

## Advanced Spine & Joint Care / Spine Decompression Center

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### Traction Research Studies/Brief Abstracts

(Random order...Journal and year)

1. Controlled distraction as a therapeutic option in moderate degeneration of the IVD-an animal study in vivo. German Ortho J 2006. The study results suggest disc regeneration can be induced by axial dynamic distraction. The decompressed rabbit IVD showed signs of tissue recovery after temporary disc distraction.
2. Is there a sub-group of patients with LBP likely to benefit from traction? Spine 2007. There may be a sub-group of patients who can benefit from traction: root compression leg pain, crossed-leg raise test or peripheralization with extension. Benefit at 2 weeks, equivocal at 6.
3. Manipulation and traction for lumbago and sciatica. **Physio Prac 1988**. A controlled trial of traction with manipulative techniques led to substantial relief in 85% of participants
4. Comparison of sacrospinalis myoelectric activity and pain levels in patients undergoing static and intermittent lumbar traction. Spine 1993. Study indicated there in NO EMG activity in prone or supine traction positions. Improved comfort is noted in intermittent group.
5. Comparison of electrical activity in sacrospinalis musculature during traction in two different positions. J Ortho Sports Phys Ther 1995. EMG indicates no electrical activity prone vs. supine traction positions.
6. Biomechanics of traction for lumbar disc prolapse. Chin Ortho 1994. IVD was recorded before & during traction. 62% of prolapsed discs showed negative pressure prior to traction. 64% reduced IDP with traction. 19% showed pressure increase with applied distraction.
7. Non-linear finite element analysis of formation & treatment of disc herniation. Proc Inst Mech Eng 1992. Analysis shows loads not greater than those occurring in daily life can cause loss of stability and allow lateral displacement. The model indicates traction therapy may retract herniation by 40%.
8. Effects of axial decompression on IDP. J Neurosurg 1994. Significant negative pressure was achieved in 3 patients during prone traction (VAX-D)...-100mmHg. A minimal threshold of 50 pounds is assumed. Patients prone with extended arm restraint.
9. Reducibility of cervical herniation: evaluation at MRI during cervical traction. Radiology 2002. 29 patients and 7 healthy volunteers had intermittent traction while in MR. Substantial vertebral elongation was seen. Full herniation reduction was seen in 3 and partial reduction in 18.
10. Intermittent cervical traction for cervical radiculopathy due to large volume herniations. JMPT 2002. Three weeks of traction as described resulted in complete resolution of symptoms in 4 patients.
11. New concepts in back pain management. AJPM 1998. The application of supine lumbar traction with adherence to several specific characteristics including progression to peak force, hip flexion, split-table and altering pull angle helped to enhance outcomes.

12. Vertebral axial decompression for pain associated with herniated and degenerated discs or facet syndrome: an outcome study. *Neuro Res* 1997. A retrospective of 770 cases assumed, though uncontrolled as to previous treatments showed a 71% good-to-excellent response through 20 prone traction treatments.
13. Lumbar spine traction: evaluation of effects and recommended application. *Manual Ther* 2000. Traction most likely benefits acute <6 weeks of pain with radicular symptoms and neurological deficit. Apparent lack of 'dose' response suggests low dose is probably sufficient to achieve benefit.
14. Traction for LBP with or without sciatica; a Cochrane systematic review. *Spine* 2006. Intermittent or static traction as a single treatment cannot be recommended. However the literature allows no firm negative conclusion that traction, in a generalized sense is not an effective treatment for LBP.
15. Comparison of 3 PT modalities for acute pain in lumbar disc herniation measured by clinical evaluation and MRI. *JMPT* 2008. Traction, ultrasound and Laser were all effective in this group with LDH.
16. Effects of different cervical traction weights on neck pain and mobility. *Niger Postgrad* 2006. This study suggests 10% body weight as the ideal weight with minimal side effects and highest therapeutic effect.
17. Computed tomographic investigation of the effects of traction on LDH. *Spine* 1989. CT scans before, during and after traction in 30 patients shows retraction in 78% medial, 66% posterolateral and 57% lateral herniations. Report of 93% success in pain relief at 6 month follow-up.
18. The natural history of HNP with radiculopathy. *Spine* 1996. Reduction of extraforaminal disc herniation using a multi-modal approach including traction therapy.
19. The non-operative treatment of HNP with radiculopathy: an outcome study. *Spine* 1989. Through an aggressive multi-modal approach patients with recalcitrant pain and disc prolapse showed an 85% success rate. Traction was used when it reduced leg symptoms.
20. Current use of lumbar traction in the management of LBP (UK). *Arch of Phys Med Rehab* 2005. 41% use traction for sub-acute, nerve root signs. 87% use it in a multi-modal approach.
21. Effects of hydrostatic pressure on matrix synthesis & matrix metalloproteinase production in human lumbar IVD. *Spine* 1997. The results suggest that hydrostatic pressures influence IVD cell metabolism. Abnormal hydrostatic pressure may accelerate disc degeneration.
22. The influence of different unloading positions upon stature recovery and paraspinal muscle activity. *Clin Biomech* 2005. Elevated EMG activity in paraspinals is found in the chronic LBP population. Gravity inversion position results in the lowest EMG activity and recovery of stature.
23. Effect of 10%-30% & 60% body weight traction on SLR test of symptomatic patients with LBP. *J Ortho Sports Phys Ther* 2000. Positive SLR below 45° improved post traction treatment in both 30% & 60% body weight. Low force many have equal benefits.
24. Effect of continuous lumbar traction on the size of herniated disc material in lumbar herniation. *Rheumatol Int* 2005. Size of herniated disc material from CT images decreased significantly as did symptoms. Lumbar traction is both effective in improving symptoms and clinical findings as well as the size of herniation.

