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Abstracts

3. Shock wave therapy: What really matters Christoph Schmitz¹, Markus Maier²

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Device and producing company: Swiss Dolorclast, EMS Electro Medical Systems SA, Ch. de la Vuarpillièrre 31, 1260 Nyon, Switzerland

Introduction: A recent study in the literature (Cleveland et al., *Ultrasound Med Biol* 2007; 33: 1327-1335) suggested that the rise times of the waveforms produced by the EMS Swiss Dolorclast shock wave source (as well as of piezoelectric and electromagnetic shock wave sources from other providers operated at low settings) would be too long for the pulses to be considered shock waves, and this could explain the negative outcome of some clinical studies performed with these sources.

Methods: We performed a comprehensive literature survey about definitions of the term "shock wave" used in the biomedical field; and the potential significance of the leading positive phase of shock waves for their biomedical effects.

Results: Several definitions of the term "shock wave" are used in the biomedical field. Importantly, cavitation consequent to the negative phase of the wave propagation appears to be the most relevant effect of shock waves on tissue.

Discussion: Focussing mainly on the leading positive phase of shock waves in further basic research on applications of shock waves to the musculo-skeletal system might be misleading. It appears more effective to evaluate the actual contribution of the positive and negative phases of shock waves to their biomedical effects, and to develop innovative strategies to maximize the exposure of patients to the predominant factor.

Conclusion: The negative outcome of some clinical studies performed with the EMS Swiss Dolorclast shock wave source was most probably due to other reasons than the relatively long rise time of the leading positive phase of the shock waves generated with this source.

6. Improving the effectiveness of shock wave therapy in plantar fasciitis: A comparative trial

Gabriele Verratti, Miguel Angel Guedez, Myriam Capasso

Institutions: Servicios medicos ortho shock, Caracas, Venezuela

Device and producing company: EMS and Dornier

This is a prospective comparative study evaluating the effectiveness of simultaneous application of shock wave therapy, physiotherapy and use of at night splint as a method of treatment of chronic plantar fasciitis unresponsive to conventional treatment methods for 6 months or longer. The paper includes 637 patients with a control group of 172 patients that received shock wave treatment alone. This study aims to demonstrate efficacy and time for the reduction of pain and thickness of the plantar fascia as well as the return of the patient to his daily routine by comparing shock wave therapy as a stand alone treatment and shock wave therapy systematically combined with other therapeutic methods. The authors will present the effectiveness and the recovery time comparing both groups as well as long-term outcomes.

7. ESWT in Plantar Fasciitis - 7 years of experience with two different devices

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Institutions: Clinica Ortopédica Brasil

Device and producing company: Epos Ultra – Dornier, Swiss DolorClast – EMS

Introduction: Comparison of the efficacy of ESWT in the treatment of plantar fasciitis using two different devices at similar levels of energy and the same number of sessions.

Methods: From January 1999 to August 2006 we performed 429 sessions of ESWT on 143 patients. We included 95 patients and excluded 48 due to the impossibility of follow up. The electromagnetic device was used on 51 patients between January 1999 and June 2005. The pneumatic device was used on 44 patients during the period of January 2004 to August 2006. Patient age was between 20 to 81 years; 49 female, 46 male; 50 right foot, 45 left foot, 9 bilateral. The point of application was guided with ultrasound of 7.5 MHz (Epos Ultra), and with the pneumatic device (Swiss DolorClast) we applied directly at the point of maximum pain. The energy applied was 0.22 mJ/mm² and 0.18 mJ/mm² with the Epos Ultra and DolorClast, respectively. We applied 2,000 shock waves over 3 weekly sessions with no anesthesia. The follow up was done using the VAS at 2, 6 and 12 months.

Results: The improvement of pain and function with the electromagnetic device was 52.4 % at 2 months post-treatment, 73.2 % at 6 months post-treatment and 85.2% at 12 months post-treatment. The improvement with the pneumatic device at 2-month follow-up was 55.2 %, at 6-month follow-up was 72.9% and at 12-month follow-up was 84%.

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Discussion: Similar levels of energy and numbers of sessions demonstrated similar clinical results.

Conclusion: The effectiveness of ESWT is similar in both devices. ESWT should be the treatment of choice before surgical intervention.

