

■ ASPECTS OF CURRENT MANAGEMENT

Posterior dislocation of the shoulder

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Posterior dislocation of the shoulder is a rare but clinically and radiologically well-defined entity. It accounts for less than 2% of all dislocations of the shoulder,^{1,2} but is of diagnostic and therapeutic interest because most are missed on the initial examination.³⁻⁶ In a series of 24 patients with posterior dislocation, 21 had not been recognised initially.⁷

There is confusion between posterior subluxation and dislocation. Posterior dislocation is an acute entity associated with trauma and with an impression defect of the humeral head. Its treatment is determined by the size of the defect and the duration of the dislocation. The term dislocation has been applied, but in fact this represents subluxation because some of the articular surface of the humeral head is in contact with the glenoid and some behind it. Recurrent posterior subluxation is a distinct and separate entity which is often not associated with trauma and requires completely different management such as non-operative treatment or posterior reconstruction of the shoulder.⁸ The patient complains of pain and instability with his arm in a provocative position usually including forward flexion, adduction and internal rotation.⁹ There is also confusion between posterior dislocation and fracture-dislocation.

Posterior dislocation may be associated with fractures of the surgical neck of the humerus or fractures of the tuberosities. Fracture-dislocations have been classified by Neer¹⁰ as two-, three- or four-part posterior fracture-dislocations. They require a different approach and treatment such as osteosynthesis or shoulder arthroplasty.

This report describes the diagnosis and treatment of posterior dislocation of the shoulder with an associated impression fracture of the articular surface of the humeral head. Chronic posterior dislocation of the shoulder has often been referred to as being either 'old', 'missed', 'locked' or 'fixed'. The terms 'locked' or 'fixed' have also been used to describe irreducible acute dislocations associated with an impression defect of the humeral head.¹¹

Chronic posterior dislocation of the shoulder is a missed acute posterior dislocation which has been unrecognised for more than three weeks and characteristically there is an impression fracture of the articular surface of the humeral head.

History

A careful history and clinical assessment of the patient are essential, otherwise the diagnosis of posterior dislocation will be missed. The condition is usually caused by an epileptic fit, an electric shock or trauma such as a fall on the outstretched arm. In the case of involuntary muscle contraction, the strong internal rotators (latissimus dorsi, pectoralis major, subscapularis and teres major) simply overpower the weak external rotators (infraspinatus and teres minor).¹²

The main symptom is loss of movement of the involved shoulder, particularly external rotation which results in difficulty in daily activities such as combing the hair and washing the face. When physiotherapy does not improve the range of movement, these patients are referred to the orthopaedic surgeon with the diagnosis of 'frozen shoulder', or post-traumatic stiff shoulder.

Physical examination

On examination the patient typically holds his arm in internal rotation in the adducted position. The arm is locked in internal rotation of between 10° and 60° and neither active nor passive external rotation from this position is possible. The humeral head is fixed on the posterior glenoid rim.

Rowe and Zarins¹³ described a test in which there is inability to supinate the forearm when the arm is flexed forwards because of the internal-rotation deformity of the shoulder. There is an increased prominence of the coracoid process anteriorly and of the humeral head posteriorly. These findings are often subtle and in combination with the characteristic marked internal rotation of the arm,

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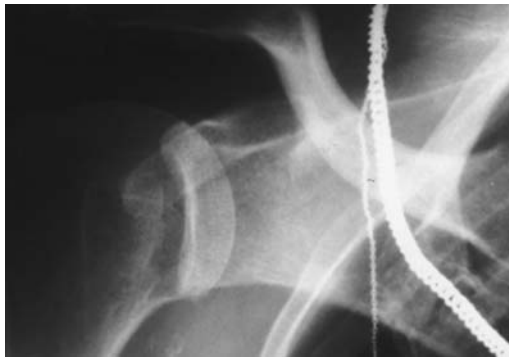


Fig. 1a



Fig. 1b



Fig. 1c

Radiographs showing a) true anteroposterior (AP), b) axillary and c) lateral scapular views of posterior dislocation of the shoulder.

there is also restriction of abduction and forward elevation to between 80° and 100°.

