1 Indications and Preoperative Evaluation for Anatomic Shoulder Arthroplasty

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Introduction

The rate of shoulder arthroplasty has increased over the last decade and is predicted to continue to rise [1]. Anatomic shoulder arthroplasty results improved pain and functional outcomes [2]. Rate of complications is acceptable and decreases with surgeons and hospitals that perform shoulder arthroplasty regularly [3, 4]. Increased risk of short-term complications is associated with fracture as the indication for surgery and greater risk of implant failure are associated with factors related to increased upper extremity activity [5]. Careful preoperative planning is essential to ensure successful shoulder arthroplasty.

Indications

Anatomic shoulder arthroplasty is indicated for patients with an arthritic shoulder experiencing shoulder pain and decreased range of motion that compromises activities of daily living. The most common indication for anatomic shoulder arthroplasty is primary glenohumeral osteoarthritis. Other indications include post-traumatic arthritis, rheumatoid arthritis, osteonecrosis, and arthritis due to shoulder instability or prior shoulder instability surgery.

Contraindications for anatomic shoulder arthroplasty include an irreparable rotator cuff repair or rotator cuff tear arthropathy [6] and insufficient glenoid bone stock to support a glenoid component. In these patients, other options such as hemiarthroplasty or reverse shoulder arthroplasty can be considered.

Osteoarthritis

Osteoarthritis is the most common indication for anatomic shoulder arthroplasty. Osteoarthritis is characterized by inferior humeral head osteophyte of variable size, other marginal osteophytes on the humeral head and glenoid, joint space narrowing, subchondral sclerosis and cyst formation, and often a tight anterior capsule with limited external rotation. In some cases, this can result in posterior subluxation of the humeral head with respect to the glenoid and can lead to posterior glenoid bone loss in particularly advanced cases. While rotator cuff disease and small partial thickness tears are common in patients with osteoarthritis, full-thickness rotator cuff tears are rare and, if present, they are usually repairable [7, 8]. Patients with osteoarthritis have predictably good pain relief and improvement in

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A.D. Armstrong, A.M. Murthi (eds.), *Anatomic Shoulder Arthroplasty*,
DOI 10.1007/978-3-319-29164-2_1

range of motion after anatomic shoulder arthroplasty [7, 9].

Rheumatoid Arthritis

Rheumatoid arthritis is a common inflammatory arthritis. Common findings include osteopenia, bone erosion, concentric joint space narrowing, and central glenoid wear, which can result in medicalization of the humeral head [10]. Patients with rheumatoid arthritis are also much more likely to have a concomitant full-thickness rotator cuff tear, which is rare in patients with glenohumeral osteoarthritis [7, 10]. Patients with rheumatoid arthritis tend to have good pain relief and improved range of motion after shoulder arthroplasty and are typically satisfied with shoulder arthroplasty results, although the outcomes are not as good as those for patients with osteoarthritis [11–13].

Post-Traumatic Arthritis

Arthritis of the glenohumeral joint may develop following proximal humerus fractures, resulting in shoulder pain with post-traumatic arthritis. Proximal humerus malunions often have angulated or rotated humeral heads with nonanatomic neck-shaft angles and malunited tuberosities. The rotator cuff may also be injured, tight, or athrophied. These anatomic abnormalities make shoulder arthroplasty challenging and outcomes are less predictable than anatomic shoulder arthroplasty for osteoarthritis, although patients usually have acceptable pain relief [14]. Tuberosity osteotomy results in less predictable outcomes and should be avoided if possible [15].

Osteonecrosis

Osteonecrosis may result as a complication of proximal humerus fracture or as a result of chronic steroid use or excessive alcohol use. Anatomic shoulder arthroplasty results in predictable improvement in pain and range of motion if osteonecrosis was not associated with post-traumatic tuberosity malunion or rotator cuff atrophy [16].

Arthritis After Instability

Anterior instability can lead to arthritis either through traumatic cartilage damage resulting from recurrent dislocations, after shoulder stabilization procedures that tighten the anterior capsule (post-capsulorrhaphy arthropathy) [17], or after surgical procedures that result in chondral damage, such as chondrolysis due to thermal capsulorrhaphy [18, 19]. These patients tend to be younger than patients with osteoarthritis and often present with an internal rotation contracture. They are also at increased risk for posterior subluxation and resulting posterior glenoid bone loss. Those with nonanatomic anterior stabilization procedures are at higher risk for neurovascular injury due to distorted anatomy. Anterior capsule release, subscapularis lengthening, and glenoid version correction either through eccentric reaming, bone grafting, or use of an augmented glenoid component are often necessary during anatomic shoulder arthroplasty in these cases. Outcomes after shoulder arthroplasty are not as reliable as outcomes after shoulder arthroplasty for osteoarthritis and may have a higher complication rate [17, 20–22]. Some studies also suggest decreased implant longevity [23].

