

PUBLICATIONS ON COX® TECHNIC and CHIROPRACTIC CARE OUTCOMES
by Cox and Colleagues
as of 6/24/14

(This list is not inclusive of all articles ever published. It is a close attempt.)

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Peer Reviewed Journals

1. Cox JM: Pedicogenic stenosis: its manipulative implications. *Journal of Manipulative and Physiological Therapeutics* (March 1979)
2. Cox JM, Fromelt KA, Shreiner S: Chiropractic statistical survey of 100 consecutive low back pain patients. *Journal of Manipulative and Physiological Therapeutics* 6(3): 117-128 (September 1983)
One hundred consecutive patients with low back and/or lower extremity pain had the clinical data, including history, diagnosis, treatment and results of conservative manipulative therapy, collected and tabulated on an IBM 370/138 computer at Indiana-Purdue University in Fort Wayne, Indiana, utilizing the Statistical Package for the Social Sciences (SPSS) based on a standardized examination form. Various congenital, developmental and ergonomic factors in low back pain patients were collected and correlated for combinations of factors leading to back pain. Treatment methods and response to treatment as to time and patient visit numbers were determined. The frequency of congenital anomalies was found and those effecting or not effecting low back pain onset determined. Overall, 50% relief of low back and leg pain was obtained in 15.95 days and 10.8 visits average; maximum relief was found in 41.2 days, or 16.1 treatments.
3. Cox JM, Shreiner S: Chiropractic manipulation in low back pain and sciatica: statistical data on the diagnosis, treatment, and response of 576 consecutive cases. *Journal of Manipulative and Physiological Therapeutics* 7(1): 1-11 (March 1984)
A chiropractic multi-center observational pilot study to compile statistics on the examination procedures, diagnosis, types of treatment rendered, results of treatment, number of day of care, and number of treatment required to arrive at a

50% and a maximum clinical improvement was collected on 576 patients with low back and/or leg pain. The purpose was to determine the congenital and developmental changes in patients with low back and/or leg pain, the combinations of such anomalies, the accuracy of orthodox diagnostic tests in assessing low back pain, ergonomic factors affecting onset, and, ultimately, the specific difficulty factors encountered in treating the various conditions seen in the average chiropractor's office. For all conditions treated, the average number of day to attain maximum improvement was 43 and the number of visits was 19. It was concluded that this study provided useful data for assessment of routine chiropractic office based diagnosis and treatment of related conditions; however, further controlled studies are necessary for validation of specific parameters.

4. Cox JM: Lumbosacral disc protrusion: a case report. *Journal of Manipulative and Physiological Therapeutics* 8(4): 261-266 (December 1985)
A negative myelogram but a positive CT for an L5 disc protrusion is presented. Five months of medical care preceded chiropractic care; the insurance company involvement in a case where treatment mode is changed from usual orthodox medical procedures of epidural steroid injection and physical therapy to chiropractic distraction manipulation is detailed. Finally, the clinical outcome of the case is provided.
At the end of 6 weeks of care the patient returned to his full work duties as a truck driver. His range of motion of the thoracolumbar spine were full and normal and his straight leg raises were positive right at 70 degrees and left at 60 degrees. He had taut hamstring muscle that required constant stretching so as to not mimic a positive straight leg raise sign. This case shows that time off work and cost were both reduced by chiropractic care.
5. Aspegren DC, Cox JM, Trier KK: Short leg correction: a clinical trial of radiographic vs. non-radiographic procedures. *Journal of Manipulative and Physiological Therapeutics* 10(5): 232-237 (October 1987)
6. Cox JM, Aspegren DD: A hypothesis introducing a new calculation for discal reduction: emphasis on stenotic factors and manipulative treatment. *J of Manipulative And Physiological Therapeutics* 1987; 10(6):287-294
A literature review of the incidence and effects of manipulation on intervertebral disc protrusion is given. A case presented has a 14% reduction of the disc bulge following manipulative care with complete relief of sciatic and low back pain. A system to evaluate the size of disc herniation in computed tomography scans performed before and after manipulative treatment of disc protrusions is offered. Stenosis, with the critical compounded factors of vertebral canal size, dural sac cross-sectional area and soft tissue stenosis in protrusion of the ligamentum flavum and disc, as well as degenerative facet joint changes, is discussed to illustrate the complexity surrounding nerve root compression etiology. Understanding this integration of causative factors can help to explain low back

symptoms and outline effective treatment plans.

7. Cox JM, Trier KK: Exercise and Smoking habits in patients with and without low back and leg pain. *Journal of Manipulative and Physiological Therapeutics* 10(5)239-45
 The exercise and smoking habits of low back or leg pain sufferers vs persons not having low back or leg pain are compared. The type, frequency and length of exercise is determined from a study of 576 low back or leg pain sufferers compared to 50 persons who state they are symptomatic. The same was done for smoking habits. Thirty-three percent of low back or leg pain sufferers smoked as compared to 14% of those without pain. Forth-seven percent of low back or leg pain sufferers as compared to 86% of non-sufferers exercised regularly.
 The level of physical activity and general exercise has been found to improve strength, mobility and endurance; this might prevent future back injury. This study is to determine difference in the exercise habits of persons with low back and/or leg pain vs. those who do not have pain, with the intention being to see if pain sufferers exercise less.
8. Cox JM, Aspegren DC: Degenerative spondylolisthesis of C7 and L4 in same patient. *Journal of Manipulative and Physiological Therapeutics* 1988;11(3):195-205
 The incidence of a C7 spondylolisthesis has never been reported, and this paper shows the presence of C7 and L4 degenerative spondylolisthesis in a 66-yr-old female; no report of this combined problem has been reported. The clinical findings of the patient are given as well as treatment protocol.
 In clinical practice, the finding of degenerative spondylolisthesis should be understood as being best handled conservatively, as it rarely causes neurological deficit nor requires surgery.
9. Cox JM: Letter to the editor in answer to a paper published in *Physical Therapy* (February 1988, 68(2): 199-207) entitled *Physical Therapy Care For Low Back Pain*. *Physical Therapy* 68(10):1591-1592 (October '88)
10. Cox JM, Trier K: Chiropractic adjustment results correlated with spondylolisthesis instability. *Journal of Manipulative and Physiological Therapeutics* 1991;6:67-72
 Ten true spondylolisthesis patients, nine with the lesion at L5 and one at L3, were tested by vertical suspension radiography compared to neutral lateral weight-bearing x-ray to determine translational segmental instability. Cases were classed as unstable (high instability) if over 3 mm of translation of the spondylolisthetic segment occurred and as stable (low instability) if less than 3 mm of motion was seen. Chiropractic distraction adjustment was applied in each case, and the response to care was evaluated by subjective rating of pain relief. Results found that all five patients with stable spondylolisthesis cases obtained 75% or greater relief from chiropractic adjustment of the type used by the author, whereas one with the unstable variety experienced over 75% relief while the other four had less

than 50% relief of pain. As defined in this paper, stable true spondylolisthesis seems to respond better than the unstable variety.

11. Cox JM, Aspegren DC, Trier K: Facet tropisms comparison of plain film and computed tomography examinations. *Journal of Manipulative and Physiological Therapeutics* 1991;14(6):355-360 (July-August 1991)
This study compares the findings of plain film x-ray and computed CT examination in the diagnosis of facet orientation and the presence of tropism. Twenty consecutive patients having lumbar disc disease with sciatica were studied using plain x-ray as well as CT scanning. A chiropractic radiologist read the films to determine if facet facings were sagittally, semi-sagittally, or coronally oriented on both CT and plain x-ray study. CT was accepted as the most accurate method to determine the true facet orientation, and plain x-ray interpretation of facet orientation was compared to the CT reading. There was a statistically significant relationship in diagnosing tropism between plain film x-ray and CT readings, with a predictive accuracy that ranged from 58-84% across the three segmental levels. However, the exact concordance of plain film x-ray and CT readings for right and left facet facings was very low. This raises the question of how the profession defines diagnostic accuracy.
12. Cox JM, Feller, J: Chiropractic treatment of low back pain: a multi-center descriptive analysis of presentation and outcome in 424 consecutive cases. *Journal of Neuromusculoskeletal Systems* 1994; 2(4):178-190
Demographic, clinical and radiographic findings were collected for 424 consecutive low back and/or leg pain patients receiving chiropractic treatment at seven participating centers. A standardized, 293-variable history and examination form was collected for each patient and they were classified into one or more of 15 clinical categories. Outcome measures included the response by days and treatments to attain maximum relief. For the entire patient populations, the average number of days to maximal improvement was 27, with a mean of 11 treatments having been administered over this time. Eight percent of this group of patients reported good to excellent relief of pain.
Among individual categories, patients with an L5 transitional segment had the best response (95% good to excellent outcome, while L4-L5 nuclear prolapse/free fragment patients had the worst response rates (57% good to excellent). Patients with nuclear protrusion required a longer treatment period and more visits than those with spondylolisthesis, facet syndrome, or spondyloarthritis.
These results are discussed in terms of other reports of nonsurgical care as well as the natural history of low back pain. These data may be expected to aid in the design of future randomized controlled studies into the efficacy of chiropractic manipulation.
13. Cox JM, Hazen LJ, Mungovan M: Distraction manipulation reduction of an L5-S1 disc herniation. *Journal of Manipulative and Physiological Therapeutics* 1993;

16(5):342-346

A computed tomography (CT)-confirmed L5-S1 disk protrusion is reported to be reduced following chiropractic adjustment, as seen on repeat CT scanning. Distraction type chiropractic manipulation, electrical stimulation, exercises, nutrition advice and low back wellness school class were administered with complete relief of sciatic pain and nearly complete relief of low back pain. Chiropractic distraction manipulation is an effective treatment of lumbar disk herniation, if the chiropractor is observant during its administration for patient tolerance to manipulation under distraction and any signs of neurological deficit demanding other types of care.

