

Value of Early Post Operative Physical Therapy Intervention in Lumbar Disc Surgery

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ABSTRACT

Background: Among patients operated upon for lumbar disc prolapse, many of them suffering from residual sciatic pain, and decreased mobility Objective: To evaluate the effect of early physical therapy intervention after lumbar disc surgery. **Methods:** Fourty patients from both gender randomly assigned into two equal groups. Group I (study group) started physical therapy two weeks after surgery, and group II (control group) started physical therapy after six weeks of surgery. The following parameters were used in the evaluation: leg pain by visual analogue scale (VAS), straight leg raising test (SLR), and trunk flexion range. The physical therapy program consisted of auto assistive straight leg raising and back extension exercises which were performed every other day for four weeks. **Results:** The results revealed that early physical therapy intervention(after two weeks of surgery) had a marked effect on reduction of pain, increase of both straight leg raising, and trunk flexion ranges with high percentage of improvement in comparison to the results of the control group (P=0.0001) . **Conclusion:** It can be concluded that early physical therapy intervention is effective in improving the prognosis following lumbar disc surgery. (*Egypt J Neurol Psychiat Neurosurg.* 2010; 47(1): 93-97).

Key Words: lumbar disc surgery, pain, physical therapy.

INTRODUCTION

Among patients operated upon for lumbar disc prolapse, many of them suffering from residual sciatic pain, and decreased mobility¹. The lumbosacral radicular syndrome is characterized by radiating pain over an area of the buttocks or leg innervated by one or more of spinal nerve roots of the lumbar vertebrae or sacrum, combined with phenomena associated with nerve root tension². Failed back syndrome is a persistent or recurrent back or leg pain following surgery for lumbar disk prolapse. It includes errors of clinical and surgical management as well as pain due to adverse recovery from surgery. It also can be used to describe a patient who suffers an unsatisfactory result following lumbar spine surgery, often complaining of pain (combination of back and leg) resulting in reduced capacity to gain full employment and activities of daily living.³

The following factors leads to failed back syndrome, sequel of disc degeneration on the neural arch and joints facet, epidural adhesion and scarring as well as local arachnoiditis. The success rate of lumbar disc surgery varies from 60% to 90%. There are differences among studies with regard to inclusion criteria for surgery, and in the way of evaluating the success rates.

Their figures showed that in 10% to 40% of patients, the results of surgical operation are unsatisfactory. Moreover, patient still suffers from symptoms usually similar to the preoperative symptoms⁴.

The persisting symptoms mainly consist of pain, motor deficits, and decreased functional status. In 2% to 19% of patients who undergone a first time lumbar disc surgery, a recurrent herniated disc occurs, and in 74% of cases, occurs within 6 months after the patient's first operation³. Moreover, after lumbar disc surgery 22% to 45% of patients experience residual sciatica, and between 30% and 70% have residual back pain and limited range of motion⁵⁻⁷.

There are wide range of controversy about the necessity and duration of restriction of activities after lumbar disc surgery. Although several active rehabilitation programs; including physical fitness programs, or protocols regarding instruction for patients to return to work after lumbar disc surgery have been suggested, there are still persistent fears of causing reinjury, reherniation, or instability^{8,9}. This study was designed to evaluate the effect of early postoperative physical therapy intervention after lumbar disc surgery.

PATIENTS AND METHODS

Subjects selection:

Fourty post operative patients of lumbar disc surgery from both genders were enrolled in this study. They were recruited from Neurosurgery Department,

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Kasr Al-Aini Hospitals, Cairo University. After the baseline measurements, the patients were randomly assigned into two equal groups:

- * **Group I:** 20 patients (14 males - 6 females), started physical therapy program two weeks post surgery.
- * **Group II:** 20 patients (15 males- 5 females), started physical therapy program after six weeks of surgery.

Inclusion criteria:

Patients who had undergone a first uncomplicated disc surgery for lumbar spine with a postoperative leg pain. Patients included in the study were operated upon by the same neurosurgeon. Standard laminectomy or laminotomy was carried out using the standard techniques

Exclusion criteria:

- 1- Intra-operative or post-operative complication, discitis, wound infection, and dural tear.
- 2- Spondylolisthesis or spinal stenosis.
- 3- Cases of discectomy with spinal fusion were excluded from the study, also, defined neurologic diseases, obesity or psychiatric disorders.

Exercise Procedures:

All participants were informed of the physical therapy program and its duration and provided a written consent.

