

# EFFECT OF SPINAL DECOMPRESSION WITH AND WITHOUT SEGMENTAL MOBILIZATION IN PATIENTS WITH POSTEROLATERAL LUMBAR DISC PROTRUSION

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**Abstract: Background:** Discogenic pain is experienced by most of the adults, during their life. Spinal pain has been reported to have an occurrence of 54% to 80% in a lifetime. vertebral decompression therapy is a better option to treat disc bulge as it creates negative intra-discal pressure that sucks the protruded nucleus pulposus back to its original place. **Objective of the study:** To evaluate the effect of spinal decompression with and without segmental mobilization in improving pain, ROM, walking time and Disability in patients with posterolateral lumbar disc protrusion. **Methodology:** This RCT include 44 diagnosed patients of lumbar disc bulge who met the inclusion criteria and were randomly assigned through coin toss method into two groups. The Experimental Group (n = 23) received decompression therapy, Maitland mobilization of lumbar spine along with conventional treatment and the Control group (n = 21) received decompression therapy and conventional Physiotherapy. Both groups received two treatment sessions per week, total of 04 sessions. Non-parametric tests was applied for the result. **Results:** Within the group comparison both groups showed significant improvement in MODI and NPRS with  $p < 0.001$  after 2 weeks of treatment. The experimental group showed significant improvement in lumbar spine range of motion with a  $p < 0.001$ . End values comparison of variables within groups showed significant improvement in lumbar ROM, NPRS and MODI with  $p < 0.001$ . **Conclusion:** From the results of the study it was concluded that Neuro spinal decompression therapy along with CPA Maitland mobilization was effective in reducing NPRS score, MODI and increase lumbar ROM.

**Key words:** CPA, MODI, Neuro decompression therapy, NPRS

## INTRODUCTION:

Disc herniation is very common in lumbar spine. It may occur due to jerk, lifting heavy loads or may happen by wear and tear of the lumbar spine. Usually sciatica is the common symptom experienced due to disc herniation<sup>1</sup>. The disc's load bearing quality is greatly affected by the loss of proteoglycans in the degenerated disc. The degenerated disc has a low water content than normal disc, as the load bearing behavior may dehydrate the disc and its osmotic pressure falls. Following the dehydration of disc, it loses its height and fluid leading to disc bulge. Due to dehydration, the proteoglycans and mechanical effects of matrix disorganization are lost, and the disc couldn't remain hydrostatic under load. Discogenic pain may also be produced in degenerated disc due to huge stress on endplates and annulus, as seen in discography<sup>2</sup>.

Saal JA and Saal JS (1989) demonstrated in their study that herniated intervertebral disc with radiculopathy can be successfully treated with aggressive non operative care. Surgery must be reserved for those patients who did not respond satisfactorily towards

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physical rehabilitation program. Stenosis is a condition that fails to respond to non-operative<sup>3</sup>.

Delauche-Cavallier(1992) suggested in his study that herniated lumbar nucleus pulposus may decrease and even disappear in patients treated successfully with conservative treatment<sup>4</sup>.

Postacchini(1996) concluded that few months of conservative management produces satisfactory results among a high proportion of patients with disc herniation who have mild to moderate nerve root compression. Symptoms are resolved rapidly with surgical treatment in patients with marked nerve root compression. Recurrence of symptoms i.e. pain, radiculopathy are similar in the patients treated conservatively or who have undergone surgical treatment. In the first few weeks or months after surgery, micro discectomy yields better results. If the patient does not respond to conservative treatment for atleast 2 monthths then surgery should be undertaken<sup>5</sup>.

A study was conducted by unlu in 2008 which showed that ultrasound, traction and laser therapies were all effective in treatment of patients with acute lumbar disc herniation<sup>6</sup>.

