



## Case Report

## Posterior shoulder dislocation associated with proximal humeral comminuted fracture

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## ABSTRACT

Posterior shoulder dislocation associated with proximal humeral comminuted fracture is rare. The posterior dislocation component is usually hidden behind comminuted fracture and not easy to be detected in routine roentgenogram. Comminuted proximal humeral fracture will cause patients to experience too much pain to receive a thorough physical examination, which can make this type of injury more frequently neglected. We present three cases of posterior shoulder dislocation associated with proximal humeral comminuted fracture. The components of the posterior shoulder dislocations were initially neglected, which led to late sequelae in the first case, reoperation in the second case, and a change of operation planning in the third case. Computed tomography is valuable in preoperative planning and detection of posterior dislocation. If it is not available, good patient positioning on the operation table with full access to a fluoroscopic guide is another way to detect posterior dislocation component. Since this type of injury is rare and easily neglected, orthopedic surgeons should have a high clinical suspicion in daily practice so as to avoid misdiagnoses.

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## 1. Introduction

The incidence of posterior shoulder dislocation is very low. When this injury is associated with proximal humeral comminuted fracture, it is even less frequently encountered. In emergent settings, when preoperative image study is not complete enough and thorough physical examination is difficult to perform, this type of injury is easily neglected, and its level of severity is frequently underestimated. A delay in diagnosis may increase the risk of unsatisfactory reduction, subsequent osteonecrosis, and collapse of the humeral head with persistent disability.<sup>1</sup>

## 2. Case reports

## 2.1. Case 1

A man 32 years of age had left shoulder painful disability following a traffic accident. No peripheral neurovascular deficit was identified. The patient was in a lot of pain and severe shoulder range of motion limitation was noted in the emergency department. Roentgenography of the left shoulder demonstrated a proximal humeral fracture with displacement (Fig. 1A). Open reduction

