Abstract Book

SHOCK WAVE BERLIN

Second international shock wave conference

Shock Wave Therapy in Progress

Conference Meeting
Historic Empress Augusta Hospital Berlin
October 3/4, 2014

SHOCK WAVE BERLIN
Second international shock wave conference

Dear friends and colleagues,

It is my pleasure to welcome you to the second international shock wave conference SHOCK WAVE Berlin at the Historic Empress Augusta Hospital Berlin, Germany, October 3/4, 2014.

Encouraged by the success of our previous meeting at Germany in 2011 – SHOCK WAVE Frankfurt – we will retain the idea of exchanging experience and expertise. Leading physicians and therapists from all over the world will present innovative concepts of radial and focused shock wave therapy and diagnosis.

Beginners as well as experienced shock wave therapists will learn about latest results and developments in shock wave therapy. Special attention will be directed towards hands-on experiences and multidisciplinary medical applications.

This conference promises to be an outstanding educational experience which features many of the acknowledged world shock wave experts and opinion leaders in the fields of orthopaedics, urology, neurology, dermatology, physical and rehabilitation medicine.

All that is left is to thank you for your support, the experience and the ideas you bring to this event. "Willkommen" in Berlin, and to the second international shock wave conference SHOCK WAVE Berlin!

Sincerely, yours

Prof Dr Heinz Lohrer, Conference President
Institute for Sports Medicine Frankfurt Main, Germany

Board SHOCK WAVE Berlin

Dr Cristina d'Agostino
Orthopaedics, Trauma Surgery
Milan, Italy

Prof Dr Ludger Gerdesmeyer
Orthopaedics, Trauma Surgery
Kiel, Germany

Prof Dr Karsten Knobloch
Sports Medicine, Plastic and Hand Surgery, Hannover, Germany

Dr Bong-Jun Kwak
Orthopaedic Surgery
Seoul, South Korea

Dr Nikos Malliaropoulos
Sports Medicine
Thessaloniki, Greece; London/UK

Dr Jean-Paul Schmid
Cardiac Rehabilitation
Bern, Switzerland

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THE IMPACT OF SHOCK WAVE MEDICINE IN THE WORLD`S HEALTH SYSTEM

Authors
S. Thiele[a], R. Thiele[b]

Institution Adresses
[a]Martin-Luther-Krankenhaus, Berlin, Germany
[b]MVZ Chimanos, Berlin, Germany

Introduction
Shockwave Therapy has gained a prominent role in medicine. Coming from urologic treatment of kidney-stones it has developed importance in orthopedics and trauma-surgery as well as sports-medicine. The treated indications vary from the standard indications like chronic tendinopathies and impaired bone healing, via empirically tested indications like muscolosceletal pain syndromes, wound-healing and further tendinopathies in sports medicine to exceptional and experimental indications in cardiology.

Like the fast development of indications the method has gained worldwide acceptance. Shockwave is performed on every continent and national and international societies strengthen the influence in healthcare-systems in many countries and popularity in public.

Methods
The aim of our survey was to analyze the extension of extra corporal shockwave treatment all over the world and take a look at the acceptance and reimbursement by the different health care systems.

A questionnaire was send to well-reputated shockwave-medics in order to see how far shockwave-therapy has developed in their countries. During international conferences like the world-congress of the ISMST with over 300 participants from more than 40 countries the review was refined verbally.

Results
We have some good news. ESWT has modified medical therapy-options and broadened physicians horizon all over the world. A number of advantages like the avoidance of surgery, safety and effectiveness support the propagation of shockwave-therapy.

The results from 19 countries are included in our overview. Mostly ESWT is highly accepted and performed in the orthopedic field. In Europe especially Austria and Germany have integrated shockwave therapy in the medical environment. The probably most evolving continent so far seems to be South-America. Here the treatment is highly accepted by public and medical society and performed due to easy and safe handling pared with reasonable expenses.

Still there are only a few countries that established a PCT-Code or the treatment is reimbursed by the healthcare system.

Conclusions
There are good reasons to state that even the costs of the ESWT are very reasonable even though only little analytic proof has been conducted. Healthcare and insurance companies are urged to reconsider the reimbursement of this successful medical treatment.

Therefore it is necessary to extend the knowledge of the biological and medical effects of shock waves by further clinical trials and basic research in cooperation between institutes, hospitals, physicians, societies and manufacturer of ESWT devices in order to support the medical and socioeconomic impact of shockwaves.

TECHNICAL INNOVATIONS IN SHOCK WAVE THERAPY

Author
P. Novak
STORZ MEDICAL AG, Tägerwilen, Switzerland

Introduction
The shock waves are used in medicine for lithotripsy since 1980, but first in the last 15 years the number of clinical indications together with published scientific research is significantly increasing. The shock waves applications evolved from powerful, non-invasive destructive tool for stone disintegration to gentle and still effective stimulator of biological processes. Also the shock wave technology developed over the years. Whereas the shock wave sources remained more or less the same, the true innovation can be seen in the different propagation fields. For radial shock waves it has been achieved mainly by introducing new types of transmitters.

Methods
The shock waves are typically investigated by measuring the pressure with hydrophones in water which replaces the tissue. These measurement provide the information regarding the intensity and the form of the propagation field.[1] Whereas this method describes the focused shock waves very well, it has significant limitations in case of the radial shock waves, where it covers only the ultrasound part with relatively small penetration depth. The shock waves consist not only from ultrasound waves in the range of 100 kHz, but also acoustic waves in audible range[2,3,4] which can be visualized in jellylike tissue phantom with high speed camera.

Results
The measurements of the acoustic waves reveal deeper penetration range of the radial shock waves in form of an elastic wave. They may provide better explanation for the working principle of different types of radial shock waves transmitters than the ultrasonic measurements.

Conclusions
The development of new radial shock wave transmitters discloses the possibility for new shock wave applications like the treatment of spine, or fascia. Nevertheless, further scientific investigations are needed, in order to show, whether the radial shock waves (pressure waves) which are from physical point of view different from focused shock waves stimulates the tissue in the same, or in a different way. This information might contribute to further development and improvement of the ESWT (extracorporeal shock wave therapy).

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ESWT AS MONOMODAL OR PART OF A MULTIMODAL THERAPY APPROACH

Author
J. Lundgren
Sollentuna, Sweden

Introduction

Extracorporeal shockwave therapy (ESWT) is readily applied in some musculoskeletal disorders with great success.[1,2] These disorders could be a result from repetitive movements, faulting technique or poor ergonomics among others. At our clinic we believe that ESWT should be part of a multimodal treatment to give patients a better succession rate and faster recovery from musculoskeletal disorders such as achillles tendinalgia, plantarfascialgia or epikondylalgia, etc. This workshop will give you a suggestion of how to use ESWT as a part of a multimodal treatment strategy.

Methods

By using ESWT in combination with relieving treatment such as kinesio-tejping, orthosis, ergonomic knowledge, trigging methods such as eccentric exercises, dry needling or functional restoring such as kinetic analysing and suitable exercises, we believe that pain relieve and function may be restored better. It is important not to ignore the fact that ESWT is trigging healing, but that the tendon is not healed until several weeks or months after healing has started.[3] Correct diagnosis is key and indispensible to know which method is best suited. Thus prior to treatment ultrasonography is used.

Conclusions

Clinical consensus is pointing towards better results with our method, but we can still not present any conclusions. We are hoping to set up a protocol for different diagnosis and stages of pathology.

