In the name of Allah, the Beneficent, the Merciful.
Evaluation of the adult with shoulder complaints

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INJECTION TESTS

- When the physical examination suggests the presence of a specific disorder, certain tests may aid diagnosis. As an example, a lidocaine injection test can be used to aid diagnosis in the following circumstances
- Evaluate glenohumeral joint involvement
- Confirm rotator cuff tendinopathy
- Evaluate rotator cuff tear
- Determine the degree of a frozen shoulder
The lidocaine injection test is used to exclude intrinsic glenohumeral joint pathology (e.g., rotator cuff tear, frozen shoulder). To increase the space for needle insertion, the clinician may need to apply downward traction to the elbow. The point of entry is 1 to 1.5 inches (2.5 to 4 cm) below the midpoint of the acromion. The angle of entry parallels the acromion. A 1.5 inch (4 cm), 22-gauge needle is inserted to a depth of 1 to 1.5 inches (2.5 to 4 cm), and 1 mL of lidocaine is injected into the deltoid and 1 to 2 mL into the subacromial bursa.
Patients with a rotator cuff tear typically manifest persistent weakness despite pain relief with injection, while those with rotator cuff tendinopathy have normal strength in association with pain relief.

Patients with a frozen shoulder have persistent loss of mobility despite the injection.

Dramatic reduction in pain and improvement in overall shoulder function after injection of the subacromial bursa provides evidence against a significant glenohumeral joint process.
Diagnostic imaging of the shoulder may be valuable when directed by the history and physical examination.
Plain radiographs

Plain radiographs of the shoulder generally have limited benefit in the evaluation of nontraumatic shoulder pain.

This was illustrated in a study of 312 patients seen in an emergency department setting for shoulder pain: only 37 of the 185 shoulder films (20 percent) were therapeutically informative, revealing conditions requiring specific therapy (ie, a fracture or dislocation).

No patient without a shoulder deformity or a precipitating fall had an informative radiograph.
A subsequent study of 206 patients used the presence or absence of the following features: history of falling, swelling, rest pain, abnormalities in range of motion, and obvious deformities of the shoulder to help identify those in whom a shoulder radiograph was unlikely to be informative.

Among those without obvious shoulder deformities and swelling, the following three groups had relatively insignificant radiographs:
● Patients without rest pain who had fallen. No significant radiographic findings were found among 18 patients with these features.

● Patients who had fallen, had rest pain, and had normal range of motion. No therapeutically informative radiographs were reported in 10 such patients.

● Patients who had not fallen. Only 1 of 107 such patients had a lytic lesion discovered on radiograph; this individual was already known to have multiple myeloma.
While there are no specific guidelines for when radiography is indicated, we generally **recommend** obtaining **plain films** in patients who have **lost range of motion**, particularly when there is severe pain, and after trauma.
An axillary view of a normal shoulder shows the components of the shoulder including the glenoid (g), humeral head (h), coracoid process (c), clavicle (cl), lesser tuberosity (lt), acromion (a), and greater tuberosity (gt).
When plain films are obtained in a patient with a history of trauma, both anteroposterior (AP) and axillary views are warranted since some conditions can be missed on the former alone. Additional views can be helpful when looking for particular pathology. As examples, a scapular Y view may reveal an anterior glenohumeral dislocation, while a true AP (ie, Grashey view) may reveal a glenoid fracture.
Plain films can identify the following:

- Fractures of the proximal humerus
clavicle

Plain radiograph of distal clavicle fracture Type I

This plain radiograph shows a Type I fracture of the distal clavicle with mild angulation (arrow). Intact ligaments hold the proximal fragment in normal position.

and scapula
Glenohumeral dislocations

Anteroposterior view of the right shoulder demonstrates medial displacement of the humeral head in relation to the glenoid fossa, with the humeral head lying inferior to the coracoid process.
This plain radiograph is from a 67-year-old woman with anterolateral shoulder pain and stiffness for several years. She denies any history of fracture, dislocation, or severe injury. However, she states: "People say I've always done man's work. It doesn't surprise me that it is arthritic since arthritis runs in my family." On plain radiograph, glenohumeral osteoarthritis is characterized by loss of articular cartilage between the humeral head and the glenoid, osteophyte formation extending from the inferior portion of the humeral head, and humeral head sclerosis. The combination of the loss of cartilage and the osteophyte creates the club-like deformity.
• Acromioclavicular (AC) joint arthritis or injury

This plain x-ray demonstrates inferiorly directed osteophytes consistent with acromioclavicular (AC) osteoarthritis.
- Sternoclavicular (SC) joint arthritis (apical lordotic views of the chest)
- Calcific tendinopathy
Plain radiograph of calcific tendinopathy of the shoulder in the resorptive phase

The plain radiograph above shows calcific deposits (arrows) in the shoulder. The deposits have a fluffy appearance with poorly defined limits, suggesting that the patient's calcific tendinopathy is in the resorptive phase.
In addition, indirect evidence of rotator cuff thinning, tear, or both may be evident on plain radiograph of the shoulder.

