ORIGINAL ARTICLE

EFFECTS OF STRAIN COUNTER STRAIN TECHNIQUE IN TREATMENT OF CHRONIC MECHANICAL LOW BACK PAIN: A RANDOMIZED CONTROLLED TRAIL

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ABSTRACT

Introduction: Chronic mechanical low back pain is generally nociceptive in nature. Strain counter strain technique is a passive technique used to relieve musculoskeletal pain by relaxing shortened tissues. This study was designed to determine the effects of strain counter strain in terms of relieving pain, increasing ROM, MMT and disability in the treatment of chronic low back pain.

Material & Methods: A randomized, single-blinded, parallel controlled trial was conducted. A total of 40 patients met the inclusion criteria and were randomly equally divided into 2 groups. Due to the lack of one patient's follow-up in the experimental group, data of 39 patients were analysed. A structured questionnaire was used and the data was analysed at baseline and after 8 sessions by using IBM SPSS 21. Outcomes were measured by inclinometer, manual muscle testing, Modified Oswestry Disability Index and NPRS.

Results: Intragroup comparison of pre to post value of NPRS, ROM, MMT & MODI showed significant p-value (0.000***) for both groups. Intergroup comparison of baseline to end value showed significant improvement in Lumbar Flexion (p value=0.001) and left side bending (p value=0.003) while lumbar extension, right side bending, MMT of trunk flexors, trunk extensors and NPRS showed non-significant p-value of 0.088, 0.066, 0.484, 0.753 and 0.177 respectively. MODI Intergroup comparison showed significant improvement on post-intervention scores (p value=.000***).

Conclusion: Strain counter strain has positive effects by increasing range of motion and improving functional status in patients with chronic low back pain.

Key Words: chronic mechanical low back pain, functional disability, strain counter strain, lumbar range of motions, manual muscle testing

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INTRODUCTION

Low Back Pain (LBP) is commonly non-specific or mechanical and its prevalence is progressively increasing with age.[1,2] It is demonstrated that various risk factors are associated with the occurrence of LBP with a prevalence of 50-80% in the adult population.[3,4] Nonspecific LBP represents broad spectrum phenomena arising due to neuropathic pain, pressure on a specific segment of the spinal nerve root which may be associated with mechanical stress. Research suggested the approximate prevalence for non-specific LBP is 84%, while the approximate prevalence for CMLBP is 23%.[5] Abnormal axial loading can precipitate pain on the lower lumber area that retains for at least 3 months is categorized as CMLBP.[6] It has been noted that LBP is more prevalent among the female gender than the male gender.[7,8] A large number of work-related risk factors including bending or twisting, kneeling, long-standing, intense workout, etc. are linked with the mechanical LBP.[9]

Studies reinforced that abnormal compression on spinal nerve roots, dysfunction in the lumbar integrity, and lumbar motor control can result in structural changes in multifidi muscle, quadratus lumborum muscle and piriformis muscle that induce nociceptive pain on the lower lumbar area.[10-13] Abnormal ergonomics and biomechanical factors may induce excessive shear or compressive forces on the lumbar joint, hence produce muscle spasms, pain and decrease range of motion that lead to degenerative changes or disability.[14-16] Treatment plan and diagnosis for LBP depends on different factors like history of patients, severity of pain, and type of pain. The management of CMLBP usually focus on pain relief and prevent disability by using conservative management[17] including nonsteroidal anti-inflammatory drugs,[18] moist heat therapy, electrotherapy[19] while functional restoration of spinal mobility is achieved by various manual therapy soft tissues techniques,[20] including muscle energy technique, neuromuscular re-education technique, mobilization technique, therapeutic exercises, reflex therapy, and Kinesio taping.[21] It has been observed that that strengthening and stretching exercises have beneficial effects on LBP.[22] Stretching exercises can increase flexibility, range of motion, and mobility by decreasing pain and discomfort.[23] It is also reported that stability exercises are more beneficial for chronic LBP patients as it reduces

pain and increases physical functional status, neuromuscular control and strength.[24]