Locked posterior dislocations have also been treated with shoulder arthroplasty. Shoulder arthroplasty results in improved pain and external rotation, although there is a risk of recurrent instability [24, 25].

Nonoperative Treatment

Nonoperative treatment is the initial standard or care for arthritic conditions of the shoulder and should be exhausted before considering TSA. The American Academy of Orthopaedic Surgeons (AAOS) Clinical Practice Guidelines reviewed operative and nonoperative treatments for glenohumeral arthritis [27]. Nonoperative

strategies include pharmacotherapy, physical therapy, corticosteroid injections, and injectable viscosupplementation.

Medications

Multiple types of medications have been used to delay shoulder arthroplasty. These include anti-inflammatories, acetaminophen, and opioids. A Cochrane Review found both acetaminophen and nonsteroidal anti-inflammatories to be useful for pain control in people with hip and knee osteoarthritis [28]. However, the AAOS Clinical Practice Guidelines were unable to find supporting evidence for glenohumeral osteoarthritis [27]. Similarly, the use of glucosamine and chondroitin sulfate for osteoarthritis of the shoulder is not supported in the orthopedic literature [27, 29, 30]. While there has been an increasing trend of prescribing opioids for osteoarthritis pain in the United States over the past 10 years, there is no clear evidence supporting the use of narcotics in the initial treatment of osteoarthritis [27, 31].

Physical Therapy

Physical therapy treatments for glenohumeral arthritis have included joint mobilization and manipulation, exercise, massage, phonophoresis, iontophoresis, ultrasound, and electrical stimulation among others. Given the wide range of physical therapy treatments, the current literature is insufficient to show a clear benefit from physical therapy for patients with osteoarthritis.

Injection

Both corticosteroid and viscosupplementation injections are used to treat glenohumeral osteoarthritis. Studies have shown a short-term improvement in pain with corticosteroid injections for knee osteoarthritis but this effect has not yet been shown in the glenohumeral joint [27, 32, 33]. Viscosupplementation injection, such as hyaluronic acid, appears more promising [32, 34]. The AAOS Clinical Practice Guidelines note that while it is a treatment option, the primary study showing its effectiveness in glenohumeral arthritis is industry supported [27]. Furthermore, there is no viscosupplementation currently available that is FDA approved for the shoulder.

Non-arthroplasty Surgery

Other treatment options that are considered less invasive than shoulder arthroplasty were also reviewed. These include arthroscopic debridement, capsular release, chondroplasty, microfracture, removal of loose bodies, subacromial decompression, distal clavicle excision, and labral repair among others. The AAOS Clinical Practice Guidelines neither support nor oppose the use of these procedures in the treatment of glenohumeral arthritis [27]. There is some data to suggest that arthroscopic debridement is a short-term option for young patients with glenohumeral arthritis as a temporizing measure prior to shoulder arthroplasty [35–37].

Preoperative Evaluation

History

A thorough history is important in identifying patients with pathology that can be treated with anatomic shoulder arthroplasty. There are many etiologies of shoulder pain including arthritis, rotator cuff tear, and cervical spine pathology. A good history and physical exam can help determine the cause of the shoulder pain and the most appropriate treatment.

Most patients with arthritis report pain and decreased range of motion. Decreased range of motion is noted as difficulty with activities of daily living, particularly activities that require external rotation such as putting on a coat. The distribution of pain is important, as radicular distribution with or without numbness may be indicative of cervical spine pathology [38]. Typically arthritic pain is characterized as deep and difficult to localize. Often there is tenderness to

palpation along the anterior and posterior glenohumeral joint lines.

Duration of pain and nonsurgical treatment history are important to elucidate. Arthritic pain is insidious in onset and worsens over time, with occasional acute flairs. The onset of pain can help differentiate acute and chronic disease processes. Arthritis pain usually has an insidious onset [39, 40]. Acute onset associated with trauma is more suggestive of injury, such as acute rotator cuff tear or fracture or an acute arthritic flair that may subside with time and medical management. Aggravating factors can also help identify shoulder pathology. Pain with most shoulder movements and gelling with periods of inactivity are characteristics of arthritis, while patients with rotator cuff tears usually report more specific activity-related pain with overhead activity [40].

