Manual Therapy for the Hip and Lower Quarter

Techniques and Supporting Evidence

Mitchell Barber
PT, MPT, CMT, OCS, FAAOMPT

Scarlett Morris
PT, DPT, CMT, OCS

Session 1: The Hip
The Hip

Hip Anatomy
- Synovial ball-and-socket joint
- The head of the femur points in an anterior/medial/superior direction
- The acetabulum faces lateral/inferior/anterior
- Anteversion angle of the neck is 10-15 degrees

The Hip

Hip Anatomy
- Femoral head articulates with acetabulum, which covers 50% of the femoral head
- Attached to the rim of the acetabulum is the fibrocartilaginous labrum, deepening the socket
- Neck angle is 125-135 degrees

The Hip

Ligamentous Stability
- Strong fibrous joint capsular extends from the bony rims and labrum of the acetabulum to the inter-trochanteric line just super to the inter-trochanteric crest
- Three ligaments, or thickenings, of the joint capsular provide stability to the hip joint
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The Hip

Ischiofemoral Ligament

- Forms the posterior margins of the capsule
- Extends from the ischial portion of the acetabulum to the superior femoral neck

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The Hip

Ischiofemoral Ligament

- Forms the posterior margins of the capsule
- Extends from the ischial portion of the acetabulum to the superior femoral neck

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The Hip

Pubofemoral Ligament

- Pubofemoral ligament lies medially and inferiorly and extends from the inferior acetabular rib to the inferior femoral neck
- Helps to limit abduction and extension
Iliofemoral Ligament

- Extends from the ventral edge of the ilium to the inter-trochanteric line
- It is taught in full extension and promotes stability of the pelvis on the femur in erect stance
The Hip

**Ligamentum Teres**
- From the acetabular notch to the head of the femur
- Aids little in joint stability and helps to arrest abduction

The Hip
- The anterior and posterior hip ligaments wind around the column in a clock-wise direction
- Extension ‘winds’ or tightens these ligaments, while flexion, ‘unwinds’ or relaxes them
- In ER the anterior fibers are taut and in IR the posterior fibers are taut

The Hip

**Range of Motion:**
- **Flexion:**
  - 120 deg w/ knee flexed
  - 30-40 deg abduction: 150 degrees
- **Abduction:** 45 degrees
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The Hip

**Range of Motion**
- **Adduction:** 30 degrees
- **Ext. Rotation:** 45 degrees
- **Int. Rotation:** 30 degrees
- **Extension:** 20 degrees w/knee extended

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The Hip

**Joint Arthrokinematics:**
- Follows convex on concave rules – roll and glide are in opposite directions
- **Flexion/extension:** Spin movement of the head of the femur
- **Abduction:** Head of femur rolls superior, glides inferior

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The Hip

**Joint Arthrokinematics:**
- **Adduction:** Head of femur rolls inferior, glides superior
- **External Rotation:** Head of femur rolls posterior, glides anterior
- **Internal Rotation:** Head of femur rolls anterior, glides posterior
The Hip

**Joint Arthrokinematics:**

- **Resting position:** Flexion 30 degrees
  Abduction 30 degrees
  Ext. rotation 20 degrees
- **Closed-packed:** Full extension, abduction, internal rotation
- **Capsular pattern:** Flexion, abduction, internal rotation
  (order may vary)

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**Joint Mobilizations**

**Distraction**

- Belt can be used.
- Be as close to the joint as possible.
- Hip should be placed in resting position – 30 flex, 30 abd, 20 ER.
- Lean away from patient gliding femoral head in lateral, inferior and posterior direction – “down and out”.

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**Long axis distraction**

- Hip in open-packed position
- Grasp ankle above malleoli
- Distract by leaning back

*Can also be a manipulation
**Think about what is behind you/body mechanics!*
Anterior glide femoral head in prone

- Place cranial hand on proximal part femur.
- Caudal hand under distal part femur. Flex knee.
- Extend hip with caudal hand, while mobilizing the proximal femur in anterior direction.
- >>> Increases extension

Anterior glide of femoral head, hip extended

- Pt supine with stabilization pad under superoposterior iliac crest.
- Pt on opposite side of table.
- Hand over hand on trochanter, elbows extended.
- Mobilize by pushing down on greater trochanter which creates an anterior glide of the femoral head.
- >>> Increases external rotation and extension.
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Posterior glide of femoral head, hip extended

- Pt prone, pillow under ASIS, foot and ankle off end of table. Therapist on opposite side of table. Hand over hand on greater trochanter, elbows extended.
- Push down on posterolateral aspect of trochanter, which creates a posterior glide of the femoral head.
- >>> Increases internal rotation and flexion.