In another study done by Krause in 2000, it was concluded that large forces are not required to separate the vertebrae in traction therapy. Radicular symptoms are relieved by vertebral separation as it removes contact forces or direct pressure from sensitized neural tissue. Most likely patients with acute radicular pain (less than 6 months) and concomitant neurological deficits get benefit from traction<sup>7</sup>.

Lee (2001) conducted a study to determine the loads acting on lumbar spine by giving traction therapy in fowler's position. It was concluded that frictional force between body and traction couch is affected by angle of pull. If traction therapy is performed at a split table, frictional force will be eliminated. Angling the line of traction force is unnecessary and it would be sensible to apply traction horizontally as it provides most effective mechanical pull. Traction force is clinically more effective as fowler's position imposes flexion moment on lumbar spine that's why it is needed to unfold posterior soft tissues. Flexion moment has a significant role in stimulating mechanoreceptors, thus assists in reduction of disc prolapse along with increase in foraminal volume<sup>8</sup>.

### OBJECTIVE OF STUDY:

To evaluate the effect of spinal decompression with and without segmental mobilization in improving pain, ROM, walking time and Disability in patients with posterolateral lumbar disc protrusion.

### MATERIALS AND METHODS:

The study design was Randomized Control trial. The study was conducted in KKT orthopedic spine center and Canada Orthopedic and Rehabilitation Center. (KKT/CORC is a specialized non-invasive center for treatment of spine. It is located in Lahore, Karachi and Islamabad. The researcher has collected data from Islamabad center).The duration of study was 16 February 2016 to 23 July 2016. Inclusion criteria was patients of age group (18 to 66 years) having posterolateral lumbar disc bulge confirmed by MRI report and patients wo had localized as well radiating back pain and associated symptoms. Patients who don't have MRI report were excluded from study. Patients

with diagnosis of lumbar spondylolisthesis, spinal stenosis, fracture of lumbar spine, spinal tumor, ankylosing spondylitis, patients taking blood thinner medications were also excluded from study. All the diagnosed patients fulfilling the inclusion criteria were included in this study. The subjects were randomly divided into 2 groups (control group and experimental group) by coin toss method using purposive non-probability sampling technique. Total number of 83 patients came to the settings with complaint of low back pain. Number of patients excluded from the study were 31. People who met the inclusion criteria and included in study were 52. Among them 26 patients were randomly assigned to each group. 5 patients in control group and 3 patients in experimental group were dropouts as they did not come for follow up so total number of 44 patients i.e. 21 patients in control group and 23 patients in experimental group were analyzed for results. Intervention protocol for control group included application of TENS and Infrared heat at lower back region for 10 mins and treadmill for 10 mins in pre physiotherapy session. Then decompression therapy session of 25 minutes was given to patient. After that short wave diathermy for 10 mins was applied at lower back region in post physiotherapy session. Same protocol was given to experimental group with addition of CPA Maitland mobilization at lumbar spine from L1 to L5 spinous process (3 sets of 10 reps) in pre physiotherapy session. The Riphah ethical review committee and KKT/CORC center approved to conduct the study in their setting. The informed consent from all patients was taken before enrollment in the study. Measurement tools were Modified Oswestry Disability Index to measure functional disability, Numeric Pain Rating Scale to measure patient's pain intensity,

walking time was calculated by asking patient to do treadmill for 10 mins and Range of motion of lumbar spine was measured by goniometer. Structural questionnaire was used for first and final assessment. Base line measures were taken at 1st visit. ROM, walking time, NPRS score and MODI score were calculated. 2 weeks treatment was given (no of sessions = 4). End values of variables were calculated after completion of treatment sessions. Data was analyzed by using IBM SPSS 21 and expressed in forms of tables. Researcher assumed data to be normally distributed unless exploratory analyses suggested otherwise, in which case a Kolmogorov-Smirnov test was to be applied. When tests of normality were applied to data, it was seen that data was dispersed and was not equally distributed. P-value was less than 0.05 so non-parametric tests were applied. Since the treatment effect was defined as the difference between before and after the therapeutic intervention, Wilcoxon test applied within the group to test whether there was a reduction in pain and MODI score and increase in ROM and walking time. Base line and end line values of variables between groups were determined by Mann-Whitney U-Test.

