COMMON SPORTS-RELATED LOWER LEG INJURIES

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COMMON CAUSES

- Gastrocnemius Strain
- Contusions
- Fractures
- Medial Tibial Stress Syndrome (Shin splints)
- Muscle Cramping
- Delayed onset muscle soreness
- Chronic Compartment Syndromes
- Stress Fractures
LESS COMMON CAUSES

- Referred Pain
- Vascular insufficiency/claudication
- Deep Vein Thrombosis
- Popliteal artery entrapment
- Baker’s cyst or ganglion cyst
- Pes anserine bursitis
- Acute compartment syndrome
CAUSES NOT TO BE MISSED

• Tumors (osteosarcoma, osteoid osteoma)
• Infection (osteomyelitis, cellulitis)
• Acute compartment syndrome
ANATOMY

- Tibia
- Fibula
- Muscles
  - Compartments
**Muscle Compartments**

- **Anterior Compartment**
  - Deep fibular (peroneal) n.
  - Tibialis anterior m.
  - Extensor hallucis longus m.
  - Extensor digitorum longus m.
  - Anterior intermuscular septum
  - Interosseous membrane

- **Deep Posterior Compartment**
  - Tibialis posterior m.
  - Fibular (peroneal) a. and vv.
  - Flexor hallucis longus m.
  - Flexor digitorum longus m.
  - Posterior tibial a. and vv.
  - Tibial n.

- **Lateral Compartment**
  - Superficial fibular (peroneal) n.
  - Fibularis (peroneus) longus m.
  - Fibularis (peroneus) brevis m.
  - Posterior intermuscular septum

- **Superficial Posterior Compartment**
  - Transverse intermuscular septum
  - Soleus m.
  - Gastrocnemius m.
ANTERIOR COMPARTMENT

- Muscles (dorsiflex the ankle & extend the toes)
  - Tibialis anterior
  - Extensor digitorum longus
  - Extensor hallucis longus

- Blood supply
  - Anterior tibial artery & vein

- Innervation
  - Deep peroneal nerve
LATERAL COMPARTMENT

- **Muscles**
  - Peroneus Longus
  - Peroneus Brevis
- **Blood supply**
  - Peroneal artery & vein
- **Innervation**
  - Superficial peroneal nerve
POSTERIOR COMPARTMENT

- Superficial muscles
  - Gastrocnemius
  - Soleus
- Deep muscles
  - Popliteus
  - Tibialis posterior
  - Flexor digitorum longus
  - Flexor hallucis longus
- Blood Supply
  - Posterior tibial artery
  - Peroneal artery
- Innervation
  - Tibial nerve
HISTORY CONSIDERATIONS

• Detailed training history
• Prior injuries and their treatment
• Menstrual history
• Footwear
• When does pain occur relative to activity?
• Does pain alter activity?
## Key Diagnostic Questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Clinical Significance of Response</th>
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</thead>
<tbody>
<tr>
<td>Was there an acute onset of pain?</td>
<td>Fractures or tendon ruptures are usually acute traumatic events</td>
</tr>
<tr>
<td>Is there a history of injury or prior leg pains?</td>
<td>Old fractures/injuries can lead to scar tissue, stiffness &amp; pain</td>
</tr>
<tr>
<td>Is the pain worse with impact?</td>
<td>Stress fractures are classically exacerbated with impact. MTSS &amp; muscle strains may also be made worse with load &amp; resistance</td>
</tr>
<tr>
<td>Is the pain worse with exertion?</td>
<td>Pain absent at rest that presents with exertion is classic for exertional compartment syndrome. Popliteal artery entrapment can have a similar presentation with posterior rather than anterior/lateral pain</td>
</tr>
<tr>
<td>Does the pain improve with warm-up &amp; stretching?</td>
<td>MTSS &amp; muscle strains frequently improve with pre-participation stretching while stress fractures &amp; exertional compartment syndrome generally don’t</td>
</tr>
<tr>
<td>Does the pain get worse with stretching or resistance?</td>
<td>Exacerbate symptoms related to MTSS &amp; muscle tendon strains &amp; tendinopathy</td>
</tr>
<tr>
<td>Is there pain at night?</td>
<td>Raise concern for tumor</td>
</tr>
<tr>
<td>Is there electrical shooting pain, weakness with pain or numbness with pain</td>
<td>Concern for nerve injury, entrapment or radiculopathy. Always check lumbar spine.</td>
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</tbody>
</table>
PHYSICAL EXAMINATION

