# THE EFFECTIVENESS OF STABILIZATION EXERCISES AND NEURAL MOBILIZATION IN PREVENTION OF POST-LUMBAR DECOMPRESSION SURGERY SYNDROME

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## ABSTRACT

**AIM** To determine the effectiveness of stabilization exercises and neural mobilization in prevention of post-lumbar decompression surgery syndrome

**METHOD** Total of 36 patients including both male and female, aged between 18-70 years of lumbar post- decompression surgery within the last 72 hours were randomly allocated in two groups. 28 patients continued the study till end as 4 patients didn't come for the follow-up, 3 patients developed infection and 2 patient didn't perform the exercises Patients with the history of spinal dislocations & fractures, tuberculous spine, serious pathological conditions, sacro-iliac joint diseases, discitis, advance scoliosis, spondylolisthesis, spinal fracture and physical disabilities were excluded from the study. The intervention group was provided with a home exercise program starting 24-48 hours after surgery and an educational leaflet on posture ergonomics. A single physical therapist educated the patients on exercises. The control group was provided with pain killers and ergonomics leaflet. Both groups were follow-up after 1 month of implementation of the training plan. The patients were assessed on Visual Analogue Scale (VAS) and Oswestry Disability Index (ODI) for low back pain as the outcome measures.

**RESULT** After one month follow-up out of 36 only 28 patients completed the study with 64% male and 36% female ratio. The statistical results of VAS (p=0.47) and the Oswestery Disability Index (p=0.287) revealed no statistical significance between the two groups regarding pain and disability outcomes.

**CONCLUSION** The study concludes that no changes were found regarding pain and disability and both groups were equally effective in improvements of symptoms following lumbar decompression.

**KEYWORDS** Lumbar decompression surgery, Failed back spinal surgery syndrome, Post-surgical rehabilitation, Lumbar stability exercises, Neural mobilization exercises.

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## INTRODUCTION

Low back pain is a major health problem present in 40-85% of the individuals.[1, 2] The underlying causes are identified in 10% of the cases.[1] About 0.5% of the affected population undergoes back surgery to relieve pain.[2, 3] Lumbar decompression surgery relieves the pressure on the nerve roots by restoring the normal spinal spaces.[2,4] The techniques used in lumbar decompression surgery are laminectomy, discectomy, spinal fusion, laminotomy, foraminotomy and laminaplasty.[5,6]

In United States about 300 thousand lumbar surgeries are carried out per year with failure rate more than 40%.[1] The inadequate surgical fusion and soft tissue dissection may cause persistent pain and post-operative destabilization.[1,7,8] Nerve roots can be damaged during surgery, causing neuropathic pain (10%) and mobility deficit.[8, 9, 10, 11] Patients with epidural scarring (20-36%) are more likely to suffer from radicular pain.[7, 8] Lumbar degenerative disc disease (20-22%) and atrophy of the Para-spinal muscles leads to segmental instability and abnormal motion.[3,7,8,9,12]

A thorough assessment and treatment may be followed for post-decompression surgery pain including pharmacological management, epidural steroid injections, discography and spinal cord stimulation.[7,8,13] This may lead to improvement in pain, yet, functional recovery needs rehabilitation.[2] Physical therapy rehabil-

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itation is often prescribed after surgery, though, little is known about its effectiveness.[3,14,15,16]

Stability exercises as a part of rehabilitation program decreases pain intensity, improves range of motion and stability in decompression surgery patients.[3,13,14,15] Neural mobilization helps in improvement of physiological function by reducing pressure on neural structures and regains joint flexibility.[11,17] Exercise program starting 4-6 weeks post-surgery leads to faster reduction in pain and disability.[16, 18] Spinal mobility exercises should start 1-2 weeks post-surgery, but, due to lack of good quality studies, there is no strong evidence supporting the effectiveness of exercise program starting immediately after surgery.[4,14,18]

Rehabilitation programs decrease the reoperation rate and improve functional status of the patient.[16] There are no differences regarding back disability between clinical-supervised and home exercise program.[15] Therefore this study is conducted to find out the effectiveness of Physical therapy rehabilitation as home exercise plan on patients of lumbar decompression surgery in the acute stage. In addition this may also define the improvements in functional status of such patients.

