OMT AND EVALUATION OF THE LOWER EXTREMITY

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OMT APPROACH OF THE KNEE

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ANATOMY (BONES)
ANATOMY (MUSCLES)
ANATOMY (LIGAMENTS)
ANATOMY (ARTERIES)

A. Anterior View

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NERVE SUPPLY OF KNEE JOINT

- Number: ten nerves.
  1) **Femoral nerve**: gives twigs from the nerves to the three vasti.
  2) **Tibial nerve**: gives:
    1) Superior medial genicular.
    2) Inferior medial genicular.
    3) Middle genicular nerve.
  3) **Common peroneal nerve**: gives:
    1) Superior lateral genicular.
    2) Inferior lateral genicular.
    3) Recurrent genicular nerve.
  4) **Obturator nerve**: gives the genicular branch from its posterior division

Dr M Eladl
DIFFERENTIAL DIAGNOSIS

Anterior Knee Pain
- Pateullar subluxation
- Tibial apophysitis
- Jumper’s knee
- Patellofemoral pain syndrome
- Gout
- OA

Posterior Knee Pain
- Popliteal cyst
- PCL injury

Lateral Knee Pain
- MCL sprain
- Medial meniscus
- Pes anserine bursitis
- Plica syndrome

Medial Knee Pain
- LCL sprain
- Lateral meniscus
- ITB syndrome
SPECIAL TESTS

- **Lachman’s test**
  - Athlete lying supine on table with knee bent at 60 degrees
  - Place one hand above and below patella
  - Move tibia posteriorly and anteriorly
  - Watch for joint laxity of the ACL or PCL
SPECIAL TESTS

- **Anterior/Posterior drawer**
  - Athlete lying supine on table
  - Bend knee to 90 degree angle
  - Sit on athlete’s foot to provide stabilization
  - Grasp posterior and anterior aspect of knee
  - Apply anterior and posterior force while observing for laxity (ACL and PCL)
SPECIAL TESTS

- **Varus/Valgus test**
  - Position athlete lying supine
  - Position knee at 30 and 60 degrees
  - Apply pressure to both lateral and medial side
  - Observe for laxity, tests for MCL and LCL

*Varus and valgus stress test.*

performed with the knee unflexed and at 30 degrees of flexion.
- **Apply’s Compression/Distraction test**
  - Position athlete lying on his/her stomach with knee flexed at 90 degrees
  - Perform compression while applying pressure to the bottom of the foot with foot internally and externally rotated
  - If pain increases, there is a meniscal tear
  - Perform distraction by pulling up on foot with foot internally and externally rotated
  - If pain is released, there is a meniscal tear
OSTEOPATHIC MANIPULATION OF THE KNEE

- Muscle energy (hamstrings, abduction, and adduction dysfunction)
- HVLA of fibular head
- Counterstrain of patella
TIBIA ON FEMUR DYSFUNCTION

- Treats abduction/adduction dysfunctions as well as torsions of tibia on femur
- Patient supine, physician contacts above and below the knee and directly applies pressure through soft tissue barriers in rotation, varus/valgus, and abduction/adduction
- Helps treat ITB and adductor muscles
ANTERIOR FIBULAR HEAD

Patient supine with pillow under knee

Physician internally rotates patient’s foot/ankle

Thrusts fibular head posteriorly while continuing to internally rotate ankle
POSTERIOR FIBULAR HEAD

Patient supine with hip and knee flexed

Physician externally rotates ankle/foot with other hand in popliteal fossa

Knee is flexed while applying anterior pressure on fibular head
- Patient supine
- Foot/tibia internally rotated
- Physician grasps quad above knee and provides an inferior force, while palpating tenderpoint with other hand (also helpful for chondromalacia)
SPORTS MEDICINE APPROACH TO THE LOWER EXTREMITY: THE ANKLE

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ANKLE ANATOMY: BONY STRUCTURES

- Three bones
  - Tibia
  - Fibula
  - Talus
- Three joints
  - Talocrural joint (True Ankle Joint)
  - Subtalar joint
  - Inferior Tibiofibular joint (High Ankle)
- Talus is wider anteriorly
- Tibiofibular glide more stable in dorsiflexion than plantarflexion
- Ligaments maintain stability
ANKLE ANATOMY: MUSCLES AND MOTION

- **Single Plane**
  - Dorsiflexion (tibialis anterior, extensor digitorum)
  - Plantar Flexion (gastrocnemius, soleus, tibialis posterior)
  - Abduction (peroneus longus)
  - Adduction (peroneus brevis)
  - Eversion (extensor digitorum)
  - Inversion (tibialis anterior)

- **Triplanar motions**
  - Supination=Adduction, Inversion, Plantar Flexion
  - Pronation=Abduction, Eversion, Dorsiflexion
ANKLE EXAMINATION: PHYSICAL EXAM

- Inspection (gait, echymosis, edema)
- Palpation (bony tenderness)
- ROM/Strength
- Stability (Squeeze Test, Talar Tilt, Anterior drawer)
- Xrays (Ottowa Ankle Rules)
ANKLE EXAMINATION: XRAY
ANKLE EXAMINATION: XRAY

- Increased medial clear space
  - <4mm on Mortise
- Increased tibiofibular clear space
  - >6mm Mortise and AP
- Decreased tibiofibular overlap
  - >6mm on AP
  - >1mm on Mortise
ANKLE EXAMINATION: STRESS VIEW XRAYS

- Gravity Stress
  - Check Deltoid ligament, Medial Clear Space

- Anterior Drawer
  - Test for ligamentous injury
  - >3mm compared to contralateral, or 10mm

