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Rehabilitation After Posterolateral Dislocation of the Elbow in a Collegiate Football Player: A Case Report

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Objective: To describe a functional rehabilitation program for a football player with a grade 2 posterolateral elbow dislocation to facilitate early return to competition.

Background: Conservative management of a posterior dislocation of the elbow is common. The elbow is the second most frequently dislocated large joint in adults. Two common mechanisms of dislocation are hyperextension and posterolateral rotation. Prolonged immobilization can be detrimental to regaining full range of motion and function of the elbow, whereas early directed rehabilitation may lead to early return to normal function.

Differential Diagnosis: Elbow dislocation with medial collateral ligament rupture, elbow subluxation, elbow dislocation with neurovascular compromise, or supracondylar fracture.

Treatment: The athlete received immediate care of reduction and immobilization in a 90° posterior splint followed by a radiologic evaluation. Postreduction treatment included a short immobilization period and early initiation of protected active and resistive range-of-motion exercises. The athlete was able to return to full football activities in 3 weeks. He competed for the rest of the season with the elbow braced and taped, with no recurring incidents of instability.

Uniqueness: The time to return to full participation was rapid. The medial collateral ligament was intact, as determined by magnetic resonance imaging. The athlete has since been followed for 2 football seasons and has not demonstrated any detrimental effects due to his early return.

Conclusions: Early determination of the status of the medial collateral ligament through physical examination or imaging combined with early directed rehabilitation of a posterolateral elbow instability enabled this athlete to respond well. He regained pain-free full range of motion, strength, and function, allowing full participation in football at the Division I level with no recurring incidence of dislocation.

Key Words: posterior elbow dislocation, football injury, elbow bracing

The elbow joint is one of the most constrained and stable joints in the body, secondary to its highly congruent bony articulations, the joint capsule, collateral ligaments, and surrounding muscles and tendons.[1,2] Despite this inherent stability, acute elbow dislocations are reported to have an annual incidence of 7 out of 100000 population.[3] Elbow dislocations are the most common dislocation seen in children under 10 years of age, likely related to increased flexibility associated with the immature elbow joint's dependence on cartilaginous structures for stability.[4] In adults, elbow dislocations are the second most common type of dislocation in large joints after the shoulder.[4,5]

Two mechanisms of dislocation have been suggested. Historically, elbow dislocations are thought to result from hyperextension, in which the olecranon process is forced into the olecranon fossa and the trochlea is then levered over the coronoid process.[4,5] A more recent proposed mechanism of injury is posterolateral rotation, in which combined forces of axial compression, elbow flexion, valgus stress, and forearm supination create a rotational displacement of the ulna on the distal humerus.[6,7] With either mechanism there may be associated fractures, neurovascular injury, or extensive soft tissue damage.

We present a rehabilitation program consisting of a short immobilization period along with an early motion and strengthening program after a posterolateral rotatory dislocation of the elbow. This method of treatment allowed a Division I college football player to return to football in 3 weeks.

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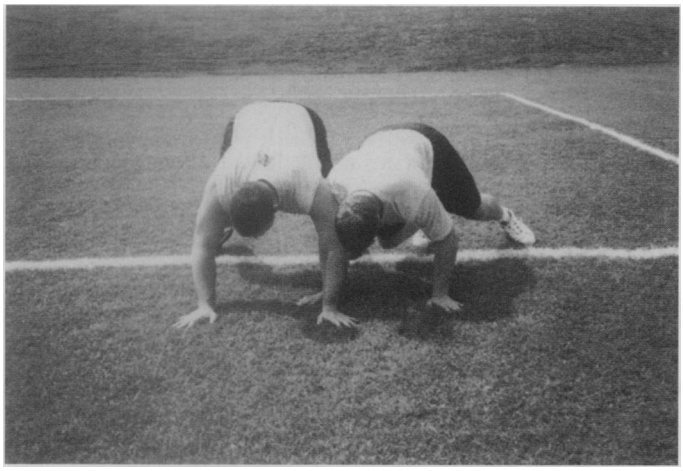
CASE REPORT

