

# The Two-Step Maneuver for Closed Reduction of Inferior Glenohumeral Dislocation (Luxatio Erecta to Anterior Dislocation to Reduction)

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**Summary:** The 2-step closed reduction maneuver was developed to aid in the rarely encountered inferior shoulder dislocation. The maneuver converts the humeral head from an inferior dislocation to an anterior dislocation and then reduces the humeral head into the glenoid. The operator places one hand on the shaft of the humerus and the other hand on the medial condyle. The hand on the shaft initiates an anteriorly directed force rotating the humeral head from an inferior to an anterior position. Once this is accomplished, the humerus is adducted against the body. The humerus is then external rotated reducing the humeral head into the glenoid. Two cases of inferior shoulder dislocation were closed reduced by using the described technique with minimal analgesia and without a change in the postreduction neurovascular status.

**Key Words:** luxatio erecta, inferior shoulder dislocation, closed reduction

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Luxatio erecta, inferior shoulder dislocation, comprises < 1% of shoulder dislocations.<sup>1</sup> Because these patients are rarely encountered, most physicians perform closed reduction maneuvers, which have been described for anterior or posterior shoulder dislocations. Rockwood and Wirth<sup>2</sup> described axial traction in the direction of the abducted humerus and countertraction provided by an assistant with a sheet across the top of the shoulder. The reduction can be difficult, and the patient often requires heavy sedation and narcotic analgesia. The purpose of this article is to describe a 2-step technique to facilitate the closed reduction of an inferior shoulder dislocation. The first step converts the inferior dislocation to an anterior dislocation. The second step reduces the

anterior dislocated humeral head into the glenohumeral joint.

## CLOSED REDUCTION TECHNIQUE

The patient is positioned in a supine position and sedation can be administered as needed. The operator should stand on the affected side, next to the head of the patient, facing caudad. The PUSH hand (adjacent to the patient) should be placed on the lateral aspect of the mid shaft of the humerus, and the PULL hand (opposite) positioned over the medial epicondyle (Fig. 1A). The PUSH hand manipulates the humeral head from an inferior position to an anterior position relative to the glenoid while the PULL hand provides a gentle superior directed force at the distal humerus. Once the humeral head has rotated to the anterior rim of the glenoid, the first step is complete as evidenced by a straight contour of the shoulder and prominence of the posterolateral edge of the acromion. The operator should now be able to adduct the humerus against the body (Fig. 1B).

At this point, the inferiorly dislocated shoulder has been converted to an anterior dislocation, and a variety of previously described maneuvers can be performed for final reduction of the glenohumeral joint. The authors preferred technique is the external rotation reduction maneuver. With the patient's arm completely adducted against the torso, the operator is now facing cephalad but his/her hands remain in the same position. The PUSH hand remains on the humeral shaft and provides an adduction force against the body (Fig. 1C). The PULL hand is now repositioned distal to the elbow and externally rotates the forearm in a clockwise direction (Fig. 1D). With the shoulder reduced, the humerus can be brought through a gentle passive range of motion with particular attention to stability and redislocation. Shoulder trauma series should be obtained to confirm reduction of the humeral head within the glenoid.

## CASE REPORT 1

A 13-year-old, right hand-dominant boy was playing basketball and attempted to defend a shot from an opposing player. The patient raised both arms in the air, and the basketball struck him on the posterior aspect of his left distal humerus.

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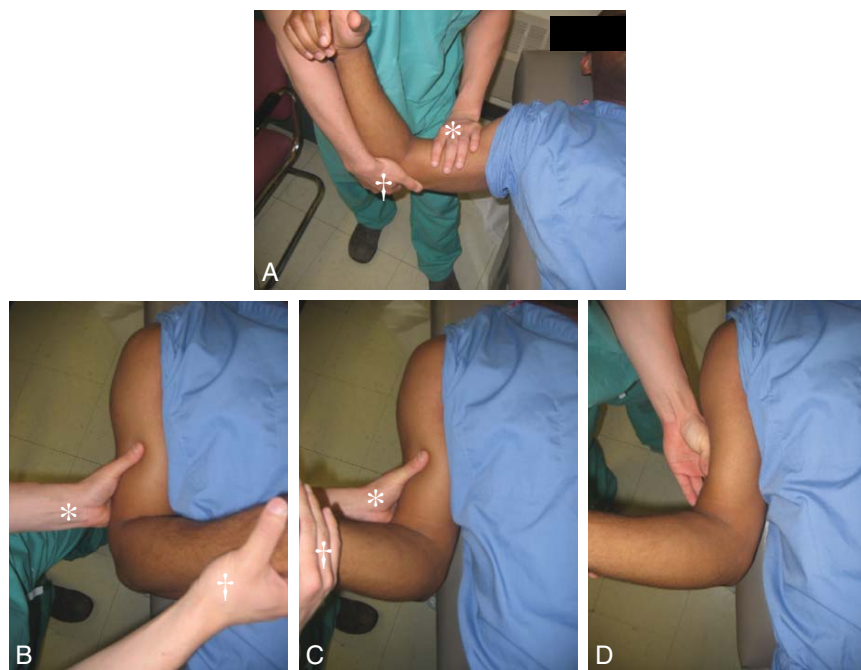
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**FIGURE 1.** The 2-step closed reduction maneuver demonstrated on 1 of the authors. A, First step, the PUSH (\*) hand on the lateral aspect of the distal humerus and the PULL (†) hand on the medial condyle. B, Shoulder has been converted to anterior dislocation. C, Second step, external rotation to reduce the anterior shoulder dislocation with the PUSH (\*) hand provide an adduction force against the lateral aspect of the humerus and the PULL (†) hand externally rotates the shoulder. D, While externally rotating the shoulder, the humeral head will reduce into the glenoid.

