

THE EXTERNAL ROTATION METHOD FOR REDUCTION OF ACUTE ANTERIOR DISLOCATIONS AND FRACTURE-DISLOCATIONS OF THE SHOULDER

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Background: Several methods of reducing an acute anterior dislocation of the shoulder have been described. The aim of this study was to assess the effectiveness of the external rotation method in the reduction of acute anterior shoulder dislocations with and without fractures of the greater tuberosity and to evaluate the causes of failure.

Methods: Senior and junior orthopaedic residents attending in the Emergency Department were instructed in the external rotation method for the reduction of a shoulder dislocation in a classroom setting. Forty patients with an acute anterior dislocation of the shoulder, with or without an associated fracture of the greater tuberosity, who were treated with this method were evaluated prospectively. Data sheets completed by the orthopaedic residents when this method was used were evaluated with regard to the type of dislocation, the effectiveness of the procedure in achieving reduction, the need for premedication, the ease of performing the reduction, and complications, if any.

Results: Of the forty patients, thirty-six had a successful reduction. No premedication was required in twenty-nine patients who had a successful reduction, and the average time required for reduction in twenty patients was less than two minutes. Only four patients reported severe pain during the process of reduction. The method was not successful in four patients, two of whom had a displaced fracture of the greater tuberosity.

Conclusions: The external rotation method for the reduction of an acute anterior dislocation of the shoulder is a safe and reliable method that can be performed relatively painlessly for both subcoracoid and subglenoid dislocations provided that a displaced fracture of the greater tuberosity is not present.

Level of Evidence: Therapeutic study, Level IV (case series [no, or historical, control group]). See Instructions to Authors for a complete description of levels of evidence.

Traditional techniques to reduce the dislocated glenohumeral joint can be painful to the patient and may also be associated with iatrogenic complications¹⁻³. The external rotation method is a relatively new technique, which is reported to be safe, comfortable, and reliable⁴. Mirick et al.⁵ studied eighty-five consecutive patients with an acute anterior dislocation of the shoulder who were treated with this method and reported that sixty-eight had a successful reduction in the first attempt. The effectiveness of the external rotation method in achieving reduction in the different subtypes of anterior dislocation of the shoulder with or without a fracture of the greater tuberosity has not been delineated. The aim of this study was to assess prospectively the efficacy of the external rotation method in the reduction of various subtypes of acute anterior shoulder dislocation with or without a greater tuberosity fracture and to evaluate the causes of failure.

Materials and Methods

A prospective study was conducted in the Emergency Department of our hospital, which is a tertiary referral center. During a period of twelve months from May 2001 to May 2002, the senior and junior orthopaedic residents attending in the Emergency Department were instructed in the external rotation method for the reduction of a shoulder dislocation in a classroom setting and were requested to use this method initially in the treatment of acute anterior dislocations of the shoulder. Patients with an associated fracture of the greater tuberosity and/or a Hill-Sachs compression defect were included in the study. Exclusion criteria included polytrauma, hemodynamic instability, dislocations associated with Neer three-part, four-part, or head-splitting proximal humeral fractures⁶, and dislocations associated with severe glenoid fractures (Ideberg Type-II to V fractures⁷). Also excluded were patients with

open growth plates and patients presenting more than twenty-four hours after the injury.

Written informed consent was sought from every patient included in the study. The orthopaedic residents were requested to complete a data sheet whenever the external rotation method was the first method used to reduce an acute anterior dislocation of the shoulder. In addition to the demographic data, the type of dislocation (subcoracoid, subglenoid, intrathoracic, or subclavicular)⁸, the laterality of the dislocation, and any previous history of ipsilateral dislocation (including the number of episodes) were documented.

A delay in presentation and previous attempts at reduction, if any, were noted. Also documented were associated problems, the mechanism of injury, and any premedication used. The use of premedication was at the discretion of the resident, guided by the patient's request. Whenever premedication was used, pentazocine (0.4 to 0.5 mg/kg) along with diazepam (0.1 to 0.2 mg/kg) were administered through an intravenous cannula fifteen minutes prior to the reduction maneuver. Other data recorded included the time needed to complete the reduction from the start of the maneuver and the number of attempts at reduction. Alternate methods (if any) that were used following unsuccessful attempts with the external rotation method were also recorded. The patient was asked to rate the amount of pain during the reduction as none, mild, moderate, or severe, and these ratings were given a score on a 4-point scale with 1 indicating no pain and 4, severe pain. Complications, such as injury to the axillary nerve, vascular compromise, and iatrogenic fracture attributable to the reduction method, were also noted.