Patients should be asked about prior conservative treatments for pain management and if these have been effective. Those who have not tried conservative therapy or who are experiencing acute pain may benefit from a trial of nonsteroidal anti-inflammatory medications or an intra-articular injection. While not supported by the AAOS Clinical Practice Guidelines, these conservative measures often help relieve pain in patients experiencing acute flairs. Conservative management may also be reasonable management for patients who are not medically stable for surgery or those who would prefer to delay arthroplasty.

Patient age, lifestyle, and expectations are an important factor when planning shoulder arthroplasty. The ideal candidate for shoulder arthroplasty is older, but in recent years younger patients are increasingly requesting this procedure as well due to its success and possibly due to perceived improved implant longevity and better revision options. There is no consensus on the results of shoulder arthroplasty in younger patients with some studies showing good implant survival rates at 10 years and others showing decreased long-term function and survival [26, 41]. Younger patients tend to be more active and have increased expectations about what activities they will be able to do after shoulder arthroplasty. While there are no clear guidelines, most surgeons discourage shoulder arthroplasty patients from activities that transmit high loads across the shoulder, such as contact sports and heavy lifting [42, 43]. Therefore, patient expectations should be discussed preoperatively. Heavy laborers and weightlifters may need to consider a new occupation or finding lower-impact activities postoperatively. If such patients are not willing to do this, it may be reasonable to postpone arthroplasty.

An understanding of the patient's social situation is also recommended. Most patients will be in a sling for at least 2 weeks postoperatively and limited activity for 6 weeks or longer to protect their subscapularis repair. This may necessitate visiting nurses or other help at home postoperatively, especially if the affected arm is their dominant arm. Ensuring adequate support postoperatively can help to increase patient compliance and, in turn, minimize complications.

Past Medical and Surgical History

While preoperative clearance by the patient's primary care physician is often required, the surgeon should also be familiar with the patient's medical and surgical history. Significant cardiac or pulmonary problems that may impact anesthesia choice should be discussed. Diabetes should be well controlled and patients should be counseled that it is a risk factor for postoperative infection. Patients with inflammatory arthritis, such as rheumatoid arthritis, may be on corticosteroids or immunomodulators, which can increase the risk of wound breakdown and postoperative infection. A history of venothromboembolism may require more aggressive postoperative anticoagulation. Smoking cessation is recommended to improve the probability of subscapularis healing. Systemic symptoms suggestive of infection at another site should be screened for, including foot ulcerations, open wounds on the ipsilateral extremity and poor dentition.

Shoulder arthroplasty is typically done in the beach chair position, which has been associated with decreased cerebral oxygenation and increased risk of neurologic events [44]. Patients should be screened for medical issues, such as

hypertension, prior stroke, or carotid disease, which may make them more susceptible to adverse effect from positioning.

History of prior shoulder injury, instability, or surgery is crucial. Previous surgery may suggest an etiology of the shoulder pain and may alert the surgeon to possible anatomic abnormalities. Prior stabilization procedures affect soft tissue tensioning, alter surgical landmarks, and can increase the risk to neurovascular structures during surgery. Bony stabilization procedures, such as a Bristow or Latarjet coracoid transfer, posterior bone grafting, or glenoid osteotomy, alter the bony anatomy and also introduce hardware into the glenoid which may require removal. Soft tissue stabilization procedures such as the Putti-Platt and Magnuson-Stack procedures can result in subscapularis shortening, severely limited external rotation, and fixed posterior subluxation of the glenohumeral joint with eccentric glenoid wear.

Patient medications and allergies should be reviewed. Special attention should be paid to immunomodulators, steroids, and anticoagulants. These medications may need to be held in the perioperative period. Current opioid use should be noted as it may make postoperative pain control more difficult. Specific attention should be paid to metal allergies and, if present, implants should be chosen that are free of those specific metals.

Physical Exam

The physical exam should start with inspection of the entire upper extremity. The shoulder should be examined for prior incisions or scars. Previous incisions suggest prior surgical procedures and potentially distorted anatomy. Use of the prior incisions should be considered in surgical planning. Erythema or swelling over the shoulder is worrisome for infection. Visible atrophy of the deltoid or rotator cuff muscles can be indicative of neurologic injury or chronic rotator cuff tear. Examination of the hands also may suggest the underlying diagnosis. Ulnar deviation of the fingers is indicative of rheumatoid arthritis while Heberden's nodes are characteristic of osteoarthritis.

