Deep Dive: Brachiation

Brandon Hetzler
1.20.2021

Video Links: click on each to watch the videos

Video 1: Intro - https://youtu.be/OZ379DRTod8

Video 2: Lit Review - https://youtu.be/tcOfshtLEgk

Video 3: Clinical Application - https://youtu.be/ZNbfyAJH9yI

Video 4: Advanced Techniques - https://youtu.be/FQA9RUvayqw

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If you are going to apply these techniques to individuals you are treating, please make sure you have a solid rationale, which should be based upon an assessment. We are hoping that you will assess, use these interventions, and then re-assess to insure you are achieving the outcome you were anticipating.

INTENT

Give you a much deeper understanding of brachiation so that you can you this tool at a higher clinical level.

Provide research supported explanations on the effects of brachiation.

Provide advanced techniques of brachiation.

Provide specific protocols for brachiation.

CEU's will be provided –upon completion of a quiz and course review- by Outlaw Movement Systems, LLC (OMS).

OBJECTIVES:

A historical perspective

Develop an advanced ability to implement brachiation into treatment plans

Construct a treatment plan that utilizes brachiation to target specific clinical objectives

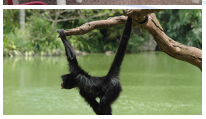
Understand the systemic effects of brachiation and inversion

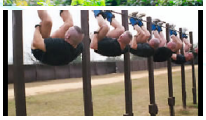
Examine what the research reveals regarding brachiation and inversion

Overview of Brachiation

What is Brachiation?

Hanging from the limbs





History

Dr. Robert Martin

- Cum Gravity – Living with Gravity (1973)
- The Gravity Guidance System (1960)
- https://youtu.be/VKTFyErotDw

Dr. Ed Thomas

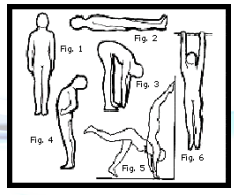
- https://youtu.be/6xUpLVM5lEk

History

Effects: Produce body *decompression* and *elongation* of stature.

Used: To counter and correct adverse effects of gravity produced by the common postures

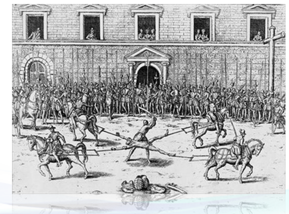
1. The EXTENDED POSTURE (The posture of Bending Backwards) F4
2. The BRACHIATED POSTURE (The posture of hanging by the limbs - upper or lower) F6
3. The INVERTED POSTURE (The Upside-down Posture) F5



Thomas, E. Children of Clay. https://www.energycenter.com/grav_f/inver_clay.html

Gravity applies its constant, relentless force to the pliable, moldable, movable structures of the body, much like a potter manipulates and molds clay.

Part 1



Klatz, RM., Goldman, RM., Tarr, RS., Pinchuk, BG. Gravity inversion therapy. Western Journal of Medicine. 1983; 139(4): 538.

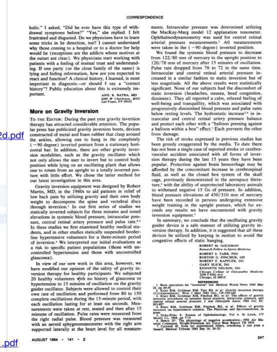
- "physicians should be made aware of the potential risks associated with inversion procedures."

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1021582/pdf/westjmed00194-0102d.pdf

Goldman, RM., Tarr, RS., Pinchuk, BG., Kappler, RE., Slick, G., Nelson, K. More on gravity inversion. Western Journal of Medicine. 1984; 141(2): 247.

- "In view of our new work in this area, however, we have modified our opinion of the safety of gravity inversion therapy for healthy participants."
- "we conclude that the oscillating gravity guider device is a safe manner of utilizing gravity inversion therapy."

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1021765/pdf/westjmed00180-0101.pdf


CORRESPONDENCE

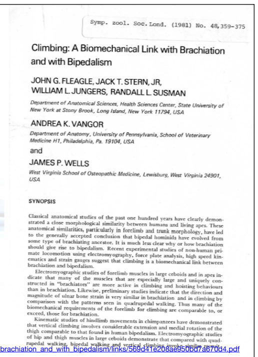
More on Gravity Inversion

AUGUST 1984 • 141 • 2

247

Fleagle, J., et al. Climbing: A Biomechanical Link with Brachiation and with Bipedalism. Symp Zool Lond. 1981; 48: 359-375.