• Look for malalignment and joint laxity
• Check strength and flexibility of entire lower extremity
• Localize pain and injured structure
• Functional movements (i.e. hopping)
• Palpation - distribution
• If asymptomatic, examine after exercise
• Check shoes
SHOE WEAR

OVERPRONATION  NEUTRAL  UNDERPRONATION
CASE #1

• 17 y/o male volleyball player who presents with 3 months of bilateral anterior knee pain. His pain is made worse with sports (volleyball & basketball) and with prolonged sitting. Denies any specific injury/trauma. No swelling, locking or instability.
Knee Exam

- No effusion
- ROM 0-135°
- Tenderness to palpation over patellar tendon, especially over the proximal insertion of the patellar tendon into the patella
- Neg Patella grind, inhibition or apprehension
- Neg Lachman, ant/post drawer, McMurray
- No laxity with valgus/varus stress at 0/30°
DISCUSSION

• What’s the diagnosis?
**Patellar Tendinopathy**

- Major cause is overuse in activities involving rapid changes in direction, jumping & running
- Overall prevalence is 14.2% but as high as 40% in elite volleyball players
- Male: female ratio is equal
RISK FACTORS

Intrinsic
• Strength imbalance
• Postural alignment
• Foot structure
• Reduced ankle dorsiflexion
• Lack of muscle strength & flexibility

Extrinsic
• OVERUSE
• Fatigue
• Poor technique
• Training errors
• Improper training surfaces
• Insufficient footwear
IMAGING

- X-ray - identify bony abnormalities or intratendinous calcification
- U/S - ill-defined hypoechogenic zone often associated with tendon thickening
- MRI - thickened tendon with areas of increased signal intensity
  - Changes seen on MRI & U/S correlate well with histopathological findings
  - Do not correspond to a good clinical correlation or guidance of therapy
TREATMENT

• Correction of intrinsic & extrinsic risk factors
  – Sufficient variation in training program
  – Hamstring & quadriceps flexibility
  – Correcting biomechanics (i.e. better landing techniques)
• Symptomatic approach
  – Relative rest
  – Orthotics, taping, &/or patella tendon straps
  – NSAIDs?
  – Nitroglycerin
  – Tenotomy
Rehabilitation

• Cornerstone of tendinopathy treatment
• Incorporates strength, flexibility, motor patterns, closed-chain rehabilitation, proprioception, endurance and gradual progression.
• Strength training is emphasized using eccentric exercise
• Incorporates 3 stages
  – Limited weight bearing loaded exercise
  – Progression
  – Sports specific return to play protocol
DECLINE ECCENTRIC SQUATS
Case #2

- A 35-year-old female is training for the LA marathon. She was running 20 mi/wk and increased to 30 mi/wk one month ago. For the last 2 weeks, she has had right leg pain with her training runs. The pain is noticeable at the beginning of the run, then dissipates after a mile or so. It then increases again toward the end the run and lasts into the next day.
The gait is normal. Mild pes planus is observed. The right leg is not swollen, skin is clear and there are no masses.