Strain Counter Strain technique (SCS) is an indirect osteopathic technique that is also known as positional release technique in which abnormal joints are moved away from their restraining barrier along with their muscles into the ease position. SCS technique is a passive technique used to relieve musculoskeletal pain, by relaxing shortened tissues.[25] This technique was first introduced by Jones in 1981 and the exact physiological mechanism is still unknown.[26] Shortened and painful tissues can be placed in a gentle position and if this comfortable position remains still for more than one minute, it can facilitate activation of Golgi tendon organ that relaxes the tensed and tightened muscle.[27] SCS is also a useful technique to reduce pain for the treatment of tender points by mechanically pressurizing the primary tender points.[28]

Chronic pain which includes fibromyalgia revealed that myofascial pain syndrome usually doesn't respond properly to the standard therapy, however, SCS reflects better effects on myofascial pain syndrome and muscle spasm.[29] Currently, there is a dearth of quality evidence on the effectiveness of comparison of SCS to different physical therapy approaches. Therefore, the objective of the study was to determine the effect of SCS in terms of pain, Range of Motion (ROM), and disability in the treatment of CMLBP.

MATERIAL AND METHODS

A randomized, single-blinded, parallel control trial was conducted at physiotherapy OPD of Benazir Bhutto General Hospital Rawalpindi, Pakistan. The study duration was 6 months, and the sample size was calculated by Epitools. Eighty-four patients with a history of chronic non-specific/mechanical lower lumbar pain more than 3 months were recruited. Forty patients 22 females and 18 males, mean age was (38.08 ±9.645) met the inclusion criteria such as limited lumbar ROM having at least for 3 months, age 20-50 years, and having moderate pain on Numeric Pain Rating Scale (NPRS). Any subject with a post-surgical lumbar history, prolapsed intervertebral disc (PIVD) history, spondylolisthesis, ankylosing spondylitis, recent traumatic history of lumbar spine fracture, or malignancy were excluded.

All subjects signed the mandatory consent form before treatment to approve their willingness in this study. The detailed treatment method was described to the patients along with the risks and benefits. All the personal records of the patients were kept confidential. Ethical approval was taken from the ethical review committee of Riphah College of Rehabilitation Sciences (RCRS) (Riphah/RCRS/REC/000155). The subjects were randomly divided into 2 groups (interventional group-A; SCS and control Group-B; conventional physical therapy (CPT) group using a convenient sampling technique. One patient in SCS was dropout as she did not come for follow-up. So, data of 39 patients were analysed, in SCS (n=19) and in CPT (n=20). It was a consecutive 2-week treatment protocol followed by (4 sessions per week) to each group (Figure No.1).

Outcomes measures for this trial included lumbar ROM which were measured by inclinometer and Manual Muscle Testing (MMT), the pain was assessed by NPRS while functional disability was evaluated by Modified Oswestry Disability Index (MODI).

Reference points on the bodies of the individuals were marked by a special marker. ROM of lumbar flexion and lumbar extension was observed in standing position by considering the spinous process of the 1st sacral vertebra as a reference point. ROM for lumbar side bending and lumbar rotation was also measured in standing position. For ROM of lumbar side bending, the spinous process of the 12th thoracic vertebra was considered as a reference point while lumbar rotation ROM was measured by considering the acromion process and the greater trochanter of the opposite side as reference points.[34]

The universal inclinometer has a known validity and reliability to measure spinal movement.[35] MMT is a less time-consuming tool to measure a patient's capacity to contract a specific muscle group voluntarily. MMT usually grading 0-5 points.[36] Supine position is used for the grading of lumbar spine trunk flexors and prone for trunk extensors.[37] Self-reported NPRS is unidimensional, widely acceptable and used to record the pain intensity in an individual. It is11-point scale, ranging from 0 ("no pain") to 10 ("worst pain").[38] The MODI is a self-reported tool used for measuring the outcome of functional disability related to LBP.[39] The Urdu version of MODI was used in this study.[40]

The control group received a conventional physical therapy treatment comprising: Moist hot pack (<15 mins) was applied at the start of treatment. Transcutaneous electrical nerve stimulation (TENS): Frequency:2-10 Hz, Intensity: to patient tolerance threshold, Time: 10-15 minutes with both channels applied simultaneously.[41] Digital TENS Besmed BE 660 was used in this study. Both Groups also received stretching of the calf muscle, hamstring muscle, knee to chest exercises along with strengthening exercises of back extensors including bridging and posterior pelvic. Both stretching and strengthening were asked to repeat as a home plan three times/ day with a hold of 5-10 sec in 10 repetitions.

