A General Review of Lower Extremity Patient Presentation
(From Kids to the Weekend Warrior)

Presented by:

J. Alan Lovejoy, D.C., LCP, FICA

Sponsored by: chirotouch

This course presents the philosophy and biomechanical approach to the evaluation and adjustment of the extra-vertebral articulations of the body, with specific focus on the lower extremities. Patient history, evaluation and analysis will focus on general patient presentations in a ChiropracTic office. Emphasis is given to the biomechanical impact on the body as a whole.

4 Part Harmony

The body was created with the innate ability to maintain "Health" and overcome sickness and disease.

The nervous system controls and coordinates every function in the body either directly or indirectly including the immune system.

Interference to the nervous system will cause dysfunction within the body. Subluxations cause nervous interference; therefore, subluxations cause dysfunction within the body.

Removal of nervous interference will allow the body's innate ability to restore health; therefore, correction of the subluxation will remove interference to the nervous system, thereby, allowing the body to heal.

Where your Attitude goes
Your Energy flows and
That's what Grows to
Become Manifest in
YOUR LIFE

Why Adjust Extremities?

♦A Brief History of Extra-Vertebral Adjusting

♦Hippocrates

On the Articulations

Written 400 B.C.E

Translated by Francis Adams http://classics.mit.edu/

Wrote mostly of dislocations but did refer to "slight displacement" (sub-luxated) and fixing these was translated in some cases as adjusted.

Also wrote of examination; comparing the bad to good.

♦Modern Day Bonesetter Practice ?

♦ "Old Dad Chiro"

1st instance of DD adjusting a foot; A letter dated Sept. 10, 1896 Nellie Richardson …adjusted the foot joints to relieve pain on the dorsal part of her arch. (Keating et.al, 1992)

Referred the bonesetter Sweet adjusting Mrs. Garrison's foot. (Palmer & Palmer, 1906,pp.191)

" The science of the cause of disease and the art of adjusting by hand all subluxations of the 300 articulations of the skeletal frame." (Palmer & Palmer, 1906, Introduction)

♦Innovators and Techniques

Some Innovators:

Gonstead
States
Charrette
Broome
Faye
Hearon
Mally
Thompson

Some Techniques:

Gonstead-analysis & adjusting
Diversified
Charette's Protocols
Activator
Thompson Drop Table
MPI-analysis & adjusting

Certifications:
Hearon-CCEP
Mally

♦A Few General Considerations:
Always relate back to the spine
Remember, an extremity *does not* have to be *symptomatic.*
History is a *very* important part of your Dx
Do active ROM *before* doing passive ROM
Take bilateral X-ray views

♦When adjusting extremities you need to:
Explain what you are doing
Be ***gentle*** with passive motion
Be ***specific*** with your contact
Be ***fast*** with your adjustment
Be sure you are at End Play
Be motivated and positive
Relate everything back to the spine
Be clear with any take home instructions

♦Optimal?Normal Joint Function
Painless movement of appendages through a complete range of motion.
Proper distribution of loads across articular tissues
Maintenance of stability during use.
Extremities do NOT have to be symptomatic

♦P.A.R.T.S.

Pain and Tenderness: evaluated by
- Quality
- Location
- Intensity

Asymmetry: identified through
- Posture
- Gait analysis
- Static palpation
- X-ray

ROM: evaluated through
- ROM testing
- Kinetic palpation
- Stress radiography

Tone, Texture, Temperature: through
- Observation
- Palpation
- Functional assessments
- Instrumentation

Special test:
Specific x-rays: MRI,CAT etc.

