



BTL-5000 SWT
BTL-6000 SWT
CLINICAL EVIDENCE

SHOCKWAVE THERAPY
CLINICAL AND RESEARCH BACKGROUND



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INTRODUCTION: SHOCKWAVE THERAPY

Shockwaves are acoustic waves with an extremely high energy peak like ones which occur in the atmosphere after an explosive event such as a lightning strike or a sonic boom. A shockwave differs from ultrasound by its extremely large pressure amplitude. Additionally, ultrasound usually consists of a periodic oscillation, whereas a shockwave is a single pulse.

The term “shockwave therapy” refers to the mechanical pressure pulses that expand as a wave within the human body. In 1980, the shockwave method was used for the first time to disintegrate kidney stones in a patient (Journal of Urology, 1982). During the past two decades, this method has become the standard treatment of choice for renal and urethral calculi.

Extracorporeal acoustic wave therapy (in contrast to lithotripsy) is not used to disintegrate tissues, but rather cause microscopic interstitial and extracellular biological effects which include tissue regeneration. In modern pain therapy, acoustic wave energy is conducted from the point of origin, which is the acoustic wave generator (via a coupling gel) to the body regions experiencing pain. There, its healing capacity is applied.

Over time, acoustic waves have proven to be an effective and non-invasive method for the treatment of localized musculoskeletal pathology including: epicondylitis, heel spur and plantar fasciitis, rotator cuff disorders, trigger points, variety of chronic tendinopathies and many other indications.



TITLE: ESWT VERSUS ESWT COMBINED WITH INFRARED LOW LEVEL LASER THERAPY (LLLT) IN TREATMENT OF CHRONIC PLANTAR FASCIITIS

Authors: Nedelka T., Bartak V., Ohshiro T.

Affiliations: Charles University, 2nd School of Medicine, Dpt. of Neurology, Prague, Czech Republic; Charles University, 1st School of Medicine, 1st Orthopaedy Clinic, Czech Republic; World Federation of Societies for Laser Medicine and Surgery, Tokyo, Japan

Source: 12th International Congress of the International Society for Medical Shockwave Treatment, 2009

Abstract:

Introduction:

Chronic Plantar Fasciitis (CPF) is one of the most common causes of heel pain. It was previously proven that ESWT is an effective conservative treatment for CPF, with better outcomes produced with higher energy ESWT however, the heel pain frequently recurs. Therefore the possibility of using other forms of conservative therapy as an adjunct to ESWT rather than performing surgery should be considered, as the indications for surgery are not well codified. The studies considering efficacy of GaAIAs low level laser therapy (LLLT) brought conflicting results, thus LLLT in monotherapy of plantar fasciitis remains controversial. The aim of this prospective study was to evaluate the effectiveness of ESWT in monotherapy as well as the effectiveness of ESWT followed by application of LLLT.

Methods:

We studied 96 patients (96 heels) with chronic plantar fasciitis persisting for at least 6 months. Fifty patients were included in the ESWT only group (group A) and 46 patients in the ESWT/LLLT group (group B). Initial evaluation included completing visual analogue scale (VAS), short form of McGill questionnaire and Roles and Maudsley scale. The VAS as evaluated before each application. Follow up was done 2 weeks and 2, 4, 6 and 12 months after the last application. In the ESWT only group, 2000 shockwaves in 4 weekly sessions were delivered by BTL-5000 Power SWT device. Applied energy was 0.16 mJ/mm^2 at a frequency of 8 Hz. In the ESWT/LLLT group, the same shockwave therapy procedure was provided and immediately followed by application of GaAIAs infrared laser, wavelength 830 nm, continuous frequency, output power of the probe was 400 mW with total dose per session equal to 20 J/cm^2 .

Results:

The complete data from 89 patients were collected. Seven subjects (4 in the group A and 3 in the group B) did not complete the study for various reasons. There was no difference in baseline pain and basic demographic data between groups A and B. VAS improvement in ESWT and ESWT/LLLT groups at 2, 6 and 12 months follow-up was significant in both groups.

Discussion:

Both ESWT and ESWT/LLLT applications are safe and effective in treatment of chronic plantar fasciitis. From the long-term perspective, the efficacy is comparable in both groups. LLLT seems to be more beneficial at the beginning of the therapy.

Conclusion:

Combining ESWT with GaAIAs low level laser therapy appears to provide moderate improvement in the initial phase of treatment. Further investigation is necessary to validate these results.



TITLE: EXTRACORPOREAL SHOCKWAVE THERAPY IN THE TREATMENT OF CHRONIC PLANTAR FASCIITIS

Authors: Magdy Hussein Ahmad Mansour

*Affiliations: Rheumatology & Rehabilitation Department Faculty of Medicine,
Zagazig University*

Source: Zagazig University Medical Journal, 2009; 15(1) 73-82

Abstract:

Patients with plantar fasciitis (PF) typically describe their pain after getting out of bed in the morning or after a period of inactivity. They state that the pain decreases after walking on the foot for a while. Most patients tolerate the condition before seeking medical help. Present conservative treatments for plantar fasciitis include rest, physical therapy, heel cushion, non steroidal anti-inflammatory drugs, corticosteroid injections, taping, orthotics, shoe modifications, night splinting, and cast. A fairly new method of treatment is extracorporeal shock wave therapy (ESWT). Despite numerous publications and clinical trials, one orthopedic application of extracorporeal shockwave therapy (ESWT), which still remains highly equivocal, is the treatment of chronic plantar fasciitis. The aim of this work was to determine the role of the extracorporeal shockwave therapy in the treatment of recalcitrant chronic plantar fasciitis. This study was carried out on 90 patients suffering from chronic plantar fasciitis recalcitrant to conservative therapies for at least 6 months. They were collected from outpatient clinic of Physical Medicine & Rehabilitation department, King Saud Hospital, Onaizah, AlQassim region, Saudi Arabia (KSA). All subjects were assessed according to the inclusion and exclusion criteria in the study protocol. Absence of calcaneal fracture, bony abnormality and other pathology was confirmed with lateral radiograph prior to treatment. Subjects were divided into two groups. Active group included 60 patients (20 males and 40 females) with a mean age of 52.1 ± 8.5 years and the control group comprised 30 patients (12 males and 18 females) with a mean age of 47.7 ± 7.8 years. Active group received Low Energy Shock Wave Therapy that was applied in four sessions as weekly interval using 2000 impulses (pressure 2.5-3.5 bar, frequency 10-15 Hz) with an average energy flux density of 0.02 to 0.33 mJ/mm². No anesthesia was used. The control group received placebo treatment of only 20 shocks with a negligible energy density of 0.02 mJ/mm². An assessment of pain by means of visual analogue scale (VAS) ranging from zero (no pain) to ten (maximal pain) was established at 4 weeks, 8 weeks, and three months after treatment. BTL-5000 SWT basic unit was used for ESWT (pressure 1-5 bar, frequency 1-15Hz). All treatments were performed according to instructions in operating manual. With regard to the outcome measure, a statistically significant difference was found in the change from baseline to 3 months in the VAS scores of the treated versus placebo group ($p < 0.01$). In the Active group, the mean pain score decreased from 7.8 to 3.8 at 3 months ($p < 0.001$), resulting in a mean percentage improvement 49.7%. In the placebo group, the mean pain score decreased from 7.8 to 5.4 at 3 months ($p < 0.001$), a mean percentage improvement 32.1%. In the Active group, 48.3% (29 of 60) of the subjects achieved greater than 60% improvement in pain, and in the Placebo group only 23.3% (12 of 30) met the same criteria. ESWT is a non-invasive, safe and effective treatment for recalcitrant plantar fasciitis.



TITLE: EXTRACORPOREAL RADIAL SHOCKWAVE THERAPY FOR THE TREATMENT OF ACHILLES TENDINOPATHIES

Authors: Edson Antonio Serrano

Affiliations: NEOMEDICA, Lima, Peru

Source: 16th International Congress of the International Society for Medical Shockwave Treatment, 2013

Abstract:

Introduction:

Extracorporeal shockwave therapy has been shown to be effective in the treatment of chronic tendon pathology in the elbow, shoulder, Achilles tendinopathy and plantar fascia. This prospective study shows the efficacy of extracorporeal radial shockwave therapy in the treatment insertional and not insertional Achilles tendinopathy.

Methods:

We performed a prospective intervention study, with thirty-two patients with Achilles tendinopathy were enrolled; 26 not insertional and 8 insertional. for treatment this group received three to five applications (every week) of 6000 impulses of radial shock waves (BTL-5000 SWT, BTL-6000 SWT) with progressive protocol, this protocol has 2000 shockwaves neurostimulation, 2000 shockwave treatment and 2000 of neurostimulation at the end of the session. Follow-up examinations were performed at a month, then every month up to 6 months using visual analog scale (VAS) of pain (0 to 10) in morning and activity pain.

Results:

Twenty four patients (75%) were very satisfied, 6 (18.76%) were satisfied, 1 (3.1%) were improved the condition, and 1 (3.1%) said it did not affect the preview condition. Ninety-three percent of patients said they would choose as first choice treatment of radial shock waves. After 6 months of follow-up the mean of VAS for morning pain decreased from 7.2 to 2.1 and activity pain decreased from 8.3 to 3.