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SHOCK WAVES ON EPIPHYSEAL GROWTH PLATES

Authors
C. Brix, H. Lohrer, T. Nauck
Sportsmedicine Institute Frankfurt, Germany

Introduction
Overuse injuries are often seen among children playing sports. Due to the weakness of their epi-/apophyseal growth plates repetitive using of the same body parts, intensifies load on the growth plates and can damage them. The consequence is long lasting, load-associated pain, leading to reduced sports ability. Various conservative treatments have been described for Osgood-Schlatter and Sever's disease (Apophysitis calcanei), but short-term results are unsatisfying.

The aim of the two presented studies was to analyse safety and effectiveness of radial shock wave therapy in children with epiphyseal growth plates injuries.

Methods
Two retrospective reviews of the medical records at Sportsmedicine Institute Frankfurt were performed to determine patients suffering from recalcitrant Osgood-Schlatter and Sever's disease and having been treated with radial shock wave therapy.

Between 1999 – 2010 were 14 adolescent patients, nine boys and five girls, median age 14, treated with radial shock wave for Osgood-Schlatter disease. At a median follow-up time of 5.6 years they were examined with the VISA-P-G questionnaire[1].

Between 2005 – 2012 were five adolescent patients, two boys and three girls, median age 12, treated with radial shock wave for Sever's disease. At a median follow up time of 7 years they were investigated with the VISA-A-G questionnaire[2].

Results
At follow up the Osgood-Schlatter patients reached a median VISA-P-G score of 100. Twelve of 16 knees reached 100 points. Four patients had persisting pain and changed sports, four knees had persisting pain when performing sports, two cases had pain induced by activities of daily living[1].

At follow up the Sever's disease patients reached a maximum VISA-A-G score of 100. Three of them returned to their preinjuriy sports activity level, two changed sports due to personal and other orthopaedic reasons. In one case, the patient had an avulsion fracture of the proximal calcaneal apophysis and underwent surgery. Four of five patients graded the shock wave treatment successful[2].

Conclusions
These two pilot investigations demonstrate that radial shock wave therapy can be a promising treatment method for juvenile and adolescent athletes suffering from growth plates overuse syndromes like Osgood-Schlatter or Sever's disease. It is safe as there were no side effects reported[1,2].

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MULTIMODAL THERAPY FOR PATELLA AND ACHILLES TENDINOPATHY IN PROFESSIONAL GERMAN BUNDESLIGA SOCCER PLAYERS

Author
K. Knobloch
SportPraxis, Hannover, Germany

Introduction

Soccer players suffer mainly from tendinopathies of the Achilles and the patella tendon. Running exposure in a usual German Bundesliga match of 10 – 12 km, potential further games in the Championsleague and/or the German cup as well as genetic factors might predispose a given German soccer player to tendinopathy. Increased blood blood flow has been described at the point of pain by both, Laser Doppler flowmetry as well as with Power Doppler ultrasound. These neoblood vessels are closely related to a neoinnervation of pain-mediating nerve fibers positively stained for CGRP and substance P. Given the neovascularisation and the neoinnervation, a number of novel treatments have been studied in randomized studies, which have led to a multimodal approach in my clinical practice.

Methods

Patients suffering from either Achilles or patella tendinopathy undergo both, conventional and Power Doppler ultrasound determining the size of tendon diameter as well as the amount and location of neovascularisation by PowerDoppler ultrasound. The multimodal treatment consists of:

- Focused extracorporeal shockwave therapy (Storz Ultra)
- Low Level Laser Therapy (LLLT)
- Polidocanol sclerosing extratendinous injection under PowerDoppler guidance
- Eccentric training
- Topical glyceryl trinitrate
- Exercise pain limited until pain level 5/10

Results

Depending on the duration of Achilles/patella tendon pain and the severity, both the tendon diameter as well as the degree of neovascularisation might vary quite tremendously. Focused ESWT is typically applied at the point of pain as well as potentially on muscular trigger points depending on the given athlete in order to stimulate stem cells. Low Level Laser therapy is able to reduce the inflammation. Polidocanol sclerosing injections target the neovascularisation under PowerDoppler ultrasound guidance in order to reduce both, neovascularisation and neoinnervation. Eccentric training is typically performed with at least 6 x 15 repetitions per leg per day over at least 12 weeks in order to improve collagen synthesis and reduce the capillary blood flow. Topical glyceryl trinitrate is able to improve pain by collagen-I induction.

Conclusions

Multimodal tendon therapy, based on level 1 evidence (randomized controlled studies), is able to improve Achilles and patella tendon function with a sustained effect in soccer athletes.

ESWT IN SPORTS MEDICINE – RARE INDICATIONS

Author
H. Lohrer
Sportsmedicine Institute Frankfurt, Germany

Introduction
Besides standard indications for musculoskeletal Extracorporeal shockwave therapy (ESWT) we recently addressed some lesions, which are rare or previously not treated by ESWT. Specifically, we feel, that the combination of focused and radial ESWT may be of specific advantage. In this workshop we present our experience and application technique with this rare ESWT applications in the field of Sports Medicine. A specific focus is put on the additional value of diagnostic ultrasound.

Methods
The Duolith ultra (Storz Medical, Tägerwilen, Switzerland) is the device which integrates diagnostic ultrasound and focused and radial ESWT.

The following lesions were subjected to ESWT as part of a multimodal treatment:
SLAP, initial Spondylolysis, painful hip impingement caused by an Os acetabulare, nekrosis of the femoral head, bone bruise of the femural neck, Osteochondritis dissecans of the medial femural condyle, Osgood-Schlatter disease, non-union of a distal fibular fracture, 4th metatarsal stress fracture, navicular stress fracture, sesamoid Osteochondrosis, painful Os tibiale externum, and apophysitis calcanei.

Results
Retrospective analyses of the treated patient's charts revealed positive reactions in all cases. Patients were able to return to their sport. However, the time to reintegration needs not only weeks, but sometimes several months.

Conclusions
ESWT seems to be effective in several Sports orthopaedic lesions which were previously not considered as ESWT indications. However, it should be considered, that ESWT in all demonstrated cases was a part of a complex, at least bimodal and mostly multimodal treatment regimen, and specifically unloading and even additional immobilisation of the treated area hat to be considered in specific cases.

COMBINED RADIAL AND FOCUSED EXTRACORPOREAL SHOCKWAVE THERAPY FOR ADHESIVE CAPSULITIS

Author
M. Alvi
Athlete's Care Sports Medicine Centre, Ontario, Canada

Introduction

Idiopathic adhesive capsulitis is an intrinsic process characterized by a thickened, contracted glenohumeral joint capsule with decreased normal joint volume and obliteration of the dependent inferior capsular fold.[5] This insidious pathological entity typically affects the non-dominant arm[3] of mainly women aged 40 to 60 years[4] and persons commonly in sedentary vocations.[6] It is a disabling condition with pain and mechanical restraint to passive motion which often affects the individuals' activities of daily living (ADL), athletic and vocational pursuits. The pathology of the disease process is a continuum of capsular inflammation to fibrosis[6] with three clinical phases (freezing, frozen and thawing) and four arthroscopic stages.[5,6]

There are multiple associations with systemic diseases which increase the risk of developing idiopathic adhesive capsulitis, with diabetes being associated with the worst prognosis.[1] Supervised physical therapy combined with home-based exercises remains to be the mainstay treatment, along with likely use of oral or intra-articular steroid injections as an adjunct. Refractory cases may be treated with manipulation under anesthesia, and/or arthroscopic capsular release. Results of other less conventional interventions such as suprascapular nerve blocks[7] and hydrodilatation[2] have not been reproduced by other authors.