There is TTP along the posteromedial border of the tibia extending proximally from 3 cm above the medial malleolus to the mid tibia. Hopping on the left leg causes pain. There is no pain with resisted plantar flexion or inversion. Normal neurovascular exam.
MEDIAL TIBIAL STRESS SYNDROME
“SHIN SPLINTS”

- Exercise induced pain of the posteromedial border of the tibia
  - Excludes stress fracture, fascial hernia or compartment syndrome
- A diffuse painful area over a length of at least 5 cm
- Incidence - from 4% to 35% in military & sportspeople
- Etiology – Due to a stress reaction involving the fascia, periosteum, or bone or some combination of these structures at the posteromedial tibial border
ETIOLOGY

- Early reports: the tibialis posterior was the primary structure involved (Slocum 1967, D’Ambrosia 1977)
- Studies using bone scans and anatomic dissection provided evidence that the soleus and its fascia play a direct role (Holder and Michael 1984)
- Anatomic study confirmed that the fibers of the soleus, the flexor digitorum longus, and the deep crural fascia attach along the posteromedial border of the tibia, where symptoms, exam findings and bone scans have localized the injury (Beck 1994)
- MR imaging found that of those with MTSS, had edema at the insertions of the soleus, flexor digitorum longus and the tibialis posterior (1995)
MTSS History

- Pain occurs with exercise but may become more tolerable as the exercise continues
  - May return after exercise & then resolve with rest
- May be bilateral
- Look for overuse risk factors
OVERUSE RISK FACTORS

- Training progression too rapid
- Inadequate rest/recovery
- Inappropriate equipment and/or footwear
- Incorrect sport technique
- Peer and/or adult influences
- Muscle imbalances
- Uneven or hard surfaces
MTSS Exam

- Tenderness along the posteromedial border of the tibia
- Resisted muscle testing usually does not cause pain
- Pain with single leg hop
- No pain with indirect percussion
- Normal neurovascular exam
- Check for malalignment (esp. pronation), inflexibility, weakness
- Check shoes for excessive wear
IMAGING

• Usually not necessary – clinical diagnosis is the gold standard
• X-ray usually normal
• A three-phase bone scan may demonstrate diffuse uptake in the delayed phase
• MRI may - periosteal edema with/without associated bone marrow edema
IMAGING

RT ANTERIOR LT

LT POSTERIOR RT
TREATMENT

• Sport specific relative rest from impact loading
• Ice massage
• Maintain conditioning via non-impact activities (cycling, pool running, swimming)
• Soft tissue therapy
TREATMENT

- Consider NSAID’s
- Rehab to increase strength and flexibility
  - Especially heel cord & dorsiflexors
- Consider modification of malalignment
  - Orthotics
RETURN TO PLAY

• Gradual return to impact activities
• Training volume slowly increased
• Use symptoms & physical findings as a guide to progression
• 6-week return – actually very variable
CASE #3

- 36-year-old man with a history of bilateral "shin splints" presents with 2 weeks of worsening right shin pain. He has been training for the LA marathon. He typically runs on sand at the beach but one month ago he started to increase his mileage on the roads. His pain is located primarily medial aspect of his tibia. He rested from running for three days and the pain resolved. On his first run back from resting his pain almost immediately returned. Denies low back pain or numbness/tingling down his leg. Denies swelling, skin discoloration or temperature changes.
Exam

- No palpable defects, deformities, or asymmetry
- Thompson test Neg
- Achilles tendon, gastroc and soleus muscles were non-tender
- **Focal** area tender to palpation along the distal tibia medially. There was no overlying soft-tissue swelling noted
- Ankle with full range of motion & no tenderness to palpation and ligaments were stable
STRESS FRACTURES

• Etiology: inability of bone to effectively remodel in response to repetitive loading
  – Ground reaction forces, repeated muscle contractions across the bone and muscle fatigue play a role
• Tibia & fibula are among the most common sites for stress fractures
  – Tibia 19-55% of all sites
    • Posteromedial border of either the proximal or distal third of the shaft
  – Fibula up to 30%
Gradual onset of pain
Initially pain occurs only with exercise & relieved with rest
Does not dissipate as activity continues
Eventually limits training and may become painful with daily activities (walking)
Pain may occur at night
Symptoms may resolve with several days of rest but return when training is reattempted
OVERUSE RISK FACTORS