14. Cox JM: Patient benefits of attending a chiropractic low back wellness clinic. *Journal of Manipulative and Physiological Therapeutics* 1994;17(1):25-28

15. Hazen LJ, Cox, JM: Lumbar intraspinal extradural synovial cyst: a case study. *J of Neuromusculoskeletal System* 1993; 1(4):167-169
 Lumbar intraspinal extradural synovial cyst is among the more rare, yet well-documented compressive neuropathies that present with low back and/or leg pain. The current base of knowledge in the medical literature concerning this interesting condition is presented, and the chiropractic protocol and treatment use in this one case of a lumbar synovial cyst.
 Lumbar intraspinal extradural synovial cysts are of a facetar degenerative etiology and may be referred to by a variety of names - hypertrophic synovitis, cysts of the ligamentum flavum, synovial cysts, ganglion cysts. Tissue studies demonstrate that these cysts contain a variety of components, including reactive fibrous connective tissue, dense fibrous connective tissue, hyperplastic synovial membrane, and fine calcifications.
 Such a cyst must be thought of in the differential diagnosis of an individual presenting clinically with LBP and leg pain, particularly in the over 50 category. Clinical examination, corollary diagnostic imaging - CT and MRI - make the diagnosis.
 The definitive treatment of intraspinal cysts in the current literature is surgical laminectomy. However, the authors recommend the possibility of a conservative, noninvasive approach to the care of the cysts via chiropractic distraction manipulation in conjunction with the appropriate physical therapy modalities

16. Cox JM, Kreissman SG, Hazen LJ: Eosinophilic granuloma of the thoracic and lumbar spine. *Journal of the Neuromusculoskeletal System* 1995; 3(4):197-202
 Chiropractic physicians see patient with spinal pain of pathologic origin. Worsening of back pain after manipulation in a 16-year-old girl alerted the treating chiropractic physician to further diagnostic workup to include magnetic resonance imaging of the spine. Eosinophilic granuloma was diagnosed and the proper referral for care was made. The case stresses the importance of recognizing contraindicatory signs to spinal manipulation and the need for proper

interdisciplinary care of such patients. Proper diagnostic and treatment protocols for eosinophilic granuloma are presented.

17. Cox, JM, Feller JA, Cox JA: Distraction Chiropractic Adjusting: Clinical Application, Treatment Algorithms, and Clinical Outcomes of 1000 Cases Studied. *Topics in Clinical Chiropractic* 1996; (3)3:45-59, 79-81
 An overview of Cox® distraction manipulation protocols is presented including diagnosis and treatment decision making in low back pain and sciatica cases and proper utilization of flexion distraction in treating lumbar spine and lower extremity pain. In addition, the outcome of 1,000 cases involving low back and/or leg pain treated with chiropractic adjusting (92% utilizing flexion distraction) is presented.
 A qualitative clinical and literature review provides the basis of the overview of diagnostic and treatment protocols. A descriptive case series design was used to collect outcome information on 1,000 patients with low back and/or leg pain; patients were pooled from two separate studies. Patients were treated by 30 different chiropractors, and a minimum of 20 cases was supplied by each physician. A descriptive review of cases showed that less than 4% of patients with low back or leg pain were candidates for surgery. Less than 9% of patients reached the chronic stage of care. The mean number of days to maximum improvement under care was 29, and the average number of treatments to maximum improvement was 12. The results of this study provide some evidence for the use of chiropractic management, particularly flexion distraction manipulation, in the treatment of back pain problems due to a variety of mechanical causes.
18. Cox JM, Alter M: Schwannoma: Challenging Diagnosis. *J of Manipulative and Physiological Therapeutics* 2001; 24(8):526-528
 When undiagnosed abdominal pain is present, spinal tumor should be considered one possible diagnosis
19. Cox JM, Cox II, JM: Chiropractic Treatment of Lumbar Spine Synovial Cysts: A Report of Two Cases. *Journal of Manipulative and Physiological Therapeutics* 2005; 28(2):143-147
 Chiropractic distraction manipulation and physiological therapeutic care relieved 2 patients with low back and radicular pain attributed to MRI-confirmed synovial cysts of the lumbar spine. This treatment may be an initial conservative treatment option for synovial cysts with careful patient monitoring for progressive neurologic deficit which would necessitate surgery. Distraction manipulation may be a safe and effective conservative treatment of synovial cyst causing radicular pain; further data collection of clinical outcomes is warranted.
20. Cox JM, Bakkum B: Possible tendon and bursae generators of retrotrochanteric gluteal and thigh pain: the Gemelli/Obturator Internus Complex. *J of Manipulative and Physiological Therapeutics* 2005; 28(7):534-538

In patients with persistent gluteal and sciatica-like pain, especially when centered in the retrotrochanteric region, the gemelli-obturator internus muscle complex and associated bursae should be considered as a possible source of the pain.

21. Cox JM: Distraction manipulation: a review of the literature. *J of Manipulative and Physiological Therapeutics* 2006; 29(1): 89-90
<http://www.journals.elsevierhealth.com/periodicals/yymt/article/PIIS016147540500326X/fulltext>
 The movement of the nucleus pulposus is unpredictable in the degenerated disk. As chiropractors, we treat degenerated disks and need to be aware of their behavior. The intervertebral disk is probably the most common source of chronic low back pain.⁸ Tolerance testing before applying manipulation to the patient's spine is prudent because of the unpredictable nature of the disk.
22. Gudavalli R, Cambron JA, McGregor M et al: A randomized clinical trial and subgroup analysis to compare flexion–distraction with active exercise for chronic low back pain. *European Spine Journal* 2006; 15: 1070-1082
 Patients with radiculopathy did significantly better with FD. There were no significant differences between groups on the Roland Morris and SF-36 outcome measures. Overall, flexion–distraction provided more pain relief than active exercise; however, these results varied based on stratification of patients with and without radiculopathy and with and without recurrent symptoms. The subgroup analysis provides a possible explanation for contrasting results among randomized clinical trials of chronic low back pain treatments and these results also provide guidance for future work in the treatment of chronic low back pain.
23. Cambron GA, Gudavalli MR, McGregor M et al: Amount of health care and self-care following a randomized clinical trial comparing flexion-distraction with exercise program for chronic low back pain. *Osteopathy and Chiropractic* 2006; 14:19
 During a one-year followup, participants previously randomized to physical therapy attended significantly more healthcare visits than those participants who received chiropractic care.
24. Cambron GA, Gudavalli MR, Hedecker D et al: One-Year Follow-Up of a Randomized Clinical Trial Comparing Flexion Distraction with an Exercise Program for Chronic Low-Back Pain. *J of Alternative and Complementary Medicine* 2006; 12(7): 659-668
 In this first trial on flexion distraction care, flexion distraction was found to be more effective in reducing pain for 1 year when compared to a form of physical therapy.
25. Cox JM et al: Grand Rounds Discussion: Patient with acute low back pain. *Chiropractic Technique* 1999; 11(1):1-17
 A Grand Rounds discussion of a patient suffering from severe low back pain with

pain radiating into the left thigh. The patient occasionally gets "stuck" in a position where he is leaning forward and to the right, and he must slowly work out his back in order to straighten up again. Dr. Cox discusses the examination of the patient, the possible pain generators for the patient's pain, and the Cox Distraction Adjusting procedures recommended for the case.

Algorithms of decision making and treatment protocol are presented for Cox® Distraction diagnosis and care of an acute low back pain patient. As well, discussion of potential sources of the pain is presented. Many references cited.