Uncertainty regarding the natural history of the disease process with expected natural trend towards progressive improvement with or without interventions, has hampered concerted efforts in establishing efficacy and outcome of the non-invasive treatment options using reproducible objective outcome measures. In this study, the effectiveness of combined radial and focused extracorporeal shockwave therapy for the treatment of idiopathic adhesive capsulitis is discussed and demonstrated.

Methods

We studied 44 patients who had shoulder pain and stiffness for at least 12 months with diagnosis of "frozen shoulder" by the referring physicians. They all had previous routine physiotherapy and subacromial and/or intra-articular cortisone injections with no significant improvement. These patients required oral analgesics or anti-inflammatory for their symptom management. These patients were divided into two groups. Group A received supervised course of accelerated physical therapy three days a week along with three times per day home stretching program for a period of 12 weeks. Group B received the same therapy regime as Group A along with 6 sessions of combined radial and focused extracorporeal shockwave therapy using DUOLITH® SD1 »ultra« Shockwave Therapy system by Storz Medical. All patients were consented to enter the study after a detailed discussion of the treatmetnt arms, the possible risks of shockwave therapy and the alternative treatment options. All patients in each group had comprehensive serological testing, radiographic examiniation incluidng an outlet view, and either an MRI or MR arthrogram in an effort to exclude other diagnoses.

Follow-up was carried out in one month, two months, three months and six months. The response to treatment was judged by the total recovery of range of motion as excellent (60 to 80%), good (40 to 60%), and poor (less than 40%). Pain intensity was measured on an 11-point pain intensity numerical rating scale (PI-NRS), where 0 = no pain and 10 = worst possible pain.

Results

About 90% of Patients in Group B had substantial sustained improvement of pain and ROM (60% excellent and 40% good) with ability to return to most of their ADLs and athletic activities. Only 18% of patients in Group A had transient improvement of pain and ROM (less than 40%) with continued dissatisfaction of their treatment.

Conclusions

Combined radial and focused shockwave therapy is an effective treatment to expedite management of idiopathic adhesive capulitis with substantial decrease in pain and improved ROM up to 6 months follow up. This study is in progress at the time of the preparation of this abstract.

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TOP 3 ESWT INDICATIONS OF LOWER EXTREMITY

Author
A. Heinzinger
DocOrtho, Praxis für Orthopädie und Unfallchirurgie MVZ, Berlin, Germany

Introduction
Patients with heel spur, jumpers knee and pseudoradicular hip pain show up very often in our clinic. Some went through several other treatments first without help. Heel spur and jumpers knee are correlated to an inflammatory process at the insertion of tendons.[1,4] Trigger points in muscles seem to be problems of muscle function. Both can be treated with ESWT.[3]

Methods
Analysis of the local or referred pain patterns. Visualisation helps. Ultrasound examination. Make sure there is no structural damage or systemic problem responsible. If there is one treat it as well. ESWT using Masterpuls and Duolith SD1 Systems. Number of Treatments per patient: 1 up to 8. 1 – 2 Treatments per week. Combine radial and focussed ESWT. R-Eswt: 500 – 4000 impulses, 1.2 – 5.0 bar 4 – 15 Hz per point. F-Eswt 200 – 500 impulses, 0.05 – 0.35 mJ/mm^2, 4 Hz per point. Demonstration of heel spur, jumpers knee und runners revenge trigger treatment.

Results
No evidence based datas for trigger point treatment, increasing number of datas for heel spur and jumpers knee problems show a change in the therapeutic options.[1,2,4,5] We use them more and more often with positive feedback in athlets and patients with high sport activity level.

Conclusions
Especially in frustrating cases where nothing seems to help it`s worth thinking of an ESWT in this common cases.

MUSCULOSKELETAL TREATMENT OF PATIENTS WITH SHOCK WAVES

Author
A. Heinzinger
DocOrtho, Praxis für Orthopädie und Unfallchirurgie MVZ, Berlin, Germany

Introduction
Trained to be a surgical weapon I realised there are problems you can`t heal with a knife. So I started to engage in ESWT (Extracorporal Shock Wave Therapy) to treat musculoskeletal problems in year 2000. According to the basic literature of Travell/Simons[6] hundreds of patients with so called trigger problems were treated since then.

Methods
Analysis of the local or referred pain patterns. Visualisation helps. Make sure there is no structural damage or systemic problem responsible. If there is one treat it as well. ESWT using Masterpuls and Duolith SD1 Systems. Number of Treatments per patient: 1 up to several hundred. 1 – 2 Treatments per week. Combine radial and focussed ESWT. R-Eswt: 500 – 4000 impulses, 1.2 – 5.0 bar 4 – 15 Hz per muscle. F-Eswt 200 – 500 impulses, 0.05 – 0.35 mJ/mm^2, 4 Hz per muscle point. Demonstration of 3 trigger points neck, shoulder and lower back.

Results
There is no statistic analysis available. The treatments vary to much from patient to patient. Sometimes it is a monotherapy, sometimes part of a combined approach. But the number of patients increased over the years. Especially in sports men and women.

Conclusions
Even evidence based datas are rare in this kind of treatment, it`s always worth thinking of it. Especially when there is no success in other approaches.

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RADIAL EXTRACORPOREAL SHOCKWAVE THERAPY (RESWT) FOR THE TREATMENT OF FINGER FLEXOR TENOSYNOVITIS (TRIGGER FINGER) AND DE QUERVAIN'S TENOSYNOVITIS (TRIGGER THUMB)

Authors
N. Malliaropoulos[a,b,c], R. Jury[a,b], N. Padhiar[c], M. Mekke[a], H. Lohrer[d]

Institution Adresses
[a]Thessaloniki Sports and Exercise Medicine Clinic, Thessaloniki, Greece
[b]National Athletics Sports and Exercise Medicine Center Thessaloniki, Greece
[c]European Sports Care
[d]Sports Medicine Institute Frankfurt, Germany

Introduction
Stenosing tenosynovitis of the digital flexor tendon (trigger digit) is the most common flexor tendonopathy. However, traditional conservative therapy is often not effective. Radial extracorporeal shock wave therapy (RESWT) is effective in the treatment of numerous other tendonopathies and offers an alternative to surgery, allowing fast recovery without the need for immobilisation and without the complications associated with surgery. According to our knowledge this is the first study on fingers tenosynovitis-TRIGGER DIGIT and Radial Shock wave therapy.

Objectives
Analyse the number ofradial extracorporeal shockwave therapy (rESWT) sessions needed for the treatment of trigger digits in the fields of a retrospective cohort study and assess the mean Visual Analogue Scale (VAS) reductions over a one-year follow up period. Individual rESWT protocols were applied according to each patient response to treatment and tolerance.

Methods
39 patients (49 fingers) diagnosed with trigger digitby visiting a Sports Medicine outpatient clinicwere treated with rESWT and retrospectively analysed regarding the mean number of sessions completed and mean shockwave impulses, pressure and frequency applied. Significant treatment results were assessed by mean VAS reductions at 1, 3 and 12 month post-treatment follow ups with paired difference test. It was also tested if a relationship exists between the pain durations in months prior to the rESWT treatment with the number of session performed and with the post-treatment VAS scores. One-year recurrence rate was assessed.

Results
We found significant ($p<.05$) mean VAS reductions at all three follow up stages (67% at 1-month, 84% at 3 months, 91% at 12 months). Additionally, pre-treatment symptom duration was significantly correlatedwithrESWT number of sessions required until recovery ($r=.776$, $p<.01$)and with the 1-year finger pain leveloutcome after treatment ($r=.301$, $p<.05$).

