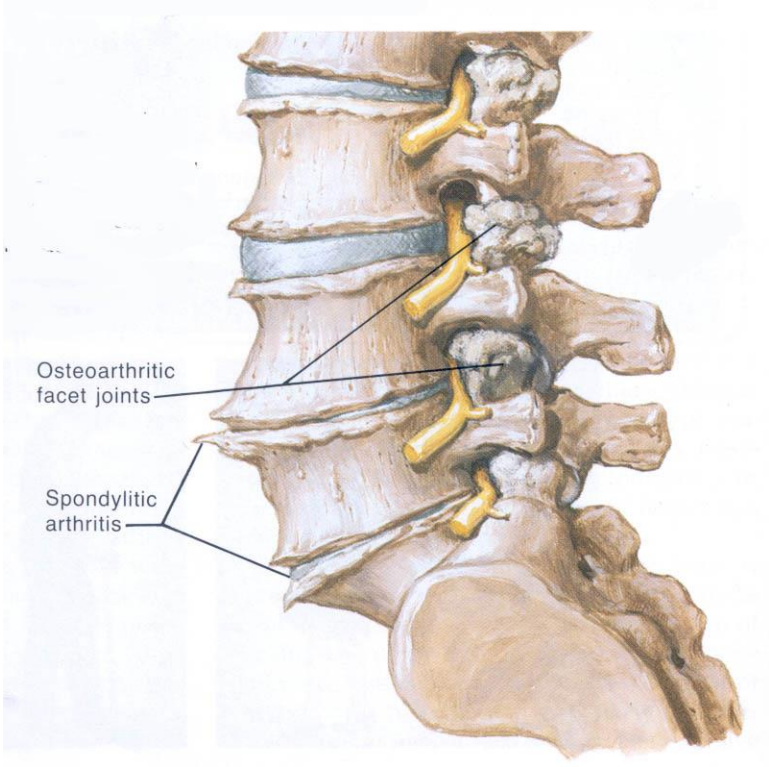
MANAGING DISC DISEASE



Non-Surgical Management of Disc Disease

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What is Disc Disease?

Disc Disease is primarily a tear in the disc tissue. This is generally caused by a breakdown of the normal mechanical function of the spine or surrounding joints. It is characterized by the sharp, radiating pain in the neck, shoulder arm and/or hand or the back, hip buttocks thigh and calf, foot or ankle. Pain is usually increased when coughing, sitting or bearing down and aggravated by stomach sleeping or with hyperextension movements.

What Causes Disc Disease?

Disc disease is common in today's population. The increasing amount of time spent in front of the computer lends to more dysfunction of the discs and joints of the spine and allows for the early deterioration of the disc tissue. Proper sitting techniques and stress reduction help reduce the frequency and intensity of pain. If left untreated, this common problem gives rise to surgical intervention. When treated properly, the mechanical dysfunction is restored, the muscular components strengthened and the disc may be allowed to heal if fed properly and left un-aggravated. Proper healing may take up to 6 months while acute phase treatment is often effective within 2-3 months. Restored mobility of the spine, regular exercise and modification of aggravating life style habits are all necessary for restoration.

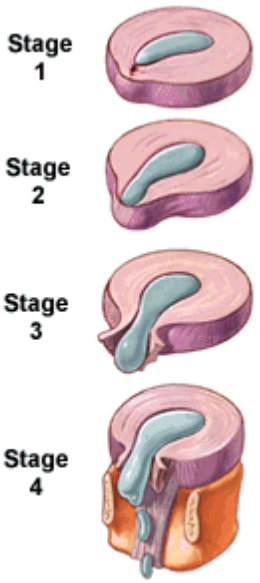
Who May Have Disc Disease?

Disc disease is no respecter of persons. Although it generally does not exhibit symptoms in the young, injuries that tear the disc, compression the disc or create torsion forces that exceed the disc tissue strength can damage an otherwise healthy disc and can occur at almost any age. When this happens, the process of disc disease may begin at a very early age.

We know that the blood supply to the intervertebral discs gradually dissolves around age 25 in most adults. After that, nutrition to the disc is accomplished by imbibition, or the sponge like effect. This is not very effective and makes it critical that disc nutrition be understood. Read the section on Healing the Disc very carefully.

