

Complete Avulsion of the Pectoralis Major Tendon: a Case Report

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Abstract

Rupture of the pectoralis major muscle is a rare injury, usually occurring during sports activities or after direct trauma. This article describes the clinical presentation, diagnostic tools and treatment of a patient with a complete avulsion of the pectoralis major tendon.

Key Words

Pectoralis major muscle rupture · Trauma

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Introduction

Pectoralis major rupture is a rare injury, usually occurring during sports activities. While partial ruptures can be managed with conservative treatment, complete ruptures require surgical therapy for full recovery. We present a case of a patient with a complete pectoralis major muscle rupture after direct trauma, and review the current literature on diagnosis and treatment.

Case Report

A 74 year old, physically active man, without remarkable previous medical history, presented in the Emergency Department with severe pain in the right shoulder. He reported that he fell off a ship, landing on the quay on his right shoulder. On physical examination, there was an anterior hematoma of the affected side and an asymmetrical chest wall muscle contour, with a visible defect of the right anterior axillary fold (Figure 1). Shoulder movements were painful and

range of motion was restricted. Roentgenograph did not show any bone abnormality. Ultrasound revealed a large hematoma in the area of the musculotendinous junction of the pectoralis major; the tendon of the muscle could not be clearly identified (Figure 2). Similar findings were described on magnetic resonance imaging (MRI), showing a hematoma in the anterior axillary fold and medial retraction of the muscle (Figure 3); the pectoralis major tendon could not be identified at the junction or at its insertion to the humerus (Figure 4). Furthermore, a significant amount of edema was seen near the humeral head, cranial to the expected site of insertion of the pectoralis major tendon.

A diagnosis of “traumatic rupture of the pectoralis major muscle” was made and surgery was performed 4 weeks after the injury. Under general anesthesia, the pectoralis major muscle was approached through a deltopectoral incision. A complete avulsion of the pectoralis major tendon from the insertion to the humerus was identified (Figure 5); the tendon was curled up in a subcutaneous cavity filled with serous fluid. Reattachment of the tendon was performed using four Mitek[®] G2 anchors (Johnson & Johnson Medical BV, Amersfoort, the Netherlands) and heavy nonresorbable, number two Ticron Bunnell sutures through drill holes in the humerus, just laterally from the bicipital groove (Figure 6).

The postoperative course was uneventful and the patient was discharged 2 days after surgery. His right arm was immobilized in a sling/collar and cuff for 4 weeks, with active and passive exercises limited to 60 degrees abduction. Active strengthening training was started 4 weeks after the procedure. Follow-up after 2 months and 1 year revealed an excellent

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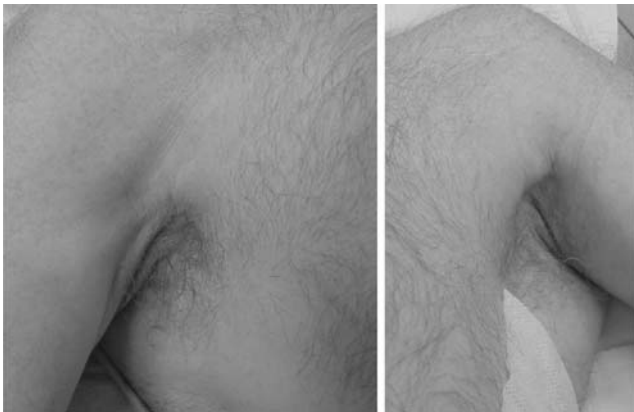


Figure 1. Visible defect of the right anterior axillary fold in a patient with complete avulsion of the pectoralis major muscle tendon, as compared to the unaffected left shoulder.

shoulder function, normal range of motion, symmetrical shoulder strength, minimal pain and satisfactory cosmetic results. The patient had resumed all his previous activities, including sailing.

Discussion

Rupture of the pectoralis major muscle is a rare injury. To our knowledge, only approximately 200 cases have been reported in the English literature [1, 2]. The pectoralis major is a broad, thick and fan-shaped muscle, originating from the anterior surface of the medial end of the clavicle, the lateral half of the sternum as low down as the cartilaginous attachments

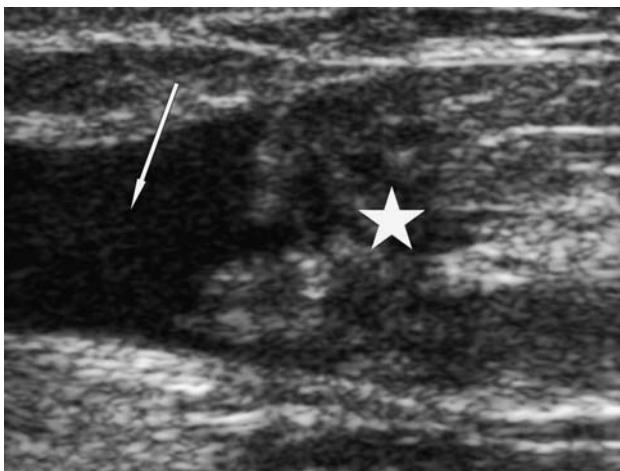


Figure 2. Axial ultrasound image of the pectoralis muscle at the level of the anterior axillary fold. There is a fluid collection seen (arrow) and, more medially, the retracted muscle together with the tendon (asterisk).

