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In contractures of the anterior tibialis muscle , to determine the effectiveness of physical movements (strengthening, stretching) of the tibial anterior muscle in parallel with the treatment (foam cylinder massage and Shockwave therapy).

D I S S E R T A T I O N

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INTRODUCTION

Tibialis anterior occurs in several places; Lateral condyle of the tibia. Upper two-thirds of the lateral surface of the tibia. Anterior surface of the interosseous membrane. Deep surface of the deep fascia of the leg. Anterior intermuscular septum. It runs down the leg, giving off a cord-like tendon in the distal third of the tibia. The tendon passes through the ankle and the dorsum of the foot, inserting at the medial cuneiform and adjacent base of the first metatarsal. The tibialis anterior lies medial to the extensor digitorum longus and extensor hallucis longus, making it the most medial muscle in the anterior tibia.(2) It also encloses the anterior tibial vessels and the deep peroneal nerve in the proximal tibia.(7) The deep peroneal (peroneal) nerve (L4, L5), a branch of the common peroneal nerve, innervates the tibialis anterior muscle. (8)

The anterior tibialis muscle pain comes from the muscle, which lies at the front of the lower leg, and attaches to the top of the foot. Pain in this area can be confused with shin splints, which is pain on the inside of the lower leg/shin. Instead, this pain would be at the front of the lower leg to the outside of the tibia bone, or at the tendon on the top of the foot.(13) This tendon is the large tendon visible crossing the front of the ankle. One of the main functions of the anterior tibialis muscle is to pull the foot up (ankle flexion or dorsiflexion), and it assists in keeping the arch from collapsing. When the anterior tibialis muscle is overworked or injured, pain can develop here.(14) Because the anterior tibialis muscle assists in keeping the medial (inside) arch up, an arch collapse can overwork the muscle. If there is pain elsewhere causing an abnormal gait, the anterior tibialis muscle may compensate by overworking. One example of this is pain at the ball of the foot causing a heel walk, which activates the anterior tibialis muscle with more force and for a longer period of time. Another instance when the tibialis anterior muscle becomes overworked, is when another related muscle is weak or not activating properly. If the tibialis anterior muscle has to take over the job of another muscle, the load may be too much to handle. Tight anterior tibialis muscles can be rather annoying as it makes the simple task of walking unpleasant. The causes of tight tibialis anterior can lead to shin splints and can be a result of any of the following:

- Direct trauma to the muscle area
- Intense workouts or prolonged workouts where your ankle is constantly flexed upwards
- Running, jumping or other high impact activities on hard surfaces
- Imbalance gait while walking or running
- Sudden change in exercise routine (40)

There are many treatments for muscle tight, ranging from exercises therapy to physiotherapy. Conventional treatment options include massage or massage with Foam roll, stretching, physical therapy. Extracorporeal shock wave therapy (ESWT) is a non-invasive procedure that includes delivering shock waves to the traumatic region with the goal of decreasing pain and encouraging soft tissue healing. The shock waves for orthopedic signs are the same as those used to break up kidney stones, but they have 10 times less energy. Low energy defocused ESWT or soft focused acoustical wave pattern is used for wound healing.(4)

DIFFERENTIAL DIAGNOSIS

Lumbar discopathy. Arthritic toes. Anterior tibial compartment syndrome. Shin splints (anterior). Varicose veins. Gout.

LITERATURE REVIEW

Literature Review Types of Shock Wave systems

Focused SW is produced by electrohydraulic, electromagnetic and piezoelectric systems. They focus the acoustic energy on a well-defined target tissue point with variable focal size, penetration depth, amount of energetic flux density (EDF) and complete power consumption.

Some electromagnetic and electrohydraulic generators transform the acoustic wave into planar or defocused (soft-focused) waves that maintain the same physical features but give the energy to a bigger surface area.

Pneumatic generators generate radial waves, or pressure waves, whose physical characteristics vary considerably from those of concentrated SW. The linear pressure, the low energy values, the relatively low speed of propagation and, above all, the short duration of the rise time, distinguish radial waves from the focused SW.

The globally recognized damaging sound level is 85 dB beyond which hearing loss can occur, which continues to accumulate over time. Constant exposure to high-level noise creates certain modifications, especially in the corti organ situated in the inner ear. Hair cells are impacted as well. It has been shown that the outer hair cells are the most affected cells.