Discussion:

This is a preliminary study demonstrates the effectiveness of radial shock waves not only in insertional tendinopathy, also no insertional tendinopathy with intra tendinous calcifications, using progressive protocol, however requires higher studies.

Conclusion:

Extracorporeal radial shockwave therapy has been shown to be effective in the treatment of patients with lateral Achilles tendinopathy.



TITLE: SHOCKWAVE THERAPY IN PATELLAR TENDINOPATHIES

Authors: Carlos Leal, Orlando Hernández, Margarita Cardozo, María Camila Gallo

Affiliations: Fenway Medical ESWT Group, Bogota DC, Colombia

Source: 15th International Congress of the International Society for Medical Shockwave Treatment, 2012

Introduction:

Extracorporeal shock wave therapy (SWT) has proven to be effective in the treatment of chronic tendinopathies. The effects of mechanotransductional stimulation of cells and capillaries result in improved neovascularization, and enhanced cell migration and differentiation. Patellar tendinopathies are difficult and challenging, because the mechanical forces of the extensor mechanism are the largest in the human body and the inferior pole of the patella is poorly vascularized. Previous studies have shown the reduction of VAS evaluated pain of 51% with a single session of radial SWT as compared with 24% in the control group at a 12 month follow up. As we have better results in treating other chronic tendinopathies such as tennis elbow or plantar fasciitis with a two-session protocol of SWT, we wanted to compare the use of single vs. double session SWT treatments.

Methods:

49 patients with diagnosis of chronic patellar tendinopathy were studied from June 2009 to January 2012. Twenty-four patients were treated with one session of radial SWT (control group) and twenty-five patients were treated with a double session protocol of SWT (treatment group). Patients were randomly assigned to the treatment or control groups. All treatments were performed using a BTL-5000 Power radial shockwave device (BTL Industries - Czech Republic). The single session protocol used energy up to 4 BAR. The two sessions used the same protocol with a difference of 7 days between sessions. Evaluation was by change in Visual Analogue Scale (VAS), Victoria Institute of Sport Assessment score for patellar tendinopathy (VISA-P) score and by Roles and Maudsley Score. Follow up was done at one, three and twelve months after the treatment. Mean VAS score was 8.2 in the treatment group and 8.3 in the control group. One month, 3 months, and 12 months after treatment, the mean VAS for the control and treatment groups were 5.7 and 4.8, 4.5 and 3.2, and 2.5 and 1.7, respectively.

Results:

One month, 3 months, and 12 months after treatment, the mean VISA for the control and treatment groups were 66.1 and 67.5, 72 and 75, and 78 and 84, respectively. At final follow-up, the good and excellent results for the treatment and control groups were 21 and 18 respectively. The fair and poor results were 4 and 6 respectively.

Conclusion:

Using a double session we improved our good and excellent results from 75% to 84%. The pain reduction was of 66% in the treatment group and 57% in the control group. We found similar results as previously reported with a single session SWT, and improved the results using a double session protocol to levels similar to those reported with the use of focused SWT or in other common tendinopathies. We recommend the use of double session radial SWT protocols as an improved effective non-invasive treatment for chronic patellar tendinopathy.



TITLE: SHOCKWAVE THERAPY FOR PATELLAR TENDINOPATHY IN PATIENTS WITH TOTAL KNEE ARTHROPLASTIES

Authors: Carlos Leal, Diana Lemus, Jenny Juschten

Affiliations: Fenway Medical; Bosque University; Bogota, Colombia

Source: 17th International Congress of the International Society for Medical Shockwave Treatment, 2014

Abstract:

Introduction:

Patients that have received a total knee arthroplasty (TKA) are more active day by day, not only because of the current lifestyle of the senior citizens, but because of the modern surgical and rehabilitation techniques in knee surgery. It is a common fact to have sport rehabilitation programs in our total knee patients that would have been almost a sin a decade ago, including low impact sports like golf or cycling. The major concern is the risk of loosening in the short term and wear in the long term. Anterior knee pain during exercise is common, and usually directs the knee surgeon to rule out infection or loosening. However, many patients have an extensor mechanism overload in a somehow un-natural biomechanical environment. We have found a number of TKA patients that clearly have a patellar tendinopathy and not a joint or prosthetic problem. We have treated patients with patellar tendinopathy with Shockwave Medicine for the past 15 years with excellent results. We hypothesize that the use of low energy radial shockwaves could safely provide pain control and tendon regeneration in our TKA patients with patellar tendinopathy. In this short case series we followed four patients with patellar tendinopathy and a TKA treated with radial shockwave therapy.

Methods:

We treated four volunteer patients with previous TKA that signed an informed consent to receive shockwave therapy for their patellar tendinopathy. All cases had a total knee arthroplasty operated by the senior author. All cases had the same implant and technique: a Genesis II total knee implant, with no patellar implant (Smith & Nephew - London England). The average age was 64 years o, and had the surgery done between 18 and 26 months before (avg. 22 months). They all were male active executive patients that play golf twice a week regularly for more than 20 years. They were symptomatic for anterior knee pain for 7-12 months (avg. 9.5 months). All had normal X-rays, bone scans and lab tests that ruled our infection or implant loosening. They all had at least three physical therapy protocols in the past six months without results. They all have been prescribed with NSAIDS and pain medication with temporary relief. The main complaint was pain during and after walking or golfing. They all received a standard 6000 radial LPSP shockwave protocol in two weekly sessions, with 2000 initial analgesic shockwaves, 2000 therapeutic shockwaves over 2 bar and 2000 final analgesic shockwaves on each session. In all cases, the treatment was performed by the authors, using a BTL-5000 Power Radial Shockwave device (BTL Industries, Czech Rep). Patients were followed for three months and assessed for pain-VAS and function Roles and Maudsley scores, and any adverse effect was recorded. At the end of the study we performed a new X-ray and bone scan in order to determine possible changes or signs of loosening. The study was done independently with no financial or material support from the manufacturers of the mentioned devices or implants.



Results:

All patients improved pain and function. Three patients improved the VAS score over 50% after one session, and one improved only 26% with an average of 46%. After the first month follow up the average VAS improvement was of 65%, and did not change much, to a 63% and 69% after two and three months. The functional score showed an improvement in all patients. All four had a poor rating at the beginning of the study, and ended with two excellent, one good and one fair rating. All patients revealed satisfaction with the treatment, and a good return to golf with little or no pain during or after sports. No complications or side effects were found or reported by the patients. No X-ray or bone scan changes were found at the three-month follow up.

Discussion:

This is the first report of Extracorporeal Shockwave Therapy for this medical condition. Even though the series is a short one, the results are very encouraging in active patients that had no results with previous conventional treatments. The low energy and the low depth of the radial pressure waves did not cause any damage, symptoms or changes on the implants or the bone-cement-prosthesis interfaces. Our previous experimental studies using high-energy focused shockwaves on an experimental hip prosthesis cemented model did not show any changes in the interfaces. More studies must be performed in order to provide the solid evidence we require as knee surgeons to use this promising procedure as a standard in our patients.

Conclusion:

The use of shockwave therapy in this series of patellar tendinopathy patients with previous total knee arthroplasty is favorable, has similar results as those found in other patients with the same condition and without a knee implant.



TITLE: SHOCKWAVE THERAPY FOR KNEE OSTEOARTHROSIS

Authors: N.I.Sheveleva, L.S. Minbaeva

Affiliations: The Karaganda state University of Medicine

Source: Главный Врач 4(10) Осень 2014 [original article in Russian language]

Osteoarthritis is a widespread disease affecting 10% of the world's population. According to various authors, frequency of this pathology ranges from 30 to 55% among all orthopedic patients who visit the doctor. Among all degenerative-dystrophic joint diseases deforming knee osteoarthritis occurs in 54.7-69.7% of patients, at the same time the advanced stages of disease occur in 75% of patients .

Gonarthrosis often occurs in young people, including those engaged in sports activities and active labor activity. In case of gonarthrosis 80% of patients note the decrease in quality of life, and invalidation rates from 10 to 21% of observations/leading to handicap in 10 to 21% of cases . The treatment of patients suffering from deforming knee osteoarthritis is a challenge for doctors who deal with this disease. The main reasons bringing the patient to visit a doctor are pain and decreased joint function.

The complex approach of osteoarthritis patients' treatment implies the wide use of physiotherapeutic methods. Their application promotes the microcirculation improvement in subchondral bone, synovial membrane and periarticular tissues, the improvement of metabolism and suppression of destructive processes.

Nevertheless, the remaining high occurrence of the disease and long rehabilitation process of patients make the search of new effective methods and recovery facilities actual. A promising method of conservative therapy of arthrosis patients is the application of extracorporeal shockwave therapy (ESWT), a new method of treatment which represents a promising alternative surgery treatment of deforming knee osteoarthritis.