Conclusions
These results demonstrate that low doser ESWT is a safe and effective treatment for trigger digit.

ADAPTION OF THE MUSCLE-TENDON COMPLEX TO MECHANICAL LOAD AND IMPLICATIONS FOR SHOCK WAVE THERAPY

Authors
U. Dreisliker, K. Karanikas
Mettmann, Germany

Introduction

Eccentric stretching exercises (loading exercises) in the longitudinal direction of the tendon improve both strength and elasticity of the tendon.[1,2,3,4,5,6,7,8,9] In our opinion the mechanism of this adaption can be explained by fibrocyte proliferation and collagen fiber synthesis.[2] Less is known about the effect of shear forces in angular or diagonal direction to the tendon. In physical therapy, deep frictions (Cyriax, "Japanese stick massage" or trigger point massage tool) are being applied manually when treating a tendinopathy. Already minor shear forces mean stress for the tendon, comparable to a stretched elastic strap which does not tolerate it well when forces are applied from the side. Analogous to this, low shock waves are applied in angular and diagonal direction to the course of the tendon in order to accelerate the process of fibrocyte proliferation responsible for collagen synthesis and remodeling during the healing of the tendon.[10]

Methods

Case reports of 18 patients in total with tendinopathies of the Achilles tendon, lateral and medial epicondylitis, and proximal insertion tendinopathies of the patellar ligament. Focused/radial shock wave application in angular/diagonal direction (apply the 90° rule) without gel or oil (applying RSW). Intervals 1 week, 5 – 8 sessions. Recommendation of stretching exercises 3 times/day for 15 minutes for the duration of at least 8 weeks. VAS test was used for documentation.

Results

Case report in process.

Conclusions

By parallel treatment with ESW and instruction of loading exercises, patient compliance is improved. According to our experience, the sole prescription of stretching exercises is not sufficient as they are often not done regularly. Discontinuations of therapy were avoided because of the parallel treatment. The SW shear treatment of tendinopathies with radial and focused shock waves seems to be an improved treatment option when treating tendinopathies.

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WOULD SHOCK WAVES EXPOSURE IMPROVE TENDON REGENERATION?

Authors
V. Visco[a], M. Vetrano[b], M. C. Vulpiani[b]

Institution Adresses
[a] Department of Clinical and Molecular Medicine, "Sapienza" University of Rome, Sant'Andrea Hospital, Italy
[b] Department of Ortophaedics and Traumatology, "Sapienza" University of Rome, Sant'Andrea Hospital, Italy

Introduction
In the past years, several works on the biological effects of shock waves, performed on animal models and cell lines, have been published; even though – more recently – such effects started to be evaluated also on human cultured tenocytes[1,2]. To provide possible explanations of Extracorporeal Shock Wave (ESW) benefits in the management of several tendhinopaties, although the exact mechanisms are largely unknown, we established primary cultures of human tenocytes by tendon explants. In two recent studies, we reported – for the first time – the specific effects of SW treatment on human cultured tenocytes derived either from healthy or ruptured[3,4].

Methods
Human tendon-derived cells were obtained by semitendinosus (ST) or Achilles tendons (AT), expanded in culture and then exposed at different shock waves energy doses, in order to obtain a good arrangement between the in vitro cell viability and the clinical benefits. First, cells were molecularly characterized by RT-PCR. SW effects were then evaluated by vitality, proliferation and migration tests. The functional secretive activity of the treated cells was analyzed by the Sircol total collagen and double immunofluorescence assays.

Results
We showed that ESWT significantly enhances proliferation, migration and functional activities of the tenocytes, mainly in cultures derived from ruptured compared to healthy tendons.

Conclusions
Human cultured tenocytes derived from ruptured tendons are more susceptible to shock waves than those derived from healthy tendons: those data corroborate the rationale of using ESWT, amenable to induce tendon regeneration.

However the correlation between human tenocyte differentiation and shock wave-mediated effects should be better elucidated, considering the possible recruitment of tendon-derived stem cells (TDSCs) at the site of injury. Future investigations may provide the identification of further molecules (e.g. growth factors) able to stimulate tendon repair.

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FASCIAL MANIPULATION WITH SHOCK WAVES

Author
U. Piontkowski
Zentrum für Orthopädie, Bietigheim-Bissingen, Germany

Abstract
Accompanying the rising up of Fascia tissue from the " Cinderella of Orthopaedic research" to the highest rank of citation index and practical work of body workers as well as Orthopaedic doctors we are again crossing the border of classical indications for shock wave therapy.

According to the model of myofascial trains we have used shock waves for treatment of myofascial pain syndroms not knowing exactly what we do for about 10 years.[1] With the new model of fascial mobilisation and manipulation following the Centers of communiction, perception and fusion,[2,3] we have extended and precised the myofascial and trigger therapy using shock waves. Specific movement tests and precise anatomical information are nessary to determine the new areas and points which are responsible for any given dysfunction.

We are using the combined shock wave therapy with radial and focussed handpieces. For effective fascial mobilisation and manipulation and based on the old chinese therapy method Gua Sha we have developed new handpieces and tips for radial shock wave.

Leaving the common field of shock wave therapy we are still using shock wave impulses in a special manner.

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FASCIA TREATMENT

Author
M. Legat
Schmerz Zentrum Zofingen, Switzerland

Abstract
Disorders of fascial origin originate in the connective tissue. Connective tissue comprises subcutaneous fascia, connective tissue that surrounds muscles as well as tendons and tendon insertions.

During the last few decades, edifices of thought have evolved both in osteopathy and in the European schools of manual medicine that consider fascial structures to have a major impact on the genesis of musculoskeletal disorders.

As far as pathological factors are concerned, both general changes in tone such as fascial hypertension and local alterations, so-called tender points, play a role. The tender point criteria defined by the ACR for the diagnosis of fibromyalgia do not apply here even if the painful areas described are located in the tendon insertions. Moreover, tender points are distinctly different from trigger points which are located in the actual muscle tissue and induce the so-called referred pain. In clinical practice, muscular and fascial disorders often occur concurrently and then need to be treated together. For didactic reasons, fascial therapy will be discussed as an isolated discipline in the following sections.

There are several different approaches to the treatment of fascia. While direct techniques use stretching for tissue elongation, indirect techniques initially relax the tissue to encourage its natural reactions and reorientation. These techniques are mostly used in osteopathy.

Other options include techniques that are based on Rolfing and use strong external manipulation. For the sake of completeness, we should also cite the Fascial Distortion Model developed by Stephen Typaldos which has gained increasing attention over the last five years. Basically, all these therapies lead to tissue regeneration and to reorientation of its form and structure. This is exactly where modern shock wave therapy comes to the fore. Scientists discuss regenerative processes, induced vascular dilation and angiogenesis. Drainage of lymphatic vessels is increased. This is where the body's fascia provides an enormous storage capacity.

'SHOCKING' UROLOGICAL DISEASES : ESWT AS A UROLOGICAL TREATMENT

Authors
D. F. Miclea, D. Fahlenkamp
Bethanien Krankenhaus Chemnitz Urology, Chemnitz, Germany

Introduction
Since the introduction of the ESWL, which had a great impact on the urolithiasis therapy, the hunger for new treatment methods pulled the scientific minds to accomplish once more a potent and viable treatment solution: the ESWT .

Finding itself in a vast array of usability, the ESWT is becoming more and more aware in the urological use. Thus, here are the three areas of use. Induratio penis plastic is the first one we started with. After that we focused on the Pelvic Pain Syndrome, with good results. Other clinics are using the shock waves for the Erectile Dysfunction.