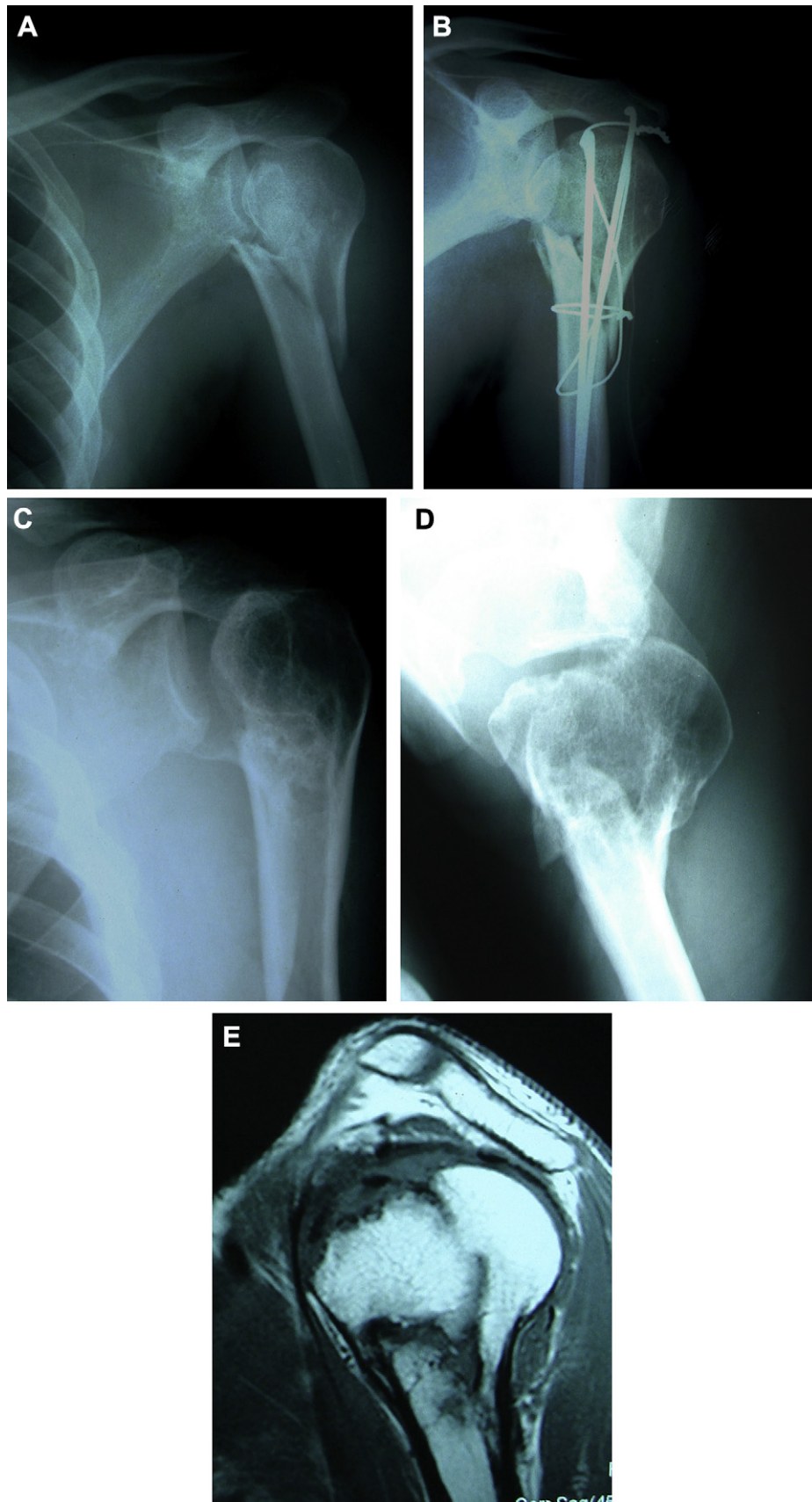
and internal fixation with tension band wiring were performed through an anterolateral approach (Fig. 1B). The patient was placed in a sling postoperatively for 6 weeks and was then started on a gentle range of motion exercises. Follow-up roentgenography showed callus formation and an eventual union was achieved about 5 months after operation. However, the patient had persistent range of motion limitation in shoulder external rotation and elevation even after a strenuous program of rehabilitation. Impingement of protruded implants was initially suspected. Nevertheless, follow-up radiography of his left shoulder after the implants were removed revealed an obvious double cortical shadow within the humeral head and posterior shoulder dislocation (Fig. 1C). The axillary view (Fig. 1D) and magnetic resonance image (Fig. 1E) were arranged, revealing the neglected posterior fracture dislocation. The patient thought the range of motion (elevation was 95°, external rotation was 40°, and internal rotation was 65°) was functionally adequate for his left nondominant shoulder and refused further treatment.

## 2.2. Case 2

A man 28 years of age fell from a bicycle, and this incident resulted in a painful left shoulder disability. He had severe pain and left shoulder range of motion limitation. Roentgenography of the left shoulder revealed a proximal humeral comminuted fracture. Open reduction and internal fixation were performed with a fixed-

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**Fig. 1.** (A) Anteroposterior radiograph of the left shoulder joint showing a proximal humeral displaced fracture with comminution; (B) open reduction and internal fixation with tension band wiring; (C) after removal of the implants, a double cortical shadow of the humeral head is evident; (D, E) axillary radiography and magnetic resonance image revealed a posterior dislocated humeral head.

angle plate using the anterolateral approach with a minimal invasive technique. Postoperative radiography showed unsatisfactory reduction and a persistent, posteriorly dislocated humeral head (Fig. 2C). By careful review of the respective roentgenograms, a double cortical shadow in the anteroposterior view (Fig. 2A) and a posterior-oriented humeral head could be seen in scapular lateral view (Fig. 2B). Postoperative computed tomography revealed the severity of the comminution with the posterior dislocated humeral head (Fig. 2D). Revision operation was performed 2 days later. Through an extended incision from the previous minimal invasive wound, the joint capsule was open to better visualize the humeral head. The fixed-angle plate was reapplied and the orientation of the humeral head was adjusted and fixed in a more appropriate position (Fig. 2E). After 1 year of follow-up, the patient has had little limitation of shoulder movement (elevation was  $170^\circ$  and external and internal rotations were  $80^\circ$ ), and he could resume most of his previous activities, including playing basketball and bicycle riding.

