



Effect of Shock Wave in Treatment of Sciatic Neuralgia

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Abstract

Sciatica is a relatively common condition with a lifetime incidence varying from 13% to 40%. The corresponding annual incidence of an episode of sciatica ranges from 1% to 5%.

Objective: of this study was to determine the effect of shock wave in treatment of sciatic neuralgia in Egypt

Methods: Thirty male and female patients suffering from sciatic neuralgia were assigned randomly into two equal groups. Study group (GA) (n=15) and control group (GB) (n=15). The group (A) received shock wave and therapeutic exercise, the patients in group (B) received therapeutic exercise only. Parameter of pain assessment through visual analogue scale and balance stability through biodex stability system were measured before and after four weeks of treatment for both groups.

Design: prospective Two groups pre-post design

Results: post treatment results showed there was significant decrease in pain and significant improve in balance overall stability index, medio /lateral stability and antro-post stability in the study group. There was no significant improvement in pain and stability index in the control group.

Conclusion: It can be concluded that shock wave is effective as a method of treatment of sciatic neuralgia.

Keywords: Sciatic neuralgia, Pain, Balance, Shockwave.

INTRODUCTION

Sciatica is pain that radiates from the buttock downward along the course of the sciatic nerve but the term has been used indiscriminately for a variety of back and leg symptoms⁽¹⁾.

Sciatic neuralgia is defined as 'pain in the distribution of the sciatic nerve due to pathology of the nerve itself'. Radicular pain is defined as 'pain perceived as arising in a limb or the trunk caused by ectopic activation of nociceptive afferent fibres in a spinal nerve or its roots or other neuropathic mechanisms'. According to these definitions, sciatic neuralgia is clearly a

form of radicular pain, and is described as a disease of the peripheral nervous system⁽²⁾.

Extracorporeal shockwave therapy (ESWT) has shown effectiveness in many orthopedic disorders including soft tissue tendinopathy and non-union of long bone fractures^(3,4). Accordingly, shock waves are characterized by (A) high positive peak pressure (P+), sometimes more than 100 megapascals (MPa) but more often approximately 50 to 80 MPa, (B) fast initial rise in pressure (Tr) during a period of less than 10 nano second (ns), (C) low tensile amplitude (P-, up to 10 MPa),

(D) short life cycle (I) of approximately 10micrsecond(μ s),(E) broad frequency spectrum, typically from 16 Hz to20 megahertz (MHz) ⁽⁵⁾ Shock waves have both a direct and indirect effect on treated tissues. The direct effect is the result of the energy of the shock wave being transferred to the targeted tissues. The indirect effect is the result of the production of cavitations bubbles in the treated tissue. Both the direct and indirect effects produce a biological response in the treated tissues ⁽⁶⁾.

SUBJECTS AND METHODS

Thirty patients (male and female) with sciatic neuralgia had been selected. They referred to physical therapy by Neurologist from outpatient clinic of faculty of physical therapy, Cairo University. These patients had been randomly (one by one for each group) divided into two equal groups.

Subjects included in the study their ages ranging from 30- 50 years. They were diagnosed as sciatic neuralgia based on careful clinical assessment and radiological investigations including X-ray and/ or magnetic resonance imaging (MRI).

The duration of illness ranged from one to six month. Straight leg raising test (Lasègue's test), (Fajersztajn's test), Bechterew test had been selected from the pain provocation tests & were applied to all the patients on both sides. All patients were medically and psychologically stable.

Exclusion criteria were Perceptual, cognitive disorders, uncooperative patients, Patients with phobia from shock wave. Patients with any spinal causes of low back pain. Patients with fixed contractures in lower limbs.

INSTRUMENTATION AND MATERIALS

Biodex stability system (BSS) had been used for objective assessment of balance.

Visual analogue scale (VAS): had been used to measure the amount of pain that the patient feels ranges across a continuum line from none to an extreme pain.

Shock wave therapy had been used as a treatment instrument for the study group.

Therapeutic exercise had been done for both group, consist of strengthening and stretching exercise.

STUDY PROTOCOL

Group A (study group) treatment: Fifteen patients had received the shock wave and therapeutic exercise. For shock wave the patient lie in a prone lying position, Common ultrasound gel was used as a contact medium between the cylinder and the skin.2000 impulse, energy level 3-5 bar, were administered to the sciatic nerve distribution, two times per week for successive four weeks and therapeutic exercise two times per week for successive four weeks.

Group B (control group) treatment: Fifteen patients had received therapeutic exercise only three times per week for successive four weeks.