Radiography

The standard views of the shoulder, which are used after injury are required to make the diagnosis of a posterior dislocation. These include an anteroposterior (AP) view in the plane of the scapula, an axillary view and a lateral scapular view (Fig. 1). The standard AP view looks normal or shows only subtle abnormalities. The true AP view is difficult to interpret because there is only subluxation of the shoulder. The anterior part of the humeral head is inside the joint and the posterior part outside. Several signs have been described on the AP view which suggest the diagnosis of posterior dislocation.^{14,15} These include internal rotation of the humerus because of the fixed position of the humeral head on the posterior glenoid rim, the vacant glenoid sign since the anterior glenoid fossa looks empty, the 'light-bulb' appearance of the humeral head, the 'rim sign' in which there is more than 6 mm between the anterior glenoid rim and the humeral head, and the 'trough line' which is a vertical line made by the impaction fracture of the humeral head (Fig. 2).

The axillary lateral view is essential for diagnosis and estimates the size of the anteromedial defect of the humeral head. It may be difficult to obtain because of pain and lim-

itation of abduction, but may be obtained with the patient's arm held passively in at least 20° of abduction. If pain and muscle spasm do not allow enough abduction to obtain a good axillary view, modified axillary lateral or lateral scapular views should be taken.^{16,17}

The lateral scapular view is particularly helpful in determining the relationship of the humeral head to the glenoid. In anterior dislocations of the shoulder, the humeral head lies anterior to the glenoid; in posterior dislocations it is posterior.

Other investigations

CT is very useful for evaluating the size of the defect in the humeral head and associated glenoid changes.¹⁸ MRI is not necessary because soft-tissue injury is very rare in posterior dislocation of the shoulder.

During the past decade sonography has become a reliable method for the diagnosis of various types of shoulder disorder, especially tears of the rotator cuff. It is usually not appropriate for evaluation of instability of the shoulder. The capsuloligamentous complex is more readily investigated by CT arthrography and MR arthrography. However, ultrasound may be used in the evaluation of glenohumeral instability.¹⁹ It gives good visualisation of the humeral head and allows evaluation of almost the entire surface of its convexity during dynamic examination of the



Fig. 2a

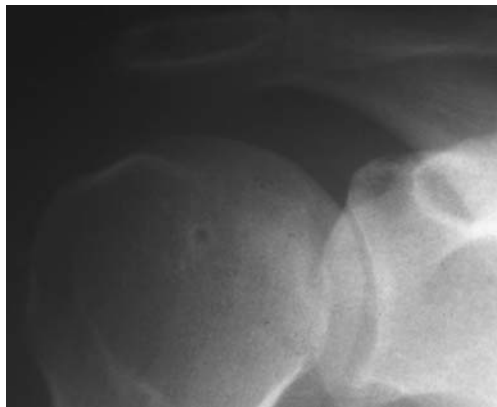


Fig. 2b



Fig. 2c

Radiographic signs of posterior dislocation on the AP view showing a) the 'vacant' sign, b) the 'light-bulb' sign and c) the trough line.

shoulder. Any loss of normal convexity in the posterolateral part represents the Hill-Sachs lesion or in the anteromedial part the reverse Hill-Sachs lesion²⁰ and appears as a depression or defect of the humeral head. Irregularities of the surface of the humeral head caused by degeneration, arthropathy of the rotator cuff and post-fracture deformity can be mistaken for a reverse Hill-Sachs lesion.²¹ Ultra-

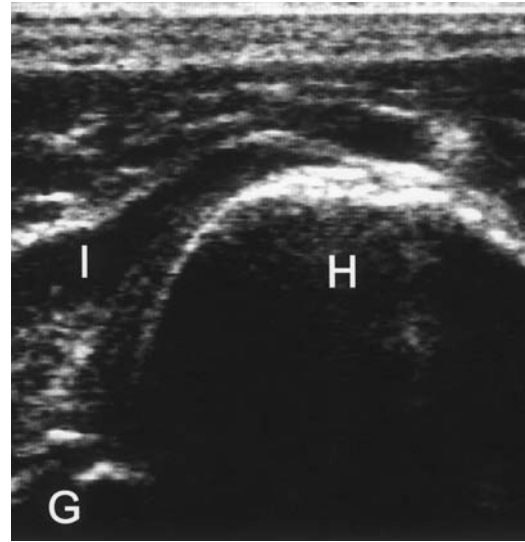


Fig. 3

Ultrasonograph of a shoulder with a posterior dislocation. The head of the humerus (H) is exposed more posteriorly in relation to the posterior glenoid rim (G) (I, infraspinatus).

sound can be used to determine the direction of glenohumeral instability. In anterior dislocation, the glenoid fossa is empty and the humeral head is located underneath the coracoid in front of the shoulder. In posterior dislocation the humeral head is more exposed posteriorly in relation to the posterior glenoid rim (Fig. 3). In anterior instability, an impression defect of the humeral head is located in the posterolateral part of the humeral head (a Hill-Sachs lesion), while in posterior instability the impression defect is in the anteromedial part of the head (reverse Hill-Sachs lesion).