According to Mark W. Appearing to be an important placebo effect with low-energy ESWT in patients with tibial pain and absence of proof for the efficacy of ESWT using a new generation pneumatic device.

Most research in this sector indicates only the efficacy of ESWT in the therapy of tibial pain. Meanwhile, there are numerous immediate reverse results. An important portion of the job comprises of evaluating the dynamics of pain syndrome under the impact of ESWT which generates problems in interpreting the final outcomes.

.Literature Review of Treatment with ESWT

Extracorporeal shock wave therapy is a non-invasive procedure that includes delivering shock waves to the traumatic region with the goal of decreasing pain and encouraging soft tissue healing. The shock waves for orthopedic signs are the same as those used to break up kidney stones, but they have 10 times less energy. Low energy defocused ESWT or soft focused acoustical wave pattern is used for wound healing.

Contraindications for this operation include: bony knee or ankle abnormalities, neurological abnormalities, prior heel surgery, under 18 years of age, pregnancy, local infections, tumors, foot vascular diseases, plantar fascia rupture, pregnancy, metal implants and anti-coagulant treatment .

The heterogeneous evidence base and the variety of therapy kinds and protocols that were in use were discussed in an overview of this author's therapy modality in 2004. There was proof of the advantage of centered F-ESWT in the therapy of calcific rotator cuff tendinopathy and in plantar fasciitis .

Extracorporeal shock wave therapy for tendinopathy therapy was provided in the mid-1990s. Thus, shock waves are used to treat multiple orthopedic circumstances of knee tendinopathy, elbow tendinopathy, patellar tendinopathy, and Achilles tendinopathy. It was suggested as a therapy for chronic plantar fasciitis in patients susceptible to conservative therapy. The particular mechanisms of ESWT in the treatment of musculoskeletal pain stay uncertain; however, numerous trials have shown that it can destroy sensory non-myelinated nerve cells and stimulate neovascularization and collagen synthesis in degenerative tissues.

According to IH Chow the delivery of ESWT with maximum tolerable energy density is a more efficient therapy protocol than a set energy density to relieve pain and restore the functional activity of individuals suffering from chronic heel pain .(26)

Radwan et al. handled symptomatic chronic cases with electrohydraulic ESWT for at least 6 months and reported improvement in AOFAS results starting at week 3.

Ogden reported using high-energy ESWT, resulting in 56 percent more of the treated patients having a good outcome after 12 weeks compared to those handled with placebo.

ESWT, according to Magdy, is a non-invasive, secure and efficient therapy for recalcitrant plantar fasciitis .

Jiale et al. proposed that FSWT (Focus Shock wave therapy) is more probable to provide relief from chronic plantar fasciitis than no treatment at all .

Extracorporeal shockwave treatment led in a 73.2% decrease in composite heel pain, which was 32.7% lower than that obtained with placebo (Golwitzer et.al,2007).

However, not all appropriate studies have revealed beneficial outcomes on the impacts of ESWT on plantar fasciitis.

Indeed, some scientists noted that ESWT was not efficient compared to the control group. The reasons for such varied ESWT outcomes include the position of the applicator, the use of local anesthesia and, most importantly, the respective different concentrations of intensity, defined as the energy stream through a region with a perpendicular orientation to wave propagation .

Focused extracorporeal shock wave therapy has become a popular alternative to traditional surgical approaches .

A systematic review in 2007 found that extracorporeal shock wave therapy is a feasible treatment alternative for chronic recalcitrant, but each research used distinct treatment protocols. The benefits of extracorporeal shock wave treatment are that it is non-invasive and provides hope for a quicker recovery moment. The adverse effects of extracorporeal shock wave treatment are pain during and after the operation, local swelling / ecchymosis, and dysesthesia numbness .(27)

According to Adiil A. there was a significant difference in the change of VAS scores from baseline when treated with ESWT and placebo.

ESWT can contribute to healing and pain reduction in plantar fasciitis (Vahdatpour B.,et.al.,2012).

There was only one study, Lohrer et Al's study, comparing focused versus radial extracorporeal shock waves in plantar fasciitis, showing the superiority of F-ESWT treatment over RSW treatment. Because of the restricted literature available on F-ESWT versus R-ESWT treatment, it continues to be investigated whether FSW is more efficient than R-ESWT.