The interventional group also received the same conventional therapy treatment given to the control group along with SCS for different muscles such as quadratus lumborum, multifidus, piriformis, and gluteus medius. For the SCS technique therapist place the participants in a comfortable position for each corresponding muscle, for 90 sec and then passively returned to starting position.[42] In addition, SCS was also applied for 90 sec on a spinous process of the lumbar spine, posteriorly on the lumbar 3rd , 4th, and 5th.[43] For lumber tender points, the patient was positioned in prone lying. Posterior lumbar tender points are located on the Spinous processes, in the paraspinal area, or the tips of the transverse processes. The patients' right knee was flexed followed by hip extension until the tender point became soft. This position is termed as a position of ease or position of maximum comfort. This position was held for 90 sec. SCS technique was repeated 3 times in each session. These applications aimed to produce a decrease in perceived pain and an increase in pressure tolerance.[44] Treatment was achieved by the same practitioner for both groups and was limited to 45 min to 1 hour. The treatment was given four sessions in a week for 2 consecutive weeks.

Patients in both groups were assessed at baseline, and at the end of treatment (after 2-weeks) by an experienced

physiotherapist using a semi-structured questionnaire. Data was analysed using IBM SPSS 24 (Statistical Package for Social Science) and was presented in the form of tables. Shapiro-Wilk test was used to assess the normality of data. It was shown that data was not normally distributed for ROM, MMT, and NPRS so non-parametric tests (Wilcoxon and Man Whitney test) were applied. Data was normally disturbed for MODI so parametric tests (paired t-test and independent t-test) were applied.

RESULTS

The mean age of participants was 38.08 ±9.64 years, majority of the participants were housewives 35.9 %. More than half (53.8%) had radiation of pain (Table No.1). Wilcoxon signed-rank test determined the intragroup comparison of pre-value (baseline assessment) to post-value (8th session) for NPRS, ROM & MMT. For the interventional Group-A, results showed significant p-value (<0.001) for NPRS and for all ROM (flexion, extension, right side bending, and left side bending). MMT of trunk flexors reported a significant p-value <0.001 while trunk extensors were having a p-value of 0.003. For the control group-B results showed significant p-value (<0.001) for ROM (flexion, extension, right side bending, and left side bending), MMT (trunk flexors & trunk extensors), and NPRS (Table No.2).

Intergroup comparison of baseline to end value was done by Mann Whitney U test for ROM, MMT, and NPRS. Lumbar flexion ROM and left side bending ROM were significantly improved on post-intervention having statistically significant p-value; 0.001 and 0.003, respectively. While ROM extension and ROM right side bending showed non-significant results of p-value=0.088 and p-value=0.066 respectively. The MMT for trunk flexor and trunk extensor showed p-value of 0.484 and 0.753 respectively, which was not significant. NPRS value for between the group comparison also showed a statistically non-significant p-value of 0.177 (Table No.3)

Paired t-test determined within the group comparison of pre and post value for MODI. Results indicate significant difference was found for interventional group-A and control group-B showed p-value <0.001. Between the group comparison of baseline to end value was done by Independent t-test. MODI was significantly improved on post-intervention (p value=< 0.001) (Table No.4)

DISCUSSION

The current study determined the effects of SCS in the treatment of CMLBP. Outcomes measured by NPRS scores regarding pain, showed no significant difference between groups but both methods are equally productive for the management of CMLBP. Concerning lumbar range of motion, in two groups' comparison, there was improvement in lumbar flexion and left side bending in SCS group than controlled group. However, no significant changes were observed in the right side bending and extension. Findings of a recent study also showed that SCS technique proved to be effective in decreasing the limitation of functional disability in CMLBP.