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Evidence

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Comparison of Manual Therapy and Exercise Therapy in Osteoarthritis of the Hip: A Randomized Clinical Trial[2]

- 109 hip OA patients, outpatient clinic of a large hospital.
- Treatment period: 5 weeks (9 sessions)
  - "The manual therapy program was found to be superior to the exercise therapy program."
  - "The effects [...] lasted up to 6 months after the end of therapy."
  - "Traction of the hip joint was performed, followed by traction manipulation in each limited position"
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Session 2: The Knee

The knee is the most researched joint in the body[1]
- 1.3 million annual visits to the ER in USA due to knee trauma[1]
- Comprised of the tibio-femoral joint and patello-femoral joint
The Knee

- The superior tibio-fibular joint is non-weight-bearing but can be a source of dysfunction.
- Patella is a large sesamoid bone embedded in the quadriceps tendon.

The Knee

**Anatomy**

- The distal femur has 2 facets, or condyles, which are bi-concave.
- The lateral condyle is larger and juts out more anteriorly than the medial condyle.
- The condyles are not parallel but diverge posteriorly.

The Knee

**Anatomy**

- The distal femur has a facet for articulation with the patella.
- The medial tibial condyle is bi-concave but the lateral condyle is concave med/lat but convex ant/post.
- The joint capsule is attached to the edges of the tibial condyles. The capsule winds around the cruciate ligaments, which are therefore extra-capsular.
The Knee

Ligamentous Stability

Medial or Tibial Collateral Ligament

- Arises from the medial epicondyle of the femur and extends to the medial condyle and medial surface of the tibia
- Blends with the joint capsule and has attachment to the medial meniscus
- The MCL is the prime stabilizer against valgus stress in either flexion or extension

Lateral or Fibular Collateral Ligament

- Arises from the lateral epicondyle of the femur and extends to the fibular head
- The LCL of the knee is extra-articular in that it does not blend with the joint capsular or lateral meniscus
- Plays a role in defending the knee against varus stresses
The Knee

Anterior Cruciate Ligament

- Arises from the anterio-medial tibia and extends to the posterior-medial aspect of the lateral femoral condyle
- The anterior cruciate lies entirely within the joint capsule but is extra-synovial
- The ACL is the prime restraint against anterior tibial displacement

Posterior Cruciate Ligament

- The PCL is also extra-synovial but is contained within the joint capsule
- Arises from the posterior-medial aspect of the tibia and extends to the lateral aspect of the medial femoral condyle
- The PCL is the primary restraint against excessive posterior tibial translation

Range of Motion

Active flexion w/ hip flexed: 140 degrees
Active flexion w/ hip extended: 120 degrees
Passive flexion: 160 degrees
Passive Extension: 5-10 degrees
ER in full extension: 5 degrees
ER in flexion: 45 degrees
IR in flexion: 30 degrees
The Knee

**Arthrokinematics:**

- Flexion and extension are a combination of rolling and gliding in the opposite direction (convex femur moving on concave tibia).
- The initial phase of flexion is pure rolling. This corresponds to the normal knee ROM in walking.

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- The terminal phase of extension is associated with a small amount of external rotation (around 20 deg).
- This is due to tension of the cruciate ligaments, the MCL is being tightened more rapidly than the LCL, and the lateral femoral condyle gliding more freely on the convex tibial surface.

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- **Resting position:** 25 degrees of knee flexion
- **Closed-packed:** Full extension, external rotation of tibia
- **Capsular pattern:** Gross limitation of flexion, mild limitation of extension
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**Posterior glide of femur on tibia**
- Patient supine with bolster under proximal tibia just distal to the joint line.
- Therapist standing at side of table. Distal hand stabilizes tibia just below the joint line. Keep elbow extended. Mobilizing hand is placed on femur just above the patella. Keep elbow extended and mobilize femur in posterior direction.