10. The Effectiveness of Extracorporeal Shock Wave Therapy for Patients with Plantar Fasciitis who Satisfy a Clinical Prediction Rule

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Device and producing company: Swiss Dolorclast, EMS medical

Introduction: Plantar fasciitis is a common cause of heel pain, affecting 10% of the general population. Extracorporeal shock wave therapy has been recommended as treatment for chronic plantar fasciitis in patients unresponsive to conservative treatment. The efficacy of extracorporeal shock wave therapy in plantar fasciitis cannot be ascertained owing to the poor quality of methods in previous studies. The primary goal of this study was to determine the effectiveness of extracorporeal shock wave therapy compared with placebo in the treatment of chronic plantar fasciitis.

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Methods: A prospective, randomized, blinded, controlled study with two groups of subjects was proposed. Fifty patients (50 heels), including 25 patients (25 heels) in the shockwave treatment group and 25 patients (25 heels) in the control group. All patients had been suffering from plantar fasciitis for at least 6 months. Pre-treatment measurements including a visual analog pain scale and the modified Roles and Maudsley scale were completed by the subjects. In the shockwave group, therapy was applied twice within a one-week interval (2 x 2,000 impulses at an air pressure of 3.5 bars and frequency of 8 Hz were given at each sitting). The patients in the placebo group received treatment with the clasp on the heel. ESWT was performed without local anesthesia. At 4 and 12 weeks the subjects again completed a VAS and the modified Roles and Maudsley score.

Results: Before treatment, the groups showed no significant differences in the scores for pain and function. At 12 weeks after treatment, the shockwave group showed significantly better pain and function scores as compared with the control group.. There were no systemic or local complications or device-related problems.

Discussion: Extracorporeal shock wave therapy has a statistically significant decrease in pain scores than placebo for patients with plantar fasciitis. Extracorporeal shock wave therapy has a statistically significant increase in functional outcome (better quality of life) than placebo on patients with plantar fasciitis.

Conclusion: Shock wave therapy is effective and safe for the treatment of chronic plantar fasciitis.

13. Effect of radial extracorporeal shock wave therapy for trochanter pain syndrome.

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Device and producing company: Swiss Dolor Clast, EMS

Introduction: Trochanteric pain syndrome or trochanteric bursitis is a common regional pain syndrome. It is characterized by chronic and intermittent aching pain over the lateral side of the hip and limitation of function. The prevalence is higher in females than males (rate 4:1), and the incidence is highest between the ages of 40 to 60, even though cases have been reported in all age groups. The etiology is not well known. Upon physical examination, the clinical signs are pain on resisted abduction and pain to the palpation of the greater trochanter. Treatment includes physical therapy methods, painkillers, and local steroid injection. The aim of this study was to evaluate the effect of radial extracorporeal shock wave therapy (rESWT) in trochanter pain syndrome. This study is a starting point for a future randomized clinical trial.

Methods: Between June 2005 and March 2007, 81 patients with trochanter syndrome were treated with rESWT, 15 of them with bilateral syndrome (total of 96 trochanter pain syndromes). These patients consisted of 14 men and 67 women, aged 29-69 years old (mean 56). The patients must have had clinical symptoms for at least 3 months before the treatment. The patients were treated in 3 sessions (at intervals of 1-2 weeks, mean 12 days) with 3,000 impulses per session. Device used: Swiss Dolor Clast (EMS-Switzerland). Energy flux density: 0.12-0.16 mJ/mm². The pain center was detected by biofeedback. The intensity of pain was evaluated by a Visual Analogue Scale (VAS). The pain on palpation of the greater trochanter and pain during daily activity were evaluated in each examination. Evaluation was performed several times: immediately before treatment and on the week 4th, 26th and 52nd week after treatment. Analyses: The non-parametric Wilcoxon test for dependent samples has been used to compare means of VAS. At the end of follow-up, the patients were asked to assess their level of residual pain compared with pain before treatment, according to the Roles & Maudsley scale (RM scale).

Results: Patients showed a considerable pain level decrease four weeks after the treatment (to the palpation $p < 0.05$ and during daily activity $p < 0.05$), and pain levels decreased further in the following examinations (to the palpation $p < 0.01$ and during daily activity $p < 0.01$). Good and excellent results (grades 1 and 2 by RM scale) were obtained in 69 trochanter pain syndromes (72%). These side effects were observed: small superficial haematomas (76%), petechiae (32%), swelling (52%) and pain (88%). All side effects were tolerated by all the patients and disappeared after 2-15 days.