Efficacy of ESWT for PF has been established in the current literature and assumptions on patient safety have been produced in several research over the previous ten years.

Treatment with piezoelectric focal shock waves in PF can reduce pain from the first session and achieve a subjective perception of enhancement, retaining these outcomes at 6 months post-treatment.

Literature Review of Summary of studies that have evaluated the effects of ESWT

Study	Year	Type of treat-ment	Number of Patients	Outcome measures						
				1	2	3	4	5	6	7
Ibrahim et al. 42	2010	ESWT	25		7.9	92%† (n = 25)				61.70%
		Placebo	25		1.3 (p < 0.001)	4%† (n = 25) (p < 0.001)				15.8% (p < 0.001)
Gerdesmeyer et al. 36	2008	ESWT	125	56% (SD, 39.3%)		60.98% (n = 125)	60.8% (n = 125)	60% (n = 125)	52.85 (n = 125)	58.4 % (n = 125)
		Placebo	118	44.1% (SD, 41.8%) (p = 0.0220)		42.24% (n = 118) (p = 0.002)	48.31% (n = 118) (p = 0.0269)	40.68% (n = 118) (p = 0.0014)	39.66 (n = 118) (p = 0.0216)	41.52% (n = 118) (p = 0.0031)
Marks et al. 37	2008	ESWT Placebo	16 9							
Gollwitzer et al.38	2007	ESWT	20	73.2%* (n = 20)		55%* (n = 20)	55%* (n = 20)	50%* (n = 20)	60%‡ (n = 20)	60% (n = 20)
		Placebo	20	40.5%* (n = 20) (p = 0.0302)		40%* (n = 20) (p = 0.2148)	30%* (n = 20) (p = 0.0648)	40%* (n = 20) (p = 0.3057	35%‡ (n = 20) (p = 0.0769)	40% (n = 20) (p = 0.0416)
Malay et al. 39	2006	ESWT	115		3.39 (n = 112)					
		Placebo	57		1.78 (n = 56) (p < 0.001)					
Rompe et al.6	2003	ESWT Placebo	22 23							
Speed et al.41	2003	ESWT Placebo	46 42							

1 = improvement in mean VAS composite scores (heel pain in the morning, doing daily activities, and application of dolorimeter) from baseline or mean % improvement (SD) after 12 weeks; 2 = reduction in mean VAS score (points) from baseline in participants' assessment of heel pain at 12 weeks; 3 = success rate of heel pain improvement (> 60% reduction in VAS scores) at 12 weeks for at least two of three heel pain monitoring criteria; 4 = success rate of heel pain (> 60% reduction in VAS scores) when taking first steps in morning at 12 weeks; 5 = success rate of heel pain (> 60% reduction in VAS scores) while doing daily activities at 12 weeks; 6 = success rate of heel pain (> 60% reduction in VAS scores) after application of the dolorimeter at 12 weeks; 7 = reduction in Roles and Maudsley scores (excellent to good) at 12 weeks; * % median change not % mean change; [†]only one VAS score used; [‡]F-meter used rather than a dolorimeter.

Lou J et al. indicated that ESWT appears to be particularly efficient in relieving pain associated with RPF and that ESWT should be regarded when traditional treatments have failed.

MATERIALS AND METHODS

An ethics approval was requested for this study " In contractures of the anterior tibialis muscle , to determine the effectiveness of physical movements (strengthening, stretching) of the tibial anterior muscle in parallel with the treatment (foam cylinder massage and Shockwave therapy)." to the Ethical Commission of Azerbaijan State Academy of Physical Education and Sport and approved.

