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EFFECT OF SHOCKWAVES VERSUS TRADITIONAL PHYSIOTHERAPY IN TREATING DE QUERVAIN TENOSYNOVITIS

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ABSTRACT

Objective: To compare radial shockwave treatment and Traditional physiotherapy for de Quervain tenosynovitis.
Materials And Methods: Thirty-two patients with de Quervain tenosynovitis were included in this study. They were randomly divided into two groups. Group 1 was composed of 16 patients who underwent 10 physiotherapy sessions each, consisting of ultrasound, kinesiotherapy and instruction for stretching exercises at home. Group 2 was composed of 16 patients who underwent three applications of radial shockwaves (once a week) and received instruction for stretching exercises at home. Pain and ability to function were evaluated before treatment, immediately afterwards, and three months later. The mean age of the patients was 47.3 ± 10.3 years (range 25–68); 81% were female, 87% were overweight, 56% had bilateral impairment, and 75% used analgesics regularly.
Results: Both treatments were effective for pain reduction and for improving the functional abilities of patients with de Quervain tenosynovitis. The effect of the shockwaves was apparent sooner than physiotherapy after the onset of treatment.
Conclusion: Shockwave treatment was no more effective than conventional physiotherapy treatment when evaluated three months after the end of treatment.

INTRODUCTION

Shockwaves have been used for many years as an alternative treatment for musculoskeletal disorders.[1,2] the treatment consists of mechanical acoustic waves that are transmitted through liquid and gaseous media.[1,3] Their biological effect comes from the mechanical action of (mechanical) ultrasonic vibrations on tissues.[2, 4]

Shockwaves can be focal or radial. Focal shockwaves have high tissue penetration power (10 cm) and impact force (0.08–0.28 mj/mm^2). They produce mechanical and biological effects of greater intensity, including destruction of fibrosis and stimulation of neovascularization in treated tissues.[1,3] Radial shockwaves are pneumatic waves that are generated by air compressors. They transmit radially, with lower penetration (3 cm), less impact (0.02–0.06 mj/mm^2) and limited biological effect.[5] They have been shown to be effective for treating musculoskeletal disorders that are more superficial, with clinical results that are similar to those of focal shockwaves.[2,6,7] The effect of radial shockwaves is less intense, but they have been shown to cause disintegration of fibroses and calcifications and increase blood circulation at the treated location.[5, 9]

The second common entrapment tendinitis of the hand and wrist is de Quervain tenosynovitis.[10] De Quervain tenosynovitis is caused by stenosing tenosynovitis of the first dorsal compartment of the wrist. The first dorsal compartment at the wrist includes the tendons of the abductor pollicislongus (APL) and the extensor pollicisbrevis (EPB). Patients with this condition usually report pain at the dorsolateral aspect of the wrist, with referral of pain toward the thumb and/or the lateral forearm.[11,12.]

This condition is commonly seen in females and males, the incidence of de Quervain tenosynovitis appears to be significantly greater in women.[13] Some sources even quote a female-to-male ratio as high as 8:1. Interestingly, many women suffer from de Quervain tenosynovitis during pregnancy or the postpartum period.[14] The most classic finding in de Quervain tenosynovitis is a positive Finkelstein test.[15]In some cases, de Quervain tenosynovitis may be associated with rheumatoid arthritis; therefore, assess the hands for rheumatologic deformities and malalignment.

Splinting of the thumb and wrist relieves symptoms, but most patients find the loss of the thumb for functional activities too restrictive and do not consistently wear the splints.[16] Injection of corticosteroid into the sheath of the first dorsal compartment

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may reduce tendon thickening and inflammation.[17] If injection therapy fails, surgical release of the first dorsal compartment relieves the entrapment. Although de Quervain tenosynovitis features a simple tendon entrapment and the surgical release is quick and straightforward, complications can be profound and permanent.[18]Superficial radial nerve injury, neuritis resulted from sharp injury or adhesion and Subluxation of released tendonsare the most common complication of surgical release, also persistent entrapment symptoms are possible if the tendon slips of the abductor pollicislongus are mistaken for the tendons of the abductor pollicislongus and the extensor pollicis brevis.[19] Various forms of physical therapy (PT) or occupational therapy (OT) may be used in the treatment of patients with de Quervain tenosynovitis. In the acute stage, the therapist may use cryotherapy, ultrasound, iontophoresis.[20] Over the last ten years, many clinical trials have evaluated the use of shock waves therapy for treating patients with chronic tendinopathies.[21]

The aim of the present study was to compare the results of two conservative plantar fasciitis treatments:

- Treatment 1 – application of ultrasound on radial dorsal zone and kinesiotherapy: stretching of the thenar eminence muscles into thumb extension and abduction with instruction for active stretching of the same muscle to be performed at home.
- Treatment 2 – application of radial shockwaves radial dorsal zone, together with instruction for active stretching of the thenar eminence muscles to be performed at home.