26. Kruse RA, Schliesser J, DeBono VF: Klippel-Feil Syndrome with radiculopathy. Chiropractic management utilizing flexion-distraction technique: A case report. *J of the Neuromusculoskeletal System* 2000;8(4):124-31
A 34-year-old female presented to a chiropractic office with severe, unremitting, cervical, shoulder, and arm pain of several months' duration. Past medical history, clinical evaluation, and plain-film radiographs revealed findings consistent with Klippel-Feil syndrome. The radiographs revealed a C2/3 block vertebrae, atlas assimilation, and premature degenerative changes consistent with the syndrome. Treatment consisted of cervical flexion-distraction manipulation and adjunctive therapies. This patient felt relief after the first treatment and experienced a complete resolution of her symptoms after eight treatments performed over a period of 2 months. Klippel-Feil syndrome is an anatomical entity that results in premature cervical degenerative changes, which may cause radiculopathy. Flexion-distraction manipulation performed to the cervical spine is a relatively new clinical procedure, which shows great promise for the treatment of cervical radiculopathy.
27. Kruse RA, Gregerson D: Cervical Spinal stenosis resulting in radiculopathy treated with flexion-distraction manipulation: A case study. *J of the Neuromusculoskeletal System* 2002;10(4):141-7
A 60 year old male presented with complaints of pain and limited motion in his neck, with pain and weakness in his left shoulder and arm. These symptoms began after a fall approximately 4 months prior. His previous allopathic care included medication and physical/occupational therapy, which provided no significant relief. Cervical plain film radiographs demonstrated degenerative changes and the magnetic resonance imaging revealed multilevel central stenosis. The patient was treated with flexion-distraction manipulation, which provided significant relief of his subjective and objective findings. Cervical stenosis with resultant radicular and neurological complaints may be difficult to manage with both conventional allopathic and chiropractic treatment. Flexion distraction manipulative therapy may be an effective treatment option for these often-difficult cases.
28. Schliesser JS, Kruse RA, Fleming Fallon L: Cervical radiculopathy treated with chiropractic flexion distraction manipulation: a retrospective study in a private practice setting: *JOURNAL OF MANIPULATIVE AND PHYSIOLOGICAL THERAPEUTICS* 2003; 26(9):592-596

Background: Although flexion distraction performed to the lumbar spine is commonly utilized and documented as effective, flexion distraction manipulation performed to the cervical spine has not been adequately studied.

Subjective: To objectively quantify data from the Visual Analogue Scale (VAS) to support the clinical judgment exercised for the use of flexion distraction manipulation to treat cervical radiculopathy.

Design and setting: A retrospective analysis of the files of 39 patients from a private chiropractic clinic that met diagnostic criteria for inclusion. All patients were diagnosed with cervical radiculopathy and treated by a single practitioner with flexion distraction manipulation and some form of adjunctive physical medicine modality.

Main outcome measures: The VAS was used to objectively quantify pain. Of the 39 files reviewed, 22 contained an initial and posttreatment VAS score and were therefore utilized in this study.

Results: This study revealed a statistically significant reduction in pain as quantified by visual analogue scores. The mean number of treatments required was 13.2 ± 8.2 , with a range of 6 to 37. Only 3 persons required more treatments than the mean plus 1 standard deviation.

Conclusion: The results of this study show promise for chiropractic and manual therapy techniques such as flexion distraction, as well as demonstrating that other, larger research studies must be performed for cervical radiculopathy.

29. Kruse RA, Imbarlina F, DeBono VF: Treatment of cervical radiculopathy with flexion distraction. *J Manipulative Physiological Therapeutics* 2001;24(3):206-209

Objective: To discuss the nonsurgical treatment of a cervical disk herniation with flexion distraction manipulation. **Clinical Features:** A case study of cervical disk syndrome with radicular symptoms is presented. Magnetic resonance imaging revealed a large C5-C6 disk herniation. Degenerative changes at the affected level were demonstrated on cervical spine plain film radiographs.

Intervention and Outcome: The patient received treatment in the form of flexion distraction manipulation and adjunctive therapies. A complete resolution of the patient's subjective complaints was achieved.

Conclusion: Flexion distraction has been a technique associated with musculoskeletal conditions of the lumbar spine. Flexion distraction applied to the cervical spine might be an effective therapy in the treatment of cervical disk herniations. Although further controlled studies are needed, treatment of cervical disk syndromes with flexion distraction might be a viable form of conservative care.

30. Neault CC: Conservative management of an L4-L5 left nuclear disc prolapse with a sequestered segment. *J of Manipulative and Physiological Therapeutics* 1992;15(5):318-321

A case report is discussed in which a clinically diagnosed case of an L4-L5 nuclear disk prolapse with a sequestered fragment was certified by computerized axial

tomography and magnetic resonance imaging at the initiation of the treatment period. It was treated with flexion-distraction manipulation, hot and cold fomentation, positive galvanism, a lumbosacral support, nutritional supplementation, and abstinence from sitting and exercises. Four weeks after initiation of treatment, the patient was asymptomatic. Eight weeks after initiation of treatment, and 6 weeks after the original scan, magnetic resonance imaging certified a reduction in the size of the prolapse within the vertebral canal. An 11 month follow-up examination indicated the patient had no exacerbations of her condition and all objective findings were negative.

31. Hawk C, Long C, Azad A: Chiropractic care for women with chronic pelvic pain: a prospective single-group intervention study. *J of the Neuromusculoskeletal System* 1997;20(2):73-9
Nineteen chronic pelvic patients helped with flexion distraction adjusting
32. Browning JE: The mechanically induced pelvic pain and organic dysfunction syndrome: an often overlooked cause of bladder, bowel, gynecologic, and sexual dysfunction. *J of the Neuromusculoskeletal System* 1996;4(2):52-66
Pelvic Pain and Organic Dysfunction Syndrome Helped with Flexion Distraction
33. Cox JM, Trier K: Chiropractic adjustment results correlated with spondylolisthesis instability. *J of Manual Medicine* 1991;6:67-72
Stable Spondylolisthesis 75% Relieved of Pain with Cox® Distraction
34. Hawk C, Azad A, Phongphua C, Long CR: Preliminary study of the effects of a placebo chiropractic treatment with sham adjustments. *J of Manipulative And Physiological Therapeutics* 1999;22(7):436-43
13 of 18 Low Back Patients Felt Greater Positive Effect of Flexion Distraction over Placebo
35. Snow G: Chiropractic management of a patient with lumbar spinal stenosis. *JOURNAL OF MANIPULATIVE AND PHYSIOLOGICAL THERAPEUTICS* 2001; 24(4): 300-304
To discuss the case of a patient with severe, multilevel central canal stenosis who was managed conservatively with flexion-distraction manipulation; to introduce a cautious approach to the application of treatment, which can reduce the risk of adverse effects and might make an apprehensive doctor more comfortable treating this condition; and to propose a theoretic mechanism for relief of symptoms through use of chiropractic manipulation. Clinical Features: A 78-year-old man had low back pain and severe bilateral leg pains. Objective findings were minimal, yet magnetic resonance imaging demonstrated severe degenerative lumbar stenosis at L3-L4 and L4-L5 and to a lesser degree at L2-L3. Intervention and Outcome: Flexion-distraction manipulation of the lumbar spine was performed. Incremental increases in traction forces were applied as the patient responded positively to

care. He experienced a decrease in the frequency and intensity of his leg symptoms and a resolution of his low back pain. These improvements were maintained at a 5-month follow-up visit. Conclusion: Successful management of symptoms either caused by or complicated by lumbar spinal stenosis is presented. Manipulation of the spine shows promise for relief of symptoms through improving spinal biomechanics. Further study in the form of a randomized clinical trial is warranted.

36. Bergmann TF, Jongeward BV: Manipulative therapy in lower back pain with leg pain and neurological deficit. *J Of Manipulative and Physiological Therapeutics* 1998; 21(4):288-294

Chiropractors need a nonsurgical, conservative approach to treat low back pain with sciatica as an alternative to and before beginning the more aggressive, and potentially hazardous, surgical treatment. There is some support for the idea that lumbar disc herniation with neurological deficit and radicular pain does not contraindicate the judicious use of manipulation. Although significant questions remain for the evaluation and treatment of lumbar radiculopathy (sciatica) with disc herniations) there is ample evidence to suggest that a course of conservative care, including spinal manipulation, should be completed before surgical consult is considered.

Ice was applied to a patient's lower back for 5 minutes, followed by flexion-distraction mobilization done by placing a hand contact over the L4 spinous process and using the pelvic section of the table to distract the lumbar spine between the L4-L5 segment. This procedure was repeated three times with each distractive process held for 20 seconds. The patient was told to lie on her back at home with her knees bent in a "90/90" position whenever possible. She was instructed to get up only for bathroom use.

One week after this appointment, she reported that her lower back pain was almost gone and that the leg pain no longer bothered her. Treatment again consisted of lumbar flexion distraction and long axis distraction of the lower extremity. At this point, side posture rotary manipulation was added to her treatment plan.

