

Effectiveness of Sliders Vs Tensioners on Pain and Disability in Nonspecific Low Back Pain with Associated Lower Limb Symptoms: A Pretest Posttest Experimental Study

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ABSTRACT

Non-specific low back pain (LBP) affects people of all ages and is a leading contributor to disease burden worldwide. Associated pain in lower limb is commonest symptom with nonspecific LBP. Various studies have studied the efficacy of neural tissue mobilization on radiating pain however there is paucity of literature, whether the slider or tensioner nerve technique produces reduction in symptoms and improves functional status of patients. Sixty subjects with non-specific low back pain and associated lower limb symptoms were universally recruited from a tertiary care centre and randomly allocated to two groups in this experimental study (n=30 in slider, n=30 in tensioner group). Assessment of pain and disability were done using numeric pain rating scale (NPRS), Oswestry disability index (ODI) respectively. Straight leg raise (SLR) ranges of P1 (onset of pain) and P2 (maximum pain threshold) were recorded. The subjects were administered the slider and tensioner nerve technique respectively along with home exercise program for a period of 5 days. A significant reduction in pain and disability scores were obtained within the slider and the tensioner group ($p < 0.001$). On comparison mean NPRS and disability score in slider group were lower (1, 20.75) as compared to tensioners (1, 24.75). A significant difference was obtained in between the groups ($p < 0.05$). Comparison of P1 values in between the slider and tensioner group did not show a significant change on day1 whereas P2 value showed a significant difference ($p < 0.001$). Sliders had better results in all outcome measures as compared to tensioners.

Key words: sliders, tensioners, non-specific low back pain

INTRODUCTION

Nonspecific low back pain is defined as low back pain not attributable to a recognizable, known specific pathology [1]. Associated pain in the lower limb is an important predictor of the chronicity and severity present in up to 65% of all patients with non-specific LBP. [2,3] It is defined as "pain in the lower back, hip, calf and foot radiating in the distribution of the sciatic nerve". [3] According to classification system by Shacklock the neural tissue involvement, radiating pain or associated

symptoms arises by the mechanical interface of the involved structure with the neural structure. [4] The mechanical interface is called the nerve bed and can consist of anything that resides next to nervous system such as the tendon, muscle, bone intervertebral disc, ligaments, fascia and blood vessels. [4]

The nerve root / nerve compression primarily affect the 3 mechanical function of the nervous system which includes the ability to withstand tension, slide and be compressible. [4]

Hence a treatment strategy which complies with these specific neurodynamic components of the nervous tissue is necessary in the management of radiating pain.

The slider nerve technique is a neurodynamic maneuver to produce sliding movement of the neural structures relative to their adjacent tissues. This in turn allows the tension and compression to be distributed along the nervous system more evenly rather than building up to one particular location^[4]

The tensioner acts like a neurodynamic test that produces tension in the neural structures and does not surpass the elastic limit of the tissue.^[4] Mobilizing the nervous tissue is safe and it involves lesser stretching of the nerves.

Various neurodynamic tests are used to assess the nervous system's mechano sensitivity by monitoring the response to movements that are known to alter the mechanical stresses acting on the nervous system. The most common lower quarter neurodynamic test is the passive straight-leg raise (SLR) test which assesses the mechanical sensitivity of the lumbosacral neural structures and their distal extensions which consist of trunk and plexus in the pelvis, sciatic and tibial nerves and their distal extensions in the leg and foot.^[4,5] Hence this test was used in this study.

A wide range of therapeutic interventions are used in the management of low back pain radiating to leg which includes uses of modalities and manual therapy.^[3, 6, 7,8] However there is paucity of literature regarding effectiveness of neural tissue mobilization techniques, whether the slider or tensioner nerve technique produces reduction in symptoms, hence the objective of the study was to study and compare the effectiveness of both the neural tissue mobilization techniques.

METHODS

The study was conducted in a tertiary health care center after obtaining approval from the Institutional Ethical Review Committee (IERC) ethical

committee and informed consent of the subjects. 60 subjects within the age group of 25-60 years with non-specific low back pain having associated symptoms in the unilateral lower limb were recruited for the study. Subjects included in the study had symptoms that were referred distal to the buttocks, thigh/knee and lower leg. The overt response (reproduction of patients' symptoms) was assessed using the neural tissue tension testing. Exclusion criteria included patients exhibiting a SLR of less than 45 degrees, post spinal surgery, positive neurologic signs and symptoms, patients with bilateral symptoms, peripheral neuropathy, chemical dependence or alcohol abuse, history of lower limb trauma and red flags. Subjects were then randomly allocated to the two experimental groups; group A – sliders (n=30), group B – tensioners (n=30) by using computer generated allocation table.