METHOD

This was a randomized, prospective and comparative clinical study.

Sample: Thirty-two patients with de Quervain tenosynovitis that was diagnosed by anamnesis, physical examination and positive Finkelstein test result were treated. All patients agreed to participate in the study and signed a free and informed consent statement. The inclusion criteria were:

Diagnosis of, de Quervain tenosynovitis by special orthopedic physician. age between 20 and 68 years; painful symptoms lasting three months or more; absence of heart pacemaker use; absence of anticoagulant use and absence of coagulation disease; absence of other musculoskeletal disorders of any etiology with clinical manifestations in the upper limbs or vertebral column; absence of central or peripheral neuropathy of any etiology; absence of systemic inflammatory disease; absence of associated metabolic and endocrine diseases; absence of psychiatric disorders; The mean age of the patients was 47.3 ± 10.3 years (range 25–68 years). Twenty-six patients (81%) were female and six (19%) were male. Eighteen patients (56%) were affected bilaterally, 24 (75%) were using analgesics and 23 (72%) had not undergone any previous treatment. Twenty-eight patients (87%) were considered to be overweight and only 11 (34%) performed any regular physical activity.

Treatment

After the patients had been selected, they were divided into two groups of 16 participants each in accordance with randomly drawn numbers:

- ***Group A:*** Traditional physiotherapy: These patients were treated with ultrasound at a frequency of 1.0 Hz and intensity of 1.2 watts/cm^2. Ten sessions were undertaken at a frequency of two sessions per week. All patients performed exercises after ultrasound application to stretch the thenar eminence muscles into thumb extension and abduction and make resisted exercise for finger and thumb extension, and abduction, radial deviation, supination, and thump opposition. All patients were followed up and guided by the same physiotherapist in all sessions. All patients were advised to perform active stretching of thenar eminence at home.
- ***Group B:*** Radial shockwave therapy: These patients were treated with applications of radial shockwaves, which were always administered by the same physiotherapistn. LONGEST LGT-200S equipment was used with a low-intensity applicator. Two thousand beats were applied at a frequency of 5 Hz and a pressure of 1.5MPa. The patients were positioned in supine lying position, with the radio ulnar joint was in mid position and the thump directed up. The applicator was placed perpendicular to radial dorsal zone particularly over the base of thumb, and a gel was used to maintain contact with the skin. The sessions were performed once per week for a total of three sessions.

Evaluation

Evaluations were made before the treatment, immediately afterwards, and three months after treatment. These evaluations were always performed by the same examiner. The evaluations consisted of Pain assessment through:

- Periodicity of pain, i.e. the number of times per week that patients experienced pain
- Duration of pain, i.e. the number of hours per day with pain
- Visual analog scale (VAS) assessment general pain, wrist movement pain.
- Use of analgesics during treatment.

RESULTS

There were no differences between groups 1 and 2 with regard to gender, age, physical activity, ethnicity, side affected or body mass index (BMI). Both groups showed improvement of pain symptoms including reduced number of episodes of pain per week (Table 1) and hours of pain per day (Table 2). There were decreases in the intensity general pain (Table 3) and pain during ulnar deviation of wrist joint (Table 4), as evaluated using the VAS. Most patients had decreased their intake of analgesics by the final evaluation at three months after treatment (Table 5). There was no statistically significant difference between the groups in any of the parameters used for evaluation.

Table 1 Weekly periodicity of pain symptoms in group 1 (conventional physiotherapy) and group 2 (shockwave physiotherapy) before treatment, immediately afterwards, and three months later.

Weekly frequency of pain	Group1 (n=16)			Group 2(n=16)		
	Evaluation 1	Evaluation 2	Evaluation 3	Evaluation 1	Evaluation 2	Evaluation 3
Without pain	0(0%)	5 (31%)	7 (44%)	0 (0%)	6 (37%)	6 (37%)
Pain once A week	0 (0%)	2 (13%)	3 (19%)	0 (0%)	0 (0%)	1 (6%)
Pain twice or more per week	16 (100%)	9 (56%)	6 (37%)	16 (100%)	10 (63%)	9 (56%)
p*		0.001			0.008	

Friedman test – intragroup evaluation. ANOVA – intergroup evaluation – p > 0.05(N.S.). Group 1 = ten physiotherapy sessions (ultrasound and kinesiotherapy); Group 2 = three sessions of shockwave therapy. Evaluation 1 – before treatment; Evaluation 2 = immediately after treatment; Evaluation 3 = three months after treatment.

