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Posterior Shoulder Instability with a Reverse Hill-Sachs Defect: Repair with Use of Combined Arthroscopic Labral Repair and Fracture Disimpaction

A Case Report

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Acute traumatic posterior glenohumeral dislocations are rare; they are typically caused by high-velocity trauma, epileptic seizures, or electrocution[1,2]. Anterior impression fractures of the humeral head (reverse Hill-Sachs defect) occur in over 80% of individuals following a posterior dislocation of the shoulder[3]. The size of reverse Hill-Sachs defects varies and has been reported to be as large as 55% of the cartilage surface[4]. Defects affecting less than 10% of the articular surface can be treated conservatively with closed reduction, and immobilization may produce excellent stability with a low risk for redislocation[1]. However, traditional sling immobilization in internal rotation puts the shoulder at risk to redislocate. Therefore, surgical treatment is recommended in defects that affect between 10% and 20% of the articular surface; they can be treated either with an arthroscopic approach, open remplissage, bone-grafting, or prosthetic replacement[5].

Compared with traditional posterior Hill-Sachs defects that occur with anterior dislocations, the extent of osseous and cartilaginous destruction of the anterior humeral head is usually more extensive in reverse Hill-Sachs defects[6]. Therefore, to stabilize the glenohumeral joint and avoid potential progressive cartilage destruction, which may lead to early osteoarthritis, reverse Hill-Sachs defects affecting more than 20% of the articular surface are nearly always treated surgically[7]. Several techniques have been described, including subscapularis transfer with or without the lesser tuberosity into the humeral head defect, disimpaction and bone-grafting, allograft reconstruction of the humeral articular surface, and arthroplasty[8]. If the joint becomes unstable, repair of the posterior capsulolabral structures can be performed to restore stability, as described for treatment of symptomatic posterior subluxation[9,10]. Large defects of greater than 40% of the articular surface typically require initial arthroplasty because of the increased risk of osteoarthritis, humeral head necrosis, and mechanical symptoms or instability[11-13].

We present a clinical case of a reverse Hill-Sachs defect that involved more than 30% of the articular surface. It was successfully treated with combined arthroscopic posterior labral repair; capsulorrhaphy; open disimpaction of the fracture, which was augmented with mineralized subchondral cancellous allograft bone; and internal screw fixation of a humeral head impaction fracture.

The patient was informed that data concerning the case would be submitted for publication, and he provided consent.

Case Report

A thirty-eight-year-old highly active man sustained a direct fall on the right shoulder while snowboarding. The patient sustained a posterior dislocation of the shoulder in combination with a reverse Hill-Sachs defect. The shoulder was reduced in the emergency department but it redislocated spontaneously. After another reduction, radiographs (Figs. 1-A, 1-B, and 1-C) and computed tomography (CT) (Fig. 1-D) demonstrated the large reverse Hill-Sachs defect. This defect involved approximately 33% of the articular surface of the proximal part of the humerus (Fig. 1-D). Because there was instability, the arm was placed in external rotation to maintain reduction. Surgical fixation was recommended and was performed the following day.

Surgical Procedure

After adequate regional and general anesthesia, the patient was placed in the beach-chair position. The examination under