## METHODS

Total of 36 male and female patients who had their lumbar decompression surgery were included by consecutive sampling. Patients were evaluated on the basis of the inclusion and exclusion criteria by consecutive sampling method through lottery method. The even numbers were in the intervention group and the odd numbers in the control group. Out of 36 patients 28 continued the study till end as 4 patients didn't come for the follow-up, 3 patients developed infection and 2 patient didn't perform the exercises. The selected participants were educated by explaining the purpose of the study. Information sheets and informed consent were provided to them. Written informed consent was taken from each participant. The treatments were evaluated by applying the criteria of effectiveness and also by follow-ups. The exercise plan was prescribed by a single physical therapist.

The data was collected by using the following tools;

- The clinical assessment form[19]
- Visual Analogue Scale
- Oswestry Low Back Pain Disability Questionnaire

The participants were randomly allocated in intervention and control group.

The intervention group received lumber stabilization exercises and neural mobilization, ergonomics instructions in addition to analgesics and pain killers. The training program consisted of an instructional and precautionary sheet focusing on proper ergonomics and performing the daily activities safely. The patients were advised to follow the protocols for 4 weeks. The exercises were divided into two halves. The first 2 weeks following surgery consisted of low-grade gentle exercises while in week 3-4 these exercises were progressed to a next level. These manual techniques were prescribed as home exercise plan by providing post-decompression surgery Physical therapy protocols and exercise sheets with diagrams. Call for follow-up was after 4 weeks of treatment.

The control group was given analgesics with no Physical therapy management however they were provided with the information sheets regarding safe ergonomics and posture. They followed the treatment plan prescribed by their surgeon.

## RESULTS

The current study findings reveal that in a sample size of 28 patients the mean age was found to be 42.07 years in the interventional group and 43.43 in the control group. The male and female distribution was 64% male and 35% female in both the groups. (Table: 1)

The initial assessment after 24-48 hrs of surgery show that the visual analogue scale. Mean was 4.857 for intervention and 4.714 for control, p-value 0.658 showing no statistical significance between groups. The initial Oswestry disability index for back pain revealed that the interventional group had 67.12 mean and the control group mean was 66.571. The p-value =0.592 showing no significance between the groups. (Table: 2)

After the implementation of home exercise plan for 1 month the assessment values were noted. The visual analogue scale assessment found that the mean was 2.143 for intervention group and 2.500 for control group. The p-value was 0.47 showing no statistical significance. The follow-up Oswestry score mean was 17.036 for intervention group and 24.821 for control group showing improvements of score in the treatment group however the p-value was

**TABLE 1: Age and gender distribution**

| | Group | N | Mean | SD | Gender distribution | |
|---|---|---|---|---|---|---|
| | | | | | Male | Female |
| Age | Intervention | 14 | 42.07 | 10.224 | 18% | 10% |
| | Control | 14 | 43.43 | 8.916 | | |

**TABLE 2: Independent sample test for initial scoring**

| | Group | Mean | SD | p-value |
|---|---|---|---|---|
| Initial VAS | Intervention | 4.857 | .7703 | 0.658 |
| | Control | 4.714 | .9139 | |
| Initial Oswestry | Intervention | 67.214 | 7.3817 | 0.592 |
| | Control | 66.571 | 4.3273 | |

0.232 again showing no statistical significance. (Table: 3)

The paired sample statistics initial VAS for both groups, however show significance as the p-value is 0 with mean 4.786 for initial VAS assessment for both groups (Vas 1) and mean 2.321 for follow-up VAS assessment for both groups (Vas 2). (Table: 4)

The paired sample statistics for Oswestry scale also show significance as p-value is 0 for both groups with mean 66.893 for oswes1 and 20.929 for oswes2. (Table: 5)

The paired sample statistics for Oswestry showed that the initial scoring and follow up scoring in combined groups were statistically significant with p-value 0 concluding that both the treatment plans are effective in improving the patient symptoms after lumbar spinal surgery.

