



Congress Book



XVIII

International Congress
of the **ISMST**

Mendoza - April 2015



www.ismst.com



Email: ismst2015@gmail.com

Argentina MILITANTE DE UNA
NACION



#ISMST2015



ISMST Instructional Certification Course ESWT Mendoza / Argentina. April 15th, 2015.

Organisation: Dr. W. Schaden (Austria)/ Dr. R. Thiele (Germany)

Program: 09.00h – 17.30h

9:00 Introduction Dr. M. Gleitz (Luxembourg)

9:10 Physical Principles Dr. J. Eid (Brazil)

9:35 Biological Principles Dr. W. Schaden (Austria)

10:00 Principles of Shockwave Application Dr. R. Thiele (Germany)

10:20 Demonstration of devices 25'

10:45 Break

11:00 Approved Standard Indications 1: Tendinosis Calcarea Prof. Dr. D. Moya (Argentina)

11:20 Approved Standard Indications 2: Lateral epicondylitis Dr. A. C. Souza (Brazil)

11:40 Workshop 20' 12:00 Approved Standard Indications 3: Plantar Fasciitis Dr. G. Verratti (Venezuela)

12:20 Approved Standard Indications 4: Achilles Tendinopathy Dr. E. Serrano (Peru)

12:40 Workshop 20' 13:00 Empirically-Tested Indications Dr. M. Branes (Chile)

13:20 Exceptional and Experimental Indications Dr. L. J. Guiloff (Chile)

13:45 Lunch Break

15:00 Myofascial Treatment Dr. M. Gleitz (Luxembourg)

15:30 Bone Indications Dr. W. Schaden (Austria)

15:55 Skin Indications Prof. Dr. C. Leal (Columbia)

16:20 Workshop

16:40 Socio-Political Issues Dr. R. Thiele (Germany)

17:00 Multiple Choice Test - Certificates 20' 17:30 EndoftheWorkshop



ISMST International Congress Mendoza / Argentina. April 15th, 2015.

Table of Contents.

Abstract 1. New Repetitive Extracorporeal Shock Wave Applications are Superior in Inducing Angiogenesis Compared to a Single Application: Results of an Animal Trial. Ole Goertz, Walaa Khaled, Leon von der Lohe, Henrik Lauer, Andrej Ring, Adrien Daigeler, Jonas Kolbensschlag, Marcus Lehnhardt.

Abstract 2. Radial Shock Wave Devices can Generate Cavitation. Christoph Schmitz, Nikolaus B. M. Csáczár, Stefan Milz, John Furia

Abstract 3. Radial Elastic Waves. Pavel Novak, Rudolf M. Verdaasdonk.

Abstract 4. ESWT Affects Schwann Cell Phenotype in Vitro and in Vivo Thereby Accelerating Nerve Regeneration. David Hercher, Christina Schuh, Michaela Stainer.

Abstract 5. Combination of manual therapy and SWT in treatment of chronic non-radicular low back pain - Dynamic Myofascial Therapy. Nedelka Jiri, Nedelka Tomas

Abstract 6. Efficacy of Radial Extracorporeal Shock Wave Treatment in Low Back Pain with Myofascial Pain Syndrome: A pilot randomized, Double-blind, Placebo-controlled Trial. Ricardo Kobayashi, Lin Tchia Yeng, Nancy Shizuka Yonekawa, Joaci Araujo, Maristela Zoboli Pezzucchi, Marcos Leal Brioschi, Eduardo Borba Neves, Manoel Jacobsen Teixeira.

Abstract 7. Medical Shock Waves for Chronic Low Back Pain: A Case Series. Kenneth Craig, Bradley Takai, Jacqueline Craig, Sarah Pelham, Danielle MacDonald.

Abstract 8. Unfocused SoftWave Therapy for the Treatment of Spine Injury Patients to Evaluate the Technology's Influence on Patient Strength, Mobility, Sensitivity, Perspiration, Lung Function, Spasticity, Wound Healing and the Appearance of Scars. Charles Weaver, Phil Lavin, Crystal Hambrick, Johannes Holfeld, Sarah Pelham, Danielle MacDonald.

Abstract 9. The Effects of Radial Shockwave Therapy on Function, Range of Motion, Strength, and Pain in Patients with Chronic Lateral Epicondylitis. Paolo Sanzo.

Abstract 10. Changes in Autonomic Nervous System Reactivity After Extracorporeal Shockwave Therapy in Chronic Rotator Cuff Tendonitis - A Pilot Study. Tomas Nedelka, Jiri Nedelka, Jakub Schlenker, Radim Mazanec.

Abstract 11. Experience in the use of shock waves in shoulder calcic tendinosis. Jorge Chavez Aravera, Cristian Olivares.

Abstract 12. Shockwave Therapy as an Alternative Treatment of Postoperative Residual Pain After Shoulder Arthroscopy. Pablo Hidalgo, Myriam Capasso.



Abstract 13. Efficiency-based evaluation of extracorporeal shockwave treatment in calcifying tendinopathy of the shoulder and pseudoarthrosis. S. Ramon; J. Bertran, L. Hernandez, X. Cuscó, W. Espinosa, L. Romero, E. Morales, M. García-Ballebó, R. Cugat, X. Corbella.

Abstract 14. Radial Extracorporeal Shock Wave Treatment for Cellulite may Seriously Harm Embryos- Christoph Schmitz, Stefan Milz, Hans-Georg Frank, Rüdiger Korbel.

Abstract 15. Shock Wave Treatment Activates Erk1/2 Pathways Predominantly via P2Y Receptor Involvement. Anna M. Weihs, Christine Fuchs, Andreas H. Teuschl, Joachim Hartinger, Paul Slezak, Rainer Mittermayr, Heinz Redl, Wolfgang G. Junger, Harald H. Sitte, Dominik Rünzler.

Abstract 16. Extracorporeal Shock wave Therapy Increases ERK-1/2 and Akt Activity of Intact Rat Tibia for 21 Days Following Primary stimulation. Lidia Dornelas de Faria, William Dias Belangero, Carlos Vinícius Buarque de Gusmão, Mario Jose Abdalla Saad, Juliana Falcato Vecina, Alexandre Gabarra Oliveira.

Abstract 17. High-energy Extracorporeal Shock Wave for Early Stage Osteonecrosis of the Femoral Head: A Single-center Case Series. Wei Sun, Fuqiang Gao, Zirong Li.

Abstract 18. Optimizing fracture fixation with the use of extracorporeal shockwave therapy. MKE Koolen, O van der Jagt, FC Oner, W Schaden, H Weinans.

Abstract 19. Shockwave Treatment for Osteopenian Fibular Vascularized Graft Donor Site. First Case Report. Carlos Leal MD, Arnold Fernández MD.

Abstract 20. ESWT in the Treatment of High Energy Trauma in Lower Limbs Long Bone Non Unions. Carlos Sandoval, Alvaro Valenzuela, Carlos Rojas, Diego Valiente, Sebastian Monge, Manuel Brañes.

Abstract 21. Extracorporeal Shockwave Therapy (ESWT) Ameliorates Healing of Tibial Fracture Non-Union Unresponsive to Conventional Therapy. Rainer Mittermayr, Vlado Antonic, Nicolas Haffner, Daniel Smolen, Paul Slezak, Alex Stojadinovic, Wolfgang Schaden.

Abstract 22. Extracorporeal Shock Wave Therapy for the Treatment of Non-unions – Experience with a new Device at a Level 1 Trauma Center. Jens Everding, Moritz Freistühler, Jens Gestring, Michael J. Raschke, Patric Garcia.

Abstract 23. HILT(High intensity Laser Therapy) HILT and RSWT(Radial Schockwave treatment): Pain and Patient Satisfaction Evaluation of 100 Patients. Stefan Guiloff Paradiz, Leonardo Guiloff Waissbluth, Manuel Brañes Aroca.

Abstract 24. Shock Wave Treatment for Orthopaedic Infection. Richard Coombs, Milad Hanna, Moustafa Hafez.

Abstract 25. New Treatments in Erectile Dysfunction and First Clinical Trial Results. Rafael Prieto, Nuno Louro Pelo, Ana Puigvert, Ignacio Martinez-Salamanca.

Abstract 26. Effectiveness of low-intensity extracorporeal shock wave therapy with linear approach on patients with Erectile Dysfunction and vascular risk factors associated. Walter De Bonis.



Abstract 27. Examining Shock Wave Therapy as a Treatment for Spasticity: A C. Elegans Worm Model Shows Dose-Dependent Effect on Movement Following Treatment. Christoph Schmitz, Nicolas B. Angstman, Hans-Georg Frank, Stefan Milz.

Abstract 28. 10-Year Experience in the Treatment of Sub-Acute and Chronic Wounds with Extracorporeal Shockwave Therapy in the Trauma Center Meidling, Vienna, Austria. Falko Dahm, Rainer Mittermayr, , Lukas Greiner, Michael Pusch, Michaela Pavelk, Andrea Valentin, Christine Köpl, Wolfgang Schaden.

Abstract 29. Shockwave Treatment of Pes Anserinus Tendinopathies With False Negative MRI Findings. Rosanna Audain, Roberto Audain, Maria Barrios, Yarila Alvarez, Nahin Perez, Alejandra Guevara.

Abstract 30. Radial Extracorporeal Shock Wave Treatment: A New Paradigm on Fibromyalgia. Silvia Ramon, Leonor Hernandez, Antonio Gomez, Georgina Salvador, Luis Romero, Asuncion Acosta, Elena Morales, Fernando Vidiella, Ramon Cugat, Markus Gleitz.

Abstract 31. ESWT in Treatment of Osteitis Pubis. Ana Claudia Souza, Alexander Montenegro.

Abstract 32. ESWT Therapy in Patellar Tendinopathy. Comparison of 2 Protocols. Edson Serrano, Jaen Carlo Criado.

Abstract 33. The Influence of Medical Shock Waves on Muscle Activation Patterns and Performance in Healthy Athletes:A Preliminary Report. Kenneth Craig, Dominic Sainsbury, Bradley Takai, Stephen Bickley, Jacqueline Craig, Sarah Pelham, Danielle MacDonald, Richard Wong.

Abstract 34. Radial Pressure Waves vs High Laser Treatments in Accute Ankle Sprains. Carlos Leal, Arnold Fernandez.

Abstract 35. Extracorporeal Shock Wave Therapy in Chronic Calcaneal Tendinopathy. Paulo Roberto Rockett.

Abstract 36. Heel Pain Beyond Plantar Fasciitis. Gabriele Verratti, Juan Grossmann.

Abstract 37. Experience in the use of shock waves in plantar fasciitis. Jorge Chavez Aravera, Cristian Olivares.

Abstract 38. Long Term Results of Radial Shock Wave Therapy In Chronic Plantar Fasciitis. Paulo Kertzman.

Abstract 39. Predictive factors for radial shockwaves therapy in the treatment of chronic plantar fasciopathy. Javier Crupnic.

Abstract 40. Radial Shock Wave Therapy for the Treatment of Plantar Fibromatosis. A Case Report. Ma Laura Tutté, Guillermo Galin.



Abstract 1.

New Repetitive Extracorporeal Shock Wave Applications are Superior in Inducing Angiogenesis Compared to a Single Application: Results of an Animal Trial

Ole Goertz (1), Walaa Khaled (2), Leon von der Lohe (1), Henrik Lauer (1), Andrej Ring (1), Adrien Daigeler (1), Jonas Kolbenschlager (1), Marcus Lehnhardt (1)

Institution: (1) BG-University Hospital Bergmannsheil, Bochum, Germany
(2) Clinical Application Research, Dornier MedTech Systems, Wessling, Germany

Device and producing company: Dornier Aries

Introduction: First results showing effects of low-dose extracorporeal shock waves on microcirculation were presented in 2012. The aim of this study is to analyze microcirculation and leukocyte endothelium interaction with particular focus on angiogenesis after vascular dysfunction using three different repetitions of low energy shock waves.

Methods: Full-thickness burns were inflicted to the ears of hairless mice (n = 44). Mice were randomized into four groups: the control group received a burn injury but no shock waves; group A received low-dose ESWA on day one after burn injury; group B received shock waves on day one and day three after burn injury; group C ESWA on day one, three and seven after burn injury. Intravital fluorescent microscopy was used to assess microcirculatory parameters, angiogenesis and leukocyte interaction. Values were obtained before burn (baseline value) immediately after and on days 1, 3, 7 and 12 after burn. A novel shockwave system was developed based on a commercially available device for orthopedics (Dornier Aries) that was equipped with a newly developed applicator. This system is based on the electromagnetic shock wave emitter (EMSE) technology and was introduced to accomplish a localized treatment for this study. Histologic evaluations were taken after completion of the experiments.

