

EFFECTIVENESS OF SHOCK WAVE THERAPY VERSUS STANDARD PHYSICAL THERAPY MODALITIES IN PATIENTS WITH SHOULDER PAIN

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Abstract: Painful shoulder syndrome is a condition characterised by pain in the shoulder region and limited range of motion. Shockwave therapy is a non-invasive method of treating localised musculoskeletal changes. It is an acoustic wave that transmits energy to painful sites and myoskeletal tissues in subacute, subchronic and chronic conditions. The study was a cohort study, with one group (n=30) receiving shock wave therapy (ESWT) with other modalities and the other group (n=30) received other types of physical therapy (PT). During the 10 days of treatment, both groups had therapy every day, and shock wave therapy was administered every other day. In the PT group, the average age was 52.3±11.3 years, while in the ESWT group, the average age was 47.5±13.9 years. In the PT group, 50% of respondents were workers, and 27% worked in an office. In the ESWT group, 43% of respondents were manual workers, 33% had an office job. Before any form of therapy, all subjects had significantly reduced functions (poor function). The pain was very pronounced, with an average score of 7.7±0.9 in the PT group and 8.0±1.1 in the ESWT group ($t=1.156$; $p=0.254$). Subjects who were treated with classical physical therapy after the treatment had satisfactory function (100%), while in the group of subjects who were treated with the Shockwave method, 25 (83%) had good function, and 5 (17%) had satisfactory function. Significantly more subjects had good shoulder function after shock wave therapy ($p<0.001$). After 10 days in the PT group, pain significantly decreased to a level of 6.0±0.5 ($p<0.001$). In ESWT, the group pain intensity dropped to a level of 4.0±1.1 ($p<0.001$). Although both groups proved to be effective in treating pain, shock wave therapy showed a significantly better result ($t=9.066$; $p<0.001$).

Shock wave therapy is the method of choice that is very effective in the treatment of painful shoulder syndrome, i.e. in improving daily activities of life, as well as improving the reduced function of the shoulder joint, which has been proven by the example of our respondents.

Keywords: shock wave, painful shoulder, physical therapy

1. INTRODUCTION

Shoulder pain is one of the most common musculoskeletal conditions. Pain in the shoulder girdle is a common reason for orthopaedic consultation. Lewis J. (2016) found that the most common conditions include those affecting the rotator cuff, such as tendinopathies, partial rotator cuff injuries, calcific tendinopathies and adhesive capsulitis. Liu and Yang (2019) and Shang et al (2019) found that conservative treatment with medication, physiotherapy, acupuncture, anaesthetic blocks and corticosteroid injections are usually the initial treatment and are effective in most cases. Patients who are resistant to initial treatment are not always willing or in good clinical condition for surgical treatment, which also is not always a guarantee of good results. When conservative treatment of calcific tendinopathy of the rotator cuff fails, treatment with extracorporeal shock wave therapy (ESWT) has emerged as an alternative before invasive procedures. The clinical efficacy of ESWT in non-calcific tendinopathy is still a matter of debate. The indications for ESWT have been extended to other shoulder pathologies due to good results in the treatment of rotator cuff calcifications. We review current indications and evidence-based practice. In the study by Murphy and Carr (2010), the subacromial space was the source of the pain in about 75% of cases. However, the pain can also be referred from a variety of sources, including the cervical spine, abdominal viscera, the apex of the lung, and even from myocardial ischaemia. Therefore, it is not only important to treat the symptoms of "shoulder pain". It is also important to establish an accurate diagnosis to guide the appropriate treatment. There are many indications for shock wave therapy: Shoulder tendinopathy, non-calcific rotator cuff (RC) tendinopathy, bicipital tendinopathy. Finally, recent studies, like Vahdatpour et al(2014) have suggested the use of ESWT for the treatment of adhesive capsulitis (frozen shoulder). Similar findings were observed by De Durante, Corrado, Galasso and Carillo (2001) and Chen et al (2014).

The aim of this study is to analyse the efficacy of extracorporeal shockwave therapy and to observe the impact of this method on pain and function.

2. MATERIALS AND METHODS

Two groups of patients were followed throughout the treatment period in this cohort study. All patients had a diagnosis of periartthritis humeroscapularis, (aged 30 to 65 years) divided into two groups, one group treated with shock wave therapy TUV (n=30) and the other group (n=30) treated with another modality of physical therapy (PT).

The first group of patients was treated with shock wave therapy (TUV-10 Hz, 2000 shocks, five minutes) for the duration of five sessions, with an interval of three to five days between each therapeutic programme. The second group of patients was treated with other physical procedures for ten days, including the application of TENS - transcutaneous electrical nerve stimulation (20 minutes), ultrasound - 1 W ultrasound intensity for 5 minutes, manual shoulder-upper arm massage and a kinesitherapy programme of shoulder exercises. Patients were checked and then treated around city of Bihać, Bosnia and Herzegovina, during year 2022. Excluding criteria were: mixed treatment, patients who stopped the treatment.

