



EFFECTIVENESS OF EXTRACORPOREAL SHOCKWAVE THERAPY ON CHRONIC NONSPECIFIC LOW BACK PAIN.

Physiotherapy

Jaya Radhwani	BPT, MPT, FSS, CSI, HOD of A+OSM, New Delhi,
Mayank Alok	BPT, clinical physiotherapist, A+OSM, New Delhi,
Priya Rajput	BPT, clinical physiotherapist, A+OSM, New Delhi
Gautam Gupta	MPT sports, clinical physiotherapist, A+OSM, New Delhi

ABSTRACT

A total of 30 subjects were recruited including both genders (male and female) who meets inclusion and exclusion criteria, were suffering from low back pain more than 3 months, and subjects received one session of ESWT(1000 shocks) and outcome variables were recorded before, immediately after treatment and after third day and seventh day. The result showed a significant improvement on pain relief and improvement of disability measures and has less sustained effect on ROM of lumbar spine which was measured using NPRS, Oswestry low back pain disability questionnaire and modified schober's test.

KEYWORDS

back pain, ESWT, chronic back pain

INTRODUCTION

Non-specific low back pain is defined as low back pain not attributable to a recognizable, known specific pathology (e.g., infection, tumor, osteoporosis, fracture, structural deformity, inflammatory disorder, radicular syndrome, or cauda equina syndrome^[1]). Non-specific low back pain is common and affects people of all ages^{[2][3][4]}. It is second only to the common cold as the most common affliction of mankind and is among the leading complaints bringing patients to physicians^{[3][4]}.

The reported point prevalence of non-specific low back pain is as high as 33 percent^[4], its one-year prevalence as high as 73 percent^{[4][5]} and its lifetime prevalence exceeds 70% in most industrialized countries^[1] with an annual incidence of 15% to 20% in the United States of America.

Definitions of chronicity of non-specific low back pain were proposed in the literature, mainly characterized by the duration of symptoms^[6] e.g. more than seven weeks, more than three months and^[7], at least half the days in a 12-month period in a single or in multiple episodes^[8]. In the proposed study chronicity will be defined as duration of symptoms of more than three months.

The goals of management for patients with non-specific low back pain are to decrease the pain, restore mobility, and hasten recovery so the patient can resume normal daily activities as soon as possible.

Recently extracorporeal shock wave therapy (ESWT) was introduced into the management of non-specific low back pain^{[9][10][11][12]}. ESWT can also be defined as a large amplitude compression wave, as that produced by an explosion or by supersonic motion of a body in a medium. The wave that is generated will vary in its energy content and also will have different penetration depths in human tissue. Notarnicola.A et al 2018 compared the effectiveness of exercise therapy with extracorporeal shockwave therapy for the treatment of low back pain. He evaluated on the basis of electromyographic improvement, pain relief & reduction in degree of disability in patients with LBP. He found that shockwave is effective in pain relief, improvement in disability measures & electromyographic improvement^[28].

Marwan.Y et al 2017 did study on patients those who had pain for at Least 6 weeks & had trauma to the sacro-coccygea region. They had three sessions (one session per week for three consecutive weeks) of focused shock wave therapy directed to the maximal point of coccygeal tenderness. After six month of follow up he found that there is significant relief in pain & improvement in disability measures^[13].

Methodology

Study Design: - Experimental study

Study Population & Sample: - Patient with chronic (more than 3

months) non-specific low back pain.

Place of Data Collection: A+ Orthopaedic and sports medicine centre.

Sample Size: 30

Selection Criteria

Inclusion Criteria:

- Adults (both male and female) with non-specific low back pain for more than three months.
- Age range: between 18 and 40 years.
- Chronic non-specific low back pain clinically diagnosed as repeated lumbar sourness and swelling pain or a chronic progressive process, accompanied by (i) X-ray examination to exclude lumbar vertebral fractures, spondylolysis, spondylolisthesis and severe osteoporosis, and/or (ii) MRI with normal signal or low nucleus pulposus signal.
- No contraindications for rESWT.

Exclusion criteria:

- Previous spinal fracture or spinal surgery.
- Protrusion of a lumbar intervertebral disk, ankylosing spondylitis, scoliosis, lumbar spondylolisthesis and lumbar spondylolysis.
- Systemic disorders and psychiatric disorders.
- pregnant patients,
- blood-clotting disorders (including local thrombosis),
- patients treated with oral anticoagulants,
- patients with local tumors,
- Treatment of patients with local bacterial and/or viral infections (including lumbar vertebral tuberculosis), and
- Treatment of patients treated with local corticosteroid applications in the time period of six weeks before the first rESWT session (if applicable).

Instruments Required:

Shockwave Machine

Oswestry low back pain disability questionnaire

Numeric rating scale

Modified Schober's test

Inch tape

Procedure: The study was conducted at A+OSM, Hauz Khas, with STORZ Medical machine.