♦ First Things First

History: localize, characterize, what, when, where, how, why, ADL.
Bare the Area: Skin on Skin
Bilateral observation: deformities, swelling, side to side comparison
Bilateral palpation: side to side comparison
Active ROM: have patient move extremities, do good then bad
Passive ROM: Dr. moves the extremities, do good side then bad
Orthopedics/neurological exams:
X-Rays: 2 views usually AP and Lateral and maybe a comparison view

♦ Focused Examination of Involved Joints

Inspection: gross swelling, redness, malalignment (fracture ?)
Palpation: warmth, crepitus, tenderness (not pain)
Motion: active, passive, and resisted

♦ "Cardinal Signs of Inflammation"

S - welling
H - eat
A - ltered Biomechanics
R - edness
P - ain
C-ompress

♦ A Tip on Tape:

Please be sure you know taping techniques
Perform a tape test for allergic reactions
Use appropriate tape for the area, ie. correct tape width, no non-stretch tape around muscles
Be smooth and overlap by half
Avoid gaps and wrinkles, may cause blisters
Do not wrap too tight or with too many layers, may impair circulation and neural transmission
After taping Always check for sensation and pulse distal to the taping, eg. capillary refill.
Don't leave on too long, may cause skin to breakdown
Remove slowly and carefully

♦ Do not Tape:

As first aid without assessment
If joint is swollen and painful
If skin sensation is abnormal
Where injury is acute, joint is unstable and/or bleeding is present
If not familiar with taping technique
A bad tape job is Worse than no tape

"When in doubt, Don't"

♦ Regarding differential diagnosis:

1) Biomechanical
    Rest relieves pain
    Activity increases or produces pain
    Unilateral and has specific location
    Character of pain is sharp or stabbing
    History of trauma
2) Organic
    Rest stiffens or increases pain
    Bilateral, diffuse and broad in location
    Character may be deep, dull ache
    May not have obvious trauma, but trauma may be reason for visit

♦Healing Response:
Inadequate functional recovery of tissue following injury is most frequently a result of our inability to recognize that the body has its own, inherent healing mechanisms. The fundamental principles of healing should be directed at understanding the process of injury and nature's healing response to injury. It's only then we can assist the remarkable human body with its ability to recover normal function.

Evidence may show a possible protocol, but clinical experience is the decision maker.

♦Proprioceptors:
Sensory receptors that respond to joint movement (kinesthesia) and joint position (joint position sense), but do not typically contribute to conscious sensation. .

♦Joint Proprioceptors:
Generally are "non-adapting" resulting in constant firing with abnormal ligament stress.

Clinically, can get ongoing symptoms due to **abnormal joint posture.**

Wyke BD, Polack P: Articular Neurology.
JBJS1975;57B:401.

Improved proprioception with exercise makes physiological sense
Lephart et al, 1996

♦Nociceptors:
"a continuous tridimensional plexus of unmyelinated nerve fibers that weaves
(like chicken-wire) in all directions throughout the tissue."
Wyke B.Neurological Aspects of Pain Therapy. In: Swerdlow M, Editor. The Therapy of Pain. Philadelphia: JB Lippencott: 1980

Nociceptor activity reflexively activates the sympathetic nervous system…
Kabell J. Sympathetically maintained pain.In: Willis W.ed. Hyperalgesia and Allodynia. Raven Press. NY: 1992

Nociceptors:
Fire with harmful or potentially harmful stimuli.
Thermo, mechano, and chemo, sensitive.
Estimated that half of all dorsal afferents are nociceptors.

♦Facilitation:
Repeated impulses enhance neural activity and reinforce response.

♦Hypo-mobile joints:
"Restricted joint motion causes an **increase** in nociceptive axons (A-delta and C fibers) and a **decrease** firing of large diameter mechanoreceptor axons (A-beta fibers)."*Hooshmand H. Chronic pain: reflex sympathetic dystrophy, prevention and management. Boca Raton, FL CRS Press:1993.*

"…..nociceptive input from dysfunctioning joints can cause symptoms such as sweating, palor, nausea, vomitting, abdominal pain, sinus congestions, dyspnea, cardiac palpitations, and chest pain that mimics heart disease."**Nansel D. Szlazak M. Somatic dysfunction and the phenonema of visceral disease simulation: A probable explanation for the apparent effectiveness of somatic therapy in patients presumes to be suffering from visceral disease. J. Manipulative Physiol Ther 1995:118:379-97.**

Increase of nociceptor firing, decreases mechanorecptor firing.

