Closed reduction for traumatic posterior dislocation of the shoulder using the ‘lever principle’: two case reports and a review of the literature

T Mimura, K Mori, Y Matsusue
Department of Orthopedic Surgery, Shiga University of Medical Science, Shiga, Japan

N Tanaka, Y Nishi
Department of Orthopedic Surgery, Soseikai General Hospital, Kyoto, Japan

M Kobayashi
Department of Orthopedic Surgery, Hino Memorial Hospital, Shiga, Japan

ABSTRACT

Traumatic posterior dislocation of the shoulder is frequently missed because of its rarity and the absence of characteristic symptoms. Several signs should be emphasised: an overlap of the humeral head and glenoid rim in a true anteroposterior view and the light-bulb sign in the anteroposterior view. To make an accurate and early diagnosis, use of multidirectional radiographs combined with computed tomography is recommended. Closed reduction was successfully performed under general anaesthesia using the DePalma method with slight modification—the lever principle—by pushing the medial side of the upper arm laterally to adduct the shoulder as far as possible. The dynamics of the lever principle make it a safer and more effective method of achieving a closed reduction of a posterior dislocation of the shoulder than the conventional method of solely pushing the humeral head anteriorly, especially in patients with locking of the glenohumeral joint and impression fractures.

Key words: shoulder dislocation; wounds and injuries

INTRODUCTION

Posterior dislocation of the shoulder is an uncommon injury, comprising 1 to 4% of all shoulder dislocations. McLaughlin reported 22 (3.8%) of 581 dislocations of the shoulder being posterior. Bilateral posterior dislocation is even rarer and accounts for less than 5% of all posterior dislocations of the shoulder. The main causes of posterior dislocation are trauma and seizure and indirect force is implicated. Its diagnosis is often missed and it becomes chronic and difficult to treat. To make an accurate and early diagnosis, multidirectional radiographs combined with effective diagnostic tools such as computed tomography...
Closed reduction should be performed using the conventional DePalma methods if the defect in the humeral head caused by impression fracture (reverse Hill-sacks lesion) is less than 25% of the articular surface. Pressure is applied posteriorly on the humeral head and it is pushed anteriorly. Both original and modified closed reduction techniques have been reported.

**CASE REPORTS**

**Case 1**

In September 2002, a 74-year-old woman presented to Soseikai General Hospital with shoulder pain following a fall from stairs. The patient recalled that her elbow, not shoulder, sustained the direct blow. Physical examination revealed that the upper limb was internally rotated and slightly adducted; the posterior area of the shoulder was swollen and tender and the shoulder could not be moved in any direction. No neurovascular deficit was seen. Radiography revealed a positive rim sign, absence of half-moon overlap, and the light-bulb sign on the anteroposterior (AP) view (Fig. 1a). An overlap of the glenoid rim and the humeral head were also demonstrated on a true AP view (Fig. 1b). CT clearly revealed the posterior dislocation.

Under general anaesthesia, closed reduction was successfully achieved using the DePalma method with slight modification: the patient was in a supine position and the uninjured shoulder was elevated to provide a true AP view. The injured arm was then placed in traction, with the elbow pointing caudally. Then, maintaining traction and internal rotation, the medial side of the upper arm was pushed laterally using the lever principle, making the humeral head detach from the glenoid rim (Fig. 2). The shoulder was then rotated externally and reduction achieved. As there was no indication of redislocation, the arm was immobilised using a sling and a bust band for 3 weeks. Range of motion (ROM) exercises were started afterwards. Six months later, the patient had no weakness or instability of her shoulder, and the shoulder had recovered a full ROM.

**Case 2**

In October 2002, a 55-year-old man was transferred to Soseikai General Hospital with shoulder pain following a traffic accident. The initial diagnosis made by another physician was contusion. The patient had sustained a direct blow to the elbow, not the shoulder, as in case 1. Clinical examination revealed swelling and tenderness in the posterior area of the shoulder. An AP radiograph showed a slightly positive rim sign and absence of half-moon overlap; the trough line and light-bulb sign were clearly revealed, nonetheless (Fig. 3a). A true AP radiograph confirmed an overlap of the glenoid rim and the humeral head.

![Figure 1](image1.png)  
*Figure 1* Case 1: radiographs showing (a) the positive rim sign, absence of half-moon overlap, and light-bulb sign in an anteroposterior view; (b) an overlap of the glenoid rim and humeral head in a true anteroposterior view.