All patients performed auto-assisted straight leg raising (SLR) exercise, using a rope and pulley system above the bed (Figure 1). The patient adopted supine position, one pillow under the head. A two pulley were used through traction cord, one pulley being placed at the hand level, and attached to a pulley handle, another sling attached above the ankle joint. As the patient pulled down on the handle, the leg was raised. The patient was encouraged to raise the leg, until either pain in the lumbar region, or referred to the leg(s), advised to stop the exercise. This exercise was carried out for 30 minutes every other day for four weeks.



Figure 1. Auto assisted straight leg raising exercise.

Back extension strength exercises:

Patient in a prone position, trunk was extended from the bed. The patients were asked to held the contraction for five seconds, with a rest period of five seconds between contractions. This exercise was repeated for 30 repetitions, with five minutes rest between each ten times. This program was applied every other day for four weeks.

Methods of outcome assessment:

- Passive SLR was measured using a digital gravitational goniometer (Model No 360 S R Made in USA) centered on the middle of the leg, above the ankle joint (Figure 2). The goniometer was held in position during SLR by strap, the therapist performing the SLR, with the patient in supine, up to the point where the patient was unable to tolerate further movement. Three trials were applied and the average of change in the angle (in degrees) of raising was recorded.



Figure 2. Straight leg raising test.

- Referred leg pain was assessed using visual analogue scale (VAS). The patients were instructed to mark the VAS (0-100 mm.)¹⁰ to represent their pain intensity (pre and post treatment program).The mark corresponds to the patient's level of comfort.
- Range of trunk flexion was measured with the goniometer centered on lateral aspect of the trunk midway between iliac crest and axilla (Figure 3). While patient in standing position, the patient was asked to lean forward as much as possible without feeling pain. Each outcome measure (in degrees) was assessed pre treatment (one week post surgery) for both groups, and after four weeks from the exercise program.



Figure 3. Range of trunk flexion.

Statistical analysis:

Data were statistically described in terms of mean \pm standard deviation (\pm SD). Comparison of quantitative variables between the study and control groups was done using Mann Whitney U test for independent samples. Comparison of quantitative variables between Pre and post treatment values within each group was done using Wilcoxon signed rank test for paired variables. The level of significance

was at $P < 0.05$. All statistical calculations were done using computer programs Microsoft Excel version 7 (Microsoft Corporation, NY, USA) and SPSS (Statistical Package for the Social Science; SPSS Inc., Chicago, IL, USA) program for Microsoft Windows.

RESULTS

Before physical therapy intervention there was no significant difference between the study group (G1) and control group (G2) regarding mean values of pain, straight leg raising and trunk flexion with P value > 0.05 (Table 1). After intervention, a highly significant improvement was found in the study group as well as control group compared to that before intervention with $P = 0.001$ (Table 2). The results also demonstrated a high significant differences in the percentage changes of improvement which was increased markedly in the study group (G1) than the control group (G2) regarding pain intensity (VAS), straight leg raising (SLR), trunk flexion range respectively with $P < 0.0001$ (Table 3)

Table 1. Baseline characteristics in both groups (G1 & G2) before the application of the physical therapy program.

	(G1) Mean \pm SD	(G2) Mean \pm SD	P-value
Age (year)	42.85 \pm 4.20	42.05 \pm 4.80	NS
VAS (mm.)	77.60 \pm 8.83	77.90 \pm 2.69	NS
SLR(Degree)	17.00 \pm 2.53	17.60 \pm 2.01	NS
Trunk Flexion range(Degree)	17.10 \pm 2.12	17.80 \pm 1.81	NS

NS=Not Significant.

Table 2. Comparisons of VAS, SLR, and Trunk Flexion range before and after the physical therapy program within each group and between both groups (G1 & G2).

		G1 Mean \pm SD	G2 Mean \pm SD	P-value (between G1 & G2)
VAS (mm.)	Before	77.60 \pm 2.83	77.90 \pm 2.69	0.77
	After	58.50 \pm 6.09	68.45 \pm 3.56	
P-value (within G1 & G2)		0.0001*	0.0001*	
SLR (Degree)	Before	17.00 \pm 2.53	17.60 \pm 2.01	0.43
	After	37.30 \pm 2.59	26.60 \pm 2.41	
P-value (within G1 & G2)		0.0001*	0.0001*	
Trunk Flexion (degree)	Before	17.10 \pm 2.12	17.80 \pm 1.81	0.47
	After	34.15 \pm 1.95	27.45 \pm 2.48	
P-value (within G1 & G2)		0.0001*	0.0001*	

*Significance at $P < 0.05$.