Increase mechanorecptor input, decrease nociceptor at the level of the spinal cord.

Altered Proprioception of nociceptor firing mechanoreceptor firing.

Adjusting mechanoreceptor input nociceptor firing at the level of the spinal cord.

What can a Chiropractor do?
Adjust

"Adjustments to decrease nociceptor input to the spinal cord seem to be an effective way to decrease the hyperexcitable central state."Patterson M. The spinal cord: participant in disorder. J Spinal Manip: 1993:9(3)2-11

Posture affects every part of the musculoskeltal system of the body and thus merits our consideration. Caillet R.,Soft tissue pain and disability.

♦Normal Joint Function:
Painless movement of appendages through a complete range of motion.
Proper distribution of loads across articular tissues.
Maintenance of stability during use.

♦Documenting
Documenting

♦Bone Response to Stress

Wolff's law (1892)
tissue adapts to level of imposed stress
increased stress
hypertrophy (increase strength)
decreased stress
atrophy (decrease strength)
SHAPE REFLECTS FUNCTION
Genetics, Body weight, physical activity, diet, lifestyle
Generic
Stress-Strain Relationship
Bone
Stress-Strain Relationship

♦Overuse/Repetitive Injury:

Happens when the forces are ***below*** the maximal failure load but *applied* ***enough times*** to result in an accumulation of microtrauma. ***Tissue fatigue limits*** are **exceeded** and the damage occurs ***faster than the body*** can repair it.

Common in athletes and repetitive work tasks.
Pain, onset and loss of function is *gradual* and *over a period of time*.
Loss of function, swelling and pain are not immediately disabling but *may increase* to a point of *severe loss of function*.
The extremities are especially vulnerable to long term micro trauma.
The shoulder, elbow, wrist, knee and ankle are at particular risk.

The Mechanism/Bio-mechanics of
the Injury

" The weakest and oldest among us can become some kind of athlete, but only the strongest can survive as spectators. Only the hardiest can survive the perils of inertia, inactivity, and immobility."
Bland and Cooper, 1985 *Sem Arthritis Rheum*

♦Grading Sprain/Strains:

Grade I: stretching or separation of a few ligamentous fibers; exhibits mild inflammation, edema, tenderness, no function loss.
Grade II: a more significant degree of separation or tearing of ligamentous fibers; characterized by pain, edema, inflammation, partial loss of function; possible permanent instability due to scar tissue formation
Grade III: complete ligamentous tear or disruption; characterized by edema, inflammation, hemorrhage, complete loss of function; usually requires surgical intervention

♦Muscle Grading Chart

♦Using Modalities
Ice
Laser
Heat
Ultrasound – pulsed/continuous
Electro-Muscle Stim
TENS
Massage
Other

♦Deconditioning Syndrome
Decreased strength
Decreased endurance
Decreased flexibility
Decreased cardiovascular fitness
Decreased awareness of position sense and kinesthesia
Dr. Malik Slosberg, Validating Chiropractic

Protracted bed rest leads to a catabolic state with general malaise. There is demineralization of the bone and a 3% loss of muscle strength per day. Rest, particularly prolonged bed rest may be the most harmful Tx ever devised and a potent cause of iatrogenic disability. **Waddell, MD.**,Spine 1987;12(7):632-644.

1. **Muscle atrophy: 1.0 to 1.5% of muscle mass lost per day,**

2. **Cardiopulomonary deconditioning (15% loss of aerobic capacity in 10 days)**
3. Bone mineral loss with hypercalcemia & hypercalcuria;
4. Risk of thromboembolism,
5. Social side effects such as perception of severe illness,
6. Economic loss due to increased time lost from work.

