



Comparison of Efficacy of Shortwave Diathermy (SWD) and High Velocity Low Amplitude Thrust Manipulation (HVLATM) for management of chronic mechanical low back pain

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Abstract:

Objectives: To compare the effectiveness of short wave diathermy (SWD) and high velocity low amplitude thrust manipulation (HVLATM) for management of chronic mechanical low back pain on outcome measures like VAS, ODI, ROM (flexion, extension). **Materials and Methods:** Study Design: Experimental study. A convenient sample of 30 patients was taken. They were assessed by the orthopedician for mechanical low back pain. After obtaining their consent, routine assessment was done and outcome measures were obtained on VAS, ODI and ROM (flexion, extension by using Modified Schobers method). Pre and post treatment (9th session of the treatment), outcome measures were assessed. **Results:** Total 30 subjects, 15 in HVLAT group AND 15 in SWD group were conveniently allocated. There was significant difference on above outcome measures between the two groups ($p=0.000$). In comparison with SWD (group 1) and HVLAT (group 2) showed more significant improvement on VAS, ODI and ROM in chronic mechanical low back pain subjects. **Conclusion:** We conclude that high velocity low amplitude thrust manipulation can be used in rehabilitation of chronic mechanical low back pain patients.

Key words: Chronic mechanical low back pain; HVLAT; Outcome measures; SWD

Introduction

Chronic Low back pain is most likely the result of both pathoanatomical and biochemical influences and it clearly involves a complex

pathophysiological process with symptoms and signs emanating from biochemical changes in the tissues[1].

As much as 97% of low back pain is described as "mechanical," meaning that the underlying cause is an anatomic or functional abnormality, rather than a inflammatory disease, malignant neoplasm, or manifestation of visceral disease. On a temporal axis, low back pain may be defined as acute (<3 months) or chronic (>3months) [2]. Each year 15-45% of adults suffer low back pain and 5% people present to a health care professional with a new episode. Low back pain is most common in between the ages of 35-55 years. Low back pain is mechanical in about 85% of people [3]. Interventions used in chronic low back pain are oral drugs, analgesics (acetaminophen, opioids), antidepressants, non steroidal anti inflammatory drugs (NSAIDs) local injections, epidural steroid injections, trigger point and ligamentous injections, behavior therapy, electromyography (EMG) feedback, multidisciplinary treatment programs, temperature treatments (short wave diathermy, ultrasound, ice, heat), traction and transcutaneous electrical nerve stimulation [4].

Mild degree of heating is effective in relieving pain which may be due to sedative effect. It has been suggested that pain may be due to accumulation of waste product of metabolism in the tissue and the increased flow of blood through area assist in removing this substances. SWD assist in bringing inflammation down when pain is due to inflammation and indirectly relieves pain [5]. Wag staff, Wag staff and Downey studied patients with back pain; they were allocated randomly to SWD, or PSWD (82 Hz, 700 W, mean power = 23.2 W), or a second PSWD group (200 Hz, 300W, mean power = 23.4 W). Treatment was applied for 15 minutes twice a week for 3 weeks. The results indicated that all three groups showed a significant decrease in pain, using a 15 cm VAS, by the end of the trial. The PSWD groups showed a significantly greater reduction in pain than the SWD group. There was no difference in the improvement between the two PSWD groups. However, only limited interpretations can be made from these results because the study did not contain a placebo group [6].

Velocity Low Amplitude Thrust (HVLAT) manipulations are performed at the end of pathological limit of the joint and are intended to alter positional relationship snap adhesion or stimulate joint receptor. The aim of HVLAT manipulation technique is to achieve accessory joint mobility in spinal joints which is characterized by a popping or cracking sound [7]. Evans D W stated joint mobilization is a subtype of joint manipulative therapy in which therapist moves the joints in

specific direction and depth to stretch joint itself and surrounding tissues. Thrust involves rapidly moving joint beyond its physiological or normal operating range of motion and below anatomical or maximum limit of motion. This rapid distraction or gapping of facet joint surface accompanied by audible crack or pop caused by formation of tiny gas bubbles (cavitations) in joint fluid. This sound and gas bubbles have no therapeutic properties but may indicate clean separation of joint surfaces. Thrust manipulation provides pain relief and helps to restore normal joint function.