ETHICAL CONSIDERATION

All patients were informed of the purpose, tools, procedures, and duration of the study and signed a written consent

STATISTICAL ANALYSIS

Non parametric test and measures was used (Median and Inter quartile range IQR) and wilcoxon measures inside the group and Mann whitney test between groups .The six variables (stability index , Antro/ posterior stability index , Medio/ lateral stability index , standard deviation, Antro/ posterior standard deviation , Medio/lateral standard deviation) were compared between groups, The biodex results in between the study and control groups on affected side and non affected side, The visual analogue scale to compare between boths groups in pre and post treatment.

Biodex Stability Results

a) Comparison between study and control group (Affected side)

As presented in table (1) and illustrated in figure(1), Results revealed that there was no significant difference between both groups in pre treatment evaluation, in either affected or non

affected side .In post treatment evaluation, there study group with P value 0.002**. There was also significant difference in Antro-posterior stability index with P value 0.004**.The medio- lateral

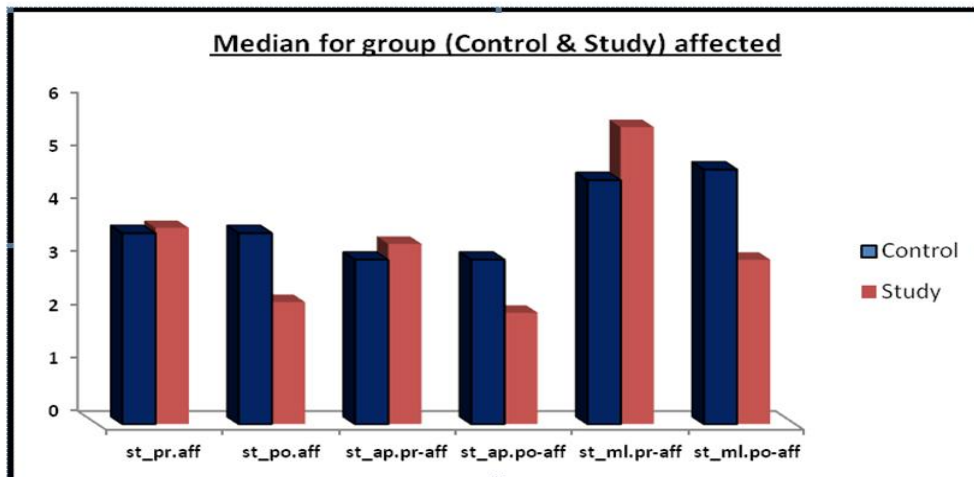
was significant difference in stability index in the stability index of the study group had shown significant difference with P value 0.005**.

Table (1) Comparison between study and control group (Affected side)

Variable	Control		Study		Z	P-value	Indication
	Median	IQR	Median	IQR			
st_pr.aff	3.60	1.70	3.70	2.20	-0.957	0.339	Not Sig.
st_po.aff	3.60	1.60	2.30	1.40	-3.095	0.002**	Sig.
st_ap.pr-aff	3.10	1.10	3.40	2.50	-1.372	0.17	Not Sig.
st_ap.po-aff	3.10	0.70	2.10	0.90	-2.874	0.004**	Sig.
st_ml.pr-aff	4.60	2.40	5.60	2.60	-0.125	0.901	Not Sig.
st_ml.po-aff	4.80	2.40	3.10	1.30	-2.807	0.005**	Sig.
sd_pr.aff	1.50	0.60	1.50	0.30	-0.063	0.95	Not Sig.
sd_po.aff	1.60	0.60	0.60	0.40	-3.761	0.001**	Sig.
sd_ap.pr-aff	2.30	0.90	1.90	1.60	-0.817	0.414	Not Sig.
sd_ap.po-aff	2.50	1.40	1.20	0.40	-3.698	0.001**	Sig.
sd_ml.pr-aff	0.80	0.90	1.60	1.10	-1.2	0.23	Not Sig.
sd_ml.po-aff	0.90	1.10	0.60	0.40	-2.272	0.023*	Sig.

* Significant Level (P < 0.05) Aff Affected
 ** Significant Level (P < 0.01) St Stability Index
 ML Medio/ lateral SD Standard deviation
 AP Antro/posterior

Figure (1) Comparison between study and control group (Affected side)



b) Comparison between study and control group (Non Affected Side)

As represented in table (2) and illustrated in figure (2) there was no difference between both groups on pre assessment evaluation for non affected side, the both groups were homogenous. Post

