**Research Paper**

**Review**

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### Review Title: Early Multimodal Rehab Following Lumbar Disc Surgery: RCT Comparing Two Exercise Programs

#### Research Review By Dr. Keshena Malik ©

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#### Study Title:

Early multimodal rehabilitation following lumbar disc surgery: A randomised clinical trial comparing the effects of two exercise programmes on clinical outcome and lumbar multifidus muscle function

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#### Background Information:

Lumbar discectomy is the most common surgical spine procedure, however, its clinical outcomes are poorly defined and the post-operative management outcomes of this patient population has received little research attention (1-3)! Therapeutic exercise is one aspect of post-operative management, thought to improve outcomes following lumbar discectomy. A meta-analysis of randomised trials concluded that exercise programs, 4-6 weeks after lumbar discectomy, improve post-operative pain and disability (4). There is little consistency, however, between exercise protocols (4-6) and the most effective rehabilitation approach is unknown.

Also, the timing of rehabilitation may impact outcomes following lumbar discectomy. Exercise and physical activity are often restricted due to fear of re-injury, re-herniation and instability (7). Eliminating activity avoidance and encouraging exercise immediately following lumbar discectomy may allow for an earlier return to function without increasing rate of re-herniation or other complications (7, 8). Reportedly, however, there is large variability in post-operative activity restrictions and exercise recommendations among physical therapists, rehabilitations clinicians and spine surgeons (5, 6).

Lastly, the restoration of lumbar multifidus (LM) function may be an important determinant of lumbar discectomy clinical outcomes. LM deficits have been reported to be associated with worsened prognosis following lumbar spine surgery, and injury to LM intra-operatively has been associated with ‘failed back surgery syndrome’ (9, 10). As a result, a common rehabilitation protocol for individuals with lumbar spine surgery is aimed at restoring LM function (11-13). Previous randomized trials, however, have not examined the effectiveness of an exercise protocol focusing on LM restoration of function following lumbar discectomy.

The aim of this study, therefore, was to compare clinical and muscle function outcomes of patients randomised to receive early multimodal rehabilitation following single-level lumbar discectomy consisting of exercise targeting specific trunk muscles (including LM) or general trunk exercise, with those in the former group experiencing greater improvement in outcomes.

#### Pertinent Results:

**Participants & Adverse Surgical Events:**

* 105 participants were referred to the study and 61 were recruited (29 randomized to specific exercise (SPEC) group and 32 to the general exercise (GEN) group).
* There were 7 peri-operative adverse events (3 GEN and 4 SPEC) requiring further surgery (none thought to occur because of exercise, and 6 of 7 were able to complete their prescribed exercise protocols).
* 2 subjects in the GEN group experienced re-herniation at the level of surgery; 3 subjects experienced dural tears during surgery (2 SPEC and 1 GEN) – two of these three were repaired during the initial surgery while one became symptomatic within five days post-op.
* 4 SPEC and 2 GEN participants were not measured using ultrasound due to body habitus.

Exercise compliance was 69% in the GEN group and 59% in the SPEC group.

**General (GEN) versus Specific (SPEC) exercise:**

* There were no statistically significant or clinically important between-group differences in pain, disability, global change, sciatica frequency and bothersomeness and LM function at 10 weeks and 6 months.
* There were, however, significant main effects of time indicating improvements from baseline for the same outcomes.

#### Clinical Application & Conclusions:

Based on the results of this study, practicing clinicians can be confident that patients who undergo lumbar discectomy experience improved outcomes with early rehabilitation that is aimed at both general and targeted low back and core exercises. Each patient should, however, still be considered unique in terms of performance capability, potential re-herniation incidence, presentation and intensity of symptoms (ex. impaired muscle function, residual leg pain). These patients may require specific post-op management. Exercise education and supervision should be adopted by the practitioner to limit fear-avoidance and improve clinical outcomes by addressing psychosocial and physical components of recovery.