Acute and Chronic Stages

The early stages of the condition involve the outer rings of the disc. Each episode of back pain involving the disc aggravated the disc disease process that eventually becomes progressive until the disc bulges and sometimes impinges on the adjacent nerve roots. With each untreated episode of pain, the tear in the outer fibers grows closer to the inner nucleus of fluid that can eventually protrude into the spinal canal and cause impingement of the nerve roots. When advanced to this stage, the condition becomes a surgical concern for pain management as conservative treatments of



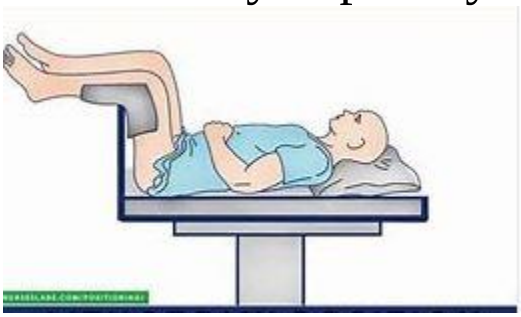
physical therapy, manipulation and exercise-very effective early on, become less effective later. Proper management of the early acute episodes may reduce the likelihood of the chronic disease. The condition is often seen in two forms, the disc alone as a singular lesion or what is referred to as the three joint complex wherein the disc and the posterior joints on each side have failed to function properly as well. This form is far more difficult to treat and becomes a surgical consideration if left unmanaged.

Pain Management

It is a long term challenge to heal the disc. Each patient must embrace the concept of management as a long term solution. Resolving the disease takes years but management of the disorder can be accomplished is a few weeks or months with complete commitment to the protocol. The first issue is to manage the pain. Disc disease often causes several of types of pain at various levels of intensity. It is usually quite intense, may include sharp and dull quality of pain and often is associated with radiating pain, numbness, tingling and burning. Although shutting off the pain is not considered a primary treatment, we consider pain management very important. Without proper management of your pain, you will not be able to exercise as needed or perform your daily work routine; both of which are absolutely critical to your ultimate healing and recovery. Understand that managing your pain is not the same as healing your injury or disease. They are very different. Healing your injury or disease can only begin once you have managed your pain, eliminated your aggravating activities and are taking all the indicated supplements for healing.

There are several effective methods of pain management. We recommend three:

1. Positional Management: Mechanical or positional pain control means that you place your body in a position so as to relieve the mechanical stress on the areas or joints that are painful. It may take some time and experimentation and will only be effective if you are not taking chemical blockers of the pain, but once you find this position, stay in it for long periods of time to allow for healing of the painful (injured tissue). If position alone does not relieve the pain, ask the doctor to fit you with a brace or support to augment the mechanical control. Braces and supports provide immobility, compression, restriction and serve as a reminder to avoid aggravating positions or behaviors. They also allow for resting of the joints and discs so that healing can take place and aggravating movements can be reduced.



2. Temperature change on the injured area will often relieve the pain. In the first 0-72 hours cold will usually help. Ice packs or frozen gel packs reduce local skin temperature in 5 minutes or less and may be difficult to tolerate for much longer due to the extreme cold. Care must be taken so that the skin is not damaged. Direct contact with ice will damage the skin within 2-5 minutes. We recommend keeping a rice bag (or several) in the freezer for 2 hours and then using it as a cold pack on the painful area. Move it around the painful area until it warms, then replace it with another rice bag from the freezer and then repeat this procedure again. Heat may also be used. Infrared heat is available for home use in the form of hot packs or a rice bag heated for 1 minute in the microwave and then moved around the painful area until it cools, then repeat that procedure two more times. Hot and cold may be used alternatively for good results. Experiment to see what your body responds to best. Sometimes the combination of mechanical or positional control combined with temperature change is not enough to remove or sufficiently manage all pain. When this occurs, we recommend adding method 3.

Before moving to method 3 however, we need to fully understand a bit more about pain, where it actually comes from and another purpose it serves other than to make you stop doing the things that further injury the tissues involved.

In many cases, pain is caused by the onset of inflammation. Pain from injured or diseased tissue causes the body to trigger an inflammatory response. This means that histamine is released around the cells, swelling occurs and inflammatory products increase the pain and release of fluids or swelling which increases the inflammatory response and a vicious cycle begins. The expansion of the inflammatory response triggers your immune system to send help to the inflamed area to fix it and eventually heal it. So chemically shutting off or blocking the natural inflammatory response will limit or completely arrest your immune response. This is why we stress doing all you can with methods 1 and 2 to manage your pain prior to resorting to method 3. Once you resort to using chemicals to block the inflammatory response, you lose a good deal of your immune response that you need to heal the problem.

We realize that sometimes, there is no other way to block pain without the use of chemical compounds. We also understand that some people can endure a great deal of pain and others cannot tolerate much. You know best how much pain you can manage before ingesting chemicals to block the pain signals to your brain.