Literature supports that SCS is effective in improving functional capacity of the patient with mechanical LBP. A study was done by Lewis et al; on low back pain to resolve abnormal neuromuscular activity, showed all individuals reported improvement in disability and pain following SCS intervention.[45] This study supports the researcher's results which shows statistically significant improvement in functional status after SCS treatment A case study conducted on the effectiveness of SCS therapy showed 50 % to 100 % improvement in functional status, reduction in pain, which occurred in 19 of 20 patients after SCS therapy. This study supports the researcher's study which showed that MODI score is significantly improved in SCS group at the end of the treatment.[46] A case report on the outcomes of SCS showed a clinically significant reduction in overall pain intensity, as measured with NPRS. During the treatment session, an increase in function and gait improvement was noticed. Results of the study showed that SCS may be a useful tool in the management of CRPS I. This study supports the researcher's results in term of ROM which was significantly increased.[47] An RCT conducted on the positional release technique applied on quadratus lumborum, multifidus, piriformis and gluteus medius muscle, reported decreased patients' symptoms in both groups with high statistical significance in the experimental group. Improvement in MODI score was statistically more significant in the treatment group compared to the control group. These findings suggested that in patients with mechanical LBP, use of positional release technique was effective in improving lumbar ROM, reducing pain and improving the functional status more than traditional therapeutic exercises.[48] This study does not support the researcher's results in term of pain, which indicated no significant difference between groups but results are significant regarding ROM and functional disability. The results of our study can be acknowledged by the outcomes of previous studies carried out.[29,44,49]

CONCLUSION

Strain counter strain has a positive effect by increasing range of motion and improving functional status. Also concluded that both, conventional physiotherapy and strain counter strain exercises equally proved beneficial in treatment of chronic mechanical low back pain.

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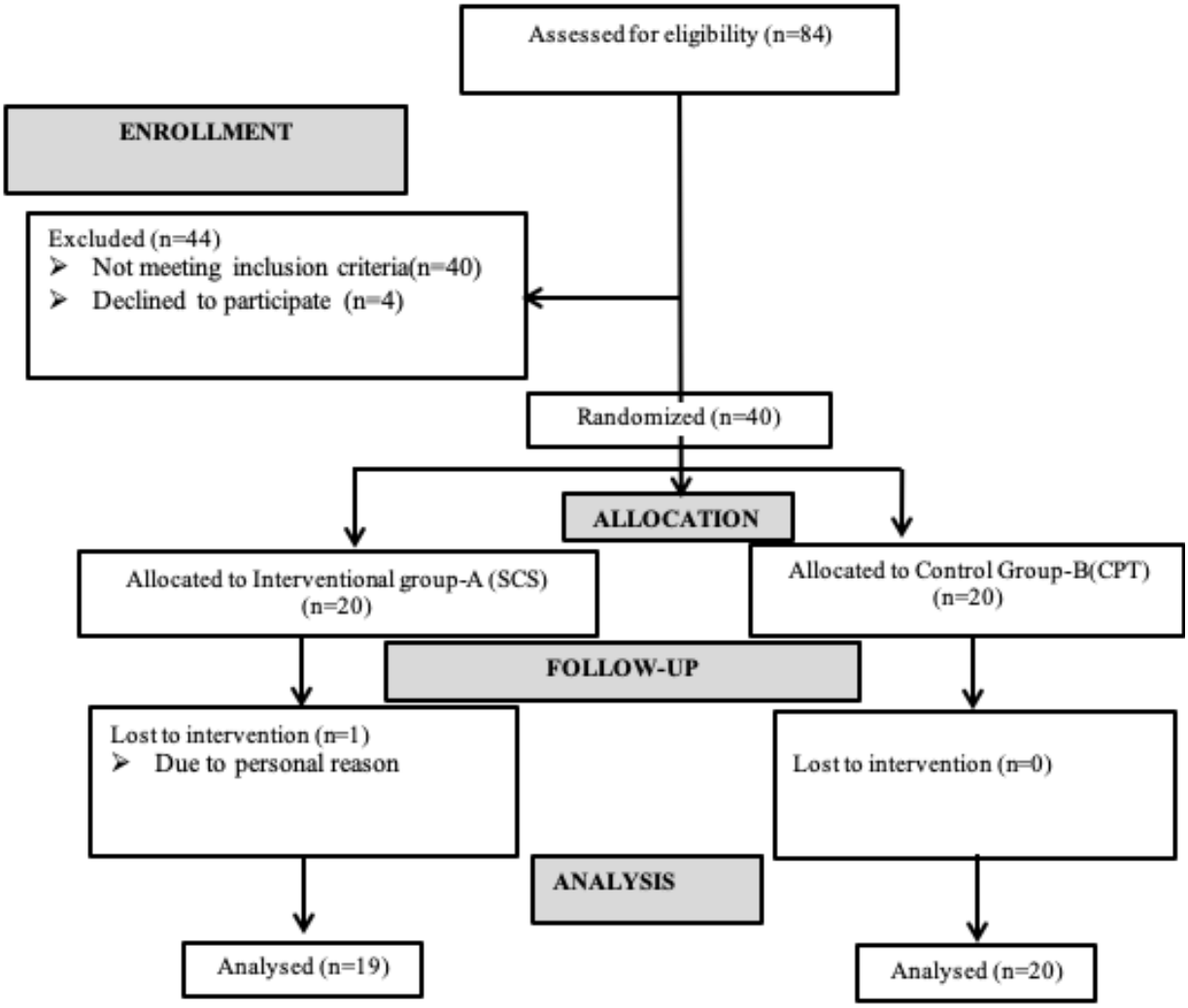