- **Climbing and Hanging are not the same**
  - High muscle activation vs. low
  - Suspension from the arm creates unique strain on the MT interface and the skeletal system
- There is a presence of brachiating adaptations in the limbs of many species that are not currently brachiators


Symp. zool. Soc. Lond. (1981) No. 48, 359-375

Climbing: A Biomechanical Link with Brachiation and with Bipedalism

JOHN G. FLEAGLE, JACK T. STERN, JR, WILLIAM L. JUNGERS, RANDALL L. SUSMAN

ANDREA K. VANGOR

and

JAMES P. WELLS

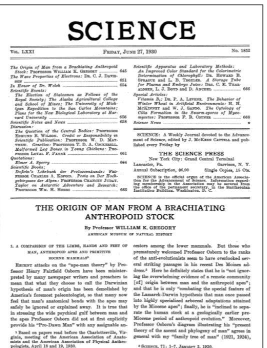
SYNOPSIS

https://www.researchgate.net/profile/John_Fleagle/publication/285387305_Climbing_A_biomechanical_link_with_brachiation_and_with_bipedalism/links/

Gregory, WK. The origin of man from a brachiating anthropoid stock. Science. 1930; 71(1852): 645-650

- **Man has not lost the ability to brachiate effectively.**
- Comparative anatomy supports that all bones of the limbs, hands, feet, pectoral and pelvic girdle of man are very similar to those of gorillas and chimpanzees
- The humerus of man is very near that of the brachiating chimpanzees

http://phsgirard.org/Anthropology/Evolutionofman.pdf


SCIENCE

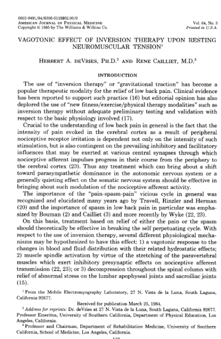
Vol. LXXI   Friday, June 27, 1930   No. 1852

THE ORIGIN OF MAN FROM A BRACHIATING ANTHROPOID STOCK

By Professor WILLIAM K. GREGORY

DeVries, HA., Cailliet, R. Vagotonic Effect of Inversion Therapy Upon Resting Neuromuscular Tension. American Journal of Physical Medicine. 1985; 64(3): 119-129.

- 28% decrease in NM tension
- 2-min inversion = 2-hour of effects
- No change in resting HR or BP
- At Head down (-1G): the release of sympathetic stimulation decreases sympathetic DV responses and sets the stage fore a shift in autonomic balance toward vagal or parasympathetic dominance.


VAGOTONIC EFFECT OF INVERSION THERAPY UPON RESTING NEUROMUSCULAR TENSION

HERBERT A. DEVRIES, PH.D. AND RENE CAILLIET, M.D.

INTRODUCTION

Vernon, H., et al. Inversion Therapy: A Study of Physiological Effects. The Journal of the CCA. Sept 1985; 29 (3): 135-140.

- Minimum – 70sec
- 25% Increase in lumbar flexion ROM
- 50% decrease in paraspinal muscular activity (@3')
- Decreased lumbar lordosis
- No change in CV markers

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2484360/pdf/jcca00075-0029.pdf

Inversion therapy: a study of physiological effects

Howard Vernon, BA, DC, FCCSS(C)*
James Meachim, DC*
Joseph Nielsen, DC*

Inversion traction therapy has received only modest scientific investigation. No study to date, has investigated a complete range of physiological parameters pertinent to inversion therapy. In this study, a set of physiological parameters including cardiovascular, pulmonary and orthopaedic were measured in a normal population using the Inversator. Our results demonstrated a significant increase of forward trunk flexion, a decrease in CT-T12 distance, and a decrease in depth of the thoracolumbar kyphosis of the L4-5 and L5-S1 disc spaces, as well as a lack of change in heart rate and blood pressure. These findings establish the physiological basis for the clinical effects of Inverchair Therapy and for its appropriate clinical utilization.

KEY WORDS: inversion, traction, chiropractic, manipulation

La thérapie par traction inversée n'a fait que très modérément l'objet d'une recherche scientifique. Jusqu'à ce jour, aucune étude n'a établi une gamme complète de paramètres physiologiques se rapportant à la thérapie par inversion. Dans la présente étude, un ensemble de paramètres physiologiques a été mesuré sur parmètres cardiovasculaires, biomécaniques, et radiographiques a été établi dans une population normale en utilisant l'Inversateur. Nos résultats démontrent une augmentation significative de la flexibilité du tronc; vers l'avant, une réduction générale de l'activité paraspinale EMG, une baisse significative de la pression exercée sur les espaces intervertébraux L4-5 et L5-S1, ainsi qu'une absence de changement de la fréquence cardiaque et de la pression artérielle. Ces résultats établissent les bases physiologiques pour les effets cliniques de la Thérapie Inverchaise et pour son utilisation clinique appropriée.

MOTS CLÉS: inversion, traction, chiropractic, manipulation

Introduction

The efficacy of a particular conservative therapy is, in large part, dependent on its ability to produce results in both patients and a wide range of diagnostic entities. As well, such a therapy must be reasonably simple and economical. It must also be safe, with minimal potential for harm to the patient. As the same time, the known effects of such a therapy must attain to a high enough degree of physiological benefit and thereby clinical utility. To the extent that any particular therapy maximizes each of these points, then it will attain a status of greater value to the patient.

Many such therapeutic modalities in the treatment of low back pain are in use today. Prominent among these has been the application of the inverted position. One such method of spinal traction has been the use of gravity-assisted inverted traction or Inversion Therapy (I. T.). Sheffield[1] was the first to describe the use of the inverted position for the application of spinal traction, reporting that of 175 incapacitated patients he treated with inversion therapy, 75% returned to work full time work after an average of eight treatments. Gray[2] combined body-weight traction on a pulsleid inclined plane with manipulation of the lumbar spine. He found that the greatest gain was produced in inversion of twenty-six cases. Gray[2] was also able to show radiographic proof of significant degrees of distraction of the lumbar disc spaces during use of an inverted traction board. Wickes[3] showed that the inverted position increased the height of the lumbar intervertebral discs and bypass-spinal lumbar musculature in healthy male subjects. It was also shown that a minimum inversion time of seventy seconds was needed to achieve maximal effect of the inverted position on the lumbar musculature. Most recently Klarr[4] has shown that the Gravity Inversion Boots produce significant elevation in Gravity Inversion Boots produces significant elevation of blood pressure, heart rate, central retinal arterial pressure and ocular pressure.

