Apophyseal Injuries

Julie Wilson, MD
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Objectives

• Review anatomy of developing bones
• **Describe important clinical history differences for avulsion vs apophysitis**
• Highlight specific apophyses and treatment for apophysitis
• Understand common apophyseal avulsion injuries and treatments
Skeletally Immature

- Metaphysis
- Physis
- Epiphysis
- Apophysis
Clinical history

• What happened?
  – Time frame of symptoms
• Where is the pain?
• Age of athlete
  – Chronological vs skeletal
Apophysitis

- Osgood-Schlatter disease
- Sinding-Larsen-Johansson syndrome
- Sever’s disease
- Iselin’s disease
- Pelvic apophysitis
- Medial epicondyle, olecranon apophysitis
General Treatment Approach - Apophysitis

• Activity Modification
  – Pain guided activity
• Symptomatic therapy
  – Icing, NSAIDs
• Stretching +/- physical therapy
• Generally self-limited
• Follow up if pain changes character/location, doesn’t improve with above treatment
Osgood-Schlatter Disease

- Age 12-15
- Insidious onset anterior knee pain
  - Running/jumping sports
- Swelling localized to tibial tuberosity
- +/- limping, reduced strength

- Treatment
  - +/- Cho-pat strap
  - Rarely immobilization
  - Occasional surgery to remove persistent ossicle later in life
Sinding-Larsen-Johansson

- **Age 9-12**
- Insidious onset anterior knee pain
  - Running/jumping sports
- Swelling localized to inferior pole of patella
- +/- limping, reduced strength

- **Treatment**
  - +/- Cho-pat Strap
  - Rarely immobilization
  - Rarely surgical
Sever’s Disease

• Ages 8-13
• Insidious onset heel pain
  – Cleated/barefoot sports
  – May begin after trauma
• Limping, toe walking

• Treatment
  – Heel cups
  – Rarely immobilization
Iselin’s Disease

• Ages 9-12
• Insidious onset lateral foot pain
  – Recent footwear change
  – Activity on uneven surface
• Swelling over 5th metatarsal base
• +/- Limping

• Treatment
  – Footwear modification/arch supports
  – Immobilization if needed
Pelvic Apophysitis

- Overuse injury
- Pain and tenderness over apophysis
- Possible swelling
- No significant bruising
- Radiographs
  - Often normal vs slight physeal widening
- Treatment
  - Activity modification, pain-guided activity
  - Physical therapy
Acute Apophyseal Avulsion Injuries

- Sudden, violent muscle contraction (sprinting/jumping) or uncontrolled stretch
- Often feel pop
- Tenderness over apophysis
- Treat as avulsion fracture until proven otherwise
ASIS-Sartorius; AIlS-Rectus Femoris
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
Mechanism of Ischial 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
Epidemiology of Ischial Apophyseal Avulsion Injury

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

Rossi and Dragoni, 2001
Ischial apophyseal avulsion – x-rays

- AP +/- oblique
Treatment

• Majority treated conservatively
  – <2 cm displacement or more
  – Better outcomes if treatment started early (<1 month from injury)
• Surgical management if large fragment and/or displaced >2 cm
  – Failed conservative treatment
  – High level athlete
  – Prolonged symptoms (>4 months) or symptomatic non-union

McKinney 2009; Kujala 1997
Conservative Treatment

• Crutches until painless normal gait achieved
  – 2-4 weeks protected weight bearing
• Physical Therapy
  – Initial: gentle ROM and strengthening as pain resolves
  – 4-8 weeks: stretching and strengthening
• Return to sport after 8 weeks & asymptomatic
• Usually 8-12 weeks to return to full activity
Tibial Tubercle Avulsion

- 12 yo M track athlete in 100m
- Feels “sharp blow” to the front of shin during race
- Localized pain and swelling of anterior knee and tibial tubercle
- Unable to fully extend knee
Patellar Sleeve Fracture

- 11yo male, football injury
- Opposing player struck anterior knee
- TTP, swelling over patella, small joint effusion
- Unable to weight bear or extend knee

- MRI to eval for larger cartilaginous involvement
Tibial Tubercle/Patellar Sleeve

- **Non-displaced and intact extensor mechanism:**
  - Immobilize x 4 wks
    - Cylinder cast/hinged knee brace locked in extension
  - Brace in extension with ADLs x 2-4 weeks
    - PT, gentle ROM, quad activation
  - Out of brace with PT x 4 weeks
    - No ballistics, running, jumping
  - Gradually re-introduce running, jumping, impact
5th Metatarsal Apophyseal Avulsion

- Inversion ankle injury
- Tenderness, bruising, swelling over apophysis
- Immobilization
  - 4 wks CAM walking boot
- Physical Therapy
Take Home Points

• Gradual onset of pain/tenderness over apophysis
  – Likely apophysitis
  – Treat symptomatically and with activity modification and reassurance

• Acute onset
  – Avulsion fracture until proven otherwise
  – Obtain imaging
  – Immobilize or surgery depending on displacement
Questions?

Thank you!

julie.wilson@childrenscolorado.org
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