In medicine shockwaves have been applied for the first time in 1980 for lithotripsy of renal stones, and in 1985 for lithotripsy of the gall stones. The first publications describing application of shockwave therapy for orthopedic pathology and consequences of traumas appeared in the beginning of 1990s. Application of the shockwaves in orthopedy by means of devices for lithotripsy has shown that they do not meet the requirements for treatment pathologies of the musculoskeletal system. During the last decade special devices using various ways of shockwaves generation were developed. All of them are aimed on generation of the pressure impulse transferred to tissues with the minimum loss of energy for which purpose the various connective environments are used. Shockwaves start the cascade of effects which begins with application of the physical energy in the form of acoustic waves and finally results in restoration of vessels and metabolic activity improvement by means of various physiological mechanisms. The shockwave (acoustic wave) bearing high energy to painful spots and tendons or musculoskeletal tissues with subacute, subchronic and chronic conditions activates healing, regeneration and reparation of tendons and soft tissues. The international studies show an average ESWT efficiency of 77% (for separate nosologies up to 92%).

Given the above, an objective of this research was the investigation of the results of shockwave therapy application for gonarthrosis. We observed 30 patients with gonarthrosis showing joint function decrease of I-II grade. The average age of patients was 40 ± 5.6 years. The disease started between 1-3 years before the study started. Clinical history showed the prevalence of the painful syndrome with restriction of flexion and extension in the affected extremity up to 40° and decrease in muscular force. The palpation revealed painful spots on the back of the leg, in the joint area. Pain was significantly increasing at movements.



Patients received ESWT with the device BTL 6000 SWT TOPLINE:

There were 3 to 6 sessions performed with an interval of 3-6 days between them. The session included 2000-3000 shocks with various frequency (10-15 Hz) and pressure from 1.5 to 3.5 bars. If the patients experienced pain during the ESWT procedure, the level of the energy applied was decreased.

Procedure was performed with the patient in lying position. The knee joint, the front area of the hip (quadriceps), and painful points were treated. Treatment area localization was defined using the method of biofeedback, i.e. the patient informed the doctor about the location of the painful spot when pressing with a finger or applicator tip during the procedure. The treatment duration was 15-20 minutes. Procedures were performed daily, outpatiently. For minimization of power losses the contact gel was used. Any forced physical activities were prohibited after the procedure, since the immediate analgesic effect can provoke new damage.

ESWT was performed as monotherapy. According to the data of experimental studies, local methods of therapy (injections, physiotherapy, NSAID) can change or block the action of shockwaves. There were no complications of ESWT procedure revealed.

To estimate the efficiency of treatment the main symptoms of the disease were registered before the beginning of therapy, after the first procedure and after the last treatment on a 0-3 scale – i.e. from 0 to 3 depending on the intensity. We took into account the joint pain, exudative phenomena in joints, hyperthermia of the joints, morning stiffness, joint function restriction, articular crepitus at movements, ESR rate. The sum of all listed values in points allowed to define the process intensity in the beginning of therapy and in the end of it and to estimate its efficacy. The decrease of a total index in the end of treatment by 50% and more was regarded as considerable improvement, by 50-25% - as moderate improvement, and the decrease in number of points less than 25% was regarded as an absence of dynamics.

Objectification of the painful sensations in the areas with the highest pain level was performed by means of the VAS questionnaire (10 cm, a ruler). The criterion of treatment efficiency was the decrease in level of pain estimation on VAS with not less than 2.5 points, high efficiency – more than 5 points. If the estimation on VAS decreased less than 2.5 points the treatment was admitted inefficient.

Results:

After the treatment course 85% of patients showed considerable improvement. The morning stiffness rate was reduced by 44%, joint index reduced by 39%, and functional index reduced by 18% compared to the initial data. After the first ESWT procedure pain have decreased by 26%, after 3 procedures – by 8.5% and after 4-6 procedures – by 67 and 85%, respectively. Analgesic effect on a painful spot was observed approximately after 300-500 impulses. After the treatment course for patients with severity 1 arthrosis where VAS was 4.5 ± 0.7 before the shockwave therapy, at the moment of the last examination it was 0.5 ± 0.3 . In patients with severity 2 arthrosis, 42% showed a considerable decrease of the painful sensations by the time of the last examination. Before the treatment VAS was 6.8 ± 0.8 , and at the end it was 1.8 ± 0.9 ($\bar{d} < 0.05$). General condition of 1 patient has not improved substantially. No worsening of the condition was registered. In our opinion, this is due to the changes in the joint, long-term course of disease and previous intra-articular hormonal therapy.

Conclusion:

Shockwave therapy with the device BTL 6000 SWT TOPLINE is an effective treatment of deforming knee osteoarthritis. In 95% cases shockwave therapy decreases the painful syndrome and also improves the function of knee joints. The advantages of shockwave therapy for the treatment of gonarthrosis are its noninvasiveness, the possibility to perform the procedure outpatiently without interrupting the professional activity, the convenient schedule of procedures – 1-2 times a week.

For the pain management and treatment of microcirculatory disorders the most effective treatment course is five ESWT procedures with the gradual increasing of energy density.



TITLE: THE EFFECTS OF EXTRACORPOREAL SHOCKWAVE THERAPY (ESWT) AND CRYOTHERAPY IN TREATING PATELLAR TENDINOPATHIES IN PROFESSIONAL ATHLETES

Authors: Dobreci D. L.

Affiliations: Department of Physical Therapy and Occupational Therapy, Faculty of Movement, Sports, and Health Sciences, „Vasile Alecsandri“ University of Bacau

Source: Sport & Society / Sport si Societate;Mar2014 Special Issue, Vol. 14, p223

Abstract:

Aim:

This paper tries to optimize the existent classical treatments for patellar tendinopathies that are resistant to classical forms of therapy, in professional athletes.

Hypotheses:

This research wants to highlight the effectiveness of the ESWT and cryotherapy in treating patellar tendinopathies in professional athletes who previously underwent classical treatments that had no positive results.

Material:

The research was conducted at the Bacau Spinal Care Rehabilitation Clinic, where the systems BTL-6000 SWT and Cryo 6 Zimmer were used.

Method:

The study comprised 38 male athletes, of which 12 volleyball players, 13 handball players, 5 badminton players, 5 tennis players, and 3 football players, who were subjected over the course of 3 months (previous to this experiment) to steroidal and non-steroidal antiinflammatory treatment, cortical injections and electrotherapy, without any results. The present treatment span over 3 weeks, with two sessions per week, during which ESWT and cryotherapy (-30°C) were applied. The pain was assessed using the Visual Analogue Scale (VAS) for Pain.

Results and conclusions:

At the end of the research, out of the total 38 subjects, 32 recorded very good results both during the study, and during the intermediary assessments, one month, two and three months after the treatment ended; 4 of them, at the 3 months assessment still felt a slight pain during training, while 2 of them did not respond favorably to the treatment, at the end of which they were send to the orthopedist for PRP infiltrations. After analyzing the results, one can say that the ESWT, combined with locally administered cryotherapy of -30°C, has very good results in treating the patellar tendinopathies that are resistant to other forms of therapy. Another positive aspect that can be said after this study is that the positive effects of the applied therapy have maintained also 3 months after its end.



TITLE: RADIAL SHOCK WAVE THERAPY IN PATIENTS WITH LATERAL EPICONDYLITIS

Authors: Ilieva EM, Minchev RM, Petrova NS

Affiliations: Department of Physical Medicine and Rehabilitation, Medical University, Plovdiv, Bulgaria

Source: Folia Med (Plovdiv). 2012 Jul-Sep;54(3):35-41.

Abstract:

Introduction:

Lateral epicondylitis, or “tennis elbow”, is a relatively common disorder. Various therapeutic modalities have been tried in an attempt to manage the disorder but neither the conservative methods nor the surgical options have proved to be beneficial so far. During the past decade in the USA and European countries and the past several years in Bulgaria, the shock wave therapy (focused and radial) has been introduced as a method of choice in the treatment of chronic tendinopathies. The AIM of the present study was to make quantitative assessment of the effect of radial shockwave therapy in patients with lateral epicondylitis.

Patients and methods:

The study included 16 patients with lateral epicondylitis (9 males, 7 females, mean age 47.2 +/- 2.3 yrs) of mean duration of 15.06 +/- 4.06 months. We used the BTL-5000 SWT radial shockwave therapy equipment and performed 5 procedures (one per week). The total number of shocks was 2500, the pressure was 2 bars: 1500 shocks of 5 Hz frequency followed by 500 shocks of 10 Hz frequency were applied locally on the lateral epicondyle and 500 shocks of 2 bar pressure and 5 Hz frequency were applied along the muscles near the insertion. The patients were evaluated 5 times: before treatment, immediately after the end of treatment and at 3, 6 and 12 months of follow-up. Pain was assessed at rest, on palpation and by the Thomsen test using a visual analogue scale (VAS). The patient-rated tennis elbow evaluation (PRTEE) questionnaire was used to assess the patients' pain, functional condition and limitations in performing specific activities, as well as for the overall self evaluation.

Results:

We found significant difference ($p < 0.05$) between the mean pain scores (at rest, on palpation and by Thomsen test) before treatment and these scores obtained immediately after treatment, the decrease sustained at 3, 6 and 12 months. VAS showed decrease from 3.75 +/- 0.49 before therapy to 2.44 +/- 0.39 after treatment, to 1.94 +/- 0.46 at 3 months and to 0.69 +/- 0.38 at one year at rest, from 7.44 +/- 0.38 before therapy to 4.69 +/- 0.51 after treatment, to 3.56 +/- 0.40 at 3 months and 1.46 +/- 0.56 at one year at palpation, and from 5.87 +/- 0.46 before therapy to 3.5 +/- 0.29 after it, to 2.5 +/- 0.40 at 3 months and 1 +/- 0.38 at one year in the Thomsen test. The pain, function and the total score as assessed on the patient-rated scale (PRTEE) also showed statistically significant improvement ($p < 0.05$) after completion of therapy and over the whole follow-up. Total score decreased from 56.75 +/- 2.34 before therapy to 39.38 +/- 3.96 after treatment, to 27.53 +/- 3.7 at 3 months and to 13.69 +/- 4.48 at one year.