Sonography should be used as a routine method for the evaluation of acute shoulder injuries because of its simplicity, low cost and non-invasiveness.

Treatment

Before any treatment is undertaken, careful consideration is necessary for each patient. Appropriate management of a posterior dislocation depends on the size of the defect, the duration of the dislocation and the age and activity of the patient. A useful guide to the classification and treatment of the locked posterior dislocation of the shoulder is the size of the humeral impression fracture (Fig. 4). A small impression defect of up to 25% of the articular surface of the head can be treated by closed or open reduction. If the shoulder is unstable, a transfer of the upper one-third of the subscapularis can be performed. A medium head defect, between 25% and 50% of the articular surface, can be treated by transfer of the lesser tuberosity and a large defect of more than 50% of the articular surface by shoulder arthroplasty. The patient must be informed of the expected functional result after non-operative or operative treatment.

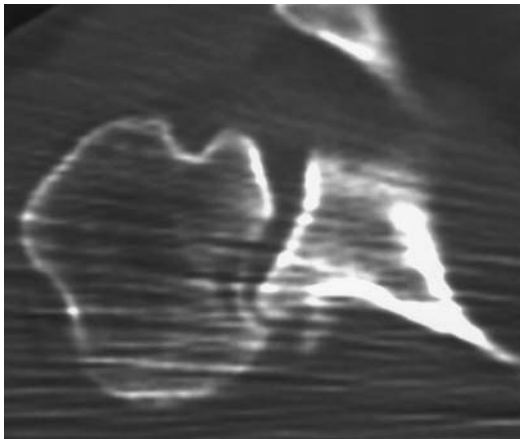


Fig. 4a

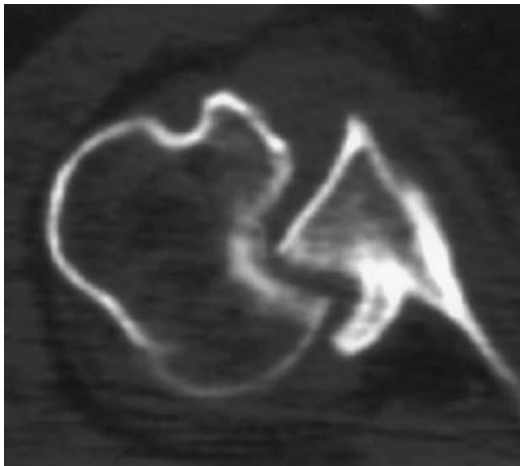
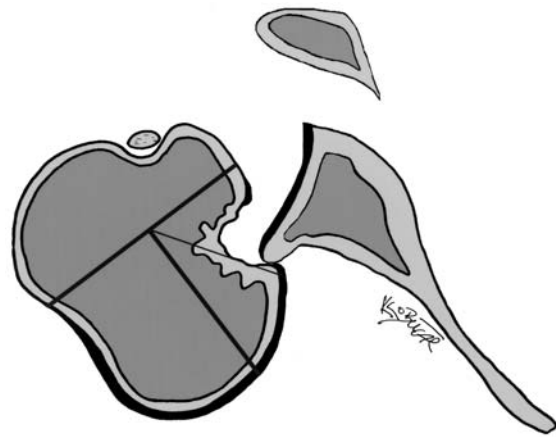