- Training progression too rapid
- Inadequate rest/recovery
- Inappropriate equipment and/or footwear
- Incorrect sport technique
- Peer and/or adult influences
- Muscle imbalances
- Uneven or hard surfaces
EXAMINATION

- Well localized tibial tenderness
- Pain with single leg hop
- May have pain with indirect percussion
- Resisted manual muscle testing usually does not produce symptoms
- Check for malalignment, inflexibility, weakness and muscle imbalance
IMAGING

• Radiographs – periosteal reaction, sclerosis, callus formation or lucent fracture line
  – Often negative initially
• Three phase bone scan – localized uptake in delayed phase, all phases abnormal
• MRI – more specific than bone scan
  – Graded on presence of periosteal edema, marrow edema and fracture line
# MRI Grading of Tibial Stress Injury

<table>
<thead>
<tr>
<th>Grade</th>
<th>Periosteal Edema</th>
<th>Marrow Edema</th>
<th>Fracture Line</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mild – Moderate on T2-weighted images</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>2</td>
<td>Moderate – severe on T2-weighted images</td>
<td>Seen on T-2</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>weighted images</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Moderate – severe on T2-weighted images</td>
<td>Seen on T1 &amp;</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T2 weighted</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>images</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Moderate – severe on T2-weighted images</td>
<td>Seen on T1 &amp;</td>
<td>Visible</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T2 weighted</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>images</td>
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MANAGEMENT

• Rest from impact activities
• Long pneumatic splint or walking boot if daily activities are painful
  – Crutches if needed
• Maintain conditioning
  – Low/no impact activities – cycling & swimming
  – Stair climbers and ski machines may be painful
MANAGEMENT

• Rehab to address flexibility and strength
• Calcium + Vit D supplementation if needed
• Address menstrual dysfunction and /or disordered eating if present
• Consider modification of malalignment
• Rule out underlying metabolic cause
RETURN TO PLAY

• Once pain with daily activities has resolved, begin brisk walking
• Gradually increase time
• Introduce jogging
• Gradual increase duration & frequency if symptom free
• Begin faster running & sprinting when able to jog daily without pain
• Add sport specific skills
• Resume training when able to perform sport specific activities without symptoms
RUN PROGRESSION

1. Complete rest x 2 weeks, if pain with walking use crutches.
2. If no pain with walking can do non-weight bearing activities such as swimming or cycling x 2 weeks. Stop if becomes painful.
3. After 2 weeks of pain free walking can start low impact activities 3 days a week x 2 weeks, no 2 days in a row (ie. M/W/F). Initially start at 15 min and can increase by 5 minutes every 2nd or 3rd session. Example Elliptical or arc trainer. Can supplement additional cardio with non-weight bearing cardio as in step 2.
4. Running progression (start if pain free after 2 weeks of low impact activities above): 3 days/week starting at 10 minutes (no 2 days in a row, ideally on softer surfaces, this is all just building base - no sprinting/stadiums/speed work). Increase weekly volume by no more than 10% per week spread out over the 3 runs. Once running 30 minutes 3d/week could add in a 4th day but still obeying the 10% rule.
PREVENTION

• Review factors that may have lead to the stress fracture
• Menstrual disturbances and disordered eating behavior should be evaluated & treated
• Consider use of custom orthoses
  – 50% reduction in military recruits (Finestone 1997)
**SURGICAL INDICATIONS**

- Fractures of the anterior cortex of the midshaft
  - “dreaded black line”
- High rate of delayed union, nonunion & complete fracture
- Intramedullarly rod and/or bone grafting may be required
## Differentiating MTSS from Tibial Stress Fracture