Conclusion: rESWT is an effective treatment method for trochanter pain syndrome. Further randomized and controlled studies are necessary to underline the results of this investigation.

15. Eccentric loading versus shock wave treatment for chronic insertional Achilles tendinopathy

Jan-Dirk Rompe¹, John Furia², Nicola Maffulli³

Institutions:

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2) SUN Orthopaedics, Lewisburg, USA

3) Dept. of Trauma and Orthopaedic Surgery, Keele, University School of Medicine, UK

Device and producing company: Swiss Dolorclast, EMS

Introduction: Nonoperative management of chronic tendinopathy of the Achilles tendon insertion is poorly studied. With demonstrated effectiveness of eccentric loading and of repetitive low-energy shock wave therapy in patients with midsubstance Achilles tendinopathy recently, this randomized controlled trial aimed at verifying effectiveness of both procedures exclusively in patients with insertional Achilles tendinopathy.

Methods: Fifty patients with chronic recalcitrant (> 6 months) insertional Achilles tendinopathy were enrolled in a randomized controlled study. All patients had been treated unsuccessfully for at least 3 months, including local injections and non-steroidal anti-inflammatory drugs and physiotherapy. A computerized random-number generator was used to draw up an allocation schedule. Twenty-five patients were allocated to Group 1 (eccentric loading), 25 patients were allocated to Group 2 (repetitive low-energy shock wave therapy). Analysis was on an intention-to-treat basis. Primary follow-up was at 4 months, afterwards patients were allowed to cross over. The last follow-up was at one year after completion of the initial treatment. The patients were assessed for pain, function and activity using a validated questionnaire (the VISA-A).

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Results: At 4 months from baseline, the VISA-A score had increased in both groups, from 53 to 62 points in Group 1, and from 53 to 80 points in Group 2. The pain rating decreased in both groups, from 7 to 5 points in Group 1, and from 7 to 3 points in Group 2. Seven patients (28%) in Group 1, and sixteen patients (64%) in Group 2 reported that were “completely recovered” or “much improved”. For all outcome measures, Group 1 and 2 differed significantly in favour of shock wave therapy. At 4 months, 18 of 25 patients from Group I opted to cross over, as did 9 of 25 patients from Group 2. The favorable results after shock wave therapy at 4 months were stable at 1-year follow-up.

Discussion: Eccentric loading as applied showed inferior results to low-energy shock wave therapy as applied in patients with chronic recalcitrant tendinopathy of the insertion of the Achilles tendon at 4 months of follow-up.

Conclusion: Further research is warranted to better define the indication of this treatment modality.

17. Chronic Achilles tendon pain: tendon microcirculation and radial extracorporeal shock wave therapy (rESWT).

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Institutions: University of Catanzaro – Orthopaedic Clinic

Device and producing company: EMS Swiss DolorClast

Introduction: Achilles tendinopathy is a common cause of posterior heel pain and is often difficult to treat. This condition is more frequent in athletes, particularly runners and jumpers, but it can affect non-athletes as well. The origin and pathogenesis of the tendinopathy are unknown, however some intrinsic and extrinsic factors have been implicated (1,2). Intrinsic factors include abnormal range of motion of the subtalar joints such as those seen in hyperpronation syndrome or a leg length discrepancy. Extrinsic factors for athletes include training errors with subsequent excessive mechanical overload. Other possible extrinsic causes are advanced age, fatigue, and obesity (3,4,5,6,7,8). Recently, some clinical studies have demonstrated the association between increased tendon microvascularity and the symptomatic chronic Achilles tendinopathy. Using Doppler Ultrasonography, an increased vascular density in the Achilles tendon has been demonstrated that is clinically associated with chronic Achilles tendinopathy (9,10,11,12,13). Traditional non-operative treatment of chronic Achilles tendinopathy consists of rest and the administration of NSAIDs. Some studies have suggested different types of therapeutic interventions such as: steroid injection, sclerosing therapy, aprotinin injection, eccentric training, heel lifts and custom orthoses (14,15,16,17,18,19,20). Recently, extracorporeal shock wave therapy (ESWT) has been reported to be effective for the treatment of Achilles tendinopathy, but until now few studies have investigated the efficacy of ESWT for the treatment of chronic Achilles tendinopathy (21, 22, 23 and 24). The purpose of this study is to evaluate the correlation between increased tendon microvascularity and pain and to determine the efficacy of low energy radial ESWT for the treatment of chronic Achilles tendinopathy.