3. Chemicals- Taking pills and medications is often the first method chosen by most people when addressing pain. This is a poor, first choice as there are so many disadvantages. These will be discussed shortly. If chemical management becomes necessary, we recommend using natural ingredients to relieve pain. See the natural pain management recommended in the section Healing the Disc.

Chlorophyll Complex™

The advantage of natural pain relievers is that they have little if any side effects, they do not become toxic to the body, they are not habit forming and they help heal the injured tissue to some degree. Popular over-the-counter medications and prescription pain medications cannot claim any of those advantages I just mentioned. They all are toxic to a certain degree, they all have a variety of side effects, each is habit forming to a large degree and none helps the injured tissue heal much. In fact, they act to shut off the inflammatory response of the body which does actually reduce pain but also inhibits or eliminates the immune response; most are designed simply to shut off the nerve signals to the brain to make you think nothing is wrong when actually, the only thing that has changed is that you are no longer notified that tissue is being damaged.

The management of your pain is best supervised and controlled by you, as you and you alone feel the extent to which you can perform

each management item. To avoid chronic pain, make these management items part of your daily routine.

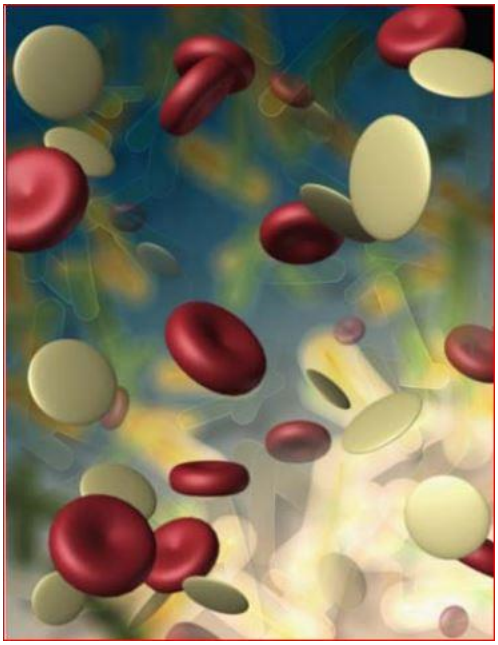
When you begin the process of healing, pain will no longer be part of your life. Healing of tissues is possible in most cases. In rare instances when patients have had a long history of repetitive injury and continued use of chemical relief agents, chronic pain may become a serious challenge. Proper pain management following the steps recommended above can help you avoid chronic pain and addiction to pain relievers.

Other pain relieving methods include over-the-counter anti-inflammatories and analgesics as well as other pain relievers and opioids. Injections into the disc, joints and spinal canal structures to relieve pain are provided by other specialists. These may be temporarily adequate to ease pain but may cause considerable damage to the surrounding tissues. Many forms and styles of surgical intervention also provide temporary relief of the pain. Understand that even these invasive procedures are meant to control the pain. They do not heal the disc disease and may have no clinical effect after two years. We do not recommend them in the initial management of disc disease.

The Auto-Immune Component

Simply put, it may be difficult to grow new cartilage because when the cartilage is injured, the cellular components are discharged into the surrounding space awaiting cleaning and removal by the lymphatic drainage process. If your system is toxic from years of eating a bad diet, and many other toxic behaviors, the lymph

drainage you expect will not happen rapidly enough. The contents of the damaged cells include cartilage DNA and if left lying around long enough will eventually be picked up by the venous drainage process. DNA is not supposed to be transported by the blood. When it is, the immune system senses it and creates antibodies against it so that for example, knee cartilage DNA does not get transported to the lungs and implanted and begin growing knee cartilage in the lung. It's a great protection. Unfortunately, it also does not get implanted in the knee but rather gets encapsulated and neutralized. Due to this toxicity of the lymphatic system, we gradually lose the ability to grow new knee cartilage; so we don't. When the cartilage is worn out, we are told we can't grow any new so we need a joint replacement surgery. It's popular. We must admit, if we continue the toxic life that got us to this point, we will not be able to grow any new tissue. Stopping the toxic life is difficult but possible. In order to stop, first, knowing what is toxic is critical. See the video on "How to Destroy Your Immune Response," on our web page: www.holladayphysicalmedicine.com



Regenerative Medicine Procedures

We deliver a unique protocol of physical medicine procedures designed to provide relief and regeneration of diseased disc tissue. The protocol has proven effective in restoring functional disc tissue. Each session includes delivery of the following:

1. Spinal Decompression is delivered at a frequency of daily, three, two and then one per week, depending on the severity of pain and the degree of disc damage;

2. Ozone Therapy consisting of O^3 subdermal injections to the affected area trigger points are administered at each session to multiple trigger points surrounding the symptomatic area;

