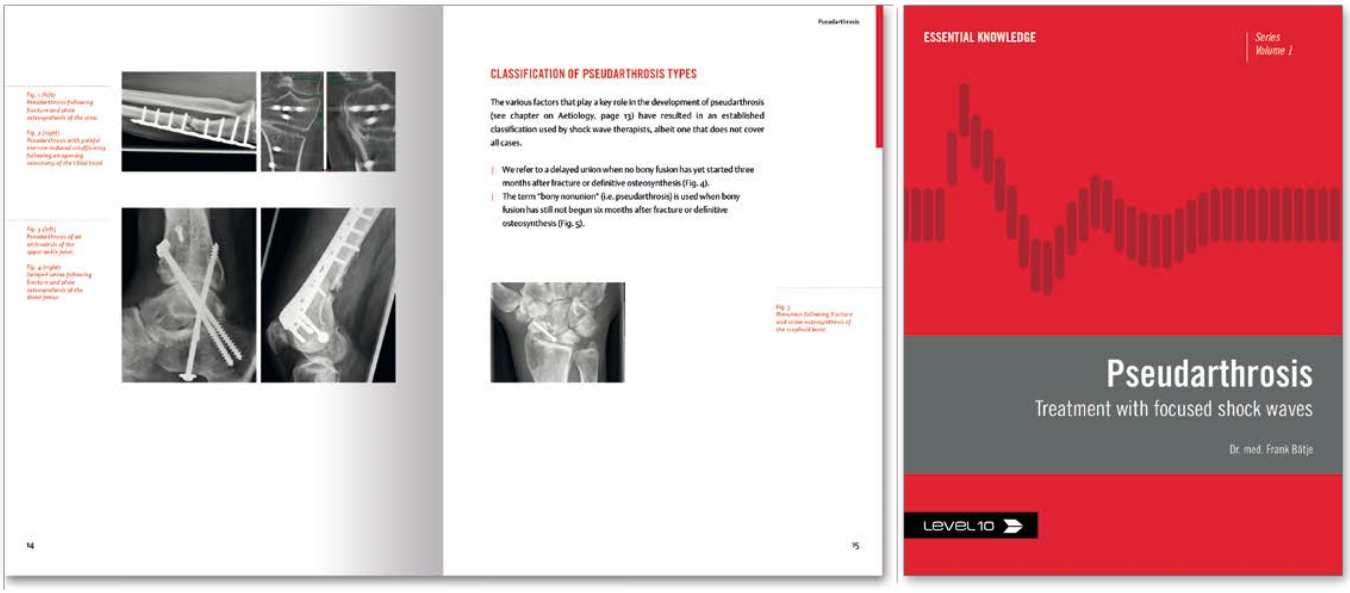


The left trapezius muscle also shows a normal resting pattern without treatment.

At a Glance

- CMD frequently comprises myofascial trigger points of the masticatory muscles; they can be treated effectively with focused ESWT.

New Level10 Publishing House Book on Pseudarthrosis



Look inside the book and cover

»Pseudarthrosis: Treatment with focused shock waves« is the first volume of the new Level10 »Essential Knowledge« series. With this manual, the publishing house is complementing the book series »Shock Wave Therapy in Practice« and is focusing on a specific topic.

The treatment of pseudarthrosis is one of the most interesting areas of application for extracorporeal shock wave therapy (ESWT). A growing number of orthopaedists consider ESWT to be an alternative to surgery. And for good reason: ESWT is non-invasive and can be performed on an out-patient basis. This also shortens the patients' rehabilitation period.

In his succinct introduction, the distinguished shock wave therapy expert Dr Frank Bätje presents the key points for using focused shock waves for treating pseudarthrosis. Numerous treatment examples and colourful illustrations help the reader navigate the topic and facilitate understanding. The author also provides valuable tips for everyday practice.

The book »Pseudarthrosis: Treatment with focused shock waves« is available in German and English and can be ordered from Level10 publishing house (info@level-books.de).

Dr Frank Bätje, Hanover, Germany, author of the book »Pseudarthrosis: Treatment with focused shock waves«

At a Glance

Contents

- Aetiology of pseudarthrosis
- Classification of pseudarthrosis
- Treatment options for pseudarthrosis
- Shock wave therapy mechanism of action
- Treating pseudarthrosis with ESWT
- Combining different methods
- Treatment recommendations with illustrations

Further product information

- Price: €29; 77 pages
- Languages: German and English
- ISBN of the German edition: 978-3-945106-051
- ISBN of the English edition: 978-3-945106-06-8
- Order from: www.level-books.com

Plantar Fasciopathy: New Study Investigates Success and Recurrence Rate After Individualised rESWT

Radial treatment of plantar fasciopathy

Plantar fasciopathy (PF) is a common cause of heel pain. Previous studies have already shown that PF can be treated effectively with radial shock wave therapy (rESWT). The effectiveness of an »individualised« radial shock wave therapy, however, has not been investigated yet (individualised = number of sessions, number of impulses, pressure and frequency depend on the individual patient tolerance and response to the treatment). The aim of a new retrospective study* by Dr Nikos Malliaropoulos and Prof Dr Heinz Lohrer was to report the success and recurrence rate of PF after individualised treatment with rESWT.