Methods: Twenty-four subjects were evaluated. Twelve athletes (group A – 9 males and 3 females) with an average age of 25.9 years were included. The athletes were runners of mid and long distance races. All twelve patients displayed evidence of chronic Achilles tendinopathy in painful phase and had undergone medical treatment and physical therapy for a minimum of 3 months without clinical improvement. For the control group, we selected 12 subjects (group B – 9 males and 3 females) with an average age of 25.6 years and morphologic characteristics similar to subjects of group A, but who were sedentary. All subjects were chosen for this study after obtaining informed consent and undergoing accurate clinical examination, excluding patients with associated pathologies that would prohibit them from receiving ESWT; coagulopathies, local infection, or tumors. The intensity of pain was registered using a VAS scale for pain with direct palpation of the tendon as well as pain during ambulation. In group B subjects no pain was reported. All 24 subjects underwent one

identical ultrasonographic evaluation with Color Doppler, provided by a single operator, using a Toshiba Power Vision 9000 scanner with a small parts 5-12 MHz transducer. The twelve athletes with tendinopathy demonstrated a diffuse disomogeneous hypoechogenicity of the Achilles tendon with blood flow at the depth over 5 mm (mean 5.5 mm, range 4.5/6.5 mm). All 12 group B subjects demonstrated normal sonographic characteristics of the tendon. All 24 subjects underwent low energy (less than 3 bar) radial ESWT by the same operator, using a Swiss Dolorclast device by EMS. Treatment consisted of three sessions, one every 72 hours, during which subjects received 2,000 shocks each session, for a total of 6,000 shocks, using a flux of energy density averaging 2.2 bar. No local anesthetic was used and no patients required pain medication. A Color Doppler examination was performed one month and six months following the end of the treatment with ESWT and all subjects underwent clinical evaluation one month and six months after the end of the treatment. We also evaluated whether patients had pain under direct palpation or pain with ambulation. All subjects were asked to refrain from athletic activities and allowed only to walk normally during the treatment phase. A return to normal activities was allowed for all subjects one month after the end of the treatment.

Results: Doppler Ultrasonographic evaluation of subjects who underwent radial ESWT treatment demonstrated a reduction of the microvascularity present prior to treatment in group A subjects, with a disappearance of microvascularity in 58.3 % of group A subjects (7 out of 12) at one month and 83.3 % (10 out of 12) at six months. In group B subjects we noted no significant differences and no symptoms. Furthermore, at six months after the end of the treatment we registered a reduction of local pain on walking or running in 83.3% of the athletes of the group A ($P < 0.0001$ – T test) (TAB. II). No significant complications were observed in either treatment group, except for a temporary increase in paratendon edema in three subjects of group A, which responded to local cryotherapy.

Discussion: Many studies have evaluated the association of increased microvascularity of the Achilles and patellar tendons and the associated clinical symptoms in patients with Achilles and patellar tendinopathy with Color Doppler. This test has proven to be highly specific (100%) and 50% specificity for the evaluation of altered microvascularity with tendinopathy (10,25). Ohberg (9) used Colored Power Doppler ultrasonography to demonstrate an increase of microvascularity in patients with Achilles tendinopathy. The same author also noted a reduction of pain in 8 of 12 subjects in whom he injected a sclerosing agent in the paratendon near the Achilles tendon insertion. In 2003 Silvestri observed a hypervascularity (paratendinosis) in patients with acute tenosynovitis, compared with normal subjects (26). Other authors have also demonstrated an increase of microvascularity in patients with Achilles tendinopathy, while in asymptomatic subjects no altered microvascularity was observed (12,13). Treatment of Achilles tendinopathy has included many types of treatment, but in some cases complications have occurred (17,18). Injection of steroids may reduce pain and microvascularity, but are associated with rupture of the tendon (17). Some studies have evaluated the effect of eccentric exercise on the pain and microvascularity of the Achilles tendon and have shown successful results in 83% of patient symptoms and alteration of the microvascularity in 17% of patients (16). Recently injection of aprotine, a proteinase inhibitor, has been proposed, but results have been unsatisfactory (18). Among treatment modalities of Achilles tendinopathy, ESWT has become for many authors a treatment of choice with satisfactory results in more than eighty percent of patients (22,24). We observed a similar improvement in 83% of patients without significant side effects. In our study we observed a decrease in tendon microvascularity in group A subjects within one month of treatment with radial ESWT. This was associated with a significant decrease ($P < 0.0001$) in discomfort at rest and during ambulation (average VAS 1.04 at rest and 1.25