Pain level was examined using a pain scale with a range from 0 to 10. Function of shoulders was examined using DASH questionnaire. The Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire is a self-administered, region-specific outcome instrument designed to measure self-reported upper extremity disability and symptoms. The DASH questionnaire consists of 30 items which assess the patient's ability to perform certain activities of the upper limb.

This questionnaire is a self-report questionnaire that patients can rate difficulty and interference with daily life on a 5 point Likert scale. The intended population for the DASH is any person with one or more upper extremity musculoskeletal disorders. Inclusion criteria for study were: Patients older than 18 years, Patients diagnosed with chronic shoulder pain, Patients who accepted to be tested and to complete questionnaires before the start of therapy and after the end of therapy. Exclusion criteria were: Patients who did not undergo testing at baseline and at the end of treatment, patients who did not complete treatment, patients who refused to be tested.

Shoulder examination: It begins with an inspection that is used to check and observe the posture of the patient, the symmetry of the shoulder, the muscular trophism and the contours of the shoulder. Palpation is performed carefully and gently, keeping the patient relaxed and calm, to assess skin mobility and elasticity, muscle tone and tenderness of the joint. Joint movements and range of motion are assessed using specific tests: Yergason's test, Land and Shift test, push-pull test, Hawkins test. The subjects were seated with the shoulder abducted at 45 degrees, the elbow flexed at 90 degrees and the forearm resting on a flat surface. The shock wave applicator was positioned in the direction of the calcifications. In both the treatment and control groups, no local anaesthetics or analgesics were administered before or during the treatment, and no therapeutic co-intervention was performed. The shock wave therapy device consisted of a control unit, a hand piece with a variety of head applicators, and a medical air compressor. The compressor generates pneumatic energy. This is used to accelerate a projectile inside the handpiece. A shock wave is generated and propagates radially from the tip of the applicator to the target area when the projectile strikes the applicator. The obtained data were analyzed with the Statistical Package for the Social Sciences version 26.0 (SPSS Inc., Chicago, IL, USA), using independent t-test, paired t-test, Chi-square test.

3. RESULTS

A total of 60 people with painful shoulder syndrome, divided into two groups, were included in the study. Of these, 30 subjects were treated with physical therapy (PT) and 30 with extracorporeal shock wave therapy (ESWT). In terms of gender, in the group that received shockwave therapy, 14 (47%) were men and 16 (53%) were women. In the group that received physiotherapy, 12 (40%) were men and 18 (60%) were women. There was no statistical significance. In the PT group, the mean age was 52.3 ± 11.3 years, while in the ESWT group, the mean age was 47.5 ± 13.9 years. No statistically significant difference was found $t = -1.468$; $p = 0.147$. In the PT group 50% of the subjects were workers and 27% had an office job. In the ESWT group, 43% of the subjects were manual workers and 33% had an office job. In both groups, the pain was mostly on the right side, 50% of the subjects in both groups. Pain on the left side was present in 37% of cases and both sides were affected in 13% of cases. The dominant hand in both groups was the right hand (83% in the PT group and 87% in the ESWT group). Pre-treatment functional status was assessed using the DASH questionnaire (Table 1).

Table 1. DASH Functional status of shoulder before treatment

DASH value	Level of function	Physical therapy		Shockwave		Total	
		N	%	N	%	N	%
0-30	Good function	0	0%	0	0%	0	0%
31-60	Satisfying function	0	0%	0	0%	0	0%
61-95	Bad function	30	100%	30	100%	60	100%

All subjects had significantly reduced function (poor function) prior to any form of therapy. Pain was very present, with an average score of 7.7 ± 0.9 in the PT group and 8.0 ± 1.1 in the SCT group. After treatment, function and pain scores were reassessed (Table 2). Subjects treated with classical physiotherapy had satisfactory function after treatment (100%), whereas in the group of subjects treated with the shockwave method, 25 (83%) had good function and 5 (17%) had satisfactory function. Significantly more subjects had good shoulder function after shockwave therapy ($p < 0.001$).

Table 2. DASH Functional status of shoulder after treatment

DASH value	Level of function	Physical therapy		Shockwave		Total	
		N	%	N	%	N	%
0-30	Good function	0	0%	25	83%	25	42%
31-60	Satisfying function	30	100%	5	17%	35	58%
61-95	Bad function	0	0%	0	0%	60	100%

Pain was analyzed before the therapy and after full cycles of therapy (table 3).

Table 3. Pain intensity before and after therapy

		Mean	SD	t	p
Pain intensity before treatment	PT group	7.7	0.9	1.156	0.254
	ESWT group	8.0	1.1		
Pain intensity after treatment	PT group	6.0	0.5	-9.066	<0.001
	ESWT group	4.0	1.1		

Before treatment, the pain level in the physiotherapy group had a mean value of 7.7 ± 0.9 and in the shockwave therapy group it was 8.0 ± 1.1 , without statistical significance ($t = 1.156$; $p = 0.254$). After 10 days in the PT group, pain decreased significantly to a level of 6.0 ± 0.5 ($p < 0.001$). In the ESWT group, pain intensity decreased to a level of 4.0 ± 1.1 . Although both groups proved to be effective in treating pain, shock wave therapy showed a significantly better result ($t = -9.066$; $p < 0.001$). In relative terms, the pain level decreased by 22.1% in the PT group and by 50% in the ESWT group.

