Objectives

- Review some basic anatomy of shoulder and lower extremity joints
- Review and demonstrate some common physical exam maneuvers to identify diagnosis
- Discuss imaging considerations for common shoulder and lower extremity problems
- Demonstrate some osteopathic manipulative techniques that may be considered in the treatment of common extremity complaints

General Concepts Upper Extremity

- Shoulder is third most common MS complaint in primary care offices
  - Second only to knee pain for referrals
- Incidence 25/1000 patients
- Up to 26% of athletic injuries involve the shoulder
General Concepts Upper Extremity

- Upper extremity pain:
  - Intrinsic disease
  - Pathology of the peri-articular structures
  - Referred pain
- Role of structure and function
- Intrinsic factors
  - Skeletal immaturity
  - Weak muscles
- Extrinsic factors
  - Level of competition
  - Intensity, duration, and frequency
  - Biomechanical and physiological demands of each sport

Shoulder Examination—HISTORY

- Stiffness or loss of motion may be the major symptom in patients with adhesive capsulitis or arthritis
- Pain with throwing (such as pitching a baseball) suggests anterior glenohumeral instability, or labral etiology
- Acute trauma with the arm abducted and externally rotated strongly suggests shoulder subluxation or dislocation and possible glenoid labral injury
- Chronic pain and loss of passive range of motion suggest frozen shoulder or tears of the rotator cuff
- Pain in shoulder coming from rotator cuff or bursa radiates to lateral deltoid – NOT past elbow!
- Pain on rolling over in bed suggests bursitis
- Pain that wakes from sleep suggests rotator cuff tear
  - 88% sensitive, 20% specific

Anatomy

- Shoulder is a complicated anatomical and biomechanical joint
  - “Fragile Equilibrium”
    - Loss of stability
    - Gain in mobility
    - Suspended by soft tissue
  - Five Joints
    - Sternoclavicular joint
    - Acromioclavicular joint
    - Glenohumeral joint
    - Subacromial/Suprnhumeral
    - Scapulothoracic
Anatomy—Shoulder

- Static stabilizers
  - Labrum
  - Capsule
  - Adhesion-cohesion
  - Intra-articular pressure

- Dynamic stabilizers
  - Mainly through compression
    - RC muscles
    - Deltoid
    - Long head of biceps
    - Scapulothoracic muscles
  - Allows the “dropping down”
  - Proprioceptive feedback

Anatomy—Scapular Mechanics

- 6 motions possible in 3 planes:
  - Frontal plane
    - Upward/downward rotation
  - Sagittal plane
    - Anterior/posterior tilt
  - Transversal plane
    - Internal/External rotation
  - Also can have superior/inferior & medial/lateral shifts over the posterior rib cage

- These motions are rarely individual, but are usually combined to allow for smooth glenohumeral function
- Functional base for shoulder
- Complex biomechanics

Functional Biomechanical Exam

- Inspection
  - Evaluate posture, deformity
    - Atrophy of the supraspinatus or infraspinatus
      - Rotator cuff tear
    - Examine subacromial bursa
      - Cervical neuropathy
    - Scapulae “winging”
      - Can be associated with superior instability and excessive external or impetus dysfunction

- Neurovascular
- A/P ROM
- Palpation**
- TART
- Strength Testing
- Biomechanics
- Special Testing
Scapular Dyskinesis

- Alterations in the resting position or dynamic motion
- Effects timing and magnitude of:
  - Acromial upward rotation
  - Excessive movement of the glenoid
  - Decrease maximal RC activation
- Often associated with other upper extremity disorders

Shoulder Complex

- Subacromial Impingement
  - 48-72% of shoulder pain in primary care office
- Mechanism:
  - Repetitive overhead motion
  - GH laxity and instability of shoulder
  - Tensile failure
- Physical Findings:
  - Empty Can test vs full can
  - Neer test
  - Hawkins test
  - Reproduce pain in shoulder

Impingement Testing

- Neer Test
  - Empty can position
  - Passive
  - + if pain
  - Anterior margin acromion on RC
  - Sen 75-89%; Spec 30-47%
- Hawkins Test
  - Passive
  - + if pain
  - Greater tuberosity under CA ligament
  - Bursitis:
    - Sen 70-80%; Spec 41-50%
    - RC pathology:
      - Sen 83-86%; Spec 48-53%
Impingement Syndrome