during ambulation), and allowed the majority of athletes to return to sports activity. No significant difference in pain was noted in group B subjects.

Conclusion: This study was designed to demonstrate the changes of the microvasculature of the Achilles tendon in patients with chronic Achilles pain, before and after treatment with radial extracorporeal shock wave therapy (rESWT). Twelve athletes with chronic Achilles pain (group A) were compared with twelve athletes free of Achilles pain (group B), all of whom were of a similar age, sex, and weight. Each group received the same treatment protocol with radial ESWT. Clinical evaluation was undertaken prior to treatment and at one month and six months after treatment was terminated. The microvasculature of all 24 subjects was evaluated with Color Doppler echography both prior to treatment with radial ESWT and at one month and six months following treatment. In group A we observed greater microvasculature of the tendon than in group B. This hypervascularity was noted to have decreased when patients were evaluated one month after the treatment with radial ESWT. Clinically, 80% of patients of group A experienced absence of pain and were able to return to sports activity at one month after the end of the treatment with radial ESWT. No significant clinically adverse effects were noted in any subjects who received radial ESWT.

18. Eccentric loading, shock wave treatment, or a wait-and-see policy for tendinopathy of the main body of tendo Achillis

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Device and producing company: Swiss Dolorclast, EMS

Introduction: Few randomized controlled trials compare different methods of management in chronic tendinopathy of the main body of tendo Achillis. Our purpose was to compare the effectiveness of 3 management strategies Group 1, eccentric loading; Group 2, repetitive low-energy shock wave therapy (SWT); and Group 3, wait-and-see in patients with chronic tendinopathy of the main body of tendo Achillis in a randomized controlled trial.

Methods: Seventy-five patients with a chronic recalcitrant (>6 months) non-insertional Achilles tendinopathy were enrolled in a randomized controlled study. All patients had received unsuccessful management for >3 months including at least: (1) peritendinous local injections, (2) nonsteroidal anti-inflammatory drugs, and (3) physiotherapy. A computerized random-number generator was used to draw up an allocation schedule. Analysis was on intention-to-treat basis.

Results: At 4 months from baseline, the Victorian Institute of Sport Assessment (VISA)-A score increased in all groups: from 51 to 76 points in Group 1 (eccentric loading); from 50 to 70 points in Group 2 (repetitive low-energy SWT); and from 48 to 55 points in Group 3 (wait-and-see). Pain rating decreased in all groups: from 7 to 4 points in Group 1; from 7 to 4 points in Group 2; and from 8 to 6 points in Group 3. Fifteen of 25 patients in Group 1 (60%), 13 of 25 patients in Group 2 (52%), and 6 of 25 patients in Group 3 (24%) reported a Likert scale of 1 or 2 points ("completely recovered" or "much improved"). For all outcome measures, Groups 1 and 2 did not differ significantly. For all outcome measures, Groups 1 and 2 showed significantly better results than group 3.

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Discussion: At 4-month follow-up, eccentric loading and low-energy SWT showed comparable results.

Conclusion: The wait-and-see strategy was ineffective for the management of chronic recalcitrant tendinopathy of the main body of the Achilles tendon.

23. New RSWT protocols validation in inflamed tendon

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Device and producing company: Radial Shock Wave Therapy (RSWT) by a Swiss DolorClast from EMS

Introduction: The diversity of tendon injury could limit the use of RSWT. Our aim was to validate new RSWT protocols adapted to the type and location of tendonitis.

