One-stage operation for neglected posterior dislocation of the shoulder by allograft reconstruction: a case report

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Abstract

Introduction

Posterior dislocation of the shoulder is a rare injury. Diagnosis is difficult and often missed. Management of this condition must be individualized, depending on the amount of the defect of the humeral head and the amount of time that has elapsed since the time of injury. This paper reports the case of one-stage operation for neglected posterior dislocation of the shoulder by allograft reconstruction.

Case Report

This article presents the case of a 45-year-old man with a five-week history of locked posterior dislocation of his right shoulder after a history of fall. An anteromedial defect of approximately 45% of the articular surface was apparent. Open reduction and reconstruction of the humeral head with osteochondral allograft was done. At three years postoperatively, the patient was satisfied with his level of function. The shoulder joint was painless and stable and radiographs showed a congruent joint with restoration of the humeral head shape. The functional outcome showed significant improvements in the University of California at Los Angeles scoring system and the simple shoulder test scores.

Conclusion

The presented case underlines the potential for missed diagnosis and the reliability of preserving the humeral head.

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Introduction

Posterior dislocation of the shoulder is an uncommon injury, but clinically and radiologically it is a distinct entity. It amounts to less than 2% of all dislocations of the shoulder. The main causes of posterior dislocation are major trauma, seizures and electric shocks, where indirect force is implicated.

In contrast to anterior dislocation, posterior shoulder dislocation does not show remarkable deformities; therefore, it is often missed during the initial examination, resulting in a delayed diagnosis and treatment.

The variety of associated injuries varies from an isolated dislocation of the humeral head (reverse Hill-Sachs lesion) to more multifaceted fractures of the proximal humerus.

A review of the literature revealed no golden standard in the treatment of locked posterior shoulder dislocation.

Medium-sized anteromedial humeral head defects involving 25–50% of the articular surface can be reconstructed using several methods, including lesser tuberosity transfer, rotational osteotomy of the humerus, osteochondral autografting and allograft reconstruction.

This case study presents a case of irreducible neglected posterior shoulder dislocation treated by open reduction, and reconstruction of the humeral head by an osteochondral allograft.

Case Report

A 45-year-old right-hand dominant man slipped and fell down on his right shoulder. He experienced pain and restriction of movement of his shoulder immediately following the fall. The patient presented to the emergency department and at clinical evaluation, he experienced severe pain with limited movement in all directions. Initial radiographs were taken in anteroposterior and lateral views. No auxiliary view was taken (Figure 1). The patient was treated as a case of contusion of the shoulder. However, the patient had no relief of his symptoms and returned to the unit after five weeks.

On examination, the patient had moderate pain in the shoulder, which was adducted and internally rotated. Any effort to passively or actively move the shoulder joint was significantly painful. There was an internal rotation deformity of 30 degrees and forward elevation was up to 35 degrees. No external rotation was visible and the inability to completely supinate the arm was indentified. There was no vascular or neurological abnormality in the limb.

Anteroposterior, Y-scapula and auxiliary views, this time, revealed a posterior dislocation with a large anteromedial depression in the right humeral head. Additional multiple varieties of radiographic studies were done preoperatively and the defect was estimated to be roughly up to 45%.

A decision was made to perform an open reduction and allograft reconstruction of the segmental defect of the humeral head. Various aspects of the shoulder before and after surgery were compared in the patient using the simple shoulder test (SST) and the University of California at Los Angeles scoring system (UCLA).
Under general anaesthetic, the patient was placed in a beach chair position. The shoulder was exposed through a standard deltopectoral approach. The subscapularis tendon and anterior capsule were divided together 1 cm from their humeral attachment. With difficulty, the dislocation was reduced. An inspection showed that the impacted anteromedial defect of the humeral head was up to 45% (Figure 2). The defect was debrided to a healthy cancellous tissue.

A cryo-preserved femoral head was used. The allograft was contoured to fit the segmental defect and to restore the original sphericity of the humeral head. The graft was fixed with two counter-sunk cancellous-bone screws (Figure 3). The anterior capsule and subscapularis were repaired in their anatomical positions.

Postoperatively, the shoulder was immobilized for four weeks in a brace with the arm alongside the body in 20 degrees of external rotation and 10 degrees of abduction. At four weeks, passive shoulder and pendulum exercises were initiated.

Figure 1: Initial radiographs done for the patients, no auxiliary view was taken.

Figure 2: Intraoperative view showing the humeral head defect.

Figure 3: Intraoperative view showing the allograft fixed by cancellous screws.
and the patient was advised to use a sling for a further four weeks. At six weeks, more aggressive physical therapy with an active range of motion was started.

On follow-up, the patient had less pain, a better range of movement and significant improvement in the aspects of SST and UCLA scoring systems. At the latest follow-up, three years postoperatively, the active range of motion measured 160 degrees in forward elevation and 150 degrees in abduction. External rotation was 75 degrees and internal rotation allowed the thumb to reach the 10th thoracic vertebra. The patient was free from re-dislocation. Radiographs revealed no signs of allograft failure. The contour of the graft was maintained with no evidence of avascular necrosis (Figure 4). At the same time, the functional outcome was assessed. The UCLA scores improved from 15 to 30, and the SST score improved in seven areas. The patient resumed his former work duties and sport activities with greater ease and comfort.

Discussion
The infrequency of the prevalence of the posterior locked shoulder fracture dislocation, the possibility for delay in diagnosis and the lack of evidence-based management strategies, make this particular injury type challenging to treat. In a series of 40 patients reported by Hawkins et al., approximately 60% of the diagnosed cases were missed and a mean delay of one year between injury and diagnosis was reported; only 30% of diagnoses were made within six weeks. Posterior dislocation ascends fewer major symptoms than anterior dislocation. The position of the dislocation is not clearly revealed on anteroposterior radiographs, and axial radiographs are frequently not obtained because of severe pain.