Figure 1: Flow of participants through the trial

Table No 1: Demographic Characteristics

VARIABLES	OVERALL %	SCS GROUP-A %	CPT GROUP-B %
Age	Mean Age 38.08±9.645	Mean Age 40.26 ±9.61	Mean Age 36 ±9.442
Occupation	35.9 % Housewives	47.4% Housewives	25% Housewives
	15.4% labour	10.5% labour	20% labour
	48.7 % others	42.1% others	55% others
Onset of Pain	40% 6 months before	21 % 6 months before	40% 6 months before
	30% 9 months before	5.3 % 9 months before	30% 9 months before
	30% more than a year	73.7% more than a year	30% more than a year
Pain radiation	53.8% yes	68.4% yes	40% yes
	46.2% no	31.6% no	60% no
PR unilateral/ bilateral	46.2% no radiation	31.6% no radiation	60% no radiation
	33.3% unilateral	42.1% unilateral	25% unilateral
	20.5% bilateral	26.3% bilateral	15% bilateral

Table No. 2: table showing within group comparison of experimental and control group for ROM, MMT, NPRS.

Variable		SCS Group-A Pre-Median ± IQ rank	SCS Group-A Post Median ± IQ rank	SCS Group-A P-value	CPT Group-B Pre-Median ± IQ rank	CPT Group-B Post Median ± IQ rank	CPT Group-B P-value
ROM	Flexion	30(15)	57(14)	<0.001	33.5(12)	49(9)	<0.001
	Extension	10(5)	24(5)	<0.001	15(5.25)	20(5)	<0.001
	Rt. Side Bending	10(4)	18(5)	.000***	10(1.5)	15(2.25)	<0.001
	Lt. Side Bending	10(2)	20(5)	<0.001	10(2)	15(5)	.000***
MMT	Trunk Flexors	2(1)	3(0)	<0.001	2(1)	3(0)	<0.001
	Trunk Extensors	3(1)	3(1)	.003	3(1)	3(1)	<0.001
NPRS		6(2)	4(1)	.000***	6(1.75)	4(1)	.000***

Table No.3: Inter group comparison at pre and post treatment measurement on mean ranks of ROM, MMT, NPRS

Variable		Pre-treatment Mean Rank SCS Group-A	CPT Group-B	P-value	Post-treatment Mean Rank SCS Group-A	CPT Group-B	P-value
ROM	Flexion	19.32	20.65	.713	25.95	14.35	.001
	Extension	14.61	25.13	.003	23.08	17.08	.088
	Rt. Side Bending	19.24	20.73	.667	23.26	16.90	.066
	Lt. Side Bending	22.66	17.48	.131	25.37	14.90	.003
MMT	Trunk Flexors	19.37	20.60	.687	20.92	19.13	.484
	Trunk Extensors	21.16	18.90	.487	20.50	19.53	.753
NPRS		20.71	19.33	.692	17.63	22.25	.177

Table No.4: Intragroup and Intergroup comparison for MODIFIED ODI, values are presented as Mean ± SD.

Variable	Group (n=39)	Pre-treatment (Mean ± SD)	Post-treatment (Mean ± SD)	p-value
Modified OD	SCS Group-A	47.26±13.87	21.89±7.923	<0.001
	CPT Group-B	49.9±7.580	34.80±5.634	<0.001
	p-value	0.463	<0.001	