### 2.3. Case 3

A man aged 54 years sustained a motorcycle accident that left him with left shoulder painful disability. Roentgenography revealed a left proximal humeral comminuted fracture (Fig. 3A). He was in pain and experienced severe swelling of his left shoulder; thus, the physical examination was difficult to perform. Operation was performed by open reduction and internal fixation with a fixed-angle plate. After the initial reduction and temporary fixation of the plate, the authors rotated the patient's shoulder and checked the implant position and fracture reduction under fluoroscopy. It was at that moment when the posterior dislocation of the humeral head was discovered (Fig. 3B). Initially, the authors tried indirect reduction by pushing the head from posterior shoulder, but this was not successful. Instead, they had to open the joint capsule and the head was reduced through direct vision. Postoperative radiography revealed a satisfactory reduction and union was achieved (Fig. 3C and D) 3 months later with a satisfactory range of motion (elevation was  $160^\circ$ , external rotation was  $60^\circ$ , and internal rotation was  $70^\circ$ ).

### 3. Discussion

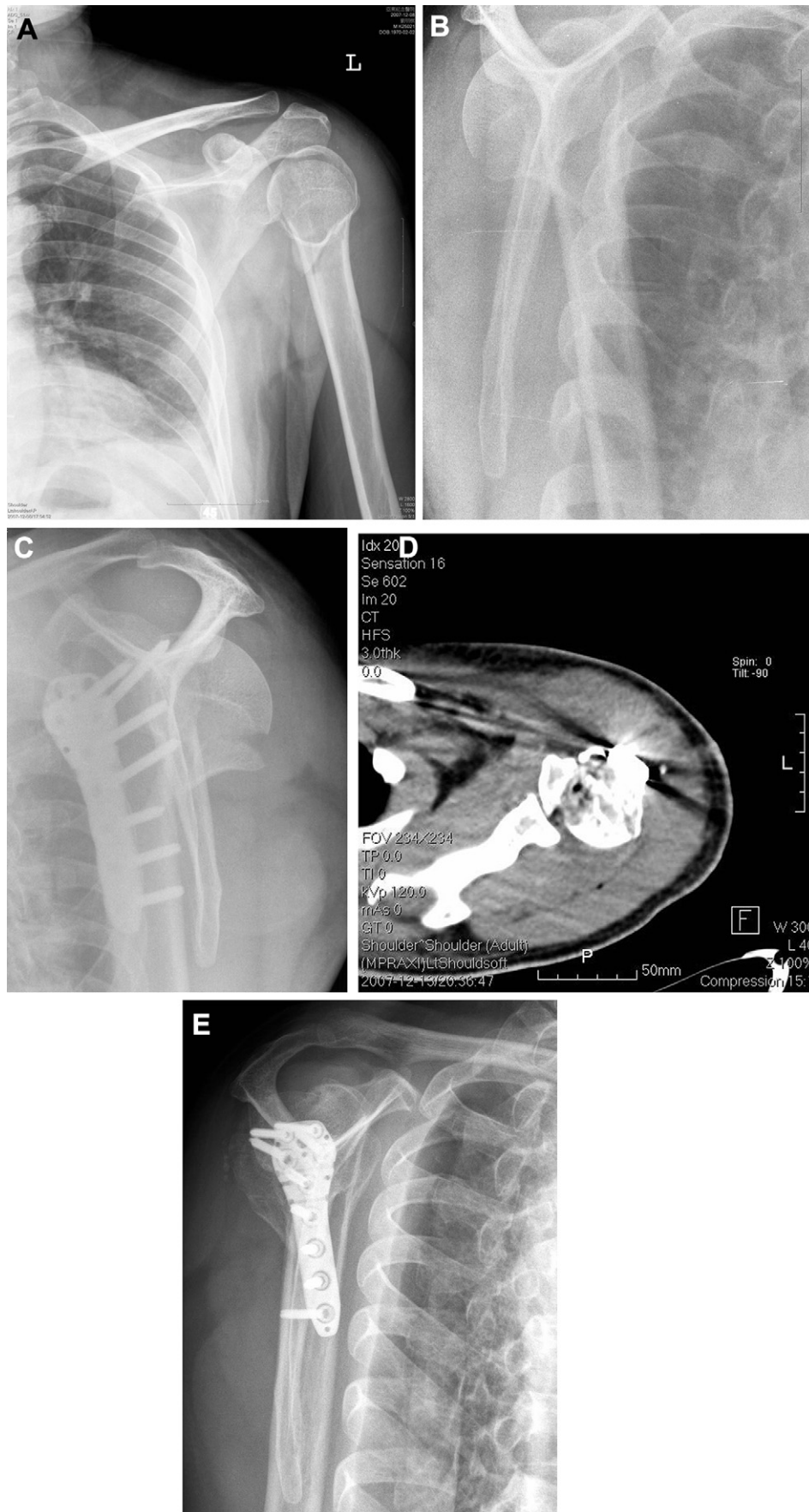
Proximal humeral fracture associated with posterior shoulder dislocation is a rare lesion, which is seen in less than 1% of all shoulder injuries.<sup>2</sup> It is usually due to motor-vehicle accident, seizure, alcohol-related injury, or electroshock therapy.<sup>3</sup> The mechanisms for this type of injury are usually due to forced internal rotation, flexion, and adduction of the shoulder joint. In patients who have only experienced posterior dislocation of the shoulder, physical examination will usually reveal that the patient willion will is fixed in an internal rotation position, the coracoid process will be anteriorly prominent, and the deltoid muscle will be laterally flattened. Posterior fullness of the shoulder