

# DECOMPRESSION

(traction therapy)

for back/neck & leg/arm pain  
& associated symptoms

March 2009

# About Us

- Not traction guru
- Practicing DCs
- Using Traction Table
  - 4 ½ years
  - 4500-5500 Traction Encounters
- Recently certified in Kennedy Decompression Technique
- Excellent results over last 4 years
- Evolving Treatment Protocol with new knowledge
  - ATMI

# Traction is Traction

However...

It has great clinical value with:

- Proper patient selection by clinician
- Matching unique patient need to traction hierarchy for maximum benefit
- One more alternative for non-surgical disc, or those failing other interventions

# Traction History

- Dating 400 B.C.
- Hippocrates: First written account
  - “Hippocrates advocated that the patient be given a steam bath, then placed prone, bound to a board, and traction applied by assistants, pulling on head and feet. While this was being done, the physician would press sharply on the affected area, or sit on the back and bounce up and down or even stand on the back”
- Galen (200 A.D.): “traction for dislocated discs”

- The Egyptian papyri (circa 3,000 B.C.)
  - Reducing spinal fractures, dislocations, and other conditions)
- W. Gayle Crutchfield (1933)
- Cyriax (1950's)
- Gertrude Lind (1974)
- Sister Kenny Institute (1974)
  - Graviy Lumbar Reducing Institute

# Is it Traction or Decompression

- Mechanical traction creates axial elongation of the spine, producing (hopefully) reduced intradiscal pressure or decompression
- No valid scientific differentiation between traction and decompression
- Traction creates accessory motion...  
Distraction (-Y Translation)
- Decompression of Disc  $\approx$  50 lbs.

# Pressure changes during prone traction...

**-IDP during linear application phase**

G. Ramos and W. Martin

J Neuro Surg 1994

TABLE 1

*Effect of lumbar traction on intradiscal pressure\**

Case No.	Sex, Age (yrs)	Index Monitored	Session No.							
			1	2	3	4	5	6	7	8
3	M, 23	traction tension (lbs)	0	47	55	58	69			
		intradiscal pressure (mm Hg)	75	-25	-39	-43	-66			
4	F, 41	traction tension (lbs)	0	20	40	55	60	63	65	70
		intradiscal pressure (mm Hg)	60	30	-76	-110	-126	-117	-160	-106
5	M, 34	traction tension (lbs)	0	50	90	94	98			
		intradiscal pressure (mm Hg)	62	-106	-138	-134	-157			

\* See Fig. 2 for graphs of data points. Measurements in the first two patients could not be translated accurately and are omitted (see text).

# Traction Devices - FDA

- All have 501K premarket clearance as mechanical/mechanized traction
- FDA allows decompression to be cited as an outcome... when defined as: unloading due to distracting and positioning
- Traction can achieve effects through “decompression”
- No device has the classification Decompression
- Term FDA “Cleared”



# Effects: Mechanical

- Separates vertebrae
- Changes intradiscal pressure
- Opens lateral canal
- Stresses facet joints and IVD
- Stretches intervertebral ligaments
- Stretches muscles