A 21-year-old Division I intercollegiate football player (ht = 190.5 cm, wt = 129.5 kg) sustained a posterolateral elbow dislocation during a game. The athlete was performing a "crab block" when his teammate at the guard position was pushed into his left elbow. As reported by the athlete, the force was primarily on the posterior aspect of the humerus, producing a valgus stress at the elbow (Figure). The athlete felt and heard a loud "pop" and realized immediately that his elbow was "out of place." Immediate treatment by the head athletic trainer and orthopaedic team physician was to evaluate the neurovascular status of the left arm and manually stabilize the posteriorly dislocated elbow while they escorted the athlete off the field to the locker room.



Mechanism of posterolateral elbow dislocation: combined axial compression, elbow flexion, valgus stress, and forearm supination.

The orthopaedist reduced the elbow in the training room by a technique in which the athlete hangs the arm over the back of a chair while the ulna is reduced with downward traction. The elbow was immobilized at 90° with a posterior splint and supported in a sling. The team physician prescribed pain medication, and the elbow was iced for 20 minutes every 2 to 3 hours for the next 3 days. Radiologic evaluation revealed a chip fracture of the coronoid process and soft tissue swelling. Magnetic resonance imaging revealed a partial rupture of the lateral ulnar collateral ligament and an intact medial collateral ligament, consistent with a grade 2 posterolateral rotatory dislocation as described by O'Driscoll.[7]

At evaluation with the orthopaedist 4 days after injury, the posterior splint was removed, and the athlete was placed into a hinged brace (Orthomerica Products, Inc, Newport Beach, CA) that limited range of motion from 45° of extension to 90° of flexion. The athlete came out of this brace for cold whirlpool treatment and pain-free active range of motion 2 times a day. On day 6 postinjury, light resistive exercises were initiated for elbow flexion and shoulder flexion.

By 9 days postinjury, the athlete had regained active range of 100° flexion to 20° from full extension, limited by pain and minimal swelling. Progressive resistive exercises were added for all elbow and wrist musculature within the limits of pain, augmented by simulated upper extremity football linemen drills in a pool. Proprioception and endurance activities were initiated by bouncing a basketball against a wall for 3 30-second intervals with both hands. On day 11 postinjury, 2-handed medicine ball activities with a Plyoback II (M-F Athletics, Inc, Cranston, RI) and 1.81-kg (4-pound) ball were initiated, replacing the basketball drill. Strengthening and endurance exercises were progressed as long as no increase in soreness was reported during the activity or on the following day.

Range of motion of the elbow improved to 115° of flexion and 10° from full extension by 15 days postinjury. At this time, the athlete was cleared to start machine weight lifting supervised by a certified athletic trainer. The weight machine's range of motion was limited to stress the elbow only in the available pain-free range.

Seventeen days after the initial injury, the athlete dressed out for practice and performed sport-specific tests with a certified athletic trainer. The athlete wore a Don Joy small hinged knee brace (dj Orthopedics, Vista, CA) that was blocked to prevent elbow flexion beyond 100° and the last 30° of elbow extension. The athlete was also taped to support the medial collateral ligament of the elbow and to prevent hyperextension.

Sport-specific tests incorporated up-downs in which the athlete would fall forward and catch his body weight with his upper extremities. The athlete had to drive a blocking dummy 5 times in a row for 4 yards. He also performed sequential blocking drills followed by "butt rolls" to the right and left. Finally, the athlete had to snap the ball and perform pass protection with his arm extended in front of him and take on an opponent.

All sport-specific tests were performed to the satisfaction of the certified athletic trainer and the athlete, with no report of pain. The athlete was cleared to return to full practice at 18 days postinjury and was able to fully participate in a game at 3 weeks postinjury. During all contact practices and games, the elbow was taped, and a hinged brace was applied to limit range of motion.