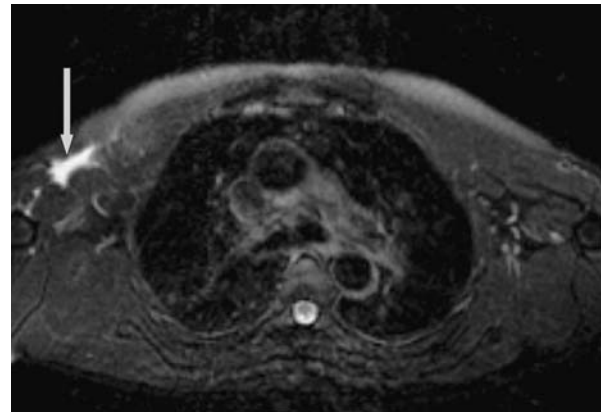


Figure 3. Axial T2-Fat Saturated Image of both shoulders. The discontinuity of the pectoralis muscle is seen on the right side together with the fluid collection (seroma/hematoma), which was seen with ultrasound (arrow).

of the sixth or seventh rib, the cartilages of all true ribs (with the exception, frequently, of the first or seventh), and from the aponeurosis of the obliquus externus abdominis. These various parts converge into a flat tendon, approximately 4–5 cm broad, inserting on the crest of the greater tubercle of the humerus. It is a powerful internal rotator, flexor and adductor of the arm, and gives form to the anterior chest wall and anterior axillary fold [3].

The majority of cases of pectoralis major rupture have been reported in young, male athletes, usually occurring during sports activities, especially weight training and weight lifting, bodybuilding, wrestling, and bench pressing [1, 4, 5]. The rupture often results from extreme muscle tension by overloading an maximally contracted pectoralis major with an external force that exceeds tissue tolerance [6]. A classic mechanism is bench pressing: when the arms are fully abducted and externally rotated, the pectoralis major can be under severe tension; either fatigue, an uncoordinated motion or a sudden forceful overload could overstress the muscle fibers and cause rupture [1, 5]. A comparable mechanism occurs when a person tries to break a fall with his arms. Furthermore, similar to this case, direct trauma to the shoulder region is also a known cause for this type of injury [1, 4]. In addition, several cases have recently been reported in elderly nursing home patients [7–9]; the injury was most probably caused when the patients were being dressed or transferred, where a sudden forceful movement of the often stiff and atrophic pectoralis major could lead to strain or rupture.

Rupture of the major pectoral muscle can be graded according to the classification of Tietjen based upon the extent and site of the injury [1, 10, 11]: type I

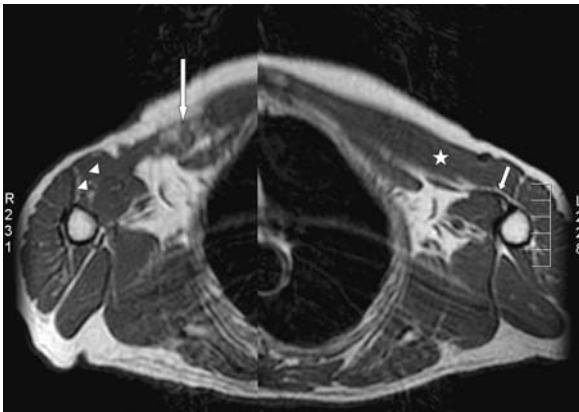


Figure 4. Composed axial T1-weighted image of the right and left shoulder. The injury to the pectoralis major muscle in the right shoulder is well appreciated (*longer white arrow*) compared to the uninjured left shoulder (*white asterisk*). In the uninjured shoulder the tendon of the pectoralis muscle is seen anterior of the coracobrachialis muscle (*short white arrow*); in the injured shoulder the tendon is absent and the normal fatplane is not seen (*arrowheads*).