**TABLE 3: Independent sample tests for follow-up scoring**

| | Group | Mean | SD | p |
|---|---|---|---|---|
| Follow-up VAS | Intervention | 2.143 | 1.2924 | 0.47 |
| | Control | 2.500 | 1.2860 | |
| Follow-up oswestry | Intervention | 17.036 | 15.1435 | 0.287 |
| | Control | 24.821 | 18.3551 | |

**TABLE 5: Initial and Follow-Up Visual Analogue Scale Paired Samples Statistics**

| | | Mean | N | SD | p |
|---|---|---|---|---|---|
| PAIR 1 | Vas 1 | 4.786 | 28 | .8325 | 0.000 |
| | Vas 2 | 2.321 | 28 | 1.2781 | |

**TABLE 6: Oswestry Disability Score Paired Sample Statistics**

| | | Mean | N | SD | p |
|---|---|---|---|---|---|
| PAIR 1 | Oswes 1 | 66.893 | 28 | 5.9463 | 0.000 |
| | Oswes 2 | 20.929 | 28 | 16.9808 | |

## DISCUSSION

The findings of the study concluded that both groups had majority males revealing that low back pain affects a large number of male populations.[7,27] The age in this study ranged from 24-65 years and the mean was 42.3 as also evident in a study where the sample age ranged between 30-68 years and mean was 45.[7] The total sample size initially taken was 36 patients however only 28 patients succeeded to follow the 4 weeks protocol. Labiba Abdkader Mohamed et al. in their study also used sample size of 30 patients.[7] Other studies show varied sample sizes of 98 patients,[12] 40 patients,[22] 126 patients,[17] 55 patient,[28] 60 patients,[30] 48 patients [31] and 82 patients.[34]

The duration of intervention in the current study ranged to 4 weeks. However Lisa G. Oestergaard et al. and Arja Hakkenin et al. conducted the study for 1 year.[17,34] Other authors prescribed 6 weeks intervention,[7, 20] 8 weeks exercise program,[31, 35] 12 weeks[12,28,29,30] and 4 weeks[22] rehabilitation plan for lumbar post-surgical patients. The program of exercise training started within 24-48 hours following surgery. Mohamed N. El-Bahrawy et al. conducted a study on with 2 groups with 1 group starting exercises 2 weeks post and other group starting 6 weeks following surgery however showing greater improvement in the group that started exercises 2 weeks after surgery.[22] A study by Sean P.Flanagan started the exercise intervention 4-6 weeks post-surgery.[28] Gunilla Kjellby-Wendt started day after surgery.[30] Lisa G. Oestergaard et al. started exercise plan 6 weeks and 12 weeks after surgery with better improvements in 12 weeks group.[34] Raymond W. J. G. Ostelo et al. conducted a Cochrane review suggesting that exercise starting 4-6 weeks post-surgery leads to faster improvements as compared to no treatment,[31] Jeffrey J. Hebert et al. started exercises 10 days after surgery.[35] The assessment tool for the outcome measures used was the visual analogue scale[16,25,30] and oswestry disability index.[14,16,23,27,28]