The exam continues with palpation. Palpation should focus on areas of tenderness and any masses around the shoulder. Deep pain that is not localized is typical of arthritis. Point tenderness to palpation over the acromioclavicular joint may suggest other etiologies such as symptomatic acromioclavicular arthritis.

Shoulder range of motion is assessed. The shoulder should be fully exposed so that scapulothoracic motion can be appreciated. Patients with arthritis typically have decreased active and passive range of motion due to osteophytes and capsular contractures. Range of motion is often painful [40]. Loss of external rotation is characteristic of arthritis. Patients may partially compensate for loss of glenohumeral motion with scapulothoracic motion. Decreased glenohumeral range of motion does not appear to significantly impact postoperative outcomes [45]. There has not been any association between preoperative and postoperative forward elevation. However, preoperative internal rotation contracture has been associated with decreased postoperative external rotation [45]. Severe preoperative internal rotation contractures may require subscapularis lengthening in addition to the standard anterior capsulectomy at the time of surgery.

Assessment of the rotator cuff is a crucial part of the physical exam when considering anatomic shoulder arthroplasty. Rotator cuff assessment should consist of individual rotator cuff muscle evaluation [46]. The lift-off test, belly press, and internal rotation strength assess the subscapularis. External rotation lag sign and external rotation strength assess the supraspinatus and infraspinatus. The empty can test evaluates the supraspinatus. Hornblower's sign assesses teres minor. Large, irreparable rotator cuff tear is a contraindication for an anatomic shoulder arthroplasty [6]. Patients with minimally retracted supraspinatus tears and rotator cuff atrophy are still candidates for anatomic shoulder [8, 47]. Rotator cuff assessment can be difficult in patients with arthritis due to range of motion limitations. If there are concerns for rotator cuff integrity, advanced imaging should be considered.

Anatomic shoulder replacement is still a reasonable option in conjunction with solid repair of small full-thickness rotator cuff tears.

Neurovascular testing is an essential part of the physical exam prior to proceeding with shoulder arthroplasty. Atrophy of the infraspinatus or deltoid can be appreciated on inspection of the shoulder and is suggestive of neurologic compromise around the shoulder. Neurovascular testing should include strength testing of shoulder abduction, elbow flexion and extension, wrist flexion and extension, and finger function. It should also include sensory testing in the axillary, lateral antebrachial cutaneous, radial, median, and ulnar nerve distribution. Brachial plexopathy and axillary nerve palsy may be contraindications to anatomic shoulder arthroplasty or may require tendon transfer prior to shoulder arthroplasty or shoulder arthrodesis [48, 49]. Radial pulse should be palpable.

Imaging

Appropriate imaging is essential in preoperative planning for shoulder arthroplasty.

Radiographs

Radiographic evaluation of the affected shoulder should begin with standard radiographs. Important views include Grashey or glenoid oblique, scapular Y, and axillary views. The Grashey or glenoid oblique view shows joint space narrowing more accurately than the AP shoulder and inferior osteophytes are best visualized (Fig. 1.1a, b). Humeral head height can also be evaluated. A high riding humeral head, defined as an acromiohumeral distance less than 7 mm, is suggestive of a rotator cuff tear. The scapular Y view can show humeral head subluxation and loose bodies in the subscapular recess or long head biceps sheath. The axillary view is crucial to ensure the glenohumeral joint is concentrically reduced and identifies anterior or posterior humeral head subluxation. The joint space, osteophytes, glenoid wear pattern, and glenoid bone stock can also be studied from an axillary view (Fig. 1.1c, d).

Shoulder radiographs should be inspected for any hardware that may need to be removed prior to shoulder arthroplasty and for any evidence of prior surgery. After evaluating the shoulder, the humerus should be examined. The humeral canal can be measured in the AP and lateral views to estimate stem size. Decreased cortical thickness or proximal tapering should also be evaluated and, if very thin, cementation of the humeral component may be optimal to minimize risk of intraoperative humerus fracture with press-fit technique. With appropriate software and magnification markers, it is possible to electronically template an anatomic shoulder arthroplasty from the radiographs preoperatively.

The proximal humerus and humeral shaft should be closely examined in patients with a history of prior fracture. Prior proximal humerus fractures may have varus or valgus angulated and/or malrotated humeral head. Prior fractures involving the greater tuberosity often result in superiorly and posteriorly displaced tuberosity malunion. Full-length humerus images should be obtained if the patient has a history of humeral shaft fracture to ensure that a standard stemmed implant can be placed.