- External Rotation
  - Evaluate syndesmosis injury
  - Widening of the mortise, lateral talar shift

- Talar Tilt Stress
  - Test for ligamentous injury
  - Normal tilt <5 degrees
ANKLE SPRAINS

- Where
  - Lateral
  - Medial
  - “High”

- Severity
  - 1<sup>st</sup> degree (no laxity)
  - 2<sup>nd</sup> degree (mild to moderate laxity)
  - 3<sup>rd</sup> degree (severe laxity)
LATERAL ANKLE SPRAIN

• Inversion injury
• Most common sports injury
• Most common ankle injury
• Order of injury:
  • ATF
  • CFL
  • PTFL
LATERAL ANKLE SPRAIN: TREATMENT

- PRICE
- Analgesic (NSAIDS initially?)
- Isometric > Isotonic exercise
- Proprioceptive exercise
- RTP when full strength and stability with sport specific activity
- Bracing during competition for 6 months
MEDIAL ANKLE SPRAIN

- Eversion Injury
- Less frequent due to the strength of Deltoid ligament
- Associated with Medial Malleolus fracture
- Treatment approach same as lateral ankle sprain
HIGH ANKLE SPRAIN

- Result of Dorsiflexion and ER
- Injury to AIFTFL
- Xrays (AP, Lateral, Mortise)
- Stress Views
- Risk for Proximal Fibula (Maisonneuve) Fracture
  - Check Tib/Fib Xrays
- Consider advanced imaging
  - CT vs MRI
MAISSONNEUVE FRACTURE

- Spiral fracture of proximal Fibula from eversion injury
HIGH ANKLE SPRAIN

- Grade 1: Conservative Treatment
  - Stable exam
  - PRICE
  - Immobilize 4-6 weeks
  - Therapy
- Much Longer Return to Play
- Grade 2-3: Ortho Consult
ANKLE FRACTURES: CLASSIFICATION

• Danis Weber
  • Based on fibula and mortise

• Lauge Hansen
  • Based on foot position and force applied e.g. supination, external rotation

• A-O
  • Based on fibula fracture level, Medial Malleolar involvement, Syndesmosis disruption
ANKLE FRACTURES

- Determine Stability and Look for Displacement
- Ankle as a Ring, > 1 Fracture is Unstable
- Must Consider Proximal Fractures
- Stable Fracture (Weber Type A)
  - Treat Conservatively
  - Boot
  - RTP 6-12 weeks
ANKLE FRACTURE

- Indication for Ortho Referral
  - Weber Type B, C
  - Bi or Trimalleolar Fracture
  - Posterior Malleolar Fracture with >25% articular involvement or >2mm step off
  - Lateral Malleolus Fracture Displaced >3mm
  - Displaced Medial Malleolar Fracture
ANKLE DISLOCATION

- Named for relation of talus to distal fibula
- Usually associated with fracture
- Posterior=most common, Anterior=least common
- Assess neurovascular status
- Reduction:
  - Bend knee to reduce Achilles tension
  - Apply countertraction at knee
  - Plantarflexion; Force depending upon type of dislocation
  - May Require ORIF
SUMMARY

• Ankle Sprains
  • Lateral
  • Medial
  • High
• Ankle Fractures
  • Stable or Unstable
• Ankle Dislocations
OMT FOR THE LOWER EXTREMITY

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ANKLE TESTING

- Anterior Drawer
  - Check ATF Ligament

- Talar Tilt
ANKLE TESTING

• Squeeze Test
  • Evaluate Syndesmosis injury

• External Rotation
  • Evaluate Syndesmosis injury
COUNTERSTRAIN TECHNIQUE FOR ANKLE

- Patient on side, with affected leg up
- Physician Seated beside Table
- Locate Tender Point, typically anterior to lateral malleolus
- Ankle Everted to point of maximal relief
- Hold for 90 seconds
- Reassess
FIBULAR HEAD MOTION

- **Anterolateral**
  - Created by dorsiflexion of ankle
  - Distal Fibula moves posterior
  - Plantarflexion restricted

- **Posteromedial**
  - Created by plantarflexion of the ankle
  - Distal Fibula moves anterior
  - Common Peroneal Nerve
  - Dorsiflexion restricted
POSTERIOR FIBULAR HEAD ME
TREATMENT

- Patient supine
- Physician on side of involved leg
- Knee flexed to 90 degrees
- Hold the fibular head between thumb and index finger with cephalad hand
- Evert and dorsiflex the foot with other hand
- Patient attempts to return to neutral position against resistance for 3-5 seconds
- Patient relaxes for 3-5 seconds, and repeat until motion restored
POSTERIOR FIBULAR HEAD HVLA

- Flex Knee
- Dorsiflex and Evert Foot
- MCP of Index Finger behind fibular head
- Apply thrust by forcibly flexing the knee
TALAR TUG

- Treatment for Posterior Tibia on Talus, Ankle prefers plantarflexion
- Patient Supine
- Physician at end of table
- Grasp foot with both hands
- Apply traction, dorsiflexion and eversion of ankle to barrier
- Gentle Tug
OMT OF THE FOOT

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Figure 11.21 Extrinsic Muscles That Move the Foot and Toes
NERVES OF THE FOOT
Flat Foot (Pes Planus)

Normal Foot Position

Flat Foot (Pes Planus)
PHYSICAL EXAM
PLANTAR FASCIITIS
NEUROMA
OMT FOR FOOT INJURIES
MUSCLE ENERGY
SOFT TISSUE
QUESTIONS?