Conclusion:

Based on the results of this preliminary study we could recommend the radial shock wave therapy in the treatment of lateral epicondylitis of more than 6 months' duration if the condition is recalcitrant to other conservative methods of treatment.



TITLE: EXTRACORPOREAL RADIAL SHOCKWAVE THERAPY FOR LATERAL EPICONDYLITIS

Authors: Edson Antonio Serrano

Affiliations: NEOMEDICA, Lima, Peru

Source: 16th International Congress of the International Society for Medical Shockwave Treatment, 2013

Abstract:

Introduction:

Extracorporeal radial shockwave therapy has shown to be effective in the treatment of chronic tendinopathies of the elbow, shoulder and plantar fascia. This prospective case series study evaluates the efficacy of extracorporeal radial shockwave therapy in the treatment of chronic lateral epicondylitis.

Methods:

We conducted a prospective study in forty-two patients with lateral epicondylitis. Our patients were treated with three to five weekly applications of 6000 impulses of radial shock waves (BTL-5000 SWT, BTL-6000 SWT) with a 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 12 - 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 12 to 6 impulses per second in a decreasing manner. Follow-up examinations were performed after one month, then every month up to 6 months using a pain visual analog scale from 0 to 10.

Results:

After 6 months of follow up, twenty-seven elbows (64.2%) were free of complaints, 10 (23.8%) were significantly better, 2 (4.7%) were slightly better, and 2 (4.7%) were unchanged. The only minor complication observed in the series was petechiae in 5 (11.9%) patients.

Discussion:

This case series showed the benefits of radial shock waves using a progressive protocol that includes analgesic shockwaves before and after the therapeutic session, in the treatment of lateral epicondylitis.

Conclusion:

Our protocols showed to be effective and safe in the treatment of lateral epicondylitis of the elbow with radial extracorporeal shockwaves. Case control studies are required to follow our results.



TITLE: RADIAL SHOCKWAVE THERAPY AND HIGH INTENSITY LASER COMBINED TREATMENT IN ELBOW TENDINOPATHIES

Authors: Carlos Leal, Diana Lemus, Jenny Juschten

Affiliations: Fenway Medical; Bosque University; Bogota, Colombia

Source: 17th International Congress of the International Society for Medical Shockwave Treatment, 2014

Abstract:

Introduction:

The treatment of elbow tendinopathies with radial pressure waves (RSWT) has showed good and excellent results in over 75% of the cases in most of the series in the literature. In the past ten years we have used a two-session RSWT protocol with 2000 therapeutic radial shockwaves above 2 BAR, preceded by 2000 analgesic shockwaves with high number of repetitions per second, followed by another analgesic 2000 shockwaves. This protocol has allowed us to have 81% success rate in the treatment of chronic elbow tendinopathies. Our protocol includes a follow up visit two weeks after the final SWT session. If the patient reports a VAS pain scale improvement lower than 50%, we proceed to a third and final session, usually with a higher power focused device. Our group has been working in the past year with High Intensity Laser therapy (HIL) for acute musculoskeletal painful conditions with excellent results. We hypothesize that the use of HIL may have a significant control of pain if combined with RSWT. In this study we compare the outcome of a combined therapy of RSWT and HILT on the third session of Focused Shockwaves in patients that did not improve pain over 50% in their follow up evaluation.

Methods:

We performed a case control study on 21 patients diagnosed for chronic lateral epicondyle elbow tendinopathy, that did not improve pain control over 50% in the VAS scale on the follow up visit two weeks after the second RSWT session. We had 14 female and 7 male subjects with an average age of 35.5 y/o (19-52 y/o). They were divided in two groups of 10 and 11 patients. The two groups were statistically similar. They all signed an informed consent. In all cases we used for the first two sessions a Radial SWT generator (BTL-5000 Power – BTL Industries Czech Rep). All subjects were tested and evaluated by ISMST & ONLAT certified specialists. In the Cases Group (RSWT+HIL) we applied a progressive protocol using 200 shocks on 15 Hz, 200 shocks on 10 Hz and 200 shocks on 5 Hz, plus the application of 2500 laser shots over the elbow epicondyle painful region. We used a HIL unit (BTL Industries Czech Rep). The laser treatment was then repeated every 4 days in four more sessions. In the Control Group (RSWT+FSWT) we used our regular protocol of 1000 focused shockwaves using an electrohydraulic device (MTS Orthogold – OE155 – soft focused applicator - MTS Medical – Konstanz, Germany). We followed up the patients for four months, with a monthly record of VAS pain score, the Roles and Maudsley scale, and a record for any adverse effects. All data was recorded and analyzed using a One-Way ANOVA, and the P value was based in <0.01. The study was done independently with no financial or material support from the manufacturers of the mentioned devices.

Results:

Both the cases group and the control group patients improved pain and function in the four-month follow up. The RSWT+HIL treated patients had a 71% VAS pain reduction after 5 months, as compared with a 70% in the RSWT+FSWT control group. The Roles and Maudsley scores showed good and excellent results in 70% of the cases group patients, as compared with 73% in the control group. 9/11 patients improved 25%-50% their pain in the four-month follow up, and 2/11 improved over 50% in the cases group.



The control group had similar results, with 7/10 patients that improved 25%-50% and 3/10 over 50%. All reported data in pain control, functional score and improvement rates were not statistically significant. No patients showed increase in pain or any complications.

Discussion:

The use of HIL has proven efficacy and safety in pain control of musculoskeletal lesions, and its regenerative power is still under research. Shockwave medicine has proven to be a great tool in tissue regeneration, neovasculogenesis and healing, but pain control is still a short and long-term issue. This study shows a possible use of the best of both technologies in benefit of our tendinopathy patients. We do have better results in our cases with RSWT that did not require a third session, with a 81% pain control, as compared with the 71% and 70% of the patients included in this study, who were the poor-results individuals who required a third treatment session. In future studies we will compare primary patients using RSWT, FSWT and combined RSWT+HILT.

Conclusion:

The use of a combined therapy of radial shockwaves and high intensity laser therapy showed similar results as the use of focused shockwaves in the recurrent pain after a primary shockwave treatment for tennis elbow.



TITLE: THE EFFECTS OF EXTRACORPOREAL SHOCKWAVE THERAPY (ESWT) IN TREATING LATERAL EPICONDYLITIS IN PEOPLE BETWEEN 40 AND 50 YEARS OLD

Authors: Dobreci Daniel-Lucian, Dobrescu Tatiana

Affiliations: "Vasile Alecsandri" University of Bacău, 157 Mărășești Street, Bacău, 600115, România

Source: Procedia - Social and Behavioral Sciences, Volume 137, 9 July 2014

Abstract:

The extracorporeal shockwave therapy (ESWT) was used for the first time in 1980, for fragmenting kidney stones. Since 1981, it also began to be used in Orthopedics, due to the contribution of German scientists - its use was to be developed more after 1990. Ten years later, ESWT was introduced in the treatment of several musculoskeletal disorders.

This paper aims at highlighting the effects of ESWT on lateral epicondylitis in people between 40 and 50 years old, who unsuccessfully followed a conventional treatment. Lateral epicondylitis can be encountered in tennis players (5% of the cases), violinists, surgeons, dentists, persons who type (secretaries), people who use the computer mouse very often, housewives. The largest incidence can be found in the age groups between 40 and 50, especially in amateur tennis players.

The treatment for this condition is very diverse and complex. Nevertheless, the recurrences are quite frequent, a large number of patients being unresponsive even after 3 months of treatment.

The experiment was conducted on a group of 43 patients, men and women, with various backgrounds, diagnosed with lateral epicondylitis, and who had previously been subjected to classical treatments, without any result. The study was conducted over a period of 5 weeks. The ESWT treatment (BTL-5000 SWT) was performed twice a week. The assessment of the subjects was done by observing and recording their pain intensity during palpation, and during the performance of their daily activities, at the beginning and at the end of treatment. This was done using the Visual Analogue Scale (VAS) for Pain. The final results presented a significant decrease and disappearance of the patients' pain.

Thus, one can say that positive results were obtained, and the ESWT treatment had an effect on the athletes with lateral epicondylitis who did not respond to a conventional treatment.



TITLE: SHOCK WAVE THERAPY IN SCAPULOHUMERAL PERIARTHRITIS WITH CALCIFIC TENDINITIS OF THE SHOULDER

Authors: Augustin Dima, Simona Popescu, Sebastian Diaconescu, Gina Galbeaza, Victorita Marcu, Daniela Poenaru, Delia Cinteza

Affiliations: Institutul National de Recuperare, Bucuresti

Source: Al 31-lea Congres National de Medicina Fizica si de Recuperare cu Participare Internationala, 2008

Purposes:

Establishing a medical rehabilitation protocol completely efficient and safe, concerning the patients with degenerative and inflammatory pathology of the shoulder with tendinous lesions idiopathic calcific disease.