Table 2 Number of hours of pain per day in Groups 1 and 2 before and after treatment.

Number of hours of pain per day	Group1 (n=16)			Group 2(n=16)		
	Evaluation 1	Evaluation 2	Evaluation 3	Evaluation 1	Evaluation 2	Evaluation 3
0 hours	0 (0%)	6 (37%)	8 (50%)	0 (0%)	6 (37%)	7 (44%)
Less than 4 hours	7 (44%)	8 (50%)	7 (44%)	8 (50%)	9 (56%)	8 (50%)
At least four hours	9 (56%)	2 (13%)	1 (6%)	8 (50%)	1 (6%)	1 (6%)
p*		0.000			0.001	

Friedman test – intragroup evaluation. ANOVA – intergroup evaluation – p > 0.05(N.S.). Group 1 = ten physiotherapy sessions (ultrasound and kinesiotherapy); Group 2 = three sessions of shockwave therapy. Evaluation 1 – before treatment; Evaluation 2 = immediately after treatment; Evaluation 3 = three months after treatment.

Table 3 Patient distribution according to intensity of general pain on visual analog scale (VAS) in Groups 1 and 2 before and after treatment

VAS	Group1 (n=16)			Group 2(n=16)		
	Evaluation 1	Evaluation 2	Evaluation 3	Evaluation 1	Evaluation 2	Evaluation 3
Good (0-1)	2 (13%)	10 (62%)	11 (69%)	2 (13%)	8 (50%)	10 (62%)
Regular (2–5)	3 (19%)	3 (19%)	3 (19%)	2 (13%)	3 (19%)	3 (19%)
Poor (6–10)	11 (69%)	3 (19%)	2 (13%)	12 (75%)	5 (31%)	3 (19%)
p*		0.002			0.001	

*Friedman test – intragroup evaluation. ANOVA – intergroup evaluation – p > 0.05(N.S.). Group 1 = ten physiotherapy sessions (ultrasound and kinesiotherapy); Group 2 = three sessions of shockwave therapy. Evaluation 1 – before treatment; Evaluation 2 = immediately after treatment; Evaluation 3 = three months after treatment

Table 4 Patient distribution according to intensity of pain during ulnar deviation of wrist joint on visual analog scale (VAS) in Groups 1 and 2 before and after treatment

VAS	Group1 (n=16)			Group 2(n=16)		
	Evaluation 1	Evaluation 2	Evaluation 3	Evaluation 1	Evaluation 2	Evaluation 3
Good (0-1)	2 (13%)	6 (37%)	8 (50%)	1 (6%)	7 (44%)	8 (50%)
Regular (2–5)	2 (13%)	6 (37%)	5 (31%)	2 (13%)	3 (19%)	5 (31%)
Poor (6–10)	12 (75%)	4 (25%)	3 (19%)	13 (81%)	6 (37%)	3 (19%)
p*		0.003			0.000	

*Friedman test – intragroup evaluation. ANOVA – intergroup evaluation – p > 0.05(N.S.). Group 1 = ten physiotherapy sessions (ultrasound and kinesiotherapy); Group 2 = three sessions of shockwave therapy. Evaluation 1 – before treatment; Evaluation 2 = immediately after treatment; Evaluation 3 = three months after treatment.

Table 5 Frequency and percentage of patients who had stopped using analgesics three months after treatment

	Stopped using analgesics three months after treatment		Total number who used analgesics before treatment	p
	Yes	No		
Group1	10 (76.9%)	3 (23.1%)	13 (100%)	0.411
Group 2	7 (53.8%)	6 (46.2%)	13 (100%)	

Fisher's exact test - p > 0.5 (N.S.)

DISCUSSION

de Quervain tenosynovitis is an entrapment tendinitis of the tendons contained within the first dorsal compartment at the wrist; it causes pain during thumb motion. The tendons of the abductor pollicislongus and the extensor pollicisbrevis pass through the first dorsal compartment. The abductor pollicislongus tendon is usually multistranded.

