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Session 1:

ESWT in Sports Medicine

The rationale and therapeutic effects of extracorporeal shock wave therapy (ESWT) on the rotator cuff lesions with shoulder stiffness: a prospective randomized study

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1. Introduction

Frozen shoulder usually undergoes three phases, freezing, frozen, and thawing state. However, secondary shoulder stiffness usually lasts longer if the underlying disease does not improve. We wish to investigate the rationale and therapeutic potential of a single-session high-energy extracorporeal shock wave therapy (ESWT) on the rotator cuff lesions with shoulder stiffness.

2. Material & Method

Thirty-seven patients afflicted with rotator cuff lesions with shoulder stiffness were randomized to receive either shockwave or sham treatment based on statistical randomization often failure of activity modification and / on physiotherapy for at least 3 months. In the shockwave group, we used Orthospec™ Extracorporeal Shock Wave Therapy

3000 impulse 24 kV (0.32 mJ/mm²) focused at two points as one session. The sham intervention entailed the use of the device in which the silicone pad was removed from the stand-off device. The visual analogue scale (VAS), muscle power of the shoulder, Constant and Murley score (CMS), and range of motion (ROM) of the shoulder were assessed for all patients. Ten millilitres of peripheral venous blood were obtained from every participant for the measurements of bio- markers before and at 1 week and 4 weeks after intervention.

3. Results

There was no difference in the demographic data between the two groups. The ESWT group has significantly better VAS, muscle power, CMS, and ROM at 6 and 12 months after intervention. No between-group differences were observed before as well as 1 and 4 weeks after intervention in the selected biomarkers.

4. Discussion

Initial resting, activity modification physiotherapy and anti-inflammatory management were important for the freezing phase. ESWT may be a good adjuvant for the treatment of rotator cuff lesions with shoulder stiffness after failure of initial treatment for at least 3 months.

Focused type extracorporeal shock wave therapy for ischial apophysitis in young gymnasts

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1. Introduction

The purpose of this study was to investigate the effectiveness of focused type extracorporeal shock wave therapy (ESWT) for ischial apophysitis in young gymnasts regarding pain improvement.

2. Material & Method

The subjects were 18 gymnasts who visited our hospital from November 2010 to June 2019 complaining of localized buttock pain: 4 male and 14 female with a mean age of 12.7 years (11-14), 11 right and 7 left, and a mean follow-up period of 213 days (27-852). In all 18 cases, radiographs revealed abnormal findings in the lateral wall of the ischium, therefore they were considered to have ischial apophysitis. 10 patients underwent only rehabilitation (R group), and 8 patients had both rehabilitation and ESWT (SW group).

Whether the pain had disappeared at the last observation and the duration from the first visit to pain disappearance were examined in each group. In SW group, the duration from the first visit to the start of ESWT, and from the start of ESWT to pain disappearance were also examined.

3000 shots of ESWT were administered at less than 0.20 mJ/mm^2 , with a mean of 3.6 sessions (2-6), with approximately 1-month intervals.

3. Results

All patients in SW group were free of pain after treatment, whereas only 2 patients in R group were. The duration from the first visit to the disappearance of pain was 51 days and 63 days in 2 patients of R group and 274 days (60-578) in SW group. In SW group, the mean duration from the first visit to the start of ESWT was 136 days (0-522), and the mean duration from the start of ESWT to pain, disappearance was 139 days (56-272).

4. Discussion

Once ischial apophysitis develops, it can take a long time for the pain to disappear. In fact, 80% of the patients in R group still had pain at final observation. On the other hand, pain had disappeared in all patients in SW group within approximately 4 months after the start of ESWT, suggesting that ESWT would be effective in pain improvement and the treatment of ischial apophysitis.

Extracorporeal shock wave therapy for First rib stress fracture.

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1. Introduction

The first rib stress fracture is a very rare fracture and is more likely to occur in sports that overuse the upper limbs. Good results are obtained in many cases, but in some cases long-term sports restrictions can be a serious problem for athletes. We report the good results of ESWT for the first rib stress fracture.

2. Material & Method

Six patients who visited our hospital from 2017 to 2021 and were diagnosed with stress fracture of the first rib by X-ray or CT were included. The average age was 18.3 ± 5.2 years and all patients were male. Chest CT was performed before ESWT in all cases. Confirming the absence of bulla at the apex of the lung. ESWT was performed with the DUOLITH SD1 shock wave system (from Storz Medical AG, Switzerland). We applied 3000 shocks at an energy flux density of 0.01-0.2 mJ/mm² depending on bio-feedback. During ESWT irradiation, it was performed at an angle of 30 degrees from the caudal side to the fractured part to prevent damage to the lung tissue. The average number of ESWT trials was 4.3 ± 1.6 . We evaluated the pain score by Numerical Rating Scale (NRS) and the period of return to sports.

3. Results

NRS improved from 10 points to an average of 0.5 ± 0.70 after ESWT. All patients returned to sports, and the average return to sports period was 31.5 ± 16.4 days. No complications were found in all cases.

4. Discussion

The clinical effects of ESWT on stress fractures include early pain relief by destroying free nerve endings, increased growth factors, and long-term tissue repair by promoting angiogenesis. In our case, an early pain-relieving effect was observed, and it was possible to return to sports at an early stage. ISMST contraindicates irradiation of high-energy shock waves of 0.2 mJ / mm² or more on lung tissue. We believe that CT to confirm the absence of bulla before ESWT and irradiating a low-energy shock wave from the caudal to the cranial side will minimize the effect on lung tissue. At the moment, it has passed without complications, but there is a need for long-term follow-up.

Session 2:

Basic Research

Effects of ESWT on neuroregeneration after median nerve reconstruction with autologous nerve grafts or three different conduits in the rat

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1. Introduction

Several studies evaluating the effects of ESWT on nerve regeneration in the sciatic nerve model of the rat have shown proregenerative effects of this non-invasive treatment method. Effects of ESWT on nerve conduits remain mostly unstudied so far. A feasible alternative to the murine sciatic nerve model, which has some severe disadvantages regarding animal welfare and evaluation of experimental outcome, is the median nerve model of the rat. The aim of this work was to evaluate nerve regeneration following conduit repair of the median nerve with and without immediate ESWT in rats.

2. Material & Method

We microscopically resected a 7-mm segment of the right median nerve in 123 male Lewis rats. The nerve defect was reconstructed with either an autologous nerve graft, muscle-in-vein conduit, chitosan-conduit, or silk fibroin conduit. Half of the animals in each group received a single application of ESWT (MTS, defocused, electrohydraulic applicator, 300 impulses, 3 Hz, 0.1 mJ/mm²). Functional recovery during the 12-weeks observation period was assessed via the grasping test, computerized gait analysis and electrophysiological evaluations.

3. Results

Regarding grasping strength, no significant effects of ESWT were apparent when comparing different reconstructive techniques, despite some positive tendencies. Electrophysiological evaluations did also not reveal any significant differences between reconstructive techniques, although autologous nerve grafts + ESWT were superior to both groups treated with muscle-in-vein conduits ($p < 0.05$) and animals treated with silk fibroin conduits ($p < 0.05$). Computerized gait analysis did also not reveal any significant effects of ESWT when comparing different reconstructive techniques.

4. Discussion

No significant effects of ESWT on peripheral nerve regeneration were observable in our study. This could on the one hand be related to the animal model we used, on the other hand the exact modes of action and optimum application forms of ESWT remain to be elucidated in future studies. The same applies to the materials used to manufacture nerve conduits. While evaluation of functional recovery via the grasping test was impeded in our study due to the animals' limited motivation to participate in the procedure, we were able to show that functional recovery was evaluable via computerized gait analysis.

Histomorphometric analysis of tidemark roughness and articular calcified cartilage thickness after extracorporeal shockwave therapy on various locations of knee osteoarthritis

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1. Introduction

Extracorporeal shockwave therapy (ESWT) on the various locations of knee osteoarthritis (OA) displayed the different therapeutic effects. Here, we exhibited the pathological changes and relationship of modified Mankin score, tidemark roughness (R_{tm}) and calcified cartilage thickness (CC_{thick}) by ESWT on different locations of rat knee OA.

2. Material & Method

The animal groups were named and examined for the ESWT on the specific locations. The knee OA was performed by anterior cruciate ligament transection and medial meniscectomy as well as treatment by shockwave at 0.25 mJ/mm² with 800 impulses. After the experiments, the pathological changes of R_{tm} and CC_{thick} of the articular cartilage were assessed using histomorphometry, image analysis and statistical analysis.

3. Results

The results of modified Mankin score, R_{tm} and CC_{thick} were significantly improved after ESWT in the medial locational groups than lateral locational groups by compared with Sham and OA groups. The data of all groups were used for statistical analysis to display a strong negative correlation between modified Mankin score and R_{tm} ($r = -0.9413$; $P < 0.001$). Positive trend correlation ($r = 0.741$, $P = 0.034$) was presented in the medial and Sham groups and negative trend correlation ($r = -0.372$, $P = 0.235$) in the lateral and OA groups between modified Mankin score and CC_{thick} . In relation of R_{tm} and CC_{thick} the medical and Sham groups were showed a negative trend ($r = -0.788$, $P = 0.022$) as well as lateral and OA groups were presented a positive trend ($r = 0.336$, $P = 0.235$). The correlation of Euclidean distance that derived from 3D scatter plot analysis presented the indicator of chondropathic conditions with strong correlation of OA stage in articular cartilage of femur ($r = 0.911$, $P < 0.001$) and tibia ($r = 0.890$, $P < 0.001$) after ESWT.

4. Discussion

Our results elucidated the pathological outcomes and correlations of efficacy from the data of R_{tm} and CC_{thick} by ESWT on different locations of knee OA. We displayed the Euclidean distance derived from modified Mankin score, R_{tm} correlation with the OA related chondropathic condition.

Advantages of preconditioning of ASCs by shockwave therapy

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1. Introduction

Objective: Benefits of preconditioning of ASCs with shockwave therapy

2. Material & Method

Manual fat collection by liposuction to avoid cell trauma and isolation of mesenchymal cells in the laboratory.

Choice of plastic with fine thickness and moldable to favor the direct application of DEFOCUSED SHOCK WAVES (Orthogold), a total of 1000 IMPULSES with 0.2 MJ/mm², 4hz.

4 Groups: Group 1: no shock wave treatment, Group 2: shock waves applied to the stromal vascular fraction, Group 3: shock waves on liposuction, Group 4: shock waves on enzyme-treated liposuction

Comparison between the groups: Cellular viability study with XLSTAT program and application of Friedman's test. Adipogenic and osteogenic differentiation study, Cell growth study (cumulative growth). Study of colony formation. Study of cell migration.