Thirty subjects of both genders with the age 18-40 years who will meet the inclusion criterion will be included in the study. The subjects will be explained about the entire procedure and informed consent for doing the intervention will be taken. The selection of subject will be done according to inclusion and exclusion criteria. Each patient will be assessed pre and post intervention by numeric rating scale for pain, Oswestry low back pain disability questionnaire for the interpretation

of disability scores and schober's test to measure the ROM of lumbar spine. The results will be compared. Also the follow-up will be taken at third and seventh day.

Protocol

To conduct extracorporeal shock wave therapy for ESWT group Storz medical shockwave machine is used in this study. Each patient assumed a prone position, and 1,000 shock waves (7 times per sec) were applied at 2.5 Hz at low energy flux densities of 0.01–0.16 mJ/mm² using a 17 mm steel head. The treatment was conducted at the quadratus lumborum muscle and the sacroiliac joint, & where the patients complained of pain. Treatment will be given for one day and follow-up will be taken on third and seventh day.

Result

The data is analysed by using t test. Paired t test is used for comparing the pretreatment and post treatment data within the group.

Table 1: Paired t test for Numeric pain rating scale

	Variable 1	Variable 2
	1	2
Mean	5.066667	1.733333
Variance	1.650575	2.133333
Observations	30	30
Pearson Correlation	0.138434	
Hypothesized Difference	Mean 0	
Df	29	
t Stat	10.10508	
P(T<=t) one-tail	2.6E-11	
t Critical one-tail	1.699127	
P(T<=t) two-tail	5.2E-11	
t Critical two-tail	2.04523	

Table 2: Paired t test for Oswestry disability index

	Variable 1	Variable 2
	1	2
Mean	20.383	13.26367
Variance	93.29728	61.63916
Observations	30	30
Pearson Correlation	0.907697	
Hypothesized Difference	Mean 0	
Df	29	
t Stat	9.383763	
P(T<=t) one-tail	1.37E-10	
t Critical one-tail	1.699127	
P(T<=t) two-tail	2.74E-10	
t Critical two-tail	2.04523	

Table 3: Paired t test for ROM

DURATION	NPRS AVERAGE
PRE-TREATMENT	5.066667
POST-TREATMENT	1.666667
DAY 3	1.633333
DAY 7	1.733333

Table 4: Table of significance

Parameters	t stat	t critical	p- value
NPRS	10.10508	1.699127	.000
ODI	9.383763	1.699127	.000

ROM	2.2166	1.699127	.035
-----	--------	----------	------

Table 5: Effect of shockwave therapy on NPRS

	Variable 1	Variable 2
Mean	20.54067	22.3
Variance	15.63306	4.217241
Observations	30	30
Pearson Correlation	0.058581	
Hypothesized Mean Difference	0	
Df	29	
t Stat	-2.21661	
P(T<=t) one-tail	0.017325	
t Critical one-tail	1.699127	
P(T<=t) two-tail	0.03465	
t Critical two-tail	2.04523	

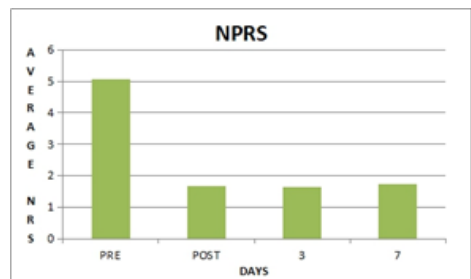


Fig:6 : Effect of shockwave therapy on NPRS.

Table 6: Effect of shockwave therapy

DAYS	ODI AVERAGE
PRE-TREATMENT	20.383
DAY 3	15.74667
DAY 7	13.26367

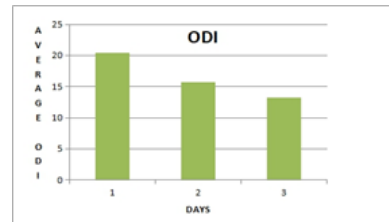


Table 7 : Effect of shockwave therapy on range of motion of lumbar flexion.

DAYS	ROM AVERAGE
PRE-TREATMENT	21.3
POST TREATMENT	22.03333
DAY 3	21.93333
DAY 7	22.3

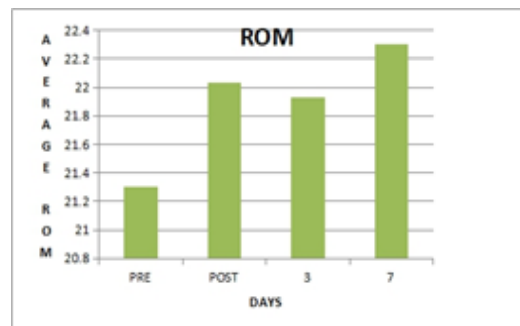


Fig 8 :Effect of shockwave therapy on range of motion of lumbar flexion.

Discussion

The major finding of the study is that the extracorporeal shockwave therapy is effective & safe for the treatment of chronic non specific low back pain.

