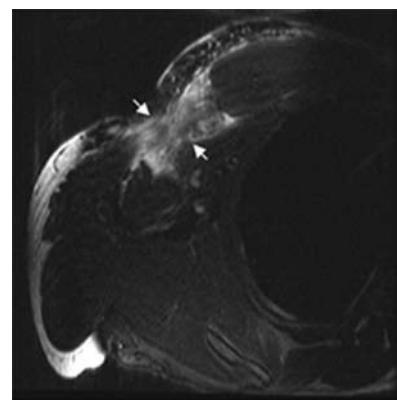


## Magnetic resonance imaging assessment of the pectoralis major muscle rupture

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A 46-year-old male patient, experienced heavy lifter in the last 10 years presented to King Khalid University Hospital, Riyadh, Kingdom of Saudi Arabia one year ago with complaints of sudden snap and marked pain in his right axilla during his sporting activity. He has no past history of antibiotic, or steroid use. On examination, the skin was intact with some ecchymosis, and moderate degree of swelling had developed around the shoulder area. He reported pain on palpation over the anterior aspect of the proximal humerus and the entire axillary area. All ranges of active motion were painful and weak relative to the opposite side. Pain and weakness were greatest during adduction, and internal rotation. The patient underwent magnetic resonance imaging (MRI), since the extent of the pectoralis muscle injury cannot be clearly evaluated because of pain and swelling, which revealed extensive high grade partial tear of the pectoralis major muscle, near the musculotendinous junction with big hematoma seen within the muscle and spreading distally to the tendinous insertion (Figure 1). The patient was managed conservatively, and he regained most of his activity after 6 months. After injury, his shoulder is immobilized in adduction and internal rotation for 2 weeks, and then he started pendulum exercise, and free passive movements also are allowed. After 4 week, he started light resistance training and strengthening exercise. Complete report is obtained for the patient including the range of movement of the shoulder joint, patient symptoms (mainly pain) with clinical evaluation of the appearance of the chest wall, and axilla and pectoralis muscle strength measurements. These clinical results were evaluated according to functional result categorization designed by Kakwani et al.<sup>1</sup> Our patient is categorized to be good as he experienced infrequent pain with slight reduction of movement, in particular during adduction, no cosmetics complain, <20% isokinetic strength deficit. We report this note to draw the attention to this rare injury.

On MRI images, the normal appearance of the pectoralis major muscle is a fan-shaped structure of striated intermediate signal intensity down to the musculotendinous junction, where it exhibits a low-signal-intensity that inserts into the humerus.<sup>2</sup> The pectoralis major muscle has a broad origin from the clavicle, sternum, and the fifth through seventh costal cartilages. The muscle fibers fan into 3 laminae (clavicular, manubrial, and abdominal) which unite into a single tendon that inserted in the bicipital groove of the humerus, just lateral to the biceps tendon. The tendon of insertion measures approximately 5 mm in transverse dimension, and 5 cm in cephalocaudal



**Figure 1** - The MRI axial T2 FS showed demonstrate swelling, and abnormal high signal (arrows) at the musculotendinous junction representing high grade partial tear of the pectoralis major muscle. MRI - magnetic resonance imaging.

dimension.<sup>3</sup> The mechanism of injury of a Pectoralis major rupture is due to direct, or indirect trauma, or due to a combination of both. Several studies have reported an increased incidence of injuries because of excessive muscle tension, rather than direct trauma.<sup>4</sup> The muscle normally helps to 'brake' the motion, preventing the weight from falling on the chest. Direct trauma causes tears of the muscle belly, whereas excessive tension or indirect trauma causes avulsion of the humeral insertion, or disruption at the musculo-tendinous junction.<sup>1</sup> The correct diagnosis of complete or partial ruptures of the pectoralis major muscle complex is important because of the muscle's vital role in the shoulder function.<sup>5</sup> The diagnosis can usually be made after a complete and careful history and exam, which may be misleading, and are often affected by hemorrhage, tenderness, or spasm in acute settings. Radiographs are unremarkable in most circumstances. The MRI is valuable in the evaluation of patients with pectoralis muscle rupture, as it provides excellent details regarding the extent of the injury, and determine the specific location (muscle substance, musculotendinous junction, or tendon insertion), and distinct between partial and complete tear. The percentage of injury is quantified by assessing the integrity of fibers arising from the muscle belly and following them to their osseous insertion. A complete tear is defined as a distinct complete interval involving all of the fibers at the site of injury. A partial tear is defined as some continuity of the fibers at the site of injury. Partial injuries are considered high grade if more than 70% of the fibers are torn, moderate if 30-70% of the fibers are torn, and low grade if less than 30% of the fibers are torn. Coronal images are the most useful for evaluating the grade of partial tearing.<sup>2</sup> Acute injury appeared as area of abnormal high signal intensity at the musculotendinous junction with retraction of the injured muscle fibers or tendon-bone discontinuity at the site of injury. Periosteal stripping

is considered present, when intermediate to increased signal intensity is seen superficial to the humeral cortex at the insertion site. Chronic injuries manifested as low signal intensity, and muscle retraction, findings indicative of scarring and fibrosis. The most important images appear to be the axial oblique, and a coronal view with the use of a surface coil to increase the signal-to-noise ratio, enhances spatial resolution, and increases the conspicuity of the injury.<sup>5</sup>

In conclusion, preoperative diagnosis of pectoralis muscle tear is important for the surgeon to define the location of the tear, and to determine whether the rupture is complete or incomplete, to select the appropriate treatment regimen because tendon avulsion from the humerus is treated with prompt surgical repair, whereas muscle-tendon injuries are generally treated in a conservative manner. Early surgical repair allows avoidance of adhesions, muscle scarring, fibrosis, and atrophy. The MRI provides excellent details of pectoralis muscle injury, and may be used to monitor interval healing including resolution of hematoma, and to evaluate muscle quality before a return to competitive sport.

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