37. Hubka MJ, Taylor JAM, Schultz GD, Traina AD: Lumbar intervertebral disc herniation: chiropractic management using flexion, extension, and rotational manipulative therapy. *Chiropractic Technique* 1991; 3(1):5-12

The chiropractic management of a patient with a large herniation of the L5-S1 intervertebral disc is described. Manipulative therapy administered twice a day, over a 16-day period, consisted of flexion distraction mobilization, rotational manipulations, and extension mobilizations. Stretching, strengthening, and coordination exercises were performed in conjunctions with the manipulative therapy. Dramatic subjective and objective improvement followed chiropractic management. The criteria used to determine the type and direction of manipulative therapy, and the rationale for applying three different forms of

manipulative therapy are discussed.

38. Hawk C, Long CR: Use of a pilot to refine the design of a study to develop a manual placebo treatment. *JNMS* 2000;8(2):39-48
Thirty-two patients with subacute or chronic low back pain were randomly assigned to group A (flexion-distraction technique and trigger point therapy), group B (sham adjustment and effleurage massage), group C (flexion-distraction and effleurage), or group D (sham adjustment and trigger point therapy) for 6 weeks of treatment. The Roland Morris Questionnaire (RMQ) and the Pain Disability Index (PDI) were the outcome instruments of primary interest. RMQ median score changes were similar across groups. PDI median score changes at week 3 were greatest in group A, less in groups C and D, and least in group B. At week 6, group B still showed less change than the others.
39. Crawford MC: Chiropractic management of acute low back pain. *Alternative Th H* 1999; 5(1):112
A 36-year-old mother of 2, previously healthy and athletic, presented with low back pain, sharp shooting pain down the side of her left leg, and a numb feeling in her toes. She stated that she was unable to toe raise or straighten her left leg at the knee.
The CT scan indicated a central left disk herniation at the L5 to S1 level, which was abutting the ventral portion of the thecal sac and the left S1 nerve sheath.
Treatment involved 9 therapy sessions over a 3 week period. Each session consisted of 4 modalities. Interferential electrotherapy with moist heat lasting 15 minutes was used to control pain. The interferential was set at a low frequency, 1 to 15 Hz, with approximately 20 mA intensity (for patient tolerance) to produce endorphin release and relieve hypertonicity.
Manipulation of the lumbar spine and sacroiliac joints was done with the patient in side posture. This manipulative technic was well tolerated and not painful during or after the procedure. Finally, flexion traction of the specific vertebral segments was accomplished using a Lloyd flexion distraction table, in which a manual traction force was applied to the L5 spinous process in a cephalad direction while the table was flexed, producing additional traction force at the specific vertebral segment. The patient improved with each session. After the 9th session, the patient felt she had improved enough to discontinue treatment.
40. Hultgren GM, Jeffers JS: Shamanism, a religious paradigm: its intrusion into the practice of chiropractic. *Journal Of Manipulative And Physiological Therapeutics* 1994; 17(6):404-410
41. Beira B, Peers A: A study of the effects of chiropractic therapy on the diameter of the spinal canal in patients with low back pain and radiculopathy. *J Of The Neuromusculoskeletal System* 1998; 6(3):114-126

42. BenEliyahu DJ: Magnetic resonance imaging and clinical follow-up: study of 27 patients receiving chiropractic care for cervical and lumbar disc herniations. *Journal Of Manipulative And Physiological Therapeutics* 1996; 19(9):597-606

80% of cervical and lumbar spine disc herniations helped by flexion distraction adjustment. 63% showed MRI reduction in size

43. Morris CE: Chiropractic rehabilitation of a patient with S1 radiculopathy associated with a large lumbar disk herniation. *Journal Of Manipulative And Physiological Therapeutics* 1999; 22(1):38-44

Objective: To describe the nonsurgical treatment of acute S1 radiculopathy from a large (12 × 12 × 13 mm) L5-S1 disk herniation. Clinical Features: A 31-year-old man presented with severe lower back pain and pain, paresthesia, and plantar flexion weakness of the left leg. His symptoms began 5 days before the initial visit and progressed despite nonsteroidal anti-inflammatory drugs and analgesic medication. An absent left Achilles reflex, left S1 dermatome hypesthesia, and left gastrocnemius/soleus weakness was noted. Magnetic resonance imaging demonstrated a large L5-S1 disk herniation. Intervention and Outcome: Initial treatment of this patient included McKenzie protocol press-ups to reduce and centralize symptoms, nonloading exercise for cardiovascular fitness, and lower leg isotonic exercises to prevent atrophy. Counseling was provided to reduce abnormal illness behavior risk. Later, flexion distraction and side-posture manipulation were provided to improve joint function. Sensory motor training, trunk stabilization exercises, and trigger point therapy were also used. He returned to modified work 27 days after symptom onset. A follow-up, comparative magnetic resonance imaging (MRI) study was unchanged. He was discharged as asymptomatic (zero rating on both the Oswestry and numerical pain scales) after 50 days and 20 visits, although the left S1 reflex remained absent. Reassessment 169 days later revealed neither significant symptoms nor lifestyle restrictions. Conclusion: This case demonstrates the potential benefit of a chiropractic rehabilitation strategy by use of multimodal therapy for lumbar radiculopathy associated with disk herniation.

44. Bulbulian R, Dishman JD, Burke J: Neuroreflex modulation of the lumbar spine in flexion distraction. New York Chiropractic College, Seneca Falls, New York 13148. Presented at 5th World Federation of Chiropractic in Auckland, New Zealand. May 15-23, 1999

Introduction: Flexion distraction has gained increased credibility as a therapeutic modality for treatment of low back pain. Although important work in the area has elucidated the intradiscal pressure profiles during flexion distraction, the accompanying neural responses have yet to be described. The purpose of this pilot study was to access neural reflex responses to motion with three degrees of

freedom applied to the lumbar spine and to evaluate H-reflex responses of the soleus.

Methods. Subjects (n=4) were measured for Hmax reflexes determined from stimulus responses recruitment curves measured in neutral prone position, flexion, left and right lateral flexion, and axial rotation on a Cox adjusting table. The mean of 10 evoked Hmax waves expressed as a percentage of maximal M-wave was the criterion measure. Spinal range of motion was quantified by Metrecom digitization. **Results.** The data showed considerable variation in some movement ranges notwithstanding identical table positioning for all subjects (i.e. Flexion 3-12°). Mean Hmax/Mmax ratios were 65.5±15, 65.5±17, 62.8±12, 59.6±17 and 65.9±19 for neutral, flexion, R. Lateral, L. Lateral flexion and R and L axial rotation respectively. The salient findings in the data were the non-existent H-reflex changes in lateral flexion and the significant suppression of neuromuscular activation in flexion (65±16 vs 60±15%; p<0.05) and ipsilateral rotation (65±16 vs 59±17%; p<0.05). Slight perturbations in numerous afferent receptors are known to significantly alter the H-reflex. The absence of measurable changes in lateral flexion may indicate that both slow and fast adapting receptors could be involved in lumbar motion. These preliminary findings suggest the need for further dynamic motion studies of the flexion distraction neurophysiology

45. Bulbulian R, Burke J, Dishman JD : Spinal reflex excitability changes after lumbar spine passive flexion mobilization. *Journal of Manipulative and Physiological Therapeutics* 2002; (Vol. 25, Issue 8, Pages 526-532

Background: Flexion distraction has gained increased credibility as a therapeutic modality for treatment of low back pain. Although important work in the area has elucidated the intradiskal pressure profiles during flexion distraction, the accompanying neural responses have yet to be described. **Objective:** The purpose of this pilot study was to assess neural reflex responses to motion with 3 degrees of freedom applied to the lumbar spine and to evaluate H-reflex responses of the soleus. **Methods:** Subjects (n = 12) were measured for H-maximum reflexes determined from stimulus response recruitment curves measured in neutral prone position. The mean of 10 evoked H-waves (at H-maximum stimulus intensity) were measured in neutral position, flexion, left and right lateral flexion, and axial rotation of the trunk on an adjusting table. H-reflexes were expressed as a percentage of maximal M-wave for the criterion measure. Spinal range of motion was quantified by digitization. **Results:** The data showed variation in some movement ranges, notwithstanding identical table positioning for all subjects. Mean H-reflex amplitude was decreased (15.2 ± 5.8 mV to 13.8 ± 5.8 mV), and the H/M ratio was also decreased in flexion compared with neutral (55.0% ± 19.1% to 50.3% ± 19.4%; P < .05). **Conclusions:** Trunk flexion is accompanied by inhibition of the motor neuron pool. Slight perturbations in numerous afferent receptors are known to significantly alter the H-reflex. The absence of measurable changes in lateral flexion and trunk rotation may indicate that both slow- and fast-adapting

receptors could be involved in lumbar motion. These preliminary findings suggest the need for further dynamic motion studies of the flexion distraction neurophysiologic condition.