Materials and methods:

Inclusion criteria were idiopathic calcific disease, at least 3 months of symptoms (pain and tenderness), calcific deposits more than 2 mm in diameter on radiography, and failed conservative treatment (including physical therapy, local anesthetic or steroid injection, and nonsteroidal anti-inflammatory drugs). Rotator cuff injury was excluded by clinical, sonographic, and, if indicated, magnetic resonance imaging before assignment.

There have been included into the study: - a group A of 32 patients in-patient or out-patient of the 4-th Medical Rehabilitation Departament on The National Rehabilitation Institute, 19 men and 13 women, with ages between 22 and 67 years old, with different types of tendinous lesions idiopathic calcific disease:

- 19 supraspinatus tendon calcifications
- 13 other rotator cuff tendon calcifications
- a control group B including 16 patients supervised as out-patient
- 10 supraspinatus tendon calcifications
- 6 other rotator cuff tendon calcifications

Patients tend to suffer limitation in shoulder mobility, tenderness and pain at the site of the lesions. Management ranges from conservative, consisting of nonsteroidal anti-inflammatory drugs (NSAID), physical therapy and subacromial cortisone injections

Patients from lot A took profit by standard physical-kinetic treatment using-ultrasounds, TENS, massage, physical therapy, an exercise program, local anesthetic or steroid injection, and nonsteroidal anti-inflammatory drugs and also with RSWT, patients from control group B taking profit only by standard physical-kinetic treatment, physical therapy, an exercise program, local anesthetic or steroid injection, and nonsteroidal anti-inflammatory drugs but without SWT.

We took benefits on the employment of standardized therapeutical programs already set by the producer (BTL-5000 SWT), with small shifts of the parameters depending on patients tolerability. Pressure between 2,2 and 2,5 bar, with 10 Hz frequency, patients received 2300 impulses of shockwaves in each session. The treatment protocol subsumes four sessions of shockwave therapy once a week, and only in 3 cases the fourth session was needed.

Regarding the signs and symptoms from subjective point of view we analysed the following parameters: visual analogue scale (VAS), pain-free grip strength test scores, Constant and Murley Scale (CMS); objectively the lesions were studied using Radiology, imaging procedures as echography of soft tissues, and in 16 cases MRI investigation was needed. Radiographic modifications in calcifications were evaluated before and after treatment.

Patients were asked to fill in a questionnaire after each session of SWT, thereupon the last session, and thereafter three months, and we still reevaluate the patients after six months. We have noticed the following parameters: etiology factors, associated affections that may influence the evolution of tendinopathies – arthrosis disease, gout, diabetes, hyperostosis disease, collagen synthesis disorders, secondary joints instabilities, post trauma complications (significant adhesions, significant muscles atrophy, CRPS tip II, chronic pain syndrome). No serious adverse effects were noted. Problems included temporary petechial bruising, or skin reddening immediately after therapy, these minor and disappeared in short time after the applications.

We have studied the speciality literature and applied a very well adjusted protocol concerning the technical possibilities in our department. The treatment was four weeks long and the main purpose was to ameliorate the pain syndrome, and the functioning one by diminishing the size of tendinous calcification lesions.

Results:

- Statistical analysis of visual analogue scale (VAS), pain-free grip strength test scores, and Constant and Murley Scale (CMS) has shown, both after treatment and to the follow-up at 3 months, significant difference comparing study group versus control group. Statistical analysis within the groups, showed always statistically significant values for the study group.
- And also the periodical iterate overseen using Radiology, ultrasounds- echography indicates an favourable evolution of the lesions: a decrease of the calcifications size and, diminishing of the size of bursitis where was discovered at the first evaluation.
- There was one patient (female) that could not stand the procedure application of SWT despite trying to modulate the parameters (pressure, frequency).
- Calcifications disappeared completely in 84.3% (27 from 32) of the subjects in the treatment group and partially in 15,6% of subjects (5 from 32); only 18.7% of the subjects (3 of 16 patients) in the control group displayed partially reduced calcifications, and none displayed a total disappearance ; the number needed to treat (NNT) that is of 1.18 at post-treatment and of the 3 months follow-up on the study group. Further studies are necessary to determine long-term prognosis

Conclusions:

The RSWT is safe and effective and must be considered as possible therapy for the treatment of patients with calcific tendinitis of the shoulder. The use of RSWT allowed a decrease of pain, and functional impairment, and an increase of the pain-free grip strength test.



TITLE: COMBINAZIONE DELLE ONDE D'URTO ASSOCIATE A LASER (RSWT & LLLT) NELLA GESTIONE DELLA SPALLA DOLOROSA DOVUTA A TENDINOPATIA DEL SOVRASPINATO: ANALISI CINEMATICA ED ELETTROMIOGRAFICA PRE E POST-TERAPIA

Authors: M.R. Carillo, V. Pezzullo, M. Colucci, R. Giganete, L. Mercogliano, L. Foggia

Affiliations: Athena Centro di Medicina Fisica e Riabilitativa, Napoli; S. C. Riabilitazione

Multispecialistica, A.O.R.N. Santobono; Pausilipon, Napoli; N.I.T. Srl, Napoli

Source: EUR MED PHYS 2009;45(Suppl. 1 to No. 3)

[original article in italian]

available on [[https://www.researchgate.net/publication/237824300_Combinazione_delle_ondedurto_associate_a_laser_\(RSWT__LLLT\)_nella_gestione_della_spalla_dolorosa_dovuta_a_tendinopatia_del_sovraspinato_analisi_cinematica_ed_elettromiografica_pre_e_post-terapia](https://www.researchgate.net/publication/237824300_Combinazione_delle_ondedurto_associate_a_laser_(RSWT__LLLT)_nella_gestione_della_spalla_dolorosa_dovuta_a_tendinopatia_del_sovraspinato_analisi_cinematica_ed_elettromiografica_pre_e_post-terapia)]



TITLE: EFFICACY OF RADIAL SHOCK WAVE THERAPY (RSWT) COMBINED WITH LOW LEVEL LASER THERAPY (LLLT) IN THE MANAGEMENT OF SUPRASPINATUS TENDINOPATHIES

Authors: Luigi Foggia, M. R. Carillo, C. Cavallaro, A. Petrosino, V. Pezzullo, P. Villano

Affiliations: Santobono Pausillipon Hospital, Naples (Italy); University "Federico II" Hospital, Naples (Italy); Athena Physical and Rehabilitation Center, Naples (Italy)

Source: 12th International Congress of the International Society for Medical Shockwave Treatment, 2009.

Abstract:

Introduction:

Although the literature demonstrates the effectiveness of RSWT (Radial Shock Wave Therapy) or LLLT (Low Level Laser Therapy) in the treatment of tendinopathies, there is still no work to assess the combination of these two methods. The purpose of this study is to demonstrate that the association of RSWT and LLLT is effective in the management of painful shoulder due to supraspinatus tendinopathies.

Methods:

In a multicenter study the authors treated a group of patients suffering from degenerative tendinopathies of supraspinatus by combining RSWT and LLLT using a BTL-5000 SWT Power device. The protocol consists of 4 treatments in weekly sessions. The parameters of RSWT in each session are 3000 shocks at a pressure of 5 bars and a frequency of 18 Hz. With regard to LLLT, the authors treated an area of 25 cm² at 20 J/cm² for 15 minutes. The LLLT immediately follows the RSWT. All patients were assessed before treatment and at 1 month follow-up by Constant score, SF-36 and computerized analysis of movement.

Results:

The combination of RSWT and LLLT is effective in the treatment of supraspinatus tendinopathies from a clinical point of view, from a functional point of view and from the point of view of quality of life perceived by the patient. By comparing the results with those in literature for each individual method it is possible to evaluate that the combination improves the results and reduces treatment time considerably. The therapy is well accepted by patients and free of side effects.

Discussion:

The combination of RSWT and LLLT offers faster and more effective treatment due to:

- anti-inflammatory effect
- analgesic effect
- anti-oedematous effect
- acceleration of the healing process
- enhancement of tendon quality

Conclusion:

This study (level III of evidence according to EBM), is important because it lays the groundwork for the organization of more detailed work, which could provide a comparison of this combined therapy with individual therapy or with other alternative therapies (for example ESWT) by prospective controlled single- or double-blinded studies.



TITLE: RADIAL EXTRACORPOREAL SHOCK WAVE THERAPY IN THE TREATMENT OF SHOULDER CALCIFIC TENDINITIS

Authors: Avancini-Dobrović V, Frlan-Vrgoc L, Stamenković D, Pavlović I, Vrbanić TS

Affiliations: Center of Physical and Rehabilitation Medicine, Rijeka University Hospital Center, Rijeka, Croatia.

Source: Coll Antropol. 2011 Sep;35 Suppl 2:221-5.