Methods
Two retrospective evaluations

1. Storz Minilith SL1 and Stortz Modulith SLK:
   There are two study groups ranging from 1997 until 1998 and 1999 until 2002 with a total of 211 patients. Target variables were pain, deviation and penetration success.
2. Storz Duolith SD1:
   A total of 30 Patients from 2008 until 2009. The patient is in a supine position, the penis being immobilized by tape. There is one treatment session per week with a total of five consecutive weeks. The patient will have 2000 impulses applied per session with an energy flux density between 0.2 and 0.3 mJ/mm^2. There is a follow up after 6 weeks.

Results
The pain symptoms were dramatically decreased in all patients, most cases showing a painfree success. 36.7% of the patients reported an intercourse improvement. Speaking of the penile curvature, it has decreased by 10 to 30 degrees in up to 40% of the cases.

Conclusions
The ESWT is an effective solution for the painful erection. A decrease in the penile curvature can be expected in part of the patients. Due to the lack of major side effects, the ESWT is a viable option for all Patients. Other therapies (if needed, for example surgery) are not hampered.

SHOCK WAVE THERAPY IN CHRONIC STABLE ANGINA PECTORIS

Author
J.-P. Schmid
Cardiology Clinic, Tiefenau Hospital and University of Bern, Switzerland

Introduction
Despite an increasing number of coronary interventions over the recent years, there is still a considerable amount of patients suffering from chronic refractory angina pectoris. The volume of no option patients is estimated to be between 2.5 – 5% of coronary angiography procedures. Low-energy shock wave therapy has been shown to induce neovascularization in various non-cardiac tissues, reason why the effect on angina pectoris was tested in a number of studies.

Methods
Cardiac shock wave therapy (CSWT) is applied during diastole, using R-wave triggering. It is delivered at the border zone of the ischaemic region with a maximum intensity of 0.09 mJ/mm^2. In the ambulatory setting, the treatment of nine to twelve spots with 200 shots per spot has proven to be of good value (European protocol). In the stationary setting, up to 60 spots with 200 shots/spot have been applied (Japanese protocol). In the ambulatory setting, three treatment sessions are clustered in one week on different days, amounting to about a third of the applied energy of a stationary setting. The clusters of three treatments within a week are repeated three times (total of nine treatment sessions) with a treatment free interval of four weeks respectively, in order to allow the tissue to respond to the intervention. In the stationary setting, the whole treatment is applied at once. In each case, treatment response is assessed three months after completion of the treatment.

Results
All human studies performed so far confirmed the efficacy of CSWT on symptoms of chronic stable angina pectoris. The results show a high responder rate with a significant improvement of CCS class, quality of life, parameters of LV-function and exercise capacity. The effect of CSWT on myocardial perfusion were demonstrated repeatedly by an improvement in the signals of single photon emission computed tomography (SPECT) imaging and interestingly only in the areas treated. Furthermore, no adverse effects of CSWT have been reported.

Conclusions
CSWT has been established in chronic stable angina pectoris, showing consistently an excellent patient acceptance and good clinical response. The indications of CSWT might expand in the future, especially towards an application after acute myocardial infarction or in chronic ischemic heart disease. Shock wave induced angiogenesis in cardiology might therefore provide a unique opportunity to become a new angiogenic therapy without requiring expensive, laborious and invasive procedures.

FOCUSED LOW ENERGY SHOCK WAVES IN THE NEUROLOGICAL REHABILITATION

Author
H. Lohse-Busch
Outpatient Department for Manual Medicine – Movement Disorder Center, Bad Krozingen, Germany

Introduction
Focused extracorporeal shock wave therapy (ESWT) upregulates endothelial nitric oxide synthase, is stimulating angiogenesis and neurogenesis. Former investigations with rats show that ESWT of the damaged spinal cord and crushed peripheral nerves improves the motor activity and the sensitivity. From 1996 till today, ESWT evolved into several fields of the neurological rehabilitation.

Methods
There will be given an overview about the results so far obtained with ESWT to the muscles and periphereal nerves, but also special treatment techniques as transcranial ESWT and ESWT of the spinal cord.

Results
ESWT alleviates the symptoms of spasticity and rigidity in children and adults suffering from cerebral palsy, brain trauma or stroke. Nowadays the indication has been widened to symptomatic treatments of paraparesis after spine injuries and myelomeningocele. The results after the ESWT of patients affected by a deep unresponsive wakefulness syndrome (“apallic syndrome”) are as surprising as they are with distally symmetric polyneuropathy.

Conclusions
The quality of the investigations is very different. The numbers of the patients treated are still small, some studies deal only with casuistics. But the results obtained so far open a fascinating horizon for the ESWT in the field of neurological rehabilitation. The purpose of this overview is to encourage more investigations in this interesting field.

ESWT AND ERECTILE DYSFUNCTION

Author
L. Lund
Department of Urology, Odense University Hospital and Clinical Institute of Southern University of Denmark

Introduction

Male impotence is a huge problem and more the 50% of men over 60 years of age have erectile dysfunction.[1] For the last 15 years, oral treatment with phosphodiesterase 5 inhibitors (PDE-5) or injection therapy with Alprostadil has been the treatments of erectile dysfunction (ED). [2,3,4] However, their effect is still limited to the sexual act and probably do not improve spontaneous erections. Studies have shown that ESWT could be a new treatment modality that would provide a rehabilitative or curative effect for ED.[5,6]

LI-ESWT (Low-intensity extracorporal shock-wave therapy) may lead to neo-angiogenesis and neo-vascularisation of organs. We want to present our data from a pilot study with a 2 year follow-up and a randomised study with 6 months follow-up.

Methods

15 men with ED were included in a pilot study and 112 men in a randomised prospective study. All men have tried treatment with PDE-5 inhibitors or injection therapy. LI-ESWT treatment was performed with a handheld Duolith SD1 machine (Storz Medical®). The treatment was applied to 6 different locations on the penis from the distal, medial and proximal part of each of the 2 corpora cavernosa. Treatment was performed without local anaesthesia with 0.13 mJ/mm^2, frequency of 5 Hz, 3000 shock-waves with a total energy of 12.8 J per treatment. The men received one treatment each week for 5 weeks.

Results

Mean-age in the pilot study was 58 years (range 42 – 67) and in the prospective study 60 years (37 – 80). In the pilot study, 11 men (73%) could now have an erection without medication after treatment and were able to have sexual intercourse. After 24 months 4 men (36%) were still able to fulfil an intercourse without medication.

In the randomized study, 29 men (57%) were able to obtain erection after treatment and could have a sexual intercourse without use of medication. In the placebo group only five men (9%) showed similar results ($p = 0.0001$).

Conclusions

These studies have shown that nearly 59% of men with ED could be treated alone by LI-ESWT compared to a placebo group. Follow-up show that it could be a possible cure in 30% of men with ED but it indicates the need for additional treatment in others.

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NON-UNIONS AND STRESS FRACTURES

Author
C. d'Agostino
Shock Waves Therapy and Research Unit, Humanitas Research Hospital, Milan, Italy

Introduction
Nonunions and stress fractures may originate respectively from impaired osteogenesis and altered bone turnover. In many cases, the therapy, if failure of conservative treatment, has been, until some years ago, the surgical approach (bone graft and osteosynthesis). Besides possible surgical side effects, some coexisting health problems can impaire the results as well. From this point of view, SW represent an undoubtely advantage in the treatment of these bone pathologies[1,2,3].