46. Bergmann T: Manual force, mechanically assisted articular chiropractic techniques using long and/or short lever contacts. *Journal of Manipulative and Physiological Therapeutics* 1993; 16(1):33-37

Cox® Technic only one with refereed articles

47. DuPriest CM: Nonoperative management of lumbar spinal stenosis. *Journal of Manipulative and Physiological Therapeutics* 1993;16(6):411-4
48. Mootz RD, Waldorf T: Chiropractic care parameters for common industrial low back conditions. *Chiropractic Technique* 1993; 5(3):119-125
49. Guadagnino MR: Flexion-distraction manipulation of a patient with a proven disc herniation. *J Of The Neuromusculoskeletal System* 1997; 5(2):70-73

Lumbar radicular symptoms can be caused by lumbar intervertebral disc herniations. If a disc injury is positively established through diagnostic imaging, surgery is a commonly recommended approach. Flexion/distraction manipulation is a therapeutic alternative that may offer relief for subjective complaints and elimination of objective signs. Success with this technique might spare the patient an operative procedure. This is a case report of one such incidence.

Flexion/distraction manipulation is a treatment developed by James M. Cox. It is often used for lumbar disc injuries (herniation, bulges, etc.), and for other low back and lower extremity radicular conditions. The technique involves the use of a specialized table which allows for passive distraction, flexion, lateral bending, and rotation. These different planes of motion, along with the use of appropriate adjunctive therapy and exercises, allow for reduction of symptoms attributable to lumbar disc syndromes. Contraindications and indications for flexion/distraction manipulation have been identified and enumerated.

Flexion/distraction manipulation is a treatment that should be investigated as a part of the algorithm for presurgical therapies of lumbar intervertebral disc injuries. This alternative in conservative care may be of benefit to a large number of patients. The surgical option for treating intervertebral disc herniations might be reduced with propagation of flexion/distraction manipulation.

50. Cooperstein R, Perle SM, Gatterman MI, Lantz C, Schneider MJ: Chiropractic technique procedures for specific low back conditions: Characterizing the literature. *Journal Of Manipulative And Physiological Therapeutics* 2001;24(6):407-11

It is necessary to determine which specific types of manipulation and non-manipulative types of chiropractic adjustive care are most effective for particular types of low back pain across both tissue-specific and functional classifications. To characterize the quantity and quality of literature gathered for an Expert Panel that was convened to rate various specific chiropractic adjustive procedures for the treatment of common types of low back pain, drawing on the clinical expertise of the panel members and the relevant literature.

A systematic review was conducted of treatment-specific, condition-specific trials, studies, and case reports of chiropractic care for low back pain.

The 3 most studied adjustive procedures are side-posture high-velocity, low-amplitude; distraction (mostly flexion distraction); and mobilization, respectively. The clinical condition most commonly addressed by the included studies is low back pain.

51. Hawk C, Phongphua C, Bleecker J, Swank L, Lopez D, Rubley T : Preliminary study of the reliability of assessment procedures for indications for chiropractic adjustments of the lumbar spine. *Journal of Manipulative and Physiological Therapeutics* 1999; Vol. 22, Issue 6, Pages 382-389

Objective: To assess the intraexaminer and interexaminer reliability of clinicians trained in flexion-distraction technique to determine the need for chiropractic adjustment of each segment of the lumbar spine. **Design:** This was an intraexaminer and interexaminer reliability study of commonly used chiropractic assessment procedures, including static and motion palpation and visual observation. **Setting:** Chiropractic college; by four licensed chiropractors trained in flexion-distraction technique, two with more than 20 years' experience and two with 3 or fewer years' experience. **Subjects:** Subjects were 18 volunteers; 16 were symptom free, and 2 had low back pain at the time the study was conducted. **Main Outcome Measure:** The kappa statistic was computed for all comparisons and interpreted in categories ranging from "poor" (<0.00) to "almost perfect" (>0.80). **Results:** Intraexaminer reliability was greater than interexaminer reliability. For intraexaminer reliability there was considerable variation by segment and among the four examiners, but intraexaminer reliability appeared generally higher than interexaminer reliability. Overall, more subluxations were identified on the second examination than on the first. For interexaminer reliability, kappa scores were generally in the "poor" to "slight" categories. **Discussion:** The results of this study, similar to those of other studies, indicate that even chiropractors trained in the same technique seem to show little consensus on the indications for the necessity to adjust specific segments of the spine. A more standardized assessment approach might be helpful in improving the reliability of diagnostic assessments.

52. Dougherty P, Bajwa S, Burke J, Dishman JD: Spinal Manipulation Postepidural Injection for Lumbar and Cervical Radiculopathy: A Retrospective Case Series.

Journal of Manipulative and Physiological Therapeutics 2004; Vol. 27, Issue 7, Pages 449-456

Objective: To describe the safety and potential therapeutic benefit of spinal manipulation postepidural injection in the nonsurgical treatment of patients with cervical and lumbar radiculopathy.

Methods: The study design was a retrospective review of outcomes of 20 cervical and 60 lumbar radiculopathy patients who underwent spinal manipulation postepidural injection in a hospital setting. Patients received either fluoroscopically guided or computed tomography (CT)–guided epidural injection of a combination of lidocaine and Depo-Medrol. The manual therapy consisted of an immediate postepidural application of flexion distraction mobilization and then high-velocity, low-amplitude spinal manipulation to the affected spinal regions. Outcome criteria were empirically defined as significant improvement, temporary improvement, or no change. The minimum follow-up time for all patients was 1 year.

Results: There were no complications associated with spinal manipulation, whereas 3 complications associated with the epidural injection procedure were noted. Of lumbar spine patients, 36.67% (n = 22) noted significant improvement, 41.67% (n = 25) experienced temporary improvement, and 21.67% (n = 13) reported no change. Of the patients undergoing spinal manipulation after cervical epidural injection, 50% (n = 10) noted significant improvement, 30% (n = 6) experienced temporary improvement, whereas 20% (n = 4) exhibited no change.

Conclusions: These data suggest that spinal manipulation postepidural injection is a safe nonsurgical procedure to use in the treatment of the patient with radiculopathy of spinal origin. This is also the first report of the use of spinal manipulation postepidural injection in the cervical spine.

53. Hawk C, Azad A, Phongphua C, Long CR: Preliminary study of the effects of a placebo chiropractic treatment with sham adjustments. *Journal of Manipulative and Physiological Therapeutics* 1999; Vol. 22, Issue 7, Pages 436-443

Objective: To identify aspects of the delivery of placebo chiropractic treatments by using sham adjustments that may cause a treatment effect and that may affect the success of blinding. **Design and Setting:** Two-period crossover design in a chiropractic college research clinic. **Subjects:** Eighteen volunteer staff, students, and faculty of the chiropractic college who reported low-back pain within the last 6 months. **Interventions:** Flexion-distraction technique was used to perform chiropractic adjustments, and a hand-held instrument (Activator adjusting instrument) with the pressure gauge set on the 0 was used to perform sham adjustments. The treatment period was 2 weeks, with a total of 4 visits. **Main Outcome Measures:** The Visual Analog Scale (VAS) for pain and Global Well-Being Scale (GWBS). **Results:** Although VAS and GWBS scores improved with both treatments, a somewhat greater improvement occurred in most cases with the active treatment. Eight of 14 patients interviewed believed that the placebo had a

treatment effect. Conclusion: This study provided preliminary information that was useful in planning the protocol for a placebo chiropractic treatment in the randomized clinical trial for which it was designed.

54. Kruse R, Gudavalli S, Cambron J: Chiropractic treatment of a pregnant patient with lumbar radiculopathy. *Journal of Chiropractic Medicine* 2007; 6(4):153-158

Objective The purpose of this report is to describe chiropractic treatment of lower back and unilateral leg pain in a pregnant patient. **Clinical Features** A 26-year-old woman in her second trimester of pregnancy had severe pain in her lower back that radiated to her hips bilaterally and to her right leg. She reported tingling down her right lower leg to the dorsum of her foot. Although no diagnostic imaging was performed, her differential diagnoses included lumbalgia with associated radiculopathy. **Intervention and Outcome** Treatment consisted of manual traction in the side-lying position using a specialized chiropractic table and treatment technique (Cox flexion-distraction decompression) modified for pregnancy. Relief was noted after the first treatment, and complete resolution of her subjective and objective findings occurred after 8 visits. **Conclusion:** When modified, this chiropractic technique appears to be an effective method for treating lower back pain with radiation to the leg in a pregnant patient who cannot lie prone.

