Apophysitis “Growing Pains” in the Young Athlete

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Objectives

- Define apophysis/apophysitis.
- Review pertinent anatomy.
- Identify conditions with similar symptoms that should not be missed.
- Discuss treatment and return to play considerations.
Definition

- Apophysis: cartilaginous prominence adjacent to the physis (growth plate).
- Site of tendon attachment prior to skeletal maturity.
- Use/overuse can result in a traction apophysitis: repetitive microtrauma caused by the force of pull of the attached tendons resulting in partial avulsions and inflammation—excessive force may result in an avulsion fracture.
Apophysis
What a “growing pain” is NOT

OR “What we better make sure it is not:”

- Infection
- Osteochondritis Dissecans
- Stress Fracture
- Tumor
Causes?

- Multiple factors:
  - During a time of rapid growth bone growth exceeds the ability of the muscle-tendon unit to stretch sufficiently to maintain its previous level of flexibility, causing increased tension at the attachment site.
  - Training and competition increase force generation of the attached muscle and amplify traction forces.
  - Underlying biomechanical factors such as foot pronation or genu valgum may exacerbate abnormal forces at the apophysis.
  - Improper technique.

*Apophysitis of the lower extremities. Contemp Peds. June 1, 2011*
Presentation

• Apophysitis typically develops from repetitive submaximal loading at the apophysis, but a forceful eccentric (lengthening) muscle contraction may cause an acute avulsion fracture at the apophysis, with immediate disability.

• In general, apophysitis presents with gradual onset of pain without a specific history of injury--it also may present as persistent and/or worsening symptoms after a single traumatic event.

Apophysitis of the lower extremities. Contemp Peds. June 1, 2011.
Diagnosis

• The diagnosis of apophysitis can be made solely on the basis of classic history and physical exam findings.

• Radiographs are not necessary for diagnosis but may help rule out other conditions such as infection or tumor, especially with an atypical history, or when concerning historical factors such as night pain, fever, weight loss, or pain persisting after skeletal maturity are present.
General Treatment Principles

- Rest from activities that cause pain and protect the apophysis from further injury.
- Although rare, inadequate protection of the apophysis during a time of increased stress can result in an avulsion fracture.
- Activity may be modified to allow continued participation, but certain athletes require complete rest depending on their level of pain and disability.
- A general rule is that sports participation is allowed as long as limping is not present during normal walking or during or after activity.
- A rehabilitation program in the form of a home exercise program, formal physical therapy, or rehab with an athletic trainer is used to correct underlying flexibility and strength deficits.

Apophysitis of the lower extremities. Contemp Peds. June 1, 2011.
Little League (Thrower’s) Shoulder

- Technically a physeal injury.
- Pain/ache in shoulder.
- Often non-specific.
- Radiographs useful for showing widening of the proximal humeral physis.
- Use comparison views.
LLS

- Tenderness at physis WITHOUT physeal widening—4 weeks of rest followed by strengthening, then gradual RTP.
- If physeal widening evident—3 months rest followed by strengthening and an interval throwing program.
- Mechanics!!!
- Later lecture will discuss pitch counts.
Little League (Thrower’s) Elbow

- Overstress of the medial elbow-stabilizing structures and repetitive compression injury to the lateral radiocapitellar articulation.
- Will often see decreased velocity and control.
- Tender/swollen medially at elbow.
- Increased pain with resisted wrist flexion and pronation.
- X-rays often negative—may show widening of medial epicondylar apophysis.
LLE

- Differentiate from UCL tear—LLE 9-12, UCL tear often older.
- May have OCD lesion as well.
- In athletes over 12 consider MRI, partic if gapping with valgus stress.
- Rest 4-6 weeks, ice, NSAID.
- Look at the shoulder (particularly the scapular mechanics), core, and MECHANICS.
- Interval throwing program.
- Again, more to come...
Osgood-Schlatter Disease

- Traction apophysitis occurring at the tibial tuberosity because of the pull of the quadriceps muscle group via the patella tendon.
- Often seen during rapid growth—8-13 in girls and 12-15 in boys.
- More common in active individuals.
- Often insidious, can be initiated by traumatic event.
- Pain often exacerbated by running/jumping/kneeling.
- Tenderness and swelling over the tibial tuberosity.
- Causative factors may be quad and hamstring tightness.
OSD

- Self-limiting.
- May take 12-24 months to resolve—will often wax and wane.
- May “play through” pain as long as not limping.
- Ice, PT (or HEP with stretching of quad/ham/SLR), NSAIDs, patellar tendon strap.
- If limping, affecting ADL’s—activity modification with rest (relative rest), with gradual reintroduction of activities.
- Immobilization/surgery rarely needed.
Sinding-Larsen-Johansson Disease

- Traction apophysitis which develops because of the pull of the patella tendon at the inferior pole of the patella.
- SLJD appears to affect males over females and is seen in active adolescents between the ages of 10 and 13 years.
- Pain inferior patella, partic with running and jumping activities.
- Bony tenderness over the inferior patellar pole with or without swelling.
- Radiographs may demonstrate irregular calcification at the inferior pole of the patella or may be normal.
SLJD

- Self-limited with resolution of symptoms occurring with apophyseal closure at the inferior pole of the patella.
- Shorter in duration than OSD lasting 3 to 18 months.
- Most children with mild symptoms are able to continue playing sports and respond to ice, NSAIDs, and therapy consisting of quadriceps strengthening and flexibility of surrounding muscle groups.
- Consider knee immobilizer, sleeve, strap.
Sever(‘s) Disease

