

Overuse Injuries in Children and Adolescents

It is estimated that 45 million children between the ages of 6 and 18 years of age participate in organized sporting activity¹⁻³. Classes, tournaments, showcases, sport specialization, and performance enhancement sessions now target younger ages. Athletes begin younger, specialize sooner, play on multiple teams in a single season, and participate year round without rest,³⁻⁴ which places the skeletally immature body at risk for injury⁵.

Because an estimated half of all visits to the primary care doctor are due to overuse injuries it is important for physicians to be aware of these types of injuries⁶. Intrinsic risk factors for overuse include lower extremity misalignment, leg length discrepancy, hyperpronation of the foot, pes planus, pes cavus, muscular inflexibility and imbalance⁷. Extrinsic factors include hard training surfaces, old shoe wear, improperly fitting equipment, and rapid increases in training⁷. The skeletally immature athlete has unique sites at risk for injury which are discussed below.

APOPHYSEAL INJURIES

The apophysis is the site where tendon inserts onto the cartilage in growing bone and serves as a secondary ossification center which does not fuse until skeletal maturity⁷. Until fusion, the attachment site is weaker than the tendon/muscle unit and therefore more susceptible to irritation or inflammation (apophysitis). During childhood, bones grow at a faster rate than muscles leading to muscular tightness and inflexibility which inadvertently places strain on the apophysis. Common sites of apophysitis are listed in Table 1 (Page 20).

Signs of apophysitis include insidious onset of pain during and after repetitive activity at the attachment site of the tendon/muscle unit. Examination may show localized swelling at the apophysis, point tenderness, and pain with resisted muscle group testing. Standard x-rays of the affected area are typically normal with open ossification centers present at the affected site. Treatment is relative rest, ice massage, activity modification with low impact activities until pain free, along with a stretching and strengthening program targeting the affected muscle group. Additionally, gel heel cups and patellar straps can be used acutely to help with pain and inflammation at the calcaneal apophysis and tibial tuberosity/inferior patellar pole apophyses respectively.

ARTICULAR CARTILAGE

The immature articular cartilage on the joint surface is susceptible to shear injury from repetitive use in youth

Author: Amy E. Valasek, M.D., M.Sc.
Nationwide Children's Hospital, The Ohio State University
amy.valadek@nationwidechildrens.org

Sports Shorts is provided by the Home & School Health Committee of the Ohio Chapter, American Academy of Pediatrics

athletes⁸⁻¹⁰. Juvenile osteochondritis dissecans (OCD) is microtrauma of incompletely vascularized subchondral bone leading to fissures of the cartilage and fragmentation. OCD is more often diagnosed in male athletes between the ages of 9 and 18 years of age. The joints affected most commonly are the knee (medial and lateral femoral condyles), ankle (talus), and elbow (capitellum)⁷. Presentation typically consists of insidious onset of joint pain, swelling and limited motion of the joint. A description of joint locking or catching occurs if a fragment has displaced. Physical examination may reveal joint effusion and limited range of motion compared to the unaffected side. X-rays may reveal the OCD lesion but an MRI is typically necessary for staging the lesion and assessing healing potential. Initial management in the primary care office includes rest from activity, symptomatic pain management, and possibly immobilization for knee and ankle lesions. Referral to orthopedic surgery is often warranted for high grade lesions or those not responding to conservative management in 6-12 months.

PHYSIS

The physis is the growth plate at the end of long bones comprised of mainly cartilage cells subject to repetitive stress. The proximal humerus and distal radius are two common sites of injury in the skeletally immature athlete. Little League Shoulder (proximal humeral epiphysiolysis) occurs in any sport with repetitive rotational overhead activity such as pitching in baseball, swimming, tennis, volleyball, and gymnastics. Symptoms are insidious onset of lateral shoulder pain exacerbated by throwing or overhead activity. Commonly the athlete describes loss of velocity and accuracy with throwing. Examination reveals tenderness at the proximal humeral physis, decreased shoulder range of motion, and pain with resisted external rotation. AP shoulder x-rays in internal and external rotation may reveal widening at the proximal humeral physis compared to contralateral side. Termination of overhead activity is recommended initially, along with physical therapy and a throwing evaluation to assess throwing mechanics if possible. Competitive overhead activity may resume once the athlete is pain free, has completed rehab and has improvement or normalization of any x-ray abnormalities. Prevention is paramount and youth pitchers should be aware of published pitch counts and pitch type guidelines for age.