3. Results

Shock waves do not affect the viability of ASCs (no change in cell morphology and power)

Shock waves do not affect differentiation into adipose and osteogenic lineage

Shock waves do not alter the ability of ASCs to form colonies of cellular progenitors

Shock waves IMPROVE CELL GROWTH AND CELL MIGRATION

4. Discussion

Shock waves can be the "link" of mechanotransduction for stimulating cell biology

Hippo/YAP/TAZ mediates angiogenic response and exosome release upon SWT

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1. Introduction

SWT has been shown to induce tissue heart regeneration via (a) the release of angiogenic exosomes and (b) stimulating innate immune receptor TLR3. Hippo/YAP/TAZ is a crucial mechanosensing pathway mediating cardiac regeneration by stimulating the TLR-IFN pathway via exosome release. We therefore hypothesized that the mechanical stimulation of SWT causes the release of TLR3-activating exosomes via the Hippo/YAP/TAZ pathway.

2. Material & Method

Human endothelial cells were treated with SWT in vitro. Hippo/YAP/TAZ signaling was analyzed via immunostaining and western blotting. Transcriptional YAP/TAZ target gene expression was analyzed via RT-PCR upon SWT. A wound healing assay, a tube formation assay and proliferation were performed upon SWT in the presence of Hippo/YAP/TAZ stimulation or inhibition. Hippo/YAP/TAZ dependent exosome release upon SWT was analyzed via nanoparticle-tracking analysis and FACS.

3. Results

SWT induced nuclear translocation of YAP/TAZ and subsequent upregulation. This resulted in transcription of *CYR61*, *ANKRD1* and *CTGF*, the transcriptional target genes of YAP/TAZ. SWT resulted in improved wound healing, increased tube formation and proliferation of endothelial cells. However, SW effects were abolished upon inhibition of YAP/TAZ, whereas stimulation with its agonist LPA could mimic SW effects. SWT induced release of exosomes. This was again dependent on YAP/TAZ signaling. Released exosomes stimulated innate immune receptor TLR3 and subsequent interferon signaling.

4. Discussion

SWT activates Hippo/YAP/TAZ with concomitant downstream signaling. Hippo/YAP/TAZ activation upon SWT induces exosome release. Released exosomes stimulate TLR3. The Hippo/YAP/TAZ pathway plays a crucial role in the mechanotransduction of SWT.

miR-19a-3p containing exosomes improve function of ischemic myocardium upon shock wave therapy

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1. Introduction

As many current approaches for heart regeneration exert unfavorable side effects, the induction of endogenous repair mechanisms in ischemic heart disease is of particular interest. Recently, exosomes carrying angiogenic miRNAs have been described to improve heart function. However, it remains challenging to stimulate specific release of reparative exosomes in ischemic myocardium. In the present study, we sought to test the hypothesis that the physical stimulus of SWT causes the release of exosomes. We aimed to substantiate the pro-angiogenic impact of the released factors, to identify the nature of their cargo, and to test their efficacy in vivo supporting regeneration and recovery after myocardial ischemia.

2. Material & Method

Ischemic muscle and human umbilical vein endothelial cells underwent SWT. Exosomes were isolated subsequently from the supernatant and characterized by transmission electron microscopy, nanoparticle tracking analysis and flow cytometry. Exosome content was evaluated via a miRNA sequencing array. To investigate a potential effect of SWT in chronic ischemic heart failure, SWT was applied to chronic ischemic myocardium. Heart function was analyzed via transthoracic echocardiography and pressure/volume measurements and myocardial scar was quantified.

3. Results

Mechanical stimulation of ischemic muscle via SWT caused extracellular vesicle (EV) release from endothelial cells both in vitro and in vivo. Characterization of EVs via electron microscopy, nanoparticle tracking analysis and flow cytometry revealed specific exosome morphology and size with presence of exosome markers CD 9, CD81 and CD63. Exosomes exhibited angiogenic properties activating protein kinase b (Akt) and extracellular-signal regulated kinase (ERK) resulting in enhanced endothelial tube formation and proliferation. A miRNA array and transcriptome analysis via next-generation sequencing were performed to specify exosome content. miR-19a-3p was identified as responsible cargo, antimir-19a-3p antagonized angiogenic exosome effects. Exosomes and target miRNA were injected intramyocardially in mice after left anterior descending artery (LAD) ligation. Exosomes resulted in improved vascularization, decreased myocardial fibrosis and increased left ventricular ejection fraction.

4. Discussion

The mechanical stimulus of SWT causes release of angiogenic exosomes. miR-19a-3p is the vesicular cargo responsible for the observed effects. Released exosomes induce angiogenesis, decrease myocardial fibrosis and improve left ventricular function after myocardial ischemia.

Shock waves induce an evolutionary conserved mechanism of spinal cord regeneration

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1. Introduction

Spinal cord ischemia (SCI) remains a devastating complication after aortic dissection or repair. A primary hypoxic damage is followed by a secondary damage resulting in further cellular loss via apoptosis. Affected patients have a poor prognosis and limited therapeutic options. In this study we aimed to (a) investigate the efficacy of SWT for regeneration of SCI and (b) to highlight underlying mechanisms.

2. Material & Method

SCI was performed in a murine contusion model in wild-type (WT) and **Tlr3^{-/-}** mice with subsequent SWT. Functional performance of animals was evaluated. Spinal cord lesions and bladder size were quantified and evaluated via MRI. Dorsal root ganglia (DRGs) were isolated and neuronal sprouting, survival and metabolism were evaluated. Human spinal slice culture was performed. Zebrafish were subjected to traumatic spinal cord injuries followed by treatment with a TLR3 inhibitor or a TLR3 agonist.

3. Results

SWT improves motor function and decreases lesion size in wild-type but not **Tlr3^{-/-}** mice via inhibition of neuronal degeneration and IL6-dependent recruitment and differentiation of neuronal progenitor cells. SWT reduced the number of ROS positive cells and apoptosis upon ischemia via induction of the antioxidative factor NRF2. Both SWT and TLR3 stimulation enhance neuronal sprouting and improve neuronal survival, even in human spinal cord cultures. We identify TLR3 as crucial enhancer of spinal cord regeneration in zebrafish. To translate our findings into a clinical setting, we treated five patients with spinal cord ischemia using SWT (mean age 65.3 years). Four patients presented with acute aortic dissection (80%), 2 of them exhibited preoperative neurological symptoms (40%). Impairment was ASIA A in 1 patient (20%), ASIA B in 3 patients (60%) and ASIA D in 1 patient (20%) at baseline. At follow up, 2 patients were graded as ASIA A (40%) and 3 patients as ASIA B (60%). SCIM score showed significant improvement. Examination of WHOQOL questionnaires revealed increased scores at follow up.

4. Discussion

Our findings indicate that TLR3-signalling is an evolutionary conserved pathway involved in spinal cord regeneration and suggest its stimulation via SWT could become a potent regenerative treatment option.

Therapeutic transdifferentiation of fibroblasts to functional endothelial cells upon shock wave therapy

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1. Introduction

Reprogramming of cardiac fibroblasts towards functional endothelial cells is a promising strategy for the vascular regeneration of ischemic myocardium. Recent studies reveal that stimulation of inflammatory signaling is required for effective chromatin remodelling and nuclear reprogramming. Mechanical conditioning of myocardium via shock wave therapy (SWT) has been shown to activate TLR3. We hypothesized that the activation of TLR3 via SWT might facilitate reprogramming of fibroblasts towards endothelial cells.

2. Material & Method

Human cardiac fibroblasts were treated with SWT or TLR3 agonist poly(I:C) in the presence of a specific induction medium known to promote endothelial lineage and analyzed for the expression of endothelial-specific markers. Induced endothelial cells (iECs) were subjected to functional endothelial cell assays including NO production and tube formation. iECs were suspended in matrigel and injected subcutaneously. A lineage tracing experiment was performed in a transgenic mouse model of Fsp1-Cre/LacZ mice after coronary occlusion and SWT. Myocardial scarring was evaluated histologically, whereas left ventricular (LV) function was assessed via transthoracic echocardiography. Chromatin remodeling and epigenetic plasticity were evaluated via Western Blot and ATAC sequencing.

3. Results

SWT activated TLR3 signaling and triggered the expression of endothelial genes in a TLR3 dependent fashion. SWT resulted in higher numbers of iECs. iECs were capable of producing endothelial nitric oxide (NO) and of forming tube-like structures. In vivo, the subcutaneous injection of iECs resulted in higher numbers of vessels and improved perfusion in a Matrigel plug assay. In a lineage tracing experiment in Fsp1-Cre/LacZ mice, we found higher numbers of LacZ/CD31 positive cells after coronary occlusion and subsequent SWT indicating transdifferentiation in vivo. Myocardial scar size was reduced after SWT, whereas LV function was improved. Mechanistically, SWT enhanced epigenetic plasticity via the TLR3 – NFκB - IL-6 –STAT3 – PRDM14 axis. SWT and Poly(I:C) induced significant changes in chromatin organization, with chromatin being more accessible after both treatments in 1705 genomic regions.

4. Discussion

We provide evidence for the induction of transdifferentiation in ischemic myocardium via SWT. Therapeutic transdifferentiation may contribute to the beneficial effects of SWT in the clinic.

Session 4:

ESWT in Pain and Myofascial Treatment

Myofascial trigger points treatment with extracorporeal shock waves: a novel approach for plantar fasciitis

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1. Introduction

Plantar fasciitis (PF) is a common cause of heel pain. Since the plantar fascia is anatomically connected with the lower limb's fascial system, they should be considered as a unique structure. Recent studies suggest that PF may be a consequence of myofascial impairment proximal to the pain area with a biomechanical disequilibrium of the entire limb and pelvis. Extracorporeal Shock Wave Therapy (ESWT) is proposed as the standard therapy for PF. Additionally, Fascial Manipulation (FM) is a manual therapy that aims at restoring the correct fascial gliding to regain biomechanical equilibrium. By combining FM and ESWT, the purpose of this study was to evaluate the effectiveness of ESWT on the impaired myofascial trigger points of the limbs and pelvis on subjects with PF and compare it to the ESWT traditional approach.

2. Material & Method

Thirty patients suffering from PF were randomly assigned to an Experimental Group (EG) and a Traditional Group (TG). EG received focused-ESWT on myofascial trigger points selected according to FM method, while TG patients were treated with focused-ESWT on the plantar fascia. Every patient underwent a 3-sessions program and follow-ups after 1 and 4 months. For each session, 1500 shocks per point (0.05-0.167 mJ/mm², 5 Hz) to EG and 2000 shocks (0.32 mJ/mm², 5 Hz) to TG were administered. Before treatments and follow-ups, outcome measures (17-iFFI; FAOS) were recorded. Mixed-model statistical analysis was performed considering the difference between each session and the baseline values (first session' score).