Results: A significant increase in the venular diameter was observed in all groups that underwent ESWA compared to the control group. Shock-wave treated groups showed significantly accelerated angiogenesis compared to the control group. The non-perfused area (NPA) is regarded as a parameter for angiogenesis and showed the following data on day 12 [2.7 ± 0.4% (group A, p = 0.001), 1.4 ± 0.5% (group B, p < 0.001), 1.0 ± 0.3% (group C, p < 0.001), 6.1 ± 0.9% (control group)]. Edema formation directly after ESWA is positively correlated with the number of shock wave applications: day 12: group A: 173.2 ± 9.8%, group B: 184.2 ± 6.6%, group C: 201.1 ± 6.9%, p = 0.009 vs. control: 162.3 ± 8.7% (all data: mean ± SEM).

Discussion: According to our data shock waves have a significant and immediate impact on microcirculation with endothelial integrity loss and increase of adherent leukocytes as part of a pro-inflammatory process. In all three treatment groups, angiogenesis was higher compared to the control group. Within the ESWA groups, double applications showed better results than single application and three applications showed better results than single or double applications.

Conclusion: Repetitive shock wave applications were significantly superior in improving microcirculation parameters compared to a single application. Angiogenesis showed significantly improved activity after treatments.



Abstract 2.

Radial Shock Wave Devices can Generate Cavitation

Christoph Schmitz (1), Nikolaus B. M. Csáczár (1), Stefan Milz (1), John Furia (2)

Institution: (1) Ludwig-Maximilians-University, Dept. of Neuroanatomy, Munich, Germany; (2) SUN Orthopedics and Sports Medicine, Lewisburg; USA

Device and producing company: Swiss DolorClast, EMS

Introduction: Focused extracorporeal shock waves (fESW) can exert therapeutic effects on tissue by means of two basic effects: the direct generation of mechanical forces (primary effect), and the indirect generation of mechanical forces by cavitation (secondary effect). Conflicting reports exist in the literature about whether radial extracorporeal shock wave (rESW) devices can generate cavitation too.

Methods: Cavitation fields of four different rESW devices were generated within a waterbath and recorded with a high-speed CCD camera with a framing rate of 300,000 frames per second and an exposure time of 1/2,700,000 seconds. For comparison purposes, the same was done with a vibrating massage device.

Results: All investigated rESW devices generated cavitation whereas the vibrating massage device did not.

Discussion: Similar to focused shock waves radial shock waves may act on tissue by means of cavitation. This distinguishes rESW devices from vibrating massage devices.

Conclusion: This is the first study demonstrating that the potential to generate cavitation is a common feature of rESW devices. These findings indicate that cavitation is one of the primary working mechanisms of both rESW and fESW devices. Cavitation is believed to exert important therapeutic bioeffects associated with shock waves, but may also cause serious negative effects on the body. Due to the non-linearity between the cavitation output and the devices' energy settings and/or pulse frequencies, future studies should investigate the clinical effects of these observed differences among the various rESW devices that are available today.



Abstract 3.

Radial Elastic Waves

Pavel Novak (1), Rudolf M. Verdaasdonk (2)

Institution: (1) Storz Medical AG, Tägerwilen, Switzerland
(2) VU University Medical Center, Amsterdam, Netherlands

Device and producing company: Masterpuls MP100; Storz Medical AG

Introduction: Calcific tendinosis of the shoulder is often associated with chronic pain and impairment of function. Extracorporeal shockwave therapy (ESWT) is considered to be a treatment option. We compared the effects of two different ESWT technologies: focal and radial.

Methods: Background Oriented Schlieren Imaging (BOS) was used to visualize the propagation of pressure waves generated by a ballistic radial shockwave device (Masterpuls MP100) through a tissue phantom. A fine line pattern imaged through a transparent gel slab is distorted, when a pressure wave is traveling through the gel. The images recorded at high speed (2000f/s) are enhanced by digital subtraction.

Results: Measurements with different transmitters and at different pressure settings were performed. They reveal deeper penetration depth of the radial shock waves in the form of an elastic wave and the dependence from the transmitter used.

Discussion: The examination of the radial elastic wave provides new information for the working principle of the radial shock waves. It explains the deeper biological effects observed and the influence of the different transmitters.

Conclusion: Further scientific investigations are needed, in order to show, whether the radial shock waves (elastic 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).



Abstract 4.

ESWT Affects Schwann Cell Phenotype in Vitro and in Vivo Thereby Accelerating Nerve Regeneration

David Hercher, Christina Schuh, Michaela Stainer

Institution: Ludwig Boltzmann Institute, Vienna, Austria

Device and producing company: Dermagold 180, MTS

Introduction: Peripheral nerve injuries are common and a frequent cause of hospitalization displaying a major burden to patients and health-care systems. ESWT has been shown to be one of very few treatment options which accelerate regeneration of peripheral nerves . Despite recent advances in understanding the underlying mechanisms of ESWT, little is known of the effect on Schwann cells(SCs) and peripheral nerve regeneration. In this study we investigated these two aspects.

Methods: in vitro: Schwann cells have been isolated from motor, sensory and mixed nerves, respectively. Dissected nerves have been treated with ESWT prior to isolation. Cultured SCs were evaluated using FACS analysis and western blot.

in vivo: A femoral nerve defect model was established in the rat. The effects of ESWT on motor fibers regenerating through a sensory environment have been evaluated using automated gait analysis, electrophysiology, histology and qPCR.

Results: In vitro data indicate a strong influence of ESWT on the activation status of SCs of different phenotype. Motor SCs differ from sensory SCs regarding proliferation and expression of myelination associated proteins. ESWT is able to enhance proliferation of motor and sensory SCs by a multiple of the control levels.

In vivo data show inferior regeneration of motor axons through a sensory nerve graft compared to a phenotypically matched graft. ESWT can ameliorate this effect. **Discussion:** This study indicates that ESWT is able to accelerate peripheral nerve regeneration in a model which reflects the clinical reality after autologous nerve transplantation.

Conclusion: This study provides support for the use of ESWT after peripheral nerve injury.



Abstract 5.

Combination of manual therapy and SWT in treatment of chronic non-radicular low back pain - Dynamic Myofascial Therapy

Nedelka Jiri, Nedelka Tomas

Introduction: The authors are presenting the original method of treatment of locomotive system, called Dynamic Myofascial Therapy. They take advantage from their long-term experience with manual therapy, according to Prague school of rehabilitation with positive effect of the shockwave therapy, based on the mechanotransduction principle, in treatment of myofascial, non-radicular acute and chronic low back pain. According to papers from Magnus et al, there is an important role of spine proprioceptors in balance and muscle tone adjustment, mainly in postural muscles of cervical and low back spine. In chronic myofascial low back pain, impaired nociceptive and proprioceptive input can lead to impaired stereotype of posture and gait, with consecutive overloading of facet joint and intervertebral discs. Authors recently published a study documenting positive role of shockwave therapy in facet joint pain. Manual medicine techniques allows to relieve painful muscle spasm, but for successful results, not only painful muscle spasm, but also referred and transferred pain should be affected.

Aim of study: The aim of this study was to combine manual therapy and SWT (Dynamic Myofascial Therapy) in treatment of non-radicular low back pain and to compare different energy levels.

Methods: The patients with chronic low back pain without radicular irradiation (lasting more than 3 months) were divided to 3 groups, each contained 20 patients. Group 1 was treated by dynamic myofascial treatment including manual therapy and radial SWT at energy level 2,6 Bar/2000 pulses/3 sessions. Group 2 was treated by dynamic myofascial treatment including manual therapy and radial SWT at energy level 3,5 Bar/2000 pulses/3 sessions. Group 3 had no manual therapy and radial SWT was applied at energy level 3,0 Bar/2000 pulses/3 sessions directly to painful spots. VAS and Oswestry score was registered before therapy, before each session and in 3 months follow up.

Results: Significant effect of the treatment on VAS and Oswestry score in patients with chronic low back pain was reached in all 3 groups compared to baseline. There was superior therapeutic impact of combination of manual therapy and SWT (Group 1 and 2) and better long-term results in 3 months follow-up.

Discussion: Combination of manual therapy as starting moment of the treatment in combination with SWT is proven as more effective as only application of SWT. It confirms also experience that complete treatment is the best solution for the patient. Instructions of changing wrong postural and dynamic habits is also very important. The effect of the treatment is discussed in this presentation.

Conclusion: Manual therapy combined with dynamic application of SWT has shown better results than static SWT application. This promising technique is enabling us to affect other multisegmental disorders not only in spine, but also in fascias and larger joints.



Abstract 6.

Efficacy of Radial Extracorporeal Shock Wave Treatment in Low Back Pain with Myofascial Pain Syndrome: A pilot randomized, Double-blind, Placebo-controlled Trial

Ricardo Kobayashi, Lin Tchia Yeng, Nancy Shizuka Yonekawa, Joaci Araujo, Maristela Zoboli Pezzucchi, Marcos Leal Brioschi, Eduardo Borba Neves, Manoel Jacobsen Teixeira

Institution: Instituto de Ortopedia e Traumatologia do Hospital das Clínicas da Faculdade de Medicina da USP, São Paulo; Brasil

Device and producing company: Swiss DolorClast Classic – EMS

Introduction: The myofascial pain syndrome is a major cause of low back pain that has high prevalence in the world population causing severe disability in these patients. Although few studies on myofascial, no clinical trial have demonstrated the efficacy of shock waves in chronic low back pain caused by myofascial pain syndrome.

Methods: A prospective, randomized, double-blind, placebo-controlled study was carried out on 10 patients who had moderate to severe pain (VAS > 4) for more than 6 months, despite 6 weeks of conservative treatment with medications associated with physical therapy. Six interventions of rESWT (3-4 bar; 1000 impulses per trigger point or 2500 impulses per muscle) were compared with placebo. The outcome measures were pain visual analogue scale (VAS), Oswestry Disability Index, Short-form McGill Pain Questionnaire, Roland Morris Disability Questionnaire and the temperature of the treated area was evaluated with Termography. The assessments were performed before treatment, after conservative treatment, 6 and 12 weeks after rESWT.

Results: There was significant improvement in VAS, Oswestry Disability Index and in the temperature of the areas evaluated with termography after 6 weeks of rESWT compare to placebo ($p < 0.05$). After 12 weeks, patients who underwent active rESWT remained better than baseline values.

Discussion: Although there was improvement in the Rolland Morris and McGill short form questionnaires of active treatment compared to placebo, the improvement was not statistically significant ($p > 0.05$). Since this is a preliminary study, perhaps the small number of sample may have interfered with the results of these questionnaires.

Conclusion: Radial extracorporeal shock wave therapy significantly improves pain and functional disability compared with placebo in patients with chronic low back pain caused by myofascial pain syndrome. In addition to significantly improving the thermography pattern of treated area.



Abstract 7.

Medical Shock Waves for Chronic Low Back Pain: A Case Series

Kenneth Craig, Bradley Takai, Jacqueline Craig, Sarah Pelham, Danielle MacDonald
Institution: Kompass, Auckland, New Zealand

Device and producing company: OmniSpec OR5 - MediSpecLtd.

Introduction: Chronic low back pain which may be either specific or non-specific in nature is a common yet enigmatic major global public health issue arising from multiple aetiologies. Since the first low back pain (LBP) guideline (Quebec Task Force, 1987), much research has been dedicated to this disease and there are now over 2000 control trials evaluating treatments for LBP in the Cochrane data base alone. European, Australian and New Zealand guidelines for the management of LBP are consistent recommending the primary use of paracetamol followed by combination with NSAID's, however consensus for use of opioids, benzodiazepines, muscle relaxants, surgical intervention and physical manipulation remain considerably varied. The issue remains that chronic LBP is often indocile to most interventions and functional capacity often remains limited even when symptomatic relief may be experienced by patients. Therefore, disease modifying interventions rather than symptomatic management alone require investigation.

Methods: Ten patients of varying gender, occupation and age were seen in our clinic. All patients underwent initial screening utilising: subjective pain scale (VAS), Oswestry Disability Index (ODI) and dorsaVi-Move quantitative analysis at baseline, wk 3 and wk12. Medical shockwaves were propagated by an electrohydraulic generator (MediSpec Ltd.) over three (3) sessions at one (1) week intervals, where a total of 1000 impulses at $0.12\text{mj}/\text{mm}^2$ per session were focused bilaterally over the erector spine region ranging from the mid sacrum to L1. All forms of analgesia and pain medications were ceased 48hrs prior to treatment and remained discontinued when possible for the entire treatment and follow-up period. Exercise prescription were commenced at wk6 and only after satisfactory symptomatic relieve was achieved.