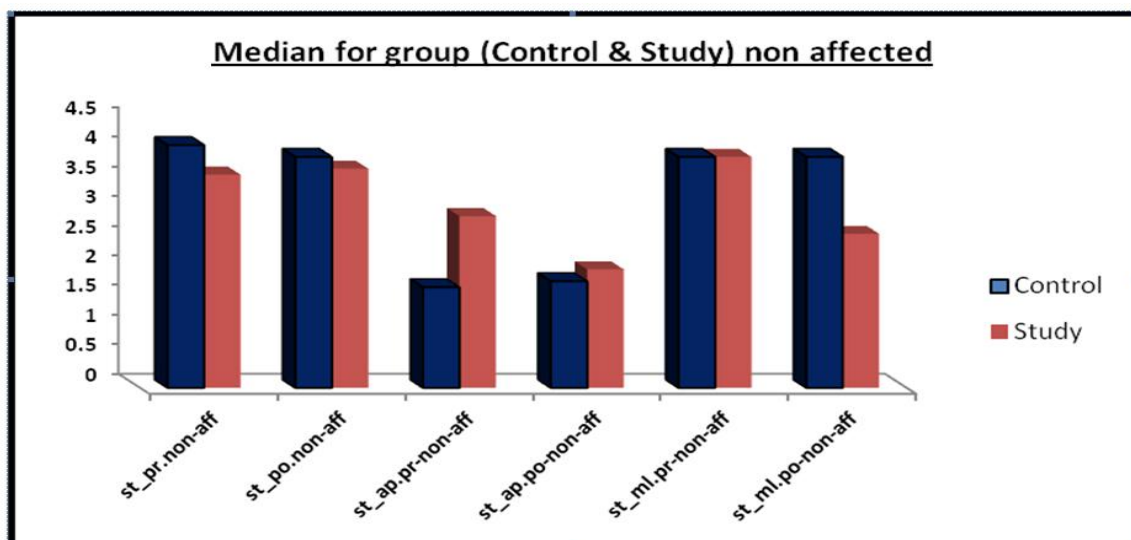
assessment there was significant difference in study group represented in over all stability index and medio lateral stability index, there was no increase in both groups in antro posterior stability index.

Table (2) Test for the difference between group (study & control) for non affected

Variable	Control		Study		Z	P-value	Indication
	Median	IQR	Median	IQR			
st_pr.non-aff	4.10	1.90	3.60	1.10	-1.497	0.134	Not Sig.
st_po.non-aff	3.90	1.60	3.70	1.20	-2.02	0.043*	Sig.
st_ap.pr-non-aff	1.70	2.40	2.90	1.60	-0.252	0.801	Not Sig.
st_ap.po-non-aff	1.80	2.60	2.00	0.50	-0.187	0.851	Not Sig.
st_ml.pr-non-aff	3.90	0.60	3.90	1.70	-0.638	0.524	Not Sig.
st_ml.po-non-aff	3.90	0.60	2.60	1.50	-3.21	0.001**	Sig.
sd_pr.non-aff	0.70	0.20	0.70	0.40	-0.958	0.338	Not Sig.
sd_po.non-aff	0.60	0.30	0.40	0.30	-1.486	0.137	Not Sig.
sd_ap.pr-non-aff	1.20	0.40	1.20	1.40	-0.627	0.531	Not Sig.
sd_ap.po-non-aff	1.10	0.60	0.90	0.30	-2.11	0.035*	Sig.
sd_ml.pr-non-aff	0.90	0.70	0.70	0.60	-1.693	0.091	Not Sig.
sd_ml.po-non-aff	0.80	0.90	0.60	0.40	-2.132	0.033*	Sig.

* Significant Level (P < 0.05) Aff Affected
 ** Significant Level (P < 0.01) St Stability Index
 ML Medio/ lateral SD Standard deviation
 AP Antro/posterior

Figure (2) Comparison between study and control group (Non Affected Side)



Visual analogue scale (VAS) results

As showed in table (3) and illustrated in figure (3)

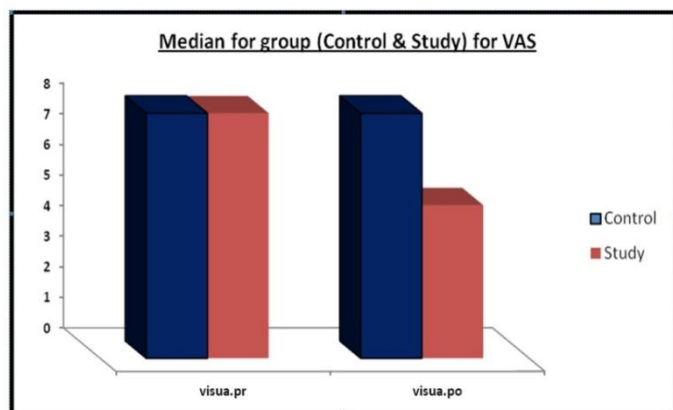
there was significant improvement in pain in the study group rather than control group.

Table (3) test for the difference between group (study & control) for VAS

Variable	Control		Study		Z	P-value	Indication
	Median	IQR	Median	IQR			
visua.pre	8.00	1.00	8.00	2.00	-0.79	0.43	Not Sig.
visua.post	8.00	1.00	5.00	2.00	-4.31	0.001**	Sig.