<table>
<thead>
<tr>
<th></th>
<th>MTSS</th>
<th>Tibial Stress Fx</th>
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</thead>
<tbody>
<tr>
<td><strong>Character</strong></td>
<td>Bony, aching; Often continue activity with pain abating</td>
<td>Bony, aching; usually cannot continue w/o increasing pain</td>
</tr>
<tr>
<td><strong>Pain location</strong></td>
<td>Mid-distal 1/3 posteromedial tibial border</td>
<td>Anywhere on tibia, including posteromedial border</td>
</tr>
<tr>
<td><strong>Pain distribution</strong></td>
<td>Several cm w/o distinct focal area</td>
<td>Distinct focal area</td>
</tr>
<tr>
<td><strong>Indirect percussion</strong></td>
<td>Pain free</td>
<td>May be painful</td>
</tr>
<tr>
<td><strong>Single leg hop</strong></td>
<td>Usually painful</td>
<td>Usually painful</td>
</tr>
<tr>
<td><strong>X-ray</strong></td>
<td>Normal</td>
<td>May show periosteal reaction, fracture line</td>
</tr>
<tr>
<td><strong>3-phase Bone scan</strong></td>
<td>Diffuse uptake in delayed phase only</td>
<td>Focal uptake, all phases abnormal</td>
</tr>
<tr>
<td><strong>MRI</strong></td>
<td>Periosteal edema w/ or w/o mild-moderate marrow edema</td>
<td>Periosteal edema w/ extensive marrow edema, fracture line</td>
</tr>
</tbody>
</table>
CASE #4

- 24 y/o female triathlete describes recurrent left leg tightness with running. No history of trauma. Her symptoms are anterior and occur about 2-3 miles into each run. The symptoms are relieved within an hour or less with rest. No swelling or skin discoloration. Occasional tingling of the dorsum of the foot can occur with running.
NORMAL !!!
CHRONIC EXERTIONAL COMPARTMENT SYNDROME (CECS)

- 1st described by Mavor in 1956
- 1962 typical hx & symptoms were matched to rise in intramuscular compartment pressure
- Most commonly affects the lower leg but also can occur in other locations
Ischemic condition that occurs when a fascial compartment is unable to accommodate the increase in volume associated with muscle contraction and swelling.

- Normal or abnormal muscle swelling with activity
- There is evidence that this does not necessarily result in tissue hypoperfusion & ischemic muscle pain *
- Abnormally thickened fascia
- Normal muscle hypertrophy in response to resistance training
- Dynamic contraction patterns during gait

**History**

- Aching or cramping leg pain or leg tightness over affected compartment, only with exercise
- Transient neurologic symptoms may occur, but pain is often the only symptoms
- Pain gradually subsides with rest
- Symptoms may be very reproducible (e.g. running a certain distance or time)
- Average of 22-28 months from presentation to correct diagnosis
Examination (Exam)

- Usually normal
- May be helpful to examine after symptom provoking activity
- May find palpable tightness over compartment
- Passive stretching may reproduce symptoms
- Pulses are normal
- If present, a palpable fascial hernia is highly suggestive of CECS

Anterior compartment is the most commonly involved
MUSCLE COMPARTMENTS

ANTERIOR COMPARTMENT
- Deep fibular (peroneal) n.
- Anterior tibial a. and vv.
- Extensor hallucis longus m.
- Extensor digitorum longus m.
- Tibialis anterior m.
- Interosseous membrane

LATERAL COMPARTMENT
- Superficial fibular (peroneal) n.
- Fibularis (peroneus) longus m.
- Fibularis (peroneus) brevis m.
- Posterior intermuscular septum

DEEP POSTERIOR COMPARTMENT
- Tibialis posterior m.
- Fibular (peroneal) a. and vv.
- Flexor hallucis longus m.
- Flexor digitorum longus m.
- Posterior tibial a. and vv.
- Tibial n.