This radiograph is from a 74-year-old woman with a 25-year history of "shoulder bursitis." She is unable to raise her arm overhead, cannot comb her hair, and cannot reach up to higher shelves to remove dishes. She cannot abduct her right shoulder without using her left arm for assistance and is unable to externally rotate her right shoulder against the slightest resistance. The plain radiograph above provides indirect evidence of a rotator cuff tendon tear, including cephalad migration of the humerus (high-riding humeral head), indicated by the arrows, and substantial loss of the subacromial space (which normally contains the 7 mm thick rotator cuff tendon and 1 mm thick subacromial bursas), indicated by the dashed arrow.
A subacromial space measurement less than 1 cm suggests thinning with or without tear, which can be confirmed by magnetic resonance imaging (MRI).
Magnetic resonance imaging

MRI is the preferred advanced imaging study for patients with suspected rotator cuff injury. A normal MRI suggests that the likelihood of a rotator cuff tear is low. MRI is also useful in the evaluation of avascular necrosis, biceps tendinopathy and rupture, inflammatory processes, and tumors.
Ultrasonography

Musculoskeletal ultrasound is widely used to assess patients with shoulder pain. In the hands of skilled operators, the diagnostic accuracy of ultrasound has been found to be the equivalent of MRI in identifying rotator cuff tears and biceps tendon tears and dislocations. Ultrasound is less expensive than MRI and preferred by patients.
Arthrography

Arthrography has largely been replaced by MRI for the diagnosis of rotator cuff disorders. It is specific for rotator cuff tears, but it has a low sensitivity since it cannot detect partial-thickness tears nor associated soft tissue injuries.

Arthrography still may be useful for evaluating frozen shoulder and may even be therapeutic.
# Imaging examinations for evaluation of shoulder pain

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<th>Imaging modality</th>
<th>Indications</th>
<th>Limitations</th>
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| Radiography (also called plain film or X-ray) | Initial choice for all shoulder pathology  
Often the only modality needed for:  
- Trauma  
- Calcific tendonitis  
- Osteoarthritis | Detection of:  
- Bone contusion  
- Subtle fractures  
- Soft tissue pathology |
| CT                               | Preoperative evaluation of intra-articular fractures  
Post arthroplasty evaluation | Limited soft tissue evaluation  
Detection of bone marrow edema |
| MRI                              | Best modality for detecting soft tissue pathologies  
Evaluation of bone marrow | Lower sensitivity for evaluation of shoulder instability/labral tear compared with MR arthrography |
| Technetium 99m bone scan         | Infection after arthroplasty (shoulder imaging)  
Suspected metastases (whole body imaging) | Lack of anatomic localization and resolution |
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<td>Conventional radiography</td>
<td>Diagnosis and treatment of frozen shoulder (adhesive capsulitis)</td>
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<td>MR arthrography</td>
<td>Procedure of choice for evaluating shoulder instability/labral tear</td>
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<td>High suspicion of rotator cuff tear with normal MRI</td>
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<td>CT arthrography</td>
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<td>Shoulder instability/labral tear when MR arthrography is not available or is contraindicated</td>
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<td>Ultrasonography</td>
<td>Evaluation of:</td>
<td>Diagnostic performance not generalizable as the technique is highly operator dependent</td>
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<td></td>
<td>- Rotator cuff tendons</td>
<td>Modalitiy is not widely available as on-site operator expertise is required</td>
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<td>- Biceps tendon</td>
<td>Limited evaluation of very small or very large (&gt;3 cm) tears and for partial thickness tears</td>
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<td>- Subacromial space</td>
<td>Limited evaluation of the labrum and bony structures</td>
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<td>- Intervventional therapeutic procedures</td>
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Intravenous contrast is not administered in shoulder CT or MRI for most clinical indications.

Soft tissues associated with the shoulder include the joint capsule, ligaments, tendons, bursa, muscles, and labrum.

CT: computed tomography; MRI: magnetic resonance imaging; MRA: magnetic resonance angiogram; MR: magnetic resonance.
INFORMATION FOR PATIENTS

UpToDate offers two types of patient education materials, “The Basics” and “Beyond the Basics.”

The Basics patient education pieces are written in plain language. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials.

Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed and are best for patients who want in-depth information and are comfortable with some medical jargon.