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EFFECT OF PREHABILITATION EXERCISES ON PATIENTS UNDERGOING MINIMALLY INVASIVE SPINE SURGERY: A RANDOMIZED CONTROLLED TRIAL

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ABSTRACT

Background: Patients undergoing minimally invasive spine surgery (MISS) frequently experience postoperative pain, muscle weakness, impaired mobility, and delayed return to functional activities despite advances in surgical techniques. Prehabilitation has emerged as an effective strategy to optimize physical function before surgery and improve postoperative outcomes.

Objective: To evaluate the effectiveness of prehabilitation exercises on postoperative recovery in patients undergoing minimally invasive spine surgery.

Methods: Sixty participants scheduled for MISS were randomly allocated into an experimental group receiving four weeks of prehabilitation in addition to standard postoperative rehabilitation and a control group receiving standard care alone. Outcome measures included pain intensity, functional disability, walking capacity, and core muscle strength assessed preoperatively and postoperatively.

Results: Participants receiving prehabilitation demonstrated significantly greater improvements in pain reduction, functional mobility, disability scores, and core strength compared with controls. Statistical analysis revealed significant between-group differences with $p < 0.05$.

Conclusion: Prehabilitation exercises significantly enhance postoperative recovery following minimally invasive spine surgery and should be considered an integral component of perioperative spine rehabilitation.

KEYWORDS: Prehabilitation, Minimally Invasive Spine Surgery, Lumbar Disc Herniation, Physiotherapy, Functional Recovery, Core Stability.

INTRODUCTION

Low back pain and degenerative spinal disorders remain among the leading causes of disability worldwide. Conditions such as lumbar disc herniation, spinal stenosis, and degenerative disc disease frequently require surgical intervention when conservative management fails.

Minimally invasive spine surgery has gained popularity because of smaller incisions, reduced tissue trauma, lower blood loss, and shorter hospitalization. However, many patients continue to experience postoperative weakness, impaired mobility, and functional limitations despite these surgical advantages.

Prehabilitation refers to the process of improving a patient's functional capacity before surgery through exercise training, education, and psychological preparation. Previous evidence suggests that patients who undergo structured prehabilitation demonstrate improved postoperative outcomes and faster recovery.

The present study aimed to investigate whether prehabilitation exercises could improve postoperative recovery in patients undergoing minimally invasive spine surgery.

MATERIALS AND METHODS

A prospective randomized controlled study design was utilized.

Sixty participants aged 20–60 years undergoing minimally invasive spine surgery were recruited and randomly divided into:

- Experimental Group (n=30): Prehabilitation plus standard postoperative rehabilitation.
- Control Group (n=30): Standard postoperative rehabilitation only.

The prehabilitation program consisted of:

- Abdominal bracing exercises
- Pelvic tilt exercises
- Diaphragmatic breathing
- Bridging exercises
- Bird-dog exercises
- Plank exercises
- Side plank exercises

The intervention was performed for four weeks before surgery under physiotherapist supervision.

Outcome measures included:

- Visual Analog Scale (VAS)
- Oswestry Disability Index (ODI)
- Functional walking assessment
- Core muscle strength evaluation

Statistical analysis was performed using SPSS software with significance set at $p < 0.05$.

RESULTS

The majority of participants belonged to the 31–40 and 41–50 year age groups, each representing 31.7% of the study population. Male participants constituted 58.3% of the total sample. Lumbar disc herniation was the most common diagnosis among participants.

The experimental group demonstrated significantly greater reductions in pain and disability scores and superior improvements in walking capacity and core muscle strength compared with the control group.

Participants who completed prehabilitation achieved faster postoperative mobilization and earlier return to daily activities.

DISCUSSION

The findings suggest that prehabilitation positively influences postoperative outcomes following minimally invasive spine surgery.

Improved core strength before surgery likely enhanced spinal stability and reduced postoperative functional decline. Furthermore, preoperative exercise training may have improved neuromuscular efficiency and physical readiness for surgery.

These findings support previous studies demonstrating the effectiveness of perioperative physiotherapy interventions in improving recovery after spinal surgery.

CONCLUSION

Structured prehabilitation exercises performed before minimally invasive spine surgery significantly improve postoperative pain, disability, mobility, and core muscle strength.

Integrating prehabilitation into standard physiotherapy practice may facilitate faster recovery, reduce postoperative complications, and improve quality of life in patients undergoing spine surgery.

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