Achieving sufficient exposure of the glenoid is one of the most demanding aspects of shoulder arthroplasty surgery. When healthy and unaffected by degenerative joint disease, the glenoid is small, buried deep in the musculature of the shoulder girdle, and difficult to visualize. In an osteoarthritic shoulder, the scale of these obstacles is amplified, making an already-challenging endeavor even more so. Because of its inherent difficulty, exposure of the glenoid should be seen less as a single step in a reconstruction procedure and more as an ongoing process that begins the moment a patient enters the operating room. Beginning with the positioning of the patient and ending with the final placement and adjustment of retractor, multiple maneuvers must be taken at each step of the procedure to ultimately allow for adequate glenoid visualization. With thoughtful planning, patience, and attention to detail, the glenoid can be reliably and reproducibly exposed to allow for a successful reconstruction. This article outlines the key technical steps and pearls for successful glenoid exposure.

The disease process of osteoarthritis distorts the anatomy of the native glenoid to varying degrees; as the result of these alterations, it is imperative to obtain proper imaging of the glenohumeral joint to evaluate the abnormal anatomy and aid in preoperative planning. The native glenoid is typically oriented in neutral version to slight retroversion. When affected by osteoarthritis, the glenoid is subjected to posterior wear, resulting in an increase in retroversion and net loss of bone (Fig. 1). Varying studies report differing degrees, but the increase in retroversion in an osteoarthritic shoulder is typically 10-15°.1-3 The amount and location of bone loss can vary on the basis of the native anatomy, but the most severe bone loss is characteristically posterior. Appropriate imaging is critical to forming a preoperative plan. The radiographic evaluation begins with a standard trauma series of AP, Grashey, scapular Y, and axillary views, with particular attention being paid to the axillary views for assessment of glenoid version and bone stock. However, multiple authors have recommended a preoperative computed tomography (CT) scan to assess the glenoid1,3,5 and this has become the standard protocol at our institution. A CT scan allows a more precise analysis of the glenoid vault and thus provides a helpful road map during glenoid preparation and implantation, as well as an accurate measure of glenoid bone stock and the possible need for glenoid bone grafting during the reconstruction (Fig. 1).

As mentioned previously in this article, achieving an adequate exposure of the glenoid should be kept perpetually in mind during a shoulder arthroplasty procedure, as multiple steps during throughout the case can cumulatively add up to sufficient visualization. A full and complete description of the surgical exposure and technique for a shoulder reconstruction is beyond the scope of this work. Rather, it is most appropriate to highlight the specific steps and pearls that can ultimately aid in optimal exposure.

Adequate glenoid exposure begins with patient positioning. The patient is positioned in a modified beach chair position, with the head of the bed elevated approximately 30-45°. The patient is placed at the edge of the bed to allow the entire arm to be fully extended. Optimal glenoid exposure requires that the arm be extended, abducted, and externally rotated; only if the patient is positioned at the edge of the bed will this positioning of the arm be possible. Two surgical
towels are placed at the medial border of the scapula to prevent migration of the entire scapula medially, which in turn causes the glenoid to a more posterior orientation. The entire upper extremity is sterilely prepped and draped to the level of the medial clavicle.

A standard deltopectoral approach is used, and specific steps are worth noting that can aid in the optimization of glenoid exposure. A 10- to 12-cm incision is made starting from 1 cm distal to the clavicle, just lateral to the coracoid, directed toward the deltoid insertion. Some authors would advocate the use of a smaller incision. However, a smaller incision can require vigorous retraction of the soft tissues, and possibly result in a tension neuropraxia in some cases6-8; therefore, we err towards a marginally longer incision to optimize exposure and minimize the need for excessive retraction. The skin is initially incised with a #10 blade, but all subsequent dissection is performed with needle-tip electrocautery, and care is taken to maintain meticulous hemostasis. A dry surgical field is critical to obtain and maintain adequate visualization throughout the case.