SUPERFICIAL POSTERIOR COMPARTMENT
- Soleus m.
- Gastrocnemius m.
- Transverse intermuscular septum
**DIAGNOSIS**

• X-ray – normal
• Bone scans & MRI – may be helpful to r/o other causes of leg pain
• Compartment pressure testing is the gold standard - either a slit-catheter technique or hand-held fluid pressure monitoring
  – Pre-exertional & post-exertional measurements
• Positive = Pedowitz et al*
  – Pre-exercise resting pressure of 15mmHg
  – 1 minute post-exercise pressure of 30mmHg
  – 5 minute post-exercise pressure of 20mmHg

TREATMENT

- Nonsurgical
  - Massage with stretching, tapping, orthotics, and NSAIDs
  - Only evidence-based treatment is activity modification & rest
- Surgical = fasciotomy
  - Anterior or lateral compartment symptoms tend to have better outcomes (>80% success rate as compared with deep posterior CECS which is 50%)
FASCIO TOMY

• Single incision (open) technique
• Subcutaneous (1 or 2 incision) techniques with or without endoscopic assistance
• Complications - infection, nerve or vascular injury, DVT, wound dehiscence, CRPS, scar hypersensitivity, and seroma/hematoma formation
• Recurrences are thought to be due to incomplete release, incorrect diagnosis, excessive scarring, or inappropriate rehabilitation
• Post-op includes 12-week rehab starting with protection & mobility, early light stretching, scar massage with mobility & desensitization
Fasciotomy
# Approach to Leg Pain

<table>
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<tr>
<th></th>
<th>Stress Fx</th>
<th>MTSS</th>
<th>CECS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onset</td>
<td>Gradual or acute</td>
<td>Gradual</td>
<td>Gradual</td>
</tr>
<tr>
<td>Pain Character</td>
<td>Increases with ongoing activity</td>
<td>Soon after exercise onset, intensity decreases</td>
<td>Pain onset at specific point during running</td>
</tr>
<tr>
<td>Exam</td>
<td>Focal TTP</td>
<td>TTP several cm long posteromedial tibia</td>
<td>May be difficult to localize</td>
</tr>
<tr>
<td>Xay Bone Scan</td>
<td>Often Neg Focal uptake Focal edema, fx line</td>
<td>Neg Diffuse uptake Diffuse edema</td>
<td>Compartment pressure testing</td>
</tr>
<tr>
<td>Treatment</td>
<td>REST from impact activity! Protection. Gradual return to activity</td>
<td>REST from impact activity! Protection. Gradual return to activity</td>
<td>May require fasciotomy</td>
</tr>
</tbody>
</table>
A 44 y/o female was playing tennis over the weekend when she felt sudden sharp pain of her right leg. Felt as she had been kicked by her doubles partner. She was unable to continue to play. Later that day swelling developed. Extensive bruising of the leg was seen the next day.

CASE #5
EXAM

- The right leg was noticeably swollen
- Ecchymosis extended from mid portion of the leg to the medial aspect of the foot
- Thompson’s test was negative
- Achilles tendon was non-tender
- Posteromedial aspect of the leg was TTP
- Pain was elicited with passive dorsiflexion
HISTORY

• Common cause of acute leg injury, most typically in middle age adults

• Etiology
  – Forced knee extension with the foot in dorsiflexion
    • Leaping or sprinting from a crouched position
    • “Tennis Leg”

• Acute onset of severe posterior leg pain

• Extensive ecchymosis

• Patient may feel as if shot or kicked in leg

• Usually unable to continue activity after injury
EXAMINATION

• Tenderness at medial head of gastrocnemius
• Swelling & ecchymosis may be present
• Amount of swelling may make palpation of a defect difficult
• Pain reproduced with passive ankle dorsiflexion with the knee extended
• Patient may be unable to perform a single leg heel raise
IMAGING

• Usually not necessary
• May be difficult to distinguish from DVT
• Ultrasound and MRI can demonstrate injury if needed
MANAGEMENT

• RICE therapy
• Crutches if unable to ambulate
• Early active range of motion (not stretching)
• Gradual flexibility & strengthening as weight bearing becomes tolerable
• Concentric strengthening (bilateral heel raise)
• Heel raise on a step -> single leg heel raise -> eccentric strengthening -> controlled plyometrics
  – Flexibility and soft tissue techniques
• Can use heel lifts when weight bearing (wean in 1-2 weeks)
RETURN TO PLAY