#### Study Methods:

This was a parallel group, prospective randomized clinical trial following lumbar discectomy. Participants in both groups underwent one pre-operative and three post-operative evaluations performed by an examiner blinded to group assignment. The primary outcome was low back pain-related disability (modified Oswestry Disability Questionnaire). Secondary outcomes included pain intensity (Numeric Pain Rating Scale) (14), Global Rating of Change (15), Sciatica Frequency and Bothersomeness (16), and LM muscle function (real-time ultrasound images of LM thickness percent change from resting to contracted states) (17).

**Study Timeline/Progression:**

1. Pre-operative assessment less than 2 weeks before surgery;
2. first post-operative assessment 2 weeks after surgery;
3. completion of 8-week post-operative rehabilitation program comprised of weekly supervised exercises (by one of three experienced physical therapist – average 12 years in practice) and daily home exercises;
4. second post-operative assessment 10 weeks after surgery; and
5. third post-operative assessment 6 months after surgery.

**Inclusion Criteria:**

* Age 18-60 years
* Pre-surgical radiographic confirmation of lumbar disc herniation (MRI or CT)
* Scheduled to undergo single-level lumbar discectomy

**Exclusion Criteria**

* Prior lumbar spine surgery
* Surgery at more than one level
* Surgical procedure other than discectomy (ex. fusion)
* Peri-operative complications resulting in a contraindication to exercise

**Interventions:**
During the first 2-3 weeks of the exercise program, participants receiving the specific exercise protocol (SPEC) performed exercises not included in the general trunk exercise protocol (GEN). To minimize any potential attention effect, the GEN group performed additional range of motion exercises to equalize the total treatment time between the two groups. Each group also received an educational pamphlet on the importance of weight management, smoking cessation and stress management.

General Trunk Exercise Protocol (GEN) – 3 components

1. Aerobic exercise (walking initially 20 mins/day progressing to a goal of 60 mins/day);
2. range of motion exercise ‘warm-up’ (20 repetitions each of: supine pelvic tilts and quadruped rocking into lumbar flexion-extension);
3. strengthening exercise (initial prescription: 5 repetitions of 5 seconds quadruped single leg lift and side-lying horizontal side support progressing from knees bent to knees extended (side plank); 10 repetitions of 5 seconds quadruped contralateral arm and leg lift and supine bridge with leg lift; 10 repetitions of 10 seconds supine (glute) bridge; 20 repetitions of 10 seconds supine abdominal curl-up with the goal of progressing to almost double the repetitions and hold for each exercise)

Specific Exercise Protocol (SPEC):
This was conducted as the same protocol as the GEN group, with the addition of the following (confirmed by a physical therapist and/or ultrasound imaging):

1. Volitional LM contraction;
2. abdominal drawing-in manoeuvre; and
3. transversus abdominis-LM co-contraction.

#### Study Strengths / Weaknesses:

**Strengths:**

* This study provides justification for which exercises to recommend early in the course of recovery of lumbar discectomy patients to promote positive outcomes.
* The authors assessed both clinical outcomes (subjective) and muscle morphology (objective) changes.
* Bias was minimized by having assessor blinded to group assignment and by maintaining the same total treatment time in each group (thus equalizing the attention effect).

**Weaknesses:**

* There was no control group, therefore we are unable to definitively conclude the effectiveness of the individual treatment protocols compared to natural history, or no intervention.
* The authors highlighted the importance of psychosocial components, however, did not evaluate this directly (i.e. no specific psychological outcome measures were utilized).
* A large number of participants was lost to follow-up (especially at 6 months), therefore caution must be exercised when interpreting the results.
* 6 month follow-up does not provide insight into longitudinal effects.
* Alternative methods (such as MRI or EMG) could be used rather than ultrasound for evaluating LM function in future studies.
* Further work is required to clarify the dosage and frequency of exercises.

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