Avulsion Fractures of the Pelvis
Closure

- Pelvic apophysis remain open until late teens/early twenties
  - Ischial apophysis may stay open until 25
Muscle attachments
Classification

- By location
- Some divide ASIS into 2 types
  - Type 1
    - Sartorius origin
  - Type 2
    - Anterior portion of attachment of Tensor Fascia Lata
- Some investigators classify Type 2 as iliac crest injuries
Epidemiology

- Pediatrics
  - Overall Male > Female
  - Average age ≈ 14.5 years
  - AIIS most common (Schuett 2014)
    - AIIS ≈ 49%
    - ASIS ≈ 30%
    - Ischial ≈ 11%
    - Iliac ≈ 10%

- Rossi 2001
  - Ischial tuberosity most common
    - Older population
    - Large portion of gymnast
Epidemiology

- Younger athletes – Risser-0
  - AIIS
- Older- Risser 4
  - ASIS
  - Iliac crest
Mechanism

• Kicking and running/sprinting most commonly reported mechanism for injury

• AIIS
  • Kicking

• ASIS
  • Running/Sprinting

• Ischial/Iliac Crest
  • Running/Sprinting
  • Falling
Diagnosis

- Plain radiographs adequate for diagnosis in most cases
  - AP Pelvis
  - Frog leg lateral
- Role of MRI is minimal as suspected non-displaced fractures are treated conservatively
- CT scan may better classify fracture displacement but difference is minimal
  - < 5mm CT versus x-ray
Treatment

- Protected weight-bearing
- Transition to full weight bearing when symptoms allow
- Low impact training when pain free
  - 3-6 weeks
- Progressive RTP
  - Usually 6-12 weeks
Treatment

- Non-unions are relatively rare
  - Most commonly reported at ischial tuberosity
- Displacement largest risk for non-union
  - > 20mm
  - Most nonunions are asymptomatic

- Persistent pain is relatively rare overall
  - Nonunion represents minor cause
  - Other causes include
    - Tendon injury
    - Tendinopathy
    - Other injuries
      - AIIS associated with labral injury
  - Re-injury can occur
    - < 10%
Treatment

• Operative indications not clear
• Most non-unions asymptomatic
• Consider for injuries with > 20 mm of displacement

• Most commonly recommended for
  • Ischial
    • Sciatic nerve irritation
  • AIIS
    • Location relative to hip in flexion
Adults

• Boney avulsions rare after mid-twenties
• May occur after surgery
  • Rare
• Atraumatic or low energy avulsion fractures in adults should prompt investigation for pathological fracture
Tendon Avulsions

• Proximal hamstring is the most commonly reported location

• Other reported locations are much less common
  • Rectus Femoris
  • Adductor longus
  • Iliac crest
Hamstring

- Most commonly reported avulsion about the pelvis
- Water skiing most common sport
  - Others
    - Falls
    - Soccer
    - Gymnastics
    - Rugby
    - Martial arts
    - Skiing
      - Downhill/Nordic

- Non-operative treatment of avulsions results in significant strength deficits
  - Data is limited for return to sport but rates appear low
- Acute surgical repair (< 4 weeks) leads to high levels of patient satisfaction and return to sport with low levels of complications
Hamstring

• Chronic repair (> 4 weeks)
  • Still leads to positive outcomes
  • May require augmentation
  • Often requires sciatic neurolysis
Rectus Femoris

- Relatively rare
- 11 cases reported from 1986-2006 in the NFL
- All cases did well conservatively with RTP in 6-12 weeks
- Usually involve the indirect head
  - Attaches at superior acetabular ridge

- Small series (n=10) reported lower recurrence rate with surgical repair in professional soccer players
- 18% recurrence rate with non-operative treatment
  - Possible sporting demands may account for some differences
    - Running versus sprinting versus kicking
Adductor longus

- Rare injury reported in multiple sports
  - Most commonly American football and soccer
- Early reports all often used surgical repair with reported good outcomes
- However more recent studies have found success with non-operative treatment
  - Schlegel 2009
    - Small numbers
    - Non-operative resulted in faster RTP with equivalent like hood of return to previous level
    - NFL
  - Other studies demonstrate good functional outcomes with release of adductor attachment for chronic groin pain
Selected References