Pediatric Overuse Sports Injury and Injury Prevention

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ABSTRACT

Participation in sports by the pediatric population has grown vastly over the years. Overuse injuries in the pediatric population signify a significant health care interest. Some reports and clinical observations designate 50% of all pediatric sport-related injuries as overuse or repetitive trauma. Furthermore, it is ventured that more than half of these injuries may be preventable with straightforward strategies. Nurse practitioners are well positioned to identify these injuries and implement injury prevention in their practices.

Keywords: injury prevention, orthopedics, overuse, sports medicine

Nurse practitioners (NPs) have a solid foundation of health assessment, and this article will build on that foundation and provide the framework of the specialty focus of orthopedic and sports medicine to providing clinical pearls for improving care for athletes who present with overuse injuries. The emphasis is on the identification of risk factors, preparticipation physical examination best habits, proper supervision, suggestions for best practices in treatment and referral, sports alterations options, available training and conditioning programs, and an explanation of the concept of delayed specialization.

Characterized as microtraumatic damage to bone or soft tissues, overuse injuries occur in structures that have been subjected to repetitive stress without sufficient recovery time.[1] Soft tissue comprises the muscles, tendons, cartilage, and ligaments. In the pediatric population, the skeletally immature physeal and apophyseal growth cartilage is particularly vulnerable. Injuries can occur to healthy tissue as a result of repetitive force or the repeated application of lesser quantities of energy to pathologic or maturing tissue or bone.[2] Overuse injuries of developing tissue include the growth-related disorders of Osgood-Schlatter disease (OSD), Sever disease and other apophyseal (growth plate) injuries such as little leaguer shoulder (humeral epiphysiolysis) and elbow (medial apophysitis), and radial epiphysiolysis (gymnast wrist). Overuse injuries resulting from recurring microtrauma and chronic submaximal loading of tissues include stress fractures, osteochondral defects (OCDs), and tendinitis. Training errors, unsuitable technique, extreme sports training, insufficient rest, muscle weakness and imbalances, and early specialization in 1 sport are all viable mechanisms for overuse injuries to occur. Overuse injuries typically present with an insidious onset of pain and can worsen to be present at rest and prevent play. The Table represents a commonly used symptom-guided grading system of overuse injuries with a 1 to 5 scale.

RISK FACTORS

Elements that are indicated in overuse injuries are typically multifactorial. These factors can occur as intrinsic or extrinsic to the athlete and can also have both overarching types of factors at the root of the overuse. At the level of the athlete, these factors include participation on multiple teams, participating in year-round involvement in sports without adequate rest, previous injury, core weakness including the hip and trunk, and specializing in 1 sport at an early age.

Extrinsic factors that are indicated in overuse injuries include pressure on the young athlete in the form of the requirements of a weekend sports tournament, such as those common in the sports of swimming, soccer, lacrosse, and baseball. These tournaments may include 6 hours each day of play.

Table. Symptom-guided Grading of Overuse Injuries

Injury Severity	Symptom Characteristics
Grade 1	Symptoms occur at the end of the activity or only at the initiation and then diminish
Grade 2	Symptoms develop during activity, late onset, diminish after activity is completed
Grade 3	Symptoms develop during activity, early onset, and persist during the remainder of activity, diminish after activity has ended
Grade 4	Symptoms develop during activity and limit training frequency, intensity, or duration
Grade 5	Symptoms prevent training

Modified from Difiori.[3]

Over a full weekend, the athlete might be involved with playing for more than 12 hours. Other extrinsic factors indicated in overuse injuries may also be in the form of parental insistence, coaching pressure, and peer or sibling competition.

Factors affecting child (younger than 11) and adolescent (age 12-18) athletes differ. The child athlete is at risk because of muscle imbalance and tissue immaturity, and the adolescent athlete is more likely to develop overuse injuries because of rapid periods of growth.[3,4]

EPIDEMIOLOGY

NPs are very likely to encounter pediatric patients who are actively participating in organized sports. In the United States, participating in sports is increasing steadily. Currently, there are an estimated 30 to 40 million children who participate in organized sports activities each year.[5] Additionally, half of pediatric patients presenting for sports medicine chief complaints are not presenting with acute injuries but rather injuries that are chronic in nature.[1] Furthermore, approximately 50% of all pediatric sport-related injuries ensue through overuse or repetitive trauma mechanisms.[1]

SELECT COMMON CLINICAL OVERUSE INJURY DIFFERENTIALS

Upper Extremity

Child. *Little Leaguer Shoulder (Humeral Epiphysiolysis)* The pathophysiology of little leaguer's shoulder is the result of the tension from repetitive throwing in overhead athletes, which can lead to a widening of the humeral growth plate or physis. Typically, a combination of repetitive throwing, weak physeal cartilage at growth centers, muscle tightness associated with rapid long bone growth, increased laxity of soft tissue structures, and decreased development of neuromuscular movement patterns will foster an increased risk of injury to the athlete.[5]

The common age for little leaguer shoulder is 11 to 15 and is typical in the throwing athlete population. The diagnosis of humeral epiphysiolysis is made when the athlete presents with proximal shoulder pain with activity. When asked to try and "pinpoint" the discomfort, the athlete will typically point to the area of the humeral growth plate. Radiographs will show widening of the proximal humeral physis and changes in the appearance of the bone including sclerosis, fragmentation, and changes that appear cystic in nature.[5] Figure 1 shows the findings that are typical for humeral epiphysiolysis. Treatment is geared toward rest, including cessation of all throwing activities. Follow-up with radiographs is indicated for the determination of healing and improvement. An important pearl, yet frequently overlooked, is that the pediatric patient needs to be reminded of what constitutes throwing. Some will take this literally to mean a baseball or a softball. However, playing catch, throwing a football or Frisbee, fetch with their dog, and even

Figure 1. Radiograph of Little Leaguer Shoulder (Humeral Epiphysiolysis).