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Cognitive-Behavioral–Based Physical Therapy for Patients With Chronic Pain Undergoing Lumbar Spine Surgery: A Randomized Controlled Trial

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Abstract: The purpose of this study was to determine the efficacy of a cognitive-behavioral–based physical therapy (CBPT) program for improving outcomes in patients after lumbar spine surgery. A randomized controlled trial was conducted on 86 adults undergoing a laminectomy with or without arthrodesis for a lumbar degenerative condition. Patients were screened preoperatively for high fear of movement using the Tampa Scale for Kinesiophobia. Randomization to either CBPT or an education program occurred at 6 weeks after surgery. Assessments were completed pretreatment, posttreatment and at 3-month follow-up. The primary outcomes were pain and disability measured by the Brief Pain Inventory and Oswestry Disability Index. Secondary outcomes included general health (SF-12) and performance-based tests (5-Chair Stand, Timed Up and Go, 10-Meter Walk). Multivariable linear regression analyses found that CBPT participants had significantly greater decreases in pain and disability and increases in general health and physical performance compared with the education group at the 3-month follow-up. Results suggest a targeted CBPT program may result in significant and clinically meaningful improvement in postoperative outcomes. CBPT has the potential to be an evidence-based program that clinicians can recommend for patients at risk for poor recovery after spine surgery.

***Perspective:** This study investigated a targeted cognitive-behavioral–based physical therapy program for patients after lumbar spine surgery. Findings lend support to the hypothesis that incorporating cognitive-behavioral strategies into postoperative physical therapy may address psychosocial risk factors and improve pain, disability, general health, and physical performance outcomes.*

***Key words:** Lumbar degenerative disease, cognitive-behavioral therapy, randomized controlled trial, postoperative rehabilitation, lumbar spinal fusion.*

Degenerative lumbar conditions, such as spinal stenosis, lead to chronic pain, physical impairment, and reduced quality of life.[2] The prevalence in the general population ranges from 20 to 25% and increases to above 45% in individuals greater than 60 years of age.[31,34,35] Lumbar spinal stenosis is one of the most common diagnoses associated with spine surgery.[2,18,72] The surgical technique for lumbar

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degenerative conditions is well established and studies have reported on the benefits of surgery compared with nonoperative management.[24,39] The Spine Patient Outcomes Research Trial (SPORT), using as-treated analysis, found that surgery for lumbar stenosis had a significant advantage over nonoperative treatment at 2 and 4 years after surgery.[84] However, as-treated SPORT findings demonstrated that the advantage of surgery was no longer significant after 5 years.[45]

The estimated percentage of people over 60 years of age is expected to increase steadily toward 2050.[77] An increased number of people will experience age-associated degenerative conditions and chronic pain; spine surgery rates will continue to increase.[4] Despite surgical advances, adults who have undergone lumbar spine surgery continue to have poorer physical and mental health outcomes compared with the general population.[50,83] Studies have found persistent pain, functional disability, and poor quality of life in up to 40% of individuals after spine surgery for lumbar degenerative conditions.[9,32,48,84] The reoperation rate has been reported to range from 18 to 23% at 8 to 10 years after surgery.[45]

Archer et al.[5,6,8] and others have found that fear of movement, avoidance coping, positive affect, and depression are independently associated with persistent pain and disability and decreased physical function after lumbar spine surgery.[17,29,47,69] Despite the literature recommending a biopsychosocial approach to postoperative care,[52,88] physical therapy programs after spine surgery continue to focus on trunk and lower extremity strengthening, flexibility, range of motion, and education on posture and proper body mechanics. Randomized trials to date have found no significant difference between traditional physical therapy and either no treatment, an educational booklet, or advice to keep active.[1,46,51,52] These results suggest that an alternative approach to postoperative rehabilitation may be needed to address the psychosocial factors often associated with poor spinal surgery outcomes.

The purpose of this study was to incorporate cognitive-behavioral strategies into physical therapy to improve outcomes in patients with chronic pain undergoing lumbar spine surgery. Individuals with high fear of movement were targeted in order to focus on adults at risk for poor postoperative recovery.[8,17,29,47] The Changing Behavior through Physical Therapy (CBPT) program was designed to decrease fear of movement and increase self-efficacy[7] and be delivered by physical therapists. Because clinic-based rehabilitation can be impractical for many older adults, a telephone-delivery model was used to allow individuals with financial, geographic, and mobility constraints to participate in the study. We hypothesized that CBPT participants would have greater improvement in patient-reported pain, disability, and general health and performance-based tests compared with education participants at 6 months after lumbar spine surgery for degenerative conditions.

Methods

Trial Design

This study was a randomized controlled trial. Participants were recruited from a single academic medical center and randomized to either CBPT or an education program during a routine postoperative clinic visit at 6 weeks after surgery. At this visit, all participants also received standard care, which may include having lifting and/or driving restrictions removed and referral to traditional physical therapy. The education program was chosen as a comparison to control for the time and attention of the therapist and for normal healing that occurs from 6 weeks to 3 months after surgery.

The investigators, participating surgeons, research personnel conducting the assessments, and patients were blinded to group assignment. Participants were informed that they would be randomly assigned to 1 of 2 different educational treatments and were asked not to discuss study procedures with their treating surgeon, medical staff, and research personnel. The study physical therapist was blinded to the aims and hypotheses of the study.

The overall study design included a clinic screening visit, preoperative assessment, pretreatment assessment (6 weeks after surgery), treatment phase, posttreatment assessment (3 months after surgery), and 3-month follow-up assessment (6 months after surgery) (see ClinicalTrials.gov and NCT01131611). The Institutional Review Board at the participating site approved the study and all patients provided informed consent before study enrollment and data collection.

Sample Size and Power

The number of study participants was based on a sample size calculation for a comparison of treatment groups on change in the outcomes of pain intensity and interference measured by the Brief Pain Inventory (BPI), disability measured by the Oswestry Disability Index (ODI), and general health measured by the 12-Item Short-Form Health Survey. Power was estimated by generating simulated data from available pilot data, then using the simulated data to estimate the original model parameters. A sample size of 80 was chosen to be able to detect minimum clinically important differences (MCID) in pain intensity of 1.2 to 2.0 points, pain interference of 1.6 to 2.2 points, disability of 10 to 12.8 points, and general health of 4.9 to 6.2 points during the postoperative period, with an 80% power while controlling type I error rate at 5%. These MCIDs were based on studies conducted in patients following lumbar spine surgery.

Participants

Participants for this study were recruited from 499 individuals, between March 2012 and April 2013, undergoing a laminectomy with or without arthrodesis for a lumbar degenerative condition (spinal stenosis, spondylosis with or without myelopathy, and degenerative spondylolisthesis). The following inclusion criteria were