Technique

The diagnosis was confirmed by clinical examination and radiographic evaluation with use of anteroposterior and axillary radiographs. A neurovascular examination of the extremity and a thorough search for coexisting injuries were carried out.

The reduction was performed with the patient lying in the supine position. The treating physician stood on the side of the affected extremity facing the patient. Sedation was used as and when needed. No traction was used. The elbow was flexed to 90°, and the arm was adducted to the side of the chest. The shoulder was placed in 20° of forward flexion. The physician held the patient's wrist with one hand and stabilized the elbow with the other. With the grasped wrist used as a guide, the shoulder was gently externally rotated until the forearm was in the coronal plane (Fig. 1). Minimal force was applied to avoid excessive torque and its associated complications. Once reduction was achieved, the arm was gently internally rotated to bring the forearm to lie across the chest.

The reduction was confirmed by clinical examination, and the neurovascular status of the arm was reassessed. The shoulder was placed in a shoulder immobilizer, and postreduction radiographs were made to confirm the reduction.

Results

The data sheets of forty-three consecutive patients with acute anterior dislocation of the shoulder who were initially treated with use of the external rotation method between May 2001 and May 2002 in the Emergency Department of our hospital were evaluated. Three patients were excluded from the study. Two of them had concomitant fractures of the fem-



Fig. 1

The external rotation method for the reduction of an acute anterior dislocation of the shoulder.

oral shaft, and the shoulder dislocation was reduced in the operating room with the patient under general anesthesia at the time of internal fixation of the femoral fracture. The third patient had spontaneous relocation of the shoulder. The remaining forty patients were included in the study. The mechanisms of injury were a simple fall (twenty-seven patients) and contact sports, a fall from a height, and a pedestrian-motor-vehicle accident for four patients each. One patient dislocated the shoulder during an epileptic seizure. There were thirty-seven male and three female patients. The mean age was 39.7 years (range, eighteen to eighty-two years). Twenty-seven right shoulders and thirteen left shoulders were involved. The dominant extremity (twenty-four right and one left shoulder) was involved in twenty-five patients, and the nondominant extremity (three right and twelve left shoulders) was involved in fifteen patients. In thirty-six patients, this was the first dislocation of the affected shoulder. The dislocation was subcoracoid for thirty-two patients and was subglenoid for eight. Associated fractures of the greater tuberosity⁷ and/or a Hill-Sachs lesion³ were noted in ten patients. The greater tuberosity fracture was displaced (displacement of >1 cm or angulation of >45°) in two patients. Twenty-five patients presented within two hours of the dislocation.

Closed reduction was achieved with use of the external rotation method in thirty-six patients (90%). Twenty-five (93%) of the twenty-seven patients with a subcoracoid dislocation without a fracture of the greater tuberosity, all six patients with a subglenoid dislocation without a fracture of the greater tuberosity, and five patients with a subcoracoid dislocation with a fracture of the greater tuberosity were treated successfully with use of the external rotation method.

The method was unsuccessful in four patients who were sixty, twenty-eight, thirty-five, and forty years old. Two of them had a subglenoid dislocation with a displaced fracture of the greater tuberosity. Two other patients had a subcoracoid dislocation. One of them had previously dislocated the shoulder (this dislocation was the second episode), while another presented twenty hours after the dislocation with a history of multiple attempts at reduction that had failed. The dislocations in three of these four patients were subsequently reduced, with the patient under general anesthesia, with use of the traction-countertraction method, while one subglenoid dislocation with a displaced greater tuberosity fracture was reduced with use of the so-called Eskimo method⁹.

Reduction of the shoulder dislocation with use of the external rotation method was achieved within two minutes in twenty patients (56%) and within five minutes in nine patients (25%). No premedication was used in thirty-two of the reduction attempts, including twenty-nine successful attempts. Of the eight patients treated with premedication, seven had a successful reduction; three of them had mild pain, three had moderate pain, and one had severe pain. Of the twenty-nine patients treated without premedication who had a successful reduction, three had no pain, fourteen had mild pain, nine had moderate pain, and three had severe pain.