25. CT evaluation of lumbar spinal structures during traction. *PhysioTher* 2005. During traction there was a reduction of Lumbar Disc Herniation, increased spinal canal space, widening of the neural foramen & decreased thickness of psoas.
26. Efficacy of home cervical traction therapy. *Am J Phy Med Rehab* 1999. 3-5 minutes of daily cervical traction provided symptom relief in 81%.
27. Blood pressure & pulse rate changes associated with cervical traction. *Niger J Med*. 2006. It is advised that cardiovascular risk factor patients (elderly & unstable systems) should be comprehensively assessed prior to the therapy. Cervical traction can create cardiovascular alterations.
28. Evaluation of the effects of pulling angle and force on intermittent cervical traction. *J Formos Med Assoc*. 1991. Examination of pull angle reveals neutral (less angulation) creates more separation at levels C4/5. +30° pull angle separates C6/7 in comparison. In terms of force: above 30 pounds increased discomfort.
29. Cervical spine disorders. A comparison of 3 types. *Spine*. 1985. Static, intermittent & manual traction methods were assessed. Intermittent traction performed significantly better than the other methods.
30. Research on the effectiveness of intermittent cervical traction using short-latency somatosensory evoked potentials. *J Ortho Sci* 2002. Traction may improve conduction disturbance primarily by increasing the blood flow from the nerve roots to the spinal parenchyma.
31. Predictors of short term outcome with patients with cervical radiculopathy. *Phys Ther* 2006. A multi-modal approach, including cervical traction therapy showed significant short-term outcomes.
32. Cervical traction and thoracic manipulation for the management of mild cervical myelopathy from a herniated cervical disc. *J Orth* 2006. Cervical traction and thoracic manipulation seem useful for the reduction of pain scores and levels of disability in this condition.
33. Effects of intermittent cervical traction on muscle pain. EMG and flowmetric studies on cervical paraspinals. *Nippon Med J* 1994. Cervical intermittent traction was shown to be effective in relieving pain, increasing frequency of myoelectric signals and improving blood flow in effected muscles.
34. Stress in lumbar IVD during distraction: a cadavaric study. *Spine* 2007. Distraction appears to predictably reduce nucleus pressure. The effect of distraction on distribution of compressive stress may be dependant in part on the health (degeneration) of the disc.
35. Analysis model simulating the correlation of cervical traction force with the pressure in the cervical nucleus pulposus. *Di Xue Bao* 2002. The exponential model best describes the trend in changes of the pressure reduction in the cervical nucleus in association with varied cervical traction forces.
36. Distraction of lumbar vertebra in gravitational traction. *Spine* 1998. Gravitational traction had a very apparent effect on intervertebral space and in distraction of the lumbar vertebra.
37. Intermittent cervical traction: a progenitor of lumbar radicular pain. *Arch Phys Med Rehab* 1992. Moderate to severe degenerative changes in the cervical spine can create a cord tethering effect generating leg symptoms from cervical distraction.
38. Outcomes after prone lumbar traction protocol with activity limiting LBP: A prospective case series study. *Arch Phys Med Rehab* 2008. Traction applied in the prone

position over an 8 week course of treatment was associated with improvements in pain intensity and disability scores in patients with ongoing LBP... Though a causal relationship between outcome and intervention cannot be made without further research.

