

EVALUATION OF THE EFFECTIVENESS OF EARLY REHABILITATION IN PATIENTS AFTER LUMBAR MICRODISCECTOMY

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Abstract. Lumbar microdiscectomy is one of the most commonly performed neurosurgical procedures for the treatment of herniated intervertebral discs. Postoperative rehabilitation plays a crucial role in functional recovery, prevention of recurrent pain, and improvement of quality of life. Early initiation of rehabilitation interventions, including physiotherapy, neuromuscular re-education, and gradual physical activity, can significantly shorten recovery time and reduce postoperative complications. This review analyzes the main approaches, timing, and effectiveness of early rehabilitation programs following lumbar microdiscectomy, based on recent clinical and experimental studies.

Keywords: microdiscectomy, lumbar spine, rehabilitation, physiotherapy, early mobilization, neurosurgery, functional recovery.

Introduction. Lumbar disc herniation is one of the leading causes of low back pain and radiculopathy, significantly affecting the working-age population worldwide. Microdiscectomy remains the gold standard surgical intervention, offering minimal tissue damage and rapid postoperative recovery [1]. However, the success of surgery depends not only on the technical precision but also on

postoperative rehabilitation, which ensures functional recovery and minimizes recurrence risk.

Recent research has shown that early mobilization and rehabilitation can accelerate neuromuscular restoration, enhance patient satisfaction, and prevent chronic pain syndromes [2]. The concept of “early rehabilitation” typically involves initiating physical therapy and functional exercises within the first few days after surgery under professional supervision.

Pathophysiological rationale for early rehabilitation. After lumbar microdiscectomy, patients often experience muscle weakness, altered biomechanics, and reduced spinal stability. Immobilization or delayed rehabilitation may lead to muscle atrophy, joint stiffness, and fibrosis around the surgical site. Early rehabilitation aims to restore normal spinal kinematics, strengthen paraspinal muscles, and promote neural recovery [3,8].

Neurophysiological studies have demonstrated that controlled mobilization stimulates proprioceptive feedback mechanisms, which are essential for motor control and postural balance. Moreover, early movement enhances local blood circulation, prevents thrombosis, and supports wound healing.

Rehabilitation protocols after lumbar microdiscectomy. The rehabilitation process is generally divided into three main phases: early, intermediate, and late.

1. Early Phase (0–2 weeks post-surgery):

The primary goal is to minimize pain and inflammation while promoting gentle mobility. Activities include breathing exercises, ankle pumps, gentle leg movements, and isometric contractions of the abdominal and gluteal muscles. Patients are encouraged to sit and walk within 24–48 hours postoperatively, depending on their condition [4].

2. Intermediate Phase (2–6 weeks post-surgery):

This stage focuses on improving flexibility, endurance, and strength of the lumbar and pelvic muscles. Supervised physiotherapy includes stretching, pelvic tilts, and core stabilization exercises. Hydrotherapy and balance training may also be introduced to improve coordination and gait stability.

3. Late Phase (6–12 weeks and beyond):

The objective is to restore full functionality and enable the patient to return to normal daily activities or occupational tasks. Progressive resistance training, proprioceptive neuromuscular facilitation, and ergonomic training are emphasized to prevent reinjury [5,9].

Clinical effectiveness of early rehabilitation. Several clinical trials have demonstrated that early postoperative rehabilitation after lumbar microdiscectomy leads to faster pain reduction and functional improvement compared to delayed programs. A randomized study by Ostelo et al. (2016) reported that patients who began supervised exercise therapy within two weeks of surgery experienced significantly improved lumbar function and earlier return to work [6]. Similarly, postoperative rehabilitation focusing on core stabilization reduced recurrence rates of disc herniation by 25–30% in long-term follow-up studies.

Furthermore, early rehabilitation has been associated with improved psychological outcomes. Patients who participate in structured physical therapy programs exhibit reduced anxiety, depression, and fear-avoidance behavior, which are known to delay recovery.

Modern approaches and technologies in rehabilitation. Recent advances in rehabilitation medicine have introduced new technologies to optimize postoperative recovery. These include robot-assisted training, virtual reality-based exercises, and neuromuscular electrical stimulation (NMES). NMES has proven effective in preventing paraspinal muscle atrophy and enhancing

proprioception. In addition, wearable motion sensors and tele-rehabilitation systems allow remote monitoring and individualized feedback, which are particularly beneficial for patients in rural areas [7,10].

Integrating these technologies with traditional physiotherapy provides a multimodal approach to recovery, ensuring both physical and neurocognitive benefits.

Challenges and future perspectives. Despite the growing evidence supporting early rehabilitation, several challenges remain. Variations in patient adherence, surgical technique, and access to specialized physiotherapy services can affect outcomes. There is also a need for standardized rehabilitation protocols tailored to patient age, comorbidities, and physical demands. Future studies should focus on developing personalized rehabilitation algorithms incorporating biomechanical assessment, AI-based motion analysis, and predictive modeling to optimize functional recovery.

Conclusion

Early rehabilitation following lumbar microdiscectomy is an essential component of postoperative care, contributing to faster recovery, reduced complications, and improved quality of life. Timely initiation of movement and structured exercise therapy restore spinal stability and prevent chronic pain. Integration of modern rehabilitation technologies and individualized approaches will further enhance the effectiveness of recovery programs.

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