Subjects in both the groups were assessed and a detailed history and physical examination were carried out. They were explained about the treatment techniques. Self-reported measures were administered to the patient prior to the treatment which included the numeric pain rating scale (NPRS) and the modified Oswestry Disability Index (ODI). The SLR range was recorded at P1(onset of symptoms) and P2 (maximum tolerance of symptoms). The sensitizing movements of hip internal rotation and adduction were added to confirm the involvement of the nerve. Prior to starting the treatment the subjects were given hot packs on the low back region for 15-20 minutes. The objective measures were recorded on day 1 and day 5 prior and post the administration of the treatment technique. The slider and the tensioner nerve techniques were repeated for 1-1.5mins and 5 sets of the techniques were administered with a break of 1-2mins in between each set respectively. Subjects in both the group reported for treatment every day and were assigned active exercises for home program.

Slider nerve technique- (supine lying) - The therapist holds the patient's limb passively and then moves the hip into flexion with ankle in plantar flexion and the knee in extension, stretching the nerve at the hip and relaxing at ankle and then reversing the movement with hip into extension, maintaining the knee in extension and ankle in dorsiflexion, relaxing the nerve at the hip and stretching at the ankle.

Tensioner nerve technique (supine lying):-The therapist passively lifts the patient's leg off the table, maintaining the hip in flexion, the knee in extension (stretch position of all the non – moving joints) and then moves the ankle into dorsiflexion and then plantar flexion.)

Slider in slumps position -The subject sits at the edge of the couch with the posterior aspect of the knee at the edge and thigh parallel to each other and flexion at the thoracic and lumbar spine (slouch position).

The therapist stands at bedside of the patient with proximal arm over the patient's shoulder and the hand guiding the neck movements of the patient and the therapist's

other hand guiding the knee movements and passively performs cervical neck flexion with knee flexion (stretching the nerve proximally and relaxing at the distal end) and then moving into cervical extension with knee extension.

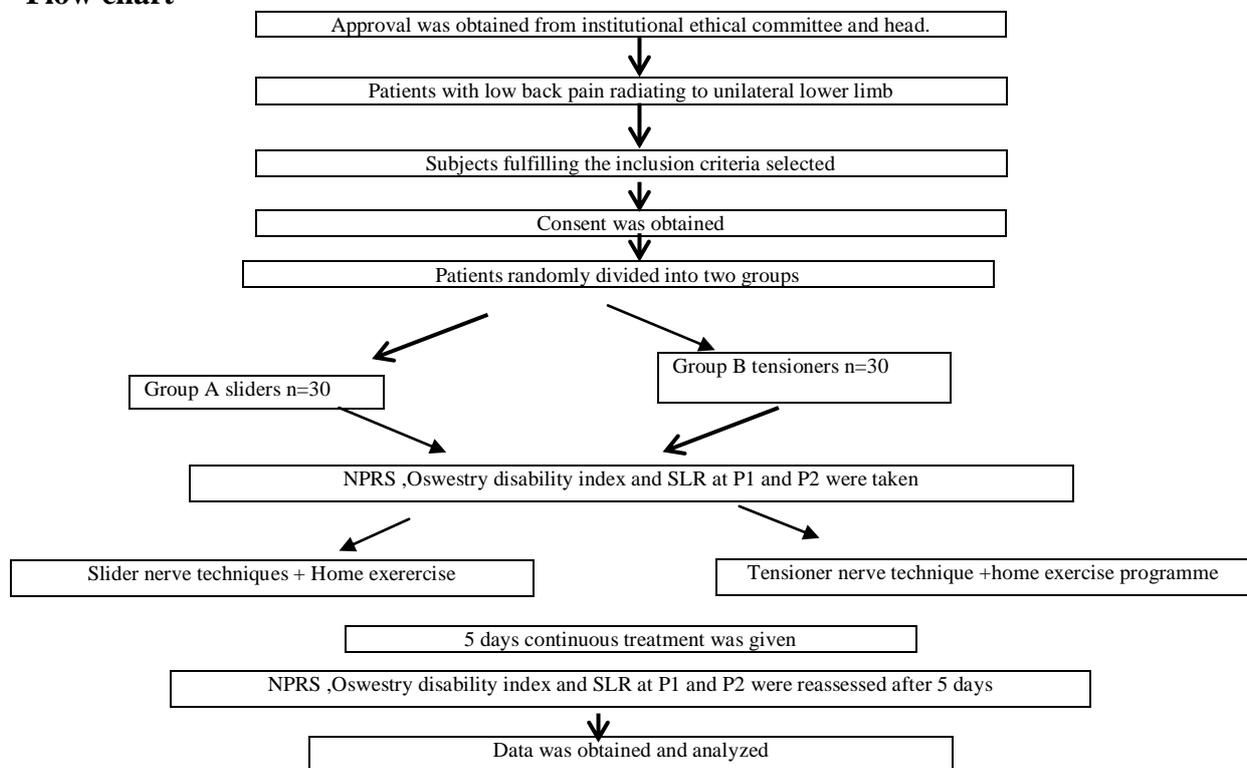
Tensioners in slumps-The patient is seated in slouch position at the edge of the couch. The therapist guides the patient's neck into flexion with knee extension and then moving the neck into extension with knee flexion.