- Type I 17%
- Type II 43%
- Type III 40%
- Type III found in up to 80% of RC tears
- Compared with 3% in Type I

[References]
http://orthoinfo.aaos.org/fact/thr_report.cfm?thread_id=133&topcategory=shoulder

Rotator Cuff Injury

- Age
  - <40 years are more likely to present with shoulder instability, impingement, or mild rotator cuff disease
  - >40 years are at an increased risk for partial or complete tear, adhesive capsulitis, or glenohumeral osteoarthritis
- Lateral deltoid pain is often correlated with rotator cuff pathology
- Associated factors
  - Night pain from sleeping on the affected shoulder
  - Painful arc
  - History of trauma
  - Overhead activities

[References]
Bigliani, L. JBJS. 1997; 79: 1854-1868

Rotator Cuff Injury

- Existence of tear and location of tear did NOT influence the location of pain
- Most common location of pain with tendinitis
  - Lateral region (45%)
- Most common location of pain with tears
  - Lateral
    - Supraspinatus (59%)
    - Infraspinatus (59%)
  - Anterior
    - Subscapularis (54%)

[References]
Itoi, E. AJSM 2006; 34 (2): 256-264
Supraspinatus Testing

- Scaption position
  - 90° Abduction; 30° forward flexion
- “Full Can Test”
  - Less impingement
  - 86% sensitive; 74% specific
- “Empty Can Test”
  - 89% sensitive; 68% specific
- Apply a downward force as the patient resists
- The test is positive with weakness or pain

Subscapularis Testing

- Gerber “Lift Off” Test
  - Minimal activation of pectoralis and latisimus
  - Examine for weakness and/or pain
  - Weakness Sens 17.79%; Spec 59-100%
  - Pain Sens 46%; Spec 69%
- Bear Hug Test
  - Examiner tries to pull the patient’s hand from the shoulder
  - ER force applied perpendicular to forearm
  - A positive test = weakness
  - Or weakness by >20% compared to other side
  - Sens 60%; Spec 92%

Teres Minor/Infraspinatus Testing

- External Rotation Strength Test
  - 0° abduction; 45° IR of humerus
  - Min activation of supraspinatus and deltoid
  - Positive test = weakness/pain
  - Sens 50-84%; Spec 53-90%
Superior Labral Anterior Posterior Lesions (SLAP)

- 6-30% prevalence
- Anterior pain with overhead activities
  - Posterior tightness
  - Clicking or popping
  - Loss of velocity
- Mechanisms
  - Eccentric loading of biceps during throwing
  - Chronic subluxation
  - Fall with compressive load
  - Forced abduction/EER
  - Excessive traction from weight lifting

SLAP Testing

- **Biceps Load Test**
  - Loads the superior labrum via stress on the biceps tendon during resisted flexion force
  - (+) test is pain or apprehension
  - Test I is 90°/90° → Sens 91%, Spec 97%
  - Test II is 120°/90° → Sens 90%, Spec 97%

SLAP Testing

• O’Brien Test
• Shoulder 90° flexion, 10-20° adduction, thumb pointed down
• Patient resists downward pressure, first
• Rotate to supination and resist flexion
• (+) test if pain alleviated in palm-up position
  – Sensitivity 100% (47%)
  – Specificity 97% (59%)

http://www.weldoen.nl/schouder/test_pass.htm

SLAP Testing

• Combination of tests
• Radiographs
  – Evidence of instability
  – Bankart
• MR arthrogram
• NSAIDs
• Rehabilitation
  – Rotator cuff
  – Scapular stabilizers
• Surgery

http://www.bocaradiology.com/cases/MSK/SLAPcor.jpg

Treatment

• Goal is to restore normal structural/functional relationships in the region:
• Activity modification
• Imaging
• Osteopathic
  – Balance axial skeleton
  – Re-establish costal mechanics
  – Improve clavicular motion
  – Improve scapular motion
  – Improve lymphatic flow
• NSAIDs
• Physical Therapy
• Injections
• Orthopedic consult

Osteopathic Treatment

- Scapular Myofascial
- Lateral Recumbant
- Relax musculature
  - Paravertebral
  - Parascapular
- Enhance dynamic function of the scapula and shoulder complex