Results: Eight of the nine patients showed excellent improvement with one having marginal improvement and requires further management. The overall improvement (n=9) were recorded as follows: VAS (mean baseline 6.7/10; mean post ESWT 0.5/10), ODI (mean baseline 55% [severe disability]; mean post ESWT 14% [minimal disability]) and dorsaVi-Move assessment recorded improvements and correction in the areas of posture and functional movement from baseline. Dependence on analgesics and pain medication was changed from daily dependence (n=10) to completely independent (n=7), and infrequent (n=2).

Discussion: Chronic low back pain is a multifactorial phenomenon that prolongs physical disability interrupting quality of life and productivity. Medical shockwaves have over the past decades demonstrated safety and efficacy across medical disciplines by what is considered to be a stimulus induced homeostatic regulation of the neuro-chemo-biocellular components of the human organism. This case series reports positive outcomes in both symptomatic relief and functional restoration in the majority of the cases.

Conclusion: The aim of this case series wasto determine if medical shockwaves may be a potential disease modifying modality for the treatment of chronic LBP. Given the outcomes of this series further investigation is warranted in this area.



Abstract 8.

Unfocused SoftWave Therapy for the Treatment of Spine Injury Patients to Evaluate the Technology's Influence on Patient Strength, Mobility, Sensitivity, Perspiration, Lung Function, Spasticity, Wound Healing and the Appearance of Scars

Charles Weaver (1), Phil Lavin (2), Crystal Hambrick (3), Johannes Holfeld (4), Sarah Pelham, Danielle MacDonald

Institution: (1) Georgia Spectrum Neurological, Roswell; (2) Lavin Consulting, LLC, Framingham; (3) TRT, Woodstock; USA; (4) Physician at University of Innsbruck Hospital; Austria

Device and producing company: DermaGold 100, TRT, Woodstock, GA/MTS Konstanz Germany

Introduction:

Published research has identified the influence of shockwaves on stem cell attractants, stem cell differentiation, nitric oxide, growth factors, nerve regeneration, apoptosis and the Toll Like Receptors 3 which can impact the immune and inflammatory systems.

Methods: Ten patients with spinal cord injuries (6 complete injury, 4 incomplete) representing multiple injury types and lesions, with 14-112 months range of time since injury. All patients were attending Project Walk Atlanta rehabilitation center and actively engaged in physical therapy. These ten patients were selected to undergo multiple SoftWave treatments. Each patient was evaluated prior to enrollment with the proprietary Project Walk Developmental Activity Score (DAS, 1 - 40) by the patient's long time Physical Therapist. A control group of 5 patients not undergoing SoftWave therapy was also selected and evaluated. All patients continued to receive the standard of care, primarily physical rehabilitation at Project Walk Atlanta. The patients were treated an average of 11 times over an average of 14 weeks with SoftWave. Each also received an average of 26 hours of physical therapy during this same time frame. After the final treatment, another DAS evaluation was performed by the physical therapist, with the patient and physical therapist filling out an extensive post treatment self-assessment questionnaire.

Results: All patients experienced clinically significant improvements in at least one measure. Patients showed improvement with both a self-assessment questionnaire and an independent, proprietary DAS evaluation. Statistical significance was achieved for both measures. Two patients with diminished lung capacity had substantial improvement, one returning to normal 7 years post injury. All patients who could not perspire below the injury showed improvement. In four patients with long term chronic wounds, all wounds totally recovered. One horribly spastic patient had his baclofen pump removed after the study. There was also a positive correlation between outcome and the number of weeks enrolled, number of shock waves, and the number of treatments. Most importantly, on the self-assessment questionnaire, patients were asked on a scale of 1 to 10, 1 being your level of ability the day before the first SoftWave treatment, and 10 representing a return to normal, the average response was a 43% improvement. Patients believed that they were 40% down the road to total recovery.

The independent Project Walk DAS assessment showed an average improvement of 65% relative to baseline. No adverse events were noted other than one minor bruise on the foot.



Discussion: Despite the limited number of patients, and the varied treatment protocols (location/durations), we are impressed by multi-dimensional benefits in a controlled setting. The degree of improvement was far beyond chance. The effects on the autonomic nervous system seemed to be the most emergent (perspiration/respiration). The chronic wound healing was probably the most appreciated and obvious. The appearance of scars was diminished in all patients. Most of the patients are still participating and receiving treatment although less frequently. We continue longer term follow up.

Conclusion: Further study is warranted with an emphasis on treating patients as soon as possible after an injury.



Abstract 9.

The Effects of Radial Shockwave Therapy on Function, Range of Motion, Strength, and Pain in Patients with Chronic Lateral Epicondylitis

Paolo Sanzo

Institution: Lakehead University, Ontario, Canada

Device and producing company: Storz Medical D-Actor

Introduction: Lateral epicondylitis (LE) is characterized by inflammation of the wrist extensors resulting in elbow and forearm pain, reduced grip strength, and pain during active wrist extension and passive wrist flexion. LE affects 30% of workers using repetitive hand tasks. The incidence and recurrence increases with age with equal prevalence between genders. The purpose of this study was to assess the effects of radial shockwave therapy (RSWT) on elbow pain, function, ROM, and strength in LE patients.

Methods: ROM, strength, functional status via the Upper Extremity Functional Scale (UEFS), and pain was measured with the P4 Scale and Visual Analog Scale (VAS) before and 3 months post-treatment. 28 subjects received 3 treatments (2000 shockwaves, 2.5 bars, 10-15 Hz, 11.5 Mp) on the painful elbow. A Wilcoxon Test and dependent t-test was used to analyze the data.

Results: A significant improvement was found in elbow pain following activity, $t(24)=4.85$, $p=.0005$; overall improvement, $t(24)=-5.25$, $p=.0005$; P4 scores $t(24)=5.176$, $p=.0005$; and UEFS scores, $t(24)=-4.06$, $p=.0005$. There was no significant effect on pain at rest, ROM and strength of the elbow and wrist, or grip strength.

Discussion: RSWT has been reported to be effective in some trials and ineffective in others; the evidence and efficacy of therapeutic benefit remains controversial. The current results add to the merit and body of literature supporting its use.

Conclusion: RSWT is an effective treatment for decreasing pain and improving function in LE patients, however, does not have a significant effect on pain at rest, elbow and wrist ROM and strength, and grip strength.



Abstract 10.

Changes in Autonomic Nervous System Reactivity After Extracorporeal Shockwave Therapy in Chronic Rotator Cuff Tendonitis - A Pilot Study

Tomas Nedelka (1), Jiri Nedelka (2), Jakub Schlenker (3), Radim Mazanec (1)

Institution: (1) Charles University Prague; (2) Rehabilitation Center and Pain Clinic, Prague; (3) Czech Technical University, Prague, Czech Republic

Device and producing company: Storz Duolith, Storz Switzerland

Introduction: Chronic rotator cuff tendonitis is a common musculoskeletal disorder caused by overload and repeated injuries to rotator cuff insertion, mainly in supraspinatus muscle. According to literature, there is a considerable evidence that chronic neck and, more importantly, shoulder pain, leads to impaired reactivity of cardiovascular autonomic reflexes (Hallman 2014, Shiro 2013). Certain abnormalities in power spectrum analysis of heart rate variability (HRV) were previously reported in chronic shoulder pain, including decreased vagal tone (high frequency - HF domain), increased sympathovagal balance (LF/HF ratio) and LF power spectrum density. The aim of our retrospective study was to examine impact of focused extracorporeal shockwave therapy on power HRV indexes in patients with chronic rotator cuff tendonitis.

Methods: 24 age and gender-matched patients diagnosed with chronic (>3 months) rotator cuff tendonitis were enrolled in our study. There were 12 patients (Group A, 6 males, 6 females), treated by focused ESWT (Storz Duolith, EFD = 0,20 mJ/mm², 1000 pulses, 4 sessions, than radial therapy 1000 pulses according to Dynamic Myofascial Therapy principles). As a control group (Group B), 12 patients with similar gender and age distribution were treated by sham device (air filled cushion). We have measured measured time and frequency domain parameters before the therapy, after each application of ESWT and in 3 months follow-up). VAS intensity score and shoulder pain severity questionnaire were noted before, after each treatment and in 3 months follow-up.

Results: At baseline, both groups did show significantly decreased power spectrum indexes compared to Task Force (Malik, 1996) results except of LF/HF ratio. In Group A significant increase in resting total spectrum power, HF vagal tone indexes and significant reduction of sympathovagal balance – LF/HF ratio was observed from 2nd ESWT application and in 3 months follow-up. In group B (sham device), significant increase in total spectrum power was also observed, however, LF/HF ratio and HF power remained unchanged as the sympathovagal balance was not changed.

Discussion: Electrophysiological examination of heart rate variability in patients with chronic shoulder pain revealed moderate autonomic nervous system dysregulation outcoming from increased sympathetic tone, which was similar to previous findings in other types of chronic neck and shoulder pain. We hypothesize, that chronic muscle and tendon inflammation in shoulder region can lead to sympathetic hyperactivity and part of the pain component can be maintained by local autonomic dysregulation.

Extracorporeal shockwave therapy lead to significant improvement in autonomic cardiovascular reflexes in rest and contributed at pain relief, as decreased LF/HF ratio correlated well with decreased shoulder pain scores.

Conclusion: Extracorporeal shockwave therapy lead to significant improvement in autonomic cardiovascular reflexes in rest and contributed at pain relief, as decreased LF/HF ratio correlated well with decreased shoulder pain scores.



Abstract 11.

Experience in the use of shock waves in shoulder calcic tendinosis

Jorge Chavez Aravera (1) Cristian Olivares (2)

(1)Valparaíso University (2) Andrés Bello University teacher.

Introduction

It is presented casuistry and analysis of treated patients with frequent pathology of shoulder calcic tendinosis consulted in traumatology, and with approved indication to the use of shock waves.

Methods

We analyzed 30 cases with shoulder calcic tendinosis, all the cases confirm the diagnostic with x-ray and echography and it is demonstrated the degenerative condition of rotator cuff associated to the calcification of this, that in only a few cases the calcic density is visible in the x-ray We applied an average of 14 HZ getting up to the 2,5 to 3 Bar of power in most of the cases, with an average of 5 sessions.

Results

It was observed pain relief and regression in some cases of the calcic density in these calcifications.



Abstract 12.

Shockwave Therapy as an Alternative Treatment of Postoperative Residual Pain After Shoulder Arthroscopy

Pablo Hidalgo, Myriam Capasso

Institution: Ortho shock C.A, Caracas; Venezuela

Device and producing company: DUOLITH® SD1 »ultra« STORZ MEDICAL

Introduction: The postoperative residual pain after shoulder arthroscopy represents a very low percentage when surgery is performed by a shoulder surgeon, however, are difficult to resolve, resulting in worker absenteeism for long periods. The purpose of this study was to determine the effectiveness of treatment with shockwave therapy in the postoperative residual pain in shoulder arthroscopy.

Methods: 14 patients from 2012-2014 who had pain after 3 months of arthroscopic surgery, between 31 and 48, M = 10 F = 4 were studied. The causes of residual pain were after these procedures; soft tissue biceps tenodesis with repair of the supraspinatus (6), SLAP II and supraspinatus repair (4), Biceps tenotomy and Supraspinatus repair (2) and bone fixation tenodesis of the biceps (2). Group A: 7 patients that were applied 3 sessions of shock waves therapy and physiotherapy. Group B: 6 patients only physiotherapy. Follow up of 24 months, clinical evaluation by EVA and SST.

Results: Group A: 100% clinically recovered between the 4th and 6th week of starting treatment with shockwaves, group B (physical only) 4 patients recovered the 7th month postoperative and 2 required other treatments to achieve improvement to 12 months.

Discussion: More studies morbidity of postoperative residual pain in shoulder arthroscopy and treatment are needed.

Conclusion: ESWT appears to represent an additional treatment option in patients with non-union after high energy fractures. The shockwave therapy may be considered an alternative in the management of postoperative residual pain always in combination with physiotherapy.



Abstract 13.

Efficiency-based evaluation of extracorporeal shockwave treatment (ESWT) in calcifying tendinopathy of the shoulder (CTS) and pseudoarthrosis.

