Technical Note

Transhumeral Head Plasty for Large Hill-Sachs Lesions

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Abstract: Large, engaging Hill-Sachs lesions can cause recurrent glenohumeral instability following Bankart repair of torn anterior capsulolabral structures. We offer a novel technique for correcting the posterolateral humeral head defect without significantly altering normal anatomic structures. The glenohumeral joint is exposed via a deltopectoral approach. After the defect geometry is appreciated by direct palpation and visualization, the tip of an anterior cruciate ligament tibial guide is centered in the defect. The drill sleeve is approximated to the anterior lesser tuberosity starting hole, and a graduated guidewire is advanced to the posterior subchondral surface. After confirmation of satisfactory positioning, an 8-mm cannulated acorn drill is drilled to within 1 cm of the posterior surface. Bone tamps are used to elevate the depressed area using the tunnel created within the head. Allograft cancellous bone chips are impacted into the defect to elevate and support the subchondral surface. After successful impaction grafting and restoration of the head surface, anterior capsulolabral reconstruction is undertaken using either the Bankart or Latarjet technique. A standard Bankart rehabilitation program is followed postoperatively. We confirmed the clinical efficacy of our technique in 4 patients who experienced no instability or other complications at an average of 1-year follow-up. **Key Words:** Hill-Sachs lesion—Humeroplasty—Recurrent shoulder instability.

Traumatic anterior dislocations of the glenohumeral joint are often accompanied by impaction injuries of the posterolateral humeral head, so-called Hill-Sachs lesions. Following Bankart repair of torn anterior capsular structures and/or physiotherapy, most shoulders stabilize[1,2] and the Hill-Sachs lesion represents little more than radiographic evidence of a history of shoulder dislocation.

Up to 20% of patients who undergo primary Bankart repair develop recurrent instability, including both dislocations and subluxations.[2] In this population, the cause of symptoms often remains elusive. Several entities, including adhesions,[2] residual capsular laxity,[3] incomplete stabilization of the labrum,[3] glenoid rim defects,[4,5] and large impaction injuries of the posterolateral humeral head[6] have been proposed as the culprit. Although most other injuries are amenable to surgical repairs, the large Hill-Sachs lesions that contribute to instability present a daunting challenge that, even Bankart noted, "nothing can be done about them if they are found."[7] Nonetheless, various surgical procedures have been devised for the treatment of these injuries. All involve significant derangements of normal anatomic structures. In this article, we offer a novel technique for correcting the defect without sacrificing normal anatomic structures.

TECHNIQUE

We considered those suffering from primary or recurrent traumatic anteroinferior shoulder instability

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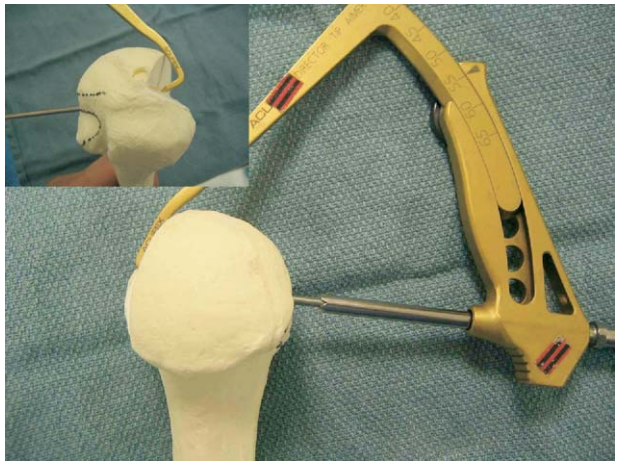

FIGURE 1. The tip of the ACL tibial guide is placed within the center of the Hill-Sachs lesion. The determination of the center of the lesion and the placement of the guide are done by palpation.