3. Electrical Stimulation on a special setting is delivered to the trigger point areas around the symptomatic area, will disperse the injected gas and realign the muscle fibers allowing better healing with less scar tissue formation;
4. Percussive Soft Tissue Manipulation using a Thera-gun will disperse the trigger-points formed and allow for pain reduction and muscle regeneration;
5. Spinal Manipulation provides realignment, muscle relaxation, pain reduction, stimulation of the neurologic bed, increased agility and mobility;

6. Eccentric Exercise Routines help foster muscle function, and restore joint mobility;
7. Eliminating Joint Aggravation is critical to allow for healing and must be achieved in order to expect success. In other words, if you want to recover and heal, you must stop doing things that aggravate/cause your condition. There is no way around this. If you are taking pain blockers, you may have difficulty discovering the things that aggravate your condition.

Healing the Disc

We have agreed that eating right will always help. Unfortunately, our the quality of our food supply has been diminished due to improper processing and soil depletion. Food supplements are necessary for this to occur. Don't run out and buy pills from the super market as they sell only synthetic vitamins and minerals that will not help you. Only properly concentrated whole food supplements will help. You can get them directly from the manufacturer however. We recommend different combinations for each of the following situations:

Chemical Pain Management

For Acute Pain Relief:

Chlorophyll Perles	2 every 3 hours	chew for acute pain
Inositol	2 every 3 hours	
Thymex	2 every 3 hours	

If this does not relieve the pain, then
2 hours after starting the three above:

Saligesic	2 every 3 hours

Boswellia Complex	2 every 3 hours (must be taken with Tuna Omega-3 oil or a fat meal)
Turmeric	2 per day
Valarian Complex	2 per day

Detox – Consult with doctor prior to taking any of these

Arth-Aid Detox	2 patches per night (obtain from the clinic)
SP Clense	27 per day w/ Gastro Fiber Shake
Livaplex	9 per day
Cruciferous Complete	6 per day
Arginex	6 per day
Cholacol II	6 per day
LivCo	4 per day

Chemical Balancing

Catalyn	6/day
Tuna Oil Omega 3	4/day
Calcium Lactate	6/day taken on empty stomach
Trace Minerals B12	2/day
Cataplex D	2/day
ProSynbiotic	2/meal
Prolamine Iodine	1/day in the evening at first then graduate slowly per instructions

Growing Disc Tissue

Ligaplex II	6/day
Cataplex ACP	4/day
Cal Ma Plus	4/day
Calcifood Wafers	4/day
Glucosamine Synergy	3/day

Collagen C	4/day
Biost	2/day

Herbal concentrates can be expected to have an immediate effect on some body functions.

Recommended Herbal Concentrates (for the first month):

Saligesic	2/day
Boswellia	4/day
St John's Wort	4/day

Ordering directly from the manufacturer.

You may order any of these by visiting our web page www.holladayphysicalmedicine.com and use the link on the left "Shop Supplements." You will be linked to our Standard Process partner page to order. Put in the names from above that you want to order and proceed. You may want to set up your own account on checkout for future convenience. I recommend it but it is not necessary as you may check out as a guest if you like.

What to Expect

If you begin today to follow the protocol contained herein, you can expect to manage your pain quite well within a week or two. Next, you can expect to begin all the exercises recommended. After two weeks of that, you should expect to be able to do all approved activities without pain. Your time off work should be limited to 1-3 days at most. After one month on the protocol, you can expect to further reduce the treatment frequency, increase activities and exercise and move to the regenerative phase.

The Right Provider

Many people have questions about the treatment protocol and finding the right provider. If you have read the information above, you should have a pretty good understanding of what needs to happen. But that is only half the battle. Finding the right provider to deliver these procedures is critical. To obtain the successful results we reference above, one must be managed by a physician board certified in neuromusculoskeletal medicine and who has the attention and commitment to detail necessary to insure the correct application of the treatment modalities. Medicine is an art and physical medicine is an acquired skill and art.

What does it meant to be board certified in neuromusculoskeletal medicine?

The practitioner who is board certified by The International Academy of Neuromusculoskeletal Medicine (NMSM) is a physician holding a license by the state to practice allopathic, osteopathic or chiropractic medicine. He has extensive, specialized training in physical examination and treatment procedures emphasizing primarily the neuromusculoskeletal structures of the body including the spine and the extremity joints. This involves conditions affecting bones, joints, muscles, tendons, ligaments, cartilage and related nerve structures.