The patient was brought to the emergency department by his parents with his left arm abducted, complaining of left shoulder pain worsening with any attempt to move the arm. The left shoulder was in 120° of abduction with the elbow flexed to 100°. The motor and sensory examination was normal with palpable radial and ulnar pulses.

Plain radiographs of the left shoulder were obtained on admission but only the true anteroposterior and axillary views were possible because the shoulder could not be adducted for the scapular-Y view. The radiographs demonstrated posteroinferior dislocation of the humeral head of a skeletally immature individual (Fig. 2).

After the manipulation, the patient was awakened from anesthesia, and a complete neurovascular examination was conducted and demonstrated no new findings compared with prereduction examination. The patient had complete sensory and motor function with palpable distal pulses. Postreduction x-rays confirmed the reduction and showed no evidence of osseous defect in the humeral head or glenoid (Fig. 3). The patient was discharged home in a shoulder immobilizer with follow-up in 1 week.

**CASE REPORT 2**

A 54-year-old, right hand-dominant, construction worker fell off the back of a truck with his right arm abducted, landing on the medial aspect of the distal arm. The patient was brought to the emergency department with his right arm locked over head, complaining of significant shoulder pain and inability to lower his arm.

On examination, the shoulder was fixed in 130° of abduction and the elbow flexed to 90°. Initially, the patient was noted to have weakness of his extensor pollicis longus and an otherwise normal motor examination. The patient did not report any sensory deficits and had palpable radial pulse and ulnar pulses.

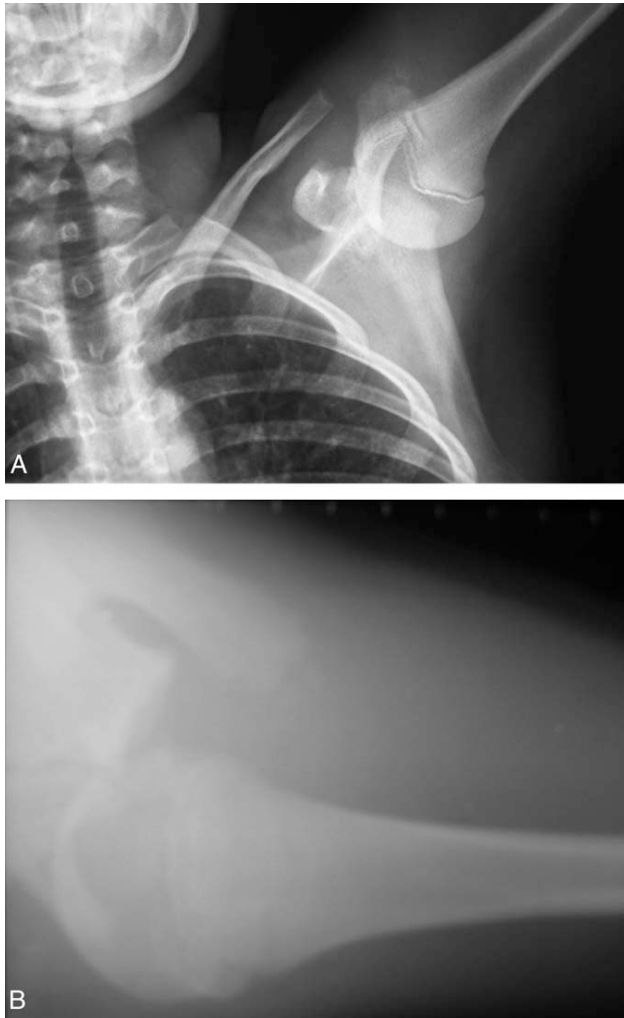
Plain shoulder radiographs with anteroposterior and axillary views were obtained and demonstrated anteroinferior dislocation of the humeral head.

After the reduction, the patient was found to have a persistent extensor pollicis longus weakness and palpable distal pulses. Postreduction x-rays confirmed the reduction and showed no evidence of osseous defect in the humeral head or glenoid. The patient was discharged home in a shoulder immobilizer with follow-up in 1 week.