Four patients had a history of recurrent dislocation of

the shoulder; three of them had a successful reduction with use of the external rotation method. All three thought that the reduction was more easily done with this method than with the previous methods. The mean duration of hospitalization for the thirty-six patients treated successfully with the external rotation method was 1.7 hours (range, 1.0 to 2.5 hours). No short-term complications were noted in this study.

Discussion

The present study demonstrated that the external rotation method is easy to perform even in the hands of relatively inexperienced physicians, as we were able to achieve a closed reduction of an acute anterior dislocation or fracture-dislocation of the shoulder in 90% of the patients. This is similar to the rate reported by Mirick et al.⁵, who used essentially the same technique.

This method has been reported to be reliable and safe while causing minimum patient discomfort and requiring only a single physician to perform it⁴. The external rotation method is remarkably similar to the original method described by Kocher¹⁰. In our method, we place the patient in the supine position with the arm adducted to the side, the shoulder in 20° of forward flexion, and the elbow in 90° of flexion. Positioning the shoulder in forward flexion was the only difference between the technique used by us and the external rotation method originally described by Leidelmeier¹¹. This positioning was used to facilitate relaxation of the anterior capsule of the shoulder and to prevent any bow-stringing action of the long head of the biceps and the conjoint tendon. As described by Zahiri et al., "Gentle but sustained external rotation was used to neutralize the medially directed contraction force of the subscapularis and the pectoralis major muscle, which are the main obstacles to lateral displacement of humeral head."¹²

The methods commonly used for reduction of an anterior dislocation depend on either traction or leverage. Traction increases muscle spasm and may make reduction difficult, more painful, and less likely to succeed¹³. Mirick et al.⁵ and Leidelmeier¹¹ recommended use of intravenous sedation in patients who are seen with a dislocation for the first time; however, in our series, twenty-six (72%) of the thirty-six successful reductions were performed without the use of sedation in patients who had a dislocation for the first time. Using other methods, authors have reported greater failure rates with subcoracoid dislocations^{14,15} or subglenoid dislocations¹⁶, unlike our series in which the rates of successful reduction for both types of dislocations were similar.

Four dislocations could not be reduced successfully. One of these patients had a recurrent dislocation and was not cooperative. This patient had had the previous dislocation reduced under general anesthesia. The other patient with a subcoracoid dislocation presented twenty hours after the injury, after multiple attempts at reduction had failed. He had severe muscle spasm and was very apprehensive. He also had to be treated under general anesthesia, and the reduction was achieved with use of the traction-countertraction method.

Dislocations in two patients who had a subglenoid dislocation associated with a displaced fracture of the greater tuberosity could not be reduced with this method. Other methods, such as traction-countertraction and the Milch¹⁷ and modified Stimson¹⁸ maneuvers, were also unsuccessful in achieving a reduction. A greater initial insult and subsequently a larger hemiarthrosis may have contributed to greater pain and muscle spasm, making reduction more difficult in these two patients. Both dislocations were reduced with the patient under general anesthesia. One previous study¹⁶ has recommended that, in a subglenoid dislocation with a fracture of the greater tuberosity, it is advisable to attempt reduction initially with the patient under general anesthesia to avoid iatrogenic fractures of the anatomical neck of the humerus. We agree with this recommendation.

The lack of short-term complications in our series further confirms the safety of this method. One limitation of the present study is that patients were not entered consecutively, and it is possible that the physicians preselected patients in whom they thought this method would be successful. The external rotation method is a rational, simple, and relatively pain-free method to reduce an acute anterior dislocation of

the shoulder. It can be used successfully to reduce both subcoracoid and subglenoid dislocations provided that a displaced greater tuberosity fracture is not present. ■

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The authors did not receive grants or outside funding in support of their research or preparation of this manuscript. They did not receive payments or other benefits or a commitment or agreement to provide such benefits from a commercial entity. No commercial entity paid or directed, or agreed to pay or direct, any benefits to any research fund, foundation, educational institution, or other charitable or nonprofit organization with which the authors are affiliated or associated.

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