The most recent development in this area is a device known as the Inverchair, which appears to offer several refinements and benefits over the existing inversion devices (see Figure 1). The most important of these benefits are the following:

- The patient is positioned sitting, rather than supine and high, a posture which is known to reduce the lumbar curvature.
- The inversion is centered on the pelvis as in more traditional horizontal modes, thus favoring the immediate and full effect of traction on the lumbo-sacral spine.
- The legs are left comfortable and unencumbered.
- The patient is fully and comfortably supported by the back and head.

No study, to date, has thoroughly investigated a wide range of physiological parameters involved in inversion therapy. It is the purpose of this study to establish the effects of inversion traction on the normal subject both in terms of immediate effects during treatment and those which occur as immediate outcomes of I.T.

Methods and materials

Two different study samples were investigated. The first involved 40 subjects, 29 males and 11 females, with a mean age of 31.2 years. Twenty-five asymptomatic subjects (S.T.) were also examined. Subjects received an initial orientation and were screened for any current low back symptomatology and any current or past pathology or condition of the heart and circulato-

Ballantyne, BT., et al. *The Effects of Inversion Traction on Spinal Column Configuration, Heart Rate, Blood Pressure and Perceived Discomfort.* The J of Orthopaedic and Sports Physical Therapy. 1986; 7(5): 254-260.

- Decrease in standing Lumbar Lordosis
- HR decreased, while BP increased during inversion
  - Both returned to normal within 1 minute
- Increased between L5-S2

https://www.jospt.org/doi/pdf/10.2519/jospt.1986.7.5.254

The Effects of Inversion Traction on Spinal Column Configuration, Heart Rate, Blood Pressure, and Perceived Discomfort

BYRON T. BALLANTYNE, BA, PT,* MICHAEL D. RESER, BS, PT,* G. WILLIAM LORENZ, BS, PT,* GARY L. MIDDT, PHD, PT†

The therapeutic effectiveness of inversion traction has only recently come under investigation. The purpose of this study was to use noninvasive methods to determine traction, cardiovascular, and perceived effects of inversion. The Gravity Gym® and Gravity Boots® inversion systems were compared. Treatment order was randomized for 20 healthy subjects (mean age = 29.5 yr). Each subject participated in each inversion device for 7 minutes. A computerized method was used for assessing posture. Three-dimensional coordinates were determined for spinous processes of C7, T12, L5, and S2 in the upright position and in maximum inversion (spinous disc spines [SD]). Heart rate was palpated and blood pressure was recorded using a standard sphygmomanometer. Pre-, initial, late, and postinversion measurements were taken. Questionnaires administered following each inverted posture assessed levels of discomfort.

Repeated measures analysis of variance was conducted to test the significance of results ($p < 0.05$). Measurements for both systems revealed an increase in L5–S2 distance, a decrease in C7–T12 distance, and a decrease in depth of the thoracolumbar kyphosis (L4–L5 and L5–S1 SD). The Gravity Gym® was more comfortable than tonight by the Gravity Gym but not the Gravity Boots. Heart rate decreased and blood pressure increased an average of 20 mm Hg for both systems as subjects were inverted. This pattern was observed throughout the inversion period. Upon return to stand, heart rate increased for both systems while blood pressure decreased only for the Gravity Gym®. Discomfort was greatest in the head and neck region for the Gravitek inversion system. Inversion can be an effective means of spinal traction but due to elevated blood pressure, inversion may be contraindicated for some patients.

Spinal traction has been proposed as an effective treatment for various low back conditions including disc herniation, spondylolisthesis, lumbar osteoarthritis, facet pathology, and muscle spasm.[1,4,11,12] Mechanically, spinal traction has become therapeutically linked to the following: 1) vertebral body distraction. 2) facet realignment. 2) tensing of the ligamentous structures. 4) widening of the intervertebral foramen. 5) reduction of the normal spinal curves. and 6) reduction of paravertebral muscle spasm.[1] Continuous, sustained, intermittent mechanical, manual, positional, and autotraction represent the more traditional modes of application. More recently, inversion traction has come under scientific investigation while gaining considerable popularity.[1] Two systems emerge from the last category which differ drastically in their design and proposed mechanisms of action. These are the Teeter hip designs incorporating a 90/45° angle at the hip and knee respectively, and the extended hip and knee version incorporating a basic design which allows free suspension from the ankles.

Only a few researchers have actually addressed themselves to an investigation of the effects of inversion traction on spinal column configuration, distraction, and measurements of curve depths. Sheffield[1] found significant improvement with in-

Azam, AM. *Efficacy of Static and Intermittent Gravity Inverted Therapy Techniques in Improvement of Motor Apraxia and Cognitive Abilities in Autism Spectrum Disorder (ASD).* World J of Neuroscience. May 2018:314-330.