** Significant Level (P < 0.01)

Figure (3) Comparison between study and control group



DISCUSSION

Sciatica affects many people. The most important symptoms are radiating leg pain and related disabilities. Patients are commonly treated in primary care but a small proportion is referred to secondary care and may eventually have surgery. Many synonyms for sciatica appear in the literature, such as lumbosacral radicular syndrome, ischias, nerve root pain, and nerve root entrapment (7).

In this study, there were no statistical significant differences between two groups in pre treatment evaluation; this indicates that the subjects in the two groups were homogenous. Comparing the pre-treatment and the post-treatment visual analogue scale result for study group; there was significant decrease in pain intensity in the study group with P Value 0.001*. This could be attributed to the effect of shockwave in pain reduction. This comes in close agreement with Schlaudraff KU et al, 2014 (8) who studied the effectiveness of shock wave in patient with low back pain, the pain was reduced following shockwave after 8 sessions in the form of 2,000 shockwave impulses (5 Hz) at an energy flux density of 0.10 mJ/mm² were delivered using a 17-mm head.

The improvement of balance stability in study group rather than control group could be attributed to the effect of shock wave to improve the balance, this come in close agreement with Sangyong Lee et al., 2014 (9) who studied the effects of extracorporeal shockwave therapy on patients with

Chronic Low Back Pain and their dynamic Balance Ability in which the patients divided into an extracorporeal shockwave therapy group (ESWTG: n=13) and a conservative physical therapy group (CPTG, n=15). An exercise program that included Williams' exercises and McKenzie's exercises was performed by both groups. The program was implemented twice a week for six weeks. The visual analog scale (VAS) was used to measure the chronic low back pain of the patients. In the VAS comparison between the groups after the treatment, the ESWTG showed a significantly larger improvement in dynamic balance ability. The improvement in pain and function in study group rather than control group could be attributed to the effect of shock wave in decrease pain and inflammation and improve the function, this comes in close agreement with Chan Park et al.2015 (10) who studied the effect of extracorporeal shockwave on frozen shoulder patients' pain and functions. Thirty frozen shoulder patients were divided into two groups: an extracorporeal shock wave therapy group of 15 patients and a conservative physical therapy group of 15 patients. The ESWT group, The patients received 1,000 shock waves at 2.5 Hz, with the energy adjusted from 0.01–0.16 mJ/mm², depending on the degree to which the patients endured pain, two times per week for six weeks, In intra-group comparisons, the two groups showed significant decreases in terms of visual analog scales and patient-specific functional scales, although the extracorporeal shock wave therapy group showed significantly lower scores than the conservative physical therapy group. Extracorporeal shock wave therapy is considered an effective intervention for improving frozen shoulder patients' pain and functions.

The results of the present study were in consistent with Hammer DS et al., 2000 (11) who studied the effect of extra corporeal shockwave in patient with tennis elbow and painful heel. Both groups received 3000 shock waves of 0.12 mJ/mm² three times at weekly intervals. After a follow-up of 5 and 6 months respectively, pain measured on a visual analogue scale (VAS) decreased

significantly in both groups. The success rate (excellent and good results) was 63% in tennis elbows and 70% in painful heels. ESWT seems to be a useful conservative alternative in the treatment of both conditions.

The results of the present study are in contradiction with the finding of Speed CA et al., 2002⁽¹²⁾. They studied the effect of extra corporeal shock wave therapy (ESWT) for patients with lateral epicondylitis. Adults with lateral epicondylitis were randomised to receive either active treatment (1500 pulses ESWT at 0.12 mJ/mm²) or sham therapy, monthly for three months. All were assessed before each treatment and one month after completion of therapy. Outcome measures consisted of visual analogue scores for pain in the day and at night. Seventy-five subjects participated and there were no significant differences between the two groups at baseline. Both groups showed significant improvements from two months. No significant difference existed between the groups with respect to the degrees of change in pain scores over the study period. At three months, 50% improvement from baseline was noted in 35% of the ESWT group and 34% of the sham group with respect to pain. It seems that the number of sessions was not enough to produce effect as the patients had received one session per month for three months so the total number of sessions was not enough to produce effect and the gap between sessions was too large (one month) which can affect on the result.

The result of statistical analysis of the current study showed that the shock wave had significant effect on sciatic neuralgia rather than therapeutic exercise, as there was a significant improvement of the affected side in single leg stance study group presenting in the overall stability and medio-lateral stability and antro-post stability.

The present findings, shock wave had significant effect in improvement in overall stability index, Medio-lateral stability index and Antro –post stability in patient with sciatic neuralgia and pain reduction.

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CONCLUSION

Based on the results and finding of this study, it is possible to conclude that: The extra corporeal shock wave therapy is an effective method to decrease pain and inflammation and improve the balance in patients with sciatic neuralgia and beneficial method in treating sciatic neuralgia more than therapeutic exercise alone.

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