S. Ramon MD, PhD^{1,2,3}, J. Bertran MD⁴, L. Hernandez MD^{1,3}, X. Cusco MD^{1,3}, W. Espinosa MD^{1,3}, L. Romero MD¹, E. Morales PT^{1,3}, M. Garcia-Balletbo MD, PhD^{1,3}, R. Cugat MD, PhD^{1,3}; X. Corbella MD, PhD, MBA². 1 Hospital Quiron, Barcelona, Spain. 2 Faculty of Medicine and Health Sciences, Universitat Internacional de Catalunya, Barcelona, Spain. 3 Garcia Cugat Foundation, CEU – UCH Chair of Medicine and Regenerative Surgery. 4 IESE Business School, University of Navarra, Barcelona, Spain.

Introduction. Recently extracorporeal shockwave treatment (ESWT) has been shown to be a good alternative to surgery in several musculoskeletal (MS) pathologies. Thus, we should introduce efficiency measures to help choosing the most cost-effective treatment. The purpose of the study was to assess the evidence from published research studies evaluating the efficiency of ESWT as an alternative to surgery in two MS pathologies: calcifying tendinopathy of the shoulder (CTS) and pseudoarthrosis.

Methods. An electronic search was performed in MEDLINE, the Cochrane Library, PEDro and ISMST abstract review, searching studies containing: #shock wave, #shockwave #efficiency #cost. Focus was placed on randomized controlled trials, systematic review and meta-analysis. An Economic Study was implement (Rehab, Surgery vs ESWT direct costs) in the two MS pathologies in our area.

Results. When compared to surgery, ESWT for CTS and pseudoarthrosis showed similar efficacy, but lower recovery time, shortened hospitalization, lower risk of complications or adverse effects, reduced costs and accelerated return to activities of daily living.

Calcifying Tendinopathy of the Shoulder (CTS)	Cost: Surgery over ESWT
Haake et al. (Int J Tech Assess Health Care 2001)	x 5-7
Tovio et al. (ISMST Winterthur 2002)	2.562 €/patient (110.169 € in 43 pt)
Dubs (ISMST Orlando 2003)	2.000 \$/patient
Eid et al. (ISMST Rio 2006)	x 6.4
Ramon, Bertran (SETOC Ibiza 2014)	x 6.6

Pseudoarthrosis	Cost: Surgery over ESWT
Tovio et al (ISMST Winterthur 2002)	4.389,76 €/patient (219.488 € in 50 pt)
Eid (ISMST Antibes 2008)	68-87%
Schaden et al (ISMST Kiel 2011): Austria estimated data	66 million/year
Hospital Clinic Barcelona (2012)	x 3.07

Discussion. It is yet to be decided if not considering ESWT for treating such pathologies would be judged as *mal praxis*.

Conclusions. ESWT showed remarkable evidence, similar efficacy and better efficiency outcomes when compared to surgery for CTS and pseudoarthrosis. These results should encourage other authors belonging to ISMST and National Societies to implement ESWT as the first-line treatment of patients with CTS and pseudoarthrosis, and to improve clinical practice guidelines.



Abstract 14.

Radial Extracorporeal Shock Wave Treatment for Cellulite may Seriously Harm Embryos

Christoph Schmitz (1), Stefan Milz (1), Hans-Georg Frank (1), Rüdiger Korbel (2)

Institution: (1) Ludwig-Maximilians-University of Munich, Dept. of Neuroanatomy;
(2) Ludwig-Maximilians-University of Munich, Clinic for Birds, Reptiles, Amphibians and Pet Fish;
Germany

Device and producing company: Swiss DolorClast, EMS

Introduction: Radial extracorporeal shock wave treatment (rESWT), originally developed for the treatment of various musculoskeletal injuries, has become one of the best investigated treatment modalities for cellulite. Earlier studies reported potential damaging effects of focused extracorporeal shock wave treatment (fESWT) on embryos. Accordingly, pregnancy is considered a contraindication for rESWT. Concerns have been raised about possible harm to the embryo caused by treatment with rESWT for cellulite, especially in the critical period of time when a woman is not aware of her pregnancy.

Methods: Chicken embryos in ovo were exposed to various doses of radial shock waves at two different stages (two and three days old) of development (positive energy flux density = 0.16 mJ/mm²). By these time points the chicken embryos possess a well developed circulatory system, well established primary optic vesicles, an identifiable telencephalon and the formation of appendages.

Results: The mortality rate of the chicken embryos increased in a dose-dependent manner after exposure to rESWT at the age of two or three days. Among those embryos that survived the shock wave exposure, three embryos showed severe congenital defects (missing eyes, malformed pelvis, or missing coat).

Discussion: Our results show a potential serious physical harm to embryos treated with rESWT. The developmental stages (two or three days old) of the embryos exposed to rESWT is comparable to four- to six-week-old human embryos. Even if the results cannot be directly transferred to the embryo of a pregnant woman treated with rESWT for cellulite, we recommend to rule out pregnancy before the application of rESWT to avoid any risk to harm the embryo.

Conclusion: The results of this study are of substantial relevance for daily clinical practice when treating cellulite with rESWT.



Abstract 15.

Shock Wave Treatment Activates Erk1/2 Pathways Predominantly via P2Y Receptor Involvement

Anna M. Weihs (1), Christine Fuchs (1), Andreas H. Teuschl (1), Joachim Hartinger (2), Paul Slezak (2), Rainer Mittermayr (2), Heinz Redl (2), Wolfgang G. Junger (3), Harald H. Sitte (4), Dominik Rünzler (1)

Institution: (1) University of Applied Sciences Technikum Wien, Department of Biochemical Engineering; The Austrian Cluster for Tissue Regeneration; (2) Ludwig Boltzmann Institute; Vienna, Austria; (3) Department of Surgery, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston USA; (4) Institute of Pharmacology, Center for Physiology and Pharmacology, Medical University of Vienna

Device and producing company: Dermagold

Introduction: Shockwave treatment (SWT) improves cell proliferation and enhances wound healing. We previously showed that SWT of mouse mesenchymal stem cells releases ATP that enhances cell proliferation via purinergic signaling and Erk1/2 activation. Here we identified the purinergic receptors involved in this effect of SWT in human cells.

Methods: A human T-cell line and primary human adipose-derived stem cells were subjected to SWT and ATP release was analyzed. Erk1/2 activation was assessed with Western blotting and proliferation was quantified using a BrdU incorporation assay. The role of different purinergic receptors in the Erk1/2 activation was assessed with specific agonists and antagonists for P1, P2X, and P2Y receptors.

Results: SWT released ATP in a dose-dependent fashion from both human cell types, increased Erk1/2 activity in a purinergic signaling-dependent manner, and enhanced cell proliferation. These data are consistent with our previous findings with murine cells that identified P2Y receptors as the predominant receptors involved in Erk1/2 activation by SWT.

Discussion: Taken together with our current findings, we conclude that the signaling cascades resulting in the proliferative effects of SWT are similar in murine and human cells and that P2Y type receptors are the most dominant among the different purinergic receptors involved in Erk1/2 activation by SWT.

Conclusion: Our data suggest that P2Y-type purinergic receptors link shockwave treatment to Erk1/2 signaling and proliferation, which may promote wound healing.



Abstract 16.

Extracorporeal Shock wave Therapy Increases ERK-1/2 and Akt Activity of Intact Rat Tibia for 21 Days Following Primary stimulation

Lidia Dornelas de Faria (1), William Dias Belangero (1),
Carlos Vinícius Buarque de Gusmão (1), Mario Jose Abdalla Saad (2),
Juliana Falcato Vecina (2), Alexandre Gabarra Oliveira (2)

Institution: (1) Laboratório de Biomateriais em Ortopedia; (2) Laboratório de Investigação Clínica em Resistência à Insulina; Faculdade de Ciências Médicas, Universidade Estadual de Campinas; Brazil

Device and producing company: Vetgold 120™ (SwiTech AG)

Introduction: The purpose of this study was to investigate whether a single extracorporeal shock wave therapy (ESWT) increases the concentration of proteins Erk1/2 (extracellular signal-regulated kinase) and Akt (akutely transforming) in tibiae and fibulae of rats.

Methods: Thirty Wistar rats, males, were initially divided randomly into two groups, each with 15 animals called Control Group (GC) and Treated Group (TG). The animals in the TG underwent extracorporeal shock wave therapy after general anesthesia in one session where they were applied to 500 pulses generated by electrohydraulic device (Switech Medical, Activator Vet, 2009) to 0,12mJ/mm² in right and left tibiae and fibulae. Then the 15 animals were divided into 3 sub-groups (n=5) to be followed and euthanized with 7, 14 and 21 days. The same procedure was performed with the GC, but without the application of ESWT. The dosage of Erk1/2 and Akt proteins of the bone tissue of tibiae and fibulae through Immunoblotting test was performed in the animals of each of the groups in different times of follow-up.

Results: The expressions of Erk1/2 and Akt were significantly higher in the group with seven, 14 and 21 days of follow-up after the implementation of the TOC when compared with their respective controls ($p < 0.05$).

Discussion: Mechanotransduction plays a crucial role in the physiology of many tissues including bone. Mechanical loading can inhibit bone resorption and increase bone formation. ESWT provide mechanical stimulation in intact bone in this study. The findings of this study are of considerable significance for Erk and Akt fosforilation effects after 7, 14 and 21 days after ESWT in intact bone when compared to control group. New approaches in the clinical application of shock waves will be tested.

Conclusion: The response of bone tissue with ESWT was effective and it was detected even after 21 days of mechanical stimulus.



Abstract 17.

High-energy Extracorporeal Shock Wave for Early Stage Osteonecrosis of the Femoral Head: A Single-center Case Series

Wei Sun, Fuqiang Gao, Zirong Li

Institution: China-Japan Friendship Hospital, Beijing, China

Device and producing company: Donier

Introduction: There is currently no standardized protocol for evaluating and treating osteonecrosis of the femoral head (ONFH). High energy shock wave provides an additional option in the treatment ONFH. The purpose of this study was to evaluate the clinical results and radiographic outcomes of high energy shock wave in the treatment of ONFH.

Methods: From Jan. 2012 to Dec. 2013 we evaluated 335 ONFH patients (528 Hips) were treated with high energy shock wave. Patients were aged from 21 to 51 (mean age, 35.2 years). According to the classification system of Association Research Circulation Osseous (ARCO), 137 hips had stage I disease, 246 hips had stage II disease and 145 hips had stage III disease and as to China-Japan friendship hospital (CJFH) Classification, L1: 111hips; L2: 57hips; L3: 95hips; M: 81 hips; C: 184hips. All patients were treated with Dornier compact Delta II (ED was $>0.44\text{mJ}/\text{mm}^2$; 3000 pulses per patients. Outcome measures were VAS score, Harris hip score, radiographic outcome measures and survivorship analysis with revision to total hip arthroplasty as the end point.

Results: Most of the patients (83.9% Hips) demonstrated pain reduction and improved mobility of the treated joint. The VAS score decreased from 6.8 ± 3.7 to 1.0 ± 2.1 ($P < 0.001$). The Harris hip score increased from 69.4 ± 14.7 to 90.9 ± 11.4 ($P < 0.001$). Overall 16 hips were converted to total hip arthroplasty (or should be THA) as to (CJFH) Classification L1: 2hips; L2: 4hips; L3: 10hips.

Discussion: The results of the current study showed regression of the lesion in and progression with stage I and II lesions after shockwave treatment. It appeared that extracorporeal shockwave treatment significantly altered the natural history of the hips affected by ONFH.

Conclusion: The survival rate after high energy shock wave treatment of osteonecrosis of the femoral head was affected by ARCO stage and CJFH classification. In total 83.9% hips got acceptable result which is a viable option for the treatment of ONFH.



Abstract 18.

Optimizing fracture fixation with the use of extracorporeal shockwave therapy

MKE Koolen, O van der Jagt, FC Oner, W Schaden, H Weinans

Background:

Fracture fixation in osteoporosis is a major problem in orthopaedic traumatology. Detoriation of cortical and cancellous bone hamper screw fixation and result in delayed weight bearing and osteosynthesis failure. We hypothesize that shockwaves can improve screw fixation and osteointegration.

Methods:

In eight female Wistar rats two cancellous and two cortical screws were implanted in each leg (see fig 1A). After implantation 3000 unfocused shockwaves (EFD 0,3 mJ/mm²) were applied to one leg. The other leg served as a control. Four weeks after implantation the animals were sacrificed. Micro-CT scanning, fluorochrome labeling and histology were used to examine bone morphology and osteointegration (see fig 1B). Biomechanical properties will be analysed by pull-out tests.