- "The sensory system plays an essential and vital role in skill development."
- Vestibular receptors are stimulated by movement and gravity.
- Significant increase in fine motor skills and cognitive processing

DOI: 10.4236/wjns.2018.82025

World Journal of Neuroscience, 2018, 8, 314-331
http://www.scirp.org/journal/wjns
ISSN Online: 2162-2019
ISSN Print: 2162-2000

Efficacy of Static and Intermittent Gravity Inverted Therapy Techniques in Improvement of Motor Apraxia and Cognitive Abilities in Autism Spectrum Disorder (ASD)

Ahmed M. Azam

Department of Physiotherapy for Developmental Disturbance and Pediatric Surgery, Faculty of Physical Therapy, Cairo University, Cairo, Egypt
Email: prof.ahmedazam@yahoo.com

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https://doi.org/10.4236/wjns.2018.82025

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Abstract

This work was carried out to investigate the efficacy of static and intermittent gravity inverted therapy techniques in improvement of motor apraxia and cognitive abilities in Autism Spectrum Disorder (ASD). 30 children were randomly paired in this study into two groups. Group A (sensory integration therapy approach plus static and intermittent inversion therapy techniques) and Group B (sensory integration therapy approach only). Bleck design test was used to locate and follow constructional apraxia, computerized information processing speed test to locate and follow cognitive processing and gristweld pegboard test was used to locate and follow fine motor skills. The total duration of the therapeutic intervention for both groups was 12 weeks, study groups in all variables. By comparison of the two groups in constructional apraxia variables test at post-treatment, there was a highly representative elevation in favour to study group ($p < 0.05$). By comparison of the two groups in cognitive processing variable at post-treatment, there was a highly representative elevation in favour to study group ($p < 0.05$). By comparison of the two groups in fine motor skills variable at post-treatment, there was a highly representative elevation in favour to study group ($p < 0.05$). According to the outcomes of this study, it can be terminated that the sensory integration therapy approach plus static and intermittent inversion therapy techniques can be recommended in improvement constructional apraxia and cognitive processing abilities in autism spectrum disorder (ASD) children.

Keywords

Inversion Therapy, Motor Apraxia, Autism Spectrum Disorder (ASD)

Manjunath Prasad, KS., et al. *Inversion Therapy in Patients with Pure Single Level Lumbar Discogenic Disease: A Pilot Randomized Trial.* Disability & Rehabilitation. 2012; 34(17): 1473-1480.

- Traction of 60% bw to reduce intradiscal pressures to 0
  - Traction <20% BW is placebo
- Diagnosed Sciatica patients
  - Inversion 77% avoided surgery
  - Control 22%

https://doi.org/10.3109/09638288.2011.647231

informa
healthcare

RESEARCH PAPER

Inversion therapy in patients with pure single level lumbar discogenic disease: a pilot randomized trial

K. S. Manjunath Prasad[1], Barbara A. Gregson[2], Gerard Hargreaves[3], Tiernan Blyton[4], Philip Welsman[5] & A. David Mendelow[6]

[1]Department of Neurosurgery, James Cook University Hospital, Middlesbrough, United Kingdom, [2]Department of Neurosurgery, Regional Neuroscience Centre, Newcastle upon Tyne, United Kingdom, and [3]Department of Physiotherapy, University of Northumbria, Newcastle upon Tyne, United Kingdom

Purpose: Backache and sciatica due to protuberant disc disease is a major cause of lost working days and health expenditure. Surgery is a well-established option in the management of this condition. To determine whether inversion therapy is effective, We report a pilot prospective randomized controlled trial comparing inversion traction and physiotherapy with standard physiotherapy alone in patients awaiting lumbar disc surgery. This study sought to study the feasibility of a large multicentre randomized trial of inversion therapy in patients with single level lumbar discogenic disease, who had been listed for surgery. Methods: This was a single centre, prospective randomized controlled trial. Patients were randomized to receive either inversion therapy plus physiotherapy or physiotherapy alone. Results: Of the 45 patients who were assessed for eligibility, 27 were randomized (13 to inversion + physiotherapy and 14 to physiotherapy alone (control)). Surgery was avoided in 10 patients (76.9%) in the inversion group, whereas it was averted in only two patients (22.2%) in the control group. Conclusions: Inversion traction with an inversion machine resulted in a significant reduction in the need for surgery. A large multicentre prospective randomized controlled trial is justified in patients with sciatica due to single level lumbar disc protrusion.

Implications for Rehabilitation

- Rehabilitation of lumpectomy and disability due to radiculopathy is the aim of any intervention.
- Avoidance of surgery assist satisfactory resolution of symptoms and disability due to radiculopathy. The aim of this study was to assess the efficacy of inversion therapy in patients awaiting surgery for lumbar disc surgery. This study sought to study the feasibility of a large multicentre randomized trial of inversion therapy in patients with single level lumbar discogenic disease, who had been listed for surgery. Methods: This was a single centre, prospective randomized controlled trial. Patients were randomized to receive either inversion therapy plus physiotherapy or physiotherapy alone (control). Surgery was avoided in 10 patients (76.9%) in the inversion group, whereas it was averted in only two patients (22.2%) in the control group. Conclusions: Inversion traction with an inversion machine resulted in a significant reduction in the need for surgery. A large multicentre prospective randomized controlled trial is justified in patients with sciatica due to single level lumbar disc protrusion.
- The (1) presenting impairment in disability for the Oswestry Disability Index is the outcome group suggests a role for this intervention in disability reduction.
- There is a potential role for inversion therapy in rehabilitation of patients with single level unilateral lumbar disc protrusion alongside other forms of physiotherapy.
- There is a potential secondary impact on the reduction of rehabilitation following surgery.