Osteopathic Treatment

- Indirect Jones Technique
  - Patient's arm is held in the adducted/internal rotation position
  - A compression force is applied on the elbow along the shaft of the humerus
  - This will externally rotate the scapula and produce more adduction of humerus in the glenoid

Osteopathic Treatment

- Green's Technique
  - Prone position with the painful arm off the edge of the table
  - The physician grabs the distal humerus and applies an anterior and caudal traction with internal and external rotation
Osteopathic Treatment

• **Green's Technique**
  - Physician then grabs the humeral neck with thumbs on the greater tuberosity, and the remaining fingers surrounding the proximal shaft
  - Movement is applied through the humeral head
    - Anterior-posterior
    - Cephalad-caudad
    - Medial and lateral traction-distraccion
    - Figure of eight
    - Circular directions

• **Spencer Technique**
  - Series of proprioceptive neuromuscular facilitation techniques
  - Can be expanded to include ME treatment
    - Physician stabilizes scapula
    - Physician engages barrier of joint
    - Patient pushes against (away from barrier)
    - Repeat 3-5 times
    - Taking up slack and engaging new barrier each time
  - Engages all of the muscles around the GH joint
  - Both diagnostic & therapeutic

Spencer Technique

The seven stages of motions are:

1. Engage GH extension barrier with elbow flexed
2. Engage GH flexion barrier with the elbow flexed
3. Circumduction with compression
   - Start small circles, then gradually increase size
   - Clockwise and counterclockwise
   - May also do ME of IR/ER barriers
4. Circumduction with traction on straight arm
   - Start small circles, then gradually increase size
   - Clockwise and counterclockwise

5. Engage abduction barrier

6. Adduction/IR with elbow flexed

7. GH pump with distraction and compression along straight arm

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General Concepts in Lower Extremity

- Lower extremity provide support and facilitate locomotion
  - Final common platform for postural alignment
- Balance and posture
  - Body slightly sinks over base of support using ankles, knees, hips
- "Pump"
  - Major contributor to venous and lymph return
- Pain
  - Skeletal
  - Articular
  - Ligamentous
  - Myofascial structures

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General Concepts in Lower Extremity

- Knee injuries account for nearly 1/3 all sports injuries
- Meniscal injuries are very common
  - 8.1 per 1000 patients (1/3 being sports related)
  - 8.1 medial: lateral
  - <30 years typically traumatic and peripheral tears
  - >30 years more complex and degenerative patterns
- Ankle injuries in the US from 1 to 10 million per year
  - 85% sprains
  - 85% of sprains are inversion injuries
  - Sports most frequently associated with ankle sprains are basketball, football and cross-country running
General Concepts in Lower Extremity

- Need to consider the entire lower extremity as a functional unit in diagnosis and treatment of dysfunction
  - Hip and pelvis pain often referred to knee
  - When swelling is present, consider starting treatments with lymphatic drainage techniques and correction of any dysfunction in the pelvic region

Knee Anatomy

- Double condylar, complex synovial articulation
- Cartilage
- Ligaments
- Move in three planes at once:
  - Flex and Extend
  - Translate Varus to Valgus
  - Rotate
    - Medial condyle is longer, resulting in posterolateral (ER) of tibia with full extension
    - Anteromedial (IR) glide with flexion

Ankle Anatomy

[Image: Ankle Anatomy Diagram]
Functional Biomechanical Exam

• Inspect
  – Evaluate gait and posture
  – Examine foot, knee, and hip alignment
  – Leg lengths

• Neurovascular
• A/P ROM
• Palpation**
  – TART
• Strength Testing
• Biomechanics
• Special Testing

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Functional Biomechanical Exam

• “Q” angle
• Major effect on tracking of patella
• May add ligamentous stress
• Muscle imbalance
  – VMO
  – Hamstring tightness
• Trigger points (TrPs)

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Functional Biomechanical Exam

• The most common structural challenge is a shorter or longer lower extremity
  – Anatomically short or long leg
  – Torsion of the lower extremity
  – Twisting or rotation of the pelvis in any of the 3 planes, either primarily or from a dysfunction elsewhere

Juhl, JH et al. JAOA 2004; 104 (10): 411-421

http://www.americanpainspecialists.com/images/361_leglengthinequality.jpg

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Gait Cycle: Osteopathic Phases