Bigos, MD., Acute Low Back Problems in Adults. Clinical Practice Guidelines. December 1994. Potential Harms & Side Effects of Bed Rest. (p.53)

♦Fear Avoidance Behavior

Leads to inactivity, immobilization and disuse
May result in tissue impairment, reduced strength and ROM, stiffness and weakness.
This will result in reduced motor skills, proprioception, balance, stability and increased risk of more injury resulting in more fear avoidance.

Dr. Malik Slosberg, Validating Chiropractic

♦Active Rehabilitation

There is clear evidence that, despite general belief, activity is not harmful, and active rehabilitation not only restores function, but also reduces pain. Wadell G:Spine, Vol.12, no. 7 ,1987

Restoring tissue function progressively
PRICE
Modification of activities and education
Modalities: heat, electrical stimulation, ultrasound, etc.
Range of motion exercises
Strength, power, endurance, and specific agility exercises
Functional Disability
Scar tissue formation
Restricted joint motion
Muscular contracture
Fascial shortening

♦If a segment is:

Hypo-mobile - Mobilize

Hyper-mobile - Stabilize
Normal/Optimal - Leave alone
Life to a Joint is MOTION Get it moving

♦Focused Examination of Involved Joints
Inspection: gross swelling, redness, malalignment
Palpation: warmth, crepitus, tenderness (not pain)
Motion: active, passive, and resisted

♦ "Cardinal Signs of Inflammation"
S - welling
H - eat
A - ltered Biomechanics
R - edness
P - ain

This Marvelous Knee

♦Basic Anatomy & Kinesiology
Femur
Tibia
Patella

♦**First Things First**
History: localize, characterize, what, when, where, how, why, ADL.
Bare the Area
Bilateral observation
Bilateral palpation
Active ROM
Passive ROM
Orthopedics/neurological exams
X-Rays: 2 views usually AP and Lateral and maybe a comparison view

♦Focused Examination of Involved Joints
Inspection: gross swelling, redness, malalignment (fracture ?)

Palpation: warmth, crepitus, tenderness (not pain)
Motion: active, passive, and resisted

♦ Ligaments of the Knee

♦ The Knee is considered to be a Two joint structure
1. Patellofemoral 2. Tibiofemoral
modified hinge joint with flexion and extension as the primary motion with "some" rotation when the knee is flexed

♦ Runners Knee

What is Runner's Knee (Patellofemoral Pain Syndrome)?

The patella does not track vertically in the Trochelar groove, but is pulled sideways.
This causes the cartilage on the undersurface of the patella, and the cartilage in the Trochlear Groove to rub abnormally against each other, producing pain.
If left untreated, the cartilage that is subjected to this excessive rubbing will become permanently damaged, and begin to deteriorate and break down.
This condition is known as **chondromalacia** and can become permanent, since damaged cartilage cannot usually repair itself.

♦ Runners Knee Presentation

Pain near the knee cap (patella), and below it. The pain is located on the anterior surface (front) of the knee, <u>not</u> deep within the knee joint.
You may feel and hear a "grinding" when the knee is flexed and extended.
Pain after sitting with the knees bent for a time, and then standing up and walking.
Walking or running downhill, or walking down stairs may produce knee pain.
Direct pressure on the knee cap may produce pain.
The area around the patella may swell when pain is present.

♦ Orthopedics:

Patella Grinding – Chondromalacia patella

Apley's compression – Meniscus
Apley's distraction – Ligament integrity
McMurray's – Meniscal tears
Varus and Valgus stress test – Collateral ligaments
Anterior drawers – Anterior cruciate
Posterior drawers – Posterior cruciate

♦Some Differential Dx's

Chronic pain – usually due to intra-articular pathology
Meniscal pain – localized at joint space,worse with activity, pain is most common symptom of tear (49%)
Patellofemoral pain – anterior knee not deep, pain increases walking down steps etc.
DJD – related to activity and weather
Inflammatory disorders – generally worse in the mornings

♦Tibiofemoral

There is a gliding type of motion found throughout the range of motion.
Tibial plateaus are the main load bearing structures. Bone, cartilage and ligaments share load bearing.
The menisci help in distributing the stresses imposed on the tibial plateaus.