Fig. 4b

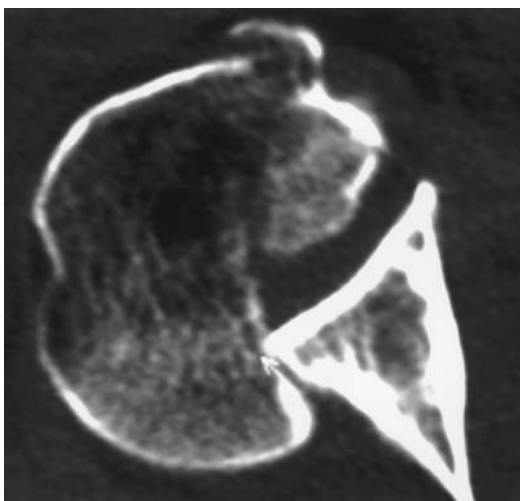
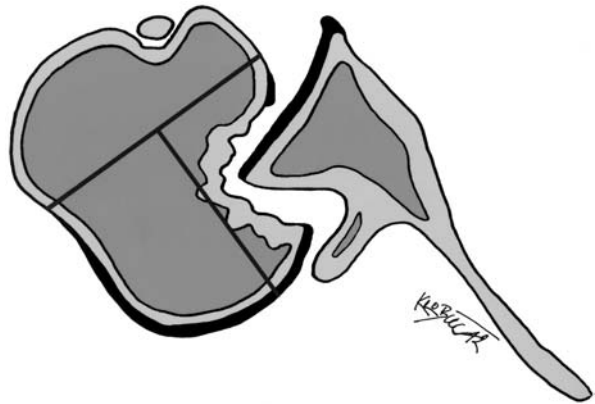


Fig. 4c



Diagrams and CT scans of a locked posterior dislocation of the shoulder with an impression fracture of the humeral head used for the determination and classification of the size of the defect. Figure 4a – A small defect of less than 25% of the articular surface of the head. Figure 4b – A medium defect of between 25% and 50% of the articular surface of the head. Figure 4c – A large defect of more than 50% of the articular surface of the head.



Fig. 5

Diagram of the transfer of the upper one-third of the tendon of subscapularis into the defect of the humeral head.

Non-operative treatment

Despite the obvious deformity of the shoulder and loss of rotation, a chronic posterior dislocation can be surprisingly well tolerated, especially in elderly patients. There is usually little pain and enough forward elevation may be regained to allow the performance of many activities of daily living.²² Gerber²³ recommends “supervised neglect” for elderly patients who have limited demands on the affected shoulder, an acceptable functional range of movement and a normal contralateral shoulder. Non-operative treatment must be considered for patients with uncontrolled fits or in any patient unable to comply with a postoperative rehabilitation programme.

Closed reduction. The time from the dislocation and the size of the humeral head are the crucial factors in determining whether or not closed reduction can be used. If the defect of the humeral head is less than 25% of the articular surface and the duration of the dislocation is less than three weeks closed reduction may be attempted. When the duration of the dislocation is more than three weeks, it is usually impossible.^{4,18} Reduction of acute traumatic posterior dislocation should be carried out under general anaesthesia as soon as possible. There is no agreement as to when an acute posterior dislocation becomes chronic.^{4,8} In my experience in the treatment of posterior dislocation and from a review of the literature, it would seem that it is considered to be chronic when the duration is more than three weeks.^{13,24}

Under general anaesthesia and muscle relaxation, gentle reduction is attempted by flexion and adduction with axial traction on the arm. Direct pressure to the humeral head from behind can facilitate reduction.

If the humeral head is locked on the glenoid rim, gentle internal rotation may help to stretch out the posterior capsule and rotator cuff. Lateral traction allows the humeral head to unlock from the glenoid rim. Once it is unlocked, the humerus is gently externally rotated. After successful reduction, stability of the shoulder is assessed. If it is stable in internal rotation, the arm is immobilised in neutral rotation for three weeks. If unstable, the shoulder is immobilised with the arm at the side and in external rotation of 20° for six weeks. If closed reduction is unsuccessful, open reduction is performed under the same general anaesthetic.

Operative treatment

Small defect:

Open reduction. In irreducible dislocation and a defect of less than 25% of the humeral head an open reduction via a deltopectoral approach can be used. The patient is placed in