- Watch foot, knee position
- Stride length
- Right heel strike
  - Right innominate rotates posterior
  - Left rotates anterior
  - Anterior sacrum rotates left
  - Superior sacrum level
  - Spine rotates left
- Midstance
  - Right leg straight
  - Innominate rotates anteriorly
  - Sacrum rotated right, SB left
  - Lumbar spine rotated left, SB right
  - Rotary @ pubic symphysis

MRI vs Clinical Exam for Meniscus

- Results of 5 studies favored routine use of MRI
  - Accuracy of PE 44-78%
  - Accuracy of MRI 68-96%
- Results of 7 studies concluded that routine MRI was unnecessary if examiner experienced orthopedist
  - McMurray, Apley, Thessaly, joint line tenderness
  - Only 9% of arthroscopically confirmed tears not dx
- Concomitant ligamentous injury, severe joint degeneration, and/or occult dx reduced accuracy

| Table 1: Sensitivity and specificity for various tests to identify meniscus tears in asymptomatic patients and asymptomatic controls. Accuracy and specificity are compared between the two groups. | Study | Joint Line Tenderness | SB Humerous | Apley | Thessaly in 2007 |
|---|---|---|---|---|
| Sensitivity | McMurray (2008) | 1.00 | 0.76 | 0.40 | 0.10 |
| | Thessaly (2004) | 0.80 | 0.50 | 0.20 | 0.00 |
| | American Orthopaedic Association (2003) | 0.80 | 0.50 | 0.30 | 0.20 |
| | McMurray (2004) | 0.80 | 0.50 | 0.30 | 0.20 |
| | American Orthopaedic Association (2003) | 0.80 | 0.50 | 0.30 | 0.20 |
| Specificity | McMurray (2008) | 0.76 | 0.90 | 0.40 | 0.10 |
| | Thessaly (2004) | 0.50 | 0.76 | 0.10 | 0.00 |
| | American Orthopaedic Association (2003) | 0.50 | 0.76 | 0.10 | 0.00 |
| | McMurray (2004) | 0.50 | 0.76 | 0.10 | 0.00 |
| | American Orthopaedic Association (2003) | 0.50 | 0.76 | 0.10 | 0.00 |
| Individual Studies Examining the Thessaly Test | McMurray (2008) | 1.00 | 0.76 | 0.40 | 0.10 |
| | American Orthopaedic Association (2003) | 0.80 | 0.50 | 0.30 | 0.20 |
| | McMurray (2004) | 0.80 | 0.50 | 0.30 | 0.20 |
| | Yankovich (2000) | 0.80 | 0.50 | 0.30 | 0.20 |
| | American Orthopaedic Association (2003) | 0.80 | 0.50 | 0.30 | 0.20 |
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| | American Orthopaedic Association (2003) | 0.50 | 0.76 | 0.10 | 0.00 |

Approach to the Knee

- Effusion
  - More helpful in younger person
- Joint line tenderness
  - Meniscus no pain fibres
  - Pain from inflammation vs other structures
- Range of motion
  - Lack of terminal extension consider anterior or bucket handle tears
  - Lack of full flexion consider posterior horn tear


Meniscal Exam

- McMurray's Test
  - Knee flexed on the side to be tested (driving the menisci posterior)
  - With right hand, ER the tibia (driving medial meniscus further posterior) and straightens the leg,
  - Straightening (extension) drives the medial meniscus anteriorly
  - An audible or palpable click is a positive test
  - *Medial-Lateral Grind Test* may augment with valgus/varus stress


- Thessaly Test
  - The patient rotates knee and body internally and externally
  - IR of the body produces ER of the tibia and medial joint-line pain when the medial meniscus is torn
  - Patients may experience joint-line discomfort and may have a sense of locking or catching

Meniscal Exam

- Apley Compression/Distraction Test
  - Sen 13-16%; Spec 80-90%
- Bounce Home
  - Sen 44%; Spec 95%

Ligamentous Testing

- Straight Anterior
  - Lachman Test
    - Sen 80-99%; Spec 94-99%
  - Anterior Drawer
    - Acute injuries
      - Sen 22-76%; Spec 97%
    - Chronic injuries
      - Sen 53-85%; Spec 97%
- Straight Posterior
  - Posterior Drawer
    - Sen 51-100%; Spec 99%
  - Posterior Lachman
  - Sag Sign
    - Sen 79%; Spec 100%
Knee Imaging

- Plain radiographs are one of the most common films in ED
  - Nearly 80% of pts get plain films
- Sensitivity 85-100%
- Specificity 88-94%
- More than 93% are negative


Knee Imaging—Ottawa Rules

- Age >55 or <18 years
- Isolated patella ttp
- Fibular head ttp
- Inability to flex knee to 90°
- Inability to weight bear after injury or in ED for 4 steps
- ↓ knee radiographs by 25-50%
- Sensitivity 97-100%
- Specificity 27-49%


Nugent, P. Phys and Sportsmed 2004; 32(5).