Keywords: Avoidance of surgery, Inversion therapy, single level lumbar discogenic disease, traction

Introduction

Degenerative lumbar disease is a major cause of disability and health expenditure in the working age group of population [1,2]. Compression of the nerve roots is often the cause of sciatica and, if sustained or severe, can result in neurological deficits. This can be caused by a degenerative disc protrusion

Correspondence: Dr. K. S. Manjunath Prasad, Department of Neurosurgery, James Cook University Hospital, Middlesbrough TS4 3BW, United Kingdom. Tel: +44 1642 850757. Fax: +44 1642 850778. E-mail: manjunath.prasad@stees.nhs.uk

(Accepted December 2011)

Choi, MS., Lee, DK. The Effect of Knee Joint Traction Therapy on Pain, Physical Function, and Depression in Patients with Degenerative Arthritis. Journal of Korean Physical Therapy. Oct 2019; 31(5): 317-321.

- Significant decrease in pain
- Significant improvement in physical function.
- Significant decrease in depression.
- Resulted in muscle relaxation, inhibition of protective muscle reflection.

https://doi.org/10.18857/jkpt.2019.31.5.317

JKPT Vol 31, No 5, October 2019
pISSN 2287-4445 eISSN 2287-4607
Journal of Korean Physical Therapy

Original Article
https://doi.org/10.18857/jkpt.2019.31.5.317

The Effect of Knee Joint Traction Therapy on Pain, Physical Function, and Depression in Patients with Degenerative Arthritis

Min Sun Choi†, Dong Kyu Lee†
Department of Orthopedic Surgery, Sunhan Hospital, Daegu, †Department of Physical Therapy, Sunhan Hospital, Gyeongsan, Korea

Purpose: To identify the effect of knee joint traction therapy on pain, physical function, and depression in patients with degenerative arthritis.

Methods: In total, 20 patients with degenerative arthritis were randomly assigned to one of two groups: the experimental group, who underwent knee joint traction therapy and the control group, who underwent general physical therapy (16 patients per group). Pain was measured using the visual analogue scale (VAS), physical function was measured using the Western Ontario and McMaster universities osteoarthritis (WOMAC) index, and depression was measured using the Beck depression inventory (BDI). The VAS, WOMAC score, and BDI were measured before and after the experiment.

Results: As a result of comparison within groups, the experimental and control groups showed significant differences for VAS, WOMAC and BDI after the experiment ($p < 0.05$). In comparison between the two groups, the experimental group in which knee joint traction was applied showed more significant change in VAS, WOMAC, and BDI than the control group ($p < 0.05$).

Conclusion: This study showed that knee joint traction therapy was effective in improving pain, physical function, and depression in patients with degenerative arthritis.

Keywords: Knee joint traction, VAS, WOMAC, BDI

INTRODUCTION

Degenerative arthritis is one of the most common diseases worldwide.[1] This condition is progressive disease that causes histological changes such as cartilage degeneration and proliferation of bone, cartilage, and surrounding connective tissue, which results in severe functional limitations in patients.[2,3] Knee joint degenerative arthritis is a disease that causes pain, functional limitation, and disability and its incidence is gradually rising, especially in the elderly population.[4,5] One of the main symptoms observed among patients with knee joint degenerative arthritis is pain,[6] and a high correlation has been found between pain and limited physical function during activities that are the keys in patients with degenerative arthritis.[7] Degenerative arthritis is a disease that can cause physical problems such as functional disorders and pain, as well as decreased quality of life, which causes psychosocial problems.[8] The persistent pain and functional disorders also lead to sociopsychological issues, such as acute depression and declined quality of life.[9] In general, the goals of the clinical management of knee degenerative arthritis are to provide pain relief and to maintain or to improve functionality.[10] A diverse range of surgical and non-surgical options are available for treating degenerative arthritis, yet each therapeutic modality has its respective limitations and side effects.[11] Furthermore, no treatments have been developed to completely cure knee degenerative arthritis. Therefore, the goals of clinical therapeutics is to relieve pain, maintain or improve joint function, and reduce joint stiffening or deformation.[6]

Since there are difficulties in the current treatment of degenerative arthritis patients to recover their structures, most treatments focus on decreasing pain or improving functions.[12] It is thus necessary to develop a treatment that improves the knee structure of degenerative arthritis patients. Traction therapy is currently being used to treat spine dislocations and has been shown to relieve joint

Intema, F., et al. Tissue Structure Modification in knee OA by use of Joint Distraction: an Open 1-Year Pilot Study. Ann Rheum Dis. 2011;70:1441–1446. doi:10.1136/ard.2010.142364

