Practical Applications of Manual Therapy for the Ankle and Foot

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Outline

- Objectives
- Case Study
- What is Manual Therapy?
- Joint Mobilization
- Joint Mobilization Techniques
- Practical Applications
Objectives

- Demonstrate safe and effective clinical use of oscillatory and sustained distal lower extremity joint mobilization
- Recognize appropriate joint mobilization interventions for a patient with ankle sprains
- Be able to utilize information and apply concepts in practical situations
Case Study

- **History:**
  - 26-year-old hockey player
  - Patient reported “twisting” his left ankle four days ago while participating in an off-season agility program
  - The mechanism of injury was ankle rolling outwards and the foot inward (plantar flexion and inversion stress)
  - Immediate post injury onset of swelling and (sharp) pain
  - Pain described as “ache” pain on the lateral aspect of left foot with localized tenderness
  - Antalgic gait and pain with standing
  - Pain relieved with ice, rest and NSAIDS
  - History of multiple left ankle sprains
  - VRS: 2/10 at rest, 4/10 with walking
# Case Study

<table>
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<tr>
<th></th>
<th>AROM</th>
<th>PROM</th>
<th>MMT</th>
<th>Joint Mobility</th>
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<tbody>
<tr>
<td>Ankle Dorsiflexion</td>
<td>5 deg</td>
<td>8 deg Limited</td>
<td>5/5 Strength</td>
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Case Study

- **Tests and Measures:**
  - **Observation and Structural Inspection:** Bilateral pes planus
    Navicular Drop Test: 6 mm
  - **Muscle length:** Gastroc/soleus tightness
  - **Girth measurement (Figure 8):** Left ankle: 51 cm, Right ankle: 50 cm
  - **Palpation:** Grade 2 tenderness on the left anterior/lateral talar dome and diffuse tenderness to the cuboid and 5th metatarsal base
  - **Special Tests:** Negative findings for Kleiger’s, Talar tilt, and positive for Anterior Drawer Test
  - **Functional Movement:** Difficulty controlling hip adduction, internal rotation and pronation during lunges and deep squats
  - **Missing arthrokinematic testing?**
  - **Manual therapy evidence?**

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What is Manual Therapy?

- Skilled hand movements intended to improve ROM, tissue extensibility, pain and induce relaxation
- **Manual Interventions:**
  - Manual Traction
  - Soft tissue Mobilization
  - Muscle Energy Techniques
  - Cranial- Sacral Therapy
  - PROM and Stretching
  - Manipulation/Mobilization

*Guide to Physical Therapist Practice, 2003*
Joint Mobilization

- Systematic approach to examining and treating the osteokinematics and arthrokinematics motions of the human body
  - **ROM:** AROM, PROM, and End-Feels
  - **Joint Play:** Involuntary interarticular motion present all synovial joints ie. glide, compression, distraction etc..
- Structural inspection and biomechanics are examined, and evaluated for possible dysfunction
- Joint mobilization requires the healthcare professional to passively move a joint either by:
  - Sustained stretch
  - Applying rhythmic oscillations
- Goal is to restore full and painless ROM

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Joint Mobilization

• **Indications:**
  • Lack of ROM
  • Painful joints
  • Muscle guarding

• **Effects:**
  • **Mechanical:**
    • Plastic deformation of inert and contractile tissue
    • Remodeling of adhesions
  • **Pain Inhibition:**
    • Gate controlled theory
    • Mechanoreceptors
  • **Joint Nutrition:**

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Joint Mobilization

- **Tibia/Fibula Techniques:**
  - Proximal Tibia/Fibula Joint: A/P and P/A
  - Distal Tibia/Fibula Joint: A/P and P/A

- **Ankle Techniques**
  - Talocrural: A/P
  - Talocrural: Weight-Bearing
  - Talocrural: Distraction

- **Foot Techniques**
  - Subtalar: Distraction
  - Subtalar: Lateral glide
  - Cuboid: P/A
Proximal Tibiofibular Joint

- Synovial joint
- Joint surface is flat or slightly oval
- Capsule is strengthened by anterior/posterior ligaments
- Proximal fibula glides on tibia anterior/lateral and superior during dorsiflexion
  - Soavi et al., *Foot Ankle Int*, 2000
Proximal Tibiofibular Joint (A/P and P/A)

- **Patient Position:**
  - Supine with knee flexed and the foot on the table

- **Stabilization**
  - Grasping the tibia

- **Action Hand:**
  - Therapist grasp the head of the fibula with thumb and index finger

- **Mobilization:**
  - Therapist applies an anterior and posterior glide motion of the fibula head on the tibia
Distal Tibiofibular Joint

- Syndesmosis joint
- No joint capsule
- Concave tibia on convex fibula facet
- Stability provided by posterior and anterior tibiofibular ligaments and interosseous membrane
- Distal fibula glides on tibia posterior superior and lateral rotation during dorsiflexion
  - Soavi et al., Foot Ankle Int, 2000
Distal Tibiofibular Joint (A/P and P/A)

- **Patient Position:**
  - Supine foot off end of table

- **Stabilization**
  - Grasping distal Tibia
  - Use leg to stabilize foot

- **Action Hand:**
  - Contact distal fibula with thenar eminence over lateral malleolus

- **Mobilization:**
  - Therapist applies a posterior and anterior glide motion of the distal fibula on the tibia

Mobilization of the distal tibiofibular joint has been shown to increase ankle dorsiflexion ROM
Fujii et al., *Man Ther*, 2010

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Talocrural Joint

- Synovial hinge joint
- Talus wide anterior than posterior
- Body of talus has three articulating facets:
  - Fibular
  - Tibial
  - Trochlear
- Thin capsule is strengthened by deltoid (medial), anterior and posterior talofibular ligaments, and calaneofibular ligament (lateral)
- Talus glides posterior and rotates externally with dorsiflexion
Talocrural Posterior Glide