♦Menisci

♦Menisci

The menisci (semilunar cartilages) attach to the tibial plateau via coronary ligaments.
They provide deeper articular depressions than are supplied by the tibial surface alone.

They are responsible for load transmission and shock absorption.

♦Anterior Cruciate Ligament

Primary role: restraint to Anterior tibial displacement
Accepts 75% of the Anterior force at full extension and ~85% at 30 degrees flexion.
Secondary role: is to resist tibial Rotation, especially toward full extension, and it functions more as a restraint to Internal Rotation.
Also helps to restrain Valgus opening in full extension.

♦ Mechanism of ACL injury

Most commonly this injury occurs during rapid cutting maneuvers in sports such as basketball, soccer, football and rugby.
Participation in these sports predisposes the knee to a collision from the lateral aspect, as occurs in tackling.

♦ Posterior Cruciate Ligament

Primary role: restraint to Posterior translation, especially at 30 and 90 degrees of flexion, sustaining 95% of the restraining force.

Secondary role: to help restrain valgus opening in full extension

♦ Mechanism of PCL injury

PCL injury can have the same positional mechanism of action as ACL injury, due to the complexity of knee mechanics and muscular and or lower leg variables (i.e. foot fixed in ski boot, contractile force of popliteus, hamstrings or other muscles crossing the knee joint at time of injury).

♦ Collateral ligament injury

Medial collateral ligament is the primary valgus restraint. Injury is caused by valgus stress to the knee.
In view of its attachment to the medial meniscus, MCL injury is commonly associated with medial meniscus and ACL injury (unhappy triad).
The iliotibial band inserts at the superior aspect of the lateral tibia.
It functions to stabilize the pelvis when the knee is in flexion during weight bearing.
Friction can be produced at the lateral femoral condyle if the knee does not flex and extend properly.
Most commonly seen in runners

♦ Iliotibial band

Friction is usually produced at the time of foot strike and produces local inflammation of he knee joint with mild-severe lateral knee pain.
Usually caused by poor mechanics.

Overuse is commonly a factor, which is why it is seen most frequently in runners.

♦ Iliotibial band cont.

Pronation of the foot: is the number one abnormality linked to I.T.B. Syndrome. Pronation causes the tibia to rotate internally and tightens the I.T.B., causing it to rub with more force against the edge of the femur.

High or low arches: prevent the arches in the feet from acting as the natural "shock absorbers" they were designed to be. Thus, the force of each foot strike (up to 3 times the body's weight) is passed on to the knee area.

Bow-legs: cause tightening of the soft tissues on the outer aspect of the leg and knee, forcing the I.T.B. to rub with greater force against the edge of the femur.

♦ Iliotibial band cont.

Pain occurs on the outside of the knee
Pain is worse on slow straight line running and actually better on fast, change of direction movements (the opposite to most knee injuries)
Pain gets worse the longer that running goes for
Pain is worse running downhill than uphill or on level ground
Pain can be **severe** once the band starts rubbing on bare bone. In this case it is relieved fully by walking with the leg totally straight.

♦ Ankle and Foot

♦ Basic Anatomy:

26 – 28 Bones and 33 joints

3 cuneiforms (wedge shaped)

the navicular (boat shape)
the cuboid (cube shape)
the talus (ankle bone)
the calcaneus (heel bone)
five metatarsals
two sesmoid?
14 phalanges

♦Focused Examination of Involved Joints

Inspection: gross swelling, redness, malalignment (fracture ?)