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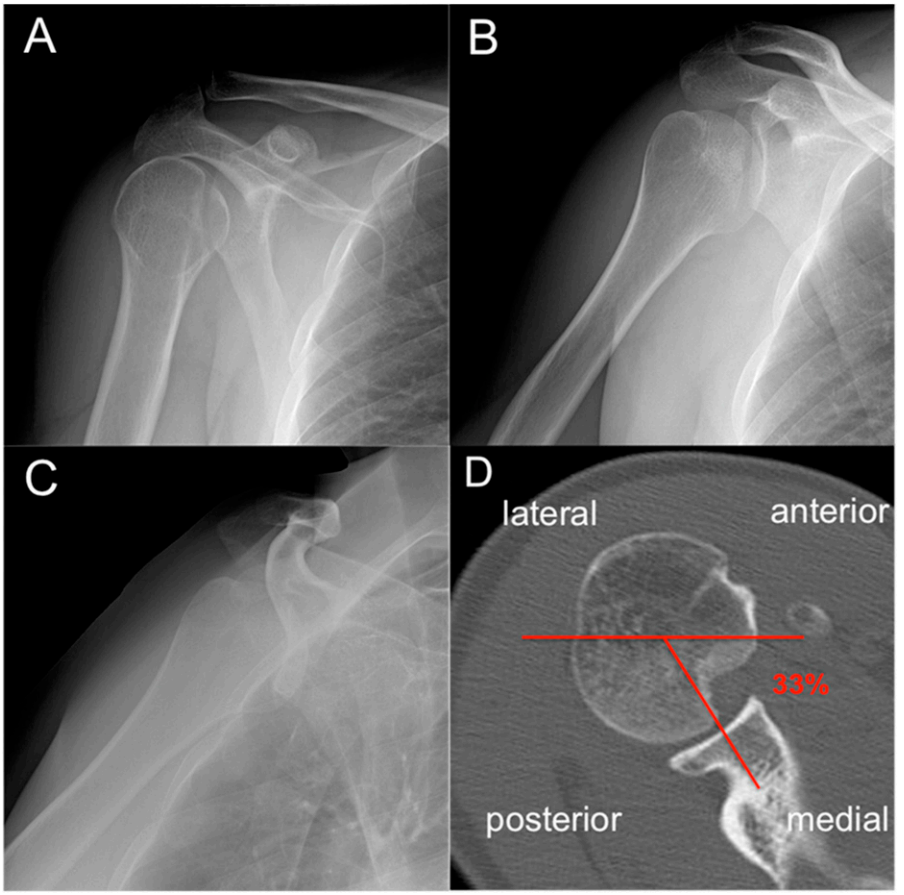

Fig. 1

Figs. 1-A through 1-D Radiographs and CT imaging. **Fig. 1-A, 1-B, and 1-C** Radiographs of the posterior dislocation. **Fig. 1-D** CT (axial view) of the shoulder. Borders of the articular surface were set by the red horizontal line; 33% of the articular surface was involved.

anesthesia showed an excessive posterior translation with crepitation. The humeral head could be easily dislocated posteriorly and locked on the impression fracture of the reverse Hill-Sachs defect. The shoulder was manually reduced. The diagnostic arthroscopic evaluation demonstrated some chondral debris and hemarthrosis; a posterior labral tear and posterior capsular injury also were evident. No other intra-articular pathologies were present.

We performed an extensive glenohumeral debridement with evacuation of the hemarthrosis, a chondroplasty, removal of multiple loose bodies, a partial labrectomy, and a synovectomy. The posterior labrum was then repaired. Three 2.4-mm anchors (BioComposite SutureTak; Arthrex, Naples, Florida) were placed in the posteroinferior glenoid rim, and a crescent suture shuttle (SutureLasso; Arthrex) was used to pass the sutures around the labrum and the capsule. Sutures were tied with use of a sliding, locking Weston knot, and they were backed up with alternating half-stitches. Upon completion, the posterior capsulolabral complex appeared very stable.

The osteochondral impression defect in the anterior humeral head was again visualized (Fig. 2). A dynamic arthroscopic examination was performed and showed that even after surgical stabilization of the posterior capsulolabral complex, the fracture continued to engage on the posterior glenoid rim when the arm was rotated internally by more than 40°. Therefore, the reverse Hill-Sachs defect fracture was addressed.

A deltopectoral approach was performed, and the rotator interval was opened. Approximately 1 cm of the upper subscapularis was reflected inferiorly to allow visualization of the

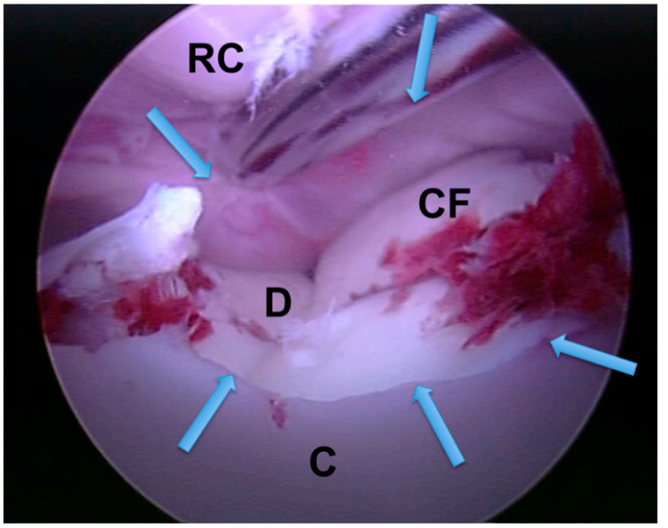

Fig. 2

Arthroscopic view of the defect. The blue arrows indicate the defect's border. RC = rotator cuff, D = defect on the humeral head, CF = chondral fragment, and C = cartilaginous surface.