- Joint distraction can reverse tissue structure changes in patients with knee OA.
- Increased cartilage thickness, increased weightbearing joint space, decreased denuded bone area
- Hypothesized that the temporary distraction prevents mechanical stress on the cartilage, prevents further wear and tear and allows tissue repair to begin

https://ard.bmj.com/content/70/8/1441.short

Extended report

Tissue structure modification in knee osteoarthritis by use of joint distraction: an open 1-year pilot study

Femke Intema,[1] Peter M Van Roermund,[1] Anne C A Marijnissen,[1] Sebastian Cotofana,[2] Felix Eckstein,[3] Rene M Castelein,[1] Johannes W J Bijlsma,[1] Simon C Mastbergen,[1] Floris P J G Lafeber[1]

ABSTRACT

Background: Modification of joint tissue damage is challenging in late-stage osteoarthritis (OA). Few options are available for treating end-stage knee OA other than joint replacement.

Objectives: To examine whether joint distraction can effectively modify knee joint tissue damage and has the potential to postpone knee joint replacement.

Methods: 18 patients (>18 years) with distressed OA were treated surgically using joint distraction. Distraction (~1 mm) was applied for 3 months using an external fixator device. Tissue structure modification at 1 year was assessed by MRI (semiquantitative MRI scoring system (MOAKS), by MRI (segmentation of cartilage, morphological and biochemical markers of collagen type II and proteoglycan content) and by radiography. Pain improvement was evaluated by Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) pain subscale and visual analogue scale (VAS) pain.

Results: Radiographic demonstrated an increase in mean and minimum JSW (2.7 to 3.3 mm and 1.0 to 1.8 mm, respectively; p<0.001) and a decrease in Kellgren-Lawrence grade (2.4 to 2.0; p=0.001) and a decrease of denuded bone areas (23% to 5%, p<0.001). Collagen type II bands showed a trend toward increased synthesis (+310%, p=0.088) and decreased breakdown (−19%, p=0.088). Cartilage thickness increased by 0.7 mm on average (p<0.001). WOMAC pain decreased from 35 to 21 mm (p=0.001).

Conclusions: Joint distraction can induce tissue structure modification in knee OA and could result in clinical benefit. The current treatment is able to reduce the need for knee joint replacement. Randomised studies on joint distraction are warranted.

Osteoarthritis (OA) is a degenerative joint disease that affects the entire joint, including articular cartilage, bone, changes in bone and other periarticular tissues and osteophyte size, secondary joint inflammation and pain, stiffness and functional disabilities.[1]

Knee OA affects roughly 6% of the adult population and is a major cause of disability in the elderly.[2] Huge socioeconomic and healthcare burden.[3]

Knee operate are available for treatment of end-stage knee OA. Joint replacement is the most effective option to halt or even reverse severe structure damage.[4] Substantial pain by replacing the destroyed joints with an endoprosthesis in the currently accepted treatment option for severe knee OA. Although joint replacement is a very effective procedure, it is expensive[5] increasing in the Western world and causes major economic burden.[6] Over 90% of all total knee prostheses are performed in patients with OA.[7] Unfortunately, the procedure has a limited lifespan, with a revision rate of 1% per year in older patients.[8] As such, development of alternative treatment strategies for severe knee OA, operating at earlier stages in the progress of the disease, are urgently needed.

Joint distraction is a surgical procedure by which the two bony ends of a joint are gradually separated to a certain extent for a certain period of time. Joint distraction is applied in the treatment of joint maldalignment and joint contracture. An external fixation frame was used to distract the joint. Distraction was performed in stage of motion. Distraction was performed to prevent damage (compression) of the joint cartilage and to avoid overstretching of the capsule and ligaments. OA was present in the treated joint and an unexpected clinical improvement of the OA symptoms was found. Joint distraction was shown to be a powerful new strategy for restoring the function of joints affected by viewing young patients with severe ankle OA.[9] Two-stitch of patients treated for 3 months were joint distraction experienced significant pain relief that lasted for at least up to 10 years.[9] Based on preliminary radiographic outcome in a limited number of patients, it was suggested that joint distraction may lead to tissue structure modification as well.

We aimed to explore whether joint distraction can induce tissue structure modification in knee OA in those cases where joint replacement surgery is indicated, and whether it has the potential to delay knee replacement surgery in relatively young patients in an open, uncontrolled clinical trial.

PATIENTS AND METHODS

Study design

Twenty patients with knee OA and with an indication for knee replacement surgery were included in this study. Patients were aged 18–65 years, having chronic age >50 years, Visual Analogue Scale (VAS) of pain >40 mm, radiographic signs of joint degeneration (Kellgren-Lawrence grade 2–3) and unilateral OA. Exclusion criteria were severe symptoms in both knees, a history of inflammatory or septic arthritis and severe knee malalignment requiring surgical correction (>10°). Patients were also excluded if they were unwilling to undergo a tibiofemoral hospital for a second operation because

Ann Rheum Dis 2011;70:1441–1446. doi:10.1136/ard.2010.142364

Abdusalam, AO., Scurr, JH., and Smith, PDC. *Effect of leg elevation on the skin microcirculation in chronic venous insufficiency."* Journal of Vascular Surgery. 1994; 20(5): 705-710.