Palpation: warmth, crepitus, tenderness
(not pain)

Motion: active, passive, and resisted

♦The Arches

♦Optimal Arch Angle

♦Indicators for Excessive Pronation

Foot Flare / Toe Out
Posterior/Lateral Heel Wear
Patellar Approximation
Achilles Tendon Bowing
Navicular / Flat Arch
Callouses on 2-3-4 Metatarsal Heads
Positive Navicular Drop Test (PSI)

Grade 4 Psoas, Gluteus Medius, Quadriceps

♦

Foot Type and Lower Extremity Injury

" Athletes with pronated and supinated feet had significantly more knee pain than the normal group."Dahle LK,et al.J Ortho Sports Phys Ther 1991;14(2):70-4

♦Muscles in the Foot

"The first line of defense of the arches is ligamentous. The muscles did not come into play until a force greater than 400 pounds was exerted and even then many remained inactive."Basmajian JV et al.The Role

of Muscles in Arch Support of the Foot: An Electromyographic Study. J of Bone and Joint Surgery, Vol 45, No 6 September 1963.

♦4 Facts About the Feet

The most common subluxation pattern of the foot is
1. EXCESSIVE PRONATION.
2. Nearly all excessive pronation is BILATERAL but ASYMMETRICAL.
3. Whatever one arch in the foot does….so do the other two.
4. Most foot subluxations do not create foot SYMPTOMATOLOGY.

♦Arch Stability

The highest relative contribution to arch stability was provided by the plantar fascia, followed by the plantar ligaments and spring ligament. Plantar fascia was a major factor in maintenance of the medial longitudinal arch.Huang et al: Biomechanical Evaluation of Longitudinal Arch Stabilty. Foot & Ankle, Vol. 14, No. 6, July/August 1993

♦Simple Relationship of Arches-Bones-Muscles

♦Chronic Foot Strain

Cause - Repeated excessive stress

What Happens?

1. Ligaments exposed to strain elongate and undergo inflammatory changes
2. If it persists….
   ligament degenerates
   loses supporting function
   DJD develops in joint

♦Plantar Fascitis
♦Pain in arch of foot
♦Continual stress may cause a calcaneal spur

- ♦Fallen arches
- ♦Elastic vs. Plastic deformation

♦Elastic vs. Plastic deformation

Elasticity - property of a material that allows the material to return to its original shape and size after the removal of the deforming load.

♦Plasticity – the property of a material to permanently deform when it is loaded beyond its elastic range.

♦Plantar Fascitis

Rx: Plantar Fascitis
Adjust
Exercise – marble pick up,
Roll a tennis ball, with slight weight bearing the length of the foot
Orthotics – to support arches, also with a depression in heel
Ultra-sound
Surgery ????

♦Metatarsalgia

"pain in the forefoot represents the most frequent cause of pain in the human foot. The most common origin of the disturbance is an alteration of the fine biomechanics of the forefoot."Viladot A: Metatarsalgia Due to Biomechanical Alterations of the Forefoot. Orthopedic Clincs of No Ameriaca, Vol 4, No 1, Jan 1973.

♦ Metatarsalgia

Usually middle 3 metatarsal heads due to depression of metatarsal arch caused by strain
Callous formation indicates excessive weight bearing on metatarsal heads
Pain greatest on weight bearing, feels like "a pebble in shoe"
Pain is constant

Rx: Metatarsalgia

Elevate Mid-metarsal Arch to assist in restoration of normal weight bearing

Adjust metarsal heads
Use foot orthotics to help restore archs
Use support under the **shafts** and **not** under the heads of the metatarsals

♦ Morton's Neuroma
Fibrous swelling of the 4th digital nerve
Usually caused by irritation due to rubbing between the metatarsal bones ie. Shoes that are too tight and narrow
Patient usually pain free when **not** wearing shoes (differentiate from metatarsalgia)
Pain is sharp, severe, stabbing
Rx: Morton's Neuroma
Adjust metatarsal heads
Eliminate the cause of the stress, properly fitted shoes
If severe surgical intervention may be necessary