Systematic Literature Review of Spinal Decompression Via Motorized Traction for Chronic Discogenic Low Back Pain

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Abstract

Objective: The objective of this study was to systematically review the literature to assess the efficacy of nonsurgical spinal decompression achieved with motorized traction for chronic discogenic lumbosacral back pain.

Design: Computer-aided systematic literature search of MEDLINE and the Cochrane collaboration for prospective clinical trials on adults with low back pain in the English literature from 1975 to October 2005. Methodologic quality for each study was assessed. Studies were included if the intervention group received motorized spinal decompression and the comparison group received sham or another type of nonsurgical treatment.

Results: Data from 10 studies were fully analyzed. Seven studies were randomized controlled trials using various apparatus types. Because of this low number, we also analyzed three nonrandomized case series studies of spinal decompression systems. As the overall quality of studies was low and the patient groups heterogeneous, a meta-analysis was not appropriate and a qualitative review was undertaken. Sample sizes averaged 121 patients (range 27–292), with six of the seven randomized studies reporting no difference with motorized spinal decompression and one study reporting reduced pain but not disability. The three unrandomized studies (no control group) of motorized spinal decompression found a 77% to 86% reduction in pain.

Conclusions: These data suggest that the efficacy of spinal decompression achieved with motorized traction for chronic discogenic low back pain remains unproved. This may be, in part, due to heterogeneous patient groups and the difficulties involved in properly blinding patients to the mechanical pulling mechanism. Scientifically more rigorous studies with better randomization, control groups, and standardized outcome measures are needed to overcome the limitations of past studies.

INTRODUCTION

Chronic low back pain (defined as lasting longer than 12 weeks) is an expensive benign condition in industrialized countries. The main mechanical causes are either injury to
lumbosacral muscles and ligaments, or discogenic disorders related to trauma or degenerative disc disease. Treatments vary widely, and should be individualized to the patient.

If noninvasive modalities are preferred, then oral analgesics, muscle relaxants, physical therapy, exercises, acupuncture, manipulation, or back school are options. More invasive therapies include epidural injections, percutaneous intradiscal radiofrequency thermocoagulation, and surgical spinal decompression via removal of disc fragments and/or fusion when there is evidence of spinal column instability.

Another treatment alternative is traction. Data supporting the use of traction to widen the intervertebral space or reduce disc protrusion exist in the literature. Traction also may improve motor evoked potentials in lumbosacral radiculopathy and reduce intradiscal pressure. Using the straight-leg raise test as the endpoint, static traction with 30% or 60% of body weight (but not 10% of body weight) improved leg mobility in patients with low back pain and radicular symptoms.

The spinal decompression force can be delivered manually by the therapist, via gravity (the weight of the patient) through a suspension device, or by the patient while lying on a specially designed table, the pelvis secured, pulling the bars at the head of the table. These types of traction can be difficult to standardize because of the patient’s or therapist’s fatigue or intolerance to the force or position. Additionally, difficulties in the development of standards for traction application strategies may be influenced by the different ways in which patients are diagnosed, grouped, and managed. Perhaps for this reason, efficacy for traction was not found in previous systematic reviews regarding the treatments for chronic low back pain and/or neck pain.

For traditional traction, the pull force (delivered manually or with gravity) is linear and may elicit the body’s proprioceptive response that triggers paravertebral muscle contraction, which could reduce the distractive effect. In contrast, a motor pulley can be designed to deliver mechanized segmental distraction that can be delivered in a static or oscillatory fashion for a preselected timeframe. This approach could be applied, for example, 2–3 times per week, 30 min per session, and with weights ranging from 30 to 85 kg. The DRX9000 (Axiom Worldwide, Tampa, FL, USA) and the vertebral axial decompression (VAX-D) (VAX-D Medical Technologies, Oldsmar, FL, USA) are mechanical apparatus types that offer this type of nonsurgical spinal decompression. The DRX 9000 system, for example, has built-in air bladders, disc angle pull adjustments, harnesses, and the ability to increase the distraction force more slowly in the latter part of the decompression.

Unlike previous systematic reviews, which looked at a variety of different traction methods, we focused on mechanized apparatus types. The objective of this study was to systematically review the literature to assess the efficacy of nonsurgical spinal decompression achieved with motorized traction for chronic discogenic low back pain.

METHODS
Systematic reviews apply strategies that limit bias to the assembly, appraisal, and synthesis of relevant studies on a specific topic.\textsuperscript{24,25} We followed published guidelines\textsuperscript{26,27} to identify prospective clinical trials in the international, peer-reviewed, published literature regarding adults with lumbosacral back pain lasting more than 12 weeks.

We used electronic searches of the National Library of Medicine’s MEDLINE database, the Cochrane Central Register of Controlled Trials, and the Cochrane Database of Systematic Reviews for articles from 1975 to October 2005. Studies prior to 1975 were excluded, as healthcare standards and practice from more than 30 years ago may not be applicable in today’s practice environment. In addition, non-English articles were excluded.\textsuperscript{28,29}

“Low back pain, mechanized or motorized traction, non-surgical spinal decompression, discogenic pain, clinical trial, DRX 9000, and VAX-D” were entered separately as medical subject headings and as text words. No minimum sample sizes were invoked for inclusion of studies, while only studies on adults (ages >18 years) were included. The last literature search was completed on November 15, 2005.

Studies were included if the intervention group received motorized traction as the main treatment and the comparison group received sham or another type of nonsurgical treatment. Thirty articles were initially screened, but 15 were disqualified for a variety of reasons, including studies of other types of traction (n = 8), non-English articles (n = 2), studies on patients with back pain due to infection or neoplasm (n = 2), and reports available only as a published abstract or case reports (n = 3). We excluded trials that investigated patients using force generated by pulling with the arms\textsuperscript{30,31} (not via a mechanized apparatus), without a sham control group,\textsuperscript{32} or cervical motorized traction.\textsuperscript{33}

Two reviewers independently conducted data extraction from the 10 fully analyzed studies. Each investigator read each article and completed a data sheet. Differences between the two reviewers were resolved by reexamination of the original article until consensus was attained about the study’s data. A third investigator was available, but not necessary to help achieve consensus.

The following study characteristics were recorded: the first author’s name, the year of publication, the country in which the study was conducted, the method of patient enrollment (prospective, retrospective, and whether patients were randomized), and the number of patients. Primary endpoints were categorized depending on how they were described in each study analyzed.

Methodologic quality for each study was assessed using the Jadad scale based on randomization procedures, blinding of the patients and the investigator, and the description of withdrawals.\textsuperscript{34} We determined whether or not each study reported a statistically significant result in favor of motorized traction.

**RESULTS**

Data from 10 studies were fully analyzed. Seven studies were randomized controlled trials of motorized traction using various apparatus types, including split tabletop, plain tabletop, and
friction-free couch with weights. Only three of the seven randomized controlled studies provided a description of the randomization procedure. None of the studies had blinded outcome assessments.

Because the overall quality of studies was low and the patient groups were heterogeneous (eg, symptom duration and diagnoses), a meta-analysis was not appropriate and a qualitative review was undertaken.

The seven randomized controlled studies had a total of 408 patients receiving placebo and 438 patients receiving motorized spinal decompression (Table 1). Sample sizes averaged 121 patients (range 27–292) per study. Follow-up averaged 28 weeks (range 6–64 weeks). Six of the seven randomized studies reported no difference with motorized spinal decompression, and one study reported reduced pain but not disability.