Home exercise program-

The subjects in addition to neural tissue mobilization were also given a home exercise program of bridging with hip and knee flexion, pelvic tilts, static glutei muscle contraction, cat and camel exercises for back, which has been shown to result in clinically meaningful improvements in disability. [9] The subjects were advised to do 10 repetitions and 3 set of exercises.

Data were collected over 12months duration. The data were analyzed descriptively using SPSS software version 20

Flow chart



RESULTS

Data were collected from 60 participants (30 - slider, 30 - tensioner). Among the 60 participants 44 subjects were female and 16 were male. Parametric tests were used to analyze the data under normal distribution. Paired t test was used for comparison within the groups and independent t test for in between the groups. The probability of chance error was set at $\alpha < 0.05$ and median difference and confidence interval was determined for pain, ODI, SLR in both the groups.

Non parametric tests were used to analyze the categorical and the data which did not follow the normal distribution. Wilcoxon signed rank test was used for comparison within the groups and Mann -

Whitney U test for in between the group. A significant difference was obtained within the pre and post values of pain and disability in the slider and tensioner groups respectively (table 2,3 and 5,6) also a statistically significant difference was obtained in between the two groups (Table 4 and table 7). A significant change was obtained in the P1 and P2 values within the slider and tensioner group from day 1 to day 5 of the treatment. (Table 8 and 9). Also a significant difference was obtained in between the groups. (Table 10) ($p < 0.001$)

Table 1:-Descriptive data for gender and distribution

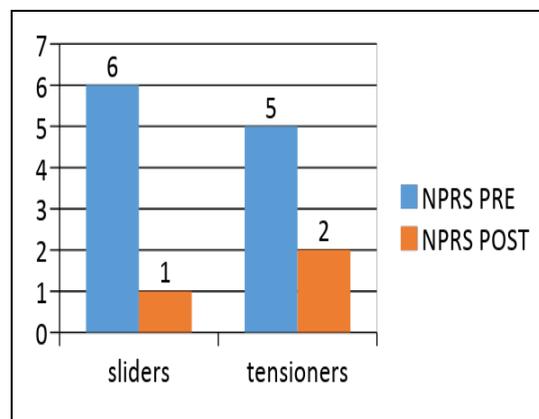
GENDER	NUMBER	PERCENTAGE	Slider	Tensioner
MALE	16	26.67%	9(30)	7(23.33%)
FEMALE	44	73.33%	21(70)	23

Table 2: - Comparison of NPRS scores for pain pre and post for slider group

	Mean	Median	SD	Wilcoxon Sign rank test(Z)	Asymp. Sig. (2 tailed)
NPRS PRE	6.23	6	1.30	-4.828	.000
NPRS POST	1.23	1	0.86		

Table 3:- Comparison of NPRS scores for pain pre and post for tensioner group

	Mean	Median	SD	Wilcoxon Sign Rank test(Z)	Asymp .Sig. (2 tailed)
NPRS PRE	5.53	5	1.00	-4.879	.000
NPRS POST	1.70	1	0.702		