The present study assessed effects of extracorporeal shockwave therapy on pain, degree of disability and range of motion of lumbar flexion which was taken using numeric rating scale, Oswestry disability index and schober's test respectively. The patients which were included in the study were instructed to avoid other treatments for their back pain. The study was conducted as a one time study and the measurement were taken pre-treatment, immediately after treatment and follow-ups were taken on day 3 and day 7. The immediate effects of ESWT are intensive. The pain which was measured using NPRS has shown significant improvement immediately after the application of ESWT when post-treatment mean values of NPRS (1.666667) were compared with pre-treatment mean values of NPRS (5.066667). The follow-up was taken on day 3 and day 7 and the effects were sustained when mean values of NPRS were observed of day three (1.633333) and day seven (1.733333). There were sequent reduction in low back pain disability index which was calculated before application of shockwaves and on follow up periods using Oswestry disability index. The flexion range of motion of lumbar has shown intensive increment immediately after the treatment with shockwave. On follow-up on day three after the treatment there were slight reduction in mean values of schober's test. The exact reason is not clear but it is suggested by many researchers that shockwave application takes the tissue from chronic to more acute state which cause local inflammatory reaction which may have contributed to reduction in ROM of lumbar flexion which was measured using schober's test. But on day seven follow-up after the treatment, increase in ROM of lumbar flexion was observed which may be due to reduction in pain. Neither of the patient which were included in the study complained of worsening of the symptoms from the baseline hence the study proved the safety of shockwave therapy.

Han H. et al 2015 also reported ESWT appeared to relieve chronic low back pain, thereby enhance the patient's physical functions and as a result of which their ability to perform daily living activities, leading to significant reduction in low back pain disability indexes.

Notarnicola. A et al 2018 also reported ESWT as an effective and safe treatment in dealing with low back pain while comparing it with exercise therapy in terms of reduction in pain and disability indexes.

The ESWT was effective for the treatment of chronic non specific low back pain as it promotes re-vascularization and improve blood supply to the muscles, tendons and bones. It promotes healing through revascularization. It also help in relieving pain by blocking the pain gait due to application of shocks over the affected muscles.

Limitation of the study

1. Large sample size and longer duration of treatment can give the better picture.
2. Perception of patient's pain is subjective.
3. Limited evidences are present for the support of effectiveness of shockwave therapy as a treatment for chronic non specific low back pain.
4. Patient compliance is less as the patient's are less aware about the effectiveness of shockwave modality for musculoskeletal problems.

Conclusion

This study concluded that ESWT is an effective and safe treatment for the treatment of chronic non specific low back pain. Also single session has its sustained effects on pain relief and improvement of disability measures. ESWT has less sustained effects on ROM of lumbar flexion but it has intense effects on ROM of lumbar flexion immediately after the application of ESWT.

References

1. Balagué F, Mannion AF, Pellisé F, Cedraschi C. Non-specific low back pain. *The Lancet*. 2012 Feb 4;379(9814):482-91.
2. Carragee EJ. Persistent low back pain. *New England Journal of Medicine*. 2005 May 5;352(18):1891-8.
3. Bhangle SD, Sapru S, Panush RS: Back pain made simple: an approach based on principles and evidence. *Cleve Clin J Med* 2009;76:393-399.
4. Maher C, Underwood M, Buchbinder R. Non-specific low back pain. *The Lancet*. 2017 Feb 18;389(10070):736-47.
5. Cassidy JD, Carroll LJ, Côté P. The Saskatchewan health and back pain survey: the prevalence of low back pain and related disability in Saskatchewan adults. *Spine*. 1998 Sep 1;23(17):1860-6.
6. Cedraschi C, Robert J, Goerg D, Perrin E, Fischer W, Vischer TL. Is chronic non-specific

low back pain chronic? Definitions of a problem and problems of a definition. *Br J Gen Pract*. 1999 May 1;49(442):358-62.

7. Frymoyer JW. Back pain and sciatica. *New England Journal of Medicine*. 1988 Feb 4;318(5):291-300.
8. Von MK. Studying the natural history of back pain. *Spine*. 1994 Sep;19(18 Suppl):2041S-6S.
9. Nedelka T, Nedelka J, Schlenker J, Hankins C, Mazanec R. Mechano-transduction effect of shockwaves in the treatment of lumbar facet joint pain: comparative effectiveness evaluation of shockwave therapy, steroid injections and radiofrequency medial branch neurotomy. *NeuroEndocrinol Lett* 2014;35:393-397
10. Lee S, Lee D, Park J. Effects of extracorporeal shockwave therapy on patients with chronic low back pain and their dynamic balance ability. *Journal of physical therapy science*. 2014;26(1):7-10.
11. Han H, Lee D, Lee S, Jeon C, Kim T. The effects of extracorporeal shock wave therapy on pain, disability, and depression of chronic low back pain patients. *Journal of physical therapy science*. 2015;27(2):397-9.
12. Moon YE, Seok H, Kim SH, Lee SY, Yeo JH. Extracorporeal shock wave therapy for sacroiliac joint pain: A prospective, randomized, sham-controlled short-term trial. *Journal of back and musculoskeletal rehabilitation*. 2017 Jan 1;30(4):779-84.
13. Marwan Y, Dahrab B, Esmael A, Ibrahim SA, Al-Failakawi J. Extracorporeal shock wave therapy for the treatment of coccydynia: a series of 23 cases. *European Journal of Orthopaedic Surgery & Traumatology*. 2017 Jul 1;27(5):591-8.