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Research Article

Non-surgical Spinal Decompression an Effective Physiotherapy Modality for Neck and Back Pain

Abstract

Background: Non-surgical spinal decompression is a novel physiotherapy that improves on conventional traction by adding computer technology and it is commonly used along with other physiotherapy modalities. Indications include bulging or herniated discs, degenerative disc disease, facet syndrome, sciatica, neck pain and lower back pain.

The purpose of this practice-based observational study was to investigate the effectiveness of decompression for patients with radiculopathy or chronic spinal pain that failed to improve with conventional treatments. Patients were treated with 6 to 8 weeks of non-surgical spinal decompression therapy, including low-level laser therapy, superficial cold, home exercise and spinal manipulation if indicated. Starting and ending pain levels on a numerical pain scale were compared using a paired t-test to determine statistical significance.

Main findings: A sample of 41 cervical spine cases and 168 lumbar spine cases was analyzed. Ending pain scores for cervical spine cases (mean = 1.8, standard deviation = 1.8) were significantly less compared to the starting pain scores (mean = 6.0, standard deviation = 2.3), with a mean pain reduction of 4.2 ($p < 0.0001$). The average number of treatments was 13. Ending pain scores for lumbar spine cases (mean = 2.3, standard deviation = 2.6) were significantly less compared to the starting pain scores (mean = 6.6, standard deviation = 2.4), with a mean pain reduction of 4.3 ($p < 0.0001$) after an average of 15 visits.

Conclusion: Non-surgical spinal decompression brought statistically significant improvements in cervical and lumbar pain. Associated paresthesia and weakness also frequently improved. Further investigation of non-surgical spinal decompression, including long-term follow up and comparison to surgical decompression is encouraged.

Abbreviations

NSD: Non-surgical spinal decompression; LLLT: Low-level laser therapy; RCT: Randomized Controlled Trial

Introduction

Non-surgical spinal decompression (NSD) is a novel physiotherapy that is an improvement on older traction modalities by adding computer technology. Computerized distraction with alternate high and low tensions, an actuator, fixed tower and variable angle repetitively unloads the spinal discs and facets at a specific segmental level without eliciting muscular contraction. NSD has been shown to lower intradiscal pressure [1]. An increase in disc height following decompression has also been noted with improvement in discogenic pain [2]. Indications include bulging or herniated discs, degenerative disc disease, facet syndrome, sciatica, neck pain and lower back pain. NSD is commonly used along with other physiotherapy modalities. Shealy recommended decompression in conjunction with heat, ice, TENS, and myofascial release [3]. NSD has been taught in chiropractic postgraduate education department at Parker University since 2012, used with other modalities for discogenic neck or back pain [4]. Henry described NSD in case report and proposed multimodal treatment approach for lumbar disc herniation in conjunction with spinal manipulation, therapeutic exercise and low-level laser therapy (LLLT) [5].

Choi et al. compared NSD with traction for chronic pain associated with lumbar disc herniation, finding both effective, with statistically significant improvements in pain (measured

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by visual analog scale), disability (measured by Oswestry) and straight leg raise (measured by goniometer) [6].

Kang et al. compared NSD and exercise with conventional traction and exercise in a randomized controlled trial, finding NSD more effective, with a significant reduction in disc herniation compared to control [7].

Demirel and colleagues used NSD with electrotherapy, deep friction massage and stabilization exercise to treat lumbar disc herniation in a double-blinded randomized controlled trial. Compared to a control group receiving the other modalities without NSD, there was a greater reduction in herniation size with no other significant difference between the groups. The authors suggested NSD as an adjunct to other therapies for lumbar disc herniations [8].

The purpose of the present practice-based observational study was to investigate the effectiveness of decompression for patients with radiculopathy or chronic spinal pain. This study differs from previous studies in that NSD and low-level laser therapy were used on a subset of patients that failed to improve with conventional treatments (i.e. medication, chiropractic, physical therapy, and injections).

It is important to investigate NSD as a non-drug and non-surgical physiotherapy approach because 1) chronic neck and back pain are leading causes of disability, 2) there is an opioid pain medication epidemic in the United States, 3) many patients wish to avoid the risks of surgery or are not good candidates for surgical intervention, and 4) NSD may offer cost savings compared to surgery.

