



# Is rehabilitation intervention during hospitalization enough for functional improvements in patients undergoing lumbar decompression surgery? A prospective randomized controlled study

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## KEYWORDS

Decompression surgery  
Perioperative period  
Physiotherapy rehabilitation  
Spinal surgery  
Hospitalization

## ABSTRACT

**Objective:** Rehabilitation has been reported to improve pain and disability for patients after lumbar surgery. However, studies to investigate the rehabilitation intervention for lumbar decompression surgery during hospitalization are scarce. The aim of this study was to examine outcomes of perioperative rehabilitation intervention for patients who underwent lumbar decompression surgery (LDS).

**Methods:** Patients aged 18–65 years old who received their first LDS were randomized into the perioperative rehabilitation group (PG) or control group (CG). The PG received rehabilitation intervention during hospitalization for lumbar decompression surgery. Pain, functional capacity, Roland-Morris Disability Questionnaire (RMDQ), and Short-Form Health Survey (SF-12) were assessed on admission, at discharge, and at follow-ups one month, three months, and six months after surgery. Two-way repeated measures ANOVAs were used for statistical analysis.

**Results:** A total of 60 patients scheduled for decompression surgery for lumbar stenosis were enrolled into the study. After surgery, the PG showed significant pain relief and improvement of disability as well as quality of life, but there were no significant functional improvements compared with the CG.

**Conclusions:** The findings of this study indicate that the rehabilitation intervention during hospitalization improves pain intensity as well as disability and quality of life, yet has limited effects on the functional performance over time up to six months post-surgery in patients who received LDS. The study suggest that rehabilitation interventions during hospitalization must include regular support for patient adherence to the intervention program and focus on task-oriented programs for lower extremities such as closed-chain exercises in functional postures.

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## 1. Introduction

Decompression surgery is the most common operation for the treatment [1–2] of lumbar spinal stenosis. It combines surgical techniques to relieve symptoms caused by compression on the spinal cord and/or nerve roots for degenerative diseases of the lumbar spine. Common techniques for decompression include discectomy, laminectomy, foraminectomy, osteophyte removal, corpectomy, and even fusion of the vertebrae to stabilize the

spine. Ideally, surgery is coupled with preoperative education and followed by a planned course of postoperative rehabilitation [3] mediated by a therapist and followed by long-term self-management.

Preoperative management is improved in the presence of a basis for establishing rapport for enhanced continuity of care after surgery as well as a mechanism for patient education regarding the scheduled surgery and components of postoperative rehabilitation. Not only patient education but also preoperative evaluation are to identify the patient's needs, anticipated goals, and expected functional outcomes as a result of the surgery. Preoperative instruction [4] gives the patient an opportunity to become familiar with wound care, any special precautions, and supportive equipment such as a spinal brace or walking aids. Of equal importance, it enables the patient to practice and

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learn postoperative exercises early, without being hampered by postoperative pain or the side effects of pain medication, such as disorientation and drowsiness. The components of preoperative patient education consist of an overview of the plan of care, postoperative precautions, and initial postoperative exercises such as deep breathing and coughing as well as active ankle exercise (pumping exercises) and gentle muscle setting exercises of the immobilized area.

During recovery from spinal decompression surgery, rehabilitation such as an instructed physical therapy program may be recommended to exercise the spine in order to regain strength and movement. Usually rehabilitation for spinal surgery starts 4 to 6 weeks post-operation, and sometimes even is suggested to be delayed up to 12 weeks if the surgery involves spinal fusion [5]. Conflicting results have made the effectiveness of rehabilitation intervention unclear. The following positive results have been seen. Patients with a recent history of lumbar microdiscectomy [6] benefited from an exercise program for weak paraspinal musculature and limited functions. Moreover, exercise programs [7] starting 4 to 6 weeks after lumbar disc surgery led to a faster decrease in pain and disability than no treatment. High intensity [7] exercise programs seemed to result in a faster decrease in pain and disability than low intensity programs. There were no significant differences between supervised and home exercises for pain relief, disability, or global perceived effects.