39. Stress in lumbar IVD during distraction: a cadaveric study. Gay RE et al. *Spine* (11)1 2007. Distraction appears to predictably reduce nucleus pulposus pressure. That reduction is ultimately dependant on the health of the disc.

40. Trunk muscle response to various protocols of lumbar traction. Cholewicki JE et al. *Manual Therapy* 1(5) 2008. The authors used EMG to assess trunk muscle activity during various protocols of lumbar traction. There was minimal activity noted though greater sacrospinalis activity with thoracic bracing. A loss of trunk flexibility noted post-treatment suggests increased intradiscal pressure from fluid in-flow which may be enhanced via intermittent protocols. The authors note LBP patients may gain relief during traction via adverse muscle co-activation patterns being reduced.

41. Cyclical tensile stress exerts a protective effect on the IVD. Sowa et al. *Am J Phys Med Rehab* (87) 2008 537-455. This in vitro study shows controlled, low level tensile stress (elongation) creates a potent anti-inflammatory, anti-catabolic effect on disc metabolism and may suggest a mechanism for relief of pain from traction/motion therapy. Motion may create an improved expression of catabolic agents

42. Intertester reliability and validity of motion assessment of lumbar spine/accessory motion testing. Landel et al. *Phys ther* 88;1. 2008 Another study showing the lack of any agreement from motion palpation tests. Further validation of the arbitrary nature of these tests but adding validity to the necessity of functional/provocative examination such as directional preference, form closure and force closure etc.

43. Segmental lumbar mobility in individuals with LBP: in vivo dynamic MRI. *BMC Musculo Disord* 2007 Jan;29(8). Persons with non-specific LBP have a tendency to have hypermobility of a lumbar segment vs. asymptomatic subjects. This, along with McGill's shear instability testing adds further validity to form/force closure concepts and the importance of motion disorders concomitant with disc lesions.

44. Changes in spinal height following sustained lumbar flexion & extension postures; a measure of IVD hydration. *JMPT* 2009 Jun;32. Height recovery, which is directly related to disc hydration, is enhanced by both flexion & extension rest postures. Vicoelastic creep probable from water content changes in the nucleus are responsible.

45. Reliability of Chiropractic methods commonly used to detect manipulable lesion(s) in patients with cLBP. *JMPT* 2000 May;23. The most widespread tests we use to discover the 'subluxation' come under fire once again. This study and many others draw us closer to the global, functional form/force closure and shear instability tests as far more valid than palpation, LLI or static film interpretation.

46. Intertester reliability and validity of motion assessments during lumbar motion testing. *PT* 2008 Jan;88. P-A testing of lumbar motion segments failed to agree with dynamic MRI findings further casting doubt that the painful segment is 'fixed' or hypomobile.

47. Quantitative changes in the cervical neural foramen resulting from axial traction: in vivo imaging. *Spine* 2008 Jul;8. During axial traction there is a significant increase in foramina size after ~12 pounds of applied traction. There was no significant size difference between 20-30 pounds of traction. This is another potential indicator for "less is more" or "more isn't necessarily better" especially in terms of traction force.