Knee Imaging—Ottawa Rules

- Can the decision rules apply to children?
  - Incomplete fused physis
  - Injure epiphyseal plates more with trauma
  - Inability of young children to localize pain
  - Dependent on child's ability to ambulate independently
- Three studies
  - One study with 234 patients missed 1 fracture so concluded that can NOT be used
  - Other two larger (400+, 750+ patients) concluded that 100% sensitivity


Knee Imaging—Pittsburgh Rules

- History of blunt trauma
- Fall as mechanism of injury
- Age >50 or <12 years
- Inability to weight bear for 4 steps
  - After injury or in ED
  - Heel pad to toe pad for each foot
- Sensitivity 99-100%
- Specificity 41-60%
- ↓ knee radiographs by 52%

Knee Imaging

1) Acute injury
   - AP and lateral views
2) OA
   - Bilateral AP standing and sunrise to allow for all 3 joint compartments
     - Medial, lateral, retropatellar
3) Mechanical symptoms/trauma
   - Tunnel view (45° flexion) to look for loose bodies
4) PFS/patella subluxation
   - Merchant view (30° flexion) to better assess patellar tilt and groove

Inversion Ankle Sprain

Typically with plantar flexion
- Thin posterior portion of talus offers little ankle stability
- Relying dynamically on soft tissue support
- Peroneal muscles are eccentrically loaded rapidly
- Weight of body coming down "jams" talus into the crural (distal tib/fib) articulation
Ligamentous Testing

- **Anterior drawer Test**
  - Tests anterior talo-fibular ligament.
  - Position hands as shown. Slight 5-10° plantar flexion. Slide foot forward while stabilizing tibia. You should feel an endpoint.
  - An abnormal exam would be an asymmetric increased motion or lack of endpoint. The figure shows the direction of force. The black arrow shows the talar prominence that is sometimes apparent at the endpoint of the drawer test.

- **Talar Tilt Test**
  - Tests the integrity of the Calcaneal Fibular Ligament.
  - The hands are placed so that the right hand fingers are monitoring the space just below the lateral malleolus. The talus and calcaneus are rotated toward the medial side. Note in the picture at right the distance between fingers and lateral malleolus is widened (red circle). Always compare to the opposite side.

- **Reverse Talar Tilt**
  - Tests integrity of Deltoid ligament.
  - Essentially the reverse of the above. Rotation is toward the lateral malleolus. You are trying to rotate the talus out from under the medial malleolus. Deltoid ligament injuries usually require a surgical consultation. Note the arrow showing where monitoring should occur.
Foot and Ankle Imaging

- Pain in malleolar zone AND:
  - Tenderness over posterior tip of either malleolus
  - Inability to bear weight immediately and in ED
- Pain in midfoot zone AND:
  - Tenderness at base of 5th metatarsal
  - Tenderness over navicular
  - Inability to bear weight immediately and in ED
- Sensitivity 96-100%
- Specificity 47-53%
- Decreased x-rays by 30-40%

Inversion Ankle Sprain

- Soft tissues
  - Peroneal muscles
  - Anterior tibialis
  - Extensor digitorum
- Navicular/cuboid dysfunction
- Talus dysfunction
- Fibular head
- Tibia
- Femur
- Hip
- Sacrum
- 3rd rib/thoracic vertebra

Soft Tissue Treatment of Lower Extremity

- Peroneal Muscle Release
  - Goal here is to reduce pain & tension
  - Promote fluid evacuation from distal ankle
  - Can also serve as a prep for another technique
  - Gently massage or apply perpendicular traction to affected tendons & muscles
  - As with any fluid model, start distally & work proximally
Soft Tissue Treatment of Lower Extremity