3. Results

17-iFFI and FAOS improved over the treatments in both groups; this was confirmed during follow-ups. Comparing to baseline, 17-iFFI significantly decreased over the course of the sessions (time-effect $p < 0.0001$), while FAOS increased accordingly (time-effect $p < 0.0001$). The EG performed best both for 17-iFFI (treatment-group effect $p = 0.0016$) and FAOS (treatment-group effect $p = 0.0072$) starting from the third treatment.

4. Discussion

ESWT on the myofascial trigger points reduced heel pain in patients with PF by restoring the correct gliding and biomechanical equilibrium of the fascial system. It could represent an interesting alternative for the conservative management of PF.

Adhesive capsulitis: combined treatment with shock waves and ballistic waves performed during the physiotherapy session

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1. Introduction

Frozen shoulder (or adhesive capsulitis) is a pathological condition characterized by pain, global reduction in the range of the glenohumeral joint. It consists of a non-specific inflammation of the joint capsule that most frequently affects women between 40 and 60 years of age, idiopathic or secondary to joint trauma and surgery. Predisposing causes can be trauma, surgery, diabetes, hypothyroidism, Parkinson's disease, recent myocardial infarction, Phenobarbital therapy. Numerous studies show the effectiveness of physical therapies and physiotherapy in reducing recovery times. In particular, shockwave treatment aims to contribute to the resolution of the pathological condition thanks to its proven effects on both pain and inflammation, in addition to the regenerative effect on tissues

2. Material & Method

18 patients aged between 18 and 70 years are recruited. After radio- and ultrasound control, they underwent 1 treatment session and clinical evaluations on a weekly basis with a protocol divided into 3 consecutive phases: 1) therapy with focused shockwaves (800 strokes at 0.08 - 0.25 mJ / mm²); 2) combined treatment with ballistic waves (with heads suitable for myofascial treatment) and physiotherapy; 3) stretching exercises, pumping maneuvers, mobilization with movement, manual therapy, and self-mobilization exercises. Clinical evaluation, including physical examination, joint ROM and VAS, DASH and SPADI scores, was performed before starting the first treatment session (T0), immediately after the first session (T1) and one month after the session (T2).

3. Results

A dramatic increase in mobility of the shoulder joint at T1 was observed, with a significant increase in both active and passive joint ROM. In addition, a significant reduction in mean VAS scores, corresponding to a reduction in pain, and a significant improvement in shoulder function with improvements in DASH and SPADI scores were demonstrated. The results show a further improvement at time T2, although the most evident increase is observed immediately.

4. Discussion

In addition to the anti-inflammatory and regenerative effects induced by shockwave therapy, this study showed how the synergistic effect of ballistic wave therapy to allow the therapist and the patient to maximize exercises and rehabilitation maneuvers.

Case report of Radial Pressure Waves efficacy on myofascial pain in patient with serious post-COVID syndrome

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1. Introduction

Covid-19 pandemia leads to increasing numbers of patients suffering from post-COVID syndrome, referred to our centre for persistent and various symptoms, including worsening of respiratory function, muscle dysbalances and impaired pain perception (myofascial and insertional pain, depression, increase in neuropathic pain in those with peripheral nerve lesions etc.). We have encountered also a lot of abnormalities in postural function among those patients.

2. Material & Method

We are presenting a case report of 46-years old woman, 4 months after serious Covid-19 pneumonia, without any previous history of chronic internal or locomotive system illnesses, now suffering from serious fatigue, dyspnea, breathing problems and chronic myofascial pain in upper neck and shoulders. We report the efficacy of low energy (2,2 bar, 2000 shocks) Radial Pressure Waves (RPW) therapy applied on behalf of our dynamic myofascial treatment principle on myofascial pain intensity, posture, breathing pattern and respiratory parameters. Reactive changes of perfusion were measured by FLIR recordings, showing changes of vascular function after RPW application.

3. Results

In our case report, we document that a low energy radial treatment appears to be effective in treatment of myofascial pain intensity, referred and transferred pain and respiratory dysfunction in a patient with post- COVID syndrome.

4. Discussion

COVID-19 is a deadly infection affecting both pulmonary function, but seems to be destructive also to other systems of human body. Post-COVID syndrome is one of frequent and serious consequences of this novel problem, and its reason is still not elucidated. RPW seem to be promising in ameliorating of locomotive, postural and respiratory symptoms. However, this preliminary report has to be followed by a study on a larger sample.

Shoulder chronic pain management and Extracorporeal Shockwave Treatment through an interdisciplinary rehabilitation perspective: A case report

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1. Introduction

Chronic pain and non union of a fracture are correlated with a decline in patient's quality of life and an increase in medical costs. We present the interaction of extracorporeal shockwave treatment (ESWT) in a female patient 71 years old who were self referred to our center due to her chronic shoulder pain. Patient suffered from shoulder chronic pain 4 months ago, due to a humeral fracture after a fall, myofascial pain syndrome (mps) in her shoulder girdle muscles, severe arm oedema, severe restriction in ROM of her left shoulder and in her participation in activities of daily living (ADL). Medical history of length leg discrepancy and right hemiparesis due to transient stroke and knee osteomyelitis

2. Material & Method

fESWT and rESWT incorporated in an interdisciplinary rehabilitation model. fESWT parameters consisted of frequency 20Hz, 4000 pulses per session, energy flux density (EFD) 0.53 J/mm² aiming to fracture healing and rESWT parameters were 15Hz, 3000 pulses per session, intensity 2.0 bars, aiming to mps pain management. Patient arm were protected with a Sarmiento cast. Patient followed Pulsed Magnetic Stimulation (PMS) and therapeutic exercise sessions too, aiming to bone healing and shoulder muscle girdle stretching and strengthening, respectively. PMS parameters were frequency 5Hz, intensity 40% of 3 Tesla, session duration 10 minutes. Therapeutic exercise sessions were of a 15min duration, 2 sessions per week. ESWT frequency sessions was one per week and 8 in total. PMS and therapeutic exercise frequency sessions were 2 per week and 16 in total. Patient followed, also, two supportive sessions with the psychologist of our center.

3. Results

Outcome scales were the Visual Analogue Scale for pain (VAS: 1/10 vs VAS: 7/10), radiographic assessment 6 weeks post treatment, X-ray improvement after first ESWT 6 sessions, improvement of ROM and painless patient return in ADLs

4. Discussion

ESWT seems that could be considered a pain tool in shoulder chronic pain management, positively influences bone remodeling, especially when it is incorporated in an interdisciplinary rehabilitation program. Treatment is patient well tolerated, without side effects, short in time, reduces medical costs and improves patient quality of life.

Session 6:

ESWT in Urology and Sexual Medicine

Efficacy low-intensity shockwave therapy plus tadalafil 5 mg once daily in men with erectile dysfunction (ED): comparison study.

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1. Introduction

Erectile Dysfunction (ED) affects 52% of men aged 40 – 70. Currently, the range of ED physiotherapy treatment methods has been supplemented by Low intensity extracorporeal shock wave therapy (Li-ESWT), based on the regeneration of blood vessels and the formation of new ones .

2. Material & Method

The research included 22 ED patients who reacted to oral PDE5i therapy, with an average age of 41 (men aged from 30 to 60). Patients were divided into 2 groups: the 1st (control) group consisted of 11 people who received PDE5i 5 mgr daily for 3 months and the 2nd (main) group is made of 11 people receiving the Li-ESWT Protocol in combination with daily pde5i 5 mgr for 3 months. The Li-ESWT procedure was performed once a week. The shock pulse number was 3000 per session, with the frequency of 3 Hz and the Course of 5.

3. Results

the treatment efficiency was evaluated by IIEF , which patients filled in 1 , 3, 6 months after the end of the treatment. The average IIEF indicators before the research did not differ significantly between groups 1 and 2: (13.36 ± 2.69 and 14.27 ± 3.23 , respectively ($p > 0.05$). Group 2 patients showed a significant increase in the average IIEF-5 indicators after 4 weeks of treatment: (23.82 ± 1.17 ($p < 0.05$), as well as after 12 weeks of therapy : (24.27 ± 1.1 ($p < 0.05$), as well as 3 months after the treatment end: 23.36 ± 1.91 ($p < 0.001$) compared to group 1: (17.91 ± 1.92 ; 18.36 ± 2.11 ; 14.0 ± 1.18 accordingly). The average IIEF indicators in group 2 peaked after 3 months of treatment and decreased slightly 3 months after the therapy end. In contrast, the effect of PDE5i-5 monotherapy reverses 3 months after the therapy stopped.

4. Discussion

the research compared the clinical effects and long-term efficacy of PDE5i monotherapy and PDE5i Li-ESWT combination therapy. The data obtained coincide with the data of other researchers and allow us to consider the effect of Li-ESWT longer-lasting compared to pde5i monotherapy.

LiESWT in the treatment of vasculogenic ED, CPPS and IPP

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1. Introduction

The aim of this presentation is to summarize recent clinical evidence and our own experience of Li-ESWT use in urological patients with vasculogenic ED, CPPS and IPP

2. Material & Method

During 2015-2020 more than 400 of men were treated at our Clinic by Li-ESWT with four different devices. Three available therapeutic techniques were compared and evaluated with an emphasis on new Linear Shockwave Tissue Coverage (LSTC) technique and an unique Motil's Algorithm for tailored treatment - both developed by us .We have also evaluated the treatment outcomes in two single-blinded, sham-controlled, clinical trials published in 2017 and 2020.

3. Results

We were able to submit a comprehensive overview of Li-ESWT treatment in urology as well as determine future tasks and goals to be done.

4. Discussion

We could conclude that the complete tissue coverage and algorithm-based tailored approach, together with a proper patient's endothelial dysfunction evaluation are very important factors for successful shockwave treatment of vasculogenic ED. We also present our experience and suggestions regarding the LiESWT treatment of CPPS and IPP.

Low Energy Shock Wave Therapy for Interstitial Cystitis: Preclinical Efficacy in HCL Induced Cystitis Rat Model and Proof of Concept Randomized Placebo Controlled Clinical Trial

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1. Introduction

We examined the effects of low energy shock wave (LESW) on bladder and mitochondrial function in a rat model of HCl induced cystitis, and measured the change of urinary biomarker levels in interstitial cystitis/bladder pain syndrome (IC/BPS) patients received LESW or placebo.