- limb elevation enhanced the microcirculatory flow velocity
- Limb elevation is frequently advocated in the treatment of venous disease associated with edema, and there is widespread agreement on its efficacy
- On leg elevation, veins empty by the effect of gravity, resulting in less volume of blood in the limb. However, capillaries, venules, and arterioles respond to leg elevation and dependency differently from the relatively passive large veins
- enhanced microcirculatory flow velocity is due to a decrease in venous pressure, with subsequent increase in arteriovenous pressure gradient and capillary flow

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Effect of leg elevation on the skin microcirculation in chronic venous insufficiency

Abdusalam Abu-Own, FRCS, John H. Scurr, FRCS, Philip D. Coleridge Smith, FRCS, *London, United Kingdom*

Purpose: **Leg elevation is advised in the treatment of venous disease associated with edema. We have used laser Doppler fluxmetry to assess the effects of leg elevation on the skin microcirculation.**
Methods: **Fifteen patients with lipodermatosclerosis caused by chronic venous insufficiency and 15 control subjects were studied. Measurements were made from the liposclerotic skin of patients and 8 cm above the medial malleolus in control subjects. Laser Doppler flux, blood cell velocity, and concentration of moving blood cells were recorded with the subject lying in the supine position and after elevating the foot 30 cm above the heart level.**
Results: **In subjects in the horizontal position, the resting laser Doppler flux was significantly higher in patients with lipodermatosclerosis than in control subjects (median difference 63 arbitrary units; 95% confidence interval: 36, 108). This difference was due to a higher concentration of moving blood cells in the patient group (median difference 6.5 arbitrary units; 95% confidence interval: 3.4, 9). The blood cell velocity was not statistically significant between the two groups. On leg elevation, there was a substantial increase in the laser Doppler flux in the patient group; the median percentage increase in flux was 45% ($p < 0.01$). This was due to an increase in blood cell velocity; the median percentage increase was 41% ($p < 0.01$). There was no corresponding change in the concentration of moving blood cells. The results in the control group showed a similar trend but have not reached statistical significance.**
Conclusion: **We conclude that limb elevation enhanced the microcirculatory flow velocity in liposclerotic skin of patients with chronic venous insufficiency. (J Vasc Surg 1994; 20:705-10.)**

Limb elevation is often used in the treatment of venous disease associated with edema.[1-3] It is known to accelerate the healing of venous ulceration. In the treatment of venous leg ulceration associated with severe local edema, some authors recommend that patients are admitted to hospital for 48 hours' bed rest with limb elevation and physiotherapy, followed by compression treatment and mobilization.[4] Other authors have suggested vertical leg elevation for drainage of edema associated with venous ulcers for 2 days in hospital; this is followed by compression treatment and mobilization, but the patient is instructed to continue vertical drainage at home for a period each day.[5] For patients with intractable leg ulceration and those who are admitted to hospital for surgical treatment (e.g., skin grafting), Browse et al.[6] recommend that bed rest with leg elevation should be an integral part of the initial treatment of these patients. The mechanism by which limb elevation may be beneficial in the treatment of venous disease is not clear.

Most studies investigating skin blood flow with use of laser Doppler fluxmetry report only the laser Doppler flux value that is related to total skin blood flow in the target tissue volume. Analysis of the components of the laser Doppler flux signal may provide useful information as to how blood flow is altered in liposclerotic skin. Laser Doppler fluxmetry relies on the Doppler principle. When laser light is

From the Department of Surgery, University College London Medical School, London.
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Reprint requests: A. Abu-Own, FRCS, Department of Surgery, University College London Medical School, The Middlesex Hospital, Mortimer Street, London, W1N 8AA, United Kingdom.
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Research Summation

Brachiation

- Man was meant to hang by the arms
- Hanging and Climbing are not the same thing
  - Hanging = decreased tension
  - Climbing = increased activation
- Creates changes within the shape of the spine

Inversion

- It is safe in a healthy population
- Promotes parasympathetic dominance
- Decreases NM tension
- 2-3 min is all that is required (at a time)
- Improves fine motor skills
- Improved venous return LE

Research Summation

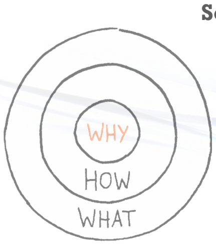
Distraction

- Reverse tissue structural damage in certain instances
- Requires 60%BW to see removal of all pressure in lumbar spine
- Decreases pain and depression
- Improve function

Part 2

Video Link

Why?



Sensory rich environment for the CNS

Downregulate the CNS

inhibition of protective muscle reflection (GTO)
Turn things off

Create Tension across lymphatic tissues

Improved vascular return

Create Space
Mechanically "open" joint spaces

GTO Review

- https://www.sciencedirect.com/topics/neuroscience/golgi-tendon-organ
- The organ is activated by muscular contractions or a stretch of the tendons. This results in an i**nhibition of alpha motor neurons innervating the contractile elements of the same striated skeletal muscle**, causing the muscle to **relax,** and thereby protecting the muscle and connective tissue from excessive loading and potential injury
- GTO can provide the CNS with specific force feedback (0.1g)

Where does brachiation fit into the NDS/C?