**DISCUSSION**

Luxatio erecta, inferior shoulder dislocation, is a rare type of glenohumeral dislocation. Although the mechanism of injury may differ, the etiology of the inferior dislocation is generally an abduction force of the humerus.<sup>2</sup> When the proximal humerus abuts the acromion, the humeral head is levered out of the inferior rim of the glenoid. A direct axial load on an abducted shoulder with an extended elbow and forearm in pronation also has been reported to cause a direct inferior dislocation.<sup>1</sup>

A careful neurovascular examination is required both before and after closed reduction. A recent literature review demonstrated that more than half of all cases are have concomitant neurologic injury, but most spontaneously resolve and may take up to 6 months to recover.<sup>1,2</sup> Vascular injury is much more infrequent, but there are reports of axillary arterial occlusion requiring bypass grafts.<sup>3,4</sup> The physician must examination these patients with a high degree of suspicion both before and after manipulation with the contralateral extremity for comparison. In both cases, the postreduction neurovas-



**FIGURE 2.** Prereduction plain shoulder radiographs from the 13-year-old patient in the first case report. A, Anteroposterior view, inferior dislocation of the humeral head. B, Axillary view, humeral head positioned in the posterior aspect of the glenoid.

cular examination did not change from the prereduction examination.

The inferior dislocations are generally associated with surrounding soft-tissue injury. Although the diagnosis may be delayed, rotator cuff tears have been reported in 12% of cases.<sup>1</sup> In a recent literature review, it was reported that 37% of inferior dislocations are associated with fractures of some type.<sup>1</sup> Greater tuberosity avulsion fractures occur in 31% of all cases, and there have been reports of fractures in the glenoid, acromion, surgical neck, humeral head, and scapular body.<sup>1</sup>

Inferior glenohumeral dislocations are thought to cause greater soft-tissue injury involving the labrum, capsule, and rotator cuff, and the humeral head may buttonhole through the inferior capsule, making these



**FIGURE 3.** Postreduction plain shoulder radiographs from the 13-year-old patient in the first case report. A, Anteroposterior view, reduction of the humeral head in the glenohumeral joint. B, Scapular-Y view, humeral head centered in the glenoid. C, Axillary view, humeral head located in glenoid without evidence of head depression.

injuries difficult to close reduce. On rare occasions, the humeral head may rupture the inferior capsule preventing closed reduction, and the injury may be severe enough to create an open inferior glenohumeral dislocation.<sup>5</sup> In a recent case report, arthroscopy before reduction of inferior glenohumeral dislocation demonstrated detachment of the superior labral anterior posterior complex (SLAP), which extended to the anteroinferior portion of the glenoid labrum.<sup>6</sup> The authors performed open reduction of the greater tuberosity fragment followed by arthroscopic labral repair with 3 suture anchors.<sup>6</sup> The patient had full shoulder range of motion and return to baseline sports activity by 9 months after surgery. This case report may demonstrate the extent of injury involved in inferior shoulder dislocations especially in comparison to anterior dislocations. Although anterior shoulder dislocations involve Bankart (or bony Bankart) lesions, the inferior shoulder dislocations may involve injury to the SLAP complex that extends to the anteroinferior aspect (Bankart) of the labrum. The authors hypothesize that such an extensive injury to the glenoid labrum may explain why conversion from inferior to anterior shoulder dislocations is possible, and also illustrates the extent of injury to shoulder stabilizers that likely occurs from the initial injury.

The most commonly described closed reduction maneuver involves overhead traction with the hyperabducted arm usually performed with an assistant to provide countertraction.<sup>7-13</sup> With the patient's arm brought to complete abduction, the physician applies traction, upward-directed force. The physician continues to pull traction on the arm while simultaneously lowering the arm into adduction. One recent case report of luxatio erecta with concomitant surgical neck fracture described difficulty with the overhead traction-counter-traction method, but when the author used direct manipulation over the humeral head with his fist, he was able to reduce the inferiorly dislocated humeral head.<sup>14</sup>

With the overhead traction maneuver, the physician must provide a force that overwhelms all the muscles around the shoulder, which may be difficult even with conscious sedation. Using the described technique, we were able to reduce each case with 1 reduction attempt and with minimal anesthesia. In the first case, the pediatric patient was consciously sedated according to the pediatric emergency department protocol with atropine (0.01 mg/kg) and ketamine (0.5 mg/kg). The second case only required a 20 mL of 2% lidocaine into the glenohumeral joint for analgesia. Longer term follow-up with imaging studies may be necessary to ensure further injury does not occur with the described maneuver. The authors can only recommend that the 2-step maneuver be used for the first reduction attempt.

### CONCLUSIONS

Because luxatio erecta is rarely encountered, there are few reduction maneuvers that have specifically been described for an inferior glenohumeral dislocation. Most orthopaedic surgeons will use overhead traction-counter-traction to attempt to reduce the shoulder but that may necessitate multiple reduction attempts, requiring at least 2 people, excessive sedation, and analgesia. The 2-step

maneuver is a closed reduction technique that first converts the inferior dislocation to an anterior dislocation followed by closed reduction of the anterior dislocation according to surgeon preference. In the 2 case reports, the 2-step maneuver successfully performed with 1 operator, a single reduction attempt, minimal force, and only local analgesia or minimal conscious sedation for our pediatric case.

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