Methods
SW treatment for nonunions and stress fractures requires the use of proper devices, in order to apply high/medium energies and low/medium ones respectively. According to the ISMST guidelines, for long bones it is recommended to target the anatomical site by fluoroscopy, while for superficial and smaller ones, ultrasound probe can be appropriate. In spite of the SW application protocols, that differs, accordingly to the different devices, one main condition has to be respected, for a successful treatment, that is mechanical stability. This can be guaranteed by osteosynthesis/immobilization and eventually not weight – bearing, varying from 3 – 4 or more weeks.

Results
The application of SW in daily practice, both in nonunions and in stress fractures, in properly selected patients, can induce positive therapeutic effects, in terms of osteogenesis stimulation and bone turnover normalization, in percentages comparable to those of surgery. Moreover, especially for stress fractures, it will be possible a rapid return to sport activities and agonism, especially if early detected. The positive effects of SW on bone, for all we know today, seems to occur at different levels: both directly on bone cells, and vasculogenesis and by interphering in the cross-talk between osteoblasts and osteoclasts as well[2,3].

Conclusions
The introduction of SW in the clinical practice, both for nonunions and stress fractures, can be considered as the first choice for the conservative treatment of these bone pathologies, with some undoubted advantages[2,3].

SW represent a safe method, whose results and efficacy are comparable with those of surgery, but without the risk and the cost of the invasive approach; moreover, especially for athletes, they allow a more rapid recovery and return to sport activities[1,2,3].

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WOUND HEALING

Author
J.-P. Schmid
Cardiology Clinic, Tiefenau Hospital and University of Bern, Switzerland

Introduction
Due to the unsatisfactorily therapeutic efficacy of standard care, many adjunctive therapies have been designed for the treatment of chronic wounds, such as negative pressure wound therapy, hyperbaric oxygen therapy or ultrasound. However, delayed treatment is still frequently observed, particularly in the elderly, patients with comorbidities (diabetes, atherosclerosis, venous insufficiency, reduced mobility) and new efficient treatment modalities are warranted.

Methods
Focussed or non-focussed shock wave therapy (ESWT), constitutes a promising new non-invasive therapeutic approach. Prior to shock wave therapy, thorough debridement of the wound is performed. Sterile ultrasound gel is applied to the wound surface, covered by a plastic drape. Around 100 pulses/cm^2 are generally applied to the wound bed, the border and the surrounding tissue with energy flux densities between 0.03 to 0.15 mJ/mm^2. The initial treatment frequency of once weekly for a minimum of 3 to 5 session might be adapted in patients with slow response to biweekly applications with treatment durations up to several months.

Results
In a study of 208 patients[1], response rates up to 75% have been reported in acute and chronic wounds. Significant associations were found between complete epithelialization and wound size (better response for wounds <10 cm^2 vs. wounds >10 cm^2) and duration (better response for wounds persisting <1 month vs. >1 month). Lowest healing rates showed venous stasis ulcers compared with arterial insufficiency ulcer, decubital ulcers, disturbed healing wounds, posttraumatic tissue necrosis, and burn wounds, the latter showing the best treatment response. No treatment-related toxicity, infection, or deterioration of any ESWT-treated wound was reported.

Conclusions
ESWT for the treatment of soft tissue wounds is a novel approach to treat difficult to heal or non-healing wounds. The physical properties of shock waves are translated to complex biological responses, including release of cyto- and chemokines involved in enhanced tissue perfusion and angiogenesis, both essential for the wound healing cascade. The suppression of a pro-inflammatory status as well as the antimicrobial effect of shock waves could further lead to improved wound healing. ESWT supporting healing of problematic wounds represents an innovative therapeutic modality, which thus far shows clinical efficacy, reproducibility, and safety.

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ACUPUNCTURE WITH SHOCKWAVES

Author
H. Everke
Constance, Germany

Introduction
Extracorporal shockwave therapy is well known in orthopaedic medicine for the treatment of tendinoses and trigger-points. Here the shockwaves are pointed with high energy directly onto the painful point, which can be very painful itself. The aim of my clinical observations was to determine if it is possible to treat painful orthopaedic diseases by stimulating acupuncture points near the area and far away from the painful area with low energy shockwaves. As we know from acupressure, many acupuncture points are very sensitive to pressure. This leads to the assumption that shockwaves of low intensity applied to a very small area could be the adequate stimulus for acupuncture points. Such an approach would represent a painless treatment for painful orthopaedic diseases.

Methods
At my suggestion, in 2002, the STORZ MEDICAL COMPANY was the first to produce a special applicator for their shockwave devices based on my specifications. This applicator has a diameter of only 6 mm and can stimulate acupuncture points. Since 2002 I have been studying opportunities for the treatment of different groups of diseases in my clinical practice. In this endeavour, I compared the treatment of chronic pain diseases of the joints and the lumbar region either with acupuncture with needles alone or in a combination of acupuncture with needles and shockwaves applied to very small areas.

Results
The best results were observed in the treatment of chronic pain diseases such as: gonarthrosis, coxarthrosis and chronic lumbar pain. I was able to observe that the combination of shockwaves applied to very small areas with the stimulation of certain other acupuncture points with needles is much more successful than the treatment with needles alone. The treatment is very well accepted by the patients since it causes nearly no pain. Most of the patients reported marked improvement or were even pain free after only six treatments.

Discussion
The treatment of pressure sensitive acupuncture points with low energy shockwaves can be very effective. The stimulation with shockwaves has an even better effect on certain points than the stimulation with needles. The effect lasts very long if the treatment with the same combination of points is repeated at a frequency of two to three times per week. This could be the result of a "learning effect": The tension in muscles or tendons can be stimulated or reduced if shockwaves of low energy are repeatedly aimed at the relevant pressure receptors. Immediately after the stimulation of the specific points, the tension in the muscles is reduced. However, pain and tension can increase again after one or two days. In most of my observations it took six treatments to achieve a positive long-lasting result.

Conclusions
Acupuncture with shockwaves is a painless and effective instrument for the treatment of chronic orthopaedic pain diseases.

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SESSIONS REQUIRED FOR RSW TREATMENT. ANY EVIDENCE BASED?

Authors
N. Malliaropoulos, G. Crate, M. Meke, T. Nauck, H. Lohrer, N. Padhiar

Institution Adresses
[a] Thessaloniki Sports Medicine Clinic, Thessaloniki, Greece
[b] National Athletics SEM Centre, Thessaloniki, Greece
[c] European Sports Care
[d] Institute for Sports Medicine Frankfurt am Main, Germany

Abstract
There are many treatment options available in Musculoskeletal Medicine, ranging from the conservative to the more invasive, injections and, in recalcitrant cases, surgery[7] ESWT is an alternative treatment modality that has been shown t to be beneficial for many Musculoskeletal Mechanical Pathologies, including tendinopathies, Medial Tibial Stress Syndrome, muscle trigger points, calcific tendinitis[1,2,8].

ESWT can be separated into two different types – radial and focussed. With regards to focussed shock wave therapy (fESWT) the waves are targeted specifically onto the affected area, whereas the waves produced by radial shock wave therapy (rESWT) do not concentrate on the area but instead disperse to the surrounding tissue too.[3] rESWT has been found to be of possibly more benefit than fESWT because the treatment area is larger, which is more beneficial for superficial injuries such as tendinopathies[4]. However there are studies that do argue for the use of fESWT over rESWT[6].

Another fact is that some studies do not provide follow-up data up or more post treatment, which would help support or dismiss rESWT as a viable treatment option[9]. Moreover, many studies do not specify whether rESWT or fESWT was applied.[5] This results in some confusion over the data.

