Elbow problems in the adolescent athlete

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Elbow problems in young adolescent athletes are not common, but since serious sequelae may arise from delayed recognition and treatment, it is important to review the injuries that occur and consider their management. Fortunately the overall incidence of injury to these adolescent athletes is relatively low; 548 of 5,088 patients (11%) examined in the athletic injury section of The Cleveland Clinic Foundation from 1972 to 1974 were age 15 or younger. Seventy-three of these adolescent patients (14%) had sustained injuries to the upper extremities, and in 10 (2%) these injuries involved the elbow. The mechanism of injury fell into one of two categories, being either contact related or the result of the repetitive act of throwing.

Contact injuries

The contact-related injuries frequently encountered are contusions, sprains, and fractures. Contusions result from a direct blow to the involved structures. Contusions to the elbow structures are generally not serious and usually respond to rest and ice; gradual resumption of activities is permitted as tolerated. One exception is the development of traumatic olecranon bursitis, which should be treated by aspiration

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followed by application of a compression dressing for several days. Repeat aspirations may be necessary, but vigorous attempts to prevent the development of chronic olecranon bursitis are warranted to avoid surgical excision.

Sprains of the capsular and ligamentous structures about the elbow most commonly involve a hyperextension and valgus mechanism placing stress on the anterior and medial structures. These are associated with pain and lack of full elbow motion, with associated tenderness of the involved ligamentous structures. When the medial or lateral collateral ligaments are involved, it is important to examine for ligamentous laxity. Roentgenograms should be obtained to exclude fracture, and occasionally stress roentgenograms are indicated to document laxity. Ligamentous sprains are graded according to severity after O'Donoghue,[1] and the management is determined by the degree of injury.

Grade I hyperextension and medial collateral ligament sprains (the most common injury of this type) should be treated with ice and active range of motion exercises followed by progressive resistance exercises when range of motion has returned to normal. Then gradual return to activity may be permitted, along with protective taping to protect against hyperextension and medial stresses. Grade II sprains, which are of moderate severity but not associated with significant laxity, should be immobilized for 1 to 3 weeks in a splint or sling, followed by the same program outlined for Grade I injuries. Grade III sprains are complete tears and usually involve the ulnar collateral ligament. These are associated with laxity, should be surgically repaired within 72 hours after injury, immobilized for a period of 4 to 6 weeks, and followed by the Grade I program.

Elbow fractures in adolescent athletes are frequently epiphyseal, and the principles of recognition and management of these injuries are reported in this issue by Dr. H. Royer Collins.

Dislocations of the elbow may also be encountered, and it is important that the neurovascular integrity of the forearm and hand be observed and protected initially and following reduction. The position and type of immobilization must not compromise the distal vascular supply, and if there is any question, the amount of flexion at the elbow must be reduced until distal circulation is restored. No obstructive circular dressings or casts should be employed. Roentgenograms are important to rule out any associated fractures, and one must also examine for complete ligamentous rupture by checking for stability following reduction. Reduction of the dislocation should be done under adequate anesthesia and relaxation (regional block or general), and should be as gentle as possible. One should resist the temptation to reduce a dislocation immediately on the playing field, but rather should splint the extremity, and immediately transfer the athlete to the nearest emergency care facility where evaluation, roentgenography, and anesthesia can be obtained for definitive care.

Throwing injuries

Mechanics of throwing. Many elbow problems in adolescent athletes are related to the repetitive act of throwing. The throwing motion varies

depending upon the sport and the individual player. However, a basic mechanism common to all sports and to all individuals has been divided into four phases: (1) the initial stance, (2) the wind up, (3) the forward motion of the arm, and (4) the follow through.[2] Injuries are generally believed to occur during phases 3 and 4, when tremendous forces are generated by the musculature of the shoulder girdle and upper arm while acting to accelerate the arm and ultimately the object being thrown. During this phase, tremendous tensile stress develops across the medial aspect of the elbow, and simultaneous compression and rotational forces are developed in the lateral aspect of the elbow joint. The muscular and ligamentous structures on the medial side must contend with the medial tensile stresses, and the articular surfaces of the radius and capitellum must absorb the lateral compression and rotational forces. During the follow through phase, the triceps mechanism is involved with rapid elbow extension at release, and the anterior structures must then decelerate and halt this explosive elbow extension.[3]

Classification of throwing injuries. Slocum[2] has classified throwing injuries of the elbow into three categories which are based upon the mechanics of throwing: medial tension overload, lateral compression injuries, and extensor overload injuries. The most common medial tension overload syndrome in adolescent athletes is the muscular overuse syndrome. The repeated stress of throwing and fatigue may cause microtears within the muscle fibers of the medial flexor-pronator group, leading to myostatic contractures that prevent full extension of the elbow. The clinical features are pain and tenderness of the flexor musculature with some degree of loss of elbow extension for 24 to 48 hours. Continued hard throwing when these symptoms are present can lead to more severe muscle injury and can ultimately cause extensive scarring and permanent loss of elbow extension. This condition must be recognized early when the treatment is simple, consisting merely of rest, ice, and prevention of active throwing until the pain has subsided and motion has returned to normal. Chronic manifestations of medial tension overload consist of bony traction spurs, loose bodies, and joint degeneration which are not seen in adolescent athletes, but can frequently be traced to elbow abuse during adolescence.