Evans D W carried out a study regarding mechanism and effect of spinal HVLAT manipulation to critically discuss previous theories and research of spinal HVLAT manipulation. Reported neurophysiologic effect that seems to be uniquely associated with cavitations of synovial fluid. In this study 2 separate modes of action from zygapophyseal HVLAT manipulation. Intra articular mechanical effects of zygapophyseal, HVLAT manipulation seem to be absolutely separate from and irrelevant to the occurrence of reported "neurophysiologic" effects. Cavitations should not be an absolute requirement for the mechanical effects to occur but may be a reliable indicator for successful joint gapping. After this study he concluded that that identification of these unique neurophysiologic effects will provide enough theoretical reason for HVLAT manipulation and mobilization to be assessed independently as individual clinical interventions [8]. There are various scales which are used to measure the efficacy of the treatment VAS (Visual Analog Scale) which assesses pain on 10 cm line anchored at either ends two extremes of pain. VAS is a simple and frequently used method for the assessment of variations in intensity of pain. In clinical practice the percentage of pain relief assessed by VAS is often considered as a measure of the efficacy of treatment [9]. Oswestry Disability Index remains valid and vigorous measure and has been worthwhile outcome measure in management of spinal disorder. Its document methods by which it has been validated data from scores in normal and back pain patients are taken [10].

As the orientation of the facet joints dictate the amount of ROM in particular segment of the spinal column the flexion and extension range of motion which is more in lumbar region this is assessed by tip to floor method by using inch tape and Modified Modified Schobers Method (MMSM) which is more valid and reliable [11,12].

Materials and Methods

A Convenient sample of 30 subjects which were referred by orthopaedician of diagnosis of chronic mechanical low back pain. After finding their suitability as per inclusion and exclusion criteria they were requested to participate in the study. Informed consent was obtained from subjects willing to participate subsequently their demographic data was collected and further evaluation involved using passive physiological intervertebral movements. Measurements were taken before and after session for pain, ROM, Oswestry disability index (ODI) Pain intensity was noted using VAS (Visual analog Scale). Group 1- 15 subjects of either gender received SWD Group 2- 15 subjects of either gender were treated with High velocity low amplitude thrust (HVLAT) manipulation maximum of 3 times per week for 3 week. HVLAT group - After appropriate positioning the thrust was applied depending upon the side of symptom. Thrust was applied with minimal leverage at end of range based on examination findings of intervertebral movements end feel, the dysfunction was ascertained and thrust delivered either to one or several segments. If cavitations was heard it was noted not always the cavitations was noted but the pain and range of motion were noted. SWD group - Calibration of the machine was ascertained by biomedical engineer of SDMCMS and hospital. SWD was administered by capacitor field method. Shortwave diathermy was used with frequency 27.12 MHz and wavelength 11mts. The intensity was increased till the subject perceived comfortable warmth. Tuning of the machine was ascertained. The total treatment lasted for 30 min [13]. All subjects were given therapy for maximum nine sessions.

Statistical Analysis:

Comparison was done between group among HVLAT and SWD with visual analog scale scores, ODI, ROM as outcome measure were done by t-test. Similarly comparison of two groups (HVLAT, SWD) with flexion and extension scores was also done by t test.

Results

Table 1 depicts intergroup comparison (HVLAT, SWD) by visual analog scale scores in which mean pretreatment VAS score was 8 and mean post treatment score rounded to 2 in HVLAT group and in SWD group pretreatment score is 9 and mean post treatment score is 4 so there is significant ($p < 0.005$)

reduction in VAS scores in either group but more so in HVLAT group than SWD group.

Table 2 depicts intergroup comparison (HVLAT, SWD) of mean (Flexion) ranges in which mean pretreatment score 4 and mean post treatment score is rounded to 2 in HVLAT group and in SWD group pretreatment score is 9 and mean post treatment score is 7. so there is significant ($p < 0.005$) increase in mean flexion ranges in either group but more so in HVLAT group than SWD group.

Table 3 depicts intergroup comparison (HVLAT, SWD) of mean (Extension) ranges in which mean pretreatment score was 14 and mean post treatment score is rounded to 11 in HVLAT group and in SWD group pretreatment score was 14 and mean post treatment score rounded to 13. So there is significant ($p < 0.005$) increase in mean extension ranges in either group but more so in HVLAT group than SWD group.

Table 4 depicts intergroup comparison (HVLAT, SWD) of mean Oswestry Disability Index scores in which mean pretreatment score is 14 and mean post treatment score is rounded to 5 in HVLAT group and in SWD group pretreatment score is 13 and mean post treatment score rounded to 9 .so there is significant ($p < 0.005$) decrease in mean ODI scores in either group but more so in HVLAT group than SWD group.

Discussion

The purpose of our study was to compare the effectiveness of short wave diathermy (SWD) and high velocity low amplitude thrust manipulation (HVLATM) for management of chronic mechanical low back pain on outcome measures like VAS, ODI, ROM (flexion, extension).