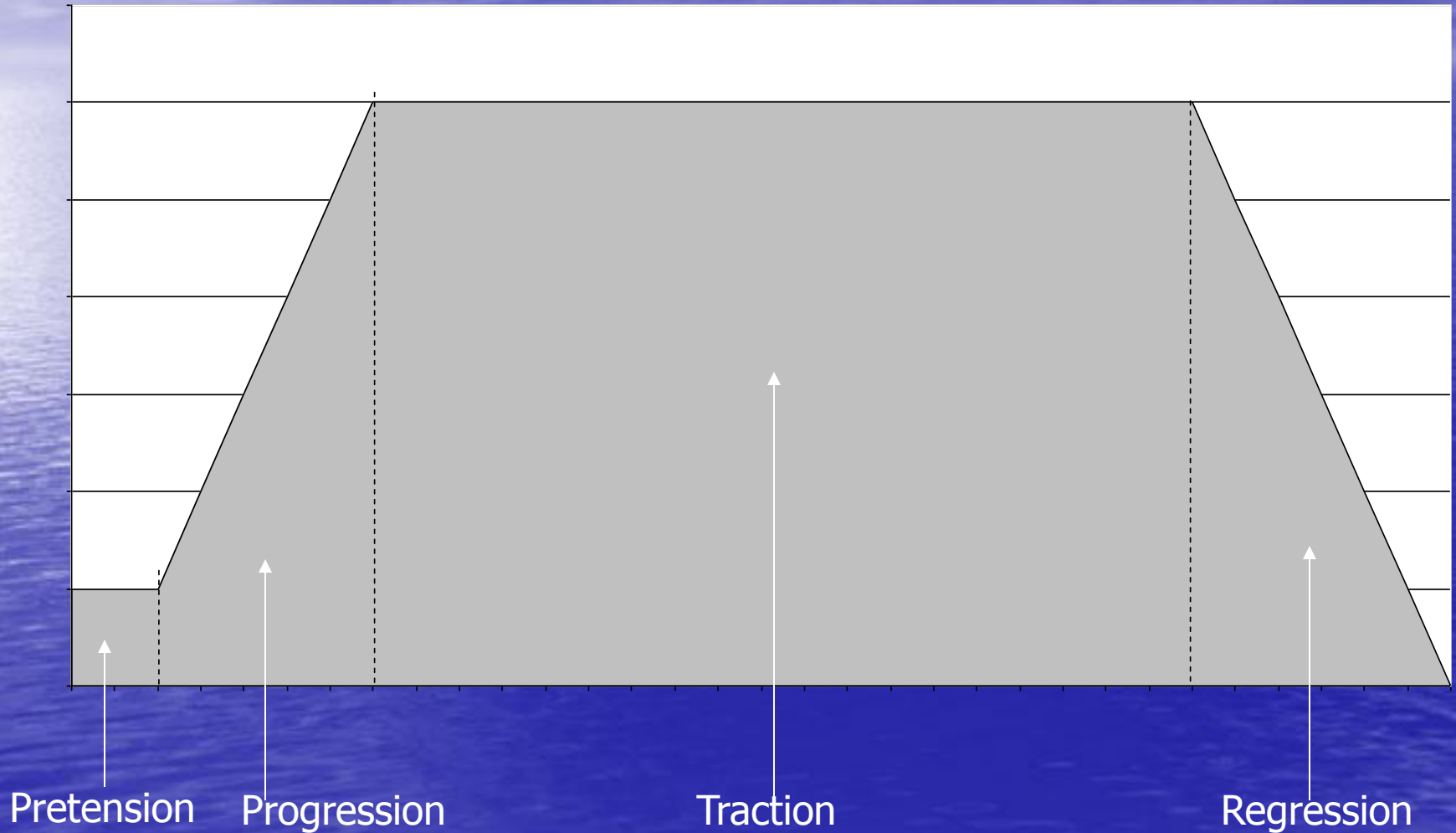
# Effects: Physiological (Disc)

- Relieves nerve root compression
- Can cause negative pressure in disc resulting in reversal of protrusion
- Improves synovial movement in facet joints
- Improves blood flow to disc
- Stimulates mechano receptors

# Evolving Design of Traction allows

- Maximum physician control over parameters
- Control over critical parameters such as speed, progression, stretch window, patterns of traction, and regression phase, intermittent
- Belting that creates support and targeted pull without patient discomfort
- Table articulations allow for postural abnormalities and patient comfort
- Friction free surface initiates automatically, eliminating operator errors
- Accommodates multiple patient position
- Elevating table/motor to change angle
- Intelligent protocols

# The Four Phases of any Traction pull



# Decompression Pull Logarithm

## Some models from (KDT)

### Long

- Mild/Moderate Pain
- Chronic/SubAcute
- Not acute sciatica
- 45 sec pull
- 30 sec rest
- Compression syndromes

### Short

- Mild/Moderate Pain
- Tentative/Acute
- 15 sec hold
- 25 sec rest

### Impulse

- Moderate/severe pain
- Chronic pain (non-inflammatory)
- Gradient impulse pull
- More Type III mechanical receptor