Method

In the study, the treatment data of 68 patients (29 men, 39 women, mean age 47 ± 11 years) with PF (58 unilateral, 10 bilateral) who had been treated with radial shock wave therapy between 2006 and 2013 was analysed. All treatments were performed with the shock wave system MASTERPULS® MP200 by STORZ MEDICAL.

Plantar fasciopathy is a common cause of heel pain

The patients were treated with an »individualised« protocol, which means that the number of sessions, the number of impulses, the pressure, and the frequency varied between the subjects depending on patient tolerance, the healing process and the severity and insistence of symptoms. However, all patients were treated for a minimum of 4 to 6 sessions and the pressure was always set at a minimum of 1 bar. One treatment was performed per week.

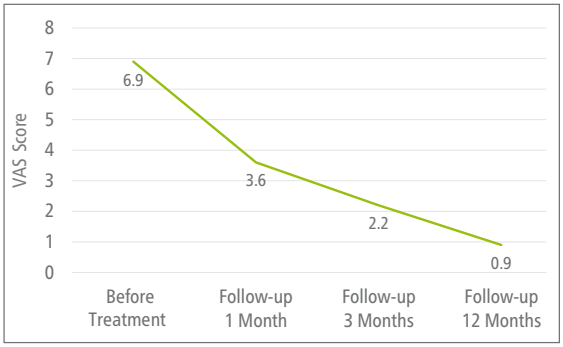
The effects of the rESWT were evaluated over a period of one year via follow-ups arranged at 1 month, 3 months, and 1 year after treatment. Patients recorded their level of pain with the Visual Analogue Scale (VAS). A treatment was rated successful if the VAS score was reduced by more than 60% at follow-up. One-year follow-up for any recurrence of symptoms was assessed during a clinic appointment.

Results and conclusion

The number of rESWT sessions per patient ranged from 4 to 11 (mean 7 ± 1.6). A total of 78 heels were treated with an average of 2000 impulses per session at a mean pressure of 1.7 ± 0.2 bar (ranged from 1.3 to 2.2) and a mean frequency of 5 ± 0.2 Hz (ranged from 5 to 6). From the total of 68 patients, 9 (13%) received 4 sessions, 10 (15%) received 5 sessions, 21 (31%) received 6 sessions, 5 (7%) received 7 sessions, 17 (25%) received 8 sessions, 2 (3%) received 9 sessions, 3 (4%) received 10 sessions, and 1 (1%) received 11 sessions.

There was a significant reduction in VAS pain score in comparison to baseline. The average pain level before treatment was 6.9. It was reduced to 3.6 one month after the last rESWT session and to 2.2 and 0.9 after 3 months and 1 year, respectively. Success rates were calculated at 19% (1 month), 70% (3 months), and 98% (1 year). The recurrence rate after one year was 8% (6 heels). Moderate positive Spearman's rho correlation ($r = 0.462$, $p < 0.001$) was found between pretreatment pain duration and the total number of rESWT sessions applied.

Dr Nikos Malliaropoulos
Sports and Exercise Medicine Clinic, Thessaloniki, Greece; Centre for Sports & Exercise Medicine, Queen Mary University of London, UK



Changes of average VAS score

The authors of the study conclude that an »individualised« radial shock wave therapy can be recommended for the treatment of PF and that it leads to better results.

*Source: Malliaropoulos N., Crate G., Meke M., Korakakis V., Nauck T., Lohrer H., Padhiar N.: Success and Recurrence Rate after Radial Extracorporeal Shock Wave Therapy for Plantar Fasciopathy: A Retrospective Study. BioMed Research International, Volume 2016 (2016)

At a Glance

- The treatment of plantar fasciopathy with an »individualised« radial shock wave therapy can lead to better treatment results.

Save the Dates:

October 2016

- **DKOU 2016 – German Congress of Orthopaedics and Trauma Surgery**
  25 – 28 October 2016
  Berlin, Germany
  http://dkou.org

- **9th Interdisciplinary World Congress on Low Back and Pelvic Girdle Pain**
  31 October – 3 November 2016
  Singapore

November 2016

- **4th European Congress of the European Region of the World Confederation of Physical Therapy**
  11 – 12 November 2016
  Liverpool, United Kingdom
  www.liverpool2016.com

- **MEDICA 2016**
  14 – 17 November 2016
  Düsseldorf, Germany
  www.medica.de

- **SHOCK WAVE Tokyo**
  27 November 2016
  Tokyo, Japan

December 2016

- **Zdravookhraneniye 2016**
  5 – 9 December 2016
  Moscow, Russia
  www.zdravo-expo.ru/en/

January 2017

- **ARAB HEALTH 2017**
  30 January – 2 February 2017
  Dubai, United Arab Emirates
  www.arabhealthonline.com

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