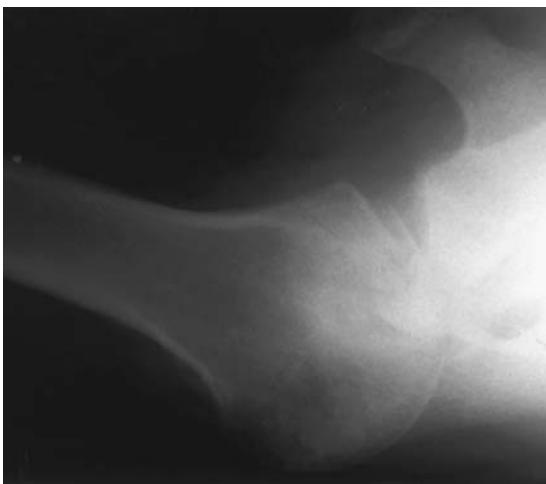


Fig. 6a

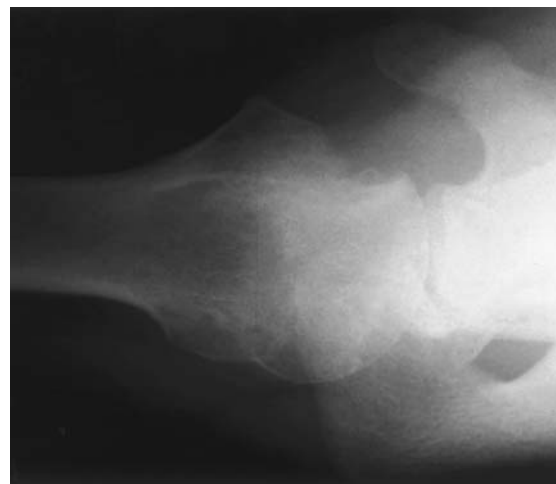


Fig. 6b

Radiographs of the patient in Figure 4a with lateral views of the shoulders a) pre-operatively and b) post-operatively.

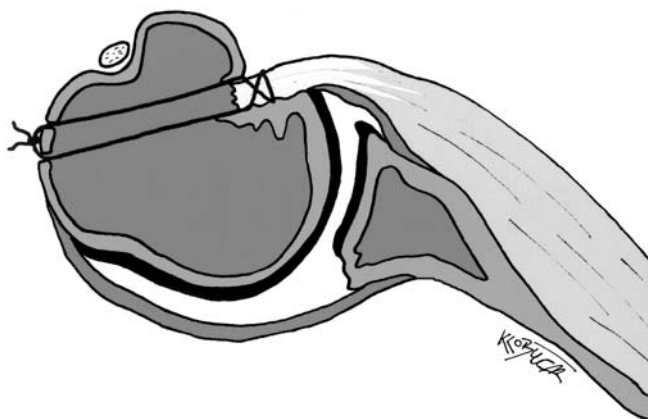


Fig. 7a

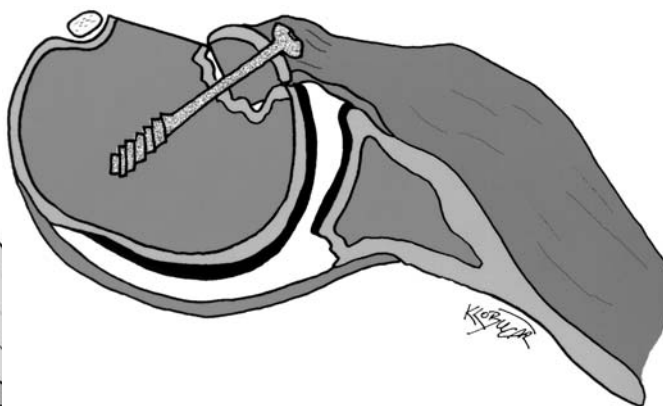


Fig. 7b

Diagrams showing a) transfer of the tendon of subscapularis and b) of the lesser tuberosity.

a semi beach-position on the operating table with the elbow nearly at the same level as the shoulder. The arm must be freely mobile. The incision is made from the tip of the coracoid process along the deltopectoral groove, slightly laterally in case it needs to be extended distally to the insertion of the deltoid. Because of the considerable internal-rotation deformity of the arm, the biceps tendon is used as a reference point to find the lesser tuberosity and rotator interval. It should be found immediately beneath the upper margin of the insertion of pectoralis major into the humerus. The rotator interval is opened and sometimes the upper margin of the subscapularis tendon is divided with the anterior capsule to allow better visualisation of the joint. Under direct visualisation the shoulder is reduced. This can be performed by internal rotation to unlock the defect of the humeral head followed by lateral distraction, external rotation and pressure on the humeral head from behind. Once the reduction is completed, the defect and articular surfaces are examined. The posterior glenoid rim is usually damaged but rarely contributes to further instability. The reduction is satisfactory if the articular cartilage is good, the impression fracture small and the shoulder stable. The rotator interval is then closed. If the shoulder is unstable with the arm in internal rotation, I usually perform a transfer of the upper one-third of the tendon of subscapularis to the defect using transosseous non-absorbable sutures (Figs 5 and 6). The suture knot should be behind the bicipital groove. After this procedure the shoulder is usually stable and the arm is immobilised at the side in slight external rotation for three weeks.