- **Patient Position:**
  - Supine foot off end of table

- **Stabilization**
  - Grasping distal Tib-Fib

- **Action Hand:**
  - Contact talus with web space between thumb and index finger

- **Mobilization:**
  - Therapist applies a posterior glide through web space contact while maintaining plantarflexion

- Posterior glide of the talocrural joint improves dorsiflexion ROM and Function

Collins et al, *Man Ther*, 2004

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Weigh-bearing Mobilization

- **Patient Position:**
  - Standing

- **Stabilization**
  - Web space of one hand stabilizes the talus and forefoot
  - Other hand guides lower extremity

- **Action Hand:**
  - The belt is placed around distal tibia and fibula
  - Towel or foam needed for Achilles tendon protection

- **Mobilization:**
  - Therapist applies an anterior glide through belt while patient actively dorsiflexes (leaning forward)
  - Dorsiflexion with movement significantly increases ROM

Collins et al
*Man Ther*, 2004

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**Talocrural Distraction**

- **Patient Position:**
  - Supine with knee extended

- **Action Hand:**
  - Grasp talus

- **Mobilization:**
  - Therapist applies a long axis distraction of talus using hand contacts and body weight for assistance
Subtalar (Talocalcaneal) Joint

- Synovial joint
- Calcaneus (posterior, middle, anterior facets) articulates with talus
- One degree of freedom (inversion and eversion) some dorsiflexion and plantarflexion
- The joint is strengthened primarily by deltoid (medial), and calcaneal fibular ligament (lateral), and secondary by the medial, posterior and lateral talocalcaneal ligaments
- Calcaneus inverts, everts and internally and externally rotates
  - Dorsiflexion: The calcaneus everts, externally rotates and dorsiflexes
  - Goto et. al., *Foot & Ankle International*, 2009
Subtalar Lateral Glide

- **Patient Position:**
  - Side lying on the involved lower extremity

- **Stabilization:**
  - Grasp tib/fib and talus

- **Action Hand:**
  - Grasp the calcaneus with the thenar eminence

- **Mobilization:**
  - Therapist applies a lateral mobilization force through the therapist's arm and thenar eminence to the medial calcaneus
Subtalar Distraction

- **Patient Position:**
  - Prone with pillow between therapist and leg
- **Stabilization:**
  - Grasp talus from dorsal side
- **Action Hand:**
  - Grasp the calcaneus between your thumb and index finger with knee flexed
- **Mobilization:**
  - Push straight up towards ceiling
Calcanecuboid Joint

- Synovial joint
- Body of cuboid articulates with:
  - Calcaneuous
  - 4th and 5th metatarsals
  - Navicular
  - Lateral cuneiform
- Stability provided by dorsal and plantar: cuboideonavicular, calcaneocuboid, cubodeiometatarsal ligaments, and long plantar ligament
- Movement of CC joint is medial and lateral rotation (pronation and supination) in an anterior/posterior axis.
Cuboid P/A

- **Patient Position:**
  - Prone with knee in 70 deg. of flexion and 0 deg. of dorsiflexion

- **Stabilization:**
  - Interlocking fingers over the dorsum of foot

- **Action Hand:**
  - Thumbs positioned on the plantar/medial aspect of cuboid

- **Mobilization:**
  - With the patient’s leg relaxed, extend the knee while plantar flexing ankle with slight inversion of the subtalar joint while delivering an P/A mobilization
    - 6.7% of plantar flexion and inversion injury

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<th>Intervention (Glides)</th>
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<td>5 deg</td>
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<td>Prox Tib/Fib:⇒ Dist Tib/Fib:⇒ Talocrural:⇒</td>
<td>Anterior Posterior Posterior Lateral</td>
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<td>Subtalar:⇒</td>
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<td>30 deg</td>
<td>35° Limited Empty end -feel</td>
<td>Anterior glide Hypermobility Talocrural Joint</td>
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Practical Applications

- Chronic lateral Ankle Sprain
- Clinical Prediction Rules (CPR) for Chronic Ankle Sprains
- Syndesmosis (High Ankle) Sprain
Chronic Lateral Ankle Sprain

- Recurrent ankle sprain demonstrate impairments in the following joints:
  - **Proximal tibiofibular**
  - **Distal tibiofibular**
    - Positional Fault
      - Hubbard & Hertel, *Man Ther*, 2008
  - **Talocrural**
  - **Subtalar**
Clinical Prediction Rules
Manual Therapy and Exercise

- Symptoms worse with standing
- Symptoms worse during evening
- Navicular bone drop ≥ 5.0 mm
- Distal tibiofibular joint hypomobility
  - ³⁄₄ +LR 5.90 with a probability of success 95%
  - Whitman et al., JOSPT, 2009
 Syndesmosis (High Ankle) Sprain

**History**
- 10% of all ankle injury
- Dorsiflexion and lateral rotation of foot injury
- May have widening mortise
- Return: 10-52 days
- Hockey average 45 days (6-147 days)
  - 74% of all ankle sprains
  - Wright et al., *The AMJ of Sports Med*, 2004
Syndesmosis (High Ankle) Sprain

- **Physical Exam**
  - Swelling/edema
  - ↓ ROM
  - Point tenderness on distal tibiofibular ligament or up the syndesmosis
  - Positional fault of distal fibula (posterior lateral)

- **Special Tests:** Squeeze or Kleiger

- **Suggested Manual Interventions:**
  - Proximal Tib/fib: Posterior Glide
  - Distal Tib/Fib: Anterior Glide
  - Talocrural Joint: Posterior Glide
  - Subtalar Joint: Lateral Glide

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Questions?

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References


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