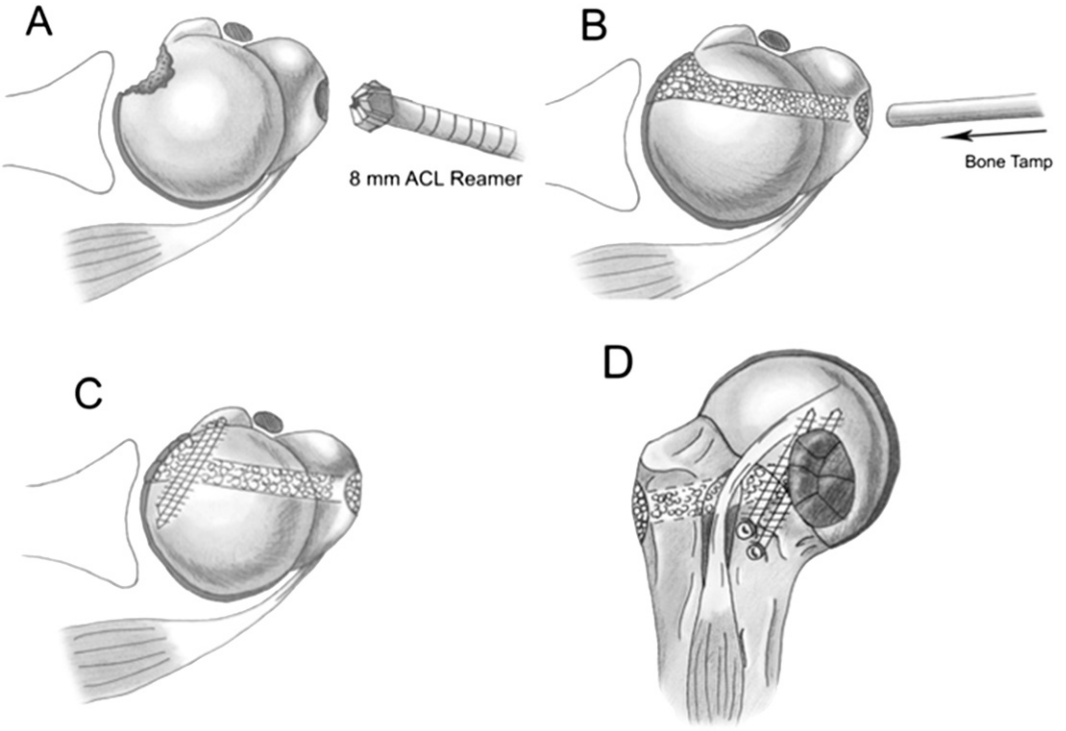

Fig. 3

Figs. 3-A through Fig. 3-D Illustrations of the surgical procedure. **Fig. 3-A** Access through the major tuberosity with an 8-mm ACL reamer. **Fig. 3-B** Retrograde reduction of the cartilaginous surface as well as defect filling with osseous chips. **Figs. 3-C and 3-D** Final setting with the surface reduced; the defect was filled, and the supportive screws were in place.

defect. The defect appeared to be approximately 1 cm deep and was easily palpable. The arm was internally rotated, and a 8-mm cortical viewing portal was created. With use of an 8-mm anterior cruciate ligament (ACL) reamer, a tunnel was made laterally in the greater tuberosity toward the defect (Fig. 3-A). The fracture was disimpacted and reduced anatomically with curved bone tamps. Reduction was controlled under direct vision through the rotator interval and with finger palpation by rotating the arm externally. The comminuted articular segments were also placed back into anatomic position. Next, 15 cc of mineralized cancellous allograft bone chips (AlloSource, Centennial, Colorado) were impacted into the bone tunnel to buttress the subchondral fracture (Fig. 3-B). The articular cartilage surface was reduced anatomically and was controlled manually by finger palpation through the rotator interval. Additionally, to support the subchondral bone