Medium defect:

Transfer of the lesser tuberosity. If the impression fracture of the humeral head is between 25% and 50%, an open reduction and transfer of the lesser tuberosity are recommended.²⁵ McLaughlin²⁶ described the transfer of subscapularis for a defect of between 20% and 40% (Fig. 7a). The tendon of subscapularis is secured into the defect

through drill holes in the bone. Hughes and Neer²⁷ modified this method by osteotomising the lesser tuberosity with the attached subscapularis (Fig. 7b). The advantages of transfer of the lesser tuberosity are better bony filling of the humeral head and more secure reinsertion of the subscapularis.²⁴ The deltopectoral interval is developed and the biceps tendon identified as a landmark for the lesser tuberosity. The rotator interval and the lower edge of the tendon of subscapularis are identified. The circumflex vessels are ligated. Under direct visualisation of the joint through this interval, osteotomy of the lesser tuberosity is performed starting from the bicipital sulcus and extending to the defect of the humeral head. The lesser tuberosity with the attached subscapularis is elevated to expose the head and the glenoid. Reduction can be difficult in cases of locked chronic dislocation with a large defect of the humeral head. Appropriate soft-tissue releases are required to facilitate reduction which may be achieved by placing an elevator into the defect and levering the head into the glenoid. When the head is lateralised enough to the level of the glenoid, gentle external rotation should be performed. The lesser tuberosity with the attached tendon of subscapularis is fixed into the defect with two cancellous lag screws (Fig. 8). If the shoulder is stable, the arm is immobilised in neutral rotation for four weeks.

Other procedures for a medium defect of the humeral head. Another option for the treatment of a defect between 25% and 50% is rotational osteotomy of the humerus and reconstruction using autograft or allograft.

Rotational osteotomy of the humerus. After open reduction, a transverse osteotomy of the surgical neck of the humerus is performed. The humeral shaft is rotated internally and the osteotomy is fixed with an angled blade plate (Fig. 9). The increased internal rotation ensures that the defect remains anterior to the glenoid throughout the entire range of movement.²⁸ The advantages of a rotational osteotomy are a stable osteosynthesis and immediate postoperative