55. Gudavalli S, Kruse R: Foraminal stenosis with radiculopathy from a cervical disc herniation in a 33-year-old man treated with flexion-distraction decompression manipulation. *Journal of Manipulative and Physiological Therapeutics* 2008; 31(5):376-380

Objective The purpose of this report was to describe the use of Cox flexion distraction decompression manipulation on a patient with radiculopathy from a C6/C7 disc herniation. **Clinical Features** A 33-year-old man complained of severe neck pain and spasms, pain radiating down his left arm and upper back, and associated numbness in his fingers. Cervical spine plain film radiographs showed mild C6/C7 osseous degenerative changes. Cervical magnetic resonance imaging revealed a moderate-sized left posterolateral disc herniation at C6/C7 causing severe foraminal stenosis. **Intervention and Outcome** Treatment consisted of Cox flexion distraction decompression manipulation and adjunctive physiotherapy modalities. The patient was treated a total of 15 times over a period of 10 weeks. Subjective findings using a pain scale and objective examination findings supported a good clinical outcome. At 2-year follow-up, subjective and objective findings remained stable. **Conclusion** This study reports Cox flexion distraction decompression manipulation and physiotherapy modalities showed good subjective and objective clinical outcomes for this patient.

56. Cox J, Bakkum B: Possible Generators of Retrotrochanteric Gluteal and Thigh Pain: The Gemelli–Obturator Internus Complex. *JOURNAL OF MANIPULATIVE AND PHYSIOLOGICAL THERAPEUTICS* 2005; 28(7):534-538
57. Gay R, Bronfort G, Evans RE et al: Distraction Manipulation of the Spine - a review of the literature. *Journal of Manipulative and Physiological Therapeutics* 2005; 28(4): 266-73.

OBJECTIVE: The purpose of this study is to review the literature concerning distraction manipulation of the lumbar spine, particularly regarding physiological effects, clinical efficacy, and safety. **DATA SOURCES:** A search of the English language literature was conducted using the MEDLINE, Embase, CINAHL, Chiropractic Research Archives Collection, and Manual, Alternative, and Natural Therapies Information System databases. A secondary hand search of bibliographies was completed to identify older or non-indexed literature. **DATA SELECTION AND EXTRACTION:** Articles were identified, which described the characteristics of distraction manipulation beyond a simple description or the results of treatment with distraction manipulation. Data were extracted on the basis of relevance to the stated objective. **DATA SYNTHESIS AND RESULTS:** Thirty articles were identified. Three were uncontrolled or pilot studies, 3 were basic science studies, and 6 were case series. Most were case reports. Lumbar distraction manipulation is a nonthrust mechanically assisted manual medicine technique with characteristics of manipulation, mobilization, and traction. It is used for a variety of lumbar conditions and chronic pelvic pain. The primary rationale for its use is on the basis of the biomechanical effects of axial spinal distraction. Little data are available describing the in vivo effect of distraction when used in combination with flexion or other motions. **CONCLUSIONS:** Despite widespread use, the efficacy of distraction manipulation is not well established. Further research is needed to establish the efficacy and safety of distraction manipulation and to explore biomechanical, neurological, and biochemical events that may be altered by this treatment.

58. Cox JM: editorial response to Gay et al *JOURNAL OF MANIPULATIVE AND PHYSIOLOGICAL THERAPEUTICS* 28(4) in *JOURNAL OF MANIPULATIVE AND PHYSIOLOGICAL THERAPEUTICS* 2006; 29(1):89-90

Gay et al¹ discussed nucleus pulposus movement during flexion and extension of the lumbar spine, citing Fennell et al² as stating that the nucleus moves anterior on extension and posterior on flexion. Full study of the Fennell paper, however, shows a different finding. Fennell studied nuclear motion on magnetic resonance imaging of 3 patients—1 normal 18-year-old patient with no history of low back pain and two 25- and 46-year-old patients with low back pain history.

The 18-year-old patient with no back pain did show anterior nuclear movement on extension and posterior motion on flexion; however, the 2 patients with a history of low back pain showed the L4-L5 disk to move anteriorly during flexion. The nucleus spread within the L4-L5 disk during flexion instead of migrating posteriorly. Fennel explained the 2 unexpected results in the painful spines as possible disk degeneration etiology.

Gay et al¹ also discussed the study of Beattie et al³ about 20 healthy young women with lumbar spine magnetic resonance imaging in extension, and Gay et al stated that they found that the posterior margin of the nucleus in the normal lower lumbar disk tends to move anteriorly with extension and posteriorly with flexion, and there was no anterior nucleus movement. Again, that is not a complete explanation of Beattie's finding. He found that in normal disks without degeneration, the posterior disk margin increased between the posterior margin of the nucleus pulposus and the posterior portion of the vertebral bodies of the normal disks of healthy young females during extension motion. However, 8 of the 20 subjects had at least one degenerative disk in the lower lumbar spine. The nucleus of the degenerative disks did not move the same as normal disks. Degenerative disks deform differently from nondegenerative disks. Other similar studies have shown that the nucleus pulposus moves posterior or does not move with extension movement.^{4, 5, 6, 7} Reading the article of Gay et al., one is led to believe that the nucleus pulposus always moves anterior on extension and posterior on flexion, when in fact that is not the case. Gay et al accurately cite literature showing that stenosis is induced into the vertebral and the osseoligamentous canals by extension, which causes posterior annulus protrusion, ligamentum flavum buckling, facet imbrication, and narrowing of the posterior disk space.

Hopefully, I have augmented the findings as given in the important paper of Gay et al. The movement of the nucleus pulposus is unpredictable in the degenerated disk. As chiropractors, we treat degenerated disks and need to be aware of their behavior. The intervertebral disk is probably the most common source of chronic low back pain.⁸ Tolerance testing before applying manipulation to the patient's spine is prudent because of the unpredictable nature of the disk. For safety, I teach that the maximum angle of flexion used is 6° when long y-axis decompression is applied to the motion segment. At that degree, our research has shown that the ligament stresses are well within normal limits so that damage will not occur to the stability of the segments. This small 6° flexion angle used may diminish the value of this discussion, but nevertheless, we must maintain correct biomechanical concepts for future study.

References

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2. 2Fennell AJ, Jones AP, Hukins DWL. Migration of the nucleus pulposus within the intervertebral disc during flexion and extension of the spine. *Spine.* 1996;21:2753–2757.
3. 3Beattie PF, Brooks WM, Rothstein JM, Sibbitt WL, Roberts RA, MacLean T, et al. Effect of lordosis on the position of the nucleus pulposus in supine subjects: a study using magnetic resonance imaging. *Spine.* 1994;19:2096–2102.
4. 4Vanharanta H, Ohnmeiss D, Stith W, Rashbaum R, Hochschuler S, Guyer R. et al. Effect of repeated trunk extension and flexion movements as seen by CT/discography orthopedic transactions. *Journal of Bone and Joint Surgery* 10 Shattuck Street, Boston, Massachusetts, 12115/Volume XIII, Number 1,1987, pg 28. Poster Exhibit, North American Spine Society, Banff, Canada, June, 1987.
5. 5Gill K, Videman T, Shimizu T, Mooney V. The effect of repeated extensions on the discographic dye patterns in cadaver lumbar motion segments. *Clin Biomech.* 1987;2:205–210.
6. Roaf R. A study of the mechanics of spinal injuries. *J Bone Joint Surg.* 1960;42B:810.
7. 7Schultz AB, Warwick DN, Berkson MH, Nachemson AL. Mechanical properties of human lumbar spine segments. Part 1. Response in flexion, extension, lateral bending and torsion. *J Biomech Eng.* 1979;101:46–52.
8. 8Kuslich SD, Ulstrom CL, Michael CJ. The tissue origin of low back pain and sciatica. *Orthop Clin North Am.* 1991;22:181–187.
59. Hondras MA, Long CR, Cao Y, Rowell RM, Meeker WC. [A randomized controlled trial comparing 2 types of spinal manipulation and minimal conservative medical care for adults 55 years and older with subacute or chronic low back pain.](#) *J Manipulative and Physiol Ther* 2009; 32:330-43
60. [Editorial Response by Cox JM: A randomized controlled trial comparing 2 types of spinal manipulation and minimal conservative medical care for adults 55 years and older with subacute or chronic low back pain.](#) *J of Manipulative and Physiol Therap* 2009; 32(7):601
61. Kruse R, Cambron J: Chiropractic Management of Postsurgical Lumbar Spine Pain: A Retrospective Study of 32 Cases. *J of Manipulative and Physiological Therapeutics* 2011; 34(6):408-412

Post-surgical continued pain patients, aka FBSS or Failed Back Surgical Syndrome, seek relief, any relief. Chiropractic offers it. In this retrospective study of 32 patients treated with chiropractic Cox Technic flexion distraction, the patients reported improvement:

4.1 out of 10 points overall

5.7 out of 10 points in patients who underwent combined surgeries (lumbar discectomy, fusion and/or laminectomy)

Best of all, no adverse side effects from the chiropractic Cox Technic treatment were reported!