- **Popliteal Fossa Release**
  - Designed to relax the tissues of the popliteal fossa
  - Promote drainage
  - Exert an anterior force with fingers in midline of fossa
  - While patient extends knee (maintaining heel on table), exert a firm, spreading force with fingertips
  - This can be uncomfortable, but should not be painful

Inversion Ankle Sprain

- **Foot Dysfunction**
  - Somatic dysfunction
    - Navicular
    - Cuboid
    - Diagnosed by pain and decreased motion
  - Trigger points

Navicular Dysfunction

- **Mechanism**
  - Chronic Posterior Tibialis dysfunction
  - Calcaneo-navicular (spring) ligament insufficiency
  - Acute inversion ankle sprain
- **Exam**
  - Prominent (& usually tender) navicular bone
  - May have increased pronation
Treatment of Navicular Dysfunction
Articulatory Technique

- Restore arch by gapping superior aspects of navicular bone & applying plantar to dorsal pressure
  - Can be done with one rapid action or with slow steady pressure
- Recheck findings

Cuboid Dysfunction

- Mechanism
  - Chronic peroneus muscle dysfunction
  - Calcaneo-cuboid ligament insufficiency
  - Often concurrent with navicular dysfunction
- Exam
  - Prominent (& usually tender) cuboid bone
  - Supination may be noticeable

Treatment of Cuboid Dysfunction
Articulatory Technique

- Grasp cuboid snugly & ‘chalking’ the 5th metatarsal head onto the cuboid gently
- Or ‘chalking’ the cuboid onto the calcaneus.

“Chalking the cue stick!”
Inversion Ankle Sprain
Talus Dysfunction

• Anterior dysfunction
  – Restricted in dorsiflexion
• Pt will complain of anterior talar pain or ‘jamming’ with attempted dorsiflexion, & possibly of reduced calf stretch when attempted
• Diagnose by “Swing Test”

Treatment of Talus Dysfunction
HVLA Technique (Talar Tug)

Treatment of Talus Dysfunction
Articulatory Technique
Treatment of Anterior Talus
Muscle Energy Technique

- Flex knee and keep foot parallel to floor until barrier is felt
- Have patient gently plantarflex (away from barrier) while maintaining position
- 2 to 3 seconds rest
- Engage new barrier
- Repeat 3-5 times

Treatment of Posterior Talus
Muscle Energy Technique

- Extend knee and keep foot parallel to floor until barrier is felt
- Have patient gently dorsiflex (away from barrier) while maintaining position
- 2 to 3 seconds rest
- Engage new barrier
- Repeat 3-5 times

Inversion Ankle Sprain
Fibular Head Dysfunction

- Commonly posterior dysfunction
- Usually secondary to a traumatic inversion mechanism at the ankle
  - Can be associated with foot/toe sensitivity, and/or mimics lateral meniscal tear
- May complain of lateral knee pain, usually with weight bearing & pivoting
  - “Crossed leg peroneal palsy”
- Rule out Maisonneuve Fx if known to be a traumatic mechanism
Inversion Ankle Sprain
Fibular Head Dysfunction

- Remember plane of tib-fib joint is about 30°
  - Anterolateral
  - Posteromedial
- Goal of all the following treatments are for the return of anterolateral glide of the proximal fibular head & to allow external rotation of tibia

Treatment of Posterior Fibular Head

- Physician wraps MCP of index finger around the fibular head
- Externally rotate patient’s tibia
- Then with light pressure or springing, flex knee, using MCP as a fulcrum to bring fibular head anteriorly
- Recheck

Treatment of Fibular Head Dysfunction
Muscle Energy Technique

- Posterior Fibular Head
- Grasp affected extremity with contralateral hand at either distal tib/fib junction or at the calcaneus
- Evert and Dorsiflex foot
- While applying anterolateral force to proximal fibula, have the patient internally rotate their foot against operator resistance for 5 seconds
- Patient relaxes
- Take up the “slack” and engage new barrier
- Repeat 3-5 x
- RECHECK
Treatment of Fibular Head Dysfunction
Muscle Energy Technique

- Anterior Fibular Head
- Grasp affected extremity with contralateral hand at either distal tib/fib junction or at the calcaneus
- Invert and plantarflex foot
- While applying posteromedial force to proximal fibula, have the patient externally rotate their foot against operator resistance for 5 seconds
- Patient relaxes
- Take up the “slack” and engage new barrier
- Repeat 3-5 x
- RECHECK