Materials and Methods

Non-surgical spinal decompression was used to treat patients over a 5-year period at a private chiropractic practice. Patients were treated using FDA cleared medical devices (Disc Force™ and / or Accu-Spina® with IDD Therapy® by North American Medical Corporation and ML830 laser®). There was no "off-label" device use. Treatment recommendations were for 20 visits over 6 to 8 weeks in accordance with the manufacturer's protocols. Time frame for patient selection was February 2012 through May, 2017. Inclusion criteria for patients was as follows: bulging, herniated or degenerative discs with radiculopathy, sciatica, and chronic neck or back pain that had failed to improve with previous care. Some patients had been previously treated by the author using chiropractic manipulation, hot or cold packs, electrical stimulation, traction, and therapeutic exercise. Previous care from other providers typically included non-surgical methods (medication, chiropractic, physical therapy, and epidural steroid injections or facet injections). Two percent of patients had prior spine surgery without hardware. Exclusion criteria was as follows: prior spine surgery with hardware, acute fracture, instability, metastasis, infection, spondylolisthesis greater than grade 2, severe osteoporosis, and symptoms of cauda equina syndrome. The 209 participants were 103 males and 106 females, with an average age of 55 years. Patients' written consent was obtained using 1) Authorization for Exam, X-rays, Treatment and Release of Information and 2) Acknowledgment of Receipt of Notice of Privacy Practices, in accordance with HIPAA Privacy Policy and Procedure. The Notice of Privacy Practices stated, "Research/Teaching/Training: We may use your information for the purpose of research, teaching, and training". No personally identifiable protected health information was included in this study.

Decompression was followed by superficial cold and low-level laser therapy (LLLT). LLLT at 830 nm and 90 mW was applied to the involved levels of the spine and associated myofascial trigger points. Most patients also received chiropractic manipulation (unless there was no palpable spinal joint fixation or asymmetry or if the patient preferred no manual treatments). Home exercises to improve flexibility and strength were recommended. For cervical spine cases the exercises consisted of neck stretches, neck isometrics, and axial retraction (chin tuck). For lumbar spine cases, exercises included knee to chest, pelvic tilt, bridge, crunch, prone extension, prone leg raise, side leg raise, quadruped leg raise, and cat / camel. Patients were instructed to do 5 repetitions on each exercise once per day as tolerated.

Patients rated their pain on a standard 10-point numerical pain scale (NPS), with 10 being the worst pain imaginable. Starting and ending pain levels were recorded each visit. The starting pain at the beginning of the treatment plan was compared with the ending pain at the conclusion of the treatment regimen. In the event that the patient discontinued treatment prematurely, the ending pain at the date of the last visit was used. Starting NPS scores were compared to ending NPS scores using the paired t-test (Apache OpenOffice™ Calc). A statistically significant difference was considered to be present if the two-tailed p-value was less than or equal to an alpha level of 0.05.

Results

Forty-one cervical spine cases and 168 lumbar spine cases were analyzed. A majority (95% of cervical cases and 96% of lumbar cases) had improvement. Two cervical cases and three lumbar cases had no change in pain. Zero cervical cases and four lumbar cases had a higher ending pain. Temporary soreness was common following lumbar decompression, which was generally relieved by the subsequent application of cold and LLLT. There were no serious adverse effects.

Average ending pain for cervical spine cases was 1.8, standard deviation (SD) = 1.8, which was significantly less (statistically speaking) compared to the average starting pain score of 6.0 (SD = 2.3), with a mean pain score reduction of 4.2 ($p < 0.0001$; Table 1)[Figure 1]. The average number of treatments was 13.

Average ending pain for lumbar spine cases was 2.3, SD = 2.6, which was significantly less (statistically speaking) compared to the average starting pain level of 6.6, SD = 2.4, with a mean pain reduction of 4.3 ($p < 0.0001$; Table 2)[Figure 2] after an average of 15 visits.

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Table 1: Cervical Spine Statistics. A sample of 41 cervical cases treated with non-surgical spinal decompression had an average pain reduction of 4.2 points on a 10-point numerical pain scale following a mean of 13 visits. The pre-post pain reduction statistically significant (p<0.0001).