2. Material & Method

Female Sprague-Dawley rats underwent urethral catheterization and intravesical instillation of 0.2 ml of 0.4N HCl (N=32) or 0.2 ml saline (N=8) kept for 90 s. After HCl instillation, the bladder received LESW treatment while filled with 0 ml, 0.2 ml or 0.4 ml saline or no LESW treatment. Continuous cystometry was performed and bladder was harvested for histology and Western blotting on day 8.

The change of 41 urinary biomarker levels, and O'Leary-Sant symptom scores (OSS) and visual analog scale (VAS) for pain was measured at baseline, 4 and 12 weeks post treatment in 25 IC/BPS patients received LESW or placebo once a week for 4 weeks.

3. Results

HCl provoked bladder overactivity, bladder wall inflammation marked by infiltration of mast cells, increased bax/bcl2 ratio consistent with increased TUNEL staining and increased release of mitochondrial-integrity markers (cleaved caspase 3 and Cytochrome c), which were suppressed by LESW treatment irrespective of the volume of saline in bladder at the time of LESW.

The LESW group exhibited a significant reduction in the OSS and VAS compared to the placebo group 4 weeks post-treatment ($p < 0.05$), and the effects were persistent at 12 weeks. The difference in urinary markers change in LESW vs placebo was $p = 0.054$ for IL4, $p = 0.013$ for VEGF, and $p = 0.039$ for IL9 at 4 weeks.

4. Discussion

These findings support that anti-inflammatory effect of LESW in chemical cystitis is associated with the reversal of the molecular-cellular perturbations in mitochondrial dependent intrinsic apoptotic pathway. Furthermore, IL4, IL9, and VEGF mediation may be involved in its pathophysiologic mechanisms and response to LESW treatment in IC/BPS. LESW may be a promising treatment of IC/BPS and controlled multicenter studies are needed.

Are radial pressure waves effective in treating erectile dysfunction? A systematic review of preclinical and clinical studies

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1. Introduction

Radial waves are low-pressure waves generated by the impact of two bodies, usually induced by pneumatic pressure, and although their use is endorsed for osteotendinous diseases, it is still not clear what their mechanism of action is for the treatment of erectile dysfunction. The aim of this systematic review is to evaluate the effect of radial waves for the treatment of men with erectile dysfunction, as well as their effect on the production of nitric oxide and vasculogenic endothelial growth factor in animal models or cell cultures.

2. Material & Method

Electronic database systematic searches and manual searches were performed to identify 1) randomized clinical trials (RCTs) or cohort studies evaluating the effectiveness of radial waves in men with ED and 2) preclinical trials in animal models or cell cultures in which the production of nitric oxide, vasculogenic endothelial growth factor or others erectil markers were evaluated. Study quality was assessed, and data were extracted from each study. A narrative synthesis of the results was performed given the high heterogeneity between the selected studies.

3. Results

Four studies in animal models and one RCT in men with ED and kidney transplantation met the selection criteria. Preclinical studies in animals suggest that radial waves increase cellular apoptosis in penile tissue, while vascular endothelial growth factor expression increases in brain tissue. In men with ED and kidney disease, no differences were found between radial wave therapy and placebo therapy in the IIEF score, EHS, or penile Doppler parameters.

4. Discussion

After an extensive literature search, we found no head-to-head studies comparing the effect of radial waves versus focal waves on erectile function. Except for one study in rats, no other studies were identified that evaluated parameters of relevance to improve erectile dysfunction in specific penile tissue. The preclinical and clinical evidence identified in this review is not conclusive and, in some cases, is contradictory. Studies with a more robust methodology are necessary to evaluate the effect of this type of wave on erectile function.

Efficacy and safety of radial pressure waves for the treatment of erectile dysfunction

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Boston Medical Group, Colombia

1. Introduction

Radial waves are an effective therapy for the management of various problems at the muscular and joint level, thanks to the effect it has on the activation of microcirculation. The effect of radial waves on men with erectile dysfunction is currently unknown; however, they are offered to patients as focal shock waves, but their mechanism of action is very different. The objective of this study was to evaluate the efficacy and safety of radial wave therapy in men with erectile dysfunction.

2. Material & Method

A randomized, double-blind, sham-controlled clinical trial was done. 80 patients with erectile dysfunction, International Index of Erectile Function – Erectile Function (IIEF-EF) score between 11 and 21, without sickle cell anemia, anticoagulation treatment, comorbidities, or conditions associated with secondary erectile dysfunction were included. Patients were randomized 1:1 to 6-week sessions of radial wave therapy, or 6-week sessions of sham therapy. All patients received sildenafil 20 mg. The change mean of the IIEF-EF score at 6 weeks after randomization was primary outcome.

3. Results

Eighty men were randomized. The average baseline IIEF-EF score was 16.3 +/- 3.2, and the median baseline erection hardness score (EHS) was 3 (range, 1 to 3). At 6 weeks after randomization, the average change in the IIEF-EF score was 3.4 (95% confidence interval [CI] 1.5-5.2) in the radial wave group and 4.2 (95% CI 2.5-5.9) in the sham wave group ($p = 0.742$). No change was observed in the median EHS score in the evaluations. No serious adverse events occurred in two (5%) patients after radial wave therapy and in one (2.5%) patient after sham therapy.

4. Discussion

No difference was found between men with erectile dysfunction treated with 6 session of radial waves and men treated with placebo waves. This can be explained because, unlike focal shock waves, the effect of radial waves is superficial and cannot activate the vascular endothelium in the corpora cavernosa of the penis.

Decrease in Opioid Use Post-Vestibulectomy Based on Pre-Operative Low Intensity Vestibular Shockwave Therapy (LiSWT)

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1. Introduction

Surgeons performing complete vestibulectomy for neuro-proliferative vestibulodynia (NPV) need to consider acute pain relief in the early postoperative period and risks for persistent opioid use. One patient who failed multiple vestibular LiSWT sessions to manage her pain eventually underwent vestibulectomy. We observed that post-operatively there was minimum hydrocodone use. Since a study showed that pre-operative LiSWT improved wound healing and surgical outcome, it was hypothesized that LiSWT promoted enhanced blood supply and angiogenesis through expression of vascular endothelial growth factor and nitric oxide synthesis, and via anti-inflammatory action downregulating necrosis factor B activation thereby lowering inflammatory cytokines. In women undergoing vestibulectomy for NPV, we wished to see if pre-operative LiSWT would reduce post-operative opioid use. We compared opioid use post-op vestibulectomy in patients who had and had not undergone LiSWT just prior to surgery.

2. Material & Method

This is a pilot study of patients' post-operative vestibulectomy experiences with opioid use for post-operative pain management. Patients scheduled for surgery were required to present to the hospital 4 days before surgery for a COVID-19 test. They underwent vestibular LiSWT at our clinic on that day and each subsequent day until surgery; 2400 shocks, energy flux density 0.09-0.11 mJ/mm², 3 Hz, membrane pressure 3 using the Urogold 100TMMTS, FDA-cleared for pain amelioration, providing unfocused electrohydraulic shockwaves with a unique parabolic reflector (OP-155).

3. Results

Patients are routinely prescribed # 60 oxycodone 5 mg/acetaminophen 325 mg tablets to be taken every 4 hours as needed. Mean post-op opioid use was 38 +/- 15 tablets in 10 vestibulectomy patients (mean age 29 +/- 10 years) who did not undergo pre-op vestibular LiSWT; opioid side effects included constipation, nausea, fainting, blurred vision. Mean post-op opioid use was 14 +/- 6 tablets in 9 vestibulectomy patients (mean age 27 +/- 9 years) who did undergo pre-op vestibular LISWT sessions x 3; opioid side effects were restricted to constipation and nausea.

4. Discussion

In this pilot study, pre-op LiSWT using Urogold 100TMMTS decreased post-op opioid use after complete vestibulectomy with vaginal advancement flap. While encouraging, more research is needed.

Session 7:

ESWT in Wound Healing Disorders

Extra Corporeal Shock Wave therapy as additional treatment for lymphedema after breast cancer and lymphatic surgery.

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1. Introduction

A complication of breast cancer (BC) patients treated with axillary surgery is upper limb lymphedema. If longstanding, fibrosis and fat hypertrophy develops and is clinically seen as a non-pitting edema.

2. Material & Method

Ten patients, 9 females and 1 male, presenting with a unilateral advanced fibro-lymphedema (stage III) after BC therapy were selected. All patients were treated initially by breast and axillary surgery, additional chemotherapy and radiation therapy. Despite complete physical therapy, derivative and reconstructive lymphatic surgery, the lymphedema persisted.

Patients were treated with an "MTS Dermagold ow 100" electro-hydraulic shock wave device with an OP155 unfocused applicator during 4 weeks, twice weekly. At each session, 1800 shocks were applied to the clinical most fibrotic zone and 800 shocks in a grid pattern around this area. The energy level was set on 0.10 mJ/mm², a frequency of 4 Hz, membrane pressure level 6 or 7. The generated shock wave with these parameters has a penetration depth of around 8 cm and a large focus of around 10 to 15 mm. The total amount of energy applied per session is 5880 mJ. No special preparation or anesthesia is required for this type of therapy.

3. Results

Mean circumference of the upper limb was significantly decreased from 32.3±3.01 cm to 31.4±2.71 cm at the height of upper arm, from 29.1±2.89 cm to 28.1±2.71 cm at the height of the elbow and from 27.5±4.08 cm to 26.8±3.75 cm at the height of the forearm. Upper limb volume decreased non-significantly, from 3086.4±539.47 ml to 2909.1±471.60 ml. Subjective measurements by Visual Analogue Scale (VAS) showed significant decrease in both hardness from 57.3±15.84 mm to 24.4±21.89 mm and subjective feeling of edema from 44.2±16.90 mm to 23.2±21.16 mm. No adverse features were reported.

4. Discussion

Extra corporeal shockwave seems to be a well-supported and harmless treatment, also in advanced LE. Administered to the fibrotic areas softening of the skin and hypodermis and further reduction of the edema brings more comfort to the patients. Direct mechanical effect on fibrotic areas and tissue regeneration by stimulating (lymph) angiogenesis are thought to be responsible for this clinical result.

Session 8:

ESWT in Neurological Pathologies

Longitudinal study of mild cognitive disease with TCE

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1. Introduction

Ultrasound-based brain stimulation techniques may become a powerful new technique to modulate the human brain in a focal and targeted manner as recently demonstrated in several studies.

To proof the efficacy of transcranial pulse stimulation (TPS) in mild cognitive decline and early Alzheimers disease. Uncontrolled pilot study of 4 patients with longterm follow up (3 months).