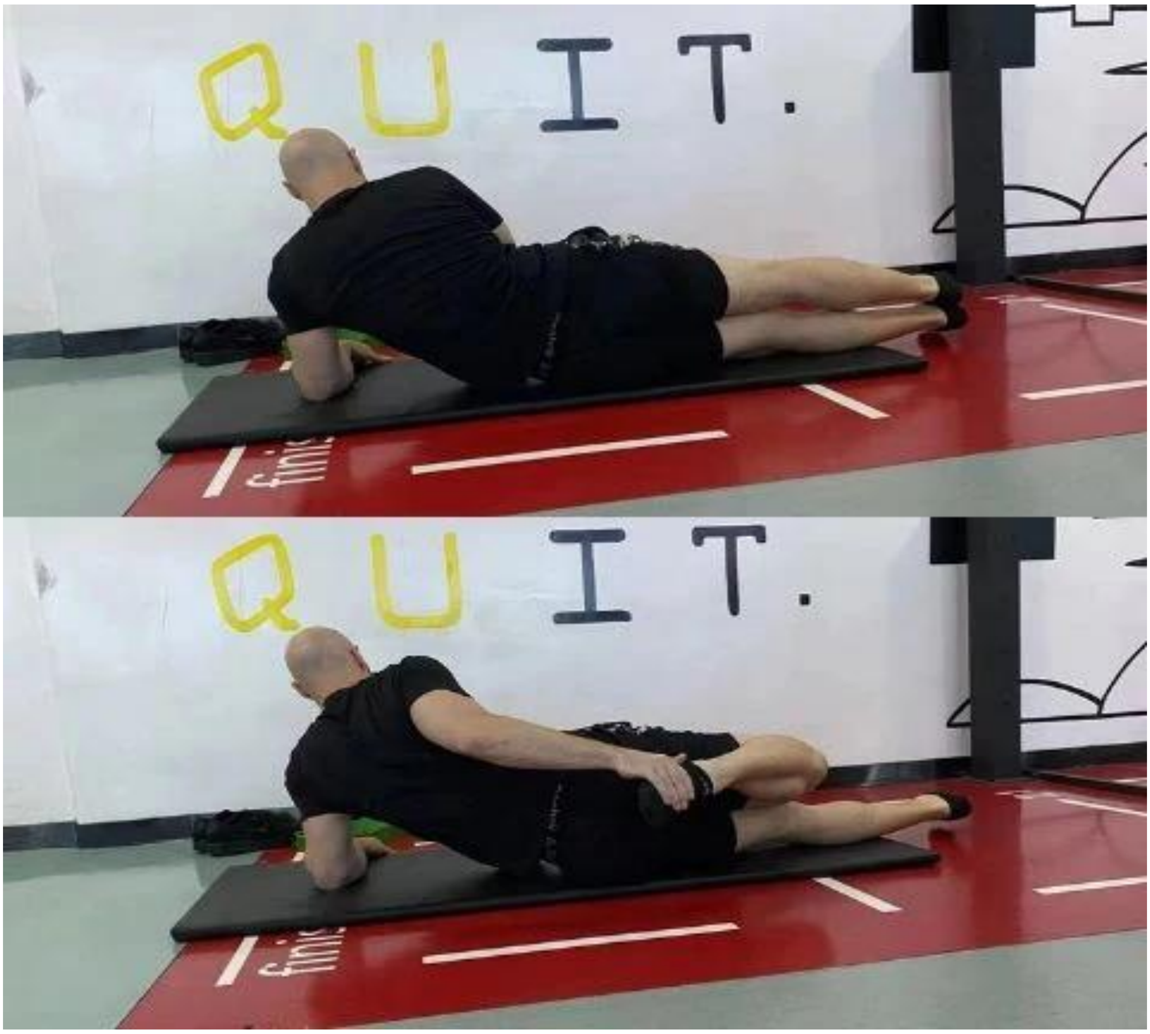
This scientific study is prospective, in which were selected patients whose VAS pain scores were almost the same. In this case, 10 patients were selected and then randomly were divided into two groups. The observations included 10 patients (man) and were randomly recruited. All patients were notified of the appropriate form of treatment and agreement was received in writing form to conduct a scientific study.

Follow up of both groups were carried out at 2 weeks and the outcome was measured with Visual Analogue Pain Scale (VAS) . Statistical analysis was done using SPSS software, version 13. Independent t-test were applied to look for significant variations in outcome.

The inclusion criteria were tenderness on palpation of the heel, presence of pain in the anterior tibial muscle.

The group 1 treated with stretching and strengthening exercises for the anterior tibial muscles.


proteam



The group 2 will do the same exercises during treatment and supplementation Low Energy Shock Wave Therapy and massage with foam Roll.