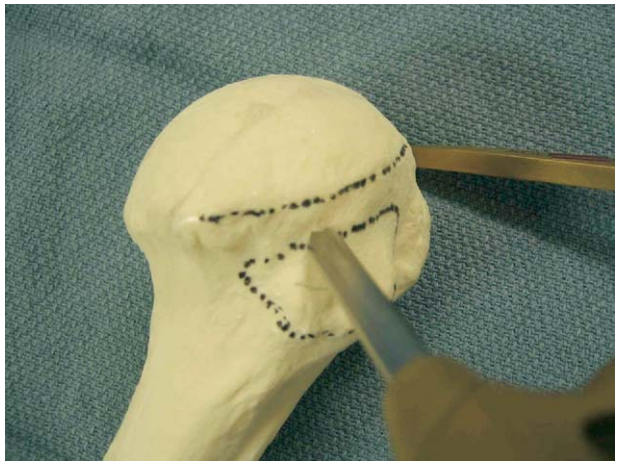

FIGURE 2. The guidewire starting point is located at the anterior humeral head equator, between articular cartilage and lesser tuberosity. This region is visualized through the standard approach used to treat Bankart lesions.

with an associated large engaging Hill-Sachs lesion as candidates for transhumeral head plasties. We performed this procedure on four patients. Concomitantly, three had a standard Bankart anterior capsulolabral reconstruction, while the other had a Latarjet procedure.

A standard deltopectoral approach was used to expose the anterior shoulder structures. The subscapularis tendon was dissected from the capsule, elevated from its attachment on the lesser tuberosity, and retracted medially. The capsule was incised along the equator in a T-shaped fashion to within 5 mm of the glenoid and tagged.

The geometry of the Hill-Sachs lesion (impaction fracture) was appreciated by direct palpation of the defect in the posterolateral aspect of the humeral head. By applying gentle inferior traction and slightly externally rotating the arm, an index finger was passed posterior superiorly and the impaction fracture palpated. Additionally, with the arm placed in extreme external rotation, the impaction fracture can be visualized. Using both palpation and direct visualization, the center of the defect was determined. The tip of an anterior cruciate ligament (ACL) tibial guide (Acufex, Mansfield, MA) was centered in the head defect (Fig 1). The guide was set to fit the curvature of the head appropriately (usually, 55° to 60°). The drill sleeve was approximated to the anterior lesser tuberosity starting hole, which was located 1.5 cm lateral to the articular surface in line with the equatorial capsular split (Fig 2). This starting point was remote from the anterolateral ascending branch of the anterior circumflex artery and thus relatively safe from injury to vascular structures.[8]

Once the guide was set and manually secured, a graduated guidewire was advanced to within a few millimeters of the posterior subchondral surface. After confirmation of satisfactory positioning, an 8-mm cannulated acorn drill was placed over the guidewire and drilled to within 1 cm of the posterior surface. The wire and acorn drill bit were then removed.

The surgeon's index finger was placed posteriorly into the Hill-Sachs impaction fracture recess. Bone tamps were used to elevate the impacted fracture via the tunnel created within the humeral head. A combination of round and "footed" bone tamps was employed. In addition, large curved curettes were used in some cases to palpate the subchondral area and assist in fracture elevation. During elevation of the Hill-Sachs fracture, allograft cancellous bone chips were

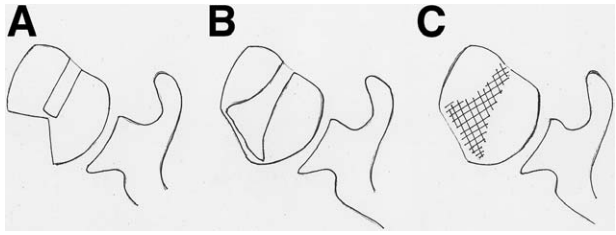

FIGURE 3. Transhumeral disimpaction with allograft reconstruction. (A) An 8-mm cannulated acorn drill is used to create a cavity for insertion of other instruments. (B) The lesion is disimpacted using a tamp to elevate the subchondral bone. (C) The defect created is packed with cancellous allograft bone chips.