CT Scan

While plain radiographs are generally sufficient for standard shoulder arthroplasty, complex shoulders may require advanced imaging. CT scan is the most accurate imaging modality for characterizing glenoid wear, bone loss, and version [50–54]. It is important for the surgeon to be aware of the glenoid morphology preoperatively in order to properly position the glenoid component (Fig. 1.2). Improperly placed components can lead to early arthroplasty failure.

Walch et al. characterized glenoid morphology into five categories (Fig. 1.3a, b). Type A1 is a centered humeral head with minimal glenoid erosion. Type A2 is a centered humeral head with major glenoid erosion. Type B1 is a posteriorly subluxed humeral head with minimal erosion.

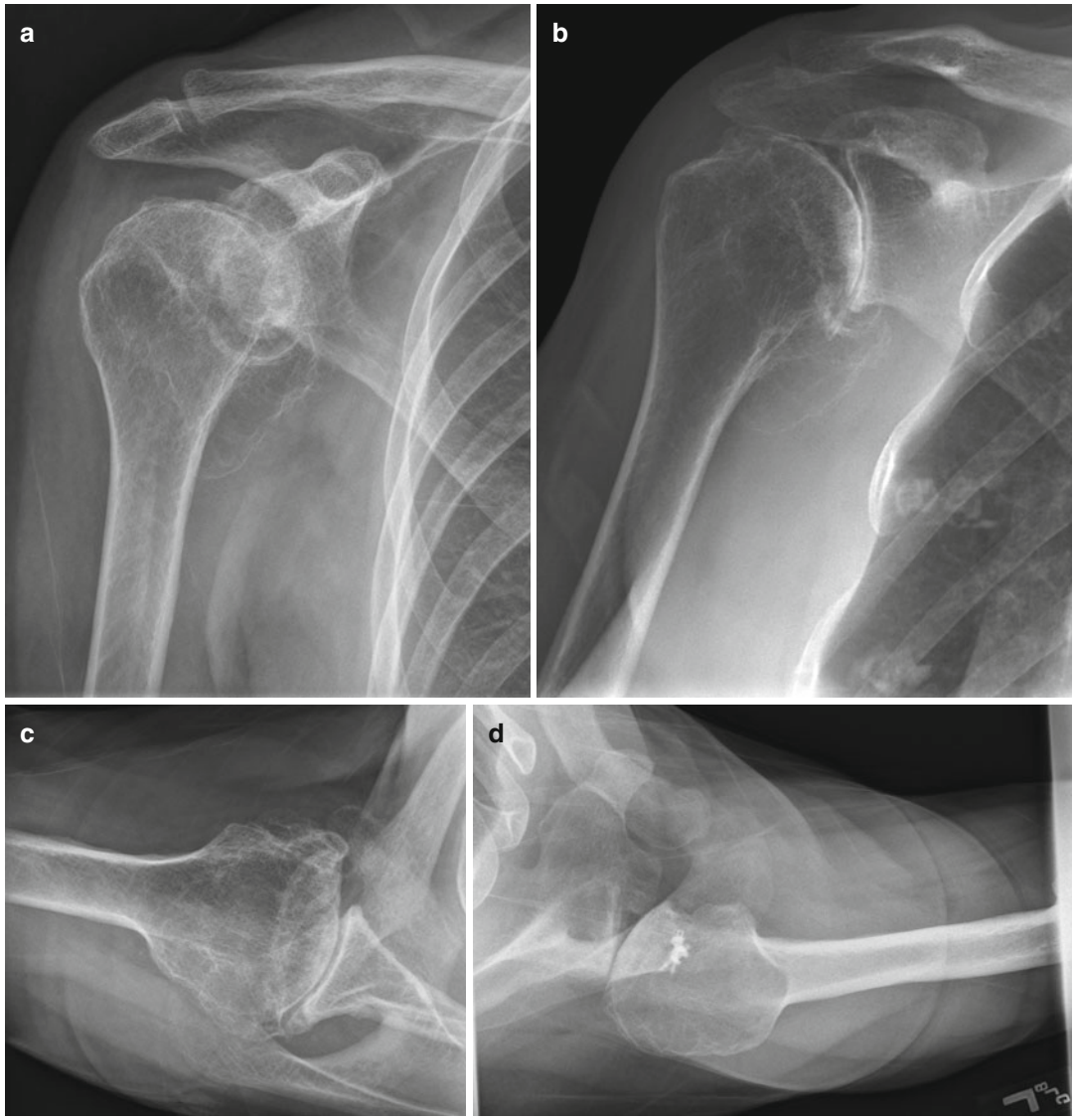

Fig. 1.1 (**a**) Standard AP of the shoulder with osteoarthritis. Note the large inferior humeral neck osteophyte and preserved acromiohumeral interval. (**b**) Grashey or glenoid oblique view of the same shoulder. Note how this view demonstrates the loss of glenohumeral joint space. (**c**) Axillary view of the same shoulder. Note osteophytes anteriorly and posteriorly that may contribute to loss of motion. Also note concentricity of the joint and loss of joint space. (**d**) Axillary view of a patient with prior anterior instability surgery. Note the posterior subluxation of the humerus with respect to the glenoid and posterior glenoid wear