Abstract:

Shoulder calcific lesions of the rotator cuff are a common problem in physiatric and orthopedic practice. The lesions are mostly located in the supraspinatus tendon, close to the insertion area in the critical zone. Patients are usually treated conservatively by nonsteroid antiinflammatory drugs, analgesic drugs, local injections, physiotherapy and rarely by applying surgical procedures. Painful shoulder gives rise to functional disabilities and may sometimes lead to pharmacological overuse. In the last twenty years, extracorporeal shock wave therapy (ESWT) has been frequently used in the treatment of calcific tendinopathies. We have evaluated the effectiveness of radial ESWT on the group of 30 patients, aged between 28 and 58 years, with calcific tendinitis of the shoulder. Cryotherapy, medical exercises and radial ESWT were applied. We used the radial ESWT device (BTL-5000 SWT), 3 bars pressure, 10 Hz frequency, 2000 shocks. Patients were examined before the beginning of the treatment, immediately after the treatment, and 6 months later. The treatment included measurement of the range of motion (ROM), measurement of voluntary isometric contraction of shoulder muscles with manual muscle test (MMT), and subjective assessment of pain intensity with visual analogue scale (VAS). X-ray was done before and 6 month after treatment. The study has shown the efficiency of the treatment with radial ESWT. The level of statistical significance was determined with student t-test. Radial ESWT applied to patients with shoulder calcific lesions of the rotator cuff resulted in pain relief increase in the range of motion and increase in the muscular strength. As shown by X-ray, these results were followed by the decrease in the size of the rotator cuff calcifications.

TITLE: EXTRACORPOREAL SHOCKWAVE THERAPY IN CALCIFIC TENDINOSIS OF THE ROTATOR CUFF: COMPARISON OF RADIAL AND FOCAL TREATMENT

Authors: Edson Serrano, Karim Flores, Jean Carlos Criado

Affiliations: Neomedica Shockwave Unit; Lima, Peru

Source: 17th International Congress of the International Society for Medical Shockwave Treatment, 2014

Abstract:

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:

Forty eight shoulders were followed in 2 groups of twenty-four each. The treatment was weekly consisted of 3 x 2000 focal electrohydraulic shockwave with an energy flux density of 0.14-0.2 mJ/mm² without anesthesia (group A) and 5 x 6000 impulses of radial impulses with progressive protocol (group B). The patients were examined at a 4 weeks, 3 and 6 months after treatment. X-rays were performed at each visit.

Results:

In six months of following after treatment the Constant Score improved from 52.5 to 78.4 in group A and from 54.2 to 72.6 in group B ($p < 0.05$). The values on the visual analog scale which ranges from 0 (no pain) to 10 (maximal pain) improved from 7.7 to 3.1 (group A) and from 7.4 to 3.3 (group B) before and 6 months after treatment respectively. X-rays showed a complete or subtotal calcific resorption in 56% in group A, and 38% in group B of patients.

Discussion:

This is a preliminary study indicates that three sessions of extracorporeal electrohydraulic focal shockwave therapy with energy flux density of 0.14-0.2 mJ/mm² may be as effective as five applications of a radial extracorporeal shockwave therapy with progressive protocol for calcific tendinosis of rotator cuff. Focal technology shortens the treatment time, but the radial treatment is more accessible to people.

Conclusion:

Both technologies of ESWT (focal and radial) had successful and comparable result in the treated patients with calcific tendinosis of rotator cuff of the shoulder. No complications seen in six months of following. Subjectively, 84% of group A and 76% of group B judged the treatment to be successful.



TITLE: EFFECT OF SHOCK WAVE THERAPY ON MUSCLE SPASTICITY IN CHILDREN WITH CEREBRAL PALSY

Authors: E. Ilieva, M. Gonkova, I. Chavdarov

Affiliations: Plovdiv Medical University, Department of Physical Medicine and Rehabilitation, Plovdiv, Bulgaria; Specialized hospital for Residential Treatment of Prolonged Therapy and Rehabilitation of Children with Cerebral Palsy "Sv. Sofia", Sofia, Bulgaria

Source: Annals of Physical and Rehabilitation Medicine, Volume 54, Supplement 1, October 2011

Abstract:

Aim of the study is to evaluate the effect of radial shock wave therapy on reducing muscle hypertonia in plantar flexor muscles in children with cerebral palsy.

Material and methods:

Eleven children with spastic plantar flexor muscles as a result of cerebral palsy were included in the study: 7 boys and 4 girls, age range 2-7, mean age 3.54 ± 1.013 . Radial shock wave therapy was applied to the gastrocnemius and soleus muscle (BTL-5000 shock-wave series): 1000 shots to each gastrocnemius and soleus muscle. Clinical and instrumental methods were used for the evaluation of the results: passive range of motion, modified Ashworth scale, pedobarometry before the treatment, immediately after it, 2 and 4 weeks later.

Results:

After a single shock wave stimulation, a significant increase in passive range of motion (with 17.13° , $t = 8.81$, $P < 0.05$) and a significant decrease in the Ashworth scale (from baseline mean 2.81 SD $[0.65]$ to 2.11 SD $[0.33]$; $t = 6.19$, $P < 0.05$) were observed immediately after treatment. This effect was persistent two weeks later. The increase in passive range of motion was with 15.95° , $t = 5.22$, $P < 0.05$. The decrease in the Ashworth scale was preserved 2.11 SD $[0.33]$ ($P < 0.05$). After placebo stimulation no significant difference was observed.

Conclusion:

Radial shock wave therapy could be appropriate adjuvant treatment for reducing muscle spasticity in plantar flexors in children with cerebral palsy. These are preliminary results and further study is needed to follow the long-term effect.



TITLE: EXTRACORPOREAL SHOCKWAVE THERAPY IN SPASTIC CHILDREN WITH CEREBRAL PALSY

Authors: Andrada Mirea, Gelu Onose, Liliana Padure

Affiliations: University of Medicine and Pharmacy CAROL DAVILA; Emergency Hospital "Elena Beldiman", Romania

Source: 16th International Congress of the International Society for Medical Shockwave Treatment, 2013

Abstract:

Introduction:

As there are already some reports of the use of Extracorporeal Shockwave Therapy (ESWT) for the management of spasticity of children with Cerebral Palsy (CP) the purpose of our trial was to achieve improvement of our patients.

Methods:

We included 56 spastic children (29 males, 27 females) in our study with CP, aged between 5 and 16 years. We used radial focused ESWT (BTL-5000 SWT) for 4 sessions during the admission of each child on the mainly affected muscles using for all children the same treatment parameters (500 shocks, frequency: 10 Hz). All patients were assessed twice: for the first time during admission (before 1st ESWT application) and the second time at discharge (after the 4th ESWT session). The following examinations have been performed: active range of motion, modified Ashworth scale scores and patient's Quality of Life (QoL).

Results:

We found a significant decrease of modified Ashworth scale level. ESWT also proved to be efficient for the improvement of global functioning of the upper and lower limbs.

Discussion:

For more reliable statistical assessment and improvement of the methodology further studies are necessary.

Conclusion:

ESWT applied 4 times in 2 weeks decreased spasticity level in children without affecting the Quality of Life as other anti-spastic procedures might do.



TITLE: EFFECT OF RADIAL SHOCK WAVE THERAPY FOR REDUCTION OF MUSCLE HYPERTONIA IN CEREBRAL PALSY

Authors: M. Gonkova, E.M. Ilieva, , I. Todorova, G. Ferriero, I. Chavdarov

Affiliations: Department of Physical and Rehabilitation Medicine, Medical University of Plovdiv, Plovdiv, Bulgaria; Unit of Occupational Rehabilitation and Ergonomics, Salvatore Maugeri Foundation, Scientific Institute of Veruno, Italy; Specialized Hospital for Rehabilitation of Children with Cerebral Palsy "St. Sofia", Sofia, Bulgaria

Source: Annals of Physical and Rehabilitation Medicine, Volume 57, Supplement 1, May 2014

Abstract:

Background:

Extracorporeal shock wave therapy is used for the treatment of musculoskeletal disorders.

Objective:

The aim of our study was to investigate the effect of radial shock wave therapy (BTL-5000 SWT) on muscle spasticity of plantar flexor muscles in children with cerebral palsy. Twenty-five children, mean age 4.84 ± 3.11 years, with spastic diplegia and hemiplegia participated in the study. One placebo session was applied followed four weeks later by one active treatment session. We used passive range of motion, Modified Ashworth Scale and baropodometric measurements for outcome assessment.

Results:

After RSWT, a significant increase in passive range of motion was observed: 47.00 ± 2.298 versus 33.25 ± 2.208 ($P < 0.001$), which persisted at fourth week (44.12 ± 1.938 , $P < 0.001$). The Modified Ashworth Scale score decreased from 2.77 to 2.00 points ($P < 0.001$), persisting at the fourth week (2.15 ± 0.76 , ($P < 0.001$). Baropodometric measurement showed a significant increase in the contact plantar surface area (from 81.32 ± 6.14 to 101.58 ± 5.41 cm², $P < 0.001$) and in heel pressure (from 50.47 ± 6.61 to 75.17 ± 3.42 N/cm², $P < 0.001$).

Conclusion:

There is a significant decrease of spasticity in children with cerebral palsy after the application of RSWT.



TITLE: RADIAL SHOCK WAVE THERAPY IN CHRONIC PELVIC PAIN SYNDROME (CPPS)

Authors: Kernesnyuk Miroslav Nikolaevich

Affiliations: URO-PRO INTERNATIONAL MEDICAL CENTER, Yekaterinburg, Sverdlovskaya oblast, Russian Federation

Source: Urology, 2013, Volume 6. [original article in Russian language]

Abstract:

Objective:

To investigate the effectiveness of extracorporeal shock wave therapy (ESWT) in comparison to pharmacological treatment in patients for symptoms alleviation in chronic pelvic pain syndrome (CPPS).

