## 82. Rotator Cuff Tears

For the performance of shoulder MR, the initial acquisition of axial images of 3 mm slice thickness or less with the shoulder in neutral or slight external rotation can be helpful for properly prescribing parasagittal and paracoronal slices parallel to the surface of the glenoid cavity and supraspinatus tendon, respectively. A dedicated surface shoulder coil allows maximization of SNR and spatial resolution. Evaluation of the long head biceps tendon, neurovascular bundles, and the relationship between the humeral head and glenoid labrum is often sufficiently performed in the axial plane, whereas the paracoronal slices (Fig. 82.1A-D) better demonstrate the rotator cuff muscles, tendons, and associated bursae. FSE T2WI (with or without fat suppression) have a high accuracy for the detection of abnormalities in the shoulder, while axial GRE T2WI and MR arthrography are useful for evaluation of the glenoid labrum. Hyaline cartilage lining the articular surfaces of the humeral head and glenoid cavity normally demonstrates intermediate SI on T2WI, whereas fibrocartilage, which lacks free mobile protons, composes the glenoid labrum and parts of the acromioclavicular (AC) joint and appears typically of low SI on intermediate- and T2-weighted images. Fibrous rotator cuff tendons similarly demonstrate low SI.
Degenerative tendinosis, partial tears, and small full-thickness tears of the rotator cuff often represent a continuum of disease and may be difficult to distinguish. Tendinosis demonstrates increased SI on T1 or PDWI. SI on FS T2WI is less than that of fluid, as illustrated in the case of supraspinatus tendinosis in Fig. 82.1A. Here, associated tendinous thickening is present along with subacromiodeltoid fluid, the latter indicating reactive bursitis. Brighter SI within the supraspinatus tendon is present in the FS T2WI of Fig. 82.1B, a case of a partial supraspinatus tear. Here, hyperintensity is limited to the more commonly involved articular surface (i.e. a partial articular or inferior surface tear). Reactive bursitis is again present. Partial tears may also demonstrate fluid SI extending to the bursal surface and are classified as low grade (less than 50% of tendon thickness) or high grade lesions (greater than 50%). Interstitial partial tears demonstrate high fluid-like SI on T2WI but do not extend to the tendon's surface. Tendon thickness and partial articular surface tears are also well-evaluated by MR arthrography. Contrast extends into the latter, but does not extend into the bursa as with complete tears. Full-thickness tears consist of hyperintensity pervading the entire tendon thickness from its articular to bursal surface (T2WI of Fig. 82.1C, arrow). Full-thickness tears are classified based on size as small (< 1 cm), medium (< 3 cm), large (3-5 cm), and massive (> 5 cm) lesions. Intra-articular fluid (and gadolinium-based contrast agent, in arthrography) typically extends into the subacromiodeltoid bursa. The tendon may retract such as in Fig. 82.1D (a T2WI), in which