Both groups checked with pain scale(VAS).

Group 2 received Low Energy Shock Wave Therapy that was applied in four sessions as 3 days interval using 1500 impulses (pressure 1.5-2 bar, frequency 10-15 Hz). No anesthesia was used.

RESTRICTIONS

It was vitally important to communicate to the study participants the two restrictions that they must abide by for the duration of the treatment proposed in the research. The first activity to avoid was performing explosive exercises, such as jumping, sprinting, or sudden changes of direction during the race, which was only allowed at a light intensity as a warm-up. This is because these movements place a high biomechanical load on the entire musculoskeletal structure of the lower limb, which leads to stress for the tendon insertions. So it was an obstacle to obtaining an optimal result with the study treatment. The other restriction that the study assets had was the consumption of drugs during the course of the investigation since they can hinder the proposed treatment and / or alter the reliability of the result obtained.

RESULTS AND ANALYSES

The mean pre-treatment VAS for the entire group 1 was 8.2 ± 1.2 . Two weeks after treatment the VAS decreased to 0.8 ± 0.8. This difference was statistically significant (P < 0.005).

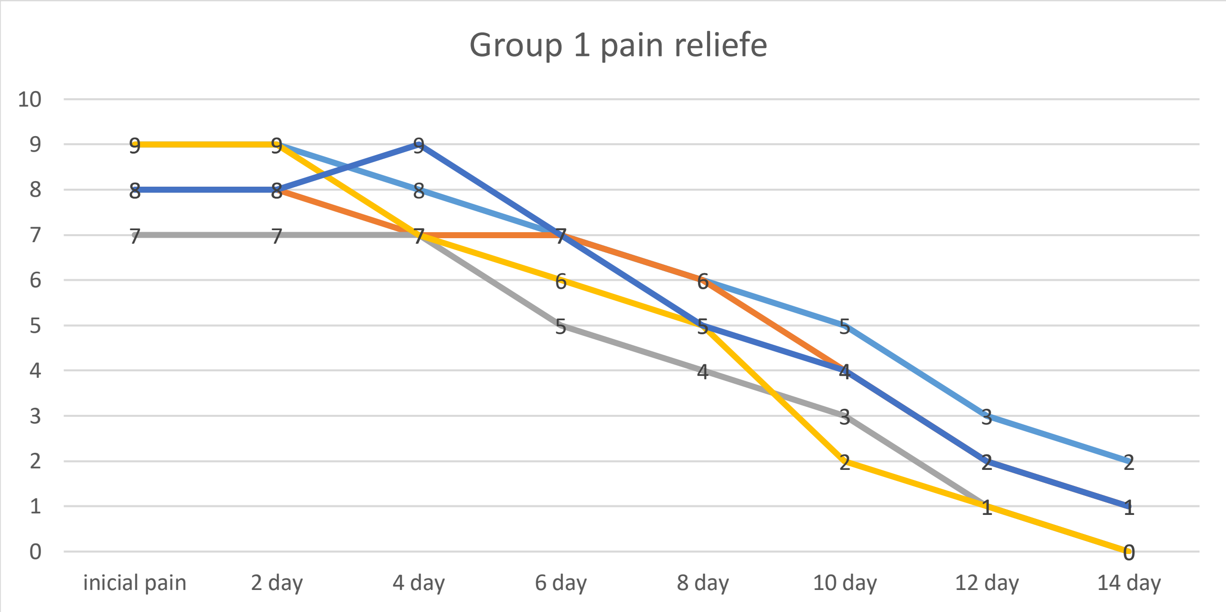
For Group 2 before treatment VAS was 7.8 ± 1.8 . Two weeks after treatment the VAS changed to 0.2 ± 0.2 This difference was statistically significant (P < 0.005)

Results of our work (see tab.1).