The board certified specialist handles both acute health problems such as automobile accidents and sports injuries as well as more chronic conditions including disc disease, arthritis, scoliosis, and fibromyalgia. Advanced procedures of x-ray, magnetic resonance imaging (MRI) and computed tomography imaging (CT), electro

diagnostic studies, diagnostic ultrasound, nerve conduction studies (EMG) and clinical laboratory procedures are used to assist in the diagnostic process when indicated.

In the course of treatment, this specialist applies manipulative/adjustive procedures along with other treatment options such as computerized axial distraction, ozone injection, physiologic therapeutic modalities, nutritional counseling, structural supports, corrective devices, exercise and rehabilitation regimens, preventive care advice and home therapy programs for patient health.

Is this protocol better than seeing a regular chiropractor, physical therapist or medical doctor?

In most cases, seeing a specialist board certified in NMSM is better than seeing a regular chiropractor, physical therapist or medical specialist because the NMSM specialist is well trained and certified as having the necessary skills of all three of those providers. He has the diagnostic skills not possessed by the physical therapist, has the manipulative skills not possessed by the medical specialist, has the diagnostic and management skills not generally possessed by the regular chiropractor and he has the skill and experience to enlist the skills of each of these others should the need arise.

If I've already seen a chiropractor, physical therapist or medical doctor, can I still see the board certified NMSM specialist?

Starting with any of these providers or having been to the Emergency Room at the hospital only makes your visit to the

NMSM specialist that much easier. He will request your records and simplify your intake process so that you can get on the path to recovery and prevention of disc disease. He will work well with any of these other providers to take advantage of everything they provided for you and increase the effectiveness and outcome of any program you may have already started.

If I go on this protocol, how many treatments will I need, and how quickly can I expect to get better?

The number of treatment sessions required depends on the diagnosis, the overall severity of your injuries and your general health status when you begin the treatment protocol. One treatment session is about 40 minutes long. The total number of treatments averages between 14 and 38 sessions during the initial phase. Some difficult cases may require additional sessions. Relief from pain varies with each individual; however, most patients will experience some pain relief within the first few treatment sessions.

Literature Review

A BRIEF SYNOPSIS OF RESEARCH ON LUMBAR and CERVICAL TRACTION

1) Bogduk, N,: The Anatomical Basis for Spinal Pain Syndromes. JMPT 6:Nov.Dec1995. There is no scientific basis for the belief muscles are a source of chronic pain. However controlled studies show how common disc and facet pain is accounting for more than 70% of chronic back pain.

2) Komari H, et al.: The Natural History of Herniated Nucleus with Radiculopathy. Spine 21: 225-229, 1996 77 patients verified

on pre-post MRI with signs and symptoms of herniation, underwent non-surgical intervention including pelvic traction. Changes in herniation and good-excellent symptomatic improvements were noted in over 82%. The authors draw the conclusion improving the disc's contact with the blood supply accounts for healing of herniation.

3) Onel,D et. al.: CT Investigation of the effects of Traction on Lumbar Herniation. Spine 14: 82-90,1989. 30 patients with lumbar herniations were tractioned in a CT scanner at >50% body weight for ~20 min. Hernia retraction occurred in 70% and good clinical improvements were seen in over 93%. The authors concluded improved blood flow was the source of healing. Additionally they speculated a force.

4) Parsons, WB previous studies showing traction doesn't create negative intradiscal pressures perhaps used too light **Cumming, JDA: Traction in Lumbar Disc Syndrome**. Can Med Jour 77:7-10,1957. 100 patients with disc syndrome unresponsive to manipulation were treated with high force traction (+801b). 86% of patients had good-excellent outcomes 12 had poor outcomes but most had pain for an extended duration.

5) Saal, JA Saal, JS: Nonoperative Treatment of Herniated Lumbar Disc w/ Radiculopathy. Spine 14 (4): 431-437, 1989. 58 subjects had an inclusive conservative program including traction (when initially shown to reduce leg symptoms). Overall 86% had good-excellent results.

6) Mathews, JA: Dynamic Discography: A Study of Lumbar Traction. Annls of Phys Med, IX (7), 265-279, 1968. 3 patients with a ruptured lumbar disc had contrast medium and radiographic

images taken during and after a lumbar traction procedure. The protrusions were shown to lessen considerably with the 30 minute prone traction sessions and a dimpling of the outer annulus suggested a negative intradiscal force was created.

7) Lidstom, A Zachrisson M: PT of the low back pain and sciatica. Scan Joul of Rehab Med, 2: 37-42, 1970. Intermittent supine traction with -+50% body-weight, (10) 20 minute sessions with added exercises showed considerable improvement in over 90% of the 62 patients.