Table 3. Comparisons of percentage (%) of improvement in VAS, SLR, and trunk flexion range between both groups (G1 & G2).

	G1 Improvement % Mean±SD	G2 Improvement % Mean±SD	P-value
VAS	19.10±7.71	9.45±3.02	0.0001*
SLR	54.42±3.34	33.83±2.40	0.0001*
Trunk Flexion	49.92±8.45	35.15 ±6.34	0.0001*

*Significance at P < 0.05.

DISCUSSION

Patients requiring lumbar disc surgery may experience a long period of inactivity before surgery, which in turn may cause decreased muscle strength and impairment of the voluntary neural activation rate^{6,11}. It is supposed that the paraspinal and abdominal muscles have a great capacity for enhancing stabilization of the spine¹². Pain can be caused by all the structures around the vertebral column but, in the postoperative patient the occurrence of arachnoiditis and fibrosis are contributing as main causes in postoperative pain³.

The results of this study showed highly significant differences between the study group patients who started the physical therapy program immediately after two weeks post surgery and the control group patients who started the program six weeks after surgery. These significant difference regarding the intensity of pain, straight leg raising test (SLR) and trunk flexion range as monitoring the improvement and prognosis of functional outcome. These differences seem to be clinically important, the increase in SLR, and pain free range suggests that movements and functional tests, which incorporate hip flexion with knee extension, should be easier (e.g. walking, getting in/out of bed, stopping, etc), and this may interpret the highly significant improvement that showed in the patients of the study group.

Another important consideration is that the early autoassistive straight leg raising exercises help in evaluating the post operative changes in and around the affected nerve root (such as scar formation from subdural adhesions, etc). So, intensive, standardized physical therapy program should be applied early within two weeks post surgery regarding the percentage improvement, there was significant differences between study group and the control group regarding pain, SLR, and trunk flexion. Previous studies of rehabilitation after a first lumbar disc surgery demonstrated that early and intense training have a positive effect on pain, disability, and lumbar mobility¹³⁻¹⁵.

The findings of this study agreed with Danielsen et al.¹⁴, Manniche et al.⁴, who reported that post operative exercise decrease pain and improve the locomotor activities during the first six months. The results of this study agreed also with Arja et al.⁷, who confirmed the importance of apply light stretching and mobility exercises for back and abdominal muscles post operative. In addition, Carrage et al.⁹ concluded that early return to vigorous activities is possible for most patients, and did not increase the rate of complications. These findings were in agreement with the results of the present study program.

Conclusion

It can be recommended that early, within two weeks, postoperative physical therapy intervention is effective in lumbar disc surgery, and consequently can reduce the incidence of failed back surgery.

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الملخص العربي

تهدف الدراسة إلى تقييم قيمة التدخل المبكر للعلاج الطبيعي بعد جراحة الغضروف القطني. أجريت الدراسة على أربعين مريضاً من الجنسين أجريت لهم جراحة بالغضروف القطني (بنفس الطيب الجراح ونفس الطريقة). تم تقسيم المرضى لمجموعتين متساويتين عددياً تم علاجهم ببرنامج علاج طبيعي موحد يتكون من تمارين علاجية للساق المتألم وكذلك تمرين لفرد الظهر بمعدل 30 دقيقة لكل تمرين، يوم بعد يوم لمدة أربعة أسابيع.

تكونت المجموعة الأولى من عشرين مريضاً من الجنسين تم علاجهم مبكراً بعد أسبوعين من الجراحة بينما تكونت المجموعة الثانية من عشرين مريضاً من الجنسين وتم علاجهم بعد ست أسابيع من الجراحة.

أستخدم مقياس مدى الحركة المرئي لقياس التحسن في مدى الحركة بينما استخدمت المسطرة المرئية لقياس شدة الألم. وقد أثبتت النتائج تحسن في المجموعتين ولكن هناك فروق ذات دلالة إحصائية عالية بين المجموعتين لصالح المجموعة الأولى ولذلك يتبين لنا أن التدخل المبكر للعلاج الطبيعي بعد جراحة الغضروف القطني ينتج عنه تحسن ملحوظ في شدة الألم وزيادة في المدى الحركي مما يقلل من احتمالية فشل في النتائج المترتبة على الجراحة.