Leg Problems in Athletes

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Skin injuries

- Lacerations
- Abrasions
  - Local treatment
  - Suturing if needed
  - Keep clean and dry
  - Prevent infection
Contusions

- Quite common
  - Any collision sport
  - Soccer
  - Field hockey
  - Hockey
  - Football

- Can go on to a hematoma

- Hematomas can be difficult to resolve
  - Can become infected
Contusions

- Protect the injured area
- Not much subcutaneous tissue over the anterior tibia
- Ice, compression
Muscular Injuries

- Anterior compartment
  - Tibialis anterior
  - EDL
  - EHL
  - Peroneus tertius
  - Anterior tibial artery and nerve

Muscular injuries in this area are uncommon

Tendinopathies more common

Contribution to shin splints
Muscular Injuries

- Deep posterior compartment
  - FDL
  - Tibialis posterior
  - FHL
  - Popliteus
  - Posterior tibial artery and vein
  - Tibial nerve
  - Peroneal artery and vein

- Less commonly injured than the contents of the superficial posterior compartment
- Tendinopathies
- Poplitus rupture
Muscular Injuries

- Lateral compartment
  - Peroneal muscles
  - Superficial peroneal nerve

- Superficial posterior compartment
  - Soleus
  - Gastocnemius
  - Plantaris
Muscular Injuries

- Strains
- Rupture
- Herniations
Muscular Injuries

- Gastrocs injuries are fairly common
- Ice, compression, rest, stretching, physical therapy, activity modification
- Can take weeks to months to resolve
- Risk of re-injury if return to sport is too soon
Shin Pain

**Etiologies**
- Chronic compartment syndrome
- Tenosynovitis
- Nerve entrapment
- Vascular entrapment
- Stress fracture
- Shin splints (MTSS)
- Periostitis

**Etiologies**
- DVT
- Radiculopathy
- Neurogenic claudication
- Infection
- Myopathy
- Tumor
Shin Splints

AKA Medial Tibial Stress Syndrome (MTSS)

Very common and yet ill defined

Traction periostitis posterior medial border of the tibia? Soleus syndrome? Tibialis posterior? Deep posterior compartment syndrome? Pre-cursor to stress fracture? All or any of the above?
Shin Splints

- More common in athletes who are new to their sport (<5 years participation)
- More common in athletes with a history of MTSS in the past or stress fracture
- Athletes in orthotics have an increased risk
- Plain radiographs are normal, diffuse increased uptake on 3 phase bone scan
Shin Splints

While running the foot makes contact in supination and then moves into pronation thru the stance phase.

The soleus is a plantarflexor and invertor contracting eccentrically as the foot moves from supination to pronation resulting in stress at the medial fascial origin.

Runners and those in running sports

Overuse injury causing pain in the medial border of the tibia.
Shin Splints

Treatment

- Relative rest
- Correct the things you can correct: shoe problems, training errors, training surface etc
- Physical therapy, stretching, ice, modalities
- Compressive sleeves
- NSAIDs
- Address biomechanical issues
Compartment syndrome

- Acute
  - Acute trauma or fracture
- Chronic exertional
  - Pain during and after activity
  - Worsens during activity
Compartment syndrome

- Compartment pressure measuring device
- VERY easy to use
- Instructions online with videos
- If you can give an injection you can use this
- Get one at your hospital and know where it is kept
Compartment syndrome

**Acute compartment syndrome**
- Surgical emergency
- Compartment pressures over 30mmHg
- Usually due to acute trauma
- Decompress all affected compartments
- Wounds are left open typically
- Over anti-coagulated patients
Compartment syndrome

Chronic exertional compartment syndrome

- Exercise/activity induced leg pain
- “Reversible ischemia secondary to a compartment that is unresponsive to the expansion of muscle volume that occurs with exercise.”
- Not trauma induced
Compartment syndrome

Chronic exertional compartment syndrome

- Diagnosis can be made on history
- More accurate to check compartment pressures
- Pain usually occurs at a predictable point in the run and worsens
- The pain may be related to CECS AND another issue
- 30% rate of co-existing stress fracture
Compartment syndrome

Chronic exertional compartment syndrome

- More common at the beginning of the season as the muscles hypertrophy thus decreasing the volume in the compartment
- Rapid increase in muscle volume due to fluid retention in athletes using creatine
- Reproduce symptoms
- Know the nerves and muscles of the compartments to determine which are effected
Rest stop
Compartment syndrome

Chronic exertional compartment syndrome

- Check compartment pressures at rest the immediately after exercise
- Anterior compartment 45%
- Deep posterior 40%
- Lateral compartment 10%
- Superficial posterior 5%
Compartment syndrome

CECS : Pressure criteria for diagnosis

- Pre-exercise pressure of 15 mmHg or higher
- 1 minute post exercise pressure of 30 mmHg or higher
- 5 minute post exercise pressure of 20 mmHg or higher
- Sport specific activity to induce symptoms
Compartment syndrome

