MR Imaging Evaluation of Disorders of the Chest Wall

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KEYWORDS

• Chest wall • MR imaging • Sarcoma

Diseases of the chest wall are uncommon in comparison with those of the heart and lungs. When the chest wall is abnormal, the unique tissue- and spatial-resolving capabilities of MR imaging are useful in characterizing the anatomic extent and tissue composition of lesions. MR imaging is complementary to radiographic and CT techniques. The authors review the uses of MR imaging in evaluating lesions of the chest wall, and describe characteristic MR imaging findings in common and unusual diseases. The thoracic inlet and brachial plexus are discussed in an article by Parker and colleagues elsewhere in this issue.

IMAGING TECHNIQUE

Selection of the appropriate MR imaging technique begins with an assessment of the extent of the suspected disease process. The patient's history should be reviewed, as should prior imaging. The size and location of suspected lesions guide the choice of field of view and coil types. When possible, dedicated surface coils should be used, and smaller palpable lesions marked at the overlying skin.

Prone imaging has been proposed as a means of minimizing respiratory motion for anterior chest wall lesions. Respiratory gating is useful for limiting breathing artifacts during image acquisition. Cardiac gating for chest wall lesions is less critical than with assessment of mediastinal structures. Although selection of imaging sequences should be tailored to the suspected disease, in general, axial and sagittal or coronal images are acquired using T1- and T2-weighted sequences. Fat-saturation sequences are useful for confirming macroscopic fat and should also be used on enhanced images. Gadolinium administration is an important part of MR imaging technique, and patients should be screened for contraindications to administration. In patients who have diminished renal function, informed consent should be obtained if gadolinium administration is required. Typically, a dose of 0.1 mmol/kg of intravenous gadolinium is administered.[1,2]

SOFT TISSUES OF THE CHEST WALL

Cellulitis, Necrotizing Fasciitis

Infections of chest wall soft tissues range from cellulitis to infections of deeper soft tissues, including myositis, osteomyelitis, abscess, and necrotizing fasciitis. Cellulitis often appears more extensive on MR imaging than on other imaging modalities because of MR imaging's sensitivity for tissue edema. Cellulitis is characterized by high T2 signal in subcutaneous soft tissues (**Fig. 1**A), sometimes with thickening of the skin or small fluid collections, with diffuse enhancement after gadolinium administration (**Fig. 1**B). MR imaging is helpful in detecting the enhancing rim of an abscess, although, because some tumors demonstrate similar appearance when centrally necrotic, correlation with clinical findings is important.[3–5]

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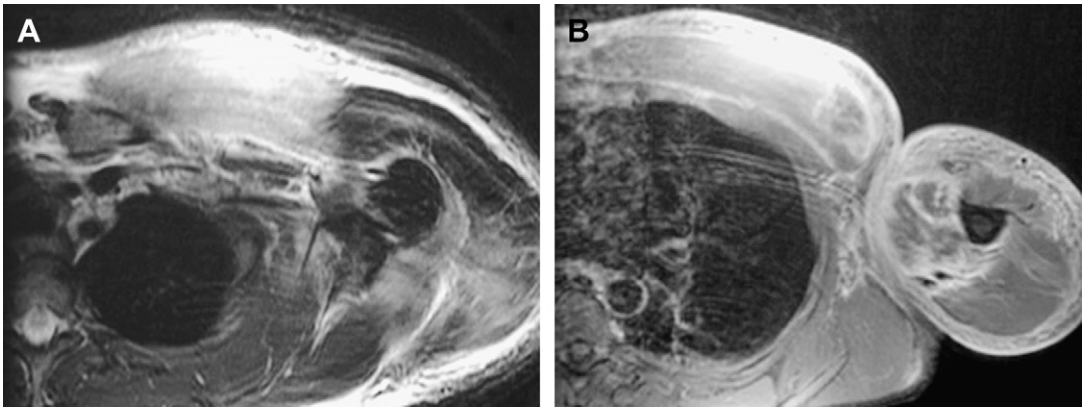

Fig. 1. Necrotizing fasciitis. (*A*) Axial T2-weighted image from a 35-year-old injection drug user demonstrates diffuse edema of the subcutaneous tissues, pectoralis major, and proximal arm muscles. (*B*) Axial T1-weighted image following intravenous administration of gadolinium shows fascial enhancement surrounding these muscle groups and also extending into the axilla.

Necrotizing fasciitis is a soft tissue infection typically caused by group A *Streptococci* that involves superficial and deep fascia with extensive tissue edema and enhancement. Soft tissue fluid collections and gas may be present, although gas is more readily discerned on CT. In the absence of deep fascial involvement on MR imaging, necrotizing fasciitis is unlikely.[4]

Muscle Lesions

Muscles of the chest wall are a frequent site of traumatic injury and inflammation. MR imaging is superior to CT and ultrasound (US) in assessment of muscle injury and pyomyositis, because of its tissue sensitivity and multiplanar capability, although CT and ultrasonography are more useful for guiding tissue biopsies or other interventions.[5–7] Muscle strains, ruptures, and hematomas are often seen as a result of sports injuries and trauma, frequently involving the pectoralis muscles. Strains are characterized by edema and perimuscular fluid, with high signal on T2 -weighted imaging sequences. When hematoma is present, the muscle may be diffusely enlarged, with heterogeneous high T1 and T2 signal intensity varying as the hematoma evolves (**Fig. 2**). Muscle hematomas typically resolve in 6 to 8 weeks, although fibrosis may develop.[7–9] Pyomyositis is a bacterial infection of the skeletal muscles, typically presenting with muscle pain and fever. Its incidence is increasing in the United States, particularly among patients who have diabetes or HIV infection. The causative organism is typically *Staphylococcus aureus*, *Streptococcus* species, or gram-negative bacteria. MR imaging typically demonstrates muscle enlargement, edema with T2 hyperintensity, and diffuse or heterogeneous

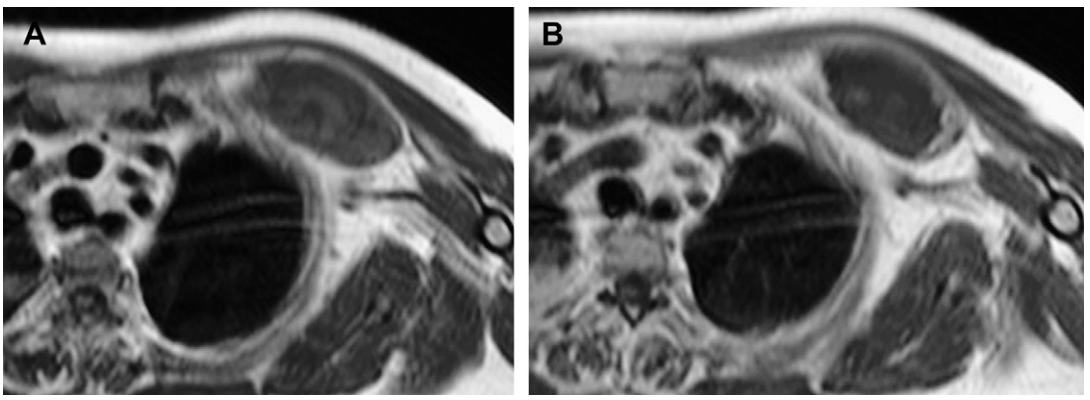

Fig. 2. Intramuscular hematoma. (*A*) Axial T1-weighted image demonstrates a circumscribed low signal intensity hematoma in the pectoralis minor muscle in this patient on anticoagulation therapy. (*B*) Axial T1-weighted image following intravenous administration of gadolinium shows peripheral nodular enhancement.