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New study of Cox® Distraction Manipulation in the treatment of lumbar spine stenosis lumbar spinal stenosis patients improved by 76% and disability improved in 73%
63. Kruse R, Cambron J: Cox decompression chiropractic manipulation of a patient with postsurgical lumbar fusion: a case report. J of Chiro Med 2011; 10(4):255-260
13 visits to attain 0 out of 10 pain score and 2% Oswestry. At 2 year follow-up, still resolved.
64. Manison A: Chiropractic management using Cox cervical flexion-distraction technique for a disk herniation with left foraminal narrowing in a 64-year-old man. J of Chiro Med 2011; 10(4):316-321
Relief of neck pain and arm pain in 10 visits in 4 weeks which continues at 8 months.
65. Rowell RM, Rylander SJ. [Low-Back Pain, Leg Pain, and Chronic Idiopathic Testicular Pain Treated with Chiropractic Care](#). J Altern Complement Med. 2012 Apr 10. [Epub ahead of print]
Testicular Pain (and Low Back Pain and Leg Pain) Relieved with Cox Technic
36 year old man with 5 years of lower back pain, right leg pain, testicular pain
19 treatments with Cox Technic (flexion distraction) in 8 weeks
Testicular pain – improved at 1 visit; gone in 3 weeks; still gone at 6 month follow up
Low back pain – decreased at 4 weeks
Leg pain – gone at 4 weeks
66. Cox JM: Chiropractic management of a patient with lumbar spine pain due to a synovial cyst: a case report. J of Chiropractic Medicine 2012; 11(1):7-15
75 year old man with low back pain and right anterior thigh and left posterior leg pain of 3 years' duration is relieved with Cox Technic (flexion distraction).
4 visits – no right or left leg pain

3 months of 16 visits – low back and buttock pain are minimal with no leg pain
80% relief

67. Fersum, KV; Dankaerts, W; O'Sullivan, PB; Maes, J; Skouen, JS; Bjordal, JM; Kvale, A. Integration of subclassification strategies in randomised controlled clinical trials evaluating manual therapy treatment and exercise therapy for non-specific chronic low back pain: a systematic review. *British Journal Of Sports Medicine* 44 (14). Nov 2010. P.1054-1062

Physical therapists take flexion distraction to new defined protocols for subclassifications of non-specific chronic low back pain.

68. Ma, SY; Je, HD; Kim, HD. A Multimodal Treatment Approach using Spinal Decompression via SpineMED, Flexion-Distraction Mobilization of the Cervical Spine, and Cervical Stabilization Exercises for the Treatment of Cervical Radiculopathy. *Journal Of Physical Therapy Science* 23 (1). FEB 2011. p.1-6

69. Hope, M: The effect of flexion distraction therapy on the lumbar spine on the electromyographic effect of the erector spinae muscles in lumbar facet dysfunction patients. University of Johannesburg Chiropractic Clinic. Published 6-30-11 (<https://ujdigispace.uj.ac.za/bitstream/handle/10210/3765/Hope.pdf?sequence=1>)

In light of these findings it can be concluded that flexion distraction therapy demonstrated favourable treatment results in terms of the pain experienced by the subjects, the resting rate and contraction ability of the Erector Spinae muscles.

70. Dunn AS, Baylis S, Ryan D. Chiropractic management of mechanical low back pain secondary to multiple-level lumbar spondylolysis with spondylolisthesis in a United States Marine Corps veteran: a case report. *J Chiropr Med.* 2009 Sep;8(3):125-30.

A course of conservative management consisting of 10 treatments including lumbar flexion/distraction and activity modification was provided over an 8-week period. Despite the long-standing nature of the complaint and underlying multiple-level lumbar spondylolysis with spondylolisthesis, there was a 25% reduction in low back pain severity on the numeric rating scale and a 22% reduction in perceived disability related to low back pain on the Revised Oswestry Disability Questionnaire.

71. Ndetan, H, Rupert R, Bae S, Singh, K: Prevalence of musculoskeletal injuries sustained by students while attending a chiropractic college. *Journal of Manipulative and Physiological Therapeutics* 2009;32(2):140-48

Cox flexion distraction showed almost no adverse side effects in its clinical application of manipulation to doctor and 1 in 54 of patients being manipulated.

Distributions of injuries associated with adjusting techniques and specifically training-related activities at Parker College of Chiropractic, 2006 (student perception of injury sources)

Adjusting Technique

Diversified	280 cases	61 to doctor (22%)	74 injuries to patient (26%)
Thompson	142 cases	3 (2%)	25 (18%)
Gonstead	135 cases	31 (23%)	39 (29%)
Cox F/D	54 cases	0 (0%)	1 (2%)

72. Greenwood D: Improvement in chronic low back pain in an aviation crash survivor with adjacent segment disease following flexion distraction therapy: a case study. *J of Chiropractic Medicine* 2012; 11(4):300-305
- A chronic low back pain patient with a 3-year history of chronic non-specific low back pain due to a lumbar disc herniation after an accident that left him with fractures and cauda equina syndrome that required fusion surgery, vertebrectomy and cage reconstruction. His adjacent segment disease is relieved with Cox Flexion Distraction protocols over 4 weeks, attaining 0/10 on the numerical pain scale. At 3 months, he works 8 to 9 hours a day. At 9 months, he reports continued complete reduction of symptoms.
73. Gudavalli R, Potluri T, Caranandang G, Havey R, Vornov L, Cox J, Rowell R, Kruse R, Joachim G, Patwardhan A, Henderson, Goertz: Intradiscal Pressure Changes during Manual Cervical Distraction: A Cadaveric Study. *Evidence-Based Complementary and Alternative Medicine* Volume 2013 (2013), Article ID 954134, 10 pages
<http://dx.doi.org/10.1155/2013/954134>
- In this cadaveric study we observed **decreases in IDP in the lower cervical spine during a chiropractic MCD procedure in prone position**. Based on the maximum number of specimens DC1 has done, moving flexion and traction seem to reduce more IDP, followed by neutral traction, fixed flexion and tractions, and generalized traction. Although the doctors of chiropractic in this study demonstrated good intraclinician reliability, the magnitude of traction forces varied. Larger powered studies should be undertaken to determine if these decreases in IDP are significant depending on the doctor, contact location, and the different traction procedures. Also, the clinical significance of these differences is unknown.
74. Maruti Ram Gudavalli, PhD, James M. Cox, DC, DACBR: Real-time force feedback during flexion-distraction procedure for low back pain: A pilot study. *J Can Chiropr Assoc* 2014; 58(2):193-197

Proceedings of Professional Conference Presentations

1. Gudavalli MR, Cox JM, Baker JA, Cramer GD, Patwardhan AG: Intervertebral disc pressure changes during the flexion-distraction procedures for low back pain. Presented at and in the proceedings of the International Society for the Study of the Lumbar Spine Meeting, June 1997, Singapore.

Cyriax, Quillette, and Kramer hypothesized that as the vertebrae in the spine are distracted, a negative pressure develops in the disc, and sucks back a protrusion. The present study shows that the decrease in the intradiscal pressures may provide the opportunity for the reduction in the disc bulge during the flexion-distraction procedure. Ramos et al. reported decreases in the intradiscal pressures during Vertebral Axial Decompression (VAD) procedure on three patients measured intraoperatively. The result of the present study are in general agreement with the study reported by Ramos and Martin. Andersson et al. reported increases in the intradiscal pressures at L3-L4 disc on four volunteers during active and passive traction. A possible reason for the increase in the intradiscal pressures could be that the muscles of the in vivo subjects could have been contracting while under active and passive traction. Work is in progress to monitor the muscle activity during in vivo situations of treating the patients using the flexion-distraction procedure.
2. Gudavalli MR, Cox JM, Baker JA, Cramer GD, Patwardhan AG: Intervertebral disc pressure changes during a chiropractic procedure. Accepted for presentation and publication at the ASME IMECE 97 Bioengineering Convention, November 16-21, 1997, Dallas, Texas. - *Advances in Bioengineering 1999; BED, vol. 39, pgs 187-188*

We observed a significant decrease in intradiscal pressure during the flexion-distraction procedure for low back pain. The pressure has increased during extension motion of the table. The pressures have increased during right lateral motion whereas the pressures have decreased during the left lateral motion. During circumduction the pressures have decreased during the left lateral and flexion motions, where as they have increased during right lateral and flexion combined motions. In all of the motions the pressures returned to their original values when the spine was brought back to the initial prone position. One of the reasons for the increase and decrease during lateral motions is due to the fact that the transducer was inserted some what right laterally from the center of the disc. The results clearly show that the pressures are affected during different motions of the spine associated with the motions of the table. Even though the present study is limited to one cadaver, the results are very interesting and studies with more number of cadavers and studies on animals can give further insight into the changes in the pressures at different regions of the spine.
3. Gudavalli MR, Cox JM, Baker JA, Cramer GD, Patwardhan AG: Intervertebral Disc Pressure Changes During a Chiropractic Procedure. Abstract from the Proceedings of the Bioengineering Conference, Phoenix