Results:

On micro-CT scans shock waves resulted in clear bone formation compared to the control legs at four weeks after treatment (see fig 2A). In most cases cancellous and cortical bone formation was increased. Furthermore, *de novo* bone formation in the marrow was observed. Bone formation was not the same in every animal. Interestingly, four out of the eight animals showed extensive periosteal bone formation (see fig 2B). Quantitative micro-CT analysis, biomechanical testing and histology are ongoing.

Discussion:

Shockwave therapy after screw implantation considerably increased bone formation. Another finding was extensive periosteal thickening in the shape of a neo cortex. Since local application of shockwaves at time of screw implantation did result in enhanced cortical and cancellous bone mass it may indeed lead to improved biomechanical properties in order to improve fracture fixation. Further analyses must prove whether this is true.



Abstract 19.

Shockwave Treatment for Osteopenian Fibular Vascularized Graft Donor Site. First Case Report

Carlos Leal MD, Arnold Fernández MD
Institution: Fenway Medical Center, Bogotá DC, Colombia

Introduction. Osteopenia is a major problem in the fibular vascularized graft donor site. This bone's shaft is removed entirely with all their vascular attachments in order to reconstruct large defects in trauma and cancer surgery. The non weight-bearing conditions of the remaining fibula create a non-loading environment that results in a poor bone turnover. This is a late complication that may result in pathologic fractures. Improving local bone mineral density is a difficult challenge in these cases, and ESWT has shown good results in bone turnover stimulation in other locations. We hypothesize that the use of focalized high energy ESWT may improve bone the mineral content in the fibular vascularized donor site.

Methods. A 52-year-old patient with a diagnosis of a lower maxillary malignant ameloblastoma was treated five years before, with a jawbone reconstruction with a fibular vascularized graft. Even though the objective of the reconstruction was achieved, the donor site developed a marked osteopenia that was diagnosed when the medial malleolus had a fracture related to a sports injury. In order to improve mineral density, a bone stimulation protocol with ESWT was applied. The patient received four sessions of 3000 shockwaves on a weekly interval, with energy of 2.5 Mj/mm² over the fibula on the ankle region. Previous to the treatment a quantitative dual bone densitometry was performed, and six months after a second exact same study was performed. Bone mineral density and bone mineral content was measured, as compared with the exact same area on the contralateral fibula, and the differences before and after the treatment. Any adverse effects or outcomes were recorded. The senior author is the patient reported in this study.

Results. Quantitative Bone Mineral Density BMD measured improved in 23% from the pre-treatment value to the six-month follow up value. Quantitative BMC improved 29% from the pre-treatment value to the six-month follow up value. The quantitative bone mineral content of the selected area was 53% lower than the contralateral fibula in the beginning, an improved to a 22% difference after six months. No adverse effects were reported. The subject tolerated the procedure with moderate pain that did not require anesthesia.

Discussion. The use of high energy focused ESWT on the osteopenic fibula improved significantly the bone mineral content and density in our case report. The results showed a lower difference of bone density and mineral content as compared with the contralateral control side. No adverse effects were reported.

Conclusion. The use of high energy focused ESWT is a noninvasive procedure that can be used to improve bone density and mineral content, and thus preventing a possible pathologic fracture in patients with osteopenic fibular vascularized graft donor site. Further studies must be done in a larger number of patients, but this is the first report that shows the positive effect of ESWT on localized bone osteopenia, that would otherwise have little options of treatment, and would probably require undesired life style changes, protective bracing or waiting for a fracture to occur in order to be treated.



Abstract 20.

ESWT in the Treatment of High Energy Trauma in Lower Limbs Long Bone Non Unions

Carlos Sandoval (1), Alvaro Valenzuela (1), Carlos Rojas (1), Diego Valiente (1), Sebastian Monge (1), Manuel Brañes (2)

Institution: (1) Hospital de Trabajador; (2) Cliniaca Arauco Salud, Santiago; Chile

Device and producing company: Storz DuolithSD1

Introduction: Delayed union and non-union of femur and tibia are common in trauma hospitals. The purpose of this study was to examine the effect of focused extracorporeal shock wave therapy (ESWT) on the treatment of non-unions in high energy lower limb long bone diaphyseal fractures.

Methods: Prospective nonrandomized study patients were investigated at a single referral trauma center of worker compensation insurance. Inclusion criteria was a minimum duration of non-union for 6 months after first surgery (ORIF). We applied two sessions of ESWT (10000 pulses /0,35mJ/mm² - 0,55mJ/mm², Storz DuolithSD1) spaced by 4 to 6 weeks period. Re-evaluation was performed once a month after treatment, with clinical examination and radiologic control. We considered "success" with 70% of bone consolidation (that include 3 corticals) within follow-up period (4 to 10 months). Cases considered "failures" comprised, a) absence of any biological reactivity in the treated area for three months after first treatment (patients underwent new surgical procedures); b) less of 70% of bone healing at the end of 10 months (f-u).

Results: We included 50 patients (average age, 38.5 years) with a diagnosis of nonunion. The average onset of therapy time since the accident was 9,4 months (range 6-20,3 months). At the time of last follow up, 34 of 50 (70%) patients have demonstrated complete fracture healing. Mean time from first shock wave therapy to complete healing of the nonunion was 4,3 months (range 2 - 9,6 months). In 31 patients (62%) one or more re-intervention had been performed prior to ESWT, in this subgroup following ESWT we found a success rate of 55% (n=17).

Discussion: Our series of patient studied have a rate of consolidation similar to the current literature reports.

Conclusion: ESWT appears to represent an additional treatment option in patients with non-union after high energy fractures.



Abstract 21.

Extracorporeal Shockwave Therapy (ESWT) Ameliorates Healing of Tibial Fracture Non-Union Unresponsive to Conventional Therapy

Rainer Mittermayr (1,2), Vlado Antonic (3), Nicolas Haffner (4), Daniel Smolen (1,2), Paul Slezak (2), Alex Stojadinovic (5), Wolfgang Schaden (1,2)

Institution: (1) AUVA Trauma Center Meidling Vienna, Austria; (2) Ludwig Boltzmann Institute, Vienna, Austria; (3) University of Maryland School of Medicine, Department of Radiation Oncology, Division of Translational Radiation Sciences, Baltimore, MD, USA; (4) Orthopedic Hospital Gersthof, Vienna, Austria; (5) Uniformed Services University for Health Sciences, Bethesda, MD; Bon Secours Cancer Institute, Richmond, VA; USA

Device and producing company: Dermagold 180, MTS Orthowave 280 (MTS, Germany), Ossatron (HMT, Switzerland)

Introduction: Tibial non-unions are common cause of demanding revision surgeries and are associated with a significant impact on patients' quality of life and health care costs. Extracorporeal shockwave therapy (ESWT) has been shown to improve osseous healing *in vitro* and *in vivo*. The main objective of present study was to evaluate the efficacy of ESWT in healing of tibial non-unions unresponsive to previous surgical and non-surgical measures.

Methods: A retrospective multivariate analysis of a prospective open, single-center, single-arm, clinical trial of patients suffering from tibia non-union was conducted. Fifty six patients with 58 eligible fractures who met the FDA criteria for non-unions characterized as being at least 9 months old and lacking any radiological signs towards osseous healing over the last 3 months were included. All patients received 3000 to 4000 impulses of electrohydraulic generated extracorporeal shockwaves at the fracture site at an energy flux density of 0.4mJ/mm² (-6db) and a frequency of 4 Hz.

Results: Six patients with six fractures were lost in follow up and excluded from the analysis. On average patients underwent 1.9 times (± 1.3 SD) previous surgical interventions prior to ESWT displaying the rather negatively selected cohort and its limited therapy responsiveness. In the 88.5% of the ESWT treated patients we observed complete bone healing after six months irrespective of fracture location, underlying pathology and importantly presence of infection. The multivariate analysis showed that time of application is important for success of the therapy. Patients achieving successful healing received ESWT earlier: mean number of days between last surgical intervention and first ESWT (healed - 355.1 days ± 167.4 SD vs. not healed - 836.7 days ± 383.0 SD; $p < 0.0001$).

Discussion: ESWT proved to be a safe, effective and non-invasive treatment modality in patients suffering from tibial non-unions recalcitrant to standard therapies. The procedure is well tolerated, time-saving, lacking serious side effects, with potential to significantly decrease health care costs associated with tibial non-unions. Thus, in our view, ESWT should be considered the treatment of first choice in established tibial non-unions.



Abstract 22.

Extracorporeal Shock Wave Therapy for the Treatment of Non-unions – Experience with a new Device at a Level 1 Trauma Center

Jens Everding, Moritz Freistühler, Jens Gestring, Michael J. Raschke, Patric Garcia

Institution: University of Münster, Germany

Device and producing company: LithSpaceOrtho, JenaMedtech

Introduction: 5–10% of all fractures show disturbed healing or nonunion formation. Extracorporeal shock wave therapy has been described as a non-surgical treatment option. Even though the outcome has shown promising results, the procedure is not commonly used in clinical practice.

Methods: In this study 44 nonunions were treated with shock waves under general anesthesia (LithSpaceOrtho, JenaMedtech, 3x1000; 0,36J/mm²). Inclusion criteria were: fracture dislocation <5mm, adequate fracture retention and absence of infection. The follow up examinations were performed over a period of 6 months. Outcome measurement included radiological fracture union and pain (VAS). The study group contained: 43 pseudarthrosis in 6 week follow up, 21 after 3 months and 23 after 6 months.

Results: None of our patients showed treatment related adverse events. After 6 weeks 12 % of patients showed fracture union and additional 63 % showed progressive callus formation. After 3 months 43 % of the fractures were completely healed and additional 52 % presented with progressive callus formation. After 6 months 70 % showed complete fracture healing, the other 30 % showed progression of callus. All patients presented significantly lower pain levels after ESWT. Hypertrophic nonunions showed higher consolidation rate than atrophic nonunions after 6 months (82 % vs. 55 %). Smoking patients showed poorer results than non-smokers.

Discussion: Despite surgical treatment, extracorporeal shock wave therapy is a valid option for patients with fracture nonunion. However reimbursement by health insurances is still critical in Germany.

Conclusion: Studies with higher level of evidence are needed to establish this treatment for patients with nonunions.



Abstract 23.

**HILT(High intensity Laser Therapy) HILT and RSWT(Radial Schockwave treatment):
Pain and Patient Satisfaction Evaluation of 100 Patients**

Stefan Guiloff Paradiz, Leonardo Guiloff Waissbluth, Manuel Brañes Aroca

Institution: Clinica Arauco Salud, Santiago, Chile

Device and producing company: BTL 6000 HILT device; BTL 6000 RSWT device

Introduction: HILT and RSWT are two technologies showing good clinical results in the literature. In this study we want to evaluate 100 patients with chronicles tendon and bone pathologies treated with one or both therapies.

Methods: 91 patients was treated with HILT and 9 with HILT and RSWT. We evaluate pain and patient satisfaction prospectively after 5 sessions HILT. The same parameters were assessed in patients with combined therapy after 5 sessions HILT and 3 sessions RSWT .

Results: Pain relief average was 68,60% and patient satisfaction average 89.78% in patients treated only with HILT. Pain relief was 40,95% and patient satisfaction 85,71% in combined treatment.

Discussion: This is a preliminary clinical study to evaluate only subjective parameters,without excluding other therapies that patients were doing when they started this treatments .We did not separate pathologies one by one,so with these findings we can only have a general vision of the use of these therapies. We need another objective research(clinical and histological),with control group, also animal research, to confirm this findings.

Conclusion: We conclude that both therapies were helpful in pain relief and also patient satisfaction.

Further studies wil be necessary ,separating by pathologies , including samples for histological study in tissues treated with one or both technics, that must be analysed in the laboratory, to confirm these results.



Abstract 24.

Shock Wave Treatment for Orthopaedic Infection

Richard Coombs (1), Milad Hanna (2), Moustafa Hafez (2)

Institution: (1) Imperial College, (2) Charing Cross Hospital, London, UK

Device and producing company: Storz SLX-F2 and Duolith

Introduction: We have used Shockwave treatment for six patients with deep infection unsuitable for alternative treatment.

Methods: We have used The Storz SLX-f2 and The Duolith machines with four to twelve sessions of treatments.

Results: All infections have so far responded to treatment.

Discussion: We believe Shockwave treatment should be considered for all patients with orthopaedic infections.

Conclusion: Shockwave treatment can be helpful for all resistant infections.



Abstract 25.