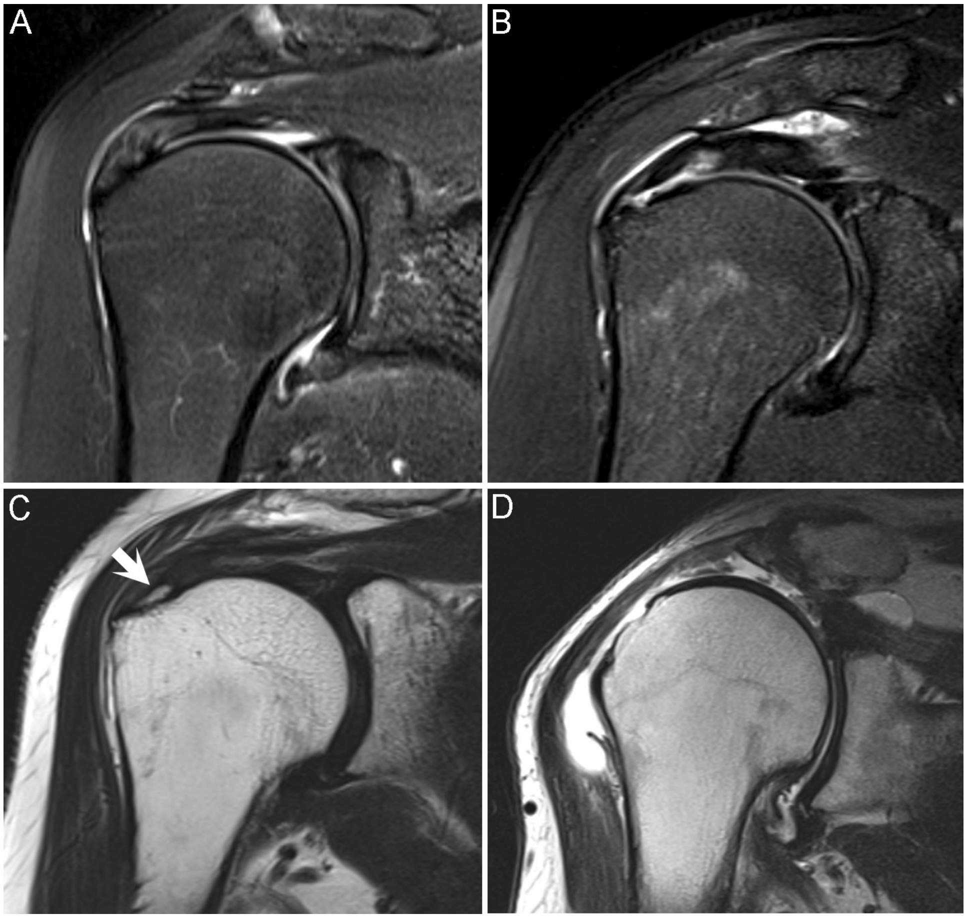


Fig 82.1

the muscle bulk, although not visualized completely, is correspondingly atrophic. Fatty infiltration often accompanies atrophy, appearing as intramuscular hyperintensity on T1WI. In this case, fluid SI is prominent within the subacromiodeltoid space. Chronically, scar or granulation tissue may infiltrate the area of a tear, AC joint cysts may form, and the acromiohumeral distance may narrow. With supraspinatus tears, stress may be progressively propagated to the infraspinatus and biceps tendon, whereas larger or anterior tears may involve the subscapularis tendon. Chronically, the humeral head ascends, resulting in greater tuberosity sclerosis or hypertrophy, manifesting as low SI on T1WI. Shoulder impingement syndrome often underlies rotator cuff tears and degeneration of the long head of the biceps tendon, AC joint, and coracoacromial ligament. This is secondary to chronic rotator cuff fatigue and is associated with the inability to maintain a concentrically located glenohumeral joint during the wide range of motion that the shoulder exhibits. Subacromial bone proliferation, osteophytosis, and capsular hypertrophy at the inferior AC joint are common findings of impingement syndrome. Small osteophytes may only consist of cortical bone and thus demonstrate low SI on conventional sequences, potentially leading to confusion with normal insertion points of the coracoacromial ligament or deltoid. Larger, marrow-containing osteophytes demonstrate central, fat-like SI of bone marrow. AC joint hypertrophy and callus formation appear as intermediate SI around the joint on all sequences. Historically, an anterolaterally angulated or type 3 (type 1 straight, type 2 curved, type 3 hooked) acromion was thought to be associated with impingement, as well as an anteriorly (best seen on sagittal images) or laterally (best seen on coronal images) downsloping acromion. “Secondary” impingement may result from joint instability, occurring in athletes who throw overhead and may lack the typical associated coracoacromial abnormalities. Failure of anterior acromial apophyseal fusion (os acromiale) may also contribute, with surrounding high SI correlating to instability or degenerative changes within.