Patients and Methods:

Thirty patients suffering from CPPS for at least 3 months were investigated in two groups. Both groups were treated once per week for a 6 months period. Group 2 was established as control group. The investigation was designed as controlled, randomized study.

ESWT was administered using a perineal approach with standard radial ESWT device (BTL-5000 SWT Power). In the first group, patients were treated by ESWT once a week for 4 weeks by a defined protocol. The second group received the pharmacological treatment. Standardised follow-up was performed 1, 2, 4 and 12 wk after the treatment.

Results:

All patients completed outpatient treatments and follow-ups. All 15 patients in the first group showed significant improvement of pain, quality of life in comparison to the control group, which experienced less significant improvements. Perineal ESWT was easy and safe to perform and was without any side-effects.

Conclusion:

The study revealed perineal ESWT as a safe and effective therapy option for CPPS with more significant effects in comparison to pharmacological treatment. ESWT is interesting because of its easy and inexpensive application, the lack of any side-effects.



TITLE: EVALUATION OF SWT EFFICIENCY IN ALLEVIATION OF CHRONIC PROSTATE INFLAMMATION

Authors: Michael Abadjiev, Rosen Dimitrov, Svetlin Zlatev

Affiliations: Department of Urology Hospital St. Anna, Sofia, Bulgaria

Source: Clinical study report, 2014

Abstract:

Purpose & Primary Objective:

This study was designed to investigate the effectiveness of extracorporeal shock wave therapy (ESWT) for symptoms alleviation in patients with chronic pelvic pain syndrome (CPPS).

The primary efficacy outcome is set to be a minimum of 50% of symptom alleviation in 50% of subjects after the last treatment with results lasting at the same level or being deteriorated by $\leq 10\%$ at 90-day follow up.

Methods:

Twenty nine male subjects of 27-70 years of age who suffering from chronic pelvic pain for more than 3 months and having no addiction to drugs or narcotics. All subjects received 4 treatments over 4-week period, with BTL-6000 SWT unit.

Results:

All subjects completed the treatment and 30-day follow up. All but two subjects (105 and 207) completed 90-day follow up. After the last treatment, twenty four subjects (82,76%) showed $\geq 50\%$ alleviation of the pelvic pain and urinary symptoms. Mean symptom alleviation through all 29 patients was 68%. Mean symptom alleviation after 30-day follow up showed result 73%.

After 90-day follow up was mean symptom alleviation back at 68%.

According to the response of the treatment, patients could be divided into two groups. In one group pre- and post-treatment evaluations showed significant reduction of symptoms ($\geq 50\%$), from moderate to mild on Symptom Scale Score (SSS), with difference 5-15 points of the SSS. In the second group, three subjects had relief from severe to moderate symptoms (even though two subjects did not comply the symptom alleviation $\geq 50\%$). Yet even another three subjects had highly significant relief from severe to mild symptoms on SSS, with difference of 11-16 points of the SSS. The BTL-6000 SWT subjects have met the primary efficacy outcome measure by achieving a minimum of 50% of symptom alleviation in 50% of subjects after the last treatment with results lasting at the same level or being deteriorated by $\leq 10\%$ at 90-day follow up.

Conclusion:

BTL-6000 SWT subjects have met the primary efficacy outcome measure and the shockwave procedure produces consistent, significant symptom alleviation after 4 once-a-week treatments, immediately post-treatment and at 30-day and 90 day follow up.

The results of the study show that the ESWT device BTL-6000 SWT is safe and efficacious for reducing chronic pelvic pain and urinary symptoms. Patients tolerate the treatment sessions nicely.



TITLE: EVALUATION OF SWT EFFICIENCY IN TREATMENT OF ERECTILE DYSFUNCTION

Authors: Krasimira Kazalakova, Stela Yordanova

Affiliations: University Multiprofile Hospital for Active Treatment and Emergency Medicine „N. I. Pirogov“, Sofia, Bulgaria;

Source: Clinical study report, 2014

Abstract:

Purpose & Primary Objective:

The main objective of the study was to investigate and prove the effectiveness and safety of extracorporeal shock wave therapy (ESWT) in treatment of erectile dysfunction (ED) caused by vascular disorders. The primary efficacy outcome is set to be a minimum increase in IIEF-EF ≥ 5 points in 50% of subjects after the last treatment with results lasting a at the same level at 90-day follow up.

Material and Methods:

We treated 8 middle-aged men 48-65 years old (average age: 55.5 ± 6.3 yr) with vasculogenic ED existence for more than 6 months. Patients underwent 8 treatments on every 3 - 4 days with BTL-6000 SWTunit. Assessment of erectile function was performed at screening, after the last treatment and at the 3- and 6-month follow-up examinations using the International Index of Erectile Function (IIEF) questionnaire. Outcome measures used are changes in the International Index of Erectile Function-erectile function domain (IIEF-EF) scores. Safety assessment was based on complications and reported adverse events.

Results:

All patients completed the treatment protocol of 8 consecutive procedures, 30 and 90-day follow-up visits. Pre- and post-treatment collected parameters from 5 patients (62.5%) met the primary efficacy criteria of IIEF-EF increase ≥ 5 points.). At 90 day follow-up examination, the IIEF-EF scores remained at the same level.

Conclusion:

The main object of the study was to investigate the effectiveness and safety of extracorporeal shock wave therapy (ESWT) in treatment of erectile dysfunction (ED) caused by vascular disorders. The results of the study show that the ESWT device BTL-6000 SWT is safe and efficacious to improve erectile function. Patients tolerate the treatment sessions well.



TITLE: THE EFFECTS OF BIOLOGICAL TOPIC ANALGESICS IN PAIN CONTROL BEFORE AND AFTER EXTRACORPOREAL SHOCKWAVE THERAPY

Authors: Carlos Leal, Orlando Hernández, María Camila Gallo, Margarita Cardozo

Affiliations: Fenway Medical Shockwave Unit, Bogota DC, Colombia

Source: 15th International Congress of the International Society for Medical Shockwave Treatment, 2012

Chronic tendinopathies are a common disease among athletes and regular patients. They cause significant pain and loss of function. Treatment is usually positive by means of load controls, physical therapy, bracing and medication. However, at least 20% of the cases remain in pain and dysfunction developing a healing disturbance commonly known as angiofibroblastic dysplasia. The biomechanical effects of this devascularization results in poor biomechanical function and ultimately, pain.

Shockwave medicine has proven to be effective in the treatment of chronic tendinopathies. However, one of the side effects of shockwave application is pain during the treatment, petechiae and superficial swelling in the area of application. The use of NSAID medications is contraindicated in shockwave treatments, as it blocks the inflammatory chain stimulated by ESWT. Local anesthesia has also been demonstrated to decrease results as it alters the local tissue acoustic resistance and hides the pain locations.

One alternative is to use topic biologic medications that do not alter the normal inflammatory process and may relieve pain during the procedure, as well as preventing swelling and petechiae. We have used Traumeel cream (Heel laboratories, Germany) as a local analgesic before and after the shockwave treatments.

Traumeel cream is made up of 14 components of natural origin, associated to the management of inflammatory process without altering the healing process of the injured tissues. It has a different mechanism of action of anti-inflammatories commonly used in medical practice. These compounds act synergistically together to accelerate the process of tissue repair and pain control based on the inflammatory response.

We performed a case-control study in patients diagnosed with chronic lateral elbow epicondylitis, treated for over six months with pain medication, physical therapy and steroid injections without improvement of the disease and who were booked for surgery. We included 76 patients diagnosed with lateral epicondylitis who were treated with two sessions of radial shockwaves. Our protocol is done with two weekly sessions of 2000 therapeutic shockwaves from 2 - 4.5 bar, using a BTL-5000 power radial shockwave generator (BTL Industries, Czech Rep.) We randomly assigned 27 patients in the study group who received Traumeel cream 6 hours before the treatment and every 12 hours for 7 days after the shockwave sessions. A placebo group of 25 patients received the same protocol, using a commercial moisturizing cream. A control group of 25 patients only received shockwave therapy with no topical additional treatment. We recorded pain with a VAS chart, and any possible adverse or side effects. We evaluated the patients on weeks 1, 2, 3 and 6.



Our results showed a significant loss of pain in the treatment group as compared with the placebo and control groups during the treatment, as well as on weeks 1 and 2. VAS pain reduction in the treatment group was 24% higher at the moment of the treatment, 20% higher at one week and 18% higher at two weeks. There were no significant differences on weeks 3 and 6. Placebo and control groups were significantly similar at all points. We did not find any differences in the presence of petechiae or hematomas on the application areas.