Participation during the remainder of the fall season was uneventful, and the athlete successfully progressed through his elbow strengthening and stretching rehabilitation program. During the following spring season and final fall season, he continued to use the brace alone, with no flexion limitation and a 10°-extension limitation. At the end of his final season, evaluation of the elbow revealed full range of motion and strength, full function, no incidence of recurrent dislocation or instability, and occasional symptoms of minimal discomfort. Stability assessment performed at this time revealed apprehension during the lateral pivot shift test, but no laxity, indicating that a possible deficiency of the lateral ulnar collateral ligament remains.

DISCUSSION

Posterior and posterolateral elbow dislocations account for 90% of all elbow dislocations.[5,8–10] This athlete sustained a grade 2 posterolateral instability with a partial rupture of the lateral ulnar collateral ligament and an intact medial collateral ligament.

Differences in opinion exist concerning the presence of instability and ligamentous injuries after dislocation of the elbow joint. The anterior bundle of the medial collateral ligament has been shown to be the most important soft tissue constraint to valgus stress of the elbow.[1,11,12] For this reason and based on clinical observations, it has been assumed that the anterior bundle must be damaged in complete elbow dislocations.[2,12,13] However, some authors[6] have observed satisfactory valgus stability when the forearm is held pronated after reduction of a dislocation. Furthermore, surgical repair of only the lateral structures has been shown to eliminate recurrent dislocations, suggesting that the essential lesion of instability affects the lateral ulnar collateral ligament.[14,15] The type and extent of ligamentous damage associated with elbow dislocations dictates the rehabilitation process. An additional consideration is whether the elbow dislocation is complicated by compromise of the neurovascular system or fractures that need surgical attention.

Historically, a postreduction immobilization period of 3 weeks or more has been recommended for uncomplicated elbow dislocations,[5] but most authors[10,16,17] agree that longer periods of immobilization are associated with deleterious effects, such as adhesion formation and resultant flexion contractures. Recent literature[10,16–18] suggests a postreduction

immobilization period of no more than 3 weeks, in which the elbow is flexed to 90° in a posterior splint or cast, with the forearm fully pronated. At approximately days 10 to 14 postinjury, the posterior splint is discontinued, and a hinged splint with an extension block is then used to prevent extension beyond the point of instability.

Andrews et al[10] recommend that rehabilitation goals focus on early restoration of motion within the limits of elbow stability. These authors emphasize the avoidance of valgus stress throughout the entire rehabilitation process. Forceful manipulation and aggressive passive range of motion are also avoided in order to prevent any development of heterotopic ossification. Protected active range of motion and multiangle isometrics may begin during the initial phase of 1 to 10 days postinjury. Andrews et al[10] recommend the institution of progressive resistance exercises for the elbow during the intermediate phase (days 10 to 14 postinjury). During the advanced phase, weeks 2 through 6 postinjury, functional progressions and sport-specific activities are initiated.

The athlete in this case returned to full participation in Division I football at 3 weeks postinjury. We attribute this favorable outcome to multiple factors. First, this was an incomplete dislocation; thus, the medial collateral ligament was intact. A second factor was that early protected active range-of-motion and strengthening exercises could be initiated and progressed with minimal pain and swelling. This was primarily related to the intact medial collateral ligament, which allowed more progressive rehabilitation. According to the description by O'Driscoll et al[6] of the relationship between pathoanatomy and degree of elbow instability, a ruptured medial collateral ligament may require a longer recovery period. The combination of cold whirlpool and range-of-motion exercises contributed to the early return of motion, which has been used to facilitate early return after a joint injury.[19,20] Third, there was a short immobilization period of only 4 days. This agrees with the results of other authors,[16,17] who indicate that early active motion is a key factor in rehabilitation after reduction of an elbow dislocation. Fourth, the combination of taping and bracing the elbow provided limited mobility and stabilization to protect the joint while allowing the athlete to perform centering and blocking tasks. The final factor was that this individual athlete was highly motivated and compliant with a treatment regimen of 3 times a day. He also provided good feedback during the rehabilitation program and worked with the athletic trainers in identifying appropriate progression to allow return to sport.