New Treatments in Erectile Dysfunction and First Clinical Trial Results

Rafael Prieto (1), Nuno Louro Pelo (1), Ana Puigvert (2), Ignacio Martinez-Salamanca (3)

Institution: (1) Centro de Medicina Sexual y Reproductiva La Arruzafa, Córdoba;

(2) Instituto de Andrologia i Medicina Sexual, Barcelona;(3) Hospital Sanitas-La Zarzuela, Aravaca; Spain

Device and producing company: Dornier Aries

Introduction: Extracorporeal shock wave application (ESWA) has been reported as an effective treatment in different urological indications and newly for erectile dysfunction (ED). We aimed to investigate the efficacy of ESWA in ED patients who were poor responders to phosphodiesterase type 5 inhibitors (PDE5i).

Methods: This was an open-label single-arm prospective study on ED patients with an IIEF-ED score (International Index of Erectile Function) of less than 15 and with a duration of more than 6 months at baseline. All patients were non-responders to PDE5i and with multiple cardiovascular risk factors. 30 patients were enrolled from July until October 2014. The protocol comprised one treatment session per week for 5 weeks. Patients were followed at 1 month, and only then an active PDE5i medication was provided if needed for additional 2 months until final follow up visit (after 12 weeks). At each treatment session, 5000 shock waves were applied using the Dornier Aries (Dornier MedTech GmbH, Wessling, Germany) on the penile shaft and crus in different anatomical sites at an energy level 4 with an energy flux density of 0.051 mJ/mm².

Each subject underwent a full baseline assessment of erectile function using validated questionnaires and objective penile hemodynamic testing before and after treatment.

Results: All patients (mean age of 53; range 40-66) completed the study and tolerated the novel therapy very well without side effects. The mean IIEF-ED score at baseline was 11±1. At the end of the treatment 26 of the 30 males (86.6%) reached an improvement of at least 7 points and an average increase of 11 points (p<0.001). 10 patients achieved an increase to IIEF-score higher than >25 and 16 patients were able to achieve full sexual intercourse after taking PDE-5i. These results were lasting for 12 weeks until the second follow up. A significant improvement (p < 0.001) in penile hemodynamics was detected after treatment and this improvement significantly correlated with increases in the IIEF-ED (p < 0.05). No patients reported pain associated with any adverse events during or after the treatment.

Discussion: Penile ESWA is a new modality that can improve treatment of severe to moderate ED patients non-responding to PDE-5i or with multiple cardiac risks. The effect of ESWA on angiogenesis and microcirculation seems to be essential for the vast improvement in erectile function. These results were significantly shown using the IIEF-ED scores, and the three parameters of penile hemodynamics and endothelial function.

Conclusion: The new treatment represents a valid option to conservative strategies for the management of patients with erectile dysfunction. These preliminary data need to be reconfirmed by multicenter sham controlled studies in a larger group of ED patients.



Abstract 26.

Effectiveness of low-intensity extracorporeal shock wave therapy with linear approach on patients with Erectile Dysfunction and vascular risk factors associated

Walter De Bonis – Argentina-

División Urología Hospital Durand – Instituto Médico Especializado

Introduction

The treatment of erectile dysfunction (ED) has evolved considerably over the last decade, following the introduction of type 5 phosphodiesterase inhibitors (PDE5i), which have become the first line of treatment for this complaint.

Despite the effectiveness of these drugs, a number of patients ranging from 40% to 50% do not respond to drug therapy even after optimization approaches such as treatment combinations have been implemented

The second and third lines of treatment are the self-injection of vasoactive drugs and penile prosthetic implants, which many patients are reluctant to accept.

Recently, two observational and one controlled trial have been published reported efficacy and safety of low-intensity extracorporeal shock wave therapy (LI-ESWT), particularly for patients with ED of vascular origin who are PDE5i non-responders

The mechanism of action is still not completely elucidated. However, it has been shown that low-intensity energy induces the production of a physiologically significant amount of non-enzymatic nitric oxide and activates the intracellular cascade pathways that trigger the release of angiogenic factors

Material and Methods

We have performed this treatment on patients with Erectile Dysfunction (ED) and risk vascular factor who have failed to respond to PDE5i treatment using RENOVA NR, a LI-ESWT device manufactured by Direx Group. The treatment consisted in applying 20,000 shock waves during a period of four weeks (four sessions). In each session, the patient received 5000 shock waves of 0.09 mJ/mm²: 1800 were applied on the penis (900 on each corpus cavernosum), and 3200 were applied on the perineum (1600 on each crus). The treatment areas were the same in all four sessions. All sessions were performed without anesthesia and in an outpatient setting, and each lasted 20 minutes.

Results

The increase in IIEF was significant from the first control, averaging 5 points. The SEP 2 and 3 improved significantly. 75% of patients showed improvement with treatment. 60% of patients improved 3 parameters erection and responded positively to the Global Assessment Question.

There were no patients reporting treatment-related adverse events.

Discussion

Low-intensity extracorporeal shock wave therapy is a new modality of treatment specially for patients with ED and vascular risk associated who are poor PDE5i responders.



Abstract 27.

Examining Shock Wave Therapy as a Treatment for Spasticity: A *C. Elegans* Worm Model Shows Dose-Dependent Effect on Movement Following Treatment

Christoph Schmitz, Nicolas B. Angstman, Hans-Georg Frank, Stefan Milz

Institution: Ludwig-Maximilians-University of Munich, Department of Neuroanatomy

Device and producing company: Swiss DolorClast, EMS

Introduction: Extracorporeal shock wave therapy (ESWT) has been shown to be an effective treatment method in the reduction of muscle spasticity. It is not yet understood, however, why and through what mechanisms the application of shock waves affects tissue involved in spasticity. *C. elegans* worms offer a unique platform for the investigation of such mechanisms, as they are well known in the neurobiology field, containing a simple, fully mapped nervous system.

Methods: Here we demonstrate a dose-dependent effect of shock wave exposure on *C. elegans* using therapeutic extracorporeal shock waves produced by a device used in medical practice.

Results: Increased exposure to shock waves resulted in an increase in the proportion of worms rendered paralyzed while decreasing mean speed of movement. Recovery of these two behavioral symptoms was observed during increasing post-treatment waiting periods. Application of shock waves in polyvinyl alcohol resulted in a reduced effect, implicating cavitation as a factor in the observed loss-of-function.

Discussion: These data, combined with the accessibility of *C. elegans*, demonstrate an intriguing model as a starting point for further research into the effect of shock waves on muscle spasticity.

Conclusion: *C. elegans* worms may serve as excellent model to understand the molecular and cellular mechanisms of ESWT for spasticity.



Abstract 28.

10-Year Experience in the Treatment of Sub-Acute and Chronic Wounds with Extracorporeal Shockwave Therapy in the Trauma Center Meidling, Vienna, Austria.

Falko Dahm (1), Rainer Mittermayr (1,2,3), , Lukas Greiner (1), Michael Pusch (1,2), Michaela Pavelka (1), Andrea Valentin (1), Christine Köpl (1), Wolfgang Schaden (1,2,3)

Institution: (1) AUVA Trauma Center Meidling Vienna, Austria;
(2) shockwavetherapy-vienna.at;
(3) Ludwig Boltzmann Institute for Experimental and Clinical Traumatology – AUVA Research Center, Vienna, Austria
Austrian Cluster for Tissue Regeneration, Vienna, Austria

Device and producing company: DermaGold, MTS

Introduction: There is accumulating evidence showing clinical efficacy of extracorporeal shockwave therapy in the management of chronic and delayed healing wounds. In August 2004 we initiated an open clinical study in the AUVA trauma center Meidling, Vienna, Austria intending to treat patients with such non-healing wounds of different etiologies. During the past 10 years of ESWT in this indication we could show the great potential and efficacy of this non-invasive treatment modality.

Methods: Patients with chronic or delayed healing wounds are recruited during routine clinical work or are referred to our hospital specifically dedicated to ESWT. Between August 2004 and December 2014 patients of both sexes with soft tissue wounds of different etiology persistent longer than 1 month (mean: 74.7 days \pm SD: 182) were included. The primary outcome measure was rate of wound closure.

Results: Until December 2014, 824 patients could be included in the analyses which were treated with unfocused extracorporeal shock waves (male: 59%, female: 41%). Mean age was 57.58 years \pm 20.05 (SD). Wound distribution concentrated on the lower extremity (79.9%) followed by the upper extremity (16.4%). In the analyzed cohort posttraumatic wounds were treated most frequently (81%). However, irrespective of etiology, we achieved complete healing in 72% of the wounds treated with defocused ESWT (0.1 mJ/mm², 3 to 5 Hz) which is comparable with the results of 2014. On average complete healing was seen after 47 days (\pm 45 SD) following the first ESWT receiving 3 \pm 2 treatments (mean \pm SD; min-1 and max-11).

Discussion: During the last 10 years of treating chronic and sub-acute wounds of different etiology with extracorporeal shockwaves we could show consistently excellent results. The healing outcome seems to be independent of the treating interval therefore treatment intervals of 2 and 3 weeks are recommended. Interestingly, patients suffering from non-healing wounds with diabetes in the medical history respond as good as wounds in patients without diabetes.



Abstract 29.

Shockwave Treatment of Pes Anserinus Tendinopathies With False Negative MRI Findings

Rosanna Audain, Roberto Audain, Maria Barrios, Yarila Alvarez, Nahin Perez, Alejandra Guevara.
Unitrond CA, Valencia, Venezuela

Device and producing company
Orthospec focused / Medispec

Introduction

The Pes Anserinus tendinitis is an inflammatory condition of the proximal anteromedial tibia, and is a common pathology in cases with an anterior knee pain syndrome (AKPS). Diagnosis is mainly clinical and the diagnostic images such as MRI's are not conclusive.

Methods

From January 2009 to March 2012, we treated 309 knee patients. 239 of these cases were diagnosed with AKPS (77.34%). 121 patients were female (50.67%) and 118 were male (49.37%). The mean age was 45 years. The diagnosis of Pes Anserinus tendinopathy was positive in 70 patients (29.28%). However, 49 out of these 70 patients (70%) had an MRI report different from tendinopathy, and were classified as False Negatives. These patients were treated with focused shockwaves using an Orthospec device, with a one-session protocol of 3000 impacts at 0,12-0,16 mJ/mm² with no sedation or anesthesia. We analyzed a Lyshom Score and a satisfaction scale, at 21 and 45 days, 3 and 6 months. Results were analyzed by analytical and inferential statistics.

Results

The level of satisfaction in the false-negative group showed 38.78% of very satisfied, 46.94% satisfied, and 14.28% unsatisfied patients. The Lyshom Score increased from an initial value of 59 to a final value of 82.

Discussion

There is a low correlation between clinical diagnosis and MRI findings in Pes Anserinus tendinopathies. The incidence of false negatives goes as high as 70% in our series. These patients were treated based upon our clinical approach, and the results in level of satisfaction and the functional Lyshom scores were encouraging.

Conclusion

The best diagnostic tool for Pes Anserinus tendinopathy is a thorough clinical evaluation, and not MRI images. With a high incidence of false negatives, a clinical diagnosis should be enough to indicate treatment with ESWT. Our results were good or excellent in these group of patients.



Abstract 30.

Radial Extracorporeal Shock Wave Treatment: A New Paradigm on Fibromyalgia

Silvia Ramon (1), Leonor Hernandez (1), Antonio Gomez (1), Georgina Salvador (1), Luis Romero (1), Asuncion Acosta (1), Elena Morales (1), Fernando Vidiella (1), Ramon Cugat (1), Markus Gleitz (2)

(1) Hospital Quiron, Barcelona; Spain. Garcia Cugat Foundation, CEU – UCH Chair of Medicine

(2) Orthopaedic Practice, Luxembourg

Device and producing company: Physiogold 50 (MTS)

Introduction: The purpose of this study is to evaluate the chronic effects of radial extracorporeal shockwave treatment (rESWT) in fibromyalgia (FM).

Methods: 24 women suffering from FM were included in a randomized study and asked to select the 3 most painful myofascial and asymmetrical points in the body. All patients were female, mean age 52.13 years, and received rESWT (Physiogold 50, MTS): 5 weekly sessions, using 2000 shocks of rESWT at each of the 3 points: group 1 (treatment) N= 13 treated with 500 shocks, 1,5 bar, 5 Hz; then 1000 shocks, 2 bar, 8 Hz; and 500 shocks, 1,5 bar, 15 Hz; group 2 (placebo) N= 11 (using a soft rubber cap leaving air between transmitter and the cap) received 500 shocks, 15 Hz; then 1000 shocks, 8 Hz; and 500 shocks, 15 Hz, with the pressure constant 1,5 bar.