2. Material & Method

Inclusion criteria: – Clinically stable patients with mild cognitive decline (MCD) or early Alzheimer´s disease (EAD) (Diagnosis according to ICD-10 (F00) and NIA-AA Criteria by an expert in cognitive neurology) – At least 3 months of stable anti-dementia therapy or no anti-dementia therapy necessary – Signed written informed consent – Age \geq 18 years.

Exclusion criteria: – Non-compliance with the protocol – Relevant intracerebral pathology unrelated to the AD (e.g. brain tumor) – Hemophilia or other blood clotting disorders or thrombosis – Corticosteroid treatment within the last 6 weeks before first treatment – Pregnant or breastfeeding women

Cranial MRI and evaluation by neurologist to check the proofs and establish the probale diagnosis of MCD or EAD. Neuropsychological assessment before and after treatment, one and three months after. Neuropsychological battery was Barcelona test .Evaluation at three months by the same specialist in neurology.

Then the patient received 6000 pulses/sesión (both frontal áreas 800 pulses, parietal areas each one 400 pulses and precunean area 600 pulses and repeat the same sequence), short pulses 3microseconds, energy level 0.2-0.3 mJ/mm² .Duration of the treatment about 30 minutes and during two weeks, three times/week.

3. Results

Inclusion of 4 patients .3 out 4 patients were diagnosed of EAD and 1 out 4 of MCD. 3 out 4 patients complete the follow up. 1 patient missed because of moving to another city. All the patients that complete the follow up experienced a sustained improvement in attention and fluency of language for at least three months.

4. Discussion

Although the number of patients is not significant the results in neuropsychological follow up visits concerning language and attention improve and this improvement is maintained and after 4 months begins to decline. Further investigation is needed and longer revision.

Shock wave treatment in patients with unilateral spasticity of the upper limb after ischemic or hemorrhagic stroke

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1. Introduction

Spasticity is a common complication in patients with stroke. Patients suffer from exaggeration of stretch reflexes with uncontrolled, repetitive, involuntary muscle contractions and enhanced reflexes. It is associated with reduced quality of life, increased pain and joint contractures. Current treatment alternatives exhibit serious side effects with limited efficacy. Therefore, there is a strong need for an effective spasticity treatment. In this study, we aimed to test the efficacy of SWT for the treatment of post-stroke spasticity (PSS).

2. Material & Method

In this prospective, randomized, single-center trial 10 patients with unilateral upper limb PSS received SWT (n=5) or standard therapy (n=5). Patients in the SWT group received four shock wave treatments within two weeks. Prior to treatment, degree of PSS was assessed by measurement of passive stretch, volitional movement and active/passive function. For this purpose, the modified Ashworth scale (MAS), the range of motion (ROM) test, the box and block test, a robotic resistance test and a full neuropathological assessment have been performed in a standardized manner. Moreover, WHO quality of life (WHOQOL) questionnaire was used.

3. Results

Primary endpoint was the functional improvement of upper limb function at 12 weeks, whereas secondary endpoints included changes in quality of life and acceleration to mobilization/rehabilitation. No side effects of SWT occurred in the treatment group. Patients in the treatment group showed improvement in PSS symptoms manifesting in improved scores in the MAS, ROM, box and block and robotic resistance tests. Moreover, WHOQOL scores were improved upon treatment and mobilization time decreased.

4. Discussion

In this study we provide evidence for the efficacy of SWT in patients with PSS. SWT could develop a potent treatment option for patients suffering from PSS.

Clinical Effect of Extracorporeal Shock Wave in the Treatment of Phiegm Pain from Complete Spinal Injury Based on Brain Function Recombination Theory

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1. Introduction

To investigate the effect of extracorporeal shock wave on phantom limb pain in complete spinal corf injury.

2. Material & Method

The inpatients with complete spinal cord injury in The First Affiliated Hospital of Lanzhou University were selected as the study object from october 2016 to october 2018. According to the random digital table method,18 patients were divided into the control group and 18 into the treatment group. The control group was given routine rehabilitation method in rehabilitation medicine department. The treatment group used a massage gun handle to relax the pain site and the corresponding part of the brain reflex area for 30 minutes before treatment on the basis of the routine rehabilitation method, and then performed shock wave treatment to observe the time and intensity of the phantom limb pain attack in the patient after one month, and the VAS score was performed.

3. Results

The therapeutic effect of the treatment group was better than that of the control group.

4. Discussion

ESW is effective in the treatment of phantom limb pain in patients with complete spinal cord injury.

Session 9:

Recent developments of ESWT in orthopedics and traumatology

Treatment of osteoporosis with defocused extracorporeal shock wave therapy: a clinical pilot study

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1. Introduction

Defocused extracorporeal shock wave therapy might stimulate bone formation to reduce the fracture risk. In this study we assessed the safety of defocused extracorporeal shock wave therapy and its effects on bone mass.

2. Materials & Method

A clinical pilot study with twelve female patients free of bone disease undergoing elective surgery of the lower extremity or elective spinal surgery under general anesthesia received 3.000 electrohydraulic generated defocused extracorporeal shock waves (energy flux density 0.3 mJ/mm²) to one distal forearm. The contra lateral forearm served as a control. We examined the effect on bone mass with the use of repeated dual energy X-ray absorptiometry measurements and we measured patient discomfort around the therapy.

3. Results

No difference in bone mineral content and density was measured six and twelve weeks after therapy. Shock wave therapy occasionally caused transient erythema or mild hematoma, but no discomfort in daily life or (late) adverse events.

4. Discussion

Defocused extracorporeal shock wave therapy is a safe treatment, but no increase in bone mass on the forearm was found at 0.3 mJ/mm² energy flux density. In this (under powered) study we were not able to demonstrate that a single treatment with defocused shock wave therapy in unselected patients had any effect in terms of BMD or BMC. A power analysis indicated that 174 patients are required to show an effect size of 0.3 with a power of 80%.

Can the total energy represent a predictive factor for non union therapy?

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1. Introduction

Pseudoarthrosis is a frequent complication of scaphoid fracture. It connects the first with the second carpal chain and so it is particularly exposed to fracture during trauma extending the wrist. For 80% the scaphoid is covered by articular cartilage and has a precarious vascularization. For this reason delayed consolidation or even non union are frequently observed. This has a higher incidence for fractures interesting the proximal third of the scaphoid. Surgical treatment is reserved to those cases with instability or diastasis over 1 mm. Anyway conservative treatment evolves to pseudoarthrosis in 10% in this type of fracture for the particular type of vascularization

2. Material & Method

Over 700 patients were treated in our department with sw using different devices and protocols. In this retrospective study the authors analyze the results obtained as a function of the total average energy used a homogeneous group of 111 patients treated with the same device (Duolith Storz) and number of sessions was selected. The only variables were power and number of shots used: not over 2000 shots and a minimum of 0,05 mJ/mm² were delivered for each of the 4 total sessions. This in function of the patients degree of pain tolerance.

3. Results

The first statistical data show a better result in patients treated with total energy average around 40J. Lower energies require a second treatment more frequently because often at Xray at 2 months have absent or partial consolidation. Instead, treatments carried out and higher energies, often give a delayed consolidation

4. Discussion

This study focused the attention on the total energy delivered and thus provides more precise parameters for the treatment of c.s. non union

Extracorporeal shockwave therapy for osteonecrosis of femoral head: traps and challenges

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1. Introduction

Extracorporeal shock wave (ESW), as a noninvasive, safe, and effective treatment, was applied to the treatment in osteonecrosis of femoral head (ONFH) since the end of last century. Although this therapy is more and more widely used, there are many traps and challenges.

2. Material & Method

2300 hips were treated with shockwave therapy in our center between Jan 2012 and Jan 2020. The hips were staging and typing according to ARCO Stage and China Japan Friendship Hospital (CJFH) type. Patients were followed up at 3, 6, and 12 months and every year after the treatment.

3. Results

For most patients, the lesion size decreased after ESWT, however, the differences were statistically not significant. A significant reduction in bone marrow edema was observed after treat, imaging revealed that bone marrow edema was significantly relieved but the necrotic bone could not be reversed after ESWT. For patients with ARCO III and CJFH type L2 and L3, ESWT treatment failure rate increased obviously

4. Discussion

We recommend using the high-energy focus ESW to treat ONFH, rather than using the low energy radial pressure wave. Furthermore, for different types ONFH, scientific personalized treatment planning should be made first. There are demands of multicenter united researches for this unknown field of ONFH treated with ESW, and so to provide high-level evidence-based medicine evidence.

Focused Shockwave Treatment for Greater Trochanteric Pain Syndrome A Multicenter, Randomized, Controlled Clinical Trial

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1. Introduction

Greater trochanteric pain syndrome (GTPS) is a condition of lateral hip pain. Its physiopathology remains unknown, and there is no consensus on optimal management. The aim of this study was to assess the effectiveness of electromagnetic-focused extracorporeal shockwave treatment (F-ESWT) in patients with GTPS.

2. Material & Method

This multicenter clinical trial included 103 patients with chronic GTPS randomly assigned to the treatment group, consisting of electromagnetic F-ESWT and a specific exercise protocol, or the control group, receiving sham F-ESWT and the same exercise protocol. Both groups were treated with 3 weekly sessions; the F-ESWT group received an energy flux density of 0.20 mJ/mm², whereas the control group received 0.01 mJ/mm². Patients were assessed at baseline and 1, 2, 3, and 6 months after treatment. A visual analogue scale (VAS) score for pain at 2 months was the primary outcome. The Harris hip score (HHS), Lower Extremity Functional Scale (LEFS), EuroQoL-5 Dimensions Questionnaire (EQ-5D), and Roles and Maudsley score were used as secondary outcomes. Complications were recorded.

3. Results

The mean VAS score decreased from 6.3 at baseline in both groups to 2.0 in the F-ESWT group versus 4.7 in the control group at 2 months; the 2-month score differed significantly between groups ($p < 0.001$). All secondary outcomes at all follow-up intervals were significantly better in the F-ESWT group, except for the LEFS score at 1 month after treatment ($p = 0.25$). No complications were observed.

4. Discussion

F-ESWT in association with a specific exercise program is safe and effective for GTPS, with a success rate of 86.8% at 2 months after treatment, which was maintained until the end of follow-up.

Comparison of insertional versus non-insertional Plantar Fasciitis treated by Focused Extracorporeal shock wave

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1. Introduction

Plantar fasciitis (PF) is a very common disease related heel pain. Insertional PF is well known but non-insertional PF is not. There is no report about the clinical outcome of non-insertional PF treated by focused ESWT. Therefore, we assessed the clinical outcomes of non-insertional PF compared with insertional PF.