Type B2 is a posteriorly subluxed humeral head with posterior erosion and a biconcave glenoid. Type C is a dysplastic glenoid that is retroverted more than 25° [55, 56]. Glenoid retroversion can be calculated by comparing the glenoid surface to a line perpendicular to the long axis of the scapula [57]. Glenoid version can be calculated on an axillary view but is more accurately calculated on CT scan [51]. A retroverted glenoid may require eccentric reaming, posterior bone grafting, or an augmented glenoid component to appropriately position the implant.

Glenoid bone deficiencies should be inspected. Surgeons should be prepared for posterior bone

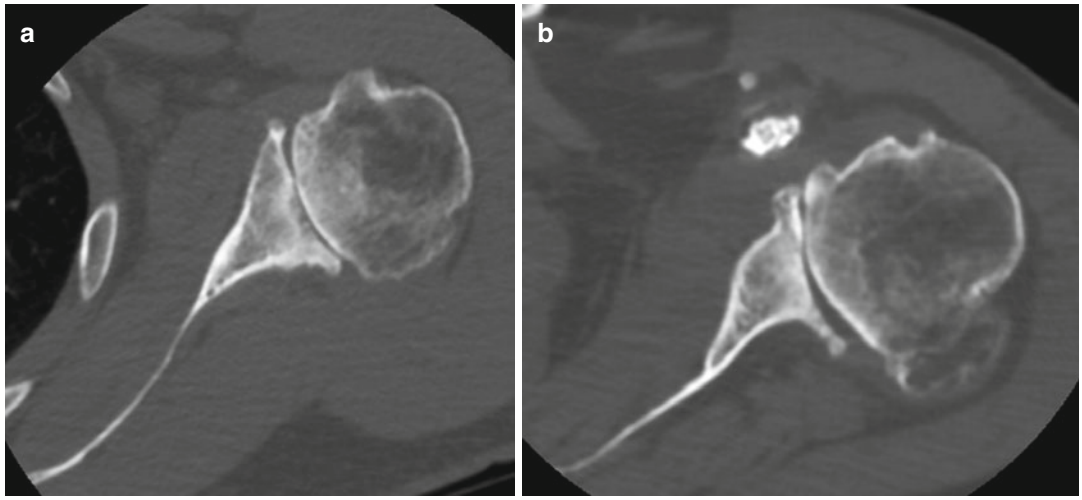

Fig. 1.2 (**a**) Axial cut of CT scan demonstrating mild posterior glenoid erosion. This can likely be treated with eccentric reaming of the anterior glenoid to restore glenoid version without significant medialization of the joint. (**b**) Axial cut of CT scan demonstrating more severe posterior glenoid bone loss. Anterior reaming alone may result in medialization with more retroversion than is desirable. Alternative options include bone grafting or augmented glenoid component implantation