## RESULTS:

Among 44 patients, 27 were males and 17 were females. Mean age of participants was  $42.45 \pm 12.38$ . Most common disc bulge level was L4-L5 (31.82%). Most of the patients were housewives (27.27%). Duty hours of majority of patients were less than 12 hours. (47.7%). Referral source of most of patients was other patients (34.09%). Most of the patients (79.55%) were experiencing pain form more than one year. (Table no 1)

Table No 01: Demographic Data

Variable	Overall	Control	Experimental
Age	Mean: 42.45±12.38	Mean: 40.57±11.49	Mean: 44.09±13.18
Gender	M(27), F(17)	M(13), F(8)	M(14), F(9)
Disc bulge level	L4-L5: 31.82%	L4-L5 : 45.5%	L2-L3: 30.4%
Occupation	House wives: 27.27% Businessman: 18.18%	Housewives; 27.3% Office workers: 22.7%	House wives: 26.1% Doctors: 21.7%
Duty hours	Less than 12 hours:47.7%	Less than 12 hours:59.1%	Less than 6 hours: 52.2%
Referral	Patients: 34.09%	Patients: 40.9%	Self: 30.4%
Onset of pain	Pain started more than one year before: 79.55%	Pain started more than one year before: 72.7%	Pain started more than one year before: 82.6%
Previous treatment	Neurophysician; 31.82%	General ractitioner:36.4%	Orthopedic consultant:39.1%
Previous PT treatment	No: 54.5%	No: 54.5%	No: 52.2%
Pain	Yes: 93.2%	Yes; 95.5%	Yes: 87%
Muscle spasm	Yes: 72.7%	Yes: 59.1%	Yes: 82.6%
Pins and needles	No: 75.0%	No; 63.6%	No: 82.6%
Numbness	Yes: 52.3%	Yes: 54.5%	No: 52.2%
On Set	Suddenly: 43.2%	Suddenly: 45.5%	Suddenly; 39.1%
Worst during activities	Bending; 36.36%	Walking: 36.4%	Bending: 52.2%
Better during activities	Lying: 43.18%	Lying: 45.5%	Lying; 39.1%
Dermatomal level	Multiple; 34.09%	Multiple; 40.9%	Multiple; 26.1
Pain radiation	Yes: 68.2%	Yes: 72.7%	Yes: 60.9%
Pain radiation side	Left: 38.6%	Left; 31.8%	Left: 43.5%
Pain radiation level	Till ankle: 25.0%	Till ankle: 22.7% Below knee: 22.7%	Till ankle: 26.1%

The base line values comparison between control and experimental group Mann-Whitney test showed non-significant result. The p-value of walking time, lumbar flexion ROM, lumbar extension ROM, lumbar right side bending ROM, lumbar left side bending ROM, lumbar right rotation ROM, lumbar left rotation ROM, NPRS and MODI was non-significant. (Table no 2)

The end values comparison between control and experimental group Mann-Whitney test showed significant result. The p- value of lumbar flexion ROM, lumbar extension ROM, lumbar right side bending ROM, lumbar left side bending ROM, lumbar right rotation

ROM, lumbar left rotation ROM, NPRS and MODI was significant while the p-value of walking time was non-significant. (Table no 3)

## DISCUSSION:

In researcher's study CPA Maitland mobilization was given at lumbar spinous process L1 to L5 in experimental group. 3 sets of 10 repetitions were given. There was a significant improvement in lumbar extension post treatment. A similar study was conducted by Rebecca L. McCollam et al (2013) to determine the effects of Maitland posteroanterior vertebral pressures on lumbar flexion and extension mobility.