BIBLIOGRAPHY LOCATED ON PAGE 26.

Overuse Injuries in Children and Adolescents

Author: Amy E. Valasek, M.D., M.Sc.
Nationwide Children's Hospital, The Ohio State University
amy.valadek@nationwidechildrens.org

Sports Shorts is provided by the Home & School Health Committee of the Ohio Chapter, American Academy of Pediatrics

WHAT ARE GENERAL INJURY TYPES?

There are two types of injuries. An acute injury is due to a single traumatic event. Examples of acute injuries are fractures, sprains or dislocations. An overuse injury is due to repetitive micro-trauma to bone, growth plate, muscle, tendon or cartilage. This is a chronic injury which develops over time. Examples of overuse injuries are little league shoulder or elbow, jumper's knee, or stress fracture.

WHY DO OVERUSE INJURIES OCCUR?

The human body needs daily exercise. However, too much exercise can stress the body leading to an imbalance. This imbalance leads to more breakdown than build up, and subsequently an overuse injury develops.

WHAT CAUSES AN OVERUSE INJURY?

Overuse injuries develop from training errors, technique error, equipment error, and general inherent imbalances of the athlete. Training errors involve rapid acceleration of intensity, duration or frequency of activity which does not allow enough time for the body to recover. Improper technique places too much stress on a body part leading to breakdown, fatigue and injury. Equipment failure predisposes to more stress on the body. Inherent imbalances of the athlete such as poor flexibility, limb length discrepancy, high or flat arches are additive insults as well.

HOW ARE OVERUSE INJURIES DIAGNOSED?

The diagnosis can usually be made after a thorough history and physical examination. At times further testing such as X-rays, MRI, CT scan or bone scan is necessary.

WHAT IS THE TREATMENT FOR OVERUSE INJURIES?

Rest! Cutting back the intensity, duration and frequency is the common prescription. During the period of rest it is critical to address any technique error, equipment error, and athletic imbalances to prevent re-occurrence.

CAN OVERUSE INJURIES BE PREVENTED?

Yes! Listen to your children's complaints. The "No pain, No gain" mantra does not apply. The following are general helpful tips based from the American Academy of Pediatrics Position Statement on Overuse Injuries in 2007¹.

1. Encourage your child to play a variety of sports when young. This will exercise different body parts and help maintain balance.

2. Encourage fun and sportsmanship in the athletic activities chosen.
3. Encourage your child to develop at their own pace with sport readiness. All children develop differently. Avoid extra coaching and training to speed up their sport readiness.
4. Avoid early sport specialization, prior to age 12, due to risk of injuries. If your child specializes in a sport early, initiate a three month consecutive rest period from the single sport to allow rest.
5. Avoid playing same sport year round. Initiate a three month consecutive rest period from the single sport to allow rest.
6. Avoid playing on multiple teams simultaneously. Remember too much of one thing is a set up for failure.
7. Seek advice of your child's doctor or sports medicine specialist early if the child is experiencing pain.

BIBLIOGRAPHY

1. Brenner JS, The Council of Sports Medicine and Fitness. Overuse injuries, overtraining, and burnout in the child and adolescent athletes. Clinical Report. Pediatrics. 2007; 119: 1242-1245.

Table 1. Common Sites of Apophysitis in the Skeletally Immature Athlete

Sever's Disease	Calcaneus and Gastrocnemius and Soleus
Iselin's Disease	5 th Metatarsal and Peroneal Brevis
Osgood-Schlatter Disease	Tibial tuberosity and Quadriceps Extensor Muscle
Sinding-Larsen-Johansson Disease	Inferior Pole of the Patella and Quadriceps Extensor Muscle
Apophyseal Disorders of the Pelvis	Anterior Superior Iliac Spine and Sartorius Anterior Inferior Iliac Spine and Rectus Femoris Ischial Tuberosity and Hamstring
Little League Elbow	Medial Epicondyle and Flexors of the Forearm