TITLE: HIGH ENERGY EXTRACORPOREAL SHOCKWAVE THERAPY VERSUS RADIAL SHOCKWAVE THERAPY IN LUMBAR FACET JOINT PAIN – SEARCHING FOR OPTIMAL TREATMENT PROTOCOL

Authors: Tomas Nedelka, Jiri Nedelka, Jakub Schlenker

Affiliations: Charles University Prague; , Center for Rehabilitation and Pain Treatment, Prague; Czech Technical University, Kladno, Czech Republic

Source: 16th International Congress of the International Society for Medical Shockwave Treatment, 2013

Abstract:

Introduction:

The facet joints are common sources of chronic low back pain with high prevalence in mid-age population. According to literature, more than 30 percent of patients with chronic non-radicular low back pain suffer from facet syndrome, which is characterized by localized axial pain, elicited by hyperextension in lumbar area, with referred pain to the buttocks and posterior thigh. Therapeutic approaches include pharmacological treatment such as 3rd generation anticonvulsant pregabalin and NSAID or opioids. Semi-invasive approaches to facet joints include diagnostic medial branch blocks, corticosteroids or radiofrequency treatment. In our previous pilot study, we have proved efficacy of radial shockwave therapy in treatment of lumbar facet joint pain, with results better than ultrasound guided corticosteroid injections and practically equal to radiofrequency treatment with favorable treatment effect duration. The aim of this study was to find optimal shockwave therapy procedure and to compare high-energy focused extracorporeal shockwave therapy (ESWT) against rSWT.

Methods:

A prospective study comparing effectiveness of high energy ESWT and rSWT was done in 64 patients fulfilling diagnostic criteria for chronic lumbar facet syndrome and responding to medial branch anesthetic nerve blocks. In all 64 patients (33 women, 31 men), we have provided MRI examination of lumbar spine, those with lumbar stenosis and moderate to severe degeneration lumbar disc disease were not included in our study. In 28 of patients, 99mTc bone scintigraphy was performed, all the results were positive with appropriate radionuclide accumulation within the facet joints. ESWT was performed in 32 patients (Group A) in 5 weekly sessions. Energy flux density was set to 0.35 mJ/mm², 1000 shocks per session were applied under US guidance, covering 2 segments. RSWT group (Group B) involved 30 patients in 5 weekly sessions and energy flux density was set to 0.12 mJ/mm² (compressor pressure of 3.8 bar), with 3000 shocks per session in 2 segments.

Results:

The data from 62 patients were collected and statistically evaluated, using paired t-test and ANOVA. Pre-treatment average visual analogue scale (VAS) was 5.2 cm in group A and 5.0 cm in group B. Severity of low back pain was measured using the Oswestry low back pain validated score with no changes between groups. Follow-up was set to 2 and 6 months. At 2 months follow up, we registered significant decrease in average VAS against the baseline value in both ESWT and rSWT groups (p=0.01 in group A, p=0.03 in group B). After 6 months, ESWT (group A, p=0.02) and rSWT (group B, p=0.04) shown significant changes in average VAS against the baseline. Mean VAS decrease (in p=50%) was higher in ESWT group (2.9 mm) than in rSWT group (2.0 mm) in 6 months follow-up. In patients with BMI>30 (6 patients in Group A, 5 in Group B, respectively), has shown significant VAS decrease in ESWT group only after 2 and 6 months.



Discussion:

In our previous study (Nedelka et al., 2012), we have found that rSWT could be the considerable therapeutic option with similar or higher efficacy, compared to ultrasound guided steroid injection. Advantages of rSWT were safety, absence of damage to facet joints and absence of local side effects - inflammatory reaction or medial branch denervations. Important pitfall of rSWT was depth of application, which restricted the usage of radial SWT to patients with BMI lower than 28. Energy administration in focused ESWT seems to be more suitable for use in facet joints. According to our recent results, ESWT confirmed increased efficacy in comparison to radial procedure almost with no limitations.

Conclusion:

Both ESWT and rSWT were effective in treatment of chronic lumbar facet joint pain. However, ESWT has shown its added value in superior pain relief with equal tolerability compared to rSWT. We have proved efficacy of ESWT also in obese patients, where rSWT usually fails due to insufficient depth of penetration.



TITLE: THE EFFECTS OF SHOCKWAVE APPLICATION FREQUENCY ON PAIN IN NORMAL SUBJECTS

Authors: Carlos Leal, Diana Lemus, Maria Camila Gallo

Affiliations: Fenway Medical, Bogota, Colombia

Source: 16th International Congress of the International Society for Medical Shockwave Treatment, 2013

Abstract:

Introduction:

For over ten years we have applied Radial SWT for chronic tendinopathies. We have found subjectively that using a progressive protocol starting with high number of repetitions per second and low energy, the patient feels less pain. This way, and using a two session treatment, we have been able to avoid the use of anesthetics, get the results we desire and match the data published in the literature. However, there are no reports of these findings, probably because pain control is a very difficult issue to analyze, and there is a great variability in evaluating this particular emotional sensation. We designed a simple case control study in normal subjects to determine the differences in pain generated by the application of Radial Pressure Waves on their hands, comparing a progressive protocol with a continuous protocol.

Methods:

We performed a case control study on 104 volunteer subjects with no medical records. They were divided in two groups of 52. They all signed an informed consent. We chose the hypothenar region of the right hand, because it is easily available, and a well-innervated area, with submuscular bone and no major nerves or vessels in the nearby region. In all cases we used a Radial SWT generator (BTL 5000 Power - BTL Industries Czech Rep). All subjects were tested and evaluated by the ISMST & ONLAT Certified authors. In the Cases Group we applied a progressive protocol using 200 shocks on 15 Hz, 200 shocks on 10 Hz and 200 shocks on 5 Hz. In the Control Group we used a constant of 600 shocks on 10 Hz. The Pressure was constant in both groups, using 2.0 bar. In order to determine any differences between subjects, both Cases and Control Groups volunteers were asked to try the opposite protocol on the opposite hand. We also recorded these data, as we wanted to determine if there were any differences within the subjects and avoid or find any placebo effect. We used numerical Visual Analogue Scale n/10, blinded for the patient. All data was recorded and analyzed using a One-Way ANOVA, and the P value was based in <0.01 . We also analyzed intergroup differences, gender and age, and a Normalized analysis of differences at the beginning and end of the trials. We had 76 males and 28 females with an average age of 31.5 y/o (17-46 y/o). All adverse effects were recorded.

Results:

The progressive protocol group experienced 29% less pain as compared with the continuous protocol group at the beginning of the test, with a VAS of 7,9 and 5,1 respectively. At the end of the test the differences were of 57% with VAS scores of 7,25 and 1,54 respectively. There was an average of in 43% in total pain reduction ($P<0.01$). The normalized analysis comparing the differences in VAS scores at the beginning and end of each test on each group



also showed a pain reduction of 34,6% in the progressive group as compared with a 7,2% in the continuous group, with a statistically significant difference of 27.4%. There were no significant differences in the data collected from the contralateral hands as compared with the primary tested hands. There were no differences in gender or age related data. There were no adverse effects in any subject.

Discussion:

The use of high repetitions with low energy seemed to favor pain control in normal subjects, as compared with a continuous protocol with the same energy and number of shockwaves delivered. The progression from high repetitions to low repetitions showed the best pain control in our series. Even though these results match our subjective clinical findings in tendinopathy patients, it calls our attention the lower progressive pain control in the continuous protocols. We have the feeling that there is also a good pain reduction in continuous protocols in our patients. We did not find a placebo effect in our study, and the results in primary or secondary tested hands were similar. We did not find any adverse effects. There was a clear and obvious apprehension in our subjects, being this pain study. All patients revealed they felt a discomfort sensation more than pain, but evaluated this sensation in very high VAS numbers. Our main limitation is having the tests done in normal subjects and not in tendinopathy patients. However, this solid data does show an effect with people that have the same pain baseline: none, something very difficult to standardize in symptomatic patients.

Conclusion:

Based on these results, we do recommend a progressive shockwave protocol in the treatment of tendinopathies, delivering a minimum dose of therapeutic impulses preceded by a progressive number of analgesic shockwaves. Further studies in clinical cases must be performed to determine these doses.



TITLE: DYNAMIC MYOFASCIAL TREATMENT AND ESWT

Authors: Jiri Nedelka , Tomas Nedelka

Affiliations: Rehabilitation Center and Pain Clinic, Prague; Charles University, 2nd Faculty of Medicine, Dept. of Neurology, Prague

Source: 17th International Congress of the International Society for Medical Shockwave Treatment, 2014

Abstract:

Introduction:

The authors are presenting the original method of treatment of locomotive system. This technique proceed from experience of Prague rehabilitation school, rehabilitation techniques in combination with the effect of shockwave therapy based on the principle of mechanotransduction. Long time experience with shockwave therapy used at the functional and structural disorders of locomotive system are presented here.

Methods:

Manual medicine techniques allow to relieve painful muscle spasm for follow up dynamic application of radial ESWT. This affects not only painful muscle spasm but also referred pain and peripheral pain perception itself.

Results:

Combination of manual therapy and dynamic application ESWT is very effective in the acute and chronic disorders of locomotive system with prompt pain relieve. Best effect was observed in non-specific cervical and low back pain and radial epicondylitis.

Discussion:

Manual therapy and dynamic application of ESWT has been much more effective than static one. This technique is enabling to affect multisegmental disorders of spine, fascias, joints.

Conclusion:

Authors are presenting own technique of treatment concered in musculoskeletal system. Optimal combination seems to be manual therapy according Prague's school and dynamic application of ESWT.