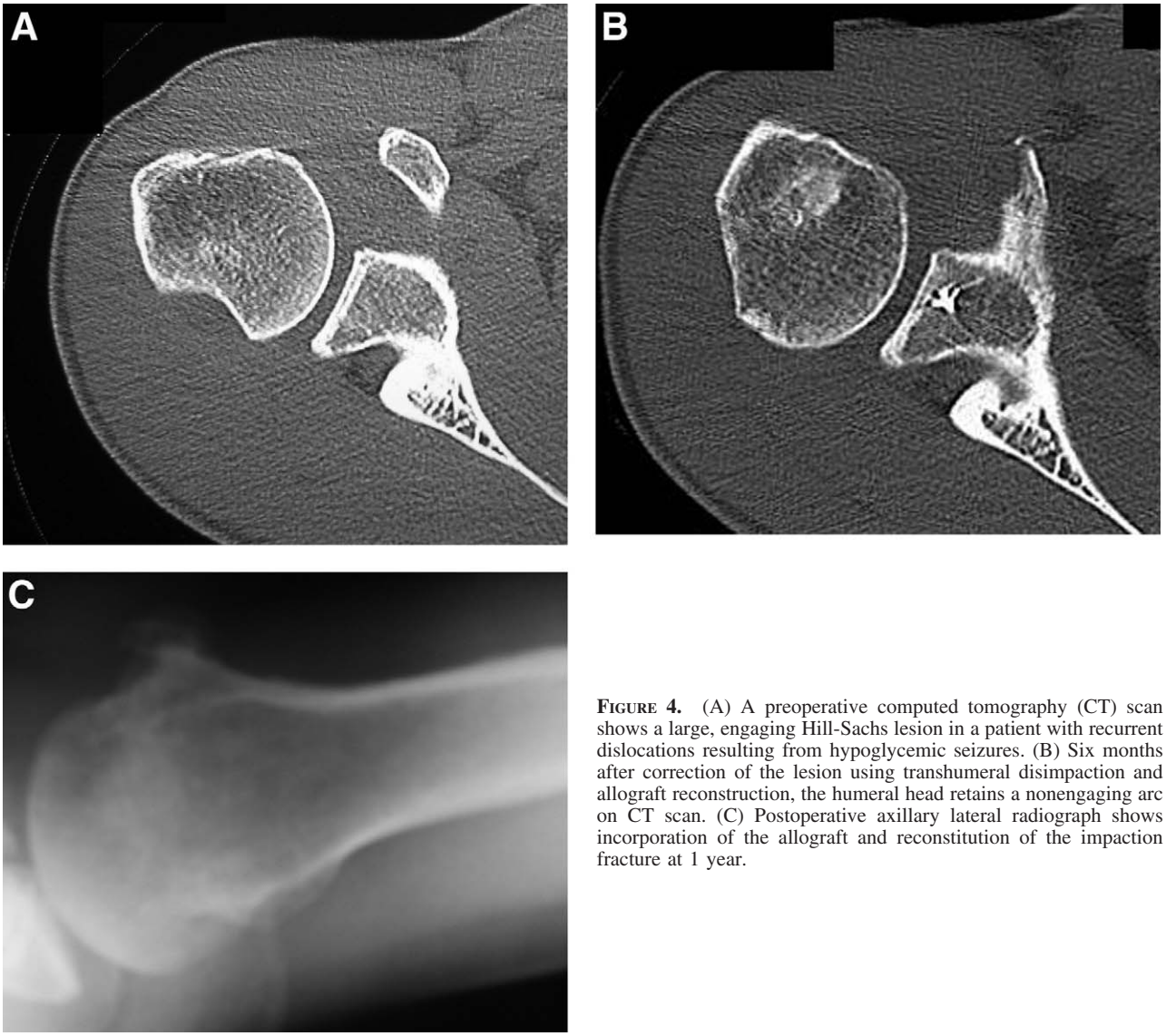

FIGURE 4. (A) A preoperative computed tomography (CT) scan shows a large, engaging Hill-Sachs lesion in a patient with recurrent dislocations resulting from hypoglycemic seizures. (B) Six months after correction of the lesion using transhumeral disimpaction and allograft reconstruction, the humeral head retains a nonengaging arc on CT scan. (C) Postoperative axillary lateral radiograph shows incorporation of the allograft and reconstitution of the impaction fracture at 1 year.