### Reverse Gradient

- Upper level lumbar
- Multilevel herniation
- Sciatica
- Reverse gradient tensioning

### Acute Inflammation

- Acute inflammatory pain
- Progressive incremental cycling
- Accelerated imbibition
- Oscillation to increase circulation and reduce chemical irritation

### CPM

- Well elderly
  - Gets better with motion
  - Feel better as day goes on
- Have facet referral
- Continuous Passive Motion
- Produces less imbibition
- Imbibition causes irritation with annular stretch



Who to Traction?

Body *imbalances* (posture faults)  
lead to:  
movement *impairments...*

ARE:

Movement *disorders* (motor control deficits,  
altered proprioception, inappropriate muscle  
activation patterns etc.)

lead to:

**compression** syndromes...  
(& additional reflexive movement *disorders*)

“Prediction detective”

Look to “**Known**” classifications:

- ✓ Extension directional relief (57%)  
or *another directional preference*
- ✓ Sit-to-stand pain...Lordotic relief
- ✓ Antalgia
- ✓ Shear instability; Form/Force Closure
- ✓ Referral of pain/symptoms
- ✓ Nerve tension signs
- ✓ IDP provocations: SLR/Milligrams...
- ✓ Radiographs & MRI/CT



# CPR for 'traction' response

- Sciatic
- SLR/Crossed SLR
- Poor-centralizer with extension initially
- At 2 weeks a defined benefit in this otherwise recalcitrant sub-group
- +6 weeks of decompression...with other methods included, may be warranted.

## *the* "TRACTION 3"

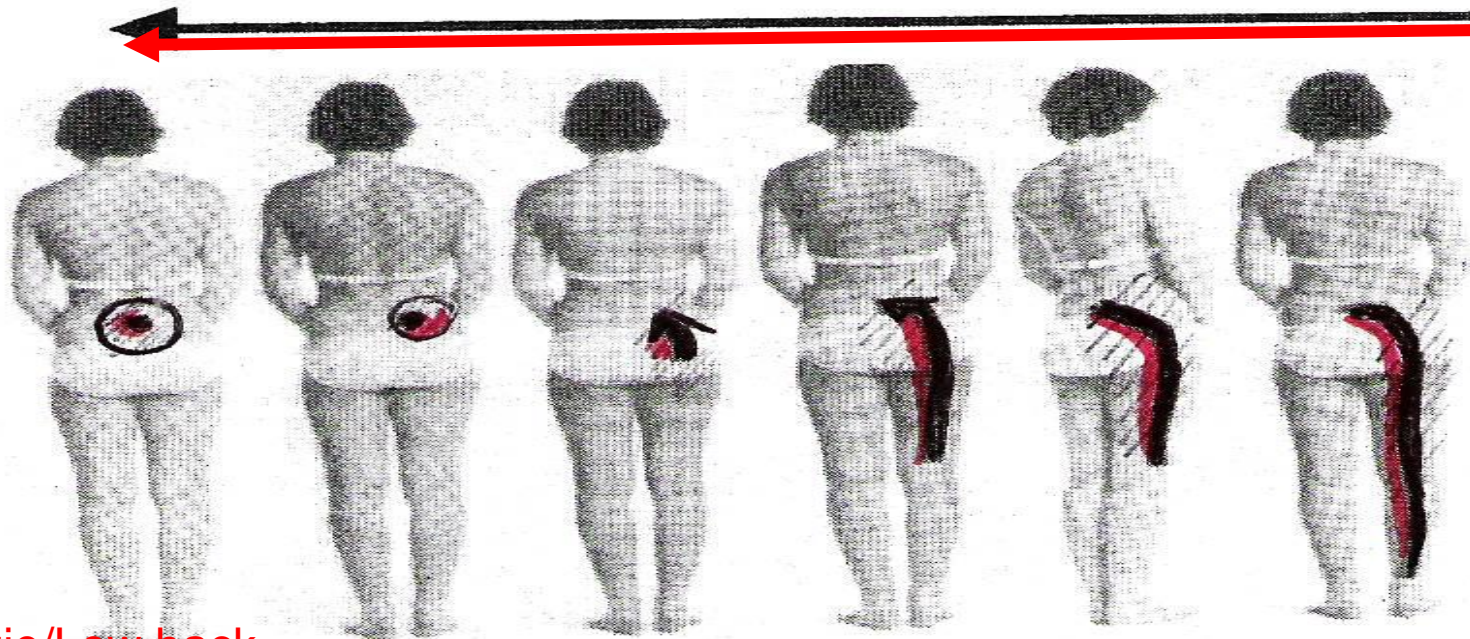
- **Decompression**...nutrient enhancement, healing improvement, centripetal effect.
- **'Stretch'**... regional mobilization, stimulation & modulation of mechanoreceptors, generalized 'stretch' of shortened structures.
- **Directional preference**...*axial* motion as a 'directional preference' to create ***centralization*** effect...may be the ***only way*** for some patients to gain fast relief.