Recurrence rates for patients treated with rESWT are not well recorded in the literature. Often, there are no recurrence rates given for those who were initially treated successfully but then suffered a relapse of symptoms later on. The aim of this lecture is to therefore report our clinical experience and protocols used at our centre after "flexible/individualised" treatments with rESWT.

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MECHANO-TRANSDUCTION EFFECT OF SHOCKWAVES IN THE TREATMENT OF LUMBAR FACET JOINT PAIN: COMPARATIVE EFFECTIVENESS EVALUATION OF SHOCKWAVE THERAPY, STEROID INJECTIONS AND RADIOFREQUENCY MEDIAL BRANCH NEUROTOMY

Author
T. Nedělka
Charles University in Prague, 2nd Faculty of Medicine, Department of Neurology, Prague, Czech Republic, Center for rehabilitation and treatment of spine pain, Prague, Czech Republic,Czech Technical University, Faculty of Biomedical Engineering, Kladno, Czech Republic

Objective
Lumbar facet joint pain is a common source of low back pain and contributes on approximmately one third of chronic low back pain. Both neuropathic and nociceptive component is involved in facet joint degeneration, usually caused by mechanical overload with all of its consequences, including arthrosis, inflammation and irritation of medial branch of dorsal nerve root, which provides segmental innervation of facet joints.

Treatment options contain neuromodulation, pharmacotherapy and non-pharmacological procedures, such as physical therapy and spinal manipulations. Neuromodulation treatment, including guided medial branch radiofrequency neurotomy, is considered as a gold standard in treatment of facet joint pain, with long lasting analgesic effect and improvement in lumbar spine range of motion. As an invasive procedure, it carries considerable risk of possible complications including infection, damage to nerve root or medial branch structures. Other therapeutic option, which has proved some efficacy, are guided corticosteroid injections. Their efficacy is widely discussed and remains controversial.

Shockwave therapy (SWT) is a relativelly new, non-invasive method for treatment of tendinosis and joint pain, based on mechano-transduction of SWT mechanical energy, transferred to cascade of biochemical processes in target tissue, including increased levels of cytokines, stimulation of angiogenesis and increased activity of fibroblasts and chondrocytes. Its efficacy was proved in treatment of different painful conditions including various types of tendinopathies (plantar fasciosis, epicondylitis, recalcitrant shoulder tendonitis) and in experimental work, SWT exhibited effect in either chondral plate repair and revascularisation. Up to now, the efficacy of SWT was not studied in pain of facet joint origin. Aim of our work was to compare the efficacy of SWT against invasive treatment procedures including medial branch radiofrequency neurotomy and guided corticosteroid facet joint injections in treatment of facet joint pain.

Methods
A retrospective study was done on 62 selected patients with unilateral chronic lumbar facet pain. Inclusion criteria was unilateral lumbar facet joint pain with positive response to ultrasound-guided medial branch block. Exclusion criteria contained severe spinal pathologies including mass lesions, spinal stenosis, disc protrusion/herniation with signs of nerve root compression regarding the MRI examination, which was performed in each patient. There were 32 women and 30 men enrolled in our study, divided into SWT group (SWT group A, 22 patients), corticosteroid injections group (FJI group B, 20 patients) and radiofrequency group (RMBN group C, 20 patients). Pain intensity was measured by VAS pain intensity scale, severity of low back pain was measured by Modified Oswestry Scale, and as a tool for neuropathic pain screening, PainDETECT validated questionnaire was used.

Conclusions
Shockwave therapy had shown better longterm results compared to FJ injections group and little inferior efficacy compared to RMBN. We did not observe any adverse effects and complications in SWT group. In 2 RMBN and 1 FJ injections patients, temporary increase in pain [more than 3 cm in VAS] was reported. Moreover, in SWT and RMBN groups, significant longterm improvement in daily activities limitation, caused by low back pain and measured by modified Oswestry score, was observed. Neuropathic pain, quantified by painDETECT validated questionnaire, however, did not show any changes between baseline and follow up.

PITFALLS IN ESWT

Author
B.-J. Kwak
Sun Clinic, Seoul, South Korea

Introduction
Shockwave therapy is non-invasive and very safe treatment, so it's difficult to find out the data about pitfalls in ESWT. Thus analyzing and solving the pitfalls that may occur in this treatment is another way to improve ESWT.

Methods
To analyze the pitfalls in ESWT and suggest the solutions.

1. Though there are many papers proving scientific evidences of ESWT, it's not easy to apply in practice. The reason is that equipments and treatment protocols(intensity and dose of SW, frequency of session, number of session and therapist) are different in each centers. To set and develop the respective disease-specific treatment protocols may be a solution of this phenomenon.
2. In case the doctor doesn't participate in the procedure due to the treatment time, it's difficult to get to the changes in symptoms. A solution for this matter is that the doctor determines the treatment points and let the assistant (physical therapist, nurse) do the treatment.
3. If the therapists are not fully protected, they may suffer from upper limb pain that may be the reason for changing their position or resignation. Therefore, we should prepare them the devices (electric bed, height-adjustable chair and different cushions in size) that can protect the therapists and study the best treatment positions and teach them the best position.
4. Analysis of the causes of treatment failure is a very good way to improve the treatment results. Step-by-step analysis are more likely in case of diagnosis failure, localization failure, targeting failure with right point, dose failure in one session or number of treatment and healing time failure(early return to overuse activity that have caused pains).

Conclusions
Study and analysis of pitfalls in the ESWT might increase patient's satisfaction and success rate of treatment, and help to develop new indications.

ESWT PROMPTING OF NEURAL RESPONSE AFTER PRP SPINAL INJECTION IN PARALYSIS OF LOWER BODY

Author
E. Pedersen
Denmark

Introduction
ESWT, neuro-spinal structural corrections (NSSC) and PRP paraspinal injections were applied to regain neurological control over the lower body motor- and organic functions (loss of bladder and defecation control) of a dog after it was paralyzed following severe spinal injury from car accident.

Methods
ESWT and NSSC were first administered five times with limited or no result. Later 60 cc of whole blood was extracted from the jugular vein of the dog and PRP separated. Thirty cc of PRP solution was injected bilaterally at the intervertebral foramens (IVF) of levels L1-3 and L7-sacrum aiming at the IVFs first the right and then the left ones using 0.25 mJ/mm^2 with the 1.5 cm standoff head at 1.5 Hz with total energy of 2.6 Joule used. For comparison radial percussion 1.2 bar at 1 Hz was used to observe the effects of the two waveforms. The procedures were repeated after 10 days and then after 8 days using the same procedures as above for a total of three treatments. At the third treatment 2.5 cc of PRP solution was also injected into the second sacral foramens bilaterally to attempt to regain autonomic control of urination and defecation.

Results
Controlled simple reflex arch response to the specific ESW targeting of each IVF was now noted in gradual increased strength. Within 15 minutes of the treatment, the dog was able to stand up and proprioception was returning.

After the first treatment the right lower leg became 60% functioning and the left leg about 10%. Over the following 10 days improvements were observed in both legs, but bowel and urinary function were still not controlled. After the second treatment recovery of motor function was seen on both legs to about 70% in the right and 60% in the left. Three weeks after the third session 100% control of motor and autonomic function was achieved.

Conclusions
ESW provides the energy necessary to affect changes to the membranes of all cells by clearing ischemic conditions of the extra-cellular space[5] providing access for primary metabolites, peptides and chemical compounds of various types and complexities hereunder beta polypeptide Nerve Growth Factor[1,2,3,4] which is assumed to have played a role in the neurological response and healing of this case.