impacted in the cancellous defect to elevate, aid in the reducing, and support the subchondral surface. Once the fracture was elevated, the resultant reconstituted region was cone/mushroom-shaped due to the 8-mm starting hole anteriorly and the posterior Hill-Sachs lesion (Fig 3). Adequate contouring of the posterior surface of the humeral head was confirmed by palpation. After successful impaction grafting and restoration of the humeral head surface, anterior capsulolabral reconstruction was undertaken using either the standard Bankart and Latarjet technique.

Postoperatively, the patient was immobilized in a sling and swathe for 4 weeks with instructions on pendulum and scapular isometric exercises. After 4r weeks, a standard Bankart rehabilitation program was followed.

DISCUSSION

Traumatic anterior instability of the glenohumeral joint is a common entity, especially among young athletes. In this population, nonoperative management is often ineffective, and surgical intervention is necessary to repair the injured anterior capsulolabral complex.[1] Recurrence rates after reconstruction with a Bankart repair and anterior capsulorrhaphy, either open or arthroscopic, range from 3% to 20%.[1,2,4,7]

Large studies by Rowe et al.[9] and Hovelius et al.[1]

have associated Hill-Sachs lesions, traumatic defects of the posterolateral humeral head, with recurrent instability. Several authors have proposed that the instability occurs when the humeral head defect engages the anterior cortex of the glenoid and consequently subluxes.[4-6,10] Typically, this "articular arc length mismatch" between the glenoid and humeral head articular surfaces is produced when the arm abducts and externally rotates.[4,5] This position is the same used to elicit the apprehension sign of the shoulder.

Although some view the Hill-Sachs defect as an important component of recurrent instability,[1,6,9,11] there is no standard accepted treatment of this lesion.[5] In their 1948 report on the importance of Hill-Sachs lesions in recurrent instability, Palmer and Widén[6] advocated an anterior bony block to prevent engagement of the lesion on the glenoid indirectly by limiting anterior subluxation, because "for technical reasons, [reconstructing the humeral head by filling in the hollow] is not practicable."[6] Over the next half century, several methods to treat these lesions emerged. Proposed solutions include restricting external rotation via capsular shift,[12] filling in the defect using a bulk humeral allograft[13] or transferred infraspinatus tendon,[11] rotating the defect away from the glenoid with a proximal humeral osteotomy,[10] and replacing the head with a prosthesis.[14] None are able to restore the normal contour and geometry of the preinjured humeral head without an extensive surgical undertaking and further alteration of normal shoulder anatomy.

Recently, Kazel et al.[15] performed a cadaveric study using a percutaneous technique similar to our method. In this series, large Hill-Sachs lesions were created and treated with percutaneous humeroplasty in 14 cadaveric specimens. The authors were able to significantly reduce the size of the lesion in all specimens.[15] We confirmed the clinical efficacy of our technique in 4 human subjects with no recurrent instability or other complications at an average follow-up of more than 1 year (Fig 4).

We have described a technique that restores the integrity of humeral head without detaching soft-tissue structures posteriorly or osteotomizing the proximal humerus. Through a standard deltopectoral approach (and perhaps in the future as our skills and knowledge with this procedure grows, through a minimally invasive technique), we are able to, as Palmer hoped, "reconstruct the humeral head by filling in the hollow"[6] and minimize alteration to the surrounding structures.

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