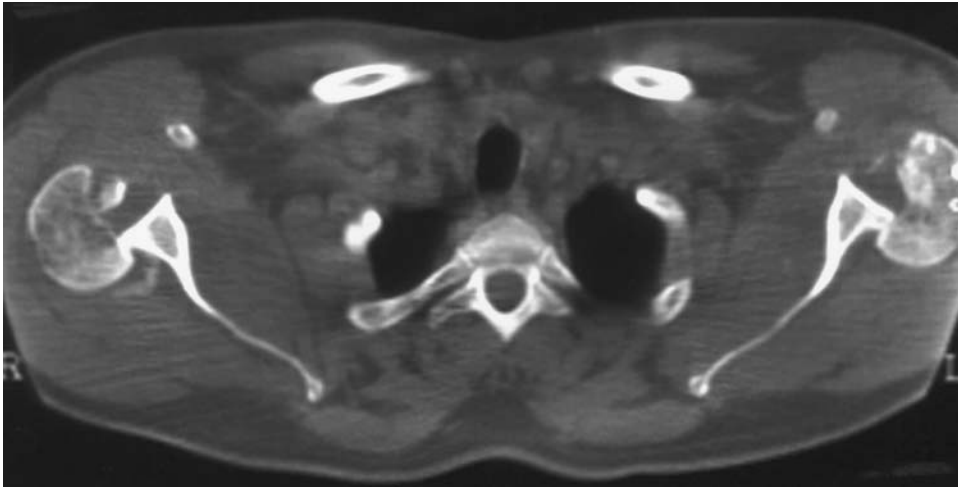


Fig. 8a

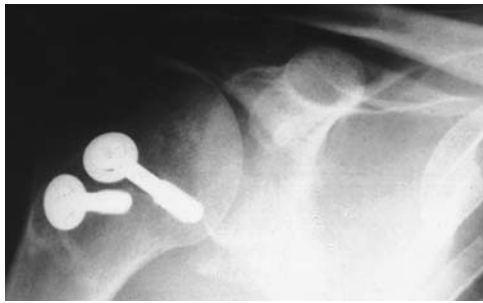


Fig. 8b

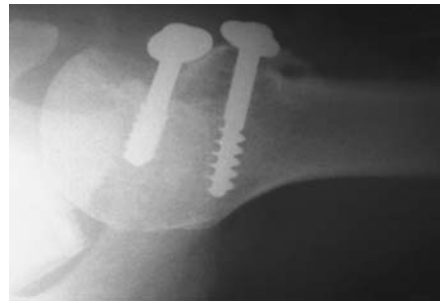


Fig. 8c

Figure 8a – A CT scan of a patient with chronic locked bilateral dislocation of the shoulder. Radiographs of the same patient after transfer of the lesser tuberosity showing b) an AP view of the right and c) an axillary view of the left shoulders. A full range of elevation was obtained post-operatively.

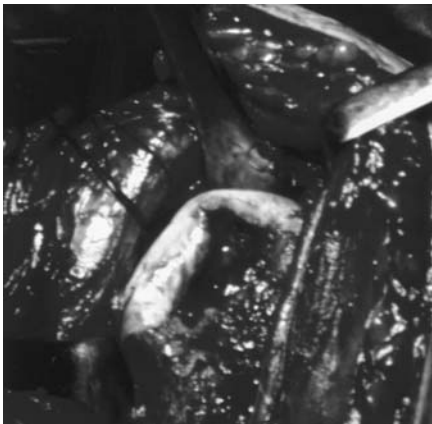


Fig. 9a

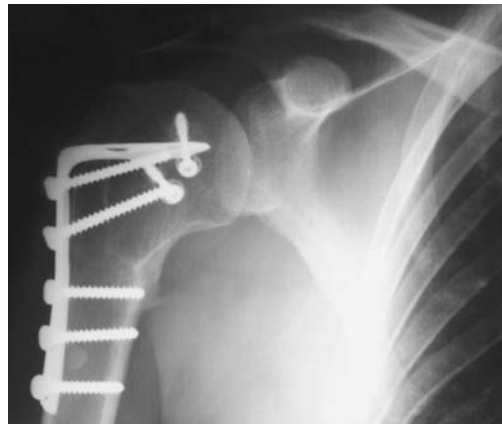


Fig. 9b

Figure 9a – An intra-operative photograph showing a large anteromedial defect of the humeral head. After transfer of the lesser tuberosity the shoulder was unstable and rotational osteotomy was performed. Figure 9b – An AP radiograph after operation. This surgery was undertaken instead of hemiarthroplasty because the patient was young and had paralysis of the contralateral arm.

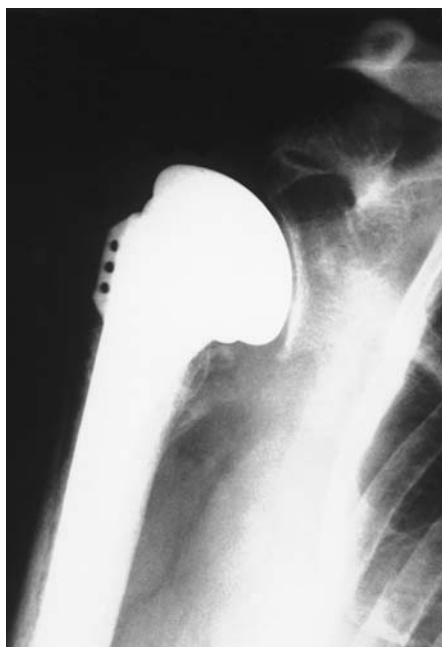


Fig. 10a

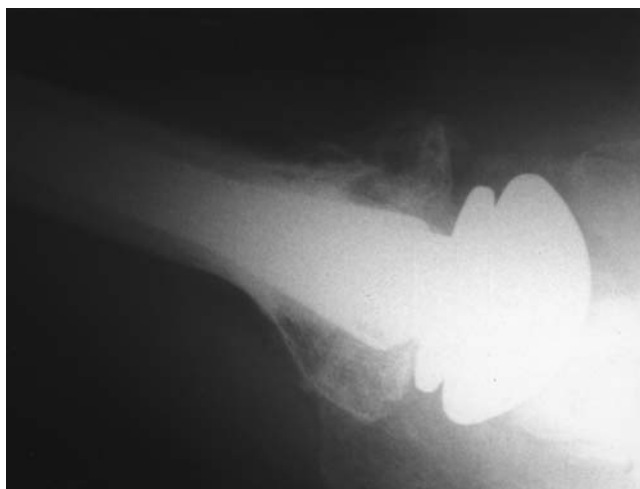


Fig. 10b

Radiographs after hemiarthroplasty in a patient with a large defect of the humeral head (the patient in Figure 5c) a) AP and b) axillary.