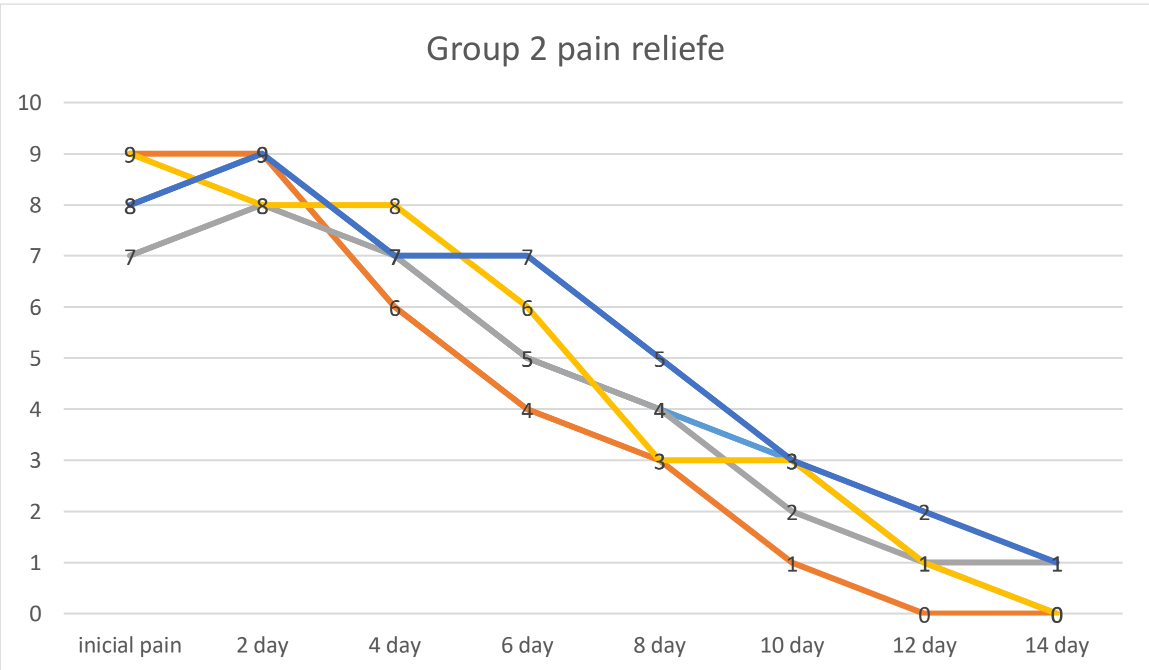
Tab.1

	Before therapy	2 day after therapy	4 day after therapy	6 day after therapy	8 day after therapy	10 day after therapy	12 day after therapy	14 day after therapy
Group 1	8.2 ± 1.2	8.2 ± 1.2	7.4 ± 0.4	6.4 ± 1.4	5.2 ± 1.2	3.6 ± 1.6	1.8 ± 0.8	0.8 ± 0.8
Group 2 (ESWT,Foam Roll)	7.8 ± 1.8	8.2 ± 1.2	6.6 ± 1.6	4.6 ± 1.6	3.2 ± 1.2	1.8 ± 1.8	0.6 ± 0.6	0.2 ± 0.2

Qrup 1	**Inicial pain**	**2 day after therapy**	**4 day after therapy**	**6 day after therapy**	8 **day after therapy**	**10 day after therapy**	12 **day after therapy**	14 **day after therapy**
A	9	9	8	7	6	5	3	2
B	8	8	7	7	6	4	2	1
C	7	7	7	5	4	3	1	0
D	9	9	7	6	5	2	1	0
E	8	8	8	7	5	4	2	1



Qrup 2	Inicial pain	2 day after therapy	4 day after therapy	6 day after therapy	8 day after therapy	10 day after therapy	12 day after therapy	14 day after therapy
A1	8	9	7	5	4	3	1	0
B1	9	9	6	4	3	1	0	0
C1	7	8	7	5	4	2	1	1
D1	9	8	8	6	3	3	1	0
E1	6	7	5	3	2	0	0	0



A good effect with the reduction or significant reduction in pain, the restoration of professional performance and the absence of restrictions on daily activity was obtained in 10 (100%) patients. In some patients, a good result was obtained much earlier than we expected.

CONCLUSION

Observations showed that the best effect was manifested in those who received ESWT + Foam Roll therapy, but the difference is small, the pain disappeared only a couple of days earlier. A search in the literature in this area shows that exercise and stretching have a very positive effect on muscle contractures.

Due to the global pandemic, we had a small number of patients studied, because of this it is difficult to draw any conclusions. But we can avoid this injury by including exercises(strengthening, stretching) on the anterior tibial muscle in everyday training.

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