On the other hand, the long-term outcomes of rehabilitation in the previous studies after lumbar decompressive surgery with up to two years follow-up were similar to outcomes in those who had not received any intervention as the control group. On the other hand, Mannion's [8] randomized controlled trial demonstrated that 12 weeks of post-operative physiotherapy did not influence the course of change in pain or disability as long as 24 months after decompression surgery, and advised that keeping active by carrying out physical activities could be as good as undertaking a supervised rehabilitation program of spine stabilization exercises. Similar results were obtained in a prospective study to treat lumbar spinal stenosis with 2-year postoperative follow-up: a routine of postoperative outpatient rehabilitation did not improve functional outcome nor did it have any impact on back and leg pain, satisfaction, and walking ability [5].

As shown in the literature, most rehabilitations start with physical therapy by patient education and instruction. However, a RCT study in 2010 reported that degenerative disease interventions with combined preoperative information and training, patient-controlled epidural analgesia, and intensive postoperative mobilization [9] improved function, shortened hospitalization, and reduced costs in patients who had undergone lumbar spinal surgery. Moreover, perioperative rehabilitation for orthopedic surgery has been reported to accelerate these outcomes. Yet little evidence regarding early rehabilitation interventions during the perioperative [10] period extending from admission for spinal surgery to discharge with a planned program has so far been documented in terms of clinical outcomes. The aim of this study was to examine the outcomes of patients after lumbar decompression surgery (LDS) receiving perioperative rehabilitation. Thus, our study hypothesis was that outcomes would improve by early perioperative rehabilitation, and that patients would experience pain and disability over a shorter time post-operation.

## 2. Materials and methods

Patients scheduled for decompression surgery for lumbar stenosis were consecutively invited to participate in the study. Inclusion criteria were: (1) between 18–65 years of age,

(2) receiving primary LDS, and (3) able to communicate and actively participate in the program. Exclusion criteria were: (1) mental disability, (2) severe neurological disease as well as contraindication to surgery in general, or (3) musculoskeletal or systemic disorders with functional impairments that limit tolerance to testing. All patients who met the inclusion criteria were given oral information and written consent of the study on admission. The patients were randomly allocated to either the perioperative group (PG) or the control group (CG) by a health professional who did not take part in the trial and only had patients fill in a baseline questionnaire. The two patient groups and their healthcare staff were kept separated during the study period; neither were they allowed to discuss the intervention, nor were the healthcare personnel treating the CG aware of the procedures for the PG. The study protocol was approved by the Institutional Review Board/ Chang Gung Memorial Hospital (IRB/ CGMH).

All the patients had spinal stenosis due to degenerative disc disease with or without leg pain and received either open or microscopic lumbar decompression surgery at the affected spinal location. Patients may have undergone other procedures, such as discectomy or lumbar interbody fusion, in combination with decompression depending on the decision taken by the surgeon during the operation.

The rehabilitation intervention for the PG group was aimed to maximize post-operative engagement and participation in physical therapy and home exercise, to improve functional recovery, and to decrease pain in individuals who had undergone LDS. Both patient education preoperatively and the postoperative program focused on goals of rehabilitation during the hospital stay and after discharge. Patient education to reinforce self-management and gradual intensifying of activities appropriately, postural awareness (i.e., advice given on the importance of good posture especially in sitting and ensuring the patient is independent with mobility preoperatively), mobilization strategies (lying to standing through side-lying), core stability exercises (in lying and in functional positions), and muscle strengthening (trunk and extremity muscles) were included. The education was designed to help participants understand their back problems and how to care for their back after surgery. On admission, the physiotherapist informed the patient about the protocol of the rehabilitation intervention during hospital stay in addition to the usual care and its continuance as a home program following discharge from hospital.

As for early postoperative mobilization strategies, the patients were advised to stay active while wearing the lumbar corset and to sit less than 30 minutes at a time for one month after surgery, and they practiced mobility skills including how to move safely in bed or leave bed. Moreover, the physiotherapist mobilized the patients to get out of beds as early as possible and practice the rehabilitative protocol for 30 minutes daily during hospitalization. The rehabilitative protocol included not only deep breathing exercises but also trunk and extremity exercises since maintaining spinal posture and stabilization during activities of daily life was emphasized. The entire protocol was delivered by a researcher (CWC) 30 minutes a day during hospitalization for the PG only. The CG received only instructions concerning post-operative care by the involved neurosurgical team, i.e., the usual care protocol.

## 3. Outcome measures

Other than participant characteristics and surgical records from medical charts, the outcome measures used in this study were the Visual Analogue Scale (VAS), the Global Rate of Change (GROC) scale, the Roland-Morris Disability Questionnaire

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