![Figure 2](image2.png)  
*Figure 2* The shoulder should be adducted as far as possible by pushing the medial side of the upper arm using the lever principle, under both traction and internal rotation.
(Fig. 3b). CT and a 3-dimensional reconstructed CT revealed posterior dislocation with an impression fracture (Fig. 4).

Despite the presence of an impression fracture, good and safe reduction was successfully achieved using the technique described in case 1. The lever principle was very effective for releasing the impression fracture. As there was no indication of redislocation, the same immobilisation period and ROM exercises were prescribed. At 8-month follow-up, the patient had a slightly contracted shoulder (160º abduction, 160º flexion, and 40º external rotation), but no instability was noted.

DISCUSSION

Posterior dislocation of the shoulder was first described by Cooper in 1839 in an epileptic patient. Posterior dislocation of the shoulder associated with fractures is less common: being seen in 0.9% of 1500 cases reported by Neer. An impression fracture of the humeral head, known as a “locked posterior dislocation of the shoulder” is a common condition associated with this injury and a major factor in unsuccessful closed reduction. Its diagnosis is often missed as in our second patient, because of its rarity and the non-specific pain it causes. Approximately 60% of diagnoses are missed and a mean delay of one year between injury and diagnosis has been reported in a series of 40 patients; only 30% of diagnoses are made within 6 weeks. The treatment selected for most delayed cases has been open reduction with percutaneous pinning or lesser tuberosity transfer. Indirect force is often implicated in this injury, as seen in our 2 patients. It is therefore important to carefully question the patient about how the injury occurred.

Inadequate radiographs and poor physical examination are both contributing factors in misdiagnosis. The internally rotated upper limb is the physical characteristic indicating posterior dislocation of the shoulder. Correct and adequate radiographic assessments are pivotal to an accurate diagnosis. Radiographs in AP, scapula Y, and axillary views are necessary; the Velpeau axillary view is also useful. Several signs indicating posterior dislocation on the AP view have been described, including the positive rim sign and absence of the half-moon overlap. The light-bulb sign and the trough line on AP view are other signs peculiar to a posterior dislocation of the shoulder. An AP radiograph of case 2 did not demonstrate an obvious positive rim sign or absence of the half-moon overlap because there was an impression fracture; however an overlap of the glenoid rim and the humeral head was clearly confirmed on a true AP view, and the light-bulb sign i.e. an internally rotated humeral head was also seen on the AP view. This indicates the importance of multidirectional radiographic assessment for achieving an accurate diagnosis. CT was useful for revealing the posterior dislocation of the shoulder and for planning the reduction procedure.

Closed reduction under general anaesthesia is the treatment of choice for posterior dislocation of the shoulder if the defect in the humeral head caused by the impression fracture is less than 25% of the
articular surface. If the defect in the humeral head is more than 20% of the articular surface, open reduction is recommended because of the difficulty achieving stability of the glenohumeral joint when using closed reduction. Conventional closed reduction technique was successful in 42% of cases in a series of 12 fresh posterior dislocations. The main factors leading to unsuccessful closed reduction were tight locking of the glenohumeral joint due to a large impression fracture, delayed diagnosis of the dislocation, and anatomical neck fracture. Soft-tissue lesions of the infraspinatus and/or biceps tendon interposition are additional factors preventing successful closed reduction. When the dislocation has been present for longer than 3 weeks, it is usually impossible to achieve a closed reduction. Release of glenohumeral joint locking is essential for achieving successful closed reduction in acute cases. To completely unlock the glenohumeral joint, the dynamics of the lever principle were effective, even with a large impression fracture, for achieving a successful closed reduction.

The positioning needed to get a true AP view is important for achieving successful closed reduction because this view helps physicians to keep locking or unlocking under control. The injured shoulder should be adducted as far as possible by pushing the medial side of the upper arm laterally using the lever principle (Fig. 2). Maintaining adduction, with complete unlocking of the glenohumeral joint and external rotation, results in successful closed reduction. If the shoulder is unstable and tends to redislocate, a stabilising procedure such as a subscapularis tendon transfer or a lesser tuberosity transfer should be performed.

Although the number of cases in this study is small, the dynamics of the lever principle were found to be a safer and more effective means of achieving a closed reduction of posterior dislocation of the shoulder than the conventional method that solely pushes the humeral head anteriorly, especially in cases with locking of the glenohumeral joint and impression fracture.

REFERENCES