Lateral compression injuries to the elbow can cause osteochondritis dissecans of the capitellum (*Figs. 1 and 2*) or osteochondrosis of the radial head (*Figs. 3 and 4*). These conditions are associated with pain, limitation of motion, and frequently medial tension overload syndromes as well. The key to diagnosis is the roentgenogram, and early recognition is very important. When either of these conditions is found in an adolescent athlete, he should be restricted from throwing activities for at least 1 year, and then be allowed to resume throwing only if a full painless range of motion has returned, and there is roentgenographic evidence of healing. If the symptoms do not subside, or if intra-articular loose bodies are present, surgical treatment is indicated. The results of surgical treatment, however, are often disappointing. Continued

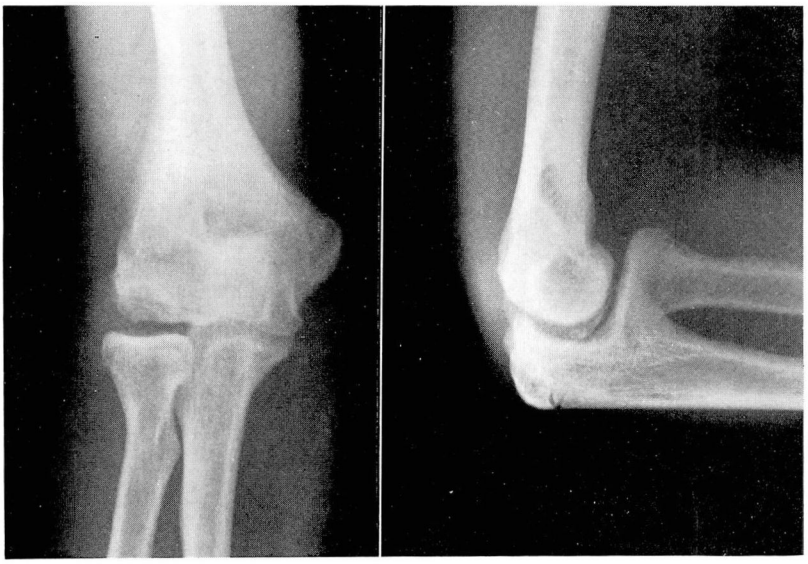

Fig. 1. Roentgenograms of the elbow of a 14-year-old Little League pitcher demonstrating osteochondritis dissecans of the capitellum with loose body formation.

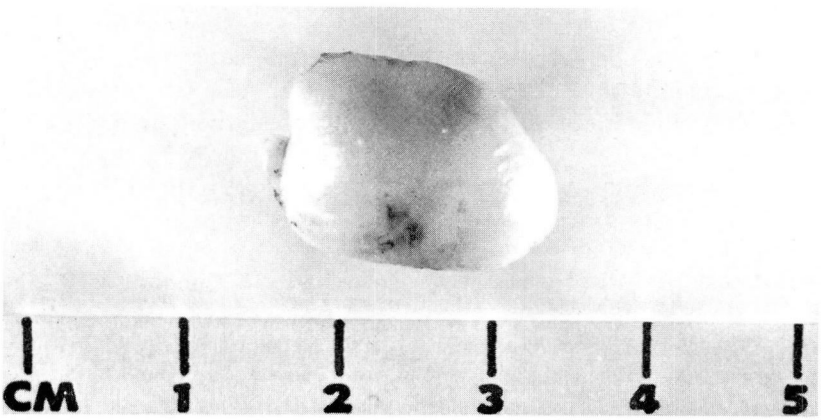

Fig. 2. The resected surgical specimen which was an osteochondral loose body that had originated from the area of osteochondritis dissecans of the capitellum.

throwing when either of these lesions is present can lead to the formation of osteochondral loose bodies, joint deformation, and ultimately degenerative, traumatic arthritis.

Extensor overload problems commonly involve acute strain of the triceps mechanism, which usually occurs at the musculotendinous junction of the triceps. Treatment of the mild cases is simply rest; in severe cases there should be a period of immobilization in a sling. Strain-fracture of the olecranon may also be encountered. Treatment is only immobilization if there is no displacement, but if dis-

Fig. 3. Roentgenograms of the elbow of a 13-year-old Little League pitcher and quarterback demonstrating flattening, irregular ossification, and early fragmentation of the radial head typical of traumatic osteochondrosis.

Fig. 4. The roentgenographic appearance of the same elbow following abstinence from throwing for 1 year. The radial head has healed satisfactorily and has an essentially normal appearance. The patient has been able to return to active throwing without difficulty.

placed, open reduction and internal fixation is usually indicated. Late changes associated with chronic extensor overload include bony hypertrophy with resultant loss of motion, loose bodies within the olecranon fossa, and degenerative joint changes. These late changes are not seen in adolescence, but again they may frequently be the result of elbow abuse during adolescence.

Little Leaguer's elbow. This term describes the problems associated with throwing during adolescence. All of the throwing related problems mentioned before, plus the added dimension of epiphyseal injury (usually medial humeral epicondylitis) are included in the usual definition. Early studies by Adams[4] focused on Little League baseball players, and elbow problems were identified in a high percentage of pitchers. Since that study was reported in 1965, Little League rules have been modified to limit the amount of pitching by immature players, and it is the opinion of the officials that the current rules adequately prevent these problems. In support of that contention is a study by Torg et al[5] reported in 1972, which indicated a much lower incidence of elbow problems than that reported by Adams (5% compared with 95%). Although the true incidence under current Little League regulations is not certain, these problems definitely occur and can be serious, and continuing efforts directed toward prevention, early recognition, and treatment are warranted. The term Little Leaguer's elbow is unfortunate, however, since many of these problems occur because of activities outside of organized Little League, and indeed may occur in sports other than baseball.

Summary

The mechanisms, clinical features, preventive measures, and treatment of injuries to the elbow sustained by adolescent athletes have been reviewed. Prevention, prompt recognition, and treatment of early symptoms are essential if the disabling sequelae of chronic involvement are to be avoided.

References

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