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ESWT THERAPY FOR FIBROUS-EDEMATOUS CELLULITE

Author
Sehyun Kim
Lyhn clinic, Seoul , South Korea

Abstract
Cellulite is classified into fibrous-edematous cellulite and adipose cellulite. Fibrous-edematous cellulite is provoked by alteration of interstitial matrix whereas adipose cellulite is by adiposity.[1] The alterations of interstitial matrix induce inflammation and fibrosis in hyper dermis connective tissues, which forms cellulite.[1]

ESWT therapy, which is commonly used for fasciitis and tendinitis[2,4] can be suggested to be effective in treatment of these inflammations in subcutaneous layer.

The aim of this study is to evaluate the size reduction induced by ESWT therapy on patients with fibrous-edematous cellulite. Since the fibrous-edematous cellulite in its early stage, just as adiposity, is accompanied by size enlargement of onsite, so the result of therapy can be measured by size reduction.

Total 42 non-obese female patients (19 – 40 years) with fibrous-edematous cellulite are treated by ESWT therapy. ESWT therapy was applied on lower leg using Duolith SD1(6,000 impulses of focused shockwave and 3,000 impulses of radial shock wave in each session) with 3 – 10 sessions weekly or biweekly in 38 cases (25 cases are with 5 sessions, 9 cases are with 3 – 4 sessions, 4 cases are with 6 – 10 sessions).

The circumferences of 6 points in lower leg were measured before first session and right after last session and all cases showed significant size reduction ($p < 0.05$). Average of size reduction at ankle point is 0.724 cm in 5 session group, 0.744 cm in 3 – 4 session group and 0.775 cm in 6 – 10 session group, at thigh point is 1.288 cm in 5 session group, 1.433 cm in 3 – 4 session group and 1.788 cm in 6 – 10 session group.

The other 4 cases are also treated by unipolar radio frequency (RF) before first session of ESWT therapy or after last session of ESWT therapy. Unipolar RF is normally effective on size reduction of patients with adiposity or adipose cellulite,[3] but in these 4 cases, size reduction by unipolar RF is significantly less than size reduction by ESWT. This result implies ESWT therapy acts on fibrous-edematous cellulite, not on adiposity or adipose cellulite.

The result of this study shows ESWT therapy is effective for size reduction in patients with fibrous-edematous cellulite.

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USE OF RADIAL SHOCKWAVE THERAPY ON LIMBS IN PATIENTS WITH AFTER-STROKE SPASTICITY

Authors
Y. Remenyuk, M. Sikorska
Rehabilitation clinic of movement disorders «MedLife-777» Zaporizhzhya, Ukraine

Introduction
Increasing in muscle tone in limbs is a main problem in rehabilitation of disorders caused by brain stroke, as it seriously complicates the patient's activities of daily living. Low efficiency of traditional methods in the treatment of after-stroke spasticity has led to searching of new methods of its reduction. The acoustic shock waves, introduced into body tissue, rise microcirculation in small blood vessels, enhance the metabolic processes, launch cell reconstruction and renovation processes and besides, continuous or intermittent pressure on muscles and tendons can decrease their spinal hyperexcitability.

Methods
Twenty seven patients with after-stroke spasticity were enrolled in the study comprising 18 men and 9 women with a mean age of 62 years. Twenty patients had ischemic stroke and 7 patients had hemorrhagic stroke that occurred from 9 to 12 months previously. The protocol consisted of 5 treatment sessions using radial shock waves (Masterpuls MP200, Storz Medical AG, Switzerland) with next parameters: total 6 000 shocks per session; pressure 2,5 – 3 bars and frequency 10 – 15 Hz. Efficiency of the treatment was evaluated in 3 months after course of treatment. Tonicity of muscles was evaluated using the Ashworth scale, neurological status according to NIHSS, also all patients were investigated with electromyography in dynamic before treatment, after it and in 3 months follow-up. All patients were divided into two groups: group I with muscle tone of 1 – 2 points and group II with muscle tone of 3 – 4 points by Ashworth scale.

Results
The reduction in muscle tone was more significant in upper limbs, but effect of the treatment was observed even in 3 months after treatment. Regard to the range of passive motion, after the treatment it was increased twice, but after 3 months the difference with baseline was small. The results of electrophysiological research were correlated with clinical indexes. In assessment of the results of RSWT therapy was observed the growth of index' amplitudes and, in most cases, recovering of the speed markers and significant reduction in deformation and normalization of M-response duration was registered.

Conclusions
Application of radial shock wave therapy on spastic muscles of limbs in ambulatory patients affected by stroke resulted in a significant reduction in muscle tone of upper and lower limbs' flexors and increased an efficiency of motor function recovering in long-lasting period without medications.

PLANTAR FASCIITIS: COMPARISON BETWEEN DIFFERENT TREATMENT METHODS

Authors
M. Sikorska, Y. Remenyuk, V. Cherniy, et al.
Rehabilitation clinic of movement disorders «MedLife-777» and clinic «Motor-Sich», Zaporizhzhya, Ukraine

Introduction
Chronic degenerative-dystrophic disorders of locomotor apparatus are very common pathology and affect 61,3 – 85,2% of adult population. Plantar fasciitis is the often disabling problem among above-mentioned disorders. The clinical presentation is characterized with next symptoms: pain in the medial heel area, often occurring from the heel along the arch of the foot, which is experienced, as a rule, in the morning, after the rest in active time of a day, also during the wearing of uncomfortable shoes and after long walking. More than 80% of all patients with plantar fasciitis have overweight. Upon palpation the most painful point is situated, as a rule, at the medial, sometimes also at the posterior part of the sole.

Methods
Under our supervision were 451 patients with enthesiopathy of heel area, with mean age of 48,8 ± 9,1 years. In group I 378 patients were treated with radial shock wave therapy (RSWT), 32 patients from group II had X-ray therapy and 41 patients from group III were treated with hormonal injections into heel spur area. The results were assessed with VAS (Visual Analogue Scale) immediately after the treatment course, after 3 months, after 6 months and after 1 year. Treatment course of group I consisted of 5 sessions with 1-week intervals. For one session 2500 – 4000 shock were made with pressure 2,5 – 3,5 bars (Masterpuls MP200, Storz Medical AG, Switzerland).

Results
In group I after 2.5 ± 0,7 weeks since first RSWT session all patients declared significant decrease of pain, which was 2,3 ± 0,5 points in the end of treatment (8,7 ± 1,4 before treatment), after 3 months it was 1,2 ± 0,8 points, after 6 months 0,8 ± 0,6 points, and in one year the same results were saved – 0,93 ± 0,8 points. Besides, during the follow-up period of 6 – 12 months 96,3% of patients had no complaints at all. In group II (with X-ray therapy) the pain syndrome was decreased till 2,3 ± 1,1 points for one month. After 3 months 25,8% of patients described the resumption of pain with intensity of 3,6 ± 2.2 points, and in 6 – 12 month follow-up 48.3% of patients again experienced heel pain with intensity of 4,4 ± 2,8 points. Before treatment the pain level in group III was 8,4 ± 2,3 points. After hormonal injections was observed fast pain relief (during 7 – 10 days), but in 3 months 53% of patients again described heel pain with intensity of 7.8 ± 3,1 points, and in 6 – 12 months follow-up period pain was occurred in 74% of patients. Main disadvantages of hormonal injections are short-lasting effect, negative influence on body in whole and limitation of repetitions of injections (not more than 3 times a year).

Conclusions
We consider radial shock wave therapy is the most effective and progressive method in plantar fasciitis treatment. The main advantages of RSWT are non-traumatic and non-invasive influence without use of medications along with fast and long-lasting effect of treatment.

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