In 1995, 8.6 million youths between the ages of 6 and 17 in the United States played baseball (Baseball and Softball Council, 1996). This number increases greatly when youth baseball players in Latin America and Asia are considered. Baseball is a sport that captivates young children and provides them with a pastime that they can participate in throughout their lives. All too often, unfortunately, these young athletes develop debilitating injuries that end their participation in baseball and might even affect other aspects of their lives. In addition, the patterns of injury associated with baseball change as players mature skeletally. Athletic trainers and therapists are in an ideal position to implement educational and exercise programs designed to prevent elbow injuries in adolescent pitchers and to correctly recognize and manage the injuries that do occur.

Elbow Anatomy

In order to maximize prevention and timely management of adolescent elbow injuries, the athletic trainer or therapist must have a thorough knowledge of elbow anatomy. The elbow is a complex joint comprising three articulations: the humeroradial, humeroulnar, and proximal radioulnar joints. Axial motions occur at the humeroradial and proximal radioulnar joints, whereas the humeroulnar articulation is a hinge-type joint.

Anteriorly, the topical landmarks of the elbow are defined by the components of the antecubital fossa. The lateral border is formed by the brachioradialis, extensor carpi radialis longus and extensor carpi radialis brevis as they arise from the lateral epicondyle. Lateral and posterior to the mobile wad are the anconeus, extensor carpi ulnaris, extensor digitorum communis, and extensor digitorum minimus. The radial head can be palpated distal to the lateral epicondyle by supinating and pronating the forearm (see Figure 1).

Key Points

- A history of some injuries should disqualify the athlete from pitching; therefore, evaluation of the adolescent pitcher's elbow should be included in any prevention program.
- Throwing under guidance and with appropriate technique is central to preventing elbow injuries in the adolescent pitcher.
- Medial elbow injuries occur on a continuum; it is important to consider all aspects of this continuum when elbow injuries in adolescents are concerned.

Key Words: pitching injuries, adolescent pitcher injuries, youth baseball injuries

Figure 1  Anatomical landmarks of the elbow.
The medial portion of the antecubital fossa is formed by the flexor-pronator mass. Moving laterally from the origin on the medial epicondyle, this mass includes the pronator teres, flexor carpi radialis, palmaris longus, and flexor carpi ulnaris. Posterior to the medial epicondyle the ulnar groove provides protection for the ulnar nerve. The two bicipital insertions, the lacertus fibrosis and the bicipital tuberosity of the radius, form the superior aspect of the fossa. Together the three borders form a triangle, with the roof consisting of the lacertus fibrosis and the floor formed by the brachialis and supinator muscles.

Another landmark pertinent to the examiner is the soft spot at the center of the anatomical triangle formed by the lateral epicondyle, olecranon process, and radial head. It is here that the joint can be evaluated for an effusion and, if need be, aspirated (see Figure 2).

Moving posteriorly, the olecranon, medial epicondyle, and lateral epicondyle can be palpated. These three anatomical structures form important landmarks for the examiner; in extension the three are arranged in a straight line, and at 90° of flexion they form an equilateral triangle.

The ligamentous structures of the elbow are divided into medial and lateral complexes. Medially, the ulnar collateral ligament (UCL) protects against valgus stresses. The UCL is divided into three distinct sections: the anterior, posterior, and transverse bundles. The most important of the three components, the anterior bundle, provides dynamic stabilization and is often referred to as the ACL of the elbow. Although it has more constituents than the medial complex, the lateral ligamentous system is not quite so distinct. This complex is composed of the radial collateral, lateral ulnar collateral, accessory lateral collateral, and annular ligaments.

**Prevention of Elbow Injuries**

The adolescent baseball player is often at a crossroads to a career. In many instances the athlete has already played baseball for years and might have a documented elbow injury. Others may have injuries that have gone undetected. In cases in which there is a predisposing condition, prevention guidelines will vary, because the primary goal of the prevention program is to prevent further injury. The athletic trainer or therapist must be aware that a history of some injuries, such as a cubitus elbow deformity and other injuries that cause a biomechanical malalignment of the elbow, should disqualify the athlete from pitching (Ireland, 1998). As a result, evaluation of the adolescent pitcher's elbow should be included in any prevention program. Prompt diagnosis, appropriate treatment, and compliance with rehabilitation are vital to preventing further elbow derangement.

The focal point of preventing elbow injuries in baseball is throwing. Throwing under guidance and with appropriate technique is central to preventing elbow injuries in the adolescent pitcher. Technique should be closely monitored, and corrections in delivery should be made promptly. Research has shown that limiting the number of pitches thrown from the mound to less than 600 per season also reduces an athlete’s chance of elbow injury. In addition to monitoring the total number of pitches thrown from the mound, the coach and athletic trainer or therapist should track the number of innings pitched per week and per game and the number of pitches per game. Knowledge of these numbers then guides the coaches and the athletic