>>> Increases extension

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**Posterior glide of tibia on femur**
- Patient supine with bolster under distal end of femur just proximal to joint line.

>>> Increases flexion of the knee.

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Slide 45

**Posterior glide tibia on femur, seated**
- Alternate version of the supine technique. Allows you to apply distraction to the tibia while mobilizing in a posterior direction.
- Patient seated in front of the therapist. Come up on your toes and place your knees against the patient’s middle tibia/fibula. When you gently drop your heels to the ground this will provide a mild distraction in the knee joint. Place both hands on the proximal lateral tibia and fibula and mobilize in posterior direction.

>>> Improves flexion

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Anterior glide of fibula at proximal tibiofibular joint

- Pt on hands and knees with affected foot over edge of table.
- Therapist standing across table from affected leg. Tibia fixated against table by pt’s body weight and by right hand holding lateral side of foot. Thenar eminence of left hand on pt’s posterior-medial fibular head.
- Mobilize in anterior-lateral direction.

• 2015 - 75 participants, 65 retained at one year
• Conclusion:
  • “Our results indicated that providing either manual therapy or booster sessions, in addition to exercise therapy, conferred incremental benefits over providing exercise therapy alone.”
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Session 3: Adverse Neural Tension

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Pain Mechanisms

- Nociceptive Pain: pain from tissue at the end of a neuron
  - Nerve endings are excited by mechanical or chemical irritants.
  - Chemical irritation: pro-inflammatory chemicals can cause excitability at the neuron.
  - Ischemia or highly acidic tissues can cause excitability at the nerve ending.
Pain Mechanisms

• **Central Sensitivity/Pain:** the neurons on the dorsal horn of the spinal cord become sensitized to impulses from the nerve.
  - Creating less activity to create an impulse to the brain.
  - The brain neurons become increasingly sensitized causing output from the brain which causes a sensation of sensitivity to movement etc.
• **Peripheral Neuropathic pain:** Pain or lesion of the peripheral nervous system.

LE Neurodynamics

Clinical Neurodynamics

- **Neurodynamics** involves mechanical and physiological alterations in the peripheral nervous system.
- May manifest as limitation in range of movement or pain with movement.
Sensitizing Movements

Maneuvers are used during neural tissue provocation tests to allow the clinician to differentiate between neural and non-neural origins of symptoms.

Assessment of Neural Tissue Movement

Neural provocation tests may be used to assess:

1. irritability
2. range of motion (of the nerve)
3. reproduction of the familiar pain

Adverse Neural Tension

A positive neural provocation test will produce:

1. a re-creation of familiar pain (and/or paresthesia)
2. a difference of 10% limitation in range of motion or more than the involved side
3. symptoms must be modifiable by a distant component change
Adverse Neural Tension

Beware of a False Positive:
These tests may produce paresthesia, pain, or a stretching sensation in asymptomatic, "normal" people.

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The Straight Leg Raise (SLR)

- Pillow or not – be consistent
- Cervical flexion alters dural tube length
- Ask for baseline first
- Knee passively fully extended
- Lift leg until symptoms are reproduced
- Stop at first sign of symptoms before adding sensitization movements
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**Lower Extremity Nerve Bias Positions:**
- Sural nerve is biased with SLR + Inversion + DF (SID)
- Peroneal nerve is biased with SLR + Inversion + PF (PIP)
  - Can be positive in patients presenting with ankle sprain
- Tibial nerve is biased with SLR + Eversion + DF (TED)
  - Can be further sensitized with hip IR, hip add, cervical flexion and trunk SB away.

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The SLR

Tibial Nerve Bias:
- Ankle DF
- Foot Eversion
- Knee Extension
- Use head and hip movements to differentiate

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**Slide 63**

The SLR & Common Peroneal Nerve Bias:
- Plantar flexion
- Inversion of the ankle
Prone Knee Bend Test – Femoral Nerve

- Palpation of the Femoral Nerve
- Equivalent to the SLR for the upper lumbar.
- 1. Knee flexion
- 2. Hip extension
- 3. –sensitize with cervical motion if needed or trunk SB

Side-Lying Slump Test

- Testing the involved leg up
- Hip extension with knee flexion
- Addition of cervical flexion and extension

Adverse Neural Tension

- Patients with radiating pain
- Numbness/tingling
- Heaviness
- Often involves a nerve root condition
- Often palpate pain is worse than proximal pain
- Would expect to find positive straight leg raise
- Positive Slump test
The Ankle

- The ankle is the most commonly injured weight-bearing joint in the body (McKinnis 2014).
- Consists of the talocrural and subtalar joints.
- Most injuries to the ankle are straight-forward, ligamentous injuries.
- Subtle ankle/foot fractures can be missed on initial examination.