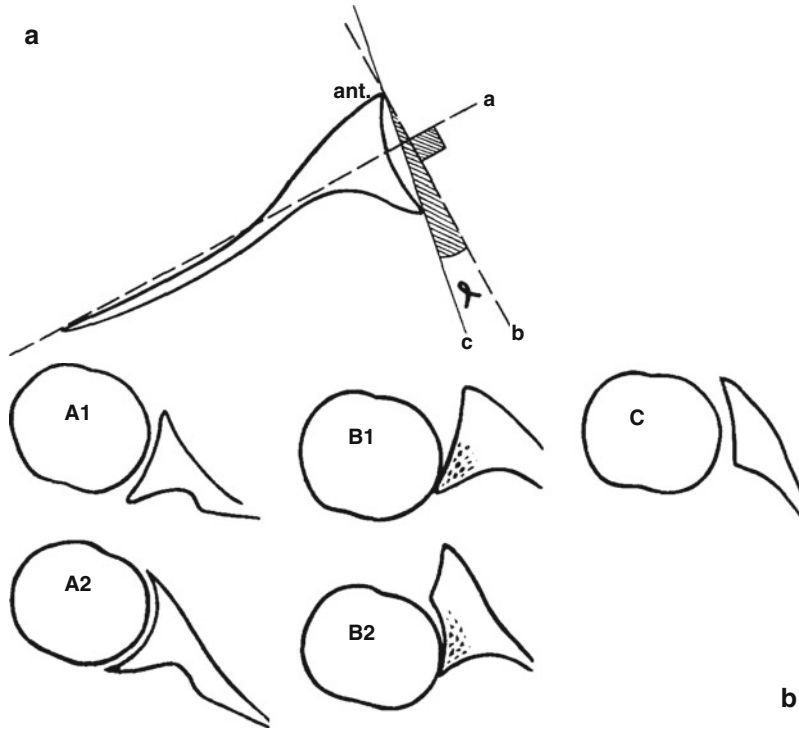

Fig. 1.3 (**a**) Method for calculation of glenoid version. *A* is the axis of the blade of the scapula. *B* is a line perpendicular to the axis of the blade of the scapula. *C* is a line tangent to the anterior and posterior edges of the glenoid fossa. γ is the angle of glenoid retroversion. (**b**) Types of glenoid morphology in primary osteoarthritis (see text) (Figs. 1 and 3 from Ref. [55])

grafting if there is more than 15° of retroversion on the glenoid or if there does not appear to be enough bone to seat the glenoid component [57]. Alternatively, there are now posteriorly augment glenoid component options available in several shoulder replacement systems for management server posterior wear without the need for bone grafting.

Recent studies have looked at using 3D CT scans for preoperative planning. 3D reconstructions with the humeral head subtracted allow for better visualization of the glenoid and understanding of its morphology, version, and bone deficiencies. Current studies suggest more accurate glenoid component placement with the use of preoperative 3D CT scans [58, 59].

MRI

MRI is the best imaging modality for evaluating soft tissues around the shoulder. It should be obtained when there is concern based on the patient's history, physical, or plain radiographs for a rotator cuff tear (Fig. 1.4a, b). An identified rotator cuff tear should be evaluated on whether or not it can be repaired. A repairable rotator cuff tear is not a contraindication for anatomic shoulder arthroplasty, but irreparable or questionably repairable rotator cuff tears are more appropriately treated with hemiarthroplasty or reverse shoulder arthroplasty depending on functional status, activity level, and patient age.

Rotator cuff atrophy can also be identified on MRI. Rotator cuff atrophy is not a contraindication to anatomic shoulder arthroplasty if the rotator cuff is intact. Long-standing arthritis limits shoulder range of motion resulting in rotator cuff atrophy in older patients. Deltoid atrophy may raise concern for axillary nerve injury or brachial plexopathy.

Other Imaging Modalities

Ultrasonography has been shown to be equivalent to MRI in identifying rotator cuff tears, measuring retraction of torn rotator cuff muscles, and characterizing fatty infiltration [60, 61]. Ultrasonography is highly operator dependent. It may replace MRI for preoperative rotator cuff assessment in hospitals that use ultrasonography for rotator cuff evaluation on a regular basis.