can be detected by inspection. However, in patients who have experienced proximal humeral comminuted fracture in association with posterior shoulder dislocation, the shoulder can still rotate and move through the fracture site and is not fixed in the internal rotation position, even though the humeral head is posteriorly displaced. Posterior fullness will be obscured by a severe swelling of the shoulder or by a deformity caused by fracture displacement. Therefore, in this type of injury, physical examination is less diagnostic and may cause the patient a great deal of pain in the process. Therefore, image studies can usually give more clues about the nature of the injury. The standard trauma series,<sup>4</sup> including anteroposterior, axillary lateral, and scapular lateral radiography, should be obtained to identify the

orientation of the humeral head and avoid misdiagnoses. In an ordinary anteroposterior radiograph in the patient with posterior shoulder dislocation, the humeral head is medially flattened and the ordinary overlap of humeral head with the glenoid is missing. The pathognomic light bulb sign and double cortical shadow of the humeral head can usually be found. Axillary view is sometimes difficult to be obtained from a patient with a proximal humeral comminuted fracture and posterior dislocation. Modification with apical oblique, Velpeau, or modified axial radiographs can be performed easier even with the patient's arm in a sling.<sup>5</sup> In the authors' experience, a scapular lateral view can demonstrate the posterior-oriented humeral head in most instances. If the diagnosis cannot be confirmed with these radiographs, then computerized tomography is very helpful in preoperative planning and as a way to avoid neglecting the posterior dislocation component. The associated injuries of a posterior shoulder fracture dislocation were rare, but axillary nerve and radial nerve injuries have been reported.<sup>2</sup>