**Table no 2: Mann-Whitney U-Test comparison of baseline variables between groups:**

Test variable	group allotted to patients	Median(IQ)	Mean rank	z-value	P value
Walking time 1st visit	Control	2(2)	23.71	-0.637	P > 0.05 (0.524)
	Experimental	2(2)	21.39		
Lumbar flexion 1st visit	Control	50(29.5)	25.00	-1.242	P > 0.05 (0.214)
	Experimental	42(20)	20.22		
Lumbar extension 1st visit	Control	20(12)	25.98	-1.719	P > 0.05 (0.086)
	Experimental	15(9)	19.33		
Lumbar right side bending 1st visit	Control	22(19)	25.24	-1.353	P > 0.05 (0.176)
	Experimental	21(5)	20.00		
Lumbar left side bending 1st visit	Control	26(19.5)	24.24	-0.859	P > 0.05 (0.390)
	Experimental	20(12)	20.91		
Lumbar right rotation 1st visit	Control	21(14)	25.52	-1.496	P > 0.05 (0.135)
	Experimental	20(8)	19.74		
Lumbar left rotation 1st visit	Control	20(12.5)	23.29	-0.389	P > 0.05 (0.697)
	Experimental	22(15)	21.78		
NPRS 1st visit	Control	7(3.5)	23.50	-0.502	P > 0.05 (0.616)
	Experimental	7(2)	21.59		
MODI 1 <sup>st</sup> visit	Control	62(22)	22.95	-0.224	P > 0.05 (0.823)
	Experimental	62(22)	22.09		

**Table no 3: Mann-whitney U-Test comparison of end-values variables between groups:**

Test variable	group allotted to patients	Median(IQ)	Mean Rank	Z-value	P value
Walking time last visit	Control	4(1)	19.55	-1.563	P > 0.05 (0.118)
	Experimental	4(1)	25.20		
Lumbar flexion last visit	Control	55(32)	17.69	-2.379	P < 0.05 (0.017)
	Experimental	72(12)	26.89		
Lumbar extension last visit	Control	19(11)	15.45	-3.489	P < 0.05 (0.000)
	Experimental	27(7)	28.93		
Lumbar right side bending last visit	Control	27(21.5)	17.17	-2.635	P < 0.05 (0.008)
	Experimental	37(10)	27.37		
Lumbar left side bending last visit	Control	23(14)	16.33	-3.045	P < 0.05 (0.002)
	Experimental	42(16)	28.13		
Lumbar right rotation last visit	Control	28(11)	18.10	-2.176	P < 0.05 (0.030)
	Experimental	38(11)	26.52		
Lumbar left rotation last visit	Control	25(12)	15.12	-3.645	P < 0.05 (0.000)
	Experimental	38(18)	29.24		
NPRS last visit	Control	5(3.5)	27.38	-2.448	P < 0.05 (0.014)
	Experimental	3(2)	18.04		
MODI last visit	Control	50(16)	27.95	-2.695	P < 0.05 (0.007)
	Experimental	40(16)	17.52		

Treatment group received three, one minute series of grade IV+ Pas at L3, L4 and L5 spinous process. Reassessment was done after one week which showed significant increase in lumbar extension range post treatment<sup>9</sup>.

The findings of researchers study indicated significant increase in lumbar flexion ROM and lumbar extension range of motion which was contradicted by a past study done by N.J. petty (1995) in which effect of posteroanterior mobilization on sagittal mobility of lumbar spine was investigated. PA mobilization was applied to L3 spinous process for 2 minutes. This study showed no significant difference in flexion or extension range of motion<sup>10</sup>.

NPRS score was significantly reduced in experimental group following treatment in present study. The results are supported by a previous study done by Michalene Goodsell et al (2000) in which short term effects of lumbar posteroanterior mobilization were compared with a control intervention. Self-controlled cross over study design was used. 26 patients of non-specific low back pain were included in study who reported pain on flexion or extension. Score for pain on movement was reduced significantly after posteroanterior mobilization according to the results<sup>11</sup>.