The extensor pollicisbrevis tendon is typically much smaller than even a single slip of the abductor pollicislongus tendon, and it may be congenitally absent. A septum separating the first dorsal compartment into distinct subcompartments for the abductor pollicislongus tendons and the extensor pollicisbrevis tendon is often noted at surgery.[10]

Inflammation at this site commonly is seen in patients who use their hands and thumbs in a repetitive fashion. Thus, de Quervain tenosynovitis can result from cumulative (repetitive) microtrauma. Inflammation also may occur after an isolated episode of acute trauma to the site. Patients with de Quervain tenosynovitis note pain resulting from thumb and wrist motion, along with tenderness and thickening at the radial styloid.[11] De Quervain tenosynovitis can also develop in individuals who have sustained a direct blow to the area of the first dorsal compartment. This condition is commonly seen in females and males, the incidence of de Quervain tenosynovitis appears to be

significantly greater in women.[13] Some sources even quote a female-to-male ratio as high as 8:1. Interestingly, many women suffer from de Quervain tenosynovitis during pregnancy or the postpartum period.[14]In the present study, patients were more frequently female (81%), mostly overweight (87%), and their mean age was 47.3 ± 10.3 years.

The occurrence of de Quervain tenosynovitis is related to professional and activities that require hand working. Patients frequently are mothers of infants aged 6-12 months, and symptoms are often noted in both wrists. Repetitive lifting of the baby as it grows heavier is responsible for friction tendinitis. Day care workers and other persons who repetitively lift infants are frequently affected as well. De Quervain tenosynovitis can also develop in individuals who have sustained a direct blow to the area of the first dorsal compartment. De Quervain tenosynovitis is relatively prevalent, especially among individuals who perform repetitive activities using their hands (eg, certain assembly line workers, secretaries).[21]Most patients in the present study (63%) were hand dependent working while standing (nurses, cleaners and computer users), On the other hand, pain with thump and wrist movement by 72% these findings are similar to those in other reports. After treatment, 14 of the 16 patients in each group had VAS scores of less than five, thus suggesting that both treatments were effective for pain reduction.

In many cases, de Quervain tenosynovitis is bilateral.[12] In the present sample, 56% of cases were bilateral. Shockwave treatment was more effective in treatment of chronic cases than in the acutestage (less than three months of symptoms).[8,9] The present sample population only included chronic cases of de Quervain.

Surgical treatment of de Quervain could lead to serious complication is common in 30% of cases. The first-choice treatment is conservative non-surgical treatment.[18,19] Application of therapeutic ultrasound accompanied by stretching exercises is one of the most indicated physiotherapeutic treatments for de Quervain.[20] In the present study, the continuous form was used with constant wave intensity. The applied doses ranged from 1.2 to 3.0 W/cm^{2}.[10] Radial shockwave therapy has shown good results without side effects, but it is a relatively new technology with high cost and needs to be comparatively evaluated with other types of conservative treatment.[7] In the present study, there were no complications from the use of radial shockwaves.

The aim of the present study was to comparatively evaluate shockwaves with conventional physiotherapeutic treatment for de Quervain. All patients were advised to perform active stretching of thenar eminence twice per day to improve flexibility, but only group 1 (conventional physiotherapy) underwent a kinesiotherapy regimen under guidance from a physiotherapist at all treatment sessions. Reinforcement of instructions by a physiotherapist at the ten treatment sessions might have influenced the good results observed for this group. More specifically, the constancy of such guidance might have greatly contributed to adherence to the exercise program and to the change of habits. Although the quality of this treatment depends on the physiotherapist, it gives good results when applied carefully and judiciously. In group 2 (shockwave therapy), the patients were individually advised to perform active stretching of thethenar eminence, but they did not receive any specific kinesiotherapy regimen during the treatment sessions and did not have any subsequent follow-up. All guidance was given during the three treatment sessions and at the assessments. Shockwave therapy might be more efficient for treatment of de Quervainpain than conventional physiotherapy, but comprehensive rehabilitation programs that are implemented carefully and with good guidance increase patient adherence and promote both pain reduction and functional improvement.

Three months after treatment, the patients in both groups presented reduced general pain, pain during thump and wrist movement: decreased duration (hours/day) and periodicity (number of crises per week) of pain; and diminished use of analgesics. There was no difference in the efficacy of the two treatments, but the more immediate effect of shockwave therapy provided faster relief from pain and incapacitation. For shockwave treatment to be effective and long-lasting, it must be complemented with the use of splint for movement limitation. Correct clinical and functional diagnosis of de Quervaintogether with a simple but well implemented rehabilitation program is a good approach to treating this disorder. It is therefore not always necessary to utilize sophisticated resources or technology to achieve optimal results.[7] the results of the present study show that a comprehensive rehabilitation program might be effective for treating de Quervain, despite its simplicity.

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