# In effect...

## Decompression relieves pain by:

- 1) Inflammatory control & cellular migration via enhanced diffusion from the reduced intradiscal pressure (IF hydrostatic).
- 2) (?) Actual physical *retraction* of displaced tissue via *centripetal* effect... 'reduced' nerve pressure
- 3) Reflex inhibition via mechanoreceptors.
- 4) Placebo effects.

# The Centralization Phenomenon



Mckenzie/Low back

Referral pain **CENTRALIZES** as the disc heals.

**Non-centralizers** often remain *non-responsive*...

**Traction can *Centralize disc* pain (with & *without* a directional preference) in many cases**

Prone traction offers advantages in many cases...

# Hierarchy of *Decompression*...

- 1) Proper patient selection.
- 2) Proper position.
- 3) Force.
- 4) Length of treatment.
- 5) Time/force interplay (pull pattern).
- 6) *Angle* of treatment.



# Patient Categorization

Based on work of:

- McKenzie
- Sahrman
- Maitland
- Grievess

Contraindication

## Disc Compression Syndromes

Access with Flex/Extension

Directional Preference

Traction Trial

## Combination

Traction

Instability

ATMZ

Stabilization

## Instability Syndromes

• Not traction candidates

• Assess with Form/Force Closure

ATMZ

Stabilization

# Traction Tables – Today Consideration

- All perform traction
  - Prices vary \$5K - \$100K+

Table Utility	vs.	Bells & Whistles
Accommodates optimal position preference	vs.	Only Supine or Only Prone
Accommodates Cervical & Lumbar Traction	vs.	Only Lumbar
Intermittent with static option	vs.	Static
Intelligent pull patterns based on Patient categories	vs.	Same patterns for all
Clinician skill	vs.	Table magic

# Traction To Create Decompression Effect

## Forces

### Lumbar:

- $\frac{1}{2}$  of  $\frac{1}{2}$  body weight plus 15 lb to start
  - If relief don't increase