Researcher's findings showed significant reduction in NPRS score in experimental group at last visit. An earlier study done by Adit Chiradejnant et al (2002) supported the current findings in which postero-anterior mobilization effectiveness was determined in relieving low back pain. Greater reduction of pain was estimated after mobilization applied to symptomatic level<sup>12</sup>.

According to researcher's current study NPRS score was significantly reduced and lumbar extension was significantly increased in experimental group after 2 weeks of treatment. Christopher M Powers (2008) examined the immediate effects of PA mobilization and press up exercises on non-specific low back pain. Pain score was significantly reduced in both groups and lumbar extension was also significantly increased in both groups<sup>13</sup>.

The results of researcher's current study showed that NPRS score was significantly reduced after decompression therapy in patients with posterolateral lumbar disc bulge. Mean age of patients was  $42.45 \pm 12.38$ . Mostly patients were males. L4-L5 disc bulge level was found in majority of patients. Previous treatment was taken by neuro-physician in most of the patients. Majority patients did not take physiotherapy treatment previously. Most of the patients reported pain radiation to lower limb till ankle level. Pain score was significantly reduced in experimental as well as control after 2 weeks of treatment. The current study was supported by previous study done by Alex Macario et al (2008) who reported that 94 patients of discogenic low back pain were given motorized spinal decompression to assess its effect on NRS, analgesic use and ADLS. Study design was retrospective chart review. Mostly patients were females. Convenient sampling technique was used. Mean age of patients was  $55 \pm 16$ . Common level of disc bulge was L4-L5. Majority of patients had radiating pain to lower leg. Previous treatment was taken by chiropractors in most of the patients. Most of the patients also took physiotherapy treatment previously. Mean NRS score was reduced significantly after 8 weeks

treatment<sup>14</sup>.

The current study suggested that NPRS score was significantly reduced in both groups after 4 weeks treatment of non-invasive motorized spinal decompression. Previous study conducted by Christian C Apfel et al (2010) supported the results of current study in which the effect of 6 weeks treatment protocol of motorized non-invasive spinal decompression DRX9000 on lumbar disc herniation was observed with pre and post CT scan. NPRS score was significantly reduced and disc height was significantly increased post treatment<sup>15</sup>.

According to current study it was concluded that MODI score was significantly reduced in control and experimental group after 2 weeks of treatment protocol. Another similar study done by Yeol ma and Hyeong-Dong Kim (2010) on the effects of motorized spinal decompression along with spinal mobilization and lumbar stabilization exercises in discogenic low back pain. It was concluded that ODI score was significantly reduced and SLR range was significantly improved post treatment<sup>16</sup>.

The results of present study showed that there was significant reduction in NPRS and MODI score after 2 weeks treatment of non-invasive motorized spinal. A study previously done by Jioun Choi et al (2015) favors the results of present study in which influence of spinal decompression therapy and general traction on pain, disability and SLR was identified in patients with disc herniation. Treatment of 4 weeks was offered to patients. Both groups showed significant reduction in VAS and ODI scores and significant increase in SLR angle<sup>17</sup>.

The researcher's study determined that NPRS score and MODI score was significantly reduced in control as well as experimental group following decompression treatment. A RCT was done by Werners et al (1999) to compare interferential therapy with lumbar traction and massage management in low back pain patients. ODI and VAS outcomes were assessed. 6 sessions of treatment were given. Final post assessment was done after 3 months. ODI score and VAS score dropped significantly in both groups receiving interferential therapy and lumbar traction with massage<sup>18</sup>.

### CONCLUSION:

From the results of the study it was concluded that Neuro spinal decompression therapy along with CPA Maitland mobilization was effective in reducing NPRS score, MODI and increase lumbar ROM.

### Declaration of interest:

The authors reported no conflict of interest

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