2. Material & Method

272 feet who had PF lasting longer than 6 months and treated by focused ESWT were included in this study. The localization of PF had confirmed by echography and divided to Insertional (I) and Non insertional (N) groups. 2500 shock waves for 3 consecutive sessions were applied to the lesion weekly. Efficacy was determined by VAS from baseline to 6 months follow up. The analysis of covariance was employed to investigate the difference of baseline characteristics.

3. Results

There were 241 feet and 31 feet (12.9%) in I and N groups respectively. Clinical outcome was significantly improved from baseline in both groups. Their average age were 53.6 (I) and 43.6 years old (N) ($P<0.05$), their average BMI were 25.5 (I) and 22.1 (N) ($P<0.05$), their average thickness of plantar fascia were 5.01 (I) and 3.23mm (N) ($P<0.05$), bilaterality of PF were 22.0% (I) and 9.7% (N) ($P<0.05$). There was no significant difference between two groups with regard to sex and clinical outcome.

4. Discussion

To our knowledge, this is the first report about the clinical outcome of non insertional PF. Typical PF is insertional PF marked by thickening plantar fascia at the calcaneal insertion, but echography allows PF to be classified two groups, insertional and non insertional PF. Non insertional PF should be treated as a different disease from insertional PF because of the difference of patient characteristics. Therefore, these two types of PF will allow the treatment modality to be properly evaluated.

In conclusion, ESWT is effective treatment for non insertional PF as well. PF should be classified the disease as insertional and non insertional PF, and this classification allows meaningful evaluation of the treatments.

Results on the use of focused shockwaves in the treatment of postoperative foot and ankle non-unions and delayed unions

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1. Introduction

Joint arthrodesis and bone osteotomies are frequently indicated to treat foot and ankle conditions. These procedures require bone healing as part of the process to obtain a good surgical result. Clinical studies have reported a nonunion rate of up to 23% in foot and ankle fusions and 15 % non-union following metatarsal osteotomies. The incidence of delayed unions is even higher. As far as we know, this is the first study that addresses the use of shockwave in these surgical complications.

2. Material & Method

We included a series of 10 consecutive patients with a diagnosis of delayed healing or non-union following foot or ankle surgery. The average time since surgery was 12.5 months. 6 cases were failed arthrodesis (4 first metatarsophalangeal, 1 talus-scaphoid and 1 ankle arthrodesis) and 4 were first metatarsal osteotomies non unions (3 proximal and one distal). Patients were treated with a focused electro-hydraulic device, three sessions with a weekly interval were applied, with an energy level of 0.55 mJ / mm². They were immobilized with a walker and had partial weight discharge between 4 to 8 weeks according to the initial diagnosis.

3. Results

The average follow-up after shockwave sessions was 30.2 months. 6 patients presented complete healing of the non-unions clearly evidenced on radiographs. All of them obtained resolution of their symptoms. All osteotomies consolidated. Only 2 of the 6 failed arthrodesis presented complete consolidation. 2 patients presented increased bone density but not the disappearance of the non-union and two patients presented no changes. Average pretreatment VAS was 7 and it was 1.6 at the moment of the final evaluation. 8 patients were satisfied with the treatment and 2 did not.

4. Discussion

Complications following joint arthrodesis and osteotomies are not uncommon and its management implies more complex and expensive surgeries. The application of shockwaves had a high degree of satisfaction in patients and objective imaging changes was achieved in 60% of patients. The healing rate was higher in cases of metatarsal osteotomy. Due to its invasiveness and reduced chances of complications, focused shockwaves are a good option before resorting to salvage surgery.

Shockwave is equally effective in treating tibial nonunion compared to standard of care surgery but cause significantly less direct health care costs

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1. Introduction

Delayed or non-healing bone fractures cause high suffering pressure in the affected patients, but also place high demands on the treating physician. In addition, protracted treatment through direct and indirect costs places a heavy burden on the socio-economic system. At present, surgical revision surgery is still the standard procedure, although recent studies indicate the high effectiveness of extracorporeal shock wave therapy (ESWT) in this indication.

2. Material & Method

Surgically treated tibial non-union from 2011 until 2018 in the AUVA trauma center Vienna, Meidling were retrospectively analyzed and compared to shockwave treated tibial non-unions from 2018 with respect to healing rate and direct health care costs.

3. Results

A healing rate of 73% (n=8) of previously non-healed tibial fractures was found after surgical intervention. A similar bony consolidation rate of tibial fractures was observed after shockwave therapy (82%; n=9). Considering the therapy-associated costs (surgical and inpatient treatment), there was a significantly lower financial expenditure for treatment with shockwaves (mean 2,943.4 € ± 619.1 € SD) compared to a surgical therapy with mean total costs of 13,381.4 ± € 9,241.3 € SD (p<0.0001). In addition to the naturally significantly higher total surgical costs for surgically rehabilitated tibial pseudarthroses (mean 3054.3 € ± 1418.8 € SD) with an average surgical time of 156 minutes ± 69 minutes SD, it is primarily the ward costs (mean 13,381.4 € ± 9,241.3 € SD) that drive up the financial burden. Corresponding figures for shockwave treatment are 430.5 € average operation costs (± 128.5 € SD) with an average treatment time of 29 minutes (±7 minutes SD). The mean ward costs amounted to 2,512.9 € (± 565.3 € SD).

4. Discussion

Same radiological healing rate of tibial pseudarthrosis was found with extracorporeal shockwave therapy in comparison to standard of care surgery. In the same time, however, ESWT cause significantly lower associated direct costs compared to surgical remediation. ESWT should therefore be considered the therapy of the first choice in this indication.

Poster Session 1:

Defining a therapeutic range for regeneration of ischemic myocardium via shock waves

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1. Introduction

Shockwave therapy (SWT) represents a promising regenerative treatment option for patients with ischemic cardiomyopathy. Although no side-effects have been described upon SWT, potential cellular damage at therapeutic energies has not been addressed so far. In this work, we aimed to define a therapeutic range for shock wave application for myocardial regeneration.

2. Material & Method

Human endothelial cells were treated with different doses of SWT under various conditions of cultivation. Endothelial cell proliferation, angiogenesis and necrosis were analyzed thereafter. AKT/ERK signaling was analyzed via western blot. Dose-response in vivo was evaluated in a murine hind limb ischemia model.

3. Results

We could demonstrate that SWT does not induce cellular damage beneath energy levels of 0.27 mJ/mm² total flux density. Endothelial cell proliferation, angiogenic gene expression and phosphorylation of AKT and ERK are enhanced in a dose dependent manner until 0.15 mJ/mm² energy flux density. SWT induces regeneration of ischemic muscle in vivo via expression of angiogenic gene expression, enhanced neovascularization and improved limb perfusion in a dose-dependent manner. Therefore, we provide evidence for a dose-dependent induction of angiogenesis after SWT, as well as the absence of cellular damage upon SWT within the therapeutic range.

4. Discussion

These data define for the first time a therapeutic range of SWT, a promising regenerative treatment option for ischemic cardiomyopathy.

Can shockwave be used for the treatment of meniscal tears

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1. Introduction

In 2019 Hashimoto et al performed a study on the avascular region of the anterior horn, post surgical injury in the form of a longitudinal tear. The results showed significant increases in healing at 4 and 8 weeks in the SWT group. ESWT stimulated proliferation of meniscal cells and the upregulation of cartilage-repairing factors such as CCN2, with the upregulation of cartilage-specific extracellular matrix expression. So what of the extrapolation to human meniscal tears? surgically the debridement of meniscal tears has lost favour since the Shivonen paper in 2013. patients are being left to basic leg strengthening without any real therapeutic option. This case study looks at two medical tear subjects who have MRI confirmed tears and show the development of healing following 6 sessions of shockwave therapy.

2. Material & Method

Two meniscal tear subjects were given 6 weeks of shockwave therapy. The MRI findings were the studied as a before and after to see the effects at 12 weeks post treatment.

3. Results

Pending

4. Discussion

Pending

Tennis elbow, study protocol for a randomized clinical trial: needling with and without platelet-rich plasma after failure of up-to-date rehabilitation

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1. Introduction

The conservative management of lateral epicondylitis is known to be a difficult-to-treat annoying condition. The conservative management often includes concomitant physical therapies & shockwave therapies. A treatment with platelet-rich plasma (PRP) might be performed, but its efficacy remains controversial.

2. Material & Method

This study is a single-center, randomized double-blind controlled trial, preceded by a case series. All the 232 planned patients of the case series will undergo an up-to-date comprehensive rehabilitation program, including focused extracorporeal shock waves therapy. This rehabilitation program is expected to have a maximum success rate 75%. It is therefore aimed to allocate a minimum of 58 patients with rehabilitation failure into the 1:1 randomized trial. Stratification is planned on age and lesion pattern. The masking will be quadruple (Participant, Care Provider, Investigator & Outcome Assessor). The patients will undergo an ultrasound (US)-guided needling combined with either PRP (intervention group) or saline (control group). The primary endpoint will be the pain improvement from baseline (month 0) at 3 months on a 0–10 visual analog scale (VAS) during a maximal strength isometric contraction of the extensor carpialis brevis muscle. The main secondary endpoints will include the rehabilitation success rate and improvements from baseline at 3, 6, and 12 months of the following outcomes: (i) Single Assessment Numeric Evaluation (SANE) score, (ii) Patient-Rated Tennis Elbow Evaluation (PRTEE) score, (iii) maximal grip strength on Jamar test, and (iv) the ultrasonographic evaluation of the US of the epicondylar tendons.

3. Results

The study protocol has been published (<https://josr-online.biomedcentral.com/articles/10.1186/s13018-020-01998-8>) The recruitment is ongoing, and up-to-date preliminary results (without p-values for statistical purposes) focussed on the rehabilitation case series will be presented.

4. Discussion

The study results will provide insight into the effectiveness of an up-to-date rehabilitation including focussed shockwave for tennis elbow management. Moreover, it will contribute to establish whether PRP as adjuvant therapy to tendon fenestration may be effective.

Clinical outcomes of Radial Versus Focused Extracorporeal Shock Waves in Plantar Fasciitis

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1. Introduction

Extracorporeal shockwave therapy has been used successfully in treatment of Plantar Fasciitis. There have been reports of ESWT and drugs, ESWT and surgical treatment of contrast, but lack of radial ESWT (R- ESWT) and focused ESWT (F- ESWT) comparison. The aim of the study was to compare the effectiveness of F-ESWT and R-ESWT for Plantar Fasciitis.

2. Material & Method

A retrospective clinical study. Eighty-five Patients were randomized into two groups. One group received the treatment of F-ESWT, and the other group received R-ESWT. Groups were evaluated at 1, 2, 3 and 4weeks using the Visual Analogue Scale (VAS). Groups were evaluated at 3,4weeks using the Foot and Ankle Ability Measure (FAAM). Groups were evaluated at 3 weeks and follow-up 1 years after treatment using Roles and Maudsley (RM).