Graph1:-Pre –Post NPRS scores in both the groups

Table 4: - Comparison of NPRS score for pain between sliders and tensioners

Mann-Whitney U test(Z)	Asymp. Sig. (2 tailed)
-2.127	.033

Table 5:-Pre and Post Oswestry disability scores for slider group

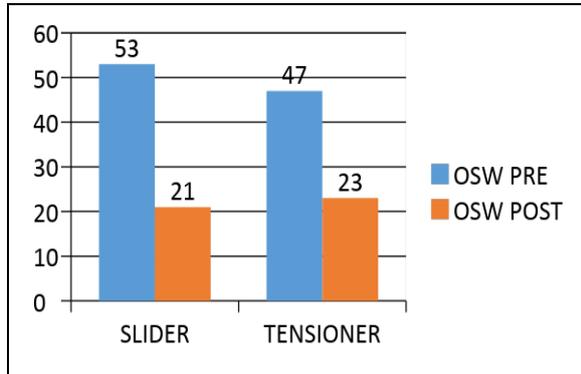
Oswestry disability index	Mean	Median	SD	Wilcoxon Sign Rank test(Z)	Asymp .Sig. (2 tailed)
OSW pre	50.93	53	8	-4.784	.000
OSW post	20.75	21	4.24		

Table 6: -Pre and Post Oswestry disability scores for tensioner group

Oswestry disability index	Mean	Median	SD	Wilcoxon Sign Rank test(Z)	Asymp .Sig. (2 tailed)
OSW pre	47.23	47	8.64	-4.786	.000
OSW post	24.5	23	6.60		

Table7: -Comparison of Oswestry scores for disability between the slider and the tensioner group

Mann-Whitney U test(Z)	Asymp. Sig. (2 tailed)
-2.056	0.040



Graph 2: -Comparison of pre and post Oswestry score in both the groups.

Table 8: -Pre and Post SLR P1 & P2 range on the 1st and 5th day in between the slider group

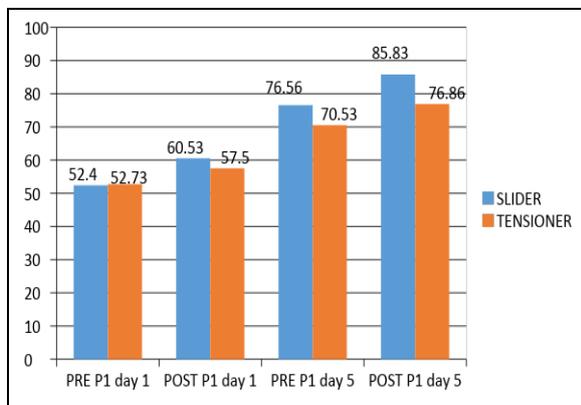
	Day 1 mean	Day 5 mean	t value	p value
SLR P1 PRE	52.37	76.57	-18.24	.000
SLR P1 POST	60.53	85.83	-17.94	.000
SLR P2 PRE	57.77	82.57	-18.28	.000
SLR P2 POST	66.33	93.33	-17.44	.000

Table 9: -Comparison of SLR ranges on the 1st and 5th day in between the tensioner group

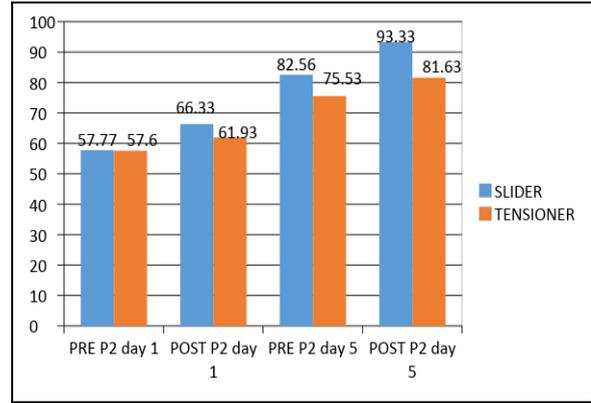
	Day 1 mean	Day 5 mean	t value	p value
SLR P1 PRE	52.73	70.53	-15.77	.000
SLR P1 POST	57.50	76.87	-16.69	.000
SLR P2 PRE	57.60	75.53	-16.70	.000
SLR P2 POST	61.93	81.63	-17.23	.000

Table 10:-Comparison of SLR P1 & P2 range in between slider and tensioner group on day 1 and 5

	slider	tensioner	t value	p value
P1pre (day1)	52.40	52.73	-.205	0.84
P1 post(day1)	60.53	57.50	1.90	.062
P2 pre(day1)	57.77	57.60	.098	.92
P2 post(day1)	66.33	61.93	2.66	.010
P1pre (day5)	76.56	70.53	3.21	.002
P1post (day5)	85.83	76.86	5.04	.000
P2 pre(day 5)	82.56	75.53	3.69	.000
P2post (day 5)	93.33	81.63	5.93	0.00



Graph 3: -Comparison of Pre and Post SLR P1 ranges in between the slider and tensioner group on day1 and day 5



