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Long-term outcome of segmental reconstruction of the humeral head for the treatment of locked posterior dislocation of the shoulder

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Background: Locked posterior glenohumeral dislocations with impaction fractures involving less than 30% to 35% of the humeral head are most frequently treated with lesser tuberosity transfer into the defect, whereas those involving more than 35% to 40% are treated with humeral head arthroplasty. As an alternative, reconstruction of the defect with segmental femoral or humeral head allograft has been proposed, but the long-term outcome of this joint-preserving procedure is unknown.

Methods: Twenty-two shoulders in 21 patients with a locked posterior shoulder dislocation and an impaction of at least 30% (mean, 43%) of the humeral head were treated with segmental reconstruction of the humeral head defect. They were reviewed clinically and radiographically at a minimum follow-up of 5 years.

Results: Of the 22 shoulders, 19 could be followed up at 128 months (range, 60-294 months) postoperatively. Only 2 of the 19 patients needed a prosthesis more than 180 months after the index operation. Of the other 17, 4 had radiographically advanced osteoarthritis (OA), 4 had mild OA, and 9 had no or minimal OA. Eighteen shoulders were rated as subjectively excellent, none were rated as good, and one was rated as fair. The final Constant-Murley score averaged 77 points (range, 52-98 points), the Subjective Shoulder Value averaged 88% (range, 75%-100%), and only 2 patients had mild to moderate pain. Mean active anterior elevation was 145°, and mean external rotation with the arm at the side was 42°.

Conclusion: Segmental reconstruction of humeral head defects for large anteromedial impaction fractures caused by locked posterior dislocations durably restores stability and freedom from pain with an excellent subjective long-term outcome.

Level of evidence: Level IV, Case Series, Treatment Study.

Keywords: Segmental reconstruction; humeral head; locked posterior dislocation; long-term

Traumatic, posterior dislocation of the shoulder is usually associated with an anteromedial—so-called reverse Hill-Sachsor McLaughlin—impression fracture of the humeral head. This lesion can be so large that closed reduction becomes impossible or is followed by immediate redislocation on slight internal rotation of the reduced arm. Locked dislocations may be seen acutely. Often, however, they are initially missed and referred to specialized institutions with considerable delay. Chronic dislocations, defined as those with a diagnostic delay of at least 1 month, are likely to be associated with osteopenia of the part of the humeral head that is no longer in contact with

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the glenoid, as well as with degenerative changes of the incongruous glenohumeral joint.

The pathomechanical role of the humeral head defect was probably first recognized by McLaughlin,[14] who recommended transferring the subscapularis tendon into the defect to prevent recurrence of dislocation. Neer and colleagues[13] modified this procedure by recommending transfer of the lesser tuberosity with its attached subscapularis tendon into the defect. For humeral defects involving more than approximately 35% to 40% of the humeral head, however, such reconstruction may compromise joint mobility and further reconstructive procedures, so humeral head arthroplasty or total shoulder replacement (total shoulder arthroplasty [TSA]) is usually preferred.[2,15,17] The mean age of the affected patients, however, is around 45 years,[13,16] so joint-preserving procedures would be desirable. Reconstruction of the humeral head defect with a segmental allograft has been proposed as an alternative to restore function and stability without compromising the original anatomy of the glenohumeral joint.[10] The long-term outcome of this joint-preserving procedure, however, is unknown.

The purpose of this study was to review a consecutive series of patients with locked posterior dislocations treated with segmental humeral head reconstruction to determine the clinical value of segmental humeral head reconstruction for locked posterior shoulder dislocation.

Methods

A total of 21 consecutive patients with 22 locked posterior dislocations (bilateral in 1 patient) with humeral head defects of at least 30% (mean, 43%; range, 30%-55%) were treated with segmental reconstruction of the humeral head and were studied. Four of these patients were the basis of a previous preliminary report, and their long-term results are included in this study.[10] There were 4 women (4 shoulders) and 17 men (18 shoulders). The mean age of the patients at the time of dislocation was 44 years (range, 25-75 years). Four shoulders were treated acutely within 7 days of injury, 5 shoulders were treated subacutely between 1 week and 1 month after injury, and 13 chronic cases were treated with a mean delay of 6.3 months (range, 1-15 months). Eight dislocations were incurred during an epileptic seizure and two were incurred during a hypoglycemic convulsion; the remaining 12 dislocations resulted from sports-related injuries (biking in 5, soccer in 1, skiing in 2, horseback riding in 1, and walking/jogging in 3). Two patients were referred after failed open reduction and internal fixation of a proximal humeral fracture in which the concomitant posterior glenohumeral joint dislocation had not been recognized. All subacute and chronic patients were seen for "painful stiffness" and had severe loss of passive and active external rotation. Except for chronic cases, no functional clinical assessment was carried out because of suspicion of posterior shoulder dislocation.

After confirmation of the diagnosis with conventional radiography, computed tomography (CT) was carried out in all patients. CT documented an impression fracture of the head involving at least 30% of the cartilaginous circumference but absence of relevant posterior glenoid rim fractures or avulsions of the infraspinatus or supraspinatus tendons. The size of the humeral head defect was measured on the preoperative CT scan with the head dislocated posteriorly. On a CT scan obtained at or immediately below the level of the coracoid, a circle was laid over the humeral head. A line from the center of the circle to the cartilage immediately adjacent to the lesser tuberosity and another line from the center of the circle to the posterior end of the cartilage adjacent to the infraspinatus insertion determined the cartilage angle. A second angle, the defect angle, was the angle formed by the lines connecting, first, the anterior limit and, second, the posterior limit of the defect with the center of the humeral head. The percentage of the cartilage angle that the defect angle represented was the estimated size of the humeral head defect (Fig. 1). A posterior glenoid rim defect of more than half of the maximal anteroposterior diameter was considered relevant.[11]

Figure 1 The defect size is calculated on a CT slice taken at or immediately below the coracoid tip. The percentage of the cartilage angle (185° in this case) that the defect angle (70° in this case) represents is the estimated size of the defect (38% in this case).

Operative treatment

A previously described operative technique[10] was performed, with slight modification. Patients were placed in the beach-chair position and operated on under general anesthesia for optimal relaxation. A deltopectoral approach was used. We divided the subscapularis tendon approximately 1 cm from its insertion from the superior border of the tendon to its inferior insertion, carefully avoiding injury to the anterior circumflex vessels and protecting the arcuate artery lateral to the bicipital groove. The capsule was then divided vertically close to its humeral attachment. The superior glenohumeral ligament and the coracohumeral ligament were divided because failure to do so had resulted in difficulties in reducing the humerus in the first cases. The capsular release was carried out inferiorly beyond the subscapularis insertion. A first attempt was then made to fully internally rotate the arm and pull