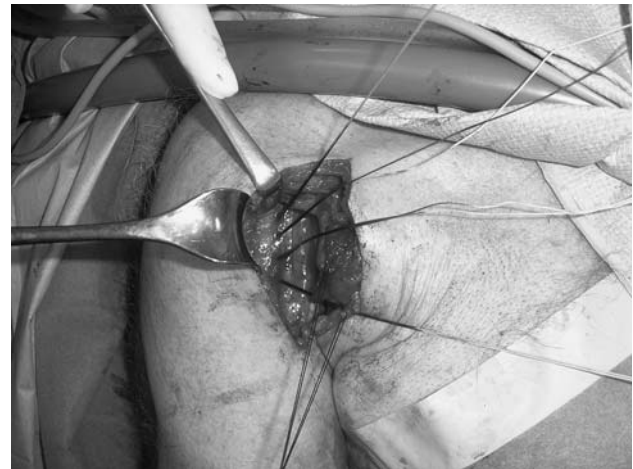


Figure 6. Four bone anchors and heavy, nonresorbable sutures have been placed through drill holes in the humerus, lateral to the long head of the biceps brachii muscle. The proximal end of the tendon of the ruptured pectoralis major muscle will then be approximated to the surface of the humerus.

consists of a simple contusion, type II of a partial rupture, and type III of a complete rupture of the pectoralis major. The anatomical site of the injury is subcategorized from A–D: category A describes a rupture at the origin of the muscle, category B a rupture in the muscle belly, category C is located at the musculotendinous junction and category D an avulsion of the tendon off the humerus. The most common sites of rupture are at the site of insertion on the humerus (58%) and at the musculotendinous junction (31%) [1]. According to the Tietjen classification, the patient described in this report had a type III-D rupture.



Figure 5. Exploration through a deltopectoral approach: absence of the pectoralis major muscle is noted; the long head of the biceps brachii muscle can be distinguished directly after incising the fascia.

Clinical presentation is characterized by severe pain and shoulder dysfunction [6]. On examination, swelling, ecchymosis and hematoma can be found, possibly extending from the anterior chest wall to the upper extremity [6]. In typical cases, there is a marked asymmetry of the anterior axillary fold with a visible defect on the affected side (Figure 1), due to retraction of the proximal part of the muscle when the rupture is complete. However, absence of such a defect offers no guarantee of an intact muscle or tendon; either edema, hematoma or an intact overlying fascia of the pectoral muscle could obscure this finding [4, 5, 12].

The severity of the injury cannot be determined based on history and physical examination alone. However, the distinction between a partial or complete rupture is of great importance for deciding optimal management. While conservative therapy is justified for partial ruptures [6, 13], early surgical management is recommended for a complete rupture [1, 2]. Additional investigations like roentgenography and ultrasonography can be helpful, but are usually inconclusive in determining the extent and site of injury. Recent data have shown that MRI can accurately differentiate between partial and complete ruptures of the major pectoral muscle [12, 14–17]. In two studies where MRI images were compared to intraoperative findings, no false positives were found in the case of complete ruptures [15, 16]. Even though these two series only report the results of 25 patients, due to the rareness of the injury it does represent more than ten percent of all reported cases in the literature.

For similar reasons, prospective randomized trials on treatment of this injury are not available. Nevertheless, there is general consensus that complete (or near complete) type III ruptures of the pectoralis major should undergo surgical treatment [1, 2, 6]. Conservative management may lead to loss of shoulder strength, loss of range of motion and poor cosmetic results. Especially in athletic patients, operative management is essential for full recovery of shoulder strength and full range of motion of the upper extremity. Furthermore, reinsertion of the tendon or suturing of the pectoralis major rupture within 3 [2] to 8 weeks [1] offers significant better results when compared to late surgical management or conservative treatment [1, 2, 6].

The pectoralis major muscle is explored through a deltopectoral approach. Depending on the type and site of injury, surgical repair can be performed either by reinserting the avulsed tendon on its site of insertion on the humerus, or suturing of the muscle or tendon rupture. Reattachment of an avulsed tendon can be performed by using heavy, nonresorbable sutures through drill holes or bone anchors in the humerus. Ruptures of the musculotendinous junction is usually managed by an end-to-end repair with mattress sutures. Postoperative rehabilitation should include immobilization and passive exercises in the first weeks after surgery, before active shoulder strength training is begun. Long-term results after surgical treatment are good. Full recovery of shoulder strength and range of motion can be expected, independent of the age of the patient and type of rupture [1, 2].

Conclusion

Rupture of the pectoralis major muscle is a rare injury. The distinction between partial and complete rupture is essential for optimal treatment selection, as is the exact location of the rupture. MRI plays an important role in the diagnosis. Partial ruptures can be managed conservatively. Complete ruptures should undergo early surgical therapy, after which full recovery of shoulder strength and range of motion can be expected.

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