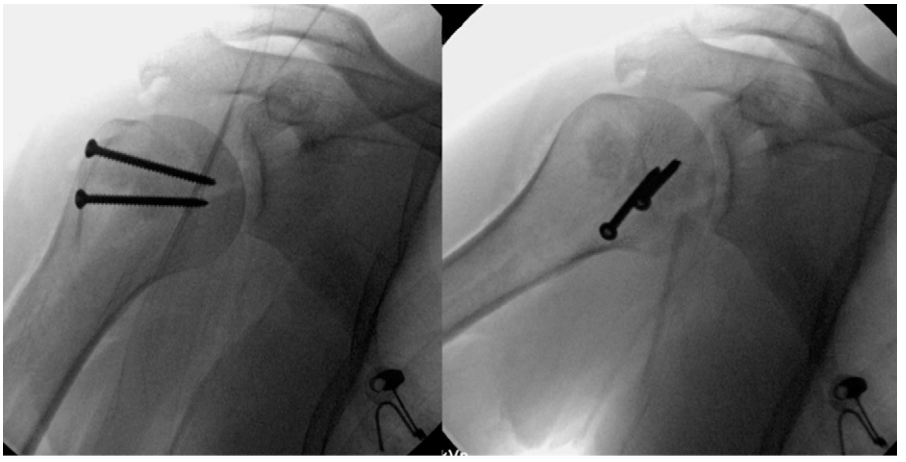

Fig. 4

Intraoperative fluoroscopic views after repair. Two screws can be visualized, leading laterally to medially, supporting the disimpacted region of the anterior aspect of the articular surface.

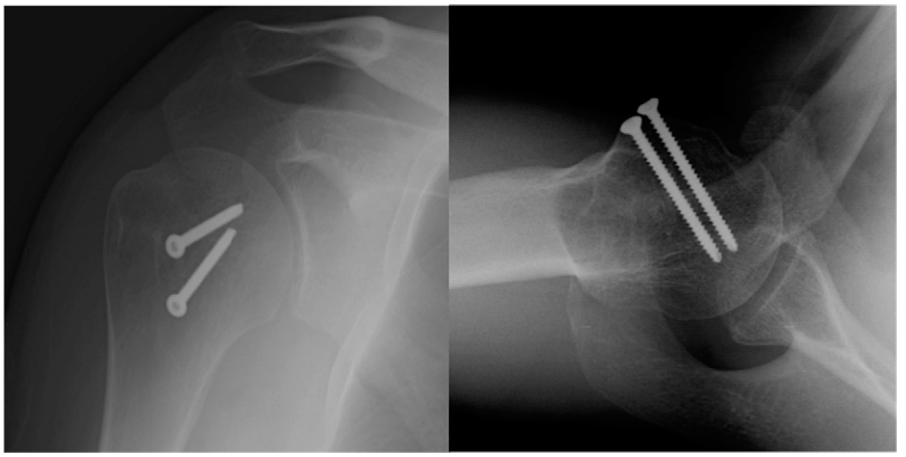

Fig. 5

Postoperative anteroposterior (left) and axial (right) radiographs at forty-three months. The fracture site was well reduced with screws in situ. There were no signs of osteoarthritis or humeral head necrosis.

under the defect, two 4.0-mm fully threaded screws were inserted extra-articularly from the anterolateral direction (Figs. 3-C and 3-D). Screw heads were countersunk laterally and thus did not interfere with rotation.

Anteroposterior and axillary fluoroscopic views confirmed an anatomic reduction and correct placement of the screws anterolaterally to medially, directly supporting the reverse Hill-Sachs defect (Fig. 4). The lesion was now visualized as flush, and the chondral surface demonstrated restoration to its normal convexity. The patient had an uneventful postoperative course and was discharged the next day.