A thorough clinical evaluation should avoid this trap. Severe swelling immediately after the injury, posterior glenohumeral fullness and block passive external rotation beyond neutral are important clinical findings that suggest the presence of posterior glenohumeral dislocation. Correct and sufficient radiographic assessments are crucial to a precise diagnosis. Radiographs in anteroposterior, Y-scacpula and auxiliary views are necessary. The most important one is the auxiliary view, which is necessary to prove posterior dislocation. If an auxiliary view cannot be obtained, a modified auxiliary lateral view should be taken, in which the arm does not have to be abducted. The patient bends backwards by 30 degrees over the cassette on the table while wearing a sling. The X-ray tube is positioned above the shoulder and the beam projected upright down through the shoulder on to the cassette. For the patient in this case, no auxiliary view was taken the first time when he came to the emergency department. Numerous signs demonstrating posterior dislocation of the shoulder on the anteroposterior view have been mentioned in the literature. These include internal rotation of the humerus, the vacant glenoid sign, 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.

The treatment should establish stability and function of the shoulder while maintaining anatomic soft tissue attachments and preserving the remaining humeral articular surface.

Figure 4: Follow-up X-rays complete consolidation, no signs of avascular necrosis or post-traumatic arthritis.

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Many treatment methods have been identified. Nonetheless, the approach for fracture dislocation varies depending on the lesion type, interval between the trauma and treatment, and the patient’s age, expectation and activity level.13

In the treatment of locked posterior shoulder fracture dislocation, McLaughlin recommended the transfer of the subscapularis tendon to the humeral head defect in cases with depression between 20% and 40% aiming to increase the stability of the shoulder and prevent recurrence of dislocation.14

Hawkins et al.3 modified McLaughlin’s technique and recommended a procedure for transferring the lesser tuberosity along with the attached subscapularis tendon. The advantages of this procedure are a better bony filling of the humeral head and more secure insertion of the subscapularis. However, it does not restore the anatomy and shape of the humeral head, and may lead to limitation of internal rotation of the shoulder joint.14,15

Alternatives include autograft and allograft reconstructions, which are advised in patients with good bone quality of the remaining head and with no osteoarthritis and a defective area not surpassing 25% to 50% of the humeral head.13,15

Arthroplasty may be the appropriate option in cases with failed open reduction, a defect affecting more than 50% of the humeral head and secondary osteoarthritic changes over the joint surface.1,13. Nevertheless, in young patients, all efforts should be made to retain the humeral head.3

Hemiarthroplasty is suggested for patients over 65 years of age with acute three of four piece humeral head fractures due to high devascularisation risk.13,15

Banerjee et al.16 described a surgical technique of elevation of the impressed osteochondral fragment followed by filling the lesion with AlloMatrix bone graft putty in two patients. The size of the head lesion was less than 35%. Underpinning graft screws were used to provide a subchondral support. Postoperatively, the sphericity of the humeral head was restored. No evidences of collapse or osteonecrosis were seen at the latest follow-up. Functional results were excellent, with a minimum follow-up of two years.

Recently, Jacquot et al.17 developed a percutaneous technique for reduction of the dislocation or reduction of the anterior impact fracture using percutaneous balloon dilatation and cement fixation. On the postoperative radiograph, the sphericity of the humeral head was restored. This technique was used in four shoulders with excellent results.

Gerber and Lambert15 reported long-term outcomes of four humeral head reconstructions using allograft in patients with impact fractures more than 40%. At six years follow-up, good stability and satisfactory painless movements were recovered in three patients, and one patient had avascular necrosis of the humeral head.15

Similarly, Martinez et al.18 followed six patients who underwent allograft reconstruction with a mean period of 122 months after the operative procedure. Good results were obtained in three patients and poor results in three other patients. The authors attributed the poor results in their study to the long period of follow-up as the possibility of development of osteoarthritic changes or collapse of the graft could increase with the years.

Gerber reported a series of nine patients treated with the same technique. Good results were achieved in seven patients and poor results in two. He concluded that the procedure was indicated in large anteromedial defect in humeral heads without osteoporosis or degenerative joint disease. If the humeral head is already osteoporotic, it can become flattened through compressive loads and it may collapse and redislocate.19

For this case of the 45-year-old man, the osteochondral graft technique was chosen because it maintains the normal anatomy and does not alter the tuberosity position, which would present technical difficulties with any revision procedure.20

The use of osteochondral grafts enables stable internal fixation. It is also well-suited for disperse loads across the entire graft segment, potentially decreasing the risk of last collapse.15

In this case, the good bone quality of the humeral head and the absence of osteoarthritis encouraged the use of this procedure.

Frozen allograft was used because fresh allograft was not available. The risk of microbiological contamination or the transmission of unrecognized microorganisms exists, but it is very low because the tissues are exhaustively analysed using bone bank techniques.

Osteochondral grafts can be fixed with screws or bioabsorbable pins.4 Metallic screws were favoured in this case because they allow enhanced fixation with earlier and vigorous physical therapy.

Conclusion
Allograft reconstruction for the treatment of segmental defects of the humeral head associated with neglected posterior shoulder dislocation represents a reliable surgical option. It restores the anatomy of the humeral head, which could be advantageous for shoulder function.

Abbreviations list
SST, simple shoulder test; UCLA, University of California at Los Angeles scoring system.

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