CONCLUSIONS

The clinical implications of this case are twofold. In an athlete with an uncomplicated posterolateral elbow dislocation, knowledge of the pathoanatomy and degree of elbow instability is important in guiding the immobilization period and rehabilitation progression.[6,7] A thorough clinical examination, perhaps augmented by a magnetic resonance imaging scan, is necessary to determine the status of the medial collateral ligament. With an intact medial collateral ligament, a short immobilization period and early, directed rehabilitation may allow early return to sport participation, as demonstrated in this case. Additionally, the early return to protected sport participation in this patient had no negative effects on long-term results. The athlete participated in 2 football seasons after the injury, with no recurrent instability and minimal episodes of discomfort. We feel that early rehabilitation with a compliant athlete will result in an earlier return to sport without deleterious consequences.

REFERENCES

1. Morrey BF, An KN. Articular and ligamentous contributions to the stability of the elbow joint. *Am J Sports Med.* 1983;11:315–319.
2. Josefsson PO, Johnell O, Wendeberg B. Ligamentous injuries in dislocations of the elbow joint. *Clin Orthop.* 1987;221:221–225.
3. Josefsson PO, Nilsson BE. Incidence of elbow dislocations. *Acta Orthop Scand.* 1986;57:537–538.
4. Linscheid RL, O'Driscoll SW. Elbow dislocation. In: Morrey BF, ed. *The Elbow and Its Disorders.* 2nd ed. Philadelphia, PA: WB Saunders; 1993:441–452.
5. Linscheid RL, Wheeler DK. Elbow dislocations. *JAMA.* 1965;194:1171–1176.
6. O'Driscoll SW, Morrey BF, Korinek S, An K-N. Elbow subluxation and dislocation: a spectrum of instability. *Clin Orthop.* 1992;280:186–197.
7. O'Driscoll SW. Elbow instability. *Hand Clinics.* 1994;10:405–415.
8. Neviaser JS, Wickstrom JK. Dislocation of the elbow: a retrospective study of 115 patients. *South Med J.* 1977;70:172–173.
9. Royle SG. Posterior dislocation of the elbow. *Clin Orthop.* 1991;269:201–204.
10. Andrews JR, Wilk KE, Groh G. Elbow rehabilitation. In: Brotzman SB, ed. *Clinical Orthopaedic Rehabilitation.* Philadelphia, PA: Mosby-Yearbook; 1996:67–71.
11. Morrey BF, Tanaka S, An K-N. Valgus stability of the elbow: a definition of primary and secondary constraints. *Clin Orthop.* 1991;265:187–195.
12. Schwab GH, Bennett JB, Woods GW, Tullos HS. Biomechanics of elbow instability: the role of the medial collateral ligament. *Clin Orthop.* 1980;146:42–52.
13. Josefsson PO, Gentz CF, Johnell O, Wendeberg B. Surgical versus non-surgical treatment of ligamentous injuries following dislocation of the elbow joint: a prospective randomized study. *J Bone Joint Surg Am.* 1987;69:605–608.
14. Durig M, Muller W, Ruedi TP, Gauer EF. The operative treatment of elbow dislocation in the adult. *J Bone Joint Surg Am.* 1979;61:239–244.
15. Hassmann GC, Brunn F, Neer CS 2d. Recurrent dislocation of the elbow. *J Bone Joint Surg Am.* 1975;57:1080–1084.
16. Protzman RR. Dislocation of the elbow joint. *J Bone Joint Surg Am.* 1978;60:539–541.
17. Mehlhoff TL, Noble PC, Bennett JB, Tullos HS. Simple dislocation of the elbow in the adult: results after closed treatment. *J Bone Joint Surg Am.* 1988;70:244–249.
18. Harrelson GL, Leaver-Dunn D. Elbow rehabilitation. In: Andrews JR, Harrelson GL, Wilk KE, eds. *Physical Rehabilitation of the Injured Athlete.* 2nd ed. Philadelphia, PA: WB Saunders Company; 1998:554–588.
19. Grant AE. Massage with ice (cryokinetics) in the treatment of painful conditions of the musculoskeletal system. *Arch Phys Med Rehabil.* 1964;45:233–238.
20. Barnes L. Cryotherapy: putting injury on ice. *Physician Sportsmed.* 1979;7(6):130–136.