Minimal invasive techniques that use an anterolateral approach have an advantage in smaller wounds with less soft-tissue damage and faster recovery.<sup>6,7</sup> It is getting more and more popular recently. However, it provides less satisfactory visualization and access to the posteriorly dislocated humeral head. The head will be fixed in the posteriorly dislocated position if posterior dislocation was not detected by preoperative radiography and intra-operative fluoroscopy. Deltopectoral approach and arthrotomy are usually suggested for better access to the posteriorly dislocated humeral head. An accessory posterior incision may sometimes be necessary for a better reduction of the humeral head. During surgery, the patient should be placed on a head-holder with full exposure of the shoulder to make this accessory approach possible. It is imperative for this operation to be performed under fluoroscopic guide to confirm the humeral head orientation and reduced fracture fragments. Images can be obtained from different views if the patient is well positioned. A radiolucent operation table will make fluoroscopic guide more accessible in all directions. In Case 3, the posterior dislocation component was not detected by preoperative radiography because the patient was in too much pain to cooperate in the standard trauma series. After the initial reduction and temporary fixed-angle plate application, the authors were able to rotate the patient's shoulder and reveal the posterior dislocation component under fluoroscopic guide. A fixed-angle plate with as many screw holes in the head region as possible is the implant of choice for the treatment of comminuted proximal humeral fracture with a posteriorly dislocated humeral head. In addition to the usual fixed-angle plate, supplement fixation implants can be used for additional fracture fragments fixation, including compression screws and Herbert screws.<sup>8</sup>

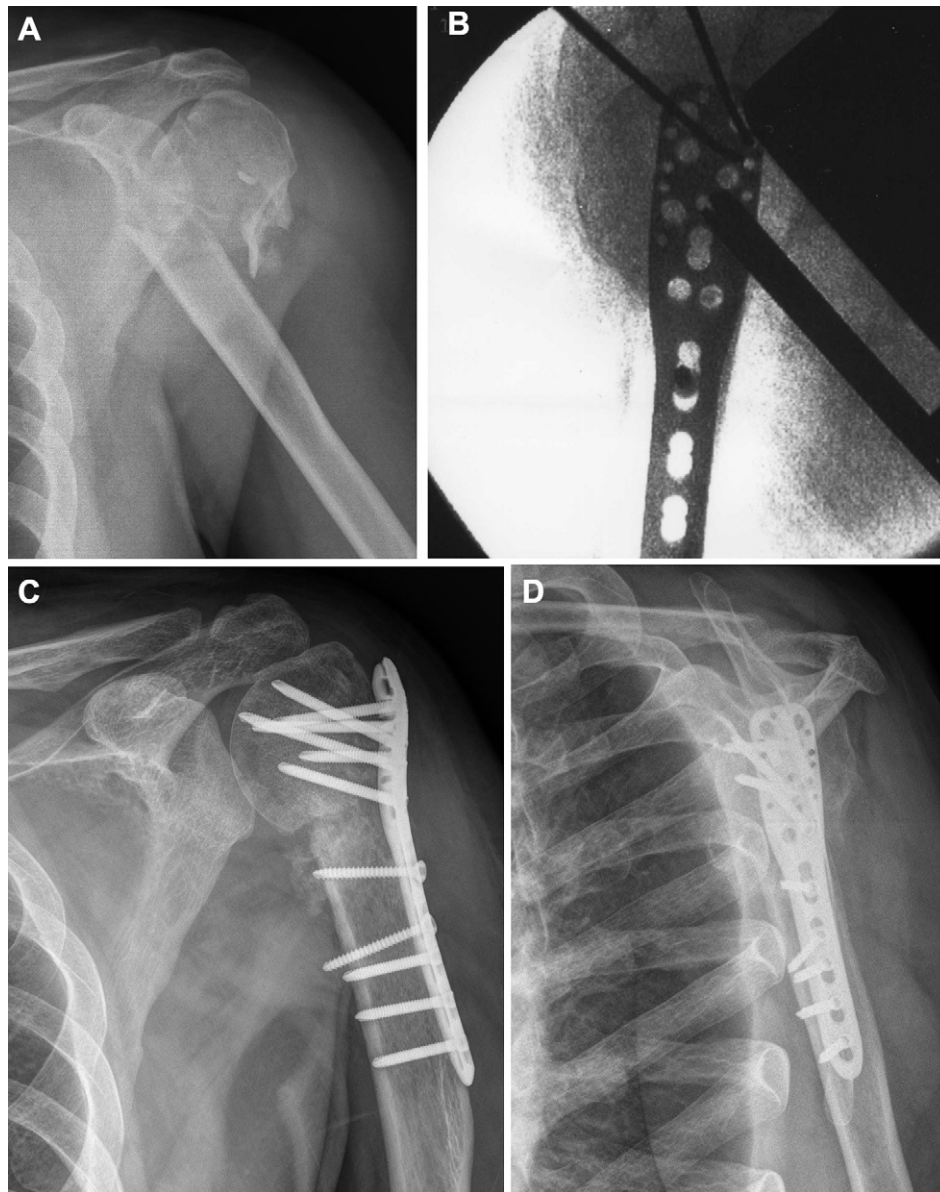
The posterior dislocation of the humeral head may be missed and fixed in an incorrect position, which may lead to revision surgery when it was detected early after surgery. If it was detected late when reoperation with open reduction and internal fixation was not possible, then the treatment options are varied according to the humeral head articular defect. If the articular defect is less than 20% of the humeral head, then McLaughlin<sup>9</sup> suggested transplanting the subscapularis into the anteromedial defect to limit maximal internal rotation and prevent the edge of the defect from falling behind the posterior glenoid rim. If the articular defect is between 20%–50% of the humeral head, lesser tuberosity transposition, humeral neck rotational osteotomy, and infraspinatus shortening myodesis were proposed with variable results.<sup>2</sup> If the articular defect is larger than 50%, prosthetic replacement is suggested.<sup>10</sup>