The Ankle

Anatomy

The ankle joint is formed by the articulation of the distal tibia and fibula with the talus.

The Ankle

- The distal end of the fibula, the lateral malleolus, is slightly posterior and inferior to the level of the medial malleolus.
- The distal end of the tibia has a broad articular surface called the tibia plafond, the medial malleolus, an expanded process of the anteromedial aspect called the anterior tubercle, and a posterior marginal rim.
The Ankle

Ligamentous Stability

Three principal sets of ligaments stabilize the ankle joint

1. Medial collateral ligament (deltoid ligament)
2. Lateral collateral ligaments
3. Distal tibiofibular syndesmotic complex

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The Ankle

Ligamentous Stability

The medial collateral ligament consists of several superficial and deep bands expanding in a fan-like shape from the medial malleolus to the talus, the navicular, and the calcaneus.
The Ankle

Ligamentous stability

The lateral collateral ligaments are three distinct bands extending the lateral malleolus to the talus and calcaneus.

The ligaments are the:
- anterior talofibular ligament (ATFL)
- posterior talofibular ligament (PTFL)
- calcaneofibular ligament (CFL)

The distal tibiofibular syndesmotic complex is considered to be among the most important stabilizing structures of the ankle and is comprised of the:
- anterior tibiofibular ligamentous
- posterior tibiofibular ligamentous
- interosseous membrane
The Ankle

Range of Motion:

Talocural joint: DF: 20 degrees
PF: 50 degrees

Subtalar joint: INV: 20 degrees
EV: 10 degrees

The Ankle

Arthrokinematics:

◦ Talocural joint: Allows plantarflexion and dorsiflexion and is a uniaxial modified hinge joint

◦ Subtalar joint: Allows supination and pronation

The Ankle

Talocural Joint

◦ Resting position: 10 degrees plantar flexion, midway between inversion/eversion

◦ Close-packed position: Maximum dorsiflexion

◦ Capsular pattern: Plantar flexion greater than dorsiflexion
The Ankle

Subtalar Joint

- **Resting position**: Midway between eversion and inversion, 10 deg PF
- **Close-packed position**: Supination
- **Capsular pattern**: Varus greater than valgus

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The Ankle

Talocrural Open-Chain Motion

The relatively convex talus rolls and glides in an opposite direction on the relatively concave distal tib/fib.

Talocrural Closed-Chain Motion

The distal tib/fib rolls and glides in the same direction on the talus.

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The Ankle

Subtalar Open-Chain Motion:

- In supination the calcaneus moves distally, medially, and inverts
- In pronation the calcaneus moves proximally, laterally, and everts

Subtalar Closed-Chain Motion:

- Pronation consists of tibial IR, talar PF/adduction, and calcaneal eversion
- Supination consists of tibial ER, talar DF/abduction, and calcaneal inversion
The Ankle

**Ankle Joint Mobilizations**

Distraction talocrural joint

- Little fingers catch neck of talus and thumbs rest over tarsals and metatarsals on dorsum of foot.
- Keep elbows in sides, one foot in front of the other.
- Distract by leaning back.
- Manipulation done in the same manner.

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Dorsal glide of talus in talocrural joint

Mobilization with movement in WB

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Evidence

Claim + Evidence + Explanation

Support your claim.
The efficacy of manual joint mobilization/manipulation in treatment of lateral ankle sprains: a systematic review


Loudon et al.

- No detrimental effects from the joint techniques were revealed in any of the studies reviewed.
- Conclusions:
  - For acute ankle sprains, manual joint mobilization diminished pain and increased dorsiflexion range of motion.
  - For treatment of subacute/chronic lateral ankle sprains, these techniques improved ankle range-of-motion, decreased pain and improved function.

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Thank you for coming!

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- www.mtitx.com

References