In a study by Kirkaldy Willis and Cassidy, 238 subjects who participated had not responded to previous conservative or surgical treatment. He in his research stated that anything less than 2 weeks of daily manipulation is inadequate for chronic low back pain patients. Cassidy and Mierau reported that they used specific side posture manipulation of only the fixed dysfunctional lumbar posterior joints. HVLAT was employed to target joint after careful positioning and relaxation of patient [14]. As audible pop once upon a time was considered as good sign of effectiveness of HVLAT but having heard no audible pop sound also has given similar outcomes of manipulation. In our study audible pop was heard in 9 subjects but the results are similar in either group.

Table 1: Intergroup comparison (HVLAT, SWD) by visual analog scale scores.

Treatment	Summary	HVLAT	SWD	Total	t-test	p-level
Pre	Means	8.3333	8.6667	8.5000	-0.5250	0.6037
	Std. Dev.	2.0237	1.3973	1.7171		
Post	Means	1.7333	3.9333	2.8333	-3.9283	0.0005*
	Std. Dev.	1.0998	1.8696	1.8770		

Table 2: Inter group Comparison (HVLAT, SWD) of mean (Flexion) ranges.

Treatment	Summary	HVLAT	SWD	Total	t-test	p-level
Pre	Means	4.3667	4.6667	4.5167	-0.9255	0.3626
	Std. Dev.	0.9348	0.8381	0.8855		
Post	Means	7.5200	6.0133	6.7667	5.1633	0.0000*
	Std. Dev.	0.6316	0.9372	1.0971		

Table 3: Inter group Comparison (HVLAT, SWD) of mean extension ranges.

Treatment	Summary	HVLAT	SWD	Total	t-test	p-level
Pre	Means	14.1333	14.2667	14.2000	-0.6563	0.5170
	Std. Dev.	0.5164	0.5936	0.5509		
Post	Means	11.1333	12.6933	11.9133	-5.4922	0.0000*
	Std. Dev.	0.9537	0.5483	1.1016		

Table 4: Inter group Comparison (HVLAT, SWD) of mean Oswestry Disability index scores.

Treatment	Summary	HVLAT	SWD	Total	t-test	p-level
Pre	Means	14.0667	12.8000	13.4333	0.7919	0.4351
	Std. Dev.	4.3172	4.4433	4.3524		
Post	Means	4.6667	8.9333	6.8000	-3.4878	0.0016*
	Std. Dev.	2.4976	4.0261	3.9427		

Flynn T W describes in his study regarding the relationship between an audible pop and symptomatic improvement with spinal manipulation in patients with low back pain [15]. Subjects with non radicular pain low back pain referred for physical therapy took part in this study. An audible pop was heard in 50 of 71 subjects during manipulative procedure. The groups who had an audible pop, and those who did not improved overtime in flexion ROM, pain rating scale scores and modified Oswestry disability index score [16]. In our study also similar trends are observed. As the total range of motion in lumbar spine the flexion and extension ranges are greater in comparison to side flexion and rotation in our study we have measured the flexion and extension ranges and the same were

used to compare the pre and post treatment effects along with other outcome measures. Oswestry disability index as stated in the literature review is reliable and valid index to be used as outcome measure in low back pain. In our study there is significant change ($p < 0.05$) in both SWD and HVLAT groups. Before and after intervention as depicted by results of statistical analyses.

Limitations

1. Compliance of the patient regarding ergonomic advice not ascertained.
2. Other ranges of lumbar spine (rotation, side flexion) were not taken into consideration.

Further Scope of Study:

1. Larger sample size with homogeneous group and gender can be considered.
2. Combination of other modalities can be considered for comparison (drugs, Exercise)
3. Long term follow up can be considered.
4. Variability in the doses form can be taken into consideration.

Conclusion

The interventions done included HVLAT and SWD on 15 subjects in each group the subject received max of 9 treatment sessions, 3 times per week for 3 weeks for both the groups. The male: female ratio within each group was same. The mean age was 32 years (SD of 5.32). Both group subjects were heterogeneous with respect to occupation. The outcome measures were VAS, ODI and ROM (flexion, extension). The objective of the study was to see the effect of HVLAT and SWD on outcome measures and compare them and Ergonomic advice being common to both groups. Both the groups showed improvement. Among the groups the HVLAT showed better improvement in the outcome measures as compared to SWD. Hence we conclude that high velocity low amplitude thrust manipulation can be used in rehabilitation of chronic mechanical low back pain patients.

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