4. DISCUSSION

The study found that the use of shockwave therapy contributed to a significant reduction in pain intensity and improvement in shoulder function. In the study Loew et al (1999) they found that using traditional methods, pain was reduced by approximately 5% after two sessions, whereas using two high energy shockwave therapies, pain was reduced by 58%.

In the Cochrane review by Surace, Deitch, Johnston and Buchbinder (2020), 42 out of 100 people reported a 50% or greater reduction in pain with shock wave therapy, compared to 38 out of 100 with placebo. Functional improvement was 8% (range 1.6% to 14%) or 8 points better (range 1.6 to 14 points better) with shock wave therapy on a scale of 0 to 100 points. The success of the treatment showed that 41 out of 100 people reported a successful treatment with shock wave therapy and 26 out of 100 people reported a successful treatment with a placebo. People who had shock wave therapy had a function score of 74 points and people who had a placebo had a function score of 66 points.

In the study by Oliveira et al (2021), there was evidence of a significant reduction in pain levels, an increase in the UCLA score and a significant reduction in the DASH score at the post-treatment assessments compared with the baseline assessment ($p < 0.001$), also a significant improvement at the three month assessment was observed ($p < 0.05$). Hsu et al (2008) also found similar results regarding the DASH score at the end of treatment. ESWT results were good to excellent in 87.9% of shoulders and fair in 12.1%, and control results were fair in 69.2% and poor in 30.1%. In our study, 83% of patients treated with ESWT had excellent function and 17% had fair results. In the control group treated with other methods, all subjects had fair results.

Limitations of the study: In this study, we didn't collect information about pain and function levels during treatment, and only analysed levels before and at the end of treatment.

5. CONCLUSION

Shockwave therapy has been shown to be effective in the treatment of periarthritis humeroscapularis, improving pain, functionality and quality of life in patients. Patients can improve their activities of daily living and reduce disability with this non-invasive, cost-effective and safe intervention. Both groups of treatments are effective in patients with periarthritis of the humeroscapular joint, but shock wave therapy was shown to be superior to standard physiotherapy in this trial.

REFERENCES

- Chen, C. Y., Hu, C. C., Weng, P. W., Huang, Y. M., Chiang, C. J., Chen, C. H., ... & Cheng, C. K. (2014). Extracorporeal shockwave therapy improves short-term functional outcomes of shoulder adhesive capsulitis. *Journal of shoulder and elbow surgery*, 23(12), 1843-1851.
- Oliveira, V. O. M. D., Vergara, J. M., Oliveira, V. F. D., Lara, P. H. S., Nogueira Junior, L. C., & Arliani, G. G. (2021). Extracorporeal shockwave therapy in shoulder injuries: prospective study. *Acta Ortopédica Brasileira*, 29, 268-273.
- De Durante, C., Corrado, B., Galasso, O., & Carillo, M. R. (2001). The frozen shoulder: Indications for extracorporeal shockwave therapy. In *Abstracts 4^o Congress International Society for Musculoskeletal Shockwave Therapy*.
- Hsu, C. J., Wang, D. Y., Tseng, K. F., Fong, Y. C., Hsu, H. C., & Jim, Y. F. (2008). Extracorporeal shock wave therapy for calcifying tendinitis of the shoulder. *Journal of shoulder and elbow surgery*, 17(1), 55-59.
- Lewis, J. (2018). Rotator cuff related shoulder pain: assessment, management and uncertainties. *Manual therapy*, 23, 57-68.
- Liu, C. T., & Yang, T. F. (2019). Intra-substance steroid injection for full-thickness supraspinatus tendon rupture. *BMC Musculoskeletal Disorders*, 20(1), 1-7.
- Loew, M., Daecke, W., Kusnierczak, D., Rahmzadeh, M., & Ewerbeck, V. (1999). Shock-wave therapy is effective for chronic calcifying tendinitis of the shoulder. *The Journal of bone and joint surgery. British volume*, 81(5), 863-867.
- Murphy, R. J., & Carr, A. J. (2010). Shoulder pain. *BMJ clinical evidence*, 2010.
- Shang, X., Zhang, Z., Pan, X., Li, J., & Li, Q. (2019). Intra-articular versus subacromial corticosteroid injection for the treatment of adhesive capsulitis: a meta-analysis and systematic review. *BioMed research international*, 2019.
- Surace, S. J., Deitch, J., Johnston, R. V., & Buchbinder, R. (2020). Shock wave therapy for rotator cuff disease with or without calcification. *Cochrane Database of Systematic Reviews*, (3).
- Vahdatpour, B., Taheri, P., Zade, A. Z., & Moradian, S. (2014). Efficacy of extracorporeal shockwave therapy in frozen shoulder. *International Journal of Preventive Medicine*, 5(7)