- It doesn't*
- Beyond Stance
- Play – advancement of the NDS/C

Requisites for all Brachiation

- Understand your physician's limitations (ROM, Strengthening, Sling, etc.)
- Understand the surgical procedure (or the injury/trauma)
- No ACUTE pain*
- Ability to get into the inversion boots
- An integrated plan of tissue work, corrective exercise, and strengthening.

UE Brachiation

No inversion, just traction
The shoulder learns to be a shoulder under load before it can be used to manipulate items [1]
The shoulder is designed to hang/climb
Gripping and distraction activate the RC
  supraspinatus and infraspinatus are significantly active during these techniques (GH distraction, posterior glide)[2]
  strong correlation between grip strength and lateral rotator strength was shown at all positions [3]
Stimulate the CNS
  GTO, Ms Spindles
Aid the vascular system

1. Irwin-Carruthers, S. H. "Developmental aspects of shoulder control." *South African Journal of Physiotherapy*. 1982; 38(1): 7-8.
2. *Swanson, Brian T., et al. "EMG activity of selected rotator cuff musculature during grade III distraction and posterior glide glenohumeral mobilization: results of a pilot trial comparing painful and non-painful shoulders." Journal of Manual & Manipulative Therapy. 2016; 24(1): 7-13.*
3. Horsley, Ian, et al. "Do changes in hand grip strength correlate with shoulder rotator cuff function?." *Shoulder & elbow*. 2016; 8(2): 124-129.

UE Brachiation

Full	Partial
• Vertical	• Horizontalish
• Full effect of GTO	• Partial effect of GTO
• More Gripping	• Less Gripping
◦ RC Strength	◦ RC activation
• Venous return	• Venous return

UE Requisites

ROM
  Full Brachiation
    Shoulder Flexion and ABDuction 180° each
      Flexion - with the scapula blocked!
  Partial Brachiation
    Shoulder flexion ≥90°
  Elbow Extension = 0°
Loading
  Surgical patients
    Full brachiation = > 8 weeks
    Partial Brachiation = as soon as ROM is present
    If there is a poundage limit, work within this

LE Brachiation

Inversion*, and traction
counter and correct adverse effects of gravity produced by the common postures
  Hip
  Knee
  Ankle
  Pelvis
  Spine
Stimulate the CNS
  GTO, Ms Spindles
  VC system
  Visual system
Aid the vascular system

LE Brachiation

Full

- Vertical
- Full effect of GTO
  - Static structures
    - ACL, PCL, MPFL grafts
    - Hip labrum/capsule
    - Meniscus
- Venous return

Partial

- Horizontalish
- Partial effect of GTO
  - Static restraings
  - Dynamic restrains dialed down
    - PT repair, QT repair, bony work on the hip
- Venous return

LE Requisites

ROM

Full Brachiation

Hip, knee extension = 0°

Partial Brachiation

Hip flexion ≥ 80°

Loading

Surgical patients

Full brachiation = > 12 weeks

Partial Brachiation

Repair/recon of static structures (ACL, PCL, MCL, MPFL) = >8 weeks

Repair/recon of dynamic structures = as soon as ROM is present

Meniscus in isolation = as soon as ROM is present

What we can target

UE

- RC activation
- Fear avoidance
- A Scapula that wants to be an ear
- Elbow Extension
- Cervical MC
- Thoracic MC

LE

- Knee Extension
- "Pinching" in Hip scopes
- Pelvic MC
- Inhibition of the anterior tilt culprits
  - Psoas
  - Iliacis
  - Hamstrings

Part 3

Video Link

"True Knowledge comes with deep understanding of a topic and its inner workings."

Albert Einstein

1830's: "far ahead in the course of actions or ideas, being beyond others in attainment, degree, etc.."

Questions

How long?

- 70 sec MINIMUM
- 2-3 minutes for full effect
  - If the goal is to decrease tension - > 3 min

How much?

- As much as tolerable
  - Within physician and/or timeframe/situational context
- Start partial – progress
- Start Staticish (breathing) progress to dynamicish

Upper body – partial brachiation

Horizontal hang – shoulder only
H-hang – trunk
Lateral H-hang – trunk
Back Rack Hang

- Variants
  - Double overhand
  - Double underhand
  - Alternated

Upper body – full brachiation

2-arm hang
  Double overhand
  Double underhand
  Alternated
Wide/Narrow
Traveling

Lower body – partial brachiation

Double leg hang
  Hips directly under bar
  Horizontalish
TRX double leg hang
Single Leg hang
  Anterior
  Lateral
Sloth

Lower body – full brachiation

Rehab scope?

Inversion table
Double leg hang
  Curls
  Heartbeats
  Swings
Single leg hang
  sloth

Play!

Don't let your patients/athletes be the first one you try these techniques on.

WARNING

READ THE MANUAL OF THE GRAVITY BOOTS OR THE INVERSION TABLE ESPECIALLY IF YOU ARE GOING INTO FULL INVERSION!

First CEU Requirement - Quiz

Follow this link using your camera app to take the quiz
Enter your Name if you want to get a certificate AND the CEU's

Second CEU Requirement – Course feedback

Follow this link using your camera app to give your input on how epic or horrible this was
ANONYMOU5E

Questions?

How Can We Help?

brandon@movementoutlaws.com

Brandon.Hetzler@mercy.net