Outcome variables were: 1) Pain: VAS, algometer (Wagner instruments®) at 3 points and contralateral; McGill Questionnaire; 2) Emotional situation (BDI; Hamilton test) and 3) QOL measures: Fibromyalgia-Impact-Questionnaire (FIQ); Fibromyalgia-R808-NP2; SF-36. Both groups received a home FM exercise program, according to Fibromyalgia Information Foundation. All patients were assessed for pain before each rESWT and at 6 weeks, 3, 6 and 12 months after treatment.

Results: rESWT showed significant improvement in subjective measures such as local pain (VAS), and objective measures (algometer, Roles & Maudsley, FIQ, pain dimension in SF-36) in treatment group at 6 weeks, 3, 6 and 12 months follow-up compared to placebo, and stabilize at 6 months.

Discussion: Patients maintained long-term benefit 6 months after treatment. At that point, reapplying ESWT could be considered.

Conclusion: rESWT appears to be safe and effective as an early adjunctive therapy in fibromyalgia lasting at least 6 months after treatment.

Therefore, Fibromyalgia is no more an exclusion criteria from ESWT.



Abstract 31.

ESWT in Treatment of Osteitis Pubis

Ana Claudia Souza (1), Alexander Montenegro (2)

Institution: (1) Cortrel; (2) Departamento Médico do Clube de Regatas Vasco da Gama; Brazil

Device and producing company: REFLECTRON – HMT

Introduction: A large number of patients have chronic conditions and the Osteitis Pubis is one of major cause of athletes' absence in several sports. Due to this condition often presents with nonspecific symptoms causing a delay in accurate diagnosis, the treatment can take several months or longer to completely recovery. The Aim of this study is demonstrate the results, the efficacy and safety of ESWT in treatment of Osteitis Pubis reviewing our cases in Professional and Amateur Athletes.

Methods: A retrospective study from February 2004 to March 2013, were treated 15 cases of chronic OsteitisPubis resistant to conservative treatments. We used a single application of 3000 impulses, 0.12 mJ/mm² of energy flux density under regional anesthesia (ilioinguinal and iliohypogastric nerves); in outpatient clinic. A rehabilitation protocol was applied after treatment. We used MRI and radiological evaluation at the end of follow-up, beyond the scale and visual analog pain (VAS) and return to activities in the analysis of results. There were no significant complications.

Results: Thirteen athletes became asymptomatic after treatment. One patient did not recover and one left the follow-up.

Discussion: We observed in literature that there are no comparative studies between conservative and surgery treatments; and in a systematic review, the authors concluded that the current medical literature shows only level four of evidence for the treatment reports or series in athletes. Even after making several conservative treatments, several athletes still presenting disabling pain complaints.

The biomechanical effect of ESWT produces a biological response, including the induction of neovascularization and bone repair, caused by increased production of growth factors. Based in this new concept of "tissue regeneration", new indications for the use of ESWT have been reported and studied.

Conclusion: ESWT is noninvasive, which is not considered doping, safe, easily administrated, it is less expensive than surgery, does not have the risk of surgical procedures, and reduces the time an athlete is absent from training and competitive activities.

For these reasons ESWT should be a part of surgeon's treatment options for these challenging clinical disorders.



Abstract 32.

ESWT Therapy in Patellar Tendinopathy Comparison of 2 Protocols

Edson Serrano, Jaen Carlo Criado

Institution: Neomedica Shockwave Unit, Lima; Peru

Device and producing company: ORTHOGOLD 100; BTL 5000, BTL 6000

Introduction: Several studies investigated the effect of the shockwave in the patellar tendinopathy (Jumper's knee), The majority reported positive and beneficial effect. The objective of this study is compare two protocols of treatment of extracorporeal shock wave therapy (ESWT) on patellar tendinopathy in amateur athletes.

Methods: We design a prospective intervention study, thirty two amateur athletes were followed for 6 months and separated in 2 groups of sixteen each one.

The group A receive 5 treatments (every week) with only radial device, with progressive protocol, this protocol includes 2000 initial analgesic shockwaves followed by 2000 therapeutic shockwaves, and ending with 2000 of neurostimulation impulses. Analgesic or neurostimulation impulses are done with high frequencies of 15 – 18 pressure waves per second at a very low constant energy of 1.5 Bar. Therapeutic levels are considered above 2 Bar, and the frequency is managed from 10 to 6 impulses per second in a decreasing manner.

The group B, receive 5 treatments (every week) the first 2 combining focal and radial devices, were performed starting with 2000 radial impulses like a progressive protocol followed by 1000 focal impulses with Energy Flux Density of 0.15 mj/mm² and ending with 2000 radial of neurostimulation impulses; and the last 3 treatments were performed using only radial device with progressive protocol.

After ESWT all the patients entered to strengthening program with eccentric drop-squat exercises 3 times a week for one month, follow-up examinations were performed after 2 months, then every 2 months up to 6 months using the Victorian Institute of Sports Assessment score (VISA).

Results: The mean of the VISA score for the group A was 42.9 pretreatment, 60.2 post-treatment at 6 months,. The mean VISA score for the group B was 40.4 pretreatment, 68.6 post treatment at 6 months.

In six months of following after treatment the overall results for the group A were 31% excellent, 38% good, 19% fair, and 12% poor. For the group B were 38% excellent, 50% good, 6% fair, and 6% poor.

Discussion: Many studies shows different success rates of the radial or focal ESWT, in this study we compare two different protocols in one of them combining both types of shockwaves to take the benefits of two technologies. Focal technology shortens the treatment time, but the radial treatment is more accessible to people, and can be used to begin and end treatment with neurostimulation impulses to make the procedure better tolerated by the patient.

Conclusion: Both protocols of ESWT had successful improving patellar tendinopathy, but the association of focal and radial devices showed better clinical results.

Is very important complement the ESWT with strengthening program with eccentric drop-squat exercises.

No complications seen in six months of following.



Abstract 33.

The Influence of Medical Shock Waves on Muscle Activation Patterns and Performance in Healthy Athletes: A Preliminary Report

Kenneth Craig (1), Dominic Sainsbury (2), Bradley Takai (1), Stephen Bickley (3), Jacqueline Craig (1), Sarah Pelham (1), Danielle MacDonald (1), Richard Wong (1)

Institution: (1) Kompass OrthoShock Centre for Shockwave Research & Rehabilitation Sciences; (2) Professional Golf Association; (3) High Performance Auckland, New Zealand

Device and producing company: Electrohydraulic

Introduction: Over the past decade medical shockwaves have been successfully utilised in sports medicine in the area of chronic tendinopathies. The stimulus transduction from medical shockwaves are understood to induce and regulate a favourable biocellular and molecular response that is seen to ameliorate the aberrances associated with various pathologies including that of sports injuries. Our project undertook to investigate what effects medical shockwaves would have on muscle activation patterns and its influence on performance in healthy athletes.

Methods: Eight amateur right handed elite male athletes from two different sports: Golf (n=4), and Weightlifting (n=4) were recruited for this project. Baseline and post treatment measures utilised quantitative instrumentation and subjective feedback. Flight Scope™ (Golf Technologies USA) recorded golf swing speed, clubface-ball interface, and ball distance. Back-squat routine was utilised for weightlifting where each lifter conducted 5 sets of back-squats carrying 120kgs. The personal best (PB) of each weight lifter for their individual back-squat category was recorded at baseline and utilised to act as marker to measure changes post intervention. Muscle activation patterns assessing onset of muscle activation and energy output in both golf swing and weightlifting were assessed utilising digital wireless Trigno™ sEMG sensors and the data was tabulated utilising EMG-Works software (Delsys Inc. USA). Six muscles were assessed in golf and eight in weightlifting. Post-ESWT assessments were conducted after a six week interval from the final ESWT session. Medical shockwaves were propagated by an electrohydraulic generator (CellSonic, Apex MediTech), where 500 acoustic impulses were administered on each muscle over three sessions at one week intervals.

Results: Flight scope recorded an increase in golf swing speed (baseline avg: 140.21km/h – post ESWT avg: 147.12km/h [+10.49%]), clubface-ball interface (baseline avg: 1.32m/sec – post ESWT avg 1.46m/sec [+11%]), and ball distance (baseline avg: 143.25m – post ESWT avg: 167.4m [11.6%]) from baseline. Muscle activation patterns in golf recorded faster muscle activation (baseline avg over 6 muscles x 4golfers: 1.35sec – postESWT avg 0.89sec), and energy output (baseline avg over 6 muscles x 4golfers: 487.44üv/swing – postESWT 575.93üv [+8.46%]) across each individual from baseline. In weightlifting muscle activation recorded faster onset patterns (baseline avg over 8 muscles x 4 weightlifters: 1.02sec – postESWT avg 0.92sec) from baseline, while energy output recorded increased output levels during 120kgs loaded back-squat routine (baseline avg over 8 muscles x 4 weightlifters: 4,043.03üv/back squat – post-ESWT 5394.36üv/back squat [+33.45%]) from baseline. Personal best of each weightlifter increased in 120kgs loaded back-squat (baseline avg: 655kgs – post-ESWT: 738kgs [11.2%]) from baseline.

Discussion: Our project undertook to determine the influence of medical shockwaves on the activation and performance of muscle tissue in health athletes. Observations utilising sport specific measurement instrumentation and sEMG suggest that medical shockwaves in this instance had a



positive influence on muscle activation and energy output patterns, which in-turn influenced performance, and could potentially reduce overuse and fatigue related pathophysiology. The benefits from ESWT demonstrated a positive influence six weeks post intervention suggesting a fairly good treatment outcome survival-curve. Over the past decades medical shockwaves have been known to promote a positive homeostatic return of several pathologies including chronic unresponsive sporting injuries. Although the impact and influence of medical shockwaves on the cellular and molecular signalling and response pathways is yet to be completely elucidated, it is considered that the acoustic stimulus from medical shockwaves influence the cellular-matrix through receptors and mechanosensory substances promoting favourable cellular interaction, communication and integrity. This cellular influence from medical shockwaves may be actively reproduced in healthy subjects and not merely restricted to pathological conditions alone. No adverse incidence was reported from this project.

Conclusion: Given the observations of our study it is plausible to suggest that medical shockwaves may potentially induce and regulate a favourable biocellular and molecular response in fatigued tissue of healthy athletes offering the potential to reduce and even prevent overuse syndromes. Further investigation is warranted in this area.



Abstract 34.

Radial Pressure Waves vs High Laser Treatments in Acute Ankle Sprains

Carlos Leal, Arnold Fernandez

Institution: Fenway Medical, Colombia

Device and producing company: BTL Hilt Laser Device; BTL 5000 Power-Radial SW Device

Introduction: Ankle sprains are common injuries in sports traumatology. They are classified as first degree if there is not a collateral ligament tear, second degree if there is a partial tear, and third degree if there is a complete tear with instability. Second-degree sprains are the most common form and are usually treated with partial immobilization or bracing, load control and medication. The usual recovery time is four weeks. High Intensity Laser and Radial Shockwave Therapy are two non-invasive approaches used previously in the treatment of musculoskeletal pain. We hypothesize that the use of these techniques may reduce recovery time, improve pain control and reduce medication in second-degree ankle sprains.

Methods: 34 patients with a diagnosis of second degree ankle sprains less than five days before were included in this study. All patients were evaluated by an orthopaedic surgeon, and X rays were reported as normal. All patients were treated with the conventional protocol of bracing, crutches for partial weight bearing, Etoricoxib 120 mg once a day and Paracetamol every 6 hours if required. Patients were randomly divided in three groups: group 1: (11 patients) high intensity laser HILT, 4 sessions in 10 days applying 3000 Joules of energy, group 2: (11 patients) radial shockwave therapy RSWT, 2 sessions in 10 days applying 4000 shockwaves at 2-4 bar of energy and 6 – 12 Hz of frequency. Group 3 (12 patients) was a control group and did not receive laser or shockwave therapies. Treatment groups 1 and 2 received the treatment over the anterior fibulo-talar external collateral ligament. Patients were evaluated with a visual analogue scale at rest, stance and gait, a Roles and Maudsley functional score and the amount of medication used, at 3, 6 and 12 weeks after the treatment. All patients signed a consent form, and any adverse effects were recorded.

Results: Patients in group 3 provided the baseline VAS score at 3,6 and 12 weeks, as well as the R&M functional score. Patients in the HILT group had an average reduction of pain of 42% at three weeks, 29% at six weeks and 7% at 12 weeks. Patients in the RSWT group had an average reduction of pain of 27% at three weeks, 12% at six weeks and 5% at twelve weeks. The R&M scale did not show any statistically significant differences between groups. The use of pain control medication was 58% lower in the HILT group and 22% lower in the ESWT group. All patients recovered fully at twelve weeks for daily and sports activities. NO complications or adverse effects were reported.