- We observed a significant decrease in intradiscal pressure during the flexion-distraction procedure for low back pain. When the discs were not pressurized, the pressures went below 0 mm Hg. When the discs were pressurized, the decrease in the intradiscal pressures was much larger, suggesting that in patients with higher intradiscal pressures, the decrease may be much higher during the treatment. The pressures returned to their original values when the spine was brought back to the initial prone position. Quillette(2), and Kramer (3) hypothesized that as the vertebrae in the spine are distracted, a negative pressure develops in the disc, and sucks back a protrusion. Ramos et al. (4) reported on the intradiscal pressure during Vertebral Axial Decompression (VAD) procedure on three patients measured intraoperatively. The results showed that the disc pressures reduced during the VAD therapy. They demonstrated that the disc pressures can go as low as -160 mmHg. The results of the present study are in general agreement with the study reported by Ramos and Martin (4). Anderson et al. (5) reported the intradiscal pressures at L3-L4 disc on four volunteers during standing, lying, active traction, and passive traction. The findings showed an increase in the disc pressure during both active and passive traction. The results from the present study do not agree with the results reported by Anderson et al. (5). A possible reason could be that the muscles of the in vivo subjects could have been contracting while under active and passive traction. Work is in progress to monitor the muscle activity during in vivo situations of treating the patients using flexion-distraction procedure.
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A study was conducted as a joint venture between Physicians First, an established chiropractic clinic, and Blue Cross and Blue Shield of Ohio. The purpose was to compile statistics on the effectiveness of chiropractic treatment of back injuries that might otherwise require surgical intervention. The study was composed of a total of 10 patients with diagnosed intervertebral disc syndrome. All 10 subjects had received treatment from a medical doctor for the diagnosed conditions. The subjects were treated under a twelve week plan which included the utilization of Cox Distraction Technique. Post-treatment surveys revealed that all 10 patients reported improvement in the frequency and severity of symptoms.

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CLINICAL FEATURES: A 31-year-old male recreational worker presented with left sided low back and leg pain for the previous 3-4 months that was exacerbated by prolonged sitting.

INTERVENTION AND OUTCOME: The plan of management included interferential current, soft tissue trigger point and myofascial therapy, **lateral recumbent manual low velocity, low amplitude traction mobilizations** and pelvic blocking as necessary. Home care included heat, icing, neural mobilizations, repeated extension exercises, stretching, core muscle strengthening, as well as the avoidance of prolonged sitting and using a low back support in his work chair. The patient responded well after the first visit and his leg and back pain were almost completely resolved by the third visit.

SUMMARY: Conservative chiropractic care appears to reduce pain and improve mobility in this case of a L5-S1 disc herniation. Active rehabilitative treatment strategies are recommended before surgical referral.

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14. Case Report #14 - Diastematomyelia
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35. Case Report #35 - MRI misses fragment, Clinical exam finds it
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37. Case Report #37 - Two Disc Herniations - one touches spinal cord
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41. Case Report #40 - Surgical Low Back Fusion with Spondylolisthesis
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43. Case Report #42 - Marked Disc Degeneration and Stenosis
44. Case Report #43 - Degenerative Spondylolisthesis & Stenosis
45. Case Report #46 - Far Lateral Disc Herniation: Surgery & Cox Technic
46. Case Report #47 - Butterfly Vertebra Treated Post Surgical Disc Removal

47. Case Report #48 - L5S1 Disc Fragment
48. Case Report #49 - Pre/Post MRI Study of a 10mm Lumbar Disc Extrusion (Drs. Gangemi & LeMarr)
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50. Case Report #51 - Sciatica with Muscle Weakness (Dr. Donna Lieberman)
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52. Case Report #53 - Leg Pain Returns after Surgery, Relieved with FD
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57. Case Report #58 - Patient Avoids Surgery for L3-4 Disc Herniation
58. Case Report #59 – Two Cases of Sciatica
59. Case Report #60 - Upper Level Disc Herniation Thigh Pain
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63. Case Report #65 - Lumbar Spine DDD and Spondylolisthesis (Dr. Ted Siciliano)
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65. Case Report #67 - 3 Level Spine Surgery Prevented (Dr. Allen Unruh)
66. Case Report #68 - Lumbar Spine Degenerative Disc Disease with Spondylolisthesis (Dr. Ted Siciliano)
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81. Case Report #88 - Degenerative Disc Disease Of The Cervical Spine With Radicular Pain Treated With Cox Decompression Adjusting (Dr. Ted Siciliano)
82. Case Report #89 - L5-S1 Extruded Disc Herniation Successfully Cared for with Cox Technic
83. Case Report #90 - Bertolotti's Syndrome (Dr. Roy Siegel)
84. Case Report #91 - Spinal Stenosis With Foot Drop Successfully Relieved with Cox Technic (Dr. Ilan Sommer)
85. Case Report #92 - Cox Technic Relieves Pain from Degenerative Scoliosis and Spinal Stenosis (Dr. Robert Patterson)
86. Case Report #93 - Cox® Technic Flexion Distraction and Decompression Treatment of L3-L4 Degenerative Spondylolisthesis and Spinal Stenosis and a Transitional L5 Vertebral Segment (Bertolotti's Syndrome) (Dr. Lee Hazen)

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89. Case Report #96 - Lumbar Intervertebral Disc Syndrome L4/5 Left with Compression of L5 Nerve – Relieved (Dr. Bryce Milam)
90. Case Report #97 - C5-6 and C6-7 Disc Herniation with Stenosis Causing Nerve Root Impingement (Dr. James Brandt)
91. Case Report #98 - Cox® Technic for Osteoporotic Thoracic Kyphosis and Pain Syndrome after Vertebroplasty (Dr. Lee Hazen)
92. Case Report #99 - Cervical Spine Degenerative Stenosis in a Post Surgical Continued Pain (FBSS) Patient (Dr. Lee Hazen)
93. Case Report #100 - Facet Arthropathy Induced Nerve Root Compression Resulting In Motor Weakness And Pain (Dr. James Cox)
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105. Case Report #112 - Post Car Accident Neck Pain and Ear Pain Relief (Dr. James Brandt)
106. Case Report #113 – Resolution of Leg Pain after Failed Back Surgery (Dr. Dean Greenwood)
107. Case Report #114 – Resolution of C6/7 Neck Pain in Male (Dr. Joel Dixon)
108. Case Report #115 – Perseverance of a Stenotic Patient Ends in Relief with Cox Technic (Dr. Kurt Olding)
109. Case Report #116 – Lumbar Disc Herniation with Radiculopathy Treated Successfully with Cox Technic (Dr. Steven Garber)
110. Case Report #117 - Disc Extrusion Resorbed Under Cox® Technic Flexion Distraction and Decompression System (Dr. Ilan Sommer)
111. Case Report #118 – Concomitant Tourette's (Maladie des TICS) and Adolescent Idiopathic Mild Scoliosis complicated by Chronic L5/S1 Facet Syndrome and spinal subluxations treated using Cox® Technic Protocols (Dr. Mike Poulin)
112. Case Report #119 - Moderate Adolescent Idiopathic Scoliosis (AIS) while being braced, now presents with lumbar disc disorder with sciatica, treated using Cox® Technic Protocols. (Dr. Mike Poulin)
113. Case Report #120 - Chronic Severe “S” Scoliosis (Lumbar dextroscoliosis and Thoracic levoscoliosis) treated successfully using Chiropractic for over 30 years and Cox® Technic Protocols for over 11 yrs. (Dr. Mike Poulin)
114. Case Report #121 - Rapid Improvement In A Lumbar Radiculopathy Patient With Cox® Technic (Dr. Tim Hayes)
115. Case Report #122 – Treatment Of Cervical Spine Disc Herniations And Radiculopathy With Cox Decompression Adjusting (Dr. Ted Siciliano)
116. Case Report #123 – Free Fragment Of Disc At L3-4 (Dr. Kurt Olding)
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119. Case Report #126 – Cox Technic Helps Relieve Pain From Disc Protrusion When Neurontin Isn't Tolerated (Dr. Sara Miller)
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121. Case Report #128 – Chiropractic Management Of A Combined L4 Lumbar Disc Protrusion A L2-L3 Synovial Cyst (Dr. Michael McMurray)
122. Case Report #129 – Lumbar Discogenic Pain With Motor Weakness Increased By Lumbar Extension (Dr. Adam Keefe)
123. Case Report #130 – Vulvodynia (And Back Pain And Leg Pain) Resolved With Cox Technic (Dr. Michael Johnson)
124. Case Report #131 – Nonspecific Back Pain, Degenerative Disc Disease, Endplate Modic Changes (Dr. Paul Vanier)