Once the deltopectoral interval has been identified and entered, dissection continues to the level of the clavicopectoral fascia. At this point, the superior edge of the pectoralis major insertion is taken down from the humerus, to be repaired at the end of the case. Releasing the pectoralis allows the humerus to be more easily manipulated into the optimal position of extension, abduction, and external rotation when the time comes for final glenoid exposure, and the morbidity of this release is minimal. After release of the pectoralis, the clavicopectoral fascia is incised just laterally to the conjoined tendon and strap muscles, and carried proximally to the level of the coracoacromial (CA) ligament. Taking care not to injure the musculocutaneous nerve, one should release any adhesions under the conjoined tendon. Next, a subdeltoid release is performed by releasing the anterior edge of the CA ligament, with continuation laterally to open the plane between the acromion and deltoid undersurface and rotator cuff. To accomplish this, the midportion of the CA ligament is grasped with an Adson forceps at the anterior edge of the CA ligament (Fig. 2). A semilunar cut is made in the CA ligament from medial to lateral, and a portion of the ligament is excised. At the lateral edge of the ligament, an elevator can be used to bluntly free the rotator cuff and humerus from the deltoid undersurface and acromion, and any subacromial bursal tissue or adhesions can be excised sharply, if necessary. This step serves 2 purposes. First, partial resection of the CA ligament provides improved visualization of the superior glenoid while preserving part of the CA arch. Second,
the subdeltoid release allows the humerus to be retracted sufficiently posteriorly for final glenoid exposure.

At this point in the procedure, release and mobilize the subscapularis in a circumferential fashion to enter the glenohumeral joint. Some authors argue that a lesser tuberosity osteotomy can enhance exposure; however, we believe that a subscapularis tenotomy also provides excellent exposure. To perform the tenotomy, begin by cauterrizing the anterior humeral circumflex artery and veins at the inferior border of the subscapularis. The tenotomy is then performed, beginning the cut 1 cm medial to the subscapularis insertion on the lesser tuberosity; the tendon edge is then tagged with 4 #2 nonabsorbable braided nylon sutures (Fig. 3). At this point, a 360-degree subscapularis release must be performed. To accomplish this, begin with a thorough inferior capsular release with needlepoint electrocautery. During the capsular release, care must be taken to protect the axillary nerve, which is in close proximity to the area of dissection. The capsule is slowly taken down off the humeral shaft to the 6-o’clock position. To protect the nerve, the arm is progressively externally rotated as the capsule is released; additionally, a metal finger retractor or a narrow Darrach retractor is placed around the neck, protecting the nerve. The inferior capsular release should continue to the level of the latissimus dorsi insertion. Superiorly, the rotator interval is released with Mayo scissors, freeing the subscapularis all the way to the level of the base of the coracoid. The anterior capsule is then dissected out and removed from the undersurface of the subscapularis. The plane between the subscapularis and anterior capsule is most readily identified at the muscular inferior border. The capsule is carefully dissected and excised from the inside-out, taking great care not to violate the subscapularis muscle and tendon. The capsulectomy proceeds medially, freeing the capsule and subscapularis from the anterior glenoid. The anterior labrum is carefully excised as well. The glenoid capsule is not released past the 6-o’clock position, the inferior midpoint, as this may lead to posterior instability. If the posterior capsule needs to be released, it can be done from the humeral side, which requires removal of the glenoid retractors and palpation of the capsule on the neck of the humerus. A full 360° release is absolutely necessary to allow the required posterior translation and retraction to expose the glenoid.

Proper preparation of the humerus is critical to achieving exposure of the glenoid. The key principles of humeral preparation as it relates to glenoid exposure are adequate removal of humeral osteophytes, and adequate resection of the humeral head with the humeral cut. It is critical to remove all anterior and inferior osteophytes, as this allows for identification of the true anatomic neck of the humerus (Fig. 4). It is critical to identify the true anatomic neck, as this allows for an accurate humeral head resection. The humeral head cut, made in the appropriate version, should exit at the suprolateral aspect of the humerus, within 5 mm of the supraspinatus insertion on the greater tuberosity. After the humeral head cut has been made, previously inaccessible posterior osteophytes can then be removed. It is critical to remove all osteophytes and resect the appropriate amount of femoral head. Excess humeral osteophytes or bone can impair visualization of the glenoid.

After all soft-tissue releases and humeral resections have been performed, the final placement of retractors is necessary to expose the glenoid. Specific retractors are necessary for adequate exposure. A Fukuda retractor is used to retract the humerus posteriorly; alternatively, a malleable...
retractor or even a narrow Darrach retractor can be used in place of the Fukuda. Anteriorly, place a special spike Darrach retractor (Fig. 5). Given the proximity of the axillary nerve and the spike on the retractor, this retractor must be placed with caution. At this point, the glenoid is exposed and ready to be prepared for whatever reconstruction is indicated.

The timeless surgical adage that one cannot fix what one cannot see is particularly true regarding the glenoid in shoulder arthroplasty. Adequate exposure of the glenoid is critical to allowing a surgeon to perform a successful and durable reconstruction. The aforementioned steps as well as an attention to detail throughout the case are helpful in achieving optimal exposure and visualization, in turn allowing a successful reconstruction.

References