CECS : Other advances in diagnosis

- Dynamic bone scan: decreased uptake in the area of increased pressure with increased uptake superior and inferior to the abnormality
- MRI: swelling in the compartment as increased signal on T2 and failure of the muscle to return to baseline by 25 minutes after exercise
Compartment syndrome

CECS : Other advances in diagnosis

- Near-infrared spectroscopy, thallous chloride scintrography with single proton emission CT, MIBI perfusion imaging
- Look for areas of ischemia
- Insurance restrictions?
Compartment syndrome

CECS Treatment: Conservative

- Relative rest
- NSAIDS
- Manual therapy
- Stretching/Strengthening
- Address biomechanical issues (Shoes, orthotics, gait training)
- Some stop their sport
Compartment syndrome

CECS Treatment: Surgical
- Symptomatic after 16-12 weeks of conservative care
- High pressure elevation
- Fasciotomy
- Anterior compartment 85% success
- Deep posterior compartment 70% success
Compartment syndrome

There have been some reported cases of compartment syndromes without contact after sports participation or a hard effort.
Fractures

- Acute or stress injuries
- Acute injuries due to direct blows, falls from sporting equipment, collision or twisting injuries
- Stress fractures overuse
Fractures

- Acute fractures of the tibia, fibula or both
- Fibular shaft fractures are often from a direct blow
- Proximal fibular fractures can be from a direct blow or from a pronation external rotation injury indicating a syndesmotic injury as well
Fractures: tib/fib shaft

- In skeletally immature can be treated conservatively
- May require reduction and then placed in a long leg cast
- If physes are open intra-medullary nailing is avoided
- External fixation or ORIF if closed reduction is unsuccessful
Fractures: Tib/fib shaft

- In adults usually treated operatively
- There is a place for casting, most adults will opt out of a long leg cast for months
- Choices are intramedullary nailing, open reduction internal fixation (plating) external fixation
Fractures
Fractures
Fracture
Fractures: stress injuries

- Overuse injury
- Tibial stress fractures account for 50% of stress fractures in athletes
- Can be seen in any sport
- More common in running sports
- In female athlete beware the female athlete triad
- Occurs in the cortical bone
Stress fractures

How?

- Training volume
- Changes in training program (frequency, duration, intensity)
- Footwear: shoes older than 6 months increase risk for stress fracture (300-500 miles = replacement)
- Training surface
- Type of sport
Stress fractures

- Women have a higher incidence of stress fractures than men.
- In military recruits the incidence in women is 10 times higher.
- Higher incidence in white and Asian women over African American women.
- Previous fitness level
- Low BMD
Stress fractures

Wolff’s Law: bones response to stress

- Every change in form and function of bone leads to changes in its internal architecture and external form
- Response of bone to repetitive stress is increased osteoclastic activity over osteoblastic new bone formation resulting in temporary weakening of the bone
Stress fractures

Bone’s response to stress

- If the stress continues osteoclastic activity predominates resulting in microfracture and eventually stress fracture can occur
- Excessive stress + inadequate rest = stress fracture
- Fatigue fracture VS Insufficiency fracture
Rest Stop
Stress fractures

- Menstrual disturbances
- Female athlete triad
- Disordered eating, nutritional factors
- Anatomic factors
  - Studies vary RE which type of foot results in more stress fractures
  - Leg length discrepancy
  - Knee alignment
Stress fractures Risk factors

- Poor muscle endurance
- Narrow tibial width (military)
- Females
- Excessive hip abduction and rear foot eversion
- Low BMD, Menstrual irregularities, nutritional deficiencies
Stress fractures: Diagnosis

- Localized pain which occurs sooner and sooner in the run sometimes progressing to pain with ADLs
- Focal area of point tenderness
- Plain radiographs: often will not show up
- Bone scan: Sensitive
- MRI: Becoming the imaging technique of choice. Also get a look at the soft tissues
Stress fractures: Diagnosis

MRI criteria

- Grade 1 Periosteal edema on T2 = shin splints
- Grade 2 Marrow edema on T2 + grade 1
- Grade 3 Marrow edema on T1
- Grade 4 Visible fracture line
Stress fracture

- Can be treated conservatively
- Activity modification
- Long leg aircast or walker boot
- If diagnosed on Bone scan or MRI and not seen on plain films FU with another study
Stress fractures

Posterior medial is the most common area

The dreaded black line

- Line seen on plain films on the cortex of the bone and high risk of non union or delayed union (Tension side of the bone)

- May go on to operative intervention in the form of intramedullary nailing

Offers quicker return to sport
Stress Fractures
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Stress Fracture
Stress fractures: treatment

- Treat the fracture
  - Activity modification
  - Protect fracture until healed
  - Maintain fitness with cross training

- Treat the cause
  - Medical: BMD, female athlete triad etc
  - Biomechanical
  - Training errors
Stress fractures: Return to play

- Symptom free for 2 weeks
- No boney tenderness
- If pain recurs with activity then stop for 2 days until pain free and resume at a lower level
- Gradual return to activity over 4-6 weeks
- Depends on the athlete to some extent: sport, level of participation, pre injury training
THANK YOU

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