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ADVANCES IN PEDIATRICS

Pediatric Overuse Injuries in Sports

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Key Points
- Overuse injuries in youth sports are increasingly common as more children and adolescents participate in some form of athletics.
- Overuse injuries are chronic injuries that occur when repetitive stress is placed on bone, muscle or tendon without adequate time for healing and recovery.
- Familiarity and basic knowledge of common sports-related overuse injuries is important so that proper diagnosis can be made. This allows timely treatment to minimize time loss from participation and ensures a safe return to sports.
- Although management of overuse injuries are centered around relative rest and activity modifications, identifying youths at risk of these injuries is key so that education, prevention, and early diagnosis and treatment can occur.

INTRODUCTION

As more children participate in recreational or organized athletics, pediatricians are evaluating more sports-related injuries in their practice. Each year an estimated 30 million children in the United States participate in some form of organized athletics [1] and this number likely will continue to grow. Moreover, many children today are playing on multiple teams during a given season or are playing different sports throughout the year. Some children have no such thing as an "off season." Consequently, an increase in the incidence of acute injuries and in chronic injuries related to overuse has been seen.

When repetitive stress is placed on bone, muscle, or tendon without adequate time for healing and recovery, microtrauma occur in these structures, resulting in an overuse injury. Physiologically, growing cartilage in pediatric bone is vulnerable to stress. These cartilaginous growth plates and apophyses lend to unique injury patterns that are specific to children. During times of rapid growth,

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apophysitis is a common overuse injury. An apophysis is a secondary ossification center that gives contour to bone and is also the site of attachment of the muscle tendon. In a growing child, the muscles attached to these apophyses are overly tight, and when overworked, repetitive traction forces are placed on these vulnerable growth centers. The result is chronic irritation, inflammation, and microavulsions at the bone-cartilage junction. Common locations of apophysitis include the heel (Sever disease), elbow (little league elbow), and knee (Osgood-Schlatter disease). Overuse injuries to the physis and epiphysis are also common in children, particularly in the overhead athlete or the gymnast. Examples include little league shoulder and gymnast's wrist. Repetitive stress and microtrauma can also lead to overuse tendon injury (tendinitis), which is another major subset of overuse injuries in children. Some of the more common tendinitis in children that are discussed in this article include patellar tendinitis and iliotibial band tendinitis (IT syndrome), although foot and ankle tendinitis and shoulder (rotator cuff) tendinitis can also occur in young athletes. Finally, stress fractures are another example of an overuse injury. Repetitive compressive or tensile forces weaken the bone through a continuum of bone marrow edema without a visible fracture line (stress reaction) and can lead to a complete fracture (stress fracture). Once a rare phenomenon, stress fractures are being reported at a much higher incidence today with the advent of organized youth sports [2,3]. Although this article reviews only spondylolysis (stress fracture of the pars interarticularis of the vertebral body), predominant sites of stress fractures in young athletes also include the tibia, fibula, femur, metatarsals, and navicular bone in the foot [2,3]. Regardless, they all have a common denominator with a multifactorial phenomenon: training errors, biomechanics, diet, and, in girls, menstrual function.

As primary care providers, familiarity and basic knowledge of some common sports-related overuse injuries become important as increasingly more children participate in sports. That way, proper diagnosis can be made and timely treatment or referral to a sports medicine specialist can commence to minimize the time lost from participation.

UPPER EXTREMITY INJURIES

Little league shoulder (proximal humerus epiphysitis)

Little league shoulder refers to an overuse injury of the proximal humerus in overhead athletes with open growth plates. It is believed to result from repetitive microtrauma to the proximal humeral epiphysis and physis from constant traction and rotational torque stresses during throwing and overhead activities [4,5]. Although most commonly seen in male baseball players, little league shoulder (or *proximal humeral epiphysitis*) can affect all overhead athletes, including tennis players, swimmers, volleyball players and even gymnasts [6,7]. It commonly occurs between 11 and 16 years of age [4,8], when the proximal humeral physis growth is at its peak, leaving it vulnerable to stress injury. In baseball players, risk factors that contribute to the development of little league shoulder include improper pitching mechanics and frequent pitching without rest periods [4].