The shoulder was secured in an immobilizing sling for four weeks. Rehabilitation was initiated on postoperative day 1 with pendulums and passive range of motion, limiting external rotation to 30° to protect the repaired upper subscapularis and to restrict internal rotation to the body. Active motion and active-assisted motion were initiated after four weeks. Posterior loading to the shoulder and overhead activities were avoided for six weeks. The patient was allowed to return to full sports activities after sixteen weeks.

Outcome

At the time of the final follow-up at forty-three months, the patient was pain-free and had returned to full activities. He had unrestricted range of motion (flexion of 170°, external rotation of 60°, and abduction of 120°; with the arm in abduction to 90°: external rotation of 90° and internal rotation of 75°), which was no different from the uninjured contralateral side. Multiplanar radiographs showed maintenance of the reduction and no signs of osteoarthritis or humeral head necrosis (Fig. 5). The patient had recovered fully from the injury, had no signs of instability, and had returned to full activity without limitation.

Discussion

Our patient had an acute traumatic posterior glenohumeral dislocation with a reverse Hill-Sachs defect that affected more than 33% of the cartilage surface. The patient was treated with combined arthroscopic posterior labral repair, capsulorrhaphy, and fracture disimpaction of the reverse Hill-Sachs defect, leading to an excellent outcome.

For defects that affect between 20% and 40% of the cartilage surface, a variety of different treatment options have been proposed. Banerjee et al. reported excellent results after two years of follow-up in two patients who had sustained reverse Hill-Sachs defects of less than 35% of the articular surface; there was no evidence of osteonecrosis, collapse, or progression of osteoarthritis[14]. The defects were filled retrograde with allogenic bone-graft putty, and two screws were used to support the subchondral zone. However, concerns have been raised about the use of an open approach through the subscapularis tendon, especially with lesions that encompass over 30% of the cartilage surface[14].

Bock et al. also reported good results for the antegrade reconstruction of reverse Hill-Sachs defects after a mean follow-up of sixty-two and one-half months[15]. In six cases where 30% to 45% of the articular surface had been affected, they used both autografts and allografts. However, the compacted cartilaginous area was elevated and completely removed from the shoulder in order to graft the impacted area. Then, the surface was secured back to the humeral head with anchors, leaving the sutures on the surface of the cartilaginous joint.

Martetschläger et al. described a modified arthroscopic McLaughlin procedure[7]. With use of suture anchors, the subscapularis was attached into the reverse Hill-Sachs defect. However, this nonanatomic repair may bear the risk of limited internal rotation and might complicate future arthroplasty[16]. It may not be ideal for more centrally located reverse Hill-Sachs defects or for larger defects because advancing the subscapularis in such settings could certainly affect glenohumeral joint kinematics.

Moroder et al. described an all-arthroscopic repair for a reverse Hill-Sachs defect that involved over 40% of the humeral head surface in which they used bone-chip allografting with cannulated screws[17]. However, because of humeral head

necrosis and partial osseous absorption, the patient required an arthroplasty six months after the initial surgery. Although the procedure had been technically feasible, the lesion size seemed to limit the biological healing response.

In a recent study, Jacquot et al. described a new technique of balloon treatment for reverse Hill-Sachs defects[18]. With fluoroscopic guidance, they percutaneously reduced four reverse Hill-Sachs defects in three patients with use of balloon dilatation and cement fixation. The defect sizes were not reported. After twelve months of follow-up, the results were moderate, with a mean Constant score[19] of 73 points. Nonetheless, information regarding medium-term to long-term results is still not well understood or available for this technique.

To prevent the humeral head from dislocating posteriorly in cases of instability, posterior labral repair and capsulorrhaphy are recommended in order to avoid recurrent (sub)luxation accompanied by potential progressive cartilage wear and osteoarthritis[20,21]. Our patient received an arthroscopic posterior labral repair and capsulorrhaphy prior to open reduction and internal fixation of the anterior humeral head defect, leading to a stable joint with full range of motion. To support the subchondral bone, two screws were inserted. This screw technique, which has been described by other authors, has been used routinely in other periarticular fractures, including tibial plateau fractures[14,17].

In conclusion, this case report demonstrates the repair of an acute, impacted, and comminuted reverse Hill-Sachs defect that involved more than 33% of the articular surface with combined arthroscopic labral repair and fracture disimpaction of the reverse Hill-Sachs defect with an excellent outcome at almost four years postoperatively. ■

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