rehabilitation. The disadvantage is limitation of external rotation.²⁹ This procedure may be indicated in a young patient in whom the only other option would be shoulder arthroplasty.

Allograft reconstruction. The defect is filled with allograft from the femoral head which is contoured to fit the segmental defect and to restore the sphericity of the head. The graft is fixed with cancellous screws. This procedure has given similar results to those of transfer of subscapularis without altering the normal anatomy of the proximal humerus.³⁰ This procedure should be used in patients with good bone quality of the residual head and with no osteoarthritis.

Autograft reconstruction. Osteochondral autograft of the humeral head may be used in patients with a medium or large anteromedial articular impression defect as may occur with bilateral acute posterior dislocation.³¹ After removing the humeral head from the contralateral shoulder during hemiarthroplasty, the articular segment of the head is fashioned into a well-fitting osteochondral autograft and fixed into the impression defect of the head with Herbert screws.

Large defect:

Arthroplasty. Hemiarthroplasty is used in patients with an impression fracture involving more than 50% of the articular surface or when the humeral head is very soft and not viable.^{32,33} Total shoulder arthroplasty is used when there is significant erosion of the glenoid.³⁴⁻³⁶ It is important to decide before surgery whether to transfer the lesser tuberosity or to perform an arthroplasty. If the latter is the case it is important not to perform an osteotomy of the lesser tuberosity. If an osteotomy is performed reconstruction of the tuberosity must be carried out with the potential prob-

lems of malunion or nonunion.²³ Reduction can be very difficult if the defect is large and the duration of the dislocation is more than six months. Again, it is important to release the soft tissues around the shoulder and to reduce the shoulder slowly using an elevator or the reverse side of the retractor as a lever with lateral distraction and external rotation. I usually try to place the reverse side of a retractor behind the posterior glenoid rim and humeral head. Also, I use the back of a chisel as a lever between the posterior glenoid rim and the defect of the humeral head. It is necessary to try both methods several times. When the humeral head is close to the posterior rim, the arm is externally rotated and the shoulder is reduced. I have never used the posterior approach for reduction in chronic posterior dislocation. Retroversion of the humeral component should be decreased from approximately 35° to 20°⁴ (Fig. 10). Excessive anteversion is not required, nor is plication of the posterior capsule. If there is a concern regarding the stability of the humeral component, the arm is immobilised in external rotation of 10° to 20°.

Conclusions

The treatment of chronic posterior dislocation of the shoulder remains difficult. It is most important to recognise the condition as early as possible from the history and physical and radiographic examinations. A history of an epileptic fit or electric shock must alert the surgeon to posterior dislocation. The key physical sign is fixed internal rotation of the arm.

The axillary lateral view is essential for diagnosis and to estimate the size of the anteromedial defect of the humeral head. One of the reasons for missing a posterior dislocation

is that the axillary lateral radiograph is not taken. 'Supervised neglect' should be considered in a patient with limited disability and low functional expectations. Closed reduction should be attempted if the defect is less than 25% of the articular surface and the duration of the dislocation is less than three weeks. Open reduction should be carried out for an irreducible dislocation with a defect of less than 25%. If the shoulder is unstable after open reduction transfer of the upper one-third of the tendon of subscapularis to the defect using transosseous non-absorbable sutures should be performed. Transfer of the lesser tuberosity remains the operation of choice in patients with a defect of between 25% and 50% of the articular surface. Hemiarthroplasty of the shoulder should be performed in patients with an impression fracture involving more than 50% of the articular surface or when the humeral head is very soft and not viable. Total shoulder arthroplasty should be performed in patients with considerable erosion of the glenoid. Open reduction with transfer of the lesser tuberosity or shoulder arthroplasty are technically demanding procedures and should be performed only by the experienced shoulder surgeon.

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