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Methods: Patients suffering from pathologic tendonopathies were treated with RSWT and followed prospectively for six months. Selection criteria included prior radiology, only one therapy (IB), and the scrupulous respect of established protocols. Tendon tears were excluded. Pain killers without local injection were permitted if present before RSWT. Three protocols (P1, P2A, and P2B) were established. P1 was used for undamaged painful tendon of the shoulder and elbow. P2A was designed for tendon injury in the shoulder and infra-patella. P2B was used for hip, Achilles and sole tendonitis. Device parameters were adapted to both the protocol and patient tolerance. Each patient signed a written informed consent, and the study was approved by the local ethical committee.

Results: Out of 244 inflamed or injured tendons initially selected, 119 were excluded. In the remaining 125 pathologic tendons (100 patients) analysed, a five-month follow-up evaluation showed patient satisfaction of 100% for Achilles (7 tendons), 91% for plantar fascia injuries (18 patients, 22 locations), 89% for hip involvement (30 patients, 55 tendons), 88% for shoulder problems (15 patients, 17 tendons), and 58% for the 19 tendons located in the lateral elbow.

Discussion: No discussion

Conclusion: Our RSWT protocols could be validated for the hip, shoulders, plantar fascias, and Achilles tendonitis.

25. The practicalities of the application of the complex enthesopathy theory in orthopaedics

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Device and producing company: Swiss DolorClast, EMS, Switzerland.

Introduction: The effectiveness of extracorporeal shock-wave therapy for treatment of musculoskeletal system diseases is recognized worldwide. As is well known, the effectiveness of SWT treatment methods average 80%, however the algorithm of treatment which we use allows us to attain positive results in 96-98% of cases.

Methods: Our research was conducted with the Swiss DolorClast (Classic). We began our procedures with the necessary diagnostics, including only exploratory, USI or R-graphical research, but also the using the device on a feed-back principle.

Results: It is known that the causes of chronic diseases of the musculoskeletal system connected with the bands overpressure are the changes in the form of calcinosis and fibrosis. Moreover the same changes are certainly present in the "contiguous" bands of that anatomical area also. In this way the algescic impulse will be associated with such a band in which these changes are more expressed. Therefore, for every chronic disease of the musculoskeletal system there needs to be an examination of the complex of ligaments, tendons and myogeloses.

Discussion: In our practice we use the term "Complex enthesopathy" to refer to all ligamentoses, tendinoses and myogeloses of one anatomical area (complex enthesopathy of the 1st order) or of some contiguous anatomical areas (complex enthesopathy of the 2nd order). Consequently, when diagnosing and treating a disease, it is necessary to pay attention to the condition of the entire ligamentous apparatus of that area, not only to the "painful" band.

Conclusion: Our new approach to the diagnosis and treatment of musculoskeletal system diseases allows us to attain good and excellent results in 96-98% of cases.

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29. ESWT as an option when surgery fails Paulo Facciolla Kertzman, Jose Eid

Institutions: Clinica Campo Belo e Clinica Brasil

Device and producing company: Dolorclast, EMS

Introduction: Treatment with ESWT for tendinopathies is a well-known treatment option with good results reported in a large number of publications. We treated some cases after failed open or arthroscopic procedures.

Methods: We treated two cases with recalcitrant plantar fasciitis after open surgery, two after open repair of Achilles tendon rupture, two patellar tendons after open procedures and three cases of lateral epicondylitis after arthroscopic surgery. All patients underwent three sessions with 2000 shocks at 0.3 mJ/mm² within a week interval.

Results: With the exception of one patellar tendon, in all cases, after 3 months pain was reduced and the patients could return to their daily activities.

Discussion: The treatment with ESW in our clinic is very effective for chronic tendinopathies and is offered to the patients before any surgical procedure.

Conclusion: ESWT is an option for patients with tendinopathies after failed surgery.

32. Focused or Radial Shockwave Therapy?

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Device and producing company: HMT (Evotron); EMS (Swiss DolorClast)

Introduction: Much discussion surrounds patient tolerance, effectiveness and cost per treatment of focused and radial ESWT. We analysed our results of using: (i) a combination of focused and radial ESWT, (ii) focused ESWT alone and (iii) r-ESWT alone, in the treatment of pain related to AVN of the left hip in a 45-year-old Chinese male.

Methods: During the first treatment regimen, the patient received 4 combination treatments and 1 rESWT treatment over 8 weeks. The patient then had 2 months rest before receiving a second treatment regimen consisting of 1 combination treatment, 1 Focused ESWT only treatment and 3 rESWT only treatments over 8 weeks.