Graph 4:-Comparison of Pre and Post SLR P2 ranges in between the slider and tensioner group on day1 and day 5

DISCUSSION

The sliding nerve technique improved the functional status of the patient and proved to be better in all the outcome parameters, this would be attributed to the concept of neurodynamics which links the mechanics and physiology of the nervous system and integrates it with musculoskeletal function. Inflamed nerves usually comprise of fluids and cells including enzymes, acids, prostaglandins, histamine and macrophages which creates an acidic environment and is known to enhance peripheral nerve sensitivity thus giving rise to pain [9]. The slider nerve techniques reduce pain and inflammation by decreasing the already elevated endoneurial fluid pressure, which may enhance dispersal of local inflammatory products in and around the nerve reducing the antidromic impulses generated in C fibers at the dysfunctional site with result in the release of neuropeptides and reducing subsequent inflammation in the tissues supplied by the nerve. [4]. Hence if normal neurodynamics are restored by alleviating any sites of neural compression, excessive friction or tension, antidromically evoked impulses may perhaps be eliminated. According to Cooptiers slider techniques mobilise a nerve through an area of increased pressure with minimal increase in nerve strain as compared to tensioner which induces more strain on the nerves [10]. In our study subjects were also administered hot packs to both the groups prior to the treatment which would have also helped in pain relief. Hot packs

have the greatest effect on cutaneous blood vessels, resulting in the greatest temperature change within the first 1 cm of tissue depth. [11] Increased superficial tissue temperature results in the release of chemical mediators, such as histamine and prostaglandins, which result in vasodilation. Vasodilation increases blood flow to reduce ischemia of injured tissue resulting in decrease activity of the pain receptors and thus elevating the pain thresholds.

The SLR ranges of P1 and P2 in the slider group showed a significant change as compared to the tensioner technique. The slider nerve technique in supine lying position led to stretching of the nerve at the hip and knee, simultaneously relaxing at the ankle and vice versa. It has been shown that passive flexion at the hip results in caudal loading of the lumbosacral nerve roots and sciatic nerve in the pelvis, followed by hip extension. During hip extension, there is unloading of these neural tissues, and they move in the cranial direction. [12] With hip flexion there is an obligatory lumbar flexion which leads to opening of the intervertebral foramina and central canal further facilitating caudal movement of the neural structures. [13,14] This movement of neural structures could be effective in dispersing intraneural edema, thus restoring pressure gradient and relieving hypoxia. [15]

According to Copptiers when movements which increase and decrease the length of the nerve bed are performed simultaneously at adjacent joints, nerve gliding occurs with almost no increase in nerve strain. [10] Facilitation of nerve gliding in this manner (sliding technique) is markedly different to inducing nerve gliding by elongating the nerve bed and increasing nerve strain (tensioning technique or isolated joint movements). [14]

This explains the reason for change in the P1 levels. Sensory nerves exist in the connective tissues of peripheral nerves which provide nociception and proprioception. The stretch receptors of which are activated with movements and act as a protective mechanism for the nervous

system. Neural tissue mobilization has shown to decrease the sensitivity of these receptors, thus increasing the tolerance to pain threshold (P2). [4] This explains the reason for change in the P2 levels.

The neurodynamic treatment technique results in changes of the mechanical or physiological function of nerve tissues along with the interface, thus restoring pressure gradients, relieving hypoxia and reducing associated symptoms. [4,16]

Hence if normal neurodynamics are restored by reducing the pain, alleviating any sites of neural compression and improving the flexibility, the overall functional status of the patient would be improved thus reducing the disability. Hence the slider group showed a significant change in the Oswestry score. A reduction in the Oswestry score of 6 points or greater are considered clinically meaningful. [17]

In our study the subjects were also given a home exercise program. It has been proved that a combination of exercise and manual therapy have been shown to be effective in reducing disability in patients with chronic low back pain which explains the change in all the outcome parameters in both the groups. [18]

Hence it can be inferred that both sliders and tensioners had better outcome results in reducing pain and improving the mobility but sliders proved to be better as compared to tensioners. Clinical **Implication:** Hence it is recommended to initially start with sliding nerve techniques and then progressing to tensioners. The findings of this study may assist the clinician in selecting appropriate nerve gliding exercises, safer and pathology-targeted techniques.

Limitations of the study:

Present study reports findings based on convenience sample, moreover subjects having bilateral symptoms in the lower extremity should be considered.

Ethical approval: The study was conducted after obtaining approval from Institutional Ethical Review Committee (IERC).

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Conflicts of interest: none

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