8) Hood, LB Chrissman, D: Intermittent Traction in the Treatment of Rupture Disc Plays Ther 48: 21, 1968. 40 patients with neurological signs were treated with traction on a friction-free table with 55-701bs for 20 minutes. Good-excellent results were seen in 55%.

9) Mathews JA et. al.: Manipulation and traction for Lumbago and Sciatica. Physio Pract 4: 201, 1988. A controlled trial of traction with manipulative techniques. Traction force Applied at ~ 100 lbs for 20 minutes leading to substantial relief in over 85%.

10) Colachis S, Strohm BR: Effects of lntermittant Traction on Vertebral Seperation. Arch of Phys Med& Rehab, 50: 251-258, 1969. Subjects were subjected to a supine 'angled' traction force of up to 100 lbs. with x-ray examination. A rope angle of 18 degrees revealed separation greatest at L4-5 (Note: we speculate a more acute angle ~ 10 degrees affords greater separation at L5-S 1). The separation was obvious up to T12-L1 with total elongation of the spine approaching +5mm. The vertebra separation is greater on the posterior vs. anterior aspect of the vertebra.

11) Constatoyannis C, et. al.: Intermittent Cervical Traction for Radiculopathy Due to Large-Volume Herniations. JMPT, 25 (3) 2002. Three weeks of the above described traction method to large volume hemiations resulted in complete resolution of symptoms in 4 patients.

12) Shealy N, Leroy P: New Concepts in Back Pain Management. AJPM (1) 20:239241 1998. The application of supine lumbar traction with adherence to several specific characteristics including progression to a peak force and altering the angle of 'pull' from 10 degrees (L5-S 1) to 30 degrees (L3) enhanced distraction at specific levels.

13) Gose E, Naguszewski W&R: Vertebral axial Decompression for Pain associated With Herniated and Degenerated Discs or Facet syndrome: an Outcome Study. Neuro Research, (20) 3, 186-190, 1997. A retrospective analysis of over 770 cases, many assumed to be unresponsive to previous therapies showed a 71% good-excellent success rate with ~20 treatments on the prone VAX-D traction device. All patients treated prone with 65-95 lbs. of force 3-5 times per week.

14) Weatherall VF: Comparison of electrical activity in the sacrospinalis musculature during traction in two different positions. J Ortho Sports Phys Ther(8):382-390, 1995. Through the use of EMG electrical activity was shown to be similar in the prone laying position vs. the supine position in a group of patients.

15) Letchuman R, Deusinger RH: Comparison of sacrospinalis myoelectric activity and pain levels in patients undergoing static and intermittent lumbar traction. Spine 18(10): 1361-1365, 1993 This study was used to determine muscular

guarding/contraction of Paraspinals with intermittent vs. static traction. Improved comfort noted in the intermittent traction group.

16) Chin YG, Li FB, Huang CD: Biomechanics of traction for lumbar disc prolapse. Chinese Ortho; Jan(l): 40-2, 1994. Intervertebral pressure was recorded before and during traction. 62% of prolapsed discs showed negative pressure prior to traction. 64% reduced IDP with traction and was related to distraction distance. In 19% of prolapsed discs the pressure actually increased, demonstrating the disruption to the hydrostatic mechanism occurring with complete annular damage and prolapse.

17) Nanno M: Effects of intermittent cervical traction on muscle pain. EMG and flowmetric studies on cervical paraspinals. Nippon Med J; Apr;61(2):137-47, 1994. Cervical intermittent traction was shown to be effective in relieving pain, increasing frequency of myoelectric signals and improving blood flow in effected muscles.

18) Chung TS, Lee YJ et ah Reducibility of cervical herniation: evaluation at MRI during cervical traction with a nonmagnetic device. Radiology Dec; 225(3):895900,2002. 29 patients and seven healthy volunteers had intermittent traction while in MR. Substantial increase in vertebral length was seen. Full herniation reduction in 3 and partial in 18 was reported.

19) Dietrich Met al: Non-linear finite element analysis of formation and treatment of disc herniation. Proc Inst Mech Eng; 206(4):225-31, 1992. The author's analysis shows loads not greater than those occurring in everyday life cause loss of stability of the disc and allow lateral nucleus displacement. The model

indicates conservative therapy by traction may result in retraction of hernia by about 40%.

20) Ramos G, Martin Wm: Effects of axial decompression on intradiscal pressure. J Neuro 81: 350-353, 1994. Significant negative pressure (-100mm Hg) was recorded at L4/5 disc in three volunteers as axial traction was administered. Negative pressure was recorded at -50 pounds tension perhaps representing a minimal threshold force. Patients were prone and harnessed.