48. The influence of cervical traction, compression and Spurling test on cervical IV foramen size. Spine 2009 Jul;15. A further study demonstrating the effect distraction and compression have on the foramen. Distraction at ~24 pounds of tension increased the foramen size in the mid-cervicals 120%..
49. McKenzie classification of mechanical spinal pain: profile of syndromes and Directional Preference. Man Ther 2008. An in-depth review reveals 140/187 cases were 'disc derangement' (reducible) with 11/187 irreducible. 98/140 were found to have an extension DP with 34/140 lateral or glides and 8/140 flexion. That translates to ~70-75% of cases demonstrating a reducible disc with an extension DP.
50. Unloaded movement facilitation exercise compared to no exercise or alternative therapy for NscLBP. JMPT 2007 May;30. A systematic review reveals that LB strengthening exercise outcomes are comparable or less effective than McKenzie type facilitation motion and Yoga.
51. Motor control patterns during an Active straight Leg Raise in cPelvic pain. Spine 2009; 34(9). The motor control pattern identified by the ALR has the potential to be a primary mechanism driving ongoing pelvic pain and disability.
52. The twin spine study: contributions to a changing view of disc degeneration. Spine 2009 Jan;9. Sets of twins separated at birth and raised in variant cultures suggest disc degeneration is determined in great part by genetic influences and in small part by environmental factors including vibration and loading.
53. Treating acute low back pain with heat wrap therapy and/or exercise. Spine 2005 Jul;5. When a directional preference was possible and heat used in conjunction a better than 80% improvement in pain relief was noted vs. the heat or exercise alone.
54. Slump stretching in the management of non-radicular LBP. Man Ther 2006. Cleland et al demonstrated that a certain class of patient; non-radicular LBP whose symptoms were tolerant to the seated slump stretch. At discharge patients given the slump had better centralization and symptom improvement.
55. A clinical prediction rule for classifying patients with LBP who demonstrate short-term improvement with mechanical traction. Euro Spine 2009 Apr;18. 4 clinical variables were identified improving the odds of improvement with traction from 20% to 70%. They were: non-involvement with manual labor, low FABQ, over 30 and no neurologic deficits. Only 3 sessions demonstrated good short-term relief at ~35% body weight traction force.
56. Omega-3 fatty acids as an anti-inflammatory: an alternative to NSAIDs. Surg Neur 2006 Jun; 65. Similar pain relief & few side-effects compared with ibuprofen. 3000-6000mg of fish oil daily over a course of several weeks seems to effectively reduce osteoarthritis pain.
57. The accuracy of MRI in the detection of lumbar disc containment. J Ortho Surg 2008 Oct;2. Disc containment status can be a valuable tool in assessment of normal vs. abnormal presentations. MRI may be inaccurate in assessing containment status up to 30% of the time.
58. Long-term outcomes of surgical vs. non-surgical mangt. Of sciatica secondary to HNP: 10 year Maine Lumbar spine study. Spine 2005 Apr;15. This 10 year follow-up of surgical vs. non-surgical cases found 25% of surgical patients had under gone a second surgery and 25% of non-surgical had as well. Overall 69% of initial surgical patients reported improvement vs. 61% of non- surgical cases. (This further demonstrates that

LBP is typically a life-long, on- going problem with little dramatic or consistent avenues for permanent relief).

59. Comparison of air-activated heat wraps to IB & Acetaminophen. Spine May 15(10) Comparison of OTC NSAIDS to air-activated heat wraps in 371 adults with moderate to severe LBP. All measures distinctly favored the heat-wraps.

60. Height changes in cLBP during intense physical exercise. Scand J Med Sci 1997 The gain in height (7.2mm on average) had a significant statistical correlation to pain reduction and improved ROM in exercise subjects compared to controls. There was no change in MRI findings.

61. Analysis of the influence of disc degeneration on the mechanical behavior of the lumbar motion segment. J Biomech 2005 Sep 28 A mildly degenerated disc increases intersegmental rotation. With increasing degeneration rotation is decreased. As IDP decreases facet joint forces increase as do annular stresses.

62. Interexaminer reliability of hip extension test for motor control impairment of the lumbar spine. JMPT 2006 Jun;29(5) The hip extension test appears to have good reliability in detecting deviation of the lumbar spine from the mid-line. Its validity remains to be determined.

63. Conventional PT with lumbar traction; clinical evaluation and MRI for lumbar disc herniation. Bratisl Lek Listy 2010; 111(10) This study showed that conventional PT with traction for the lumbar spine is effective for LDH. As many other studies determine improvement is not correlated with MRI findings.

64. The value of intermittent cervical traction in recent cervical radiculopathy. Ann Phys Rehab Med. 2009 Nov;52(9) Manual and mechanical cervical traction appear to be major contributors in rehab of CR particularly in the framework of a multi-modal clinical approach.

65. A study of diffusion in lumbar discs. MRI documenting influence of the endplate on diffusion in normal & degenerated disc. Spine 2004 Dec 1;29(23) Diffusion is the only source of nutrition to the disc. Endplate cartilage damage increases with age and produces considerable changes in diffusion. Aging and degeneration have been shown to be 2 separate processes by documenting clear-cut differences in diffusion.

66. Radiographic disc height increase after a trial of multimodal spine rehabilitation & vibration traction: a retrospective case series, J Chiro Med Dec;7(4) Though which of the multiple interventions was causative their were statistically significant improvements in both outcome and radiographic, post treatment disc height.

67. Flexibility of lumbar spinal segments correlated to types of tears in the annulus fibrosus. J Neurosurg 2000 Jan;92(1 suppl) Tears in the annulus increase the amount of motion from a torque applied to the motion segment. Radial and transverse tears have a greater effect on motion from axial rotation than torque from other motions.

68. Is increased segmental motion early after lumbar discectomy related to poor clinical outcomes 5 years later? Int Orth 2005 Aug; 29(4) This study suggest that increased inducible vertebral displacement in the early post operative phase after discectomy is associated with poor outcomes.