• Most helpful guide is ability to perform controlled jumping & running
  – Want patient with pain-free ROM
  – Strength within 90% of contralateral leg
  – Ability to perform functional skills required by the sport
• Time to return varies dependent on severity of injury
  – Mild ~ 2 weeks
  – Severe ~ 8 weeks or longer

• Flexibility is important but strengthening is the key
• No role for bracing
THE MASQUERADERS
POPLITEAL ARTERY ENTRAPMENT SYNDROME (PAES)

- Often confused with CECS and can even co-exist with CECS
- Usually unilateral calf pain during strenuous exercise
- Calf pain can be associated with leg weakness & paraesthesias
- Pain is elicited by a specific amount of exercise, aggravated by leg elevation & relieved by cessation of activity & placing the leg in a dependent position
- Reduction in pulses is considered pathognomonic
CAUSES

- Compression of popliteal artery by surrounding musculotendinous structures as it exits the popliteal fossa
  - Abnormal origin of the medial head of the gastrocnemius
  - Fibrous bands of the gastrocnemius or popliteus muscle
  - An aberrant course of the popliteal artery - passing deep to the popliteus muscle
**DIAGNOSIS**

- X-rays to rule out other cause of lower leg pain
- Ankle-brachial index (ABI) with the ankle in neutral, forced dorsiflexion and forced plantar flexion positions
  - ABI of < 0.9 = abnormal
  - ABI sensitivity & specificity is 90 & 98%
- CT angio & MRI angio are helpful
- Direct angiography considered gold standard
TREATMENT

• Surgical removal of the compressing structure
  – Decompression by division of the medial head of the gastrocnemius, abnormal muscle slips or tendinous bands
• Either venous bypass or interposition graft
NERVE ENTRAPMENT

- Burning pain brought about by activity & exacerbation by continued exercise
- Pain in the region of the nerve compression & spreads to the sensory distribution of the nerve
- Tinel’s sign can usually be elicited at the site of compression
- Sometimes can have weakness & atrophy of muscles innervated by the compressed nerve
- Trauma is the primary cause
Common Peroneal Nerve

- Risk of entrapment as it enters the fibular tunnel prior to branching into the superficial, deep & recurrent peroneal nerves
- Associated with repetitive exercises involving inversion & eversion (running & cycling)
- External compression - tight plaster casts & ACL braces
- Internal compression - osteophytes or proximal tibiofibular joint ganglion cysts
- Pain is often lateral leg & foot
COMMON PERONEAL NERVE

- Common peroneal nerve
- Lateral cutaneous nerve of calf
- Lateral collateral ligament
- Peroneus longus muscle
- Superficial branch of peroneal nerve
- Deep (profundus) branch of peroneal nerve
- Common peroneal nerve passing through peroneal (fibular) tunnel
SUPERFICIAL PERONEAL NERVE

- As it exits the fascia of the lateral compartment
- Often observed in dancers & athletes involved in bodybuilding, horse racing, running, soccer and tennis
- Pain involving the lateral calf or dorsum of the foot
**Saphenous Nerve**

- Typical presentation is of claudication or exercise-related medial leg or knee pain
- Can also mimic OA & PFPS
- May be injured in the adductor canal by local trauma, surgery or inflammatory conditions such as thrombophlebitis
- Commonly seen in cyclists and rowers - mechanism relates to repetitive knee flexion
- Also iatrogenic injury at the time of arthroscopic knee surgery
SAPHENOUS NERVE
DIAGNOSIS

• X-ray - to r/o possible compressing bony lesions, stress fractures or bone tumors
• Nerve block - best for saphenous or superficial peroneal
• Inject anesthetic where atonal sign is the strongest or at the location corresponding to maximum pain on pressure
• Immediate relief after injection = nerve entrapment
• EMG & nerve conduction
• Condition must be present for 3-4 weeks for the studies to become positive
TREATMENT

• Conservative management = mainstay of treatment
  – Modifying precipitating activity, biochemical correction, PT, massage & NSAIDs
• Nerve hydrodissection
• Radiofrequency ablation
• Surgery - superficial peroneal
THANK YOU!