Variable	Obs	Mean	Std Dev
Starting Pain	41	6.0	2.3
Ending Pain	41	1.8	1.8

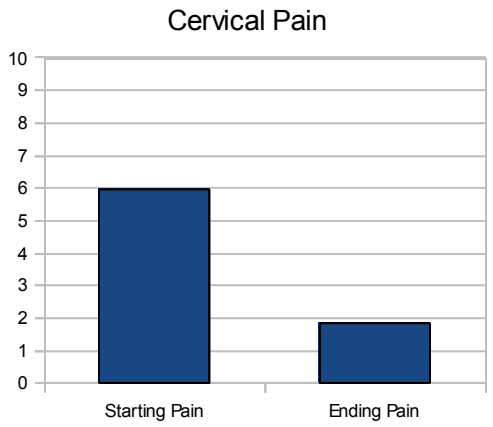

Figure 1: Cervical Pain Before and After Non-surgical Spinal Decompression.

Table 2: Lumbar Spine Statistics. A sample of 168 lumbar cases treated with non-surgical spinal decompression (mean 15 visits) had statistically significant improvement (p<0.0001), with an average pain reduction of 4.3 points on a 10-point numerical pain scale.

Variable	Obs	Mean	Std Dev
Starting Pain	168	6.6	2.4
Ending Pain	168	2.3	2.6

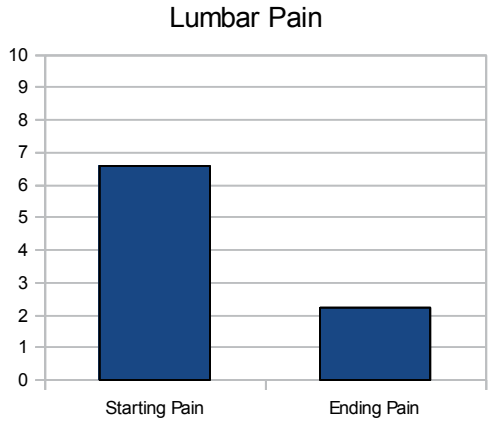

Figure 2: Lumbar Pain Before and After Non-surgical Spinal Decompression.

Discussion

NSD is presently considered investigational (and therefore not covered) under Medicare and most health insurances due to insufficient evidence. This coverage determination is in spite of the fact that NSD devices are FDA cleared. The 2017 American College of Physicians Guidelines found that evidence was insufficient to determine the effectiveness of traction for acute, subacute and chronic low back pain [9]. Conversely, the 2017 National clinical guidelines in the European Spine Journal recommended traction for cervical radiculopathy [10]. Criticism of NSD focused on cost and lack of comparison studies with established conservative treatments, such as manipulation, exercise and standard medical care [11].

In a single-blinded randomized controlled trial Schimmel et al compared two groups of back pain sufferers, both of which were treated with standard graded activity, with one group receiving IDD Therapy® and the other a sham using a negligible amount of distractive force. The authors concluded that NSD was of no additional benefit after finding no significant difference between the two groups [12]. Werners et al performed a RCT that compared interferential to mechanical traction and massage. Both groups experienced progressive back pain relief and improvement in Oswestry scores but there was no significant difference between the groups [13]. Fritz and colleagues suggested that there may be a subset of back pain sufferers who are likely to benefit from traction [14].

In the present study, NSD along with LLLT was associated with pain score improvements that were statistically significant despite these patients having failed with prior interventions. Associated paresthesia also improved and in many cases there was concomitant objective improvement in upper or lower extremity motor upon physical examination. While there was no control group per se, the author would argue that it is difficult to provide a convincing sham treatment for a physical intervention. Moreover, in a sense, the patients acted as their own "controls" when their pre and post intervention scores were compared.

Conclusion

Patients in this observational study experienced relief from their neck and back pain following non-surgical spinal decompression used with other modalities. Further investigation of non-surgical spinal decompression, including before and after MRI (which was not possible in the present study due to cost), long-term follow up, and comparison to surgical decompression is encouraged.

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