The treatment plan focused in the study was lumbar stability exercises and neural mobilization with an instructional leaflet on work and posture ergonomics. Labiba Abdkader Mohamed et al. used strength stretching aerobics endurance and ROM exercises.[7] KorneliaKulig et al. carried back extensor strength and endurance program and also gave patient education.[12] ArjaHäkkinen et al. focused on lumbar strengthening and stretching exercises.[17] Per Rotbøll Nielsen et al. gave instructions and general trunk exercises to the patient.[20] Mohamed N. El-Bahrawy et al. used back extensor and SLR 22. Sean P.Flanagan used trunk strength and endurance exercises in their study.[28] Anne F. Mannion et al. advised trunk stability and isometrics.[29] GunillaKjellby-Wendt implemented active exercise training on post-surgical patients.[30] George A Koumantakis, used exercises and an educational booklet.[31] Lisa G. Oestergaard et al. provide instructions to the patient in addition to stability exercises and ergonomics education.[34] Jeffrey J. Hebert et al. did a case report and applied exercises for the activation of transverse and multifidi.[35] Christin Johansson et al. used hip mobility back muscle activation in their treatment plan.[36]

The training program was prescribed as a home exercise plan as also prescribed by Anne F. Mannion et al,[29] Lisa G. Oestergaard et al,[34] Christin Johansson et al,[36] in their

studies. A Cochrane review by Raymond W. J. G. Ostelo et al. concluded no difference between home plan and supervised exercises.[33]

The mean score of outcome measures disability and pain were improved equally in both the control and intervention group after following the 4 weeks program. This concludes that implementation a rehabilitation program is as effective as following a surgeon's protocol of pain killers in combination with safety instructions after lumbar decompression surgery. No statistical difference was noted however the paired sample of initial scoring of VAS and Oswestry for both groups combined evaluated improvement in patient condition. However the initial disability scoring for the intervention group was higher than the control group, somehow showing the more important role of the exercises in treating the symptoms. Labiba Abdkader Mohamed et al. stated marked decrease in pain and improvement in functional outcome in the exercise given group when assessed 2 weeks and then 6 weeks post-surgery.[7] Kornelia Kulig et al. explained exercise and the education group to be more effective with lower disability score.[12] Sean P.Flanagan and show improvement in training group after surgery regarding strength and withhold time.[28] Mohamed N. El-Bahrawy et al,[22] and Gunilla Kjellby-Wendt et al,[30] stated that exercises starting 2 weeks post-surgery result in more improvement in pain and ranges as compare to a program starting 6 weeks post-surgery. This conflicts with the results of Lisa G. Oestergaard et al. who stated that exercises starting 12 week post-surgery show more improvement.[34] George A Koumantakis illustrated that in exercise group the immediate follow ups after the completion of session's revealed improvement in disability.[31]

After a generalized discussion on the study some limitations were also found. Firstly the patients in both groups should have been followed after every 2 weeks of the program. This is important because an assessment carried after 2 weeks would have evaluated the patient condition on whether to progress with the exercise session or not. Also it would have helped to the patients properly follow the program or not. Secondly, as most of the studies suggest the treatment plan could have been advised for 6-8 weeks beside 4 weeks as this would have created a clear picture about the effectiveness of exercises in the prevention of post-decompression surgery syndrome. Thirdly, the sample size taken was too small that created hurdles in getting statistically significant results for the outcome differences in the groups. And lastly the treatment plan should have focused on any of the protocols either the stability exercises or the neural mobilization exercises and not a combination.

## CONCLUSION

The study concludes that the implementation of an exercise program versus the prescription of pain killers after a lumbar decompression resulted in equal recovery of the patient with decrease in pain symptoms and improvement in disability score. No changes were found between the groups regarding pain and disability. However the ergonomic instructions that were advised for both groups may have contributed to the outcomes.

Another study can be carried as a progression of this study by taking a large sample size and carrying the study in different neuro-surgery department of the area. One exercise plan can be focused when comparing with the control group. Also a specific age group can be taken for the study. The results may also differ due to the surgical techniques used and may vary from one surgeon to another.

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## NOTES ON CONTRIBUTORS

The study was part of SA Bachelors in Physical Therapy Education. MBAJ supervised the dissertation, and was involved in every part of the analysis, idea's development, and write-up.

## CONFLICT OF INTEREST

Authors declare no conflict of interest.

## ETHICS APPROVAL

The approval/permission was obtained from Khyber Medical University Research and Ethics Board.

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