- Considered the most common overuse injury in pediatric and adolescent populations, accounting for approximately 8% of all overuse injuries in this group.
- Affects children between the ages of 8 and 12 years—girls presenting earlier.
- Males are affected 2 to 3 more times often than girls, and 60% of patients have bilateral symptoms.
- Pain posterior heel made worse by running and jumping.
- Tenderness at Achilles insertion—often more tenderness along the sides of the posterior calcaneus (“squeeze test”).
- May see tight heel cord tightness and weak ankle dorsiflexors.
- X-ray may show an apophysis that appears thickened, sclerotic, and fragmented (this can also be considered normal).
SD

- Relative rest, NSAID’s, ice, heel cord stretching and ankle strengthening.
- Role for heel cups, pads or orthotics?
- Severe cases may require crutches or walking boot/cast (2-4 weeks)—I will often keep the athlete in the boot most of the day and out for their activities.
Iselin’s Disease

- Traction apophysitis involving the tuberosity of the fifth metatarsal.
- Peroneus brevis and tertius tendons insert near the attachment of the plantar fascia.
- Females aged 8 to 12 years and in males aged 10 to 14 years.
- Made worse by running/jumping/cutting.
- Peroneus brevis repetitively pulls on the weaker apophyseal cartilage.
- Typically insidious onset—may start after inversion injury. Footwear may aggravate as well.
Physical exam may reveal tenderness at the base of the fifth metatarsal and associated soft tissue edema, mild erythema, and enlargement of the tuberosity in comparison with the uninvolved foot.

Typically will have pain with resisted eversion of the foot as well as increased pain with extreme dorsiflexion and plantar-flexion with inversion.

Best seen on the oblique view of the foot as a small, shell-shaped fleck of bone oriented obliquely to the long axis of the metatarsal shaft.
ID

- Limitation of activity based on the severity of symptoms, icing, and NSAIDs.
- Therapy including stretching of the ankle evvertors/plantar flexors and strengthening of the invertors/dorsiflexors along with proprioceptive exercises.
- Consider immobilization/walking boot with or without crutches for 2-4 weeks.
- Benign and self limiting.
- Rarely non-union may occur with symptoms later in life—consider surgical excision.
Apophyseal (and Avulsion) Injuries of the Hip and Pelvis

- Iliac Crest: abdominal (internal/external oblique and transversus)
- ASIS: sartorius
- AIIS: rectus femoris
- Greater Trochanter: glut med/min
- Lesser Trochanter: iliopsoas
- Ischial Tuberosity: hamstring
- Inferior pubic ramus: adductors
iliac crest (abdominal muscles)

anterior superior iliac spine (sartorius; tensor fasciae latae)

anterior inferior iliac spine (rectus femoris)

greater trochanter (hip rotators)

body of pubis and inferior pubic ramus (adductors; gracilis)

ischial tuberosity (hamstrings)

lesser trochanter (iliopsoas)
Apophyseal (and Avulsion) Injuries of the Hip and Pelvis

- The hip and pelvis are sites of multiple apophyses in the young athlete.
- The large, powerful muscles of this area create increased risk for avulsion fracture relative to other lower extremity sites of apophysitis.
- The anterior superior iliac spine (ASIS) and anterior inferior iliac spine (AIIS) often are injured in running events such as sprinting or hurdling, as well as kicking.
- Apophysitis of the iliac crest develops from excessive arm motion across the trunk while running.
- The lesser trochanter apophysis may be injured during a forceful kicking maneuver.
Apophyseal (and Avulsion) Injuries of the Hip and Pelvis

- Given the actions of the muscles, pelvic apophyseal injuries often are seen in runners, soccer players, dancers, and gymnasts but may occur in any athlete.
- The typical age range for these injuries varies by apophysis but is most common between the ages of 9 and 15 years.
- In apophysitis, athletes report a history of localized pain exacerbated by activity and increasing over time.
- An avulsion fracture presents as an acute injury where the athlete hears or feels a "pop" and has immediate disability.
Apophyseal (and Avulsion) Injuries of the Hip and Pelvis

- Physical examination in either case reveals localized tenderness over the involved apophysis, with occasional swelling or prominence.
- Ecchymosis is more typical of an avulsion fracture.
- ASIS and ischial avulsions are the most common (about 30% each).
- Radiographs of the hip and pelvis demonstrate an open apophysis at the affected site in the case of apophysitis and may demonstrate minimal widening or no abnormality at all.
- An avulsion fracture appears as a displaced bony fragment, and an anteroposterior (AP) view of the pelvis can be helpful for comparison in event of a subtle injury.
Apophyseal (and Avulsion) Injuries of the Hip and Pelvis

- Management of hip and pelvis apophysitis depends on the degree of pain and disability of the athlete:
  - If walking and standing are painful or the athlete is limping, then protected weight bearing on crutches may be necessary initially.
  - Rest from the offending activity is followed by a period of rehabilitation including stretching and strengthening of the hip and abdominal muscles.
  - Once the athlete achieves full, pain-free range of motion and strength, a gradual return to sport may begin.
  - Athletes can expect return to full participation in 4 to 6 weeks, depending on the initial degree of pain and disability and compliance with rest and rehabilitation.
Apophyseal (and Avulsion) Injuries of the Hip and Pelvis

- Management of an avulsion fracture is similar to that of apophysitis.
- If the fragment is minimally displaced (<2 cm), the athlete is placed on crutches for 4 weeks to allow healing of the fracture, followed by a rehabilitation program similar to that for apophysitis, with return to sport at 8 to 12 weeks.
- Ischial tuberosity avulsion greater than 2 cm in a high level athlete will likely need surgical repair.
Sources

Thank-you

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