Complete Rupture of the Pectoralis Major Tendon: Comparison of Magnetic Resonance Imaging and Intraoperative Images

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The pectoralis major (PM) is an intricate anatomic structure. The muscle is divided anatomically into a clavicular and sternal head [1]. Notably, some authors describe a small, third abdominal head arising from the aponeurosis of the external oblique muscle [2] or from the fifth through seventh costal cartilages [3]. The clavicular head is composed of a single muscle segment, whereas the sternal head is composed of 6-7 separate muscle segments [1]. The sternal head constitutes approximately 80% of the PM muscle [1] (Figure 1).

In addition to having complex muscle architecture, the tendon is bilaminar, with anterior and posterior layers/lamina [1,2]. The anterior layer/lamina is formed by contributions from the entire clavicular head and upper sternal muscle fibers and inserts onto the humerus slightly more distal than the posterior layer/lamina [1,2]. The posterior layer is formed by contributions from the short, lowermost sternal fibers and inserts onto the humerus slightly more proximal than the overlying anterior layer/lamina [1,2] (Figure 1). Notably, the anterior and posterior layers/lamina of the tendon are continuous inferiorly [1], resulting in a "J-shaped" structure.

On magnetic resonance imaging (MRI), the normal PM appears as a fan-shaped striated muscle [2]. These fibers extend to the myotendinous junction, where they form a low-signal-intensity fibrous tendon [2,3]. The tendon subsequently inserts onto the proximal humeral diaphysis, just lateral to the long head biceps tendon [3]. The quadrilateral space and deltoid tuberosity provide reliable superior and inferior anatomic landmarks [3].

This brief pictorial report is of a 43-year-old man who presented after the development of sudden-onset right shoulder pain while boxing. His MRI revealed a full-thickness distal tendon tear involving both the sternal and clavicular heads of the PM muscle (Figure 2). MRI findings were confirmed intraoperatively. For surgical
repair, 3 metal anchors were placed in the lateral aspect of the bicipital groove, and the 6 sutures from the anchors were placed in a locked fashion in the tendon (Figure 3).

PM tear is a rare diagnosis [2,3]. In 2012, ElMaraghy and Devereaux [1] identified 365 cases of PM tears reported in the literature between 1822 and 2010, with 76% reported between 1990 and 2010. This recent rise in incidence is believed to be due to the increasing number of high-performance athletes [1-5]. The injury occurs almost exclusively in men [1,3,4], with a reported age range of 14-97 years [1].

PM tears ordinarily occur during eccentric loading of weight lifting, particularly during the deep part of the bench press exercise [1-5]. Tears have also been described in waterskiing, wrestling, wind surfing, and football/rugby injuries and as a result of other types of trauma [2,4,5].

PM tears result in immediate pain in the arm and shoulder, often accompanied by an audible pop. Edema and ecchymosis within the proximal arm frequently follow [2,3]. MRI is used to determine the location and extent of injury, because edema and pain can make the clinical diagnosis challenging [3,5]. Ultrasound has also been advocated in the evaluation of PM tears [6] but requires an experienced operator. Partial-thickness tears occur more frequently than full-thickness tears. Eccentric loading injuries result in a predictable tear pattern, usually originating in the lower sternal head and extending superiorly to involve the clavicular head, with increasing severity. This predictable pattern of tear may be the result of the increased angle (relative to the long axis of the muscle) and shorter length of the lower sternal muscle segments, rendering this region of the PM more susceptible to injury during eccentric contraction [1]. As such, sternal head injuries are more common than those involving the clavicular head [1-4].

Injuries involving the tendon or myotendinous junction are treated with early surgical repair to minimize atrophy, adhesion formation, and muscle retraction [3]. Conservative treatment is used for small partial-thickness tears, inactive and/or older patients, and patients with rare intramuscular crush injuries [2,4]. Postoperative rehabilitation focuses on early elbow exercises, followed by isometric rotator cuff and PM strengthening with the shoulder in neutral rotation and passive external rotation [5]. Progressive recovery may

Figure 2. A 43-year-old man with a full-thickness tear of the distal pectoralis major tendon. Axial and coronal short tau inversion recovery magnetic resonance images demonstrate the torn and retracted sternal (A and B, curved arrow) and clavicular heads (C and D, straight arrow). D = deltoid; H = humerus; asterisk = right lung.
continue, on average, for up to 2 years from the time of surgery [5].

References


Disclosure

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