### Peak Ranges:

Male	65-110 lbs	Maximum 35% body weight
Female	60-85 lbs	

- Not less 50 lbs
- Minimum hold 30 lbs



# Traction To Create Decompression Effect

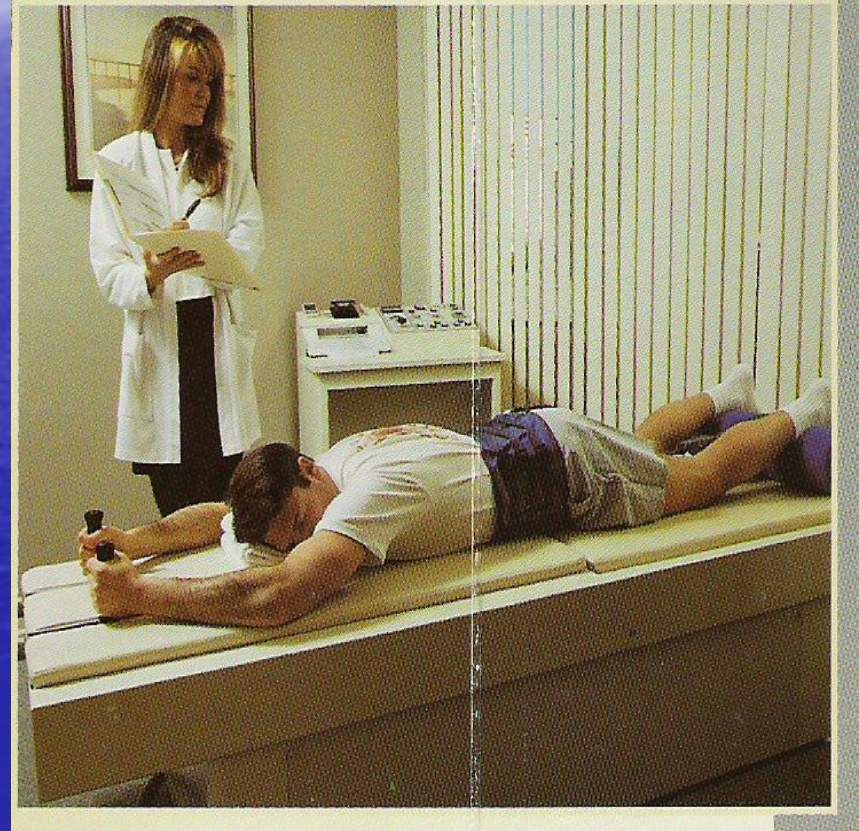
## Forces

### Cervical:

- 10% Body Weight
- Ranges
  - Male 22-25 lbs
  - Female 18-22 lbs
- Start at low end
  - Get results don't increase

# The original **Decompression** device

- VAX-D 1993
- Prone Only
- \$125,000.00
- Now \$60,000
- Equal effect with DTS



# The "original" Supine only Decompression table...DRS

- The original supine DRS system...
- \$100,000+



**DTS** combines a practical platform with an advanced programmable *traction* motor ... highly effective restraint system, utilitarian table mechanics and protocols proven through several years of clinical use.



# *Extension prone position*

Reverse hammock...