For patients with late or misdiagnosis of posterior shoulder fracture dislocation, the initial small bony defect can gradually increase in size from repeated impaction and erosion process. The



**Fig. 2.** (A) Anteroposterior radiograph of the left shoulder showing a light bulb appearance and a double cortical shadow of the proximal humerus; (B) scapular lateral radiograph showing a posteriorly dislocated humeral head; (C, D) scapular lateral radiograph and computed tomography after operation, showing a nonreduced posteriorly dislocated humeral head; (E) after revision surgery, the scapular lateral view revealed a satisfactory head orientation.





**Fig. 3.** (A) Anteroposterior radiograph, showing comminuted proximal humeral fracture with displacement; (B) fluoroscopy during operation revealed posteriorly dislocated humeral head after temporary fixation; (C, D) satisfactory reduction and callus formation was noted 3 months after operation.

patient is likely to experience early shoulder joint arthritis and a persistent limited range of motion that will cause great disability. In patients with damage to the articular surface of the glenoid or a reversed Hill-Sachs lesion greater than 45% of the humeral head, or in neglected posterior fracture dislocation with a duration of more than 6 months, total shoulder arthroplasty has been suggested.<sup>11</sup>

In elderly patients who have experienced a comminuted proximal humeral fracture associated with dislocation, the treatment is determined by the age and medical status of the patient as well as the degree of devascularization and fragmentation of the humeral head and tuberosities. Open reduction and internal fixation may fail due to poor bone quality. Arthroplasty is an alternative for these patients.<sup>11,12</sup>

Posterior shoulder dislocation associated with proximal humeral comminuted fracture is a rare injury. It is easily neglected in emergent settings. Thorough preoperative assessment, complete images study with careful interpretation and fluoroscopic guiding during operation are the keys to avoid misdiagnosis.

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