Hamstring Apophyseal Injuries in Adolescent Athletes

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Objectives

• Review anatomy of hamstrings and pelvis apophyses
• Differentiate between apophysitis and acute apophyseal avulsion injuries
• Understand epidemiology and mechanism of injury of ischial apophyseal avulsion injuries
• Understand conservative treatment and indications for surgical management of these injuries
The Big Grab
Hamstrings – Function and Anatomy

• **Semimembranosus:**
  - Knee stability
  - Flex and medially rotate the leg at the knee
  - Extending, adducting, and medially rotating the thigh at the hip

• **Semitendinosus:**
  - Flexor and internal rotator of the tibia at the knee
  - Valgus stability to the knee

• **Short head Biceps Femoris:**
  - Flex the knee with the thigh extended

• **Long head Biceps Femoris:**
  - Posterior stability to the pelvis
  - Extends the femur at the hip
Origin of Hamstring Muscles
Anatomy of Pelvic Physes

McKinney BI et al, 2009
Ischial Apophysitis

- Overuse injury
- Pain and tenderness over origin of hamstrings
- Possible swelling
- No significant bruising
- Radiographs usually normal or show slight widening of physis

Treatment
- Activity modification, pain-guided activity
- Physical therapy if needed
Ischial Apophyseal Avulsion Injury

- Typically acute injury
- Pain and tenderness over origin of hamstrings
- Weakness and pain with resisted movement
- Passive stretching may cause pain
- Bruising may be present
Epidemiology of Ischial Apophyseal Avulsion Injury

- Age 14-25yo
- 54% of hip/pelvis apophyseal avulsions
- Soccer (36%) and gymnastics (27%) most common sports involved

Rossi and Dragoni, 2001
Mechanism of Avulsion Injury

- Usually result of sudden ballistic movement
  - Sudden forceful contraction
    - Eccentric loading of tendinous insertion at apophysis
    - Running, jumping, sprinting
  - Uncontrolled stretch of hamstring
    - Rapid stretch in knee extension and hip flexion
    - Typical mechanisms for hamstring origin avulsion in adults
Hamstring injury – plain radiograph

- AP +/- oblique
- Avulsion usually apparent
  - Can determine degree of displacement
MRI of Ischial Apophyseal Avulsion

- Usually not required but can help delineate extent of injury
- Can be helpful in younger kids when apophysis not ossified
• Radiographs
• MRI
• CT
  • Can aid in determining bony displacement
• U/S
  • Can be less costly and effective in skilled hands
Treatment

• Most can be treated conservatively
  • <2 cm displacement or more
  • Better outcomes if treatment started early (<1 month from injury)
• Consider if large fragment and significantly displaced >2 cm
  • Failed conservative treatment
  • High level athlete
• Prolonged symptoms (4 months or longer) or symptomatic non-union

McKinney, 2009; Kujala, 1997
Conservative Treatment

- Crutches until painless normal gait achieved
  - 2-4 weeks protected weight bearing
- Physical Therapy for gentle range of motion and strengthening as pain resolves
  - From 4-8 weeks stretching and strengthening
- Return to sport after 8 weeks & asymptomatic
- Usually 8-10 weeks to return to full activity
Surgical Treatment

• Reduction and fixation of apophyseal fragment
  • Large fragment
• Excision of fragment with reattachment of hamstring tendons
  • Concern possible loss of power
  • One small case series found that not to be the case

Sikka, 2013; McKinney 2009
Postsurgical recovery

- Initially non-weightbearing
  - 1-6 weeks
- Gradual progressive weightbearing
  - 3-6 weeks
- Physical Therapy
  - 6 weeks-4 months
- Return to sport
  - Wide range reported; 6 weeks to 5 months

Sikka, 2013; McKinney 2009
Thank you!

Questions?

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References


• Rossi F, Dragoni S. Acute avulsion fractures of the pelvis in adolescent competitive athletes; prevalence, location and sports distribution of 203 cases collected. *Skeletal Radiol.* 2001; 30(3):127-131