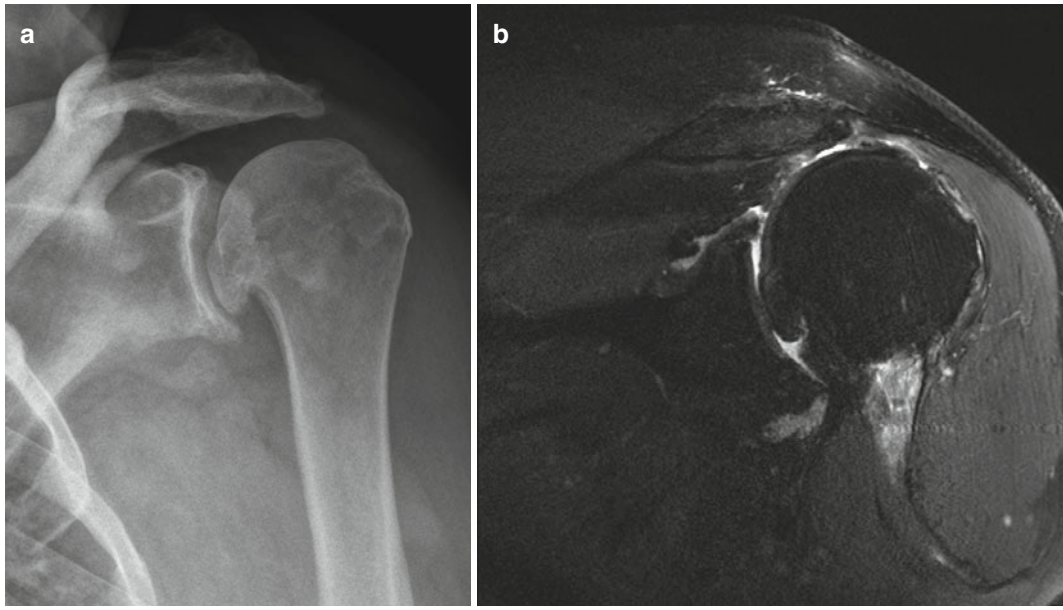

Fig. 1.4 (**a**) Grashey view of shoulder with osteoarthritis and significant rotator cuff weakness. (**b**) Coronal MRI cut showing massive retracted supraspinatus tear with cartilage loss

For patients who cannot undergo MRI, CT arthrogram is a reasonable alternative. While rotator cuff atrophy may be more difficult to characterize, full-thickness rotator cuff tears should be identifiable.

Laboratory Studies

Preoperative laboratory studies can help to ensure that the patient is medically ready for surgery. Complete blood count will identify patients with preoperative anemia or thrombocytopenia. Both of these factors will increase the patient's risk for requiring a blood transfusion postoperatively. Type and screen should be obtained on all patients preoperatively in the event a blood transfusion is required intraoperatively or postoperatively.

Coagulation markers (INR, PT, PTT) are important if the patient is on warfarin. Warfarin is generally stopped 5–7 days prior to surgery with an INR checked on the day of surgery to ensure that it has normalized. Elevated INR in patients not on warfarin may be suggestive of liver disease.

A basic metabolic panel may be obtained. Creatinine clearance can be calculated which may be necessary when dosing perioperative antibiotics. For patients with renal disease, it will establish a baseline creatinine that can be compared to postoperatively. High glucose may be suggestive of undiagnosed or poorly controlled diabetes.

Hemoglobin A1C is crucial for diabetic patients. Poorly controlled diabetics are at increased risk of wound healing complications and postoperative infections [62]. In well-controlled diabetics, hemoglobin A1C is usually below 7–7.5 %.

In elderly patients in whom there is a concern for malnutrition, pre-albumin, albumin, and transferrin should be obtained. Malnourished patients are at increased risk for wound healing complications and infection [63]. Since anatomic shoulder arthroplasty is an elective procedure, improving the patient's nutritional status is essential.

Other Considerations

Surgical Timing

Surgical timing is an important consideration for patients with osteoarthritis and inflammatory arthritis. Many of these patients have more than one joint affected. Lower extremity arthroplasty often requires the use of ambulatory aides that can compromise the shoulder arthroplasty. If possible, hip or knee arthroplasty should be done before shoulder arthroplasty [64].

Tranexamic Acid

Tranexamic acid has been used in total hip and total knee arthroplasty to decrease intraoperative and postoperative blood loss. Multiple studies have shown decrease in blood transfusions with the use of intravenous or topical tranexamic acid [65, 66]. A recent study has shown similar results with topical tranexamic acid after total shoulder arthroplasty [67]. While further study is needed, the current shoulder arthroplasty results and extrapolation from the hip and knee arthroplasty data suggests that the use of tranexamic acid might be considered during shoulder arthroplasty.

Postoperative Pain Control

Pain control is a concern after every surgery. In older patients, large doses of opioids can cause confusion and delirium. Minimizing opioids decreases many of these side effects. Multiple studies have shown that multimodal pain control results in better pain control and higher satisfaction with lower amounts of opioids. There has been no evidence of increased adverse events with the addition of an interscalene or other peripheral nerve blocks or nerve catheters to a multimodal pain control regimen [68, 69]. Regional anesthesia should be considered for pain control during and immediately after shoulder arthroplasty.

Postoperative Anticoagulation

The use of postoperative anticoagulation after orthopedic surgery is often discussed with regard to hip and knee arthroplasty patients. Shoulder arthroplasty patients tend to have better mobility postoperatively than knee and hip arthroplasty patients, and recent data suggests that deep vein thrombosis after shoulder surgery is lower than after knee arthroplasty [70]. The AAOS clinical practice guidelines recommend either mechanical or chemical venothromboembolism prophylaxis based on patient risk factors. Shoulder arthroplasty patients on anticoagulation preoperatively should have their anticoagulation restarted.

Summary

This chapter outlines the indications for anatomic shoulder arthroplasty and details the preoperative workup that should be completed prior to proceeding with surgery. Subsequent chapters will outline the technical aspects, rehabilitation, and outcomes of the procedure in great detail.

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