Discussion: The use of high intensity laser HILT or radial shockwave therapy RSWT improved both pain control and the use of medication in our patients. The effect of HILT was significantly better than the conventional treatment and the use of RSWT in our study. There were no differences in functional scales. Patients complained of moderate pain during treatment in the RSWT group. Safety was confirmed as no complications appeared.

Conclusion: The use of High Intensity Laser Therapy could be used as part of the treatment protocol for second-degree ankle sprains, as it reduces significantly pain and the use of medication. Radial Shockwave Therapy also showed some effects, but has more evidence in chronic tendinopathies. The role of HILT in acute injuries or tendinopathies and RSWT in chronic tendinopathies, seem to be positive and should be prescribed independently as part of the treatment protocols, being non invasive and with no reported complications.



Abstract 35.

Extracorporeal Shock Wave Therapy in Chronic Calcaneal Tendinopathy

Paulo Roberto Rockett

Institution: Ortosom, Porto Alegre, Brazil

Device and producing company: Reflectron - High Medical Technologies AG

Introduction: Calcaneal tendinopathy, a painful condition, is common in both active and inactive individuals. Several conservative and surgical treatments have been used.

Shock wave therapy has been introduced as a method of choice in the treatment of chronic tendinopathies.

The aim of this study was to evaluate the effect of electrohydraulic high-energy shock wave in the treatment of chronic calcaneal tendinopathy.

Methods: From May 2002 to December 2010 (103 months) the effects of shock wave therapy were investigated in 119 patients (136 cases) with calcaneal tendinopathy treated. The mean age was 55 years ranging from 13 to 87 years.

The treatments were performed with a shock wave generator electro-hydraulic, Reflectron, produced by High Medical Technologies AG, Lengwil, Switzerland. All patients received 1000 shock wave pulses, a depth of focus of 5 mm and a density of the energy flux of 0.13 mJ / mm².

The evaluation of results after treatment was based on the Visual Analogue Scale (VAS) and subjective clinical evaluation according to Roles and Maudsley score.

Results were analyzed at 45, 90 and 180 days after the last application of shock waves.

Patients who did not respond adequately underwent a second or third treatment. An application was carried out in 81 cases (59.5%). 32 (23.5%) were submitted to a second treatment, and 23 (17%) received a third application at intervals not shorter than 45 days.

Results: Results were reported as excellent in 26.5%, good in 40.4%, acceptable in 9.6% and poor in 23.5% of patients, 180 days after treatment. Side effects were rare and associated with pain during, and shortly after, the applications, but not observed in monitoring cases of worsening of the problems reported initially.

Discussion: High energy extracorporeal shockwave therapy produces significant relief of the pain and of the physical incapacity produced by the chronic calcaneal tendinopathy.

Conclusion: Based on the results of this study we could recommend electrohydraulic high-energy shock wave therapy in the treatment of chronic calcaneal tendinopathy refractory to other conservative measures.



Abstract 36.

Heel Pain Beyond Plantar Fasciitis

Gabriele Verratti, Juan Grossmann
Servicios Medicos OrthoShock, Caracas, Venezuela

Introduction:

Plantar heel pain represents 35 to 40 percent of foot and ankle consults in our daily practice. Heel pain can be challenging, because not all plantar heel pains involve plantar fasciitis, and it can coexist with other pathologies. There are many patients with a diagnosis of plantar fasciitis that fail to improve of hell pain after different treatment options. We wanted to define precisely those etiologies of heel pain not related to plantar fasciitis that may have been misdiagnosed. After a comprehensive review of the literature, we found and categorized at least 6 medical conditions that according our experience were addressed as plantar fasciitis. We pretend to compare This paper tries to compare the author's experience with previously published data.

Methods:

23 patients who were treated under the diagnosis of plantar fasciitis and reported failure of treatment were selected. These patients were treated with our standard protocols of physical therapy, ESWT and insoles, and followed up for 12 weeks, in a time frame from February to October 2014. We performed a new diagnostic protocol in order to determine possible variables of differential diagnosis. This protocol included ultrasound, X rays, MRI, Electromyography, Somatosensory Evoked Potentials (SEP), and blood tests. 20 patients followed the protocol and were included in our results.

Results:

We found that the most frequent pathologies that caused pain similar to plantar fasciitis were peripheral neurologic disorders. Other sources of heel pain were related to systemic and degenerative diseases. These results are similar to those published by several authors.

Discussion:

Identifying and being aware of all the possible differential diagnosis of heel pain is critical for the proper treatment of patients. The management of heel pain is not simple, and is certainly challenging even for specialists and experts.

Conclusion:

We recommend a full diagnostic approach in patients with heel pain, including images, lab tests and neurologic evaluation, in order to determine comorbidities different from plantar fasciitis. This is not a simple and obvious diagnosis and must be addressed under a very strict protocol in order to provide the most adequate treatment. Failure to diagnose a plantar fasciitis, a medical condition with a physiopathology similar to an insertional chronic tendinopathy, will result in a poor indication for ESWT and a very probable failure of treatment.



Abstract 37.

Experience in the use of shock waves in plantar fasciitis.

Jorge Chavez Aravera (1), Cristian Olivares (2)

(1) Valparaíso University

(2) Andrés Bello University teacher.

Introduction

We presented our casuistry and analysis of treated patients with frequent pathology of plantar fasciitis consulted in traumatology, and with approved indication to the use of shock waves.

Material and Methods

It is presented a total of 30 cases; their average age is 50 years old, all of them with previous medical treatment of physiotherapy and/or the use of local steroid used as local injection without pain relief. It was done an average treatment of 4 sessions, getting to 12 hz with 2,5 barr, reaching an 85 % of good and excellent results.

Results

All the patients went back to their normal activities and even their sports activities.



Abstract 38.

Long Term Results of Radial Shock Wave Therapy In Chronic Plantar Fasciitis

Paulo Kertzman

Santa Casa, Sao Paulo, Brasil

Device and producing company: Swiss Doloclast – EMS

Introduction

The purpose of this study was to analyze the long-term results of the treatment of chronic plantar fasciitis with radial shock waves therapy (RSWT)

Methods

We evaluated our retrospective results in patients diagnosed with chronic plantar fasciitis treated with RSWT. All patients had failure of previous treatments. Three scales were used: Visual Analogue Scale (VAS), Roles & Maudsley scale and the American Orthopaedic Foot and Ankle Society scale (AOFAS).

Results

49 feet in 35 patients were evaluated. We had 15 males and 20 females, with a mean of 50 years of age. 9 patients had plantar fasciitis on the right foot, 12 on the left foot and 14 bilateral. We could assess a follow up of 86 months (60 -120). We found that 80% of our patients had mild or no symptoms. 88.5 % were assessed as excellent or good by the Roles & Maudsley scale, and the mean score of the study group was 87.5 in the AOFAS scale.

Discussion

We found that the positive effects of RSWT remain in time, with 80% of pain relief, as well as a good functional score and patient satisfaction.

Conclusion

There are very few papers or literature reports addressing the long-term results of ESWT on plantar fasciitis. We found a positive result in time, that may provide an answer to the frequent doubt about the long-term results of Shockwave Treatments. ESWT provide a long-term effective alternative for chronic plantar fasciitis treatment.



Abstract 39.

Predictive factors for radial shockwaves therapy in the treatment of chronic plantar fasciopathy

Javier Crupnic, Argentina.

Objectives: Describe prognostic factors in the treatment of chronic plantar fasciopathy with radial shockwave therapy to make a better selection of patients.

Hypothesis: There would be a series of prognostic factors in the treatment of chronic plantar fasciopathy with radial shockwaves therapy such as: age, gender, body mass index (BMI), chronicity, previous physiotherapy treatments (PT), previous corticosteroids infiltrations (CI), bracing, presence of heel spur, anatomico-physiological foot alterations and bilaterally.

Materials and Methods: A prospective cohort analytic study was performed in 58 patients for each prognostic factor (age > 50, gender, BMI >30, more than 12 months chronicity, PT prior absent, CI prior, non-use of orthotics, presence of heel spur, dig or flat feet, bilaterally). The visual analog scale (VAS) and satisfaction Roles & Maudsley scale was used to evaluate response to treatment. Inclusion criteria: Patients with chronic plantar fasciopathy for at least 3 months of duration, diagnosed by a physician, who completed the treatment with radial shockwaves therapy and submit the factors to be evaluated. Exclusion criteria: Patients who did not complete the treatment, patients who did not sign the consent, patients who did not manage to understand scales measuring results. Measurement Methods: Visual Analog Scale for the first steps in the morning with a further decrease to 60%. Roles & Maudsley Scale. All patients were treated by the same professional and under the same protocol sessions including performed three radial shockwaves, 2500 impacts, 8 Hz of frequency, between 3 and 4 bar of intensity (energy density 0.1 and 0.16 mJ/mm²), weekly, plus the implementation of an exercise home program. They were initially evaluated and followed for at least 3 months. Prognostic factors for each cohort were performed separately by EPIDAT4 system through statistical analysis.

Results: Fifty years older or more (Relative Risk: 0.42; Interval Confidence:0.19-0.85; P: 0.0024), female (RR: 0.23, IC: 0.09-0.6; P: 0.002), obesity (BMI >30) (RR: 0.35, IC: 0.17-0.71; P: 0.003) unilateral disease (RR: 2.7; IC: 1.6-4.2); P: 0.01), and the presence of heel spur (RR: 0.45; IC:0.24 - 8.1; P: 0.02) showed statistically significant positive prognostic factors. Completed prior PT (RR: 0.92; CI: 0.32-2.6; P: 0.5), previous CI (RR: 1.05, IC: 0.5-1.9; P: 0.5) and the use of orthotics (RR: 1.11; IC: 0.5-2.1; P: 0.5) showed no statistically significant differences in response to treatment. High foot arches or flat (RR 2.9; IC: 1.2-7.1; P: 0.06) and chronic disease (>12 months) (RR: 3.7; IC: 2.1-6.7; P: 0.001) were statistically significant negative predictors.

Conclusion: The study shows with statistical support that patients respond better to treatment would be over 50 female, with no more than 12 months of disease, without foot anatomical and physiological alterations. Obesity (BMI >30) and the presence of heel spur were statistically significant positive predictors but we believe this is because the main limitation of this study is that we used the same population approached from different prognostic factors to form cohorts. The best study design would be a multivariate analysis to assess and quantify which is the real weight of each variable. The idea of this team is to make a multivariate study when the sampling is complete. We also believe it is important to make the presentation of these preliminary results since they will serve to kick a further and greater statistical power study in the future. A high concordance rate when evaluating results between the VAS and R & M, so that the results of both are not discriminated found.



Abstract 40.

Radial Shock Wave Therapy for the Treatment of Plantar Fibromatosis A Case Report

Ma Laura Tutté, Guillermo Galin
Uruguay ESWT Unit, Montevideo, Uruguay

Device and producing company: EMS Swiss DolorClast Master

Introduction

Plantar Fibromatosis, also known as Ledderhose disease, is essentially a benign hyper-proliferative disorder of the plantar aponeurosis. The physiopathology and origin of the disease is not clear, and the treatment is always symptomatic. We present our results of the treatment on a patient with Ledderhose disease, using radial extracorporeal shockwaves

Methods

A 19-year-old female with a two-year history of unilateral metatarsal pain and soreness of the medial arch of the foot was studied in our unit. Ultrasonography showed an irregular contour ovoid nodule of the plantar aponeurosis, with 6.7 mm of maximum diameter. Physical examination showed thickening of the plantar fascia with a small subcutaneous nodule between the first and second metatarsal bones. After studying different therapeutic possibilities, we decided to treat her with ESWT. She received 5 weekly sessions of radial ESWT, with as 3000p, 2,5 b, and 7Hz per session protocol.

Results

The patient had a four-point pain reduction in the VAS score, as well as a clear improvement in the pain-free gait perimeter. The nodule disappeared on palpation immediately after the end of treatment. These effects remained intact four months later.

Discussion

Literature on plantar fibromatosis is scarce, with very few published cases treated with ESWT, due to the low prevalence of the disease. In early stages, conservative therapy including physical and pharmacological treatments is commonly used. Upon progression, invasive therapy such as irradiation of the plantar surface, steroid injections, and partial or complete fasciectomy as an ultimate therapy may be indicated.

Conclusion

Radial ESWT showed to be an effective non-invasive alternative to surgical treatment in this case, achieving functional improvement and better quality of life. Large-scale prospective trials are required to elucidate the value of ESWT in plantar fibromatosis in terms of recurrence and efficacy.