On the Field Management: Apophyseal Injuries

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Objectives

• Review anatomy of developing bones
• Review important historical differences to determine risk of avulsion vs apophysitis
• Highlight specific apophyses and treatment for apophysitis
• Review common apophyseal avulsion injuries and treatments
Skeletally Immature

- Metaphysis
- Physis (growth plate)
- Epiphysis (pressure)
- Apophysis (traction)
Importance of history

- What happened
- Where is pain
- Time frame of symptoms
- Age of athlete
Chronic Apophysitis

- Osgood-Schlatter
- Sinding-Larsen-Johansson
- Sever’s
- Iselin’s
- Ischial
- ASIS/AIIS
- Olecranon
General Treatment Approach--Apophysitis

- **Activity Modification**
  - Pain guided activity
- **Symptomatic therapy**
  - Icing, NSAIDs
- **Stretching +/- physical therapy**
- **Generally self-limited**
- **f/u if pain changes character/location, doesn’t improve with rest**
Osgood-Schlatter Disease

- Age 10-15
- Activity Modification
- Symptomatic Therapy
- +/- Chopat strap
- Stretching/PT
- Rarely immobilization
- Occ surgery to remove fragment later in life
Sinding-Larsen-Johansson

- Age 10-13
- Activity Mod
- SxRx
- +/- Chopat Strap
- Rarely immobilization
- Rarely surgical
Sever’s Disease

- Activity Modification
- SxRx
- Heel cups
- Stretching/PT
- Rarely immobilization
Iselin’s Disease
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
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; AllS-Rectus Femoris
Ischial Apophyseal Avulsion Fracture
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
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 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
Ischial apophyseal avulsion—plain radiographs

- 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 apophyseal not ossified
- 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
Tibial Tubercle Avulsion

- 15yo girl in sprint race
- Feels “sharp blow” to the front of her shin
- Localized pain and swelling of anterior knee and tibial tubercle
- Unable to fully extend knee
Patellar Sleeve Fracture

• 11yo male, scooter injury
• Scooter handle struck anterior knee
• Extensor lag?
• Displacement?
• MRI to eval for larger cartilaginous involvement
Tibial Tubercle/Patellar Sleeve

- If non or minimally displaced and intact extensor mechanism
- Immobilize x 4 wks
  - Cylinder cast, hinged knee brace locked in ext
- Brace in extension x 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 often
- Tenderness, bruising, swelling over apophysis
- Immobilization
  - 4 wks CAM 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
  • Consider avulsion injuries
  • Obtain imaging
  • Immobilize or surgery depending on displacement
Thanks!

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