References

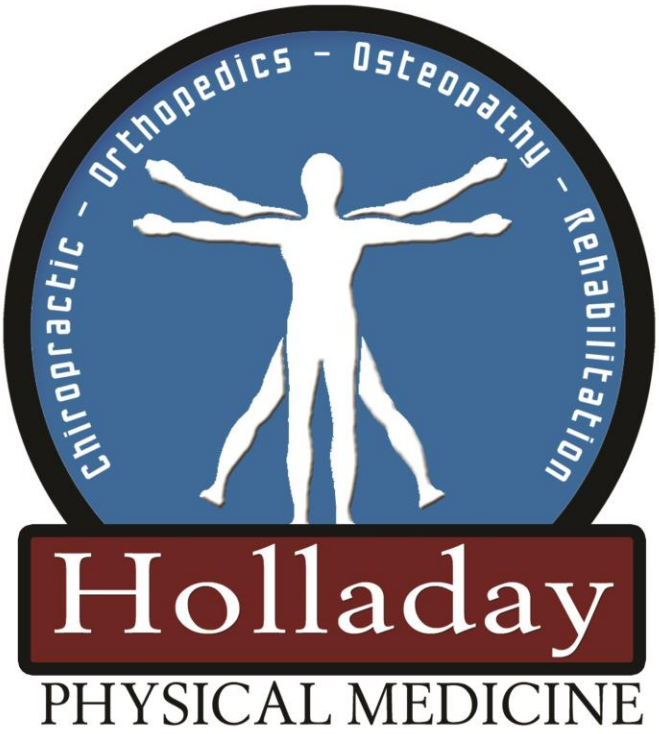
1. Mackenzie R: Mechanical diagnosis and therapy for disorders of the low back. In Taylor JR, Twomey LT (Eds.): Physical therapy of the low back. Churchill Livingstone, New York, 2000 p.26 & 143.
2. Kushlich SD, Ulstrom RN, Michael CJ: Tissue origin of low back pain and sciatica. Orthop Clin North Am (22): 181,1991.
3. Nachenson AL, Elfstrom G: Intravital dynamic pressure measurements of Lumbar discs. Scand J Rehabil Med 2 Supp 1:1-40, 1970.
4. Yong, Hing K., Kirkaldy-Willis WH:' Pathophysiology of degenerated discs of the lumbar spine. Phila. The Ortho Clinics of N. Am. Vol.(14) #3 July 83, p.p. 493504.
5. Bogduk N., Twomey L.: Clinical anatomy of the Lumbar Spine. ChurchillLivingstone New York. 1992. p.p. 68-69 & 151-173
6. Twomey LT.: Sustained lumbar traction: An experimental study of long spine segments. Spine 1985; (10): 146-149.
7. Judkovich BD.: Lumbar traction therapy-elimination of

physical factors that prevent stretch. JAMA 1955; 159.
8. Gose E, Naguszewski L.: Vertebral axial decompression therapy: an outcome study. Neuro Resarch. (20)#3, April 1998.
9. Mathews JA.: Dynamic Discograhy: A study of lumbar traction. Annals of Phy Med, IX (7) 1968, p.p. 265-279.
10. Colachis SC.et al: Effects of intermittent traction on vertebral separation. Arch of Phy Med & Rehab 1972 (50), p.p.251-258.
11. Shealy CN. Borgmeyer V.: Decompression, reduction, stabilization of the Lumbar spine: A cost effective treatment for lumbosacral pain. AJPM 1997, 7(2), 663 -665.
12. Winkle D, et al.: Diagnosis & treatment of the lumbar spine. Aspen: Maryland: 1996 p.p. 303-313.
13. Degenerative disorders of the spine. In: Hochschuler SH, Cotler HB, (Eds.) Rehab of the Spine. Mosby MO. 1993 p.p.464-465 & p.260,
14. Cyriax JH: Illustrated Manual of orthopaedic med, London, Butterworths, 1983 p.p. 30-40.
15. Schiotz E, Cyriax JH: Manipulation, past and present. London, Heinemann, 1975
16. Biomechanics. In: Hochschuler SH, Cotler HB, (Eds.) Rehab of the Spine. Mosby MO.1993 p.p. 146.
17. Kushlich S: Tissue origin of mechanical low back pain and sciatica. In: Hochschuler SH, Cotler HB, (Eds.) Rehab of the Spine. Mosby, MO. 1993 p.p.595-599.
18. Natural history of the lumbar spine. In Taylor JR, Twomey LT,(Eds):Physical Therapy of the Low Back, Churchill Livingstone, New York, 2000, p.p 25-26 & 43-51.
19. Onel D et al. Computed tomographic investigation of the