3. Results

The difference of VAS value between different time points in the same treatment is statistically significant ($f=225.298$, $p=0.000<0.05$). There was no statistically significant difference in VAS value between the F-ESWT and the R-ESWT group ($f=0.004$, $p=0.951>0.05$). Compared FAAM of the third time with it of the fourth times ($Z=-0.379$, $P=0.096>0.05$), there was no significant difference. Compared RM of follow-up 1 years with after 3 times treatment of it ($P=0.001<0.05$), there was significant difference.

4. Discussion

There were no statistically significant differences in effectiveness between F-ESWT and R-ESWT. The number of the best improvement is the first 3 times. After 3 times, it can be combined with other kinds of home physical therapy to consolidate the effect of the earlier stage. The small sample size affected the strength of the statistical analysis. Limitation of the study is the retrospective design introduced a degree of uncertainty due to missing medical record data.

Ultrasonographic Change after Extracorporeal Shockwave Therapy for Knee Osteoarthritis—pilot study

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1. Introduction

Knee osteoarthritis (OA) is a common musculoskeletal disease and is a leading cause of pain and disability. Extracorporeal shockwave therapy (ESWT) has been widely used for treatment of musculoskeletal disorders. The aim of this study was to evaluate the effects of ESWT on pain, function and the change of ultrasonographic features in patients with knee osteoarthritis.

3. Material and Method

Eight subjects with unilateral knee osteoarthritis were enrolled in this study. Shockwaves were delivered using Dornier Aries (Dornier MedTech, Wessling, Germany); 3 sessions at weekly intervals, 1,000 impulses of shockwave at 0.05 mJ/mm² on the proximal medial tibia of the affected knee.

Assessments were performed before the treatment, immediately after the last treatment session, and one month after the treatment, using the following measurements ; pain on a visual analog scale(VAS), Western Ontario and McMaster Universities Osteoarthritis Index(WOMAC), Lequesne index, knee range of motion, and ultrasonographic features. The ultrasonographic protocol comprised assessment of articular cartilage thickness, doppler activity and joint effusion height.

3. Results

VAS (3.38 ± 1.84 to 2.38 ± 1.06 , p value=0.33) and WOMAC (30.00 ± 15.34 to 21.88 ± 8.96 , p value=0.367) showed improvement immediately after the treatment but it was not statistically significant. There was no significant change in Lequesne index and knee ROM.

Doppler activity was increased in medial joint right after the third ESWT session; initial 0.12 ± 0.30 , post treatment 0.75 ± 0.46 (p value=0.01). However, doppler activity decreased to the initial level at one month follow up. Suprapatellar effusion height was decreased right after and one month after the treatment (initial 0.61 ± 0.30 , post treatment 0.41 ± 0.27 (p value=0.35), one month follow up 0.31 ± 0.26 (p value=0.11)), but it was not statistically significant. There was no significant change in cartilage thickness.

4. Discussion

The present study suggests that ESWT may increase site-specific doppler activity following ESWT, even though the increase is not sustained and seems to decrease with time. For these reasons, we conclude that ESWT could be one of the treatment methods appropriate for knee OA. Although the results of this pilot study are very encouraging, further study focusing on the treatment regimen and morphological or hemodynamic cartilaginous changes with a larger sample size will be necessary.

Case report -treatment of a patient with knee osteoarthritis

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1. Introduction

Osteoarthritis (OA), the most common musculoskeletal condition, is a long-term chronic disease involving the thinning of cartilage in joints which results in bones rubbing together, creating stiffness, pain, and impaired movement. OA is related with age, but is associated with a variety of both modifiable and non-modifiable risk factors, including obesity, lack of exercise, genetic predisposition, bone density, occupational injury, trauma, and gender. Treatment of knee osteoarthritis can be conservative including non-pharmacological and pharmacological treatment and also surgical for last resort for end-stage knee osteoarthritis with total knee arthroplasty. Extracorporeal shockwave therapy (ESWT) is a non-invasive treatment in which a device is used to pass acoustic shockwaves through the skin to the affected area. This results with beneficial effects such as neovascularization ingrowth, reversal of chronic inflammation, stimulation of collagen and dissolution of calcium build-up.

2. Material & Method

F.K. 54 years old man came in our Institute on the recommendation the general practitioner with pain and limited movements in the right knee, VAS scale at the day of admission 7, WOMAC score 81. Radio diagnostic procedure in addition of visible initial marginal osteophytes along the edges of the articular surfaces with slightly narrowed articular spaces towards the medial side of the knee. The treatment consisted of shock wave therapy once a week in a period of 5 weeks. It was used radial probe (type: continual; pressure: 2.0 bar; frequency 10 Hz; number of shocks: 3000).

3. Results

It was reached subjective and objectively improving; the pain is reduced, movements get better, VAS scale 3, WOMAC score 30

4. Discussion

Shock wave therapy can be an effective conservative treatment for early stage of knee osteoarthritis

Pilot study: Peri/Spine actors for low back pain & RPW for knee pain.

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1. Introduction

Two pilot studies were conducted into the efficacy of peri-actor shockwave application for low back pain and also radial pressure wave for OA knee.

2. Material & Method

A double blind pilot study was performed by two undergraduate students using the Storz MP100 machine.

3. Results

The results showed a 50/50 efficacy for both applications.

4. Discussion

Peru-actors on theory own show short term pain relief for low back pain but long term back pain is greater with radial pressure wave or focused shockwave. radial pressure wave shows some benefit for OA knee but less efficacious than focused shockwave therapy.

Radial shockwave therapy for elite runners

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1. Introduction

With a vast amount of experience in the delivery of radial shockwave to elite runners, this presentation delivered the background, protocols and the Graded exercise programmes most likely to generate the optimal outcome.

2. Material & Method

Combining the theory and practice, this presentation delivers a 'take home' application for running injuries. The science behind the protocols and the best way to implement the treatments in amongst the training load and home exercise programme.

3. Results

combining the science of shockwave to the practical application required this programme - without it successful treatments may not have the desired outcome.

4. Discussion

Taking into consideration treatment downtime, hyper stimulation anaesthesia, the training programme the coaches needs and the injury resolution. This programme provides a take home protocol for all injury treatments using shockwave therapy

Low-energy extracorporeal shock wave therapy for flexor carpi ulnaris calcific tendinopathy: A case report

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1. Introduction

Tendinopathies involving the hand and wrist are common, however flexor carpi ulnaris (FCU) injuries are unusual and can be misdiagnosed. Enthesopathy of the FCU might exhibit abnormalities assessable for sonographic, Xray and MRI characterization; calcification of this tendon is not a frequent diagnosis. Even if extracorporeal shock wave therapy (ESWT) is used in different tendinopathies, there is no established protocol in relation to FCU tendinopathy.

2. Material & Method

We present the case of a 31-year-old woman, who works as a pediatrician that presented with a two-month wrist pain located at the volar region adjacent to the FCU and pisiform bone (VAS score 7/10) that prevented her from working. An x-ray, MRI and ultrasound were performed with diagnosis of calcific enthesopathy of FCU. She failed conservative therapy and rejected any ultrasound injection. Ultrasound guided ESWT was performed in three sessions separated by one week each, rising to an energy of 0,028 mJ/mm².

3. Results

After three ESWT session, our patient referred an improvement in pain (VAS score 3/10), no need of oral medication, an improvement in the performance of her every-day life activities and she could resume her work. No adverse effects were found when performing or after the SW treatment.

4. Discussion

ESWT is known to be effective in several tendinopathies, however we can find very few studies in FCU tendinopathy with calcification. In our case report, we found that low energy ESWT may be safe and effective when treating this pathology. More studies with a greater number of participants should be developed.

Poster Session 2

Radial extracorporeal shock wave therapy for muscle mass and functionality in patients undergoing maintenance hemodialysis

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1. Introduction

Patients with chronic kidney disease undergoing maintenance haemodialysis (MHD) are susceptible to muscle loss and decreased muscle function, which result in shorter survival time. Moreover, because MHD patients have to get restricted protein intake to decrease the load on the renal function and spend a prolonged time during dialysis, they have significant difficulty regarding nutritional and exercise interventions commonly performed to prevent muscle wasting in general elderly populations. Radial extracorporeal shock wave therapy (rESWT) has been reported to increase the expression of myogenic factor 5 and low-intensity ESWT promoted myogenesis in rat myoblast cells. This study aimed to evaluate the effect of rESWT on muscle mass and functionality in MHD patients.

2. Material & Method

This single blind controlled study was performed to MHD patients from September 2018 to December 2019. Eighteen of 32 patients receiving MHD for over 3 months were enrolled in the ESWT and control groups. rESWT was conducted once a week for 12 weeks in both quadriceps femoris of the ESWT group. Finally, 15 patients completed all assessments before rESWT, after rESWT, and at a 12-week follow-up. Assessment tool included body composition, handgrip strength, physical performance, and blood chemistry were measured in the ESWT and control groups.

3. Results

The baseline demographic characteristics before rESWT were homogeneous between the ESWT and control groups. Leg lean mass and appendicular skeletal muscle mass index increased significantly in the ESWT group than the control group ($p=0.001$ and $p=0.017$). The timed-up-and-go test and sit-to-stand tests showed greater significant improvement in the ESWT group ($p=0.023$ and $p=0.046$).

4. Discussion

This study is the first report to show that rESWT can improve muscle mass and functionality in MHD patients. MHD patients receiving rESWT showed more increased leg lean mass and greater improvements of muscle functionality than the control patients. Further study needs with a larger sample size to demonstrate the clinical effects of rESWT in MHD patients.

Effect of diabetes on shock wave therapy for the treatment of erectile dysfunction

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1. Introduction

Diabetes is a multifactorial disease with increasing prevalence rates throughout the world. This is a risk factor for cardiovascular diseases, including erectile dysfunction. Diabetes may be related to the severity of the dysfunction and the effect of treatments, especially those that are related to the improvement of the vascular endothelium, such as shock waves. Our objective was to evaluate the effect of diabetes in patients with erectile dysfunction treated with focal shock wave therapy in a specialized center in Spain.

2. Material & Method

The clinical data of men with erectile dysfunction treated during 2018-2019 in a specialized institution in Spain, who received 1 cycle of shock waves, were extracted. Patients with other sexual dysfunctions or incomplete data were excluded for analysis. The change in the score of the IIEF-15 questionnaire in diabetics versus non-diabetics was compared, adjusting for confounding variables using linear regression models.