Results: After the first treatment regimen a 20% decrease in pain was noted (pain rating scale) as well as a 20% increase in ROM. After the second treatment regimen a further 30% decrease in pain and 30% increase in ROM were noted. Pain during Evotron treatment (focused ESWT) was 8 out of 10 and during Dolorclast treatment (rESWT) was 4 out of 10. Results were maintained at 15-month telephonic follow up.

Discussion: Both types of treatments appeared to help the patient, with rESWT being much better tolerated. Cost per treatment did not differ between the two machines. A larger study group with a more structured protocol would be useful to explore further.

Conclusion: ESWT appears to be effective in the treatment of pain associated with AVN of the hip, and there appears to be little difference between the effectiveness of the two devices used in the study although there was more tolerance to the rESWT device.

49. Radial extracorporeal shock wave therapy (rESWT) in the treatment of spasticity in cerebral palsy: a preliminary report.

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Device and producing company: Swiss Dolor Clast, EMS

Introduction: Spasticity is a disorder of excess muscle tone associated with central nervous system disease. Cerebral palsy (CP) is a central nervous system deficit resulting from a non-progressive lesion in the developing brain. Although the brain lesions are static, the movement disorders that arise are not unchanging and are characterized by atypical muscle tone, posture and movement. The spastic motor type is the most common form of CP and its conventional therapeutic management may include splinting/casting, passive stretching, facilitation of posture and movement, spasticity-reducing medication, botulinum toxin and surgery (Wasiak 2004). ESWT reduces hypertonia of the wrist and finger muscles in patients affected by stroke (Manganotti 2005). The aim of this initial experience was to evaluate the effect of radial extracorporeal shock wave therapy (rESWT) in the treatment of spasticity in patients with cerebral palsy.

Methods: In April 2008, 3 patients with spastic cerebral palsy, 2 men (34 and 48 years old) and 1 woman (42 years old), were treated with rESWT. The patients were treated in 1 session only. The muscle groups were the following: biceps, wrist flexors and triceps surae in all patients and the thenar eminence in a sole patient. Number of impulses: 2,000 in each muscle group. Device used: Swiss Dolor Clast (EMS-Switzerland). Energy flux density: 0.10mJ/mm². Spasticity was evaluated by the Ashworth Scale from 0 to 4 (0 = no spasticity to 4 = severe spasticity) in each muscle group. Passive elongation of the triceps surae was also

66. Radial extracorporeal shock wave therapy (rESWT) in wound healing – a prospective randomized Placebo-controlled animal trial

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Institutions: MARE Clinic Kiel

Device and producing company: EMS swiss Dolorclast

Introduction: Shock waves were initially used to treat wound healing disorders. First results showed good outcomes. Radial shock waves were not applied in wound healing until now.

Methods: In an epigastric skin flap model the effect of radial extracorporeal shock waves was investigated in rats (Male Sprague Dawley rats weighing 300 to 350 g). A total of 25 subjects randomly received assigned treatment. All subjects underwent surgery to create a specific skin flap with reduced perfusion due to ligation of the epigastric artery and vein. After surgery the subjects were assigned into 3 groups. The first group received 300 shock waves with an ED of 0.13 mJ and 2 Hz, the second group received 600 shock waves with an ED of 0.13 mJ and 4 Hz, the third group received a placebo. To quantify the effect, planimetry and laser Doppler imaging (LDI) were performed 7 days after intervention and compared to baseline.

Results: Baseline showed homogeneity regarding all criteria. Seven days after treatment rats receiving a total of 600 SW at 0.13 mJ showed significantly better outcomes compared to placebo and rats receiving 300 SW at 0.13 mJ. These significantly better outcomes after 600 SW at 0.13 mJ were found in both criteria (Planimetry and LDI). The group receiving 300 SW at 0.13 mJ showed slightly better outcomes but they were not significant compared to placebo. Only minor side effects such as petechial bleeding and edema were observed.

Discussion: These findings demonstrate positive effects in a rat model. The clinical effect size remains unknown and needs to be determined.

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Conclusion: rESWT is an effective and safe method to treat wound healing with impaired perfusion conditions after surgery. The effect size reaches clinical relevance. These initial findings have to be verified in further studies. Clinical feasibility trials could start to calculate the clinical effect size of radial shock waves in perfusion-related wound healing disorders.