effects of traction on lumbar disc herniations. Spine 1989; 14(1):82-9
20. Hides J, Stokes, M, et al: Evidence of lumbar multifidus wasting ipsilateral to symptoms in patients with low back pain. Spine 1995, 19(2): p. 165
21. Anderson DBJ, Nachemson, AL. Intervertebral disc pressures during traction. Scand J of Rehab Supple 1983; (9):88-91.
22. Colachis S, Strom J: Cervical traction. Arch Phys Med 1965 (64):815.
23. Harris P: Cervical traction: Review of liturature and treatment guidelines. Phys Ther (57):910, 1977.
24. Braaf MM, Rosner S. Recent concepts in treatment of headache. Headache, (5):3844 1965.
25. Cyriax J: The treatment of lumbar disc lesions. British Medl Jour Dec.23 14341438.
26. McElhannon JE: Physio-therapuetic treatment of myofascial disorders. Anaheim Hills, CA.: James McElhannon.
27. Deyo RA, Loeser JD, Bigos SJ. Herniated lumbar intervertebral disc. Ann Intern Med 1990:(112): 598-603.
28. Breig A, Troup J: Biomechanical considerations in the straight leg raise test. Spine 1979; (4):242.
29. Mazion JM, Haynes LM: Mazion's illustrated reference of orto/neuro/physio diagnostic techniques. Casa Grande, Mazion publisher, 4th ed, 1980
30. Greenstein GM: Clinical assessment of neurological disorders. St. louis, Mosbyyear book, Inc. 1995.
31. Weber H: The natural history of disc herniation and the influence of intervention. Spine 1994 (19): p.p. 2234-2238.

32. Saal JA, Saal JS: The non-operative treatment of HNP with radiculopathy: an outcome study. Spine 1989 (14): p.p. 431-437.
33. Komori H, Shinomiya K, et al., The natural history of HNP with radiculopathy. Spine (21): 225-229, 1996.
34. Quain MB, Tecklin JS,: Lumbar traction: it's effect on respiration. Phys Ther 1985; 65 (9): 1343-6.
35. Krause M, et al: Lumbar traction: evaluation of effects and recommended application for treatment. Man Ther 2000, May;5 (2): 72-81.
36. Gillstrom P, Erickson K,: CT exam of influence of autotraction on herniation of lumbar disc. Arch Orthop Trauma Surg 1985; 104(5):289-93.
37. Beurskens AJ et al: Efficacy of traction for non-specific back pain. Spine 1997 Dec 1 ;(23): 2756-62.
38. Laban MM et al: Intermittant cervical traction: a progenitor of lumbar radicular pain. Arch Phys Med Rehab 1992 Mar;73 (3):295-6.
39. Pellecchia GL: Lumbar traction: a review of the liturature. J Orthop Sports Phys Ther 1994 Nov:20 (5): 262-7.
40. Austin R: Lumbar traction a valid option. Aust J Physio 1998; 44 (4):280.
41. Constantoyannis C, et al: Intermittent cervical traction for radiculopathy due to large-volume herniated discs. JMPT 2002 Mar; 25 (3).
42. Adams M, Bogduk Net al: Biomechanics of back pain. Churchill Livingstone NY, 2002: p,p 163-167
43. Grieve G: Mobilization of the spine. Churchill Livingstone NY, 1991: p.p 273283.
44. Martin M, Ramos G: Effects of vertebral axial

decompression on intradiscal pressure. J Neur 81: 350-353, 1994.
45. Richardson C, Jull Get al: Therapeutic exercises for spinal segmental stabilization in low back pain. Churchill Livingstone NY, 1999.
46. Dullerud R, Nakstad P: CT changes after conservative treatment for lumbar disc herniation. Acta Radiol Sept;35(3):415-9, 1994.
47. Quain MB, Tecklin JS: Lumbar traction: its effect on respiration. Phys Ther Sept;65 (9):1343-6, 1985.
48. Mcgill S: Low back disorders (evidence-based prevention and rehabilitation). Human Kinetics, 2002.
49. Hseuh TC, Ju MS: Evaluation of the pulling angle and force on intermittent cervical traction. JFMed Assoc 1991 Dec;90(12): 1234-9
50. Saal JS, Saal JA: Nonoperative management of herniated cervical IVD with radiculopathy. Spine 1996 Aug 15;21(16): 1877-83.
51. Weatherall VF: Comparison of electrical activity in the sacrospinalis musculature during traction in two different positions. J Ortop Sports Phys Ther 1995;(8): 382390.
52. Letchuman R, Deusinger RH: Comparison of sacrospinalis myoelectric activity and pain levels in patients undergoing static and intermittent lumbar traction. Spine 1993;18(10): 1361-1365.



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