3. Results

409 patients met selection criteria and were included in this study. 53.5% were treated in Barcelona and 18% in Madrid, the average age was 55.5 years (+/- 12.5), 16.9% were diabetic and 80.4% had some other cardiovascular risk factor. The time with erectile dysfunction ranged between 1 and 36 months, and the baseline IIEF-5 score was 12.5 (+/- 6.2). At the end of therapy, the mean change in IIEF-5 score was lower in diabetics compared to non-diabetics (4.6 vs 1.9, p-value 0.006), it was independent of other confounding variables (p-value 0.029).

4. Discussion

The effectiveness of shock waves for the treatment of erectile dysfunction has been shown in several clinical trials, however, there are conditions such as diabetes that increase endothelial damage. The results of this study suggest that diabetes decreases the effectiveness of focal shock wave therapy in Spanish men with vasculogenic ED, therefore is why this condition should be treated to obtain better results.

Low-intensity extracorporeal shock wave therapy and manual prostate massage efficacy in treatment of chronic abacterial prostatitis with pelvic pain syndrome

Ruslan Zabolotni

Dr Zabolotni clinic, Ukraine

1. Introduction

There are various approaches that focused on physiotherapeutic treatment of non-infectious prostate inflammation, that combine traditional and novel techniques.

Aim – to compare the effectiveness of low-intensity extracorporeal shock wave therapy (LESWT) as a monotherapy method and in combination with manual prostate massage in chronic abacterial prostatitis with pelvic pain syndrome.

2. Materials and methods

During 2017-2019 the prospective study on 180 patients with chronic abacterial prostatitis with pelvic pain syndrome (ICD-10: N41) was conducted on base of “Dr. Zabolotny clinic” (Kiev, Ukraine). Contingent of a study was divided on 2 groups according to results of ultrasonic prostate scanning: group 1 (G1) – 44 patients with signs of prostate tissue fibrosis and calcification; group 2 (G2) – 136 patients without any signs of prostate tissue fibrosis or calcification. Mean age was $49\pm 6,2$ years. For LESWT therapy shock wave therapy system “DUOLITH SD1” by Storz medical was used. Visual analogue scale (VAS) was used as a tool for pain syndrome evaluation. Student’s t-test was used as methods of statistical analysis.

3. Results

Mean pelvic pain levels before treatment according to VAS data were: in G1 – $4,93\pm 1,06$; in G2 – $5,05\pm 0,93$. That showed insignificant difference between groups ($p=0,93$). No pharmacological agents that have impact on pain levels were used systematically in study population. G1 patients underwent treatment by 8 sessions of focused LESWT (2 session per week, perineum zone, 3000 strikes, frequency 3 Hz, total power up to $0,35$ mJ/mm²); G2 patients underwent same treatment with additional 10 sessions of manual prostate massage (2 session per week, 1 session before and 1 session after LESWT course). After 6 weeks of treatment VAS data was recollected and compared to initial. Mean pelvic pain levels after treatment were: in G1 – $2,29\pm 0,56$ (53% lower in comparison to initial data, $p\leq 0,01$); in G2 – $2,19\pm 1,05$ (56% lower in comparison to initial data, $p\leq 0,01$).

4. Discussion

Significant decrease in pelvic pain levels were achieved in both groups of a study without systematic use of pain-focused pharmacotherapy, however there was no significant difference in applied therapeutic models efficacy, what shows low necessity of additional manual prostate massage if LESWT treatment is used as main technique.

Low-intensity extracorporeal shock wave therapy and low-intensity pulsed ultrasound in combination with platelet rich plasma in erectile dysfunction treatment

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1. Introduction

We gain more evidences of biological and physiotherapeutic techniques efficacy in erectile dysfunction (ED), but finding an optimal therapeutic model remains a relevant target for clinical studies.

Aim – to evaluate the efficacy of additional low-intensity pulsed ultrasound application (LIPUS) on arterial ED treated with combination of low-intensity extracorporeal shock wave therapy (LESWT) and platelet rich plasma (PRP) injections.

2. Material & Method

A prospective study was conducted in 2018-2019 on population of 60 patients with severe vasculogenic arterial ED and metabolic syndrome (mean age $46\pm 4,6$ years) in Men's Health clinic (Kiev, Ukraine). As an instrument of clinical data gathering "International index of erectile function 5 (IIEF-5)" and "Erectile hardness scale (EHS)" were used. Chi-square test was used as a statistical method.

3. Results

Initial clinical examination showed IIEF-5 and EHS scores that corresponds to severe ED. Study population was randomized on 2 groups with 30 patients in each. Group 1 (G1) underwent 6 weeks treatment by model: 6 sessions of PRP-therapy (1 session per week) combined with LESWT sessions (2 sessions per week) and Icariin (ICA) 50 mg/day. Group 2 (G2) underwent same model with additional LIPUS sessions (2 sessions per week) on different days than PRP and LESWT. The follow-up study in 6 month showed significant erectile function improvement in both groups according to IIEF-5 scores. In G1 ED became mild in 23 (76,6%) patients, in G2 – in 27 (90%) patients ($p=0,16$). In 12 month follow-up study mild ED level remained in 20 (66,6%) G1 patients and 24 (80,0%) of G2 patients ($p=0,24$).

4. Discussion

PRP, LESWT and ICA combination significantly improved erectile function in arterial ED. Additional LIPUS gives certain benefits and seems to be perspective for further clinical research.

Efficacy of extracorporeal shockwave therapy (ESWT) in partial thickness tendon tears.

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1. Introduction

Previous studies have examined the effectiveness of extracorporeal shockwave therapy (ESWT) for tendinitis and especially calcific tendinopathy, but there are fewer studies on its efficacy in partial thickness tears. This study presents the results obtained in a group of patients with partial thickness tears treated with focused ESWT in various locations.

2. Material & Method

In the present study, we recruited 60 patients with partial tears in different tendons of the economy: rotator cuff (mostly), Achilles tendon and posterior tibial tendon, with partial thickness tears. The initial diagnosis was made by ultrasound or MRI. All cases had received treatment with medication and physical therapy for more than three months without results, therefore being included in the shock wave treatment group. Our patients received treatment with focal shock waves, during 4 sessions, separated by an interval between 15 and 21 days. Three months after the last session, a control ultrasound/MRI and a clinical review were performed to assess the result of the treatment.

3. Results

A 63.4% of the patients showed recovery, with image control in which no tears were appreciated. A 35.6% continued to present injuries. Clinically, there was a correspondence with the image, so those who presented image repair also showed a significant decrease or disappearance of pain. We have been able to notice that the patients who did not show improvement were those who initially presented larger tears, while those with minor tears showed a good response to treatment.

4. Discussion

ESWT has been proved to have positive effects on tendon neovascularization and can stimulate neovessel growth associated with the early release of proliferating and angiogenic growth factors. The benefits of ESWT are seen in tissue regeneration and anti-inflammation, with an important potential for the promoting of tissue regrowth. The results showed that ESWT was an effective treatment in patients with partial tendinosis tears in whom other conventional treatments have been insufficient, and it can be used to treat this group of patients before proceeding with surgery.

Efficacy of radial shock waves therapy for promoting healing of delayed of forearm fractures in children with ultrasonic guidance

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1. Introduction

To explore the clinical effect of radial extracorporeal shock wave therapy on delayed union after forearm fractures in children with ultrasonic guidance.

2. Material & Method

A retrospective analysis was conducted on information about 18 cases of delayed union of forearm fractures who received radial shock wave therapy in the extracorporeal shock wave treatment center of Beijing Jishuitan hospital from February 2018 to June 2019. The children were followed up for 6 months after the end of all courses of treatment, and the forearm X-ray was taken before treatment, 3 months and 6 months after treatment. The roentgenographic scores were performed using Lane-Sandhu X-ray score and Fernandez-Esteve X-ray evaluation for callus. Statistical analysis of the data was performed using SPSS 22.0 software to assess fracture healing.

3. Results

All children were followed up. The bone healing standard was the absence of the fracture lined shown by X-ray. After receiving the radial shock wave therapy, 11 patients got bone union within 6 months after the end of all treatment courses. The cure rates were 61%. Before treatment, 3 months and 6 months after treatment, the median (quartile) of Lane-Sandhu X-ray scores were 3.0 (1.0,4.0), 6.0 (4.0,8.0) and 10.0 (5.0,12.0), and the median (quartile) of Fernandez-Esteve X-ray evaluation for callus were 1.0 (1.0,2.0), 3.0 (2.0,4.0), and 4.0 (3.0,4.0), respectively. Except for the fact that there was no statistically significant difference between 3 months and 6 months after treatment in Fernandez-Esteve X-ray evaluation of callus grade, there was a significant difference between the two groups in three time periods ($P < 0.05$).

4. Discussion

The radial extracorporeal shock wave can treat delayed healing of forearm fracture in children, the scores of delayed union of forearm fracture and clinical efficacy were significantly improved. The treatment has high acceptance by children and their parents, which can be used as one of the methods of the treatment of delayed fracture healing in children in the future.

Fractional extra corporal shock wave therapy for Enthesiopathies, Non-Unions and pain syndromes. Optimization and Standardization

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1. Introduction

The optimization of the energy flux rate in clinical applications needs fractional growth of shock waves. The energy flux rate correlates with the number of shock waves. The Continuing optimization of the number of shock waves and the energy flux rate, as much as the total energy used takes place by comparing pretherapeutic and therapeutic pain. The standardization of shock wave therapy has been established in a retrograde conducted study, which compares numbers of shockwaves and energy flux rate.

2. Material & Method

For conducting the therapy, a Lithotripter was used. The applied energy flux rates were 0,07 mJ/mm²-1,84 mJ/mm². The number of shock waves used were not constant but variable, depending on the individual sensation of the patient within a certain applied energy level. The fractional extra corporal shock wave therapy was conducted among more than 2000 patients

3. Results

The developed method is based on the relative sensation and conditions of patients. After the first application of extra corporal shock waves 99% of patients gained benefit from the therapy. Immediately after the therapy, patients were without symptoms and within an observed period of 24h/4 Weeks/8Weeks/6-9 Months without complaints also. Further observation was not conducted.

During regular Check-ups with ultra sound and X-Ray no pathologies on the basis of the provided diagnosis were found.

4. Discussion

The fractional application of shock waves appears to be an appropriate approach for pain syndromes, enthesiopathies and non-unions. After application of shock wave impulses, under consideration of above-mentioned theory of heat conduction and the oscillation levels in the human body, the transversal and longitudinal propagation of waves depends on the pathological condition of the tissue. This condition is defined by physical variables such as density and rate of elasticity, size, propagation and mass of tissue.