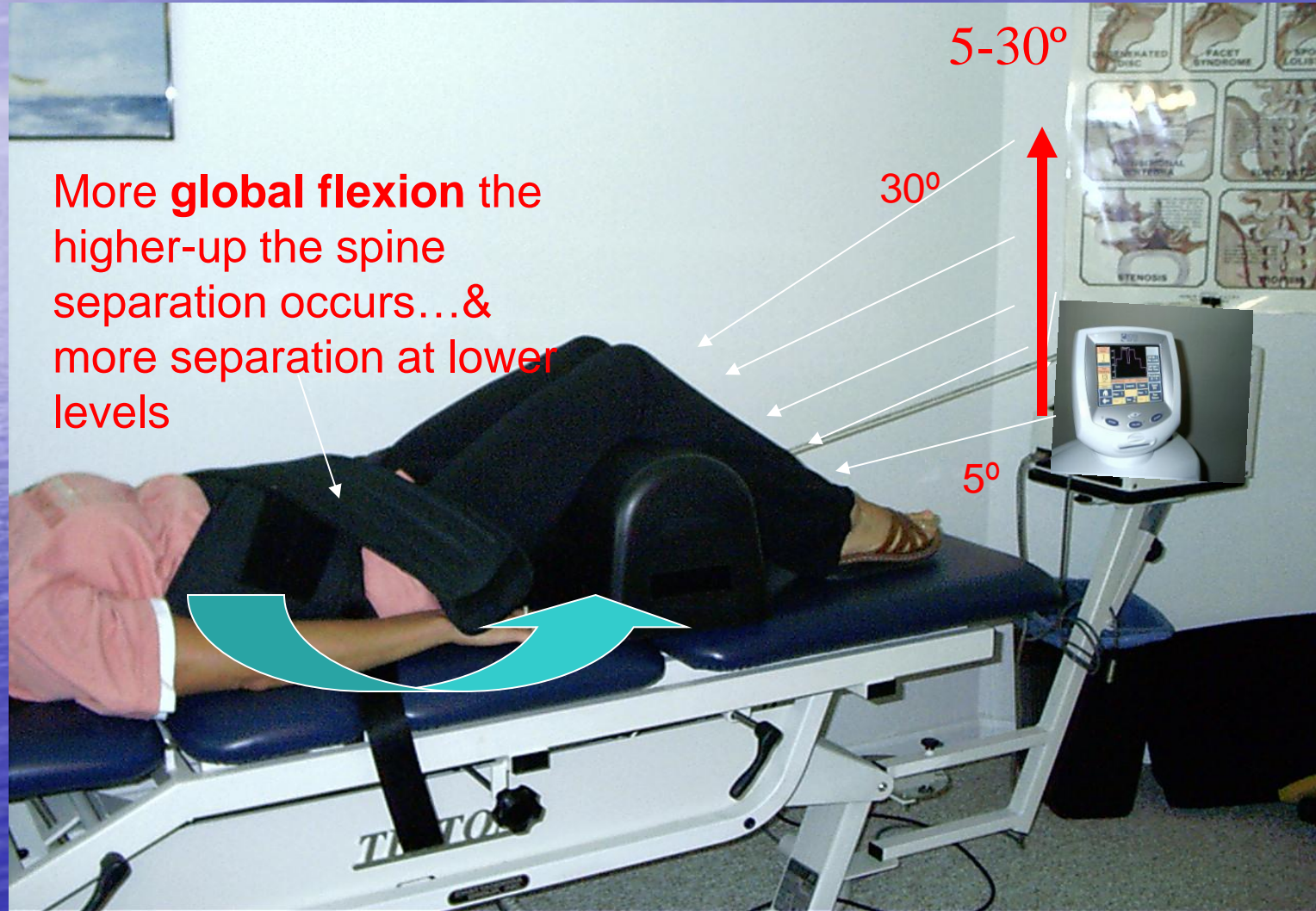


“Semi-fowler”...Hammock position...

Pain in standing & prone extension



# Supine with ~20 degree rope angle and bolsters



Cervical decompression via Saunders unit.

Similar effect as lumbar traction. Nerve tension signs/herniated disc/degenerative disc

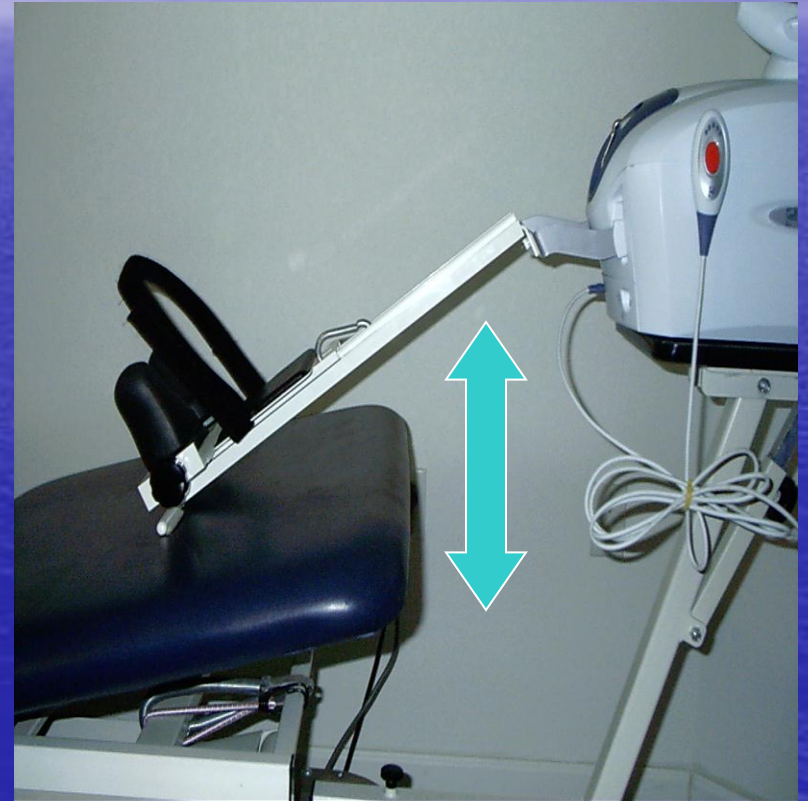




Neutral position



Flexion position



Variation of flexion angle allows relative 'targeting' of lower vs. upper cervical levels.

# Contraindication - Direct

- Bone Cancer
- Fractures
- Severe RA w/stair-stepping
- Severe Osteoporosis (>45% DeXA)
- Implanted Bone – Bone appliances (cages, screws, rods)
- Artificial Disc
- Morphine Pumps
- Acuity sprain/strain with sagittal motion impairment
- Peripheralization of pain upon axial elongation
- <6 months post-spinal surgery
- <6 months post-inguinal or umbilical hernial or abdominal surgery (or as deemed safe by surgeon)

# Contraindication = Relative

- Moderate OA & RA without obvious ligament compromise
- Grade 2+ spondylolisthesis (stable vs. unstable)
- Retro & lateral listhesis – based on traumatic vs. degenerative status
- Severe acute antalgia compromising positional comfort
- Pagets Disease or other Iliac Structure Compromise
- Severe Nerve Root Encroachment Sign (20° SLR)
- Severe Degeneration

# Traction Producing Decompression Effect

## Research

- Mixed... but promising

# Research

## Effects on Disc Herniation

- 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%.

Non-linear finite element analysis of formation & treatment of disc herniation. Proc Inst Mech Eng 1992.

- 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.

Reducibility of cervical herniation: evaluation at MRI during cervical traction. Radiology 2002.

- 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.

Computed tomographic investigation of the effects of traction on LDH. Spine 1989.

# Research

## Effects on Disc Herniation

- Reduction of extraforaminal disc herniation using a multi-modal approach including traction therapy.

The natural history of HNP with radiculopathy. Spine 1996.

- 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.

Effect of continuous lumbar traction on the size of herniated disc material in lumbar herniation. Rheumatol Int 2005.

- During traction there was a reduction of LDH, increased spinal canal space, widening of the neural foramen & decreased thickness of psoas.

CT evaluation of lumbar spinal structures during traction. PhysioTher 2005.

# Research Efficacy

- A retrospective of 770 cases assumed, though uncontrolled as to previous treatments showed a 71% good-to-excellent response through 20 prone traction treatments.

Vertebral axial decompression for pain associated with herniated and degenerated discs or facet syndrome: an outcome study. Neuro Res 1997.

- Traction, ultrasound and Laser were all effective in this group with LDH.

Comparison of 3 PT modalities for acute pain in lumbar disc herniation measured by clinical evaluation and MRI. JMPT 2008.

- 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.

The non-operative treatment of HNP with radiculopathy: an outcome study. Spine 1989.

# Research Efficacy

- 41% use traction for sub-acute, nerve root signs. 87% use it in a multi-modal approach.

Current use of lumbar traction in the management of LBP (UK). Arch of Phys Med Rehab 2005.

- A multi-modal approach, including cervical traction therapy showed significant short-term outcomes.

Predictors of short term outcome with patients with cervical radiculopathy. Phys Ther 2006.

- Cervical traction and thoracic manipulation seem useful for the reduction of pain scores and levels of disability in this condition.

Cervical traction and thoracic manipulation for the management of mild cervical myelopathy from a herniated cervical disc. J Orth 2006.

- 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.

Outcomes after prone lumbar traction protocol with activity limiting LBP: A prospective case series study. Arch Phys Med Rehab 2008.



# Research

## IVD Pressure Changes

- 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.

Biomechanics of traction for lumbar disc prolapse. Chin Ortho 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.

Effects of axial decompression on IDP. J Neurosurg 1994.

# Research

## IVD Pressure Changes

- 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.

Stress in lumbar IVD during distraction: a cadavaric study. Spine 2007.

- Distraction appears to predictably reduce nucleus pulposis pressure. That reduction is ultimately dependant on the health of the disc.

Stress in lumbar IVD during distraction: a cadaveric study. Gay RE et al. Spine (11)1 2007.

# Research

## Clinical Prediction Model

- 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.

Is there a sub-group of patients with LBP likely to benefit from traction? Spine 2007.

- 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.

Lumbar spine traction: evaluation of effects and recommended application. Manual Ther 2000.

# Research

## Modern Traction/Mechanical Effects

- 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.

New concepts in back pain management. AJPM 1998.

- Gravitational traction had a very apparent effect on intervertebral space and in distraction of the lumbar vertebra.

Distraction of lumbar vertebra in gravitational traction. Spine 1998.

# Research

## Traction Weight

- 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.

Effects of axial decompression on IDP. J Neurosurg 1994.

- This study suggests 10% body weight as the ideal weight with minimal side effects and highest therapeutic effect.

Effects of different cervical traction weights on neck pain and mobility. Niger Postgrad 2006.

- Positive SLR below 45° improved post traction treatment in both 30% & 60% body weight. Low force many have equal benefits.

Effect of 10%-30% & 60% body weight traction on SLR test of symptomatic patients with LBP. J Ortho Sports Phys Ther 2000.

# Research Traction Angle

- A rope to harness angle of  $18^{\circ}$  afforded the greatest separation through L4/L5 with reduction of frictional resistance. Separation is greatest posterior vs. anterior with separation noted through T12.

Effects of intermittent traction on vertebral separation. Arch of Phys Med & Rehab 1969.

- Examination of pull angle reveals neutral (less angulation) creates more separation at levels C4/5.  $+30^{\circ}$  pull angle separates C6/7 in comparison. In terms of force: above 30 pounds increased discomfort.

Evaluation of the effects of pulling angle and force on intermittent cervical traction. J Formos Med Assoc. 1991.

# Research

## Static vs. Intermittent

- Static, intermittent & manual traction methods were assessed. Intermittent traction performed significantly better than the other methods.

Cervical spine disorders. A comparison of 3 types. Spine. 1985.

# Research Physiology

- The results suggest that hydrostatic pressures influence IVD cell metabolism. Abnormal hydrostatic pressure may accelerate disc degeneration.

Effects of hydrostatic pressure on matrix synthesis & matrix metalloproteinase production in human lumbar IVD. Spine 1997.

- 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.

Blood pressure & pulse rate changes associated with cervical traction. Niger J Med. 2006.

- Traction may improve conduction disturbance primarily by increasing the blood flow from the nerve roots to the spinal parenchyma.

Research on the effectiveness of intermittent cervical traction using short-latency somatosensory evoked potentials. J Ortho Sci 2002.



# Research Physiology

- Cervical intermittent traction was shown to be effective in relieving pain, increasing frequency of myoelectric signals and improving blood flow in effected muscles.

Effects of intermittent cervical traction on muscle pain. EMG and flowmetric studies on cervical paraspinals. Nippon Med J 1994.

- 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

Cyclical tensile stress exerts a protective effect on the IVD. Sowa et al. [Am J Phys Med Rehab \(87\) 2008 537-455.](#)

# Research Muscle Activity

- Study indicated there is NO EMG activity in prone or supine traction positions. Improved comfort is noted in intermittent group.

Comparison of sacrospinalis myoelectric activity and pain levels in patients undergoing static and intermittent lumbar traction. Spine 1993.

- EMG indicates no electrical activity prone vs. supine traction positions.

Comparison of electrical activity in sacrospinalis musculature during traction in two different positions. J Ortho Sports Phys Ther 1995.

- 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.

The influence of different unloading positions upon stature recovery and paraspinal muscle activity. Clin Biomech 2005.

# Research Combined Treatments

- A controlled trial of traction with manipulative techniques led to substantial relief in 85% of participants.

Manipulation and traction for lumbago and sciatica. Physio Prac 1988.

The background is a smooth blue gradient. On the left side, there is a bright, glowing area